9-1-1996

Blinding Laser Weapons: New Limits on the Technology of Warfare

Ann Peters

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I. INTRODUCTION

Laws of armed conflict provide civilization with the tools to overcome barbarity and to limit the destructiveness of warfare. Even before the nineteenth and twentieth centuries, tribes, states and religions rejected the use of particular weapons and tactics. The ancient Laws of Manu prohibited Hindus from using poisoned arrows; the Lateran Council in the Middle Ages declared the crossbow an unchristian weapon.[1] The greater good of all human beings may not have been the only motivation for prohibiting particular weapons. A "mixture of self-interest [the self-interest characteristically of a certain superior class or caste] and selective humanitarianism" may also have motivated such prohibitions.[2] In either case, these prohibitions provide a foundation for the principles, laws and agreements that the international community has

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1. DOCUMENTS ON THE LAWS OF WAR 29 (Adam Roberts & Richard Guelff eds., 2d ed. 1989) [hereinafter WAR LAWS DOCUMENTS]; *see also* THE LAW OF WAR: A DOCUMENTARY HISTORY 3-5 (Leon Friedman ed., 1972) [hereinafter A DOCUMENTARY HISTORY]. Commentators have questioned whether the real motivation behind these ancient prohibitions of particular weapons or tactics was to reduce political or economic risks to persons in power. For example, the Church supposedly declared the crossbow as "odious to God" to protect its patron class because peasants used crossbows to attack knights and nobles at long range: Chris af Jochnick & Roger Normand, *The Legitimation of Violence: A Critical History of the Laws of War*, 35 HARV. INT'L L.J. 49, 61 & nn.41-43 (1994); *see also* Judith G. Gardam, *Proportionality and Force in International Law*, 87 AM. J. INT'L L. 391, 395 n.27 (1993) (citing JAMES T. JOHNSON, JUST WAR TRADITION AND THE RESTRAINT OF WAR at xxiii, 128-39 (1981)).

2. GEOFFREY BEST, WAR AND LAW SINCE 1945, at 293 (1994).

adopted to set limits on the weapons and tactics of war.

During the last decade, the military use of lasers has come under increasing scrutiny. One of the first military applications of laser technology came in the mid-1960s when lasers were used to calculate the distance to a target.[3] Today, many armored fighting vehicles, helicopters, ships and aircraft have fire control systems that include laser rangefinders or target designators to guide missiles, bombs or rockets to their targets. Small hand-held laser rangefinders are also in service. Furthermore, lasers are used in weapon training simulation, communication, guidance and radar systems.[4]

The use of lasers as weapons against the human eye, however, is distinct from these non-weapon military applications of laser technology.[5] More than two decades ago, the United States entered the field of tactical laser weapons development. It strenuously resisted any restrictions on this new generation of conventional weapons until late 1995, shortly before the international community banned the use and transfer of certain blinding laser weapons through its adoption of Protocol IV, the Protocol on Blinding Laser Weapons (Protocol IV), at the first Review Confer-

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3. Scientific work during the 1950s led to the invention of the laser. BENGT ANDERBERG & MYRON L. WOLBARSHT, LASER WEAPONS: THE DAWN OF A NEW MILITARY AGE 12-13, 43 (1992). Field-deployed rangefinders from several countries were seen as early as the mid-1960s. *Id.* at 4, 12-14. During the 1970s, military planners began to focus more on this technology, with an eye toward the possible development of laser weapons. *Id.* at 14, 43. *See also* OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION & TECHNOLOGY, U.S. DEP'T OF DEFENSE, FY96 ELECTRONIC WARFARE PLAN (1995) [hereinafter ELECTRONIC WARFARE PLAN] (giving several examples of laser technology: laser rangefinders, target designators, guided missiles, laser pulse jamming techniques, laser warning devices, electro-optic countermeasures and infrared countermeasures).

4. ANDERBERG & WOLBARSHT, *supra* note 3, at 5.

5. Human Rights Watch Arms Project uses the term "tactical laser weapons" to distinguish low-energy laser weapon systems from high-energy or non-weapon laser systems. High-energy lasers are associated with ballistic missile defenses as well as the Reagan Administration's "Star Wars" concept articulated in 1983. Non-weapon laser systems include laser rangefinders and target designators. *See United States: U.S. Blinding Laser Weapons*, HUM. RTS. WATCH ARMS PROJECT (Human Rights Watch, New York, N.Y.), May 1995, at 3-4 [hereinafter *U.S. Blinding Lasers*]; *Blinding Laser Weapons: The Need to Ban a Cruel and Inhumane Weapon*, HUM. RTS. WATCH ARMS PROJECT (Human Rights Watch, New York, N.Y.), Sept. 1995 [hereinafter *Blinding Laser Weapons*]. "Laser weapons use the laser beam as a weapon, not as an aid to another weapon. The distinction between tactical laser weapons, and laser rangefinders and target designators is in the function, mission or intent. Tactical laser weapons should be defined as *weapons that use a laser beam as the primary kill mechanism*." *Id.* at 24.

ence of the 1980 Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (CCW).[6]

The international ban on laser weapons is a landmark decision, reaffirming that weapons that cause unnecessary suffering are not to be used in war. While the use of a few weapons has been prohibited since the 1868 ban on exploding projectiles, the ban on blinding laser weapons marks the first time in more than 100 years that use of a specific weapon has been banned *before* its widescale deployment.[7] Furthermore, the ban represents the first time ever that both *use and transfer* of a prohibited conventional weapon have been outlawed.[8]

Protocol IV, its negotiating history, and its possible interpretations evidence how the military and politicians may respond to international efforts to prohibit or restrict weapons and methods of warfare through internationally recognized principles and agreements. For example, the language of Protocol IV may be interpreted to undermine the principles upon which it is based and the spirit behind its prohibitions. A high-level U.S. legal memorandum, which was written after Protocol IV's adoption, shows how the military may attempt to circumvent Protocol IV and use blinding laser weapons.[9] One of the most disturbing statements in

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6. *See Additional Protocol to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Protocol on Blinding Laser Weapons (Protocol IV)*, CCW/CONF.I/7 (Oct. 12, 1995) [hereinafter *Protocol IV*]. The Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (CCW) is more commonly referred to as the Convention on Conventional Weapons or the Inhumane Weapons Convention. The first CCW Review Conference adopted Protocol IV on October 13, 1995. Twenty countries must consent to be bound by Protocol IV before it enters into force. Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, *opened for signature* Apr. 10, 1981, art. 5, para. 3, 19 I.L.M. 1524, 1526 [hereinafter CCW].

7. *The Vienna Review Conference: Success on Blinding Laser Weapons but Deadlock on Landmines*, INT'L REV. RED CROSS (Int'l Comm. of the Red Cross, Geneva, Switz.), Nov.-Dec. 1995, at 672, 676-77.

8. *Id.*

9. Memorandum from W. Hays Parks, Special Assistant for Law of War Matters, Office of the Judge Advocate General, U.S. Department of the Army, on Effect of Laser Protocol on U.S. Army Programs to Major Kilgallin (Nov. 1, 1995) [hereinafter Effect of Laser Protocol Memo]. The memorandum is described as a "preliminary analysis," but it is signed for the Judge Advocate General. No other analysis had been made public by

the memorandum is that the State Parties sought to prohibit only mass blinding of combatants, not the blinding of individuals.[10] Such an interpretation, although subsequently dismissed by U.S. Secretary of Defense William Perry,[11] may give credence to a more cynical, or some would say realistic, interpretation of the laws of armed conflict. In short, such an interpretation concludes that more elaborate legal agreements develop "apace with the increasing savagery and destructiveness of modern war."[12] Others view the purpose of the laws of armed conflict, however, as "almost entirely humanitarian in the literal sense of the word, namely, to prevent or mitigate suffering and, in some cases, to rescue life from the savagery of battle and passion."[13]

Military applications of laser technology are not confined to military use. U.S. law enforcement has considered use of the technology under the rubric of less-than-lethal force.[14] Through a memorandum of understanding between the Department of Defense and the Department of Justice, civilian law enforcement now has the opportunity to gain such military technology. Law enforcement's concerns in deciding whether to use particular weapons and tactics differ from the military's considerations.

May 1996. *See also* Letter from Patrick Leahy, Senator, and Lane Evans, Member of Congress, to William J. Perry, Secretary of Defense (Apr. 18, 1996) [hereinafter Letter to Perry].

10. Effect of Laser Protocol Memo, *supra* note 9.

11. Letter from William J. Perry, Secretary of Defense, to Lane Evans, Member of Congress (May 8, 1996) [hereinafter Letter to Evans]. Secretary Perry unequivocally stated that both the CCW and the Department of Defense policy prohibited the use of laser weapons designed specifically to cause permanent blindness against an individual combatant. *Id. See also infra* notes 115-125 and accompanying text.

12. Jochnick & Normand, *supra* note 1, at 55.

13. Hersch Lauterpacht, *The Problem of the Revision of the Law of War*, 1952 BRIT. Y.B. INT'L L. 360, 363-64.

14. "Less-than-lethal force" is only one name given to this type of technology. Other names include non-lethal, less-lethal and non-lethal force, and soft-kill, pre-lethal and disabling technologies. *See, e.g.*, Jon B. Becker & Charles Heal, *Less-Than-Lethal Force: Doctrine Must Lead the Technology Rush*, JANE'S INT'L DEF. REV., Feb. 1996, at 62. The U.S. Department of Defense and other militaries generally have used the term "non-lethal." U.S. Department of Defense, Draft Non-Lethal Weapons Policy (July 21, 1994); *see also* Christopher Parent, *Draft Policy Directive Spells Out DOD's Rules for Non-lethal Weapons*, INSIDE PENTAGON, July 13, 1995, at 1; Barbara Starr, *USA Defines Policy on Non-lethal Weapons*, JANE'S DEF. WKLY., Mar. 6, 1996, at 6; COUNCIL ON FOREIGN RELATIONS, NON-LETHAL TECHNOLOGIES: MILITARY OPTIONS AND IMPLICATIONS: REPORT OF AN INDEPENDENT TASK FORCE 12 (1995). Laser weapons have been included and excluded from the category of less-than-lethal technologies or non-lethal weapons. For a brief discussion of this issue, see *Blinding Laser Weapons*, *supra* note 5, at 14-15.

There is, however, one common underlying issue: whether the military or law enforcement should use a weapon that specifically targets a part of the body, particularly the eye.

This Article aims to provide an understanding of the critical issues that arise in the development, production and use of laser weapons, whether by the soldier, the peacekeeper, the prison guard, or the police officer. Specifically, this Article focuses on tactical laser weapons that can be directed against the eyes of an individual and whose function is to target sight. Part II of this Article examines the physical characteristics of lasers in general and details the development of tactical laser weapons, particularly within the U.S. military. Part III provides background on the 1995 international ban on certain blinding laser weapons and looks at efforts to better define "unnecessary suffering" and "superfluous injury." Further, Part III considers the status of laser weapons during armed conflicts under international law and the international ban. Part IV briefly highlights the possible use of laser weapons by civilian law enforcement agencies. Particular non-weapon laser technology, whether in the military or law enforcement context, may make the weapons and force used more discriminate, but blinding tactical laser weapons that are directed against the human eye have no place in armed conflicts or in police operations. Use of these weapons violates the basic principle against unnecessary suffering to combatants, as well as basic ethical considerations in the treatment of suspects. The ban on blinding laser weapons, countries' statements in support of more comprehensive measures to prohibit blinding as a method of warfare, and state practice support this new agreement to ban certain blinding laser weapons, which builds upon the fundamental humanitarian principles within the laws of armed conflict.

II. LASER WEAPONS AND THEIR DEVELOPMENT IN THE UNITED STATES

A. The Operation of Lasers

Laser is an acronym for "light amplification by the stimulated emission of radiation." The eye is the organ that is most sensitive to a laser's rapid effect.[15] The extent of damage depends primari-

15. *See, e.g.*, BLINDING WEAPONS: REPORTS OF THE MEETINGS OF EXPERTS CONVENED BY THE INTERNATIONAL COMMITTEE OF THE RED CROSS ON BATTLEFIELD

ly on the wavelength and energy or power level used.[16] Particular lasers may damage the eye in less than a fraction of a second.[17] The eye sees the light coming from a point source and focuses the laser beam onto the retina, the most sensitive part of the eye.[18] When a person uses direct-view optics, such as binoculars, the potential for damage and blindness is greater because the optics collect more light together, and thus, magnify the laser's intensity.

The laser beam is silent and the energy within it moves at the speed of light.[19] It is possible to design lasers that emit energy at several wavelengths simultaneously, making it difficult to develop protective measures.[20] One disadvantage of tactical laser weapons is that they are line-of-sight weapons and thus their use in military operations is limited.

Lasers may be classified into at least four power level categories.[21] The lowest Class I lasers are intrinsically safe. They include bar-code readers in supermarket checkout counters and compact disc players.[22] The highest Class IV lasers can damage eyes, as well as burn skin, cloth and other materials, depending on the exposure time.[23] It may not be safe even to view the lasers' diffuse reflections. Class IV lasers include surgical lasers and lasers with potential military applications.[24] At least two U.S. laser weapon systems—the LCMS and Dazer—use Class IV lasers.[25] The Chinese laser weapon system, the ZM-87, is advertised as having a peak output of fifteen megawatts,[26] and experts believe

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LASER WEAPONS 1989-1991, at 29-37, 97-99 (Louise Doswald-Beck ed., 1993) [hereinafter ICRC REPORT ON BLINDING WEAPONS]; ANDERBERG & WOLBARSHT, *supra* note 3, at 71-73, 90-94, 145-154; Bengt Anderberg, *The Low-Energy Laser Aimed at the Eye as Potential Personnel Weapon*, 1988 RUSI J. 35, 36.

16. Anderberg, *supra* note 15, at 36.

17. *See* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 30.

18. Anderberg, *supra* note 15, at 36.

19. *See* ANDERBERG & WOLBARSHT, *supra* note 3, at 21-25.

20. *See id.*

21. *See generally id.* at 24-25; Malcolm W. Browne, *Lasers for the Battlefield Raise Concern for Eyesight*, N.Y. TIMES, Apr. 26, 1988; ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 102-112.

22. *See* ANDERBERG & WOLBARSHT, *supra* note 3, at 24.

23. *Id.* at 4, 81.

24. *Id.* at 24-25.

25. *See* William Arkin, *Ban on Tactical Laser Weapons, DoD Maintains Blinding is Not Violation of War*, DEF. NEWS, July 17-23, 1995, at 20.

26. China North Industries Corporation, ZM-87 Portable Laser Disturber Fact Sheet (on file with the *Loyola of Los Angeles International and Comparative Law Journal*) [hereinafter ZM-87 Fact Sheet].

that it also uses a Class IV laser.

By comparison, lasers operate either at in-band or out-of-band wavelengths. Lasers operating at in-band wavelengths are within the visible and near-infrared range, approximately 400 to 1400 nanometers.[27] This range is sometimes referred to as the retinal hazard zone.[28] Lasers operating at in-band wavelengths produce the most severe eye damage, including blindness. The energy in the visible and near-infrared range easily penetrates the cornea and the lens and is absorbed at the retina, the most sensitive part of the eye.[29] Low-energy lasers operating in the visible or near-infrared part of the spectrum are able to "damage [a person's] eyes and, in effect, cause blindness."[30] Many laser rangefinder and target designator field systems operate at 1064 nanometers, such as the rangefinder on the M1 Abrams tank and the AH-64 Apache Target Acquisition and Designation System.[31] By comparison, the Dazer weapon system operates at 755 nanometers, and the Saber 203 visible laser illuminator operates in the upper 600 nanometers.[32]

Lasers operating at out-of-band wavelengths are within the far-infrared and ultraviolet ranges. The energy in the far-ultraviolet and far-infrared range is absorbed or reflected at the surface, though the energy may still damage the cornea. The energy in the near-ultraviolet range penetrates the lens and may penetrate the retina. Lasers operating at out-of-band wavelengths can also cause eye damage, affecting the cornea more often than the retina. Such lasers cause extremely painful injuries that instantly incapacitate a person and require immediate medical care.[33]

B. The Development of Laser Weapons

After decades of research and development in laser weapons and years of opposition to any regulation of these weapons, the U.S. Department of Defense announced its policy on laser weapons in September 1995. The new policy prohibited "the use of lasers

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27. *See* Anderberg, *supra* note 15, at 36-37; ANDERBERG & WOLBARSHT, *supra* note 3, at 71-73, 150.

28. Anderberg, *supra* note 15, at 36.

29. *Id.*

30. ANDERBERG & WOLBARSHT, *supra* note 3, at 2.

31. *Blinding Laser Weapons*, *supra* note 5, app. 3.

32. *Id.*

33. Anderberg, *supra* note 15, at 36-37; Bengt Anderberg & Ove Bring, *Battlefield Laser Weapons and International Law*, 1988 NORDIC J. INT'L L. 457, 461.

specifically designed to cause permanent blindness of unenhanced vision" and supported international negotiations to accomplish that end.[34] In explaining the policy, a spokesman said that Secretary of Defense William Perry "felt strongly that we should take a lead role . . . by swearing off the development and use of lasers intentionally designed to blind people."[35] Senior Pentagon officials said that the policy statement was a major shift in U.S. Department of Defense policy and was intended to establish the unacceptability of blinding as a method of warfare.[36]

The Department of Defense policy marked a turning point for the United States, which had steadfastly opposed any restrictions, let alone a ban, on laser weapons during international negotiations leading to the first Review Conference of the CCW. Between 1975 and 1976, U.S. defense manufacturers began development of specific tactical laser weapon systems when Martin Marietta and Sanders Associates, now Lockheed Sanders, received military contracts to develop laser weapon systems for attack helicopters.[37] Subsequent technological developments focused on ground-based laser weapons and moved to hand-held systems. Martin Marietta developed the vehicle-mounted Stingray laser weapon system and its outgrowth, Outrider, for the Army and the Marine Corps. Meanwhile, three other companies competed to develop a portable tactical laser weapon: Allied-Signal developed Dazer; McDonnell-Douglas developed Cobra; and Lockheed Sanders developed the Laser Countermeasure System (LCMS).[38] Ultimately, the LCMS became the Army's most advanced portable tactical laser weapon system. In 1995, the LCMS came under some of the closest

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34. Office of Assistant Secretary of Defense, U.S. Department of Defense, News Release, DoD Announces Policy on Blinding Lasers (Sept. 1, 1995).

35. Kevin H. Bacon, Department of Defense News Briefing (Oct. 12, 1995) (Defenselink Transcript).

36. *Blinding Laser Weapons*, *supra* note 5, at 5.

37. *U.S. Blinding Lasers*, *supra* note 5, at 4. Flight tests for the Lockheed prototype, the ALQ-169 Optical Warning Location/Detection device, began in 1980, but the program was cancelled in 1986. *See* FORECAST INT'L, ELECTRONIC WARFARE: AIRBORNE ELECTRO-OPTICAL COUNTERMEASURES, FORECAST INTERNATIONAL/DMS MARKET INTELLIGENCE REPORT (1993). The tank- and helicopter-mounted C-CLAW, or Close Combat Laser Assault Weapon, was developed in the early 1980s, but it was cancelled in 1983. *See id*; *see also* Jeff Hecht, *Lasers Designed to Blind*, NEW SCIENTIST, Aug. 8, 1992, at 27, 28.

38. *U.S. Blinding Lasers*, *supra* note 5, at 5.

scrutiny of all U.S. tactical laser weapons programs.[39]

While U.S. military studies supported the development of tactical laser weapons as "highly effective force multipliers,"[40] the military also raised questions about the use of such systems against the human eye. In the late 1970s, U.S. intelligence reported on Soviet interest in tactical laser weapons and warned of the dangers of blinding by lasers.[41] During the Reagan administration, Secretary of Defense Caspar Weinberger again raised concerns about the use of blinding lasers and condemned the possible Soviet development of such laser weapons. Secretary Weinberger said that the Soviets had the technological capability to deploy low-power laser weapons "at least for [anti-personnel] use and against soft targets."[42] At that time, U.S. military officials did not distinguish between the possible use of laser weapons against soldiers' "unenhanced" and "enhanced" vision. One of their conclusions was simply that the "morale problems from battlefield lasers are horrendous."[43]

In 1989, the United States and the Soviet Union signed a bilateral agreement to prevent so-called dangerous military activities, including laser use that might harm personnel or damage equipment of the other party's armed forces.[44] Although the agreement was limited to peacetime activities, it revealed both the

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39. In May 1995, Human Rights Watch publicly detailed for the first time ten U.S. tactical laser weapons programs. *Blinding Laser Weapons*, *supra* note 5, at 4 (citing *U.S. Blinding Lasers*, *supra* note 5). At least five of those systems—LCMS, Stingray, Outrider, Dazer and Cobra—already had been introduced into prototype form and were available for use in certain circumstances. *Id.* Subsequently, Human Rights Watch identified six additional laser weapon programs in U.S. military laboratories, a Marine Corps "validated requirement" for a laser weapon, and several other laser systems "whose blinding effects or potential for collateral damage [was] unclear, but [bore] further investigation." *Id.*

40. *U.S. Blinding Lasers*, *supra* note 5, at 4 (citing CONCEPTS ANALYSIS AGENCY, U.S. DEP'T OF THE ARMY, STUDY REPORT CAA-SR-80-8, MILITARY IMPLICATIONS OF LASER EMPLOYMENT BY THE SOVIETS (MILES) (1981); TRADOC SYSTEMS ANALYSIS AGENCY, U.S. DEP'T OF THE ARMY, TRASANA TR-33-83, FORWARD AREA DIRECTED ENERGY WEAPONS (FADEW) STUDY (1983)).

41. *Id.*

42. George C. Wilson, *Pentagon Annual Says Soviets Able to Deploy Blinding Laser Weapons*, WASH. POST, Mar. 25, 1987, at 1; Warren Strobel, *Pentagon Accelerates Counter-Laser Studies*, WASH. TIMES, Oct. 15, 1987. The Pentagon accelerated research in countering laser attacks because it faced a growing number of incidents in which the Soviets had turned an experimental shipborne laser on Western military personnel and equipment. Wilson, *supra*, at 1, 6.

43. Wilson, *supra* note 42, at 1.

44. Agreement on the Prevention of Dangerous Military Activities, June 12, 1989, U.S.-U.S.S.R., 28 I.L.M. 877 (entered into force Jan. 1, 1990).

serious threat of lasers and the strong interest in tactical laser weapons development.[45] In spite of the treaty, four laser incidents involving Soviet ships and U.S. aircraft were reported in October and November 1989, including one situation that resulted in "visual injury" to a U.S. crew member.[46]

According to the Department of Defense's Fiscal Year 1996 Electronic Warfare Plan, thirty countries are involved in the military use of lasers, which includes non-weapon system laser rangefinders and target designators.[47] These countries have laser research programs "either in the form of a domestic development program or through the acquisition and application of commercially available technologies."[48]

Modifications to laser rangefinders and target designators render any laser a potential weapon, making the eyesight of individuals and optical devices "especially vulnerable."[49] Many low-energy lasers are readily available on the commercial market, and most of them "present a danger to the unaided human eye and [electro-optical] sensors at a range out to [three nautical miles]," which is roughly equal to three miles.[50] The Department of Defense Electronic Warfare Plan concluded that "[low-energy lasers] can damage eyes and sensors, disrupt a pilot's attention from flight instruments and obscure the scene outside the cockpit, and degrade weapon system sensors. Iran, Iraq, Libya, North Korea, and Syria are believed to have genuine interest in converting commercial-grade lasers into antihuman/[electro-optical] sensor

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45. ANDERBERG & WOLBARSHT, *supra* note 3, at 214. A 1987 Pentagon report catalogues one particular incident involving a Soviet ship and two U.S. military aircraft. *Id.* at 142-43. The Defense Intelligence Agency claimed that a co-pilot was impaired for ten minutes, and U.S. authorities publicly said that a laser was involved. *Id.* Two experts on lasers and their effects on the eye, however, have questioned the exact nature of the injury and the incident. *Id.* Although flash blinding without damage is only possible when the eye is adapted to the dark, the light affected no other crew member, and no other crew member reported indirectly viewing a bright light on the ship. *Id.* At least two U.S. service personnel received laser injuries in separate incidents during the Gulf War against Iraq. *See* Thomas H. Mader et al., *Ocular and Ocular Adnexal Injuries Treated by United States Military Ophthalmologists During Operations Desert Shield and Desert Storm*, 100 OPHTHALMOLOGY 1462 (1993); *Blinding Laser Weapons*, *supra* note 5, at 20-21.

46. ANDERBERG & WOLBARSHT, *supra* note 3, at 144.

47. ELECTRONIC WARFARE PLAN, *supra* note 3, at 2-13.

48. *Id.*

49. U.S. Marine Corps, Mission Need Statement (MNS) for the Active Laser Countermeasure System (ALCS) (No. Log 47) (on file with the *Loyola of Los Angeles International and Comparative Law Journal*) [hereinafter Mission Need Statement].

50. ELECTRONIC WELFARE PLAN, *supra* note 3, at 2-13.

weapons."[51]

At a 1995 weapons exhibition, China North Industries Corporation, or Norinco, marketed a portable, tripod-mounted "laser disturber" known as the ZM-87. In describing its applications, sales literature said that the laser weapon could "injure or dizzy" eyes and damage photo-electric optical sensors.[52] Officials in the Pentagon's Directorate for Combating Terrorism believed that the ZM-87 was aimed at buyers from Third World "rogue states," though it was unclear why a distinction between so-called rogue states and any other country or non-state entity was necessary.[53]

The U.S. Marine Corps appears acutely aware of the problem of laser weapons' proliferation. In its analysis of the threats from opponents' lasers, it noted: "Marines using binoculars, laser rangefinders and laser target designators now risk permanent blindness if they employ these devices toward the enemy [because] [e]nemies employing frequency agile lasers can deny us use of our optical devices and the ability to look directly toward the enemy."[54]

According to some estimates, by 1995, the United States had spent more than $400 million on research and testing of tactical laser weapons, but had not fully fielded a single system.[55] Development and production of tactical laser weapons advanced through 1995, even as the United States undertook a review of its policy and prepared for the CCW Review Conference, which led to Protocol IV's ban on blinding laser weapons. In the course of less than two months, the United States contracted to produce its most advanced tactical laser weapon, the LCMS, and then cancelled the program. On August 31, 1995, the day before the Department of

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51. *Id.*

52. Peter Felstead, *China Markets Blinding Laser*, JANE'S INTELLIGENCE REV. POINTER, June 1995, at 1; ZM-87 Fact Sheet, *supra* note 26.

53. Nick Cook, *Chinese Laser 'Blinder' Weapon for Export*, JANE'S DEF. WKLY., May 27, 1995, at 3.

54. Mission Need Statement, *supra* note 49.

55. *Blinding Laser Weapons*, *supra* note 5, at 4. In 1994, Brigadier General Jack Nix, Jr., assistant commandant for the U.S. Army Infantry School, stated, "[O]ur country has allocated resources to support testing and to write requirements that have resulted in the spending of hundreds of millions of dollars. Nevertheless, except for the two Stingray Systems that were taken to Desert Storm and have since been disassembled, we have not fielded any systems." Jack Nix, Jr., Keynote Speech at the Fifteenth Annual Lasers on the Modern Battlefield Conference (Feb. 28, 1994).

Defense issued its policy statement, the military awarded a $16.8 million contract to Lockheed Sanders, Inc. of Nashua, New Hampshire for the production of fifty actual and twenty-five low-power training units of the LCMS.[56] The contract was part of a $275 million program that called for procurement of approximately 2500 of the systems, each costing between $85,000 and $100,000.[57] The development of specific tactics and doctrine regarding tactical laser weapons was still in "the planning stages" during this time,[58] even though the military should have been aware of the need to implement specific guidelines for such controversial weapon systems well in advance of production. The Deputy Secretary of Defense subsequently ordered the termination of the LCMS program on October 5, 1995,[59] while U.S. delegates to the CCW Review Conference were finalizing the terms of a blinding laser weapons protocol, which they had helped to limit despite calls by other countries, including NATO allies, for more comprehensive measures.

III. INTERNATIONAL LAW AND BLINDING LASER WEAPONS

The modern basis for outlawing particular weapons and methods of warfare rests on several pillars. First, parties to a conflict do not have unlimited discretion in their choice of means and methods of warfare. Second, parties are not prohibited from using means and methods of warfare that are of a nature to cause superfluous injury or unnecessary suffering. Third, the military must not use a weapon or method of warfare when humanitarian considerations outweigh its military necessity. Fourth, the dictates of established custom, humanity and public conscience, known as the Martens Clause, ensure that particularly abhorrent weapons are

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56. *Blinding Laser Weapons*, *supra* note 5, at 9.

57. Letter from Michael W. McKinney, U.S. Department of the Army, to David Isenberg, *America's Defense Monitor* (Aug. 2, 1995); *Blinding Laser Weapons*, *supra* note 5, at 9.

58. Letter from Gilbert F. Decker, Assistant Secretary of the Army, Research, Development and Acquisition, to Joost Hiltermann and Stephen Goose, Human Rights Watch Arms Project (July 7, 1995).

59. Memorandum from the Secretary of the Army on Termination of the Laser Countermeasure System to the Deputy Secretary of Defense (Oct. 5, 1995). *See infra* note 114 for excerpts from a draft blinding laser weapons protocol that was submitted to the CCW Review Conference after preparatory meetings ended in January 1995.

not used, even if no specific prohibitions exist.[60] These four pillars are intended to safeguard combatants. The underlying principle is that the actual conduct of armed conflicts warrants assessment and regulation.[61] Specific prohibitions or restrictions follow from this principle.

The St. Petersburg Declaration of 1868 (St. Petersburg Declaration), which is regarded as the first major international agreement to prohibit the use of a particular weapon in warfare,[62] banned the use of explosive projectiles weighing less than 400 grams.[63] Projectiles of more than 400 grams were not less lethal, but those under that weight caused excessive damage. Not to detract from this prohibition, the importance of the St. Petersburg Declaration is often acknowledged as lying more in its preamble than in its specific provisions. The international Military Commission that assembled at St. Petersburg agreed to fix "the technical limits at which the necessities of war ought to yield to the requirements of humanity."[64] The prohibition was justified by the following principles:

> That the progress of civilization should have the effect of alleviating as much as possible the calamities of war;

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60. The Preamble to Hague Convention (IV) Respecting the Laws and Customs of War on Land contains the provisions of the Martens Clause:

> Until a more complete code of the laws of war has been issued, the High Contracting Parties deem it expedient to declare that, in cases not included in the Regulations adopted by them, the inhabitants remain under the protection and the rule of the principles of the law of nations, as they result from the usages established among civilised peoples, from the laws of humanity, and the dictates of public conscience.

Hague Convention (IV) Respecting the Laws and Customs of War on Land, Oct. 18, 1907, pmbl., *reprinted in* WAR LAWS DOCUMENTS, *supra* note 1, at 45 [hereinafter Hague Convention IV]. Article 1(2) of Additional Protocol I to the Geneva Conventions of 12 August 1949 contains the same principle: "In cases not covered by this Protocol or by other international agreements, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from the dictates of the public conscience." Additional Protocol I to the Geneva Conventions of 12 August 1949, June 8, 1977, art. 1, *reprinted in* WAR LAWS DOCUMENTS, *supra* note 1, at 390 [hereinafter Additional Protocol I].

61. The theories of just war and the conduct of war overlap. Even though the writings of Hugo Grotius showed little evidence of restraint on the conduct of warfare, he distinguished between the legal rules and "what was morally desirable in the conduct of warfare." Gardam, *supra* note 1, at 396 & n.30.

62. WAR LAWS DOCUMENTS, *supra* note 1, at 29.

63. Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, Nov. 29/Dec.11, 1868, *reprinted in* WAR LAWS DOCUMENTS, *supra* note 1, at 31.

64. *Id.* at 30.

> That the only legitimate object which States should endeavor to accomplish during war is to weaken the military forces of the enemy;
> That for this purpose it is sufficient to disable the greatest possible number of men;
> That this object would be exceeded by the employment of arms which uselessly aggravate the sufferings of disabled men, or render their death inevitable;
> That the employment of such arms would, therefore, be contrary to the laws of humanity.[65]

Based on these statements, the St. Petersburg Declaration is seen as expressing the "customary principle prohibiting the means of warfare causing unnecessary suffering."[66] The 1977 Additional Protocol I to the Geneva Conventions of 1949 (Additional Protocol I) and the 1980 CCW were the most recent codifications of this principle. Specifically, Additional Protocol I conferred "independent status"[67] on the principle by incorporating it into Article 35, titled "Basic Rules," which states:

> 1. In any armed conflict, the right of the Parties to the conflict to choose methods or means of warfare is not unlimited.
> 2. It is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering.[68]

Additional Protocol I also codifies the customary law duty to implement a treaty or customary rule in good faith.[69] Article 36 states:

> [I]n the study, development, acquisition or adoption of a new weapon, means or methods of warfare, a High Contracting Party is under an obligation to determine whether its employment

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65. *Id.* at 30-31.

66. *Id.* Subsequent agreements renounced the use of particular means of warfare. The 1899 Hague Declaration prohibited the use of dum-dum bullets, which expand or flatten easily in the human body. Hague Declaration (IV, 3) Concerning Expanding Bullets, July 29, 1899, *reprinted in* THE LAWS OF ARMED CONFLICTS 103 (Dietrich Schindler & Jiri Toman eds., 1981). The 1907 Hague Convention prohibited the use of poison or poisoned weapons. Hague Convention IV, *supra* note 60.

67. Henri Meyrowitz, *The Principle of Superfluous Injury or Unnecessary Suffering, From the Declaration of St. Petersburg of 1868 to Additional Protocol I of 1977*, INT'L REV. RED CROSS (Int'l Comm. of the Red Cross, Geneva, Switz.), Mar.-Apr. 1994, at 98, 102.

68. Additional Protocol I, *supra* note 60, art. 35.

69. Louise Doswald-Beck & Gerald C. Cauderay, *The Development of New Anti-Personnel Weapons*, INT'L REV. OF THE RED CROSS (Int'l Comm. of the Red Cross, Geneva, Switz.), Nov.-Dec. 1990, at 565, 565.

> would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.[70]

Combatants therefore are protected from weapons that cause unnecessary suffering or superfluous injury. They are also protected by society's placement of certain weapons and methods of warfare, such as intentional blinding, outside the limits of armed conflict. These are fundamental, reasonable humanitarian principles.

A. Proportionality and Military Necessity

A basic principle of the law of armed conflict is the need to weigh military necessity against humanitarian considerations. Its purpose is to safeguard combatants from excessive and unnecessary harm.[71] Under the proportionality rule, "a weapon may either inherently cause unnecessary suffering, and thus all use is prohibited, or it may cause such suffering in certain cases only and therefore these uses are proscribed."[72] Two questions then arise: (1) What is the definition of "military necessity"?; and (2) What are the definitions of "unnecessary suffering" and "superfluous injury"?

Such phrases as "indispensable," "essential," "urgent need," and "strictly necessary" have been offered as part of attempts to state what may be done to attain the military's goals and the aims of war. One criticism of "military necessity" is its elasticity, which has "enabled belligerents to legally justify virtually any conduct otherwise available to proponents of *kreigraison*."[73] Advocates of

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70. Additional Protocol I, *supra* note 60, art. 36.

71. *See generally* Gardam, *supra* note 1; Doswald-Beck & Cauderay, *supra* note 69. The proportionality rule originally safeguarded combatants and has since been incorporated into laws protecting civilians. According to historian Geoffrey Best, the law of armed conflict was less concerned with protecting civilians than combatants before 1945. Geoffrey Best, *Restraints on War by Land Before 1945, in* RESTRAINTS ON WAR: STUDIES IN THE LIMITATION OF ARMED CONFLICTS 27 (Michael Howard ed., 1979).

72. L. Doswald-Beck, Lawfulness of the Anti-Personnel Use of Laser Weapons, *in* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 330, 331.

73. Jochnick & Normand, *supra* note 1, at 64. The term *kreigraison* derives from the German phrase "kreigraison geht vor kreigsmanier," which translates as "the necessities of war are prior to the custom of war." *Id.* at 63 n.53. For further discussion of this doctrine, see *id.* at 63-65. In the words of Elihu Root, "As the belligerent is to be the sole judge of the necessity, the doctrine really is that a belligerent may violate the law or repudiate it or ignore it whenever that is deemed to be for its military advantage." William G. Downey, Jr., *The Law of War and Military Necessity*, 47 AM. J. INT'L L. 251, 253 (1953).

kreigraison argue that the demands of military necessity should always override the obligations of international law.

However, Francis Lieber, who prepared the historic Instructions for the Government of Armies of the United States in the Field during the Civil War, wrote that military necessity consists in the necessity "of those measures which are indispensable for securing the ends of war, and which are lawful according to the modern law and usages of war."[74] Under the Lieber Code, enacted in 1863 and considered a cornerstone of humanitarian law, military necessity "does not admit of cruelty—that is, the infliction of suffering for the sake of suffering or revenge" and it "does not include any act of hostility which makes the return to peace unnecessarily difficult."[75] Similarly, author Michael Walzer concluded that it is important to "weigh the mischief done, which presumably means not only the immediate harm to individuals but also any injury to the permanent interests of mankind, against the contribution that the mischief makes to the end of victory."[76] From the military's perspective, a commander must also help identify conduct or means and methods of warfare that have marginal military advantage, "particularly when there are indications such conduct may interfere with the successful conclusion of peaceful relations."[77]

In its commentary on the Additional Protocols to the Geneva Convention, the International Committee of the Red Cross (ICRC) said that military necessity can never "justify a degree of violence which exceeds the level strictly necessary to ensure the success of a particular operation in a particular case."[78] By comparison, another commentator defined military necessity as "an urgent need,

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74. Instructions for the Government of Armies of the United States in the Field, General Orders No. 100, Apr. 24, 1863, art. 14, *reprinted in* A DOCUMENTARY HISTORY, *supra* note 1, at 161 [hereinafter Lieber's Code]. *See generally* RICHARD S. HARTIGAN, LIEBER'S CODE AND THE LAW OF WAR (1983). On April 24, 1863, the U.S. War Department published General Orders No. 100, which has become known as Lieber's Code. Lieber's Code was the "first instance in western history" that a sovereign nation established formal guidelines for its army concerning conduct toward its enemies. *Id.* at 1-2.

75. Lieber's Code, *supra* note 74, art. 16.

76. MICHAEL WALZER, JUST AND UNJUST WARS 129 (2d ed. 1992).

77. Walter D. Reed, *Teaching the Law of War in the Military*, 16 A.F. L. REV. 70, 74 (1974).

78. INT'L COMM. OF THE RED CROSS, COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949, at 396 (Yves Sandoz et al. eds., 1987).

admitting of no delay, for the taking by a commander of measures, which are indispensable for forcing as quickly as possible the complete surrender of the enemy by means of regulated violence, and which are not forbidden by the laws and customs of war."[79] Historian Geoffrey Best quotes yet another definition from the U.S. Air Force Law of War Manual: "Military necessity . . . justifies measures of regulated force not forbidden by international law which are indispensible [sic] for securing the prompt submission of the enemy, with the least possible expenditures of economic and human resources."[80]

The previous paragraph in the Air Force manual may be more telling because it places military necessity in perspective and relates it to humanitarian considerations. The Air Force manual states:

> The law of armed conflict is essentially inspired by the humanitarian desire of civilised nations to diminish the effects of conflicts. It protects both combatants and non-combatants from unnecessary suffering, and safeguards the fundamental rights of civilians, POWs and the wounded and sick. The law also attempts to prevent degeneration of conflicts into savagery and brutality, thereby facilitating the restoration of peace and the friendly nations which must, at some point, inevitably accompany of follow the conclusion of hostilities. It has been said to represent in some measure *minimum standards of civilization*.[81]

Aside from the distinction between non-weapon laser systems and tactical laser weapon systems, there have been efforts to subdivide tactical laser weapons into anti-materiel and anti-personnel laser weapons. This subdivision could be effective in separating out anti-missile lasers. It has been used, however, to try to legitimize laser weapons whose function is to blind, and it is problematic when considering dual-use laser weapons. In battle, military equipment is a valid target. The problem arises fundamentally when tactical laser weapons are used against direct-view optical devices, such as binoculars. The optical device magnifies

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79. Downey, *supra* note 73, at 254.

80. Geoffrey Best, *The Restraint of War in Historical and Philosophical Perspective*, *in* HUMANITARIAN LAW OF ARMED CONFLICT: CHALLENGES AHEAD 3, 16 (Astrid J.M. Delissen & Gerard J. Tanja eds., 1991) (quoting U.S. DEP'T OF THE AIR FORCE, AFP 110-31, INTERNATIONAL LAW—THE CONDUCT OF ARMED CONFLICT AND OPERATIONS ¶ 1-2g (1976)).

81. *Id.* at 16 n.15 (emphasis added) (quoting U.S. DEP'T OF THE AIR FORCE, *supra* note 80, ¶ 1-2f).

the laser beam, which penetrates through to the eye even before disrupting the optical device. In essence, laser weapons are used for anti-personnel purposes. The eye damage is not an incidental or collateral effect of the use of a non-weapon system, such as a laser rangefinder. Given that the physical properties of lasers for weapon and non-weapon uses are similar, the distinction lies not in whether a laser weapon is specifically designed or has the sole purpose to blind, but whether the weapon's function is to target eyesight.

Originally, the military considered deployment of tactical laser weapons during high-intensity, conventional warfare. The use of tactical blinding laser weapons in this context is questionable and may only make a minor contribution to the military's capability, especially in light of increasing use of long-range "smart" weapons and the superiority of U.S. fire control systems and guns, as demonstrated during the Gulf War.[82] In addition, operators of tactical laser weapons need a direct line of sight with the target, and they may not be able to register direct hits or quickly judge the effects of the laser beam on the target. Operators of barreled weapons or missiles, on the other hand, can determine immediately whether a target has been hit.[83] Therefore, the use of tactical laser weapons to blind may be considered a tactic to disable combatants, provided the mark is hit, thus leaving combatants vulnerable to deadly conventional force.[84]

Low-intensity conflicts include operations other than war, special operations and peacekeeping missions. The presence of electro-optical devices may be minimal in such conflicts. Technical problems also may arise in carrying out such missions. For example, the usefulness of lasers in counter-sniper operations would depend on the laser weapon being on the same axis as the sniper's scope.[85] If the laser weapon is used in an urban setting,

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82. *Blinding Laser Weapons*, *supra* note 5, at 16.

83. ANDERBERG & WOLBARSHT, *supra* note 3, at 81.

84. *See generally* Nick Lewer, *Non-Lethal Weapons*, 11 MED. & WAR 78 (1995). According to Colonel Sam Gardiner, a U.S. Department of Defense consultant, the theory behind the use of non-lethal technologies in the Gulf War would have been to stop the enemy and then to "go in with conventional weapons and destroy them." *Id.* at 85.

85. A U.S. Joint Chiefs of Staff publication notes that "lasers have a limited off-axis capability." JOINT CHIEFS OF STAFF, JOINT PUB. 3-09.1, JOINT LASER DESIGNATION PROCEDURES, at I-1 (1991). The publication also notes that natural and manmade obscurants, including smoke and dust, may attenuate or reflect the laser beam and significantly degrade laser systems. *Id.* at I-3, II-7.

the deflection of the laser beam may cause civilian collateral damage. In the end, the fundamental problem is that the tactical laser weapon's mission is to detect and attack direct optics and the human eye. Blinding is the deliberate intent in high- or low-intensity conflicts. Declaring that a situation is an "operation other than war" must not provide a way for the military to circumvent the principles of humanity. Even in his military legal analysis, Lieber concluded that those "who take up arms against one another in public war do not cease on this account to be moral beings, responsible to one another and to God."[86]

B. Prohibition Against Superfluous Injury and Unnecessary Suffering

The totality of a victim's injuries, including the degree of physical pain, the severity of the wound, the incidence of permanent damage and disfigurement, and the psychological damage, must be considered in examining the extent of suffering and injury. Some commentators have included the aggregate suffering or injury caused to society as a factor in deciding whether to prohibit a weapon system or method of warfare.[87] In considering the use of blinding tactical laser weapons or blinding as a method of warfare, the impact on society of a greater number of blinded soldiers would include the need for more resources for the soldiers' rehabilitation. It also may include the psychological impact on society itself from the ethical dilemma of employing particular weapons aimed at such an important and sensitive part of the human body. "Unnecessary suffering" and "superfluous injury" are more abstract and intangible concepts that go beyond the suffering and injury that may occur generally in armed conflict and that may be deemed extreme suffering or extensive injury. These concepts have focused on the inevitability, or perhaps more likely, the probability of the specific injury and the difficulty in treating the wounded whose injuries were made more severe by a particular

86. Lieber's Code, *supra* note 74, art. 15.

87. *Cf.* C. Greenwood, Battlefield Laser Weapons in the Context of the Law on Conventional Weapons, *in* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 71, 76. In his presentation at the first ICRC Roundtable of Experts in 1989, Mr. Greenwood said that social consequences of an injury seemed to fall outside the concept of injury under existing law. *Id.* "Nevertheless, the social consequences of a particular injury are a relevant political factor which may influence States in deciding whether to introduce fresh law prohibiting certain categories of weapon." *Id.*

weapon.

In April 1991, the ICRC convened an experts roundtable to consider the impact of blindness-causing weapons on an individual and on society.[88] Sight is an essential irreplaceable sense, which provides eighty to ninety percent of a person's sensory stimulation.[89] No prosthesis exists for a lost eye and rehabilitation measures are limited, particularly in countries with inadequate resources. Advanced medical facilities would not be on or near battlefields and, in any case, would be unlikely to salvage the sight of individuals whose eyes were injured by lasers. Several experts at the ICRC meeting believed that sight is "the most precious sense that persons have and that the loss of it is a very severe handicap."[90] The effect of the weapon is not only tied to its effect on sight, but also to its effect on the other senses, because sight organizes the other senses and allows people to orient themselves.[91]

Permanent blindness is a severe disability. U.S. delegates to the CCW Review Conference repeatedly espoused the argument that it is better to blind than to kill, but such an argument belittles the point. It fails to take into account that conventional weapons, such as rifles, kill only about twenty-five percent of the casualties or that sudden blindness has a psychological impact.[92] Criteria established from injuries caused by conventional weapons may serve as a yardstick. Based on more than 17,000 cases of patients wounded in armed conflicts and admitted to ICRC hospitals, Dr. Robin Coupland has drawn up a list of health effects that may be used to objectively judge whether a weapon system inflicts superfluous injury and unnecessary suffering.[93] Proposed criteria

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88. *See generally* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15. The April 1991 experts roundtable was the final meeting convened by the ICRC as part of its examination of laser weapons. Much of the discussion centered on the legal and policy implications of the use of blinding laser weapons and the consideration of possible legal regulation. *See infra* notes 99-100 and accompanying text.

89. Discussion on the Lawfulness of the Anti-Personnel Use of Laser Weapons, *in* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 332, 339 [hereinafter Anti-Personnel Use Discussion].

90. *Id.* at 336.

91. *See id.*

92. *See id.* at 335-36.

93. Robin Coupland, *The Effect of Weapons: Defining Superfluous Injury and Unnecessary Suffering*, MED. & GLOBAL SURVIVAL (forthcoming). Dr. Coupland, ICRC surgical coordinator, first presented this paper at the ICRC's international symposium, "The Medical Profession and the Effects of Weapons," held in Montreux on March 8-10,

include the inevitable infliction of permanent disability, the targeting of a specific part of the human anatomy, physiology or biochemistry, and the inability to treat the victim's injuries in a non-specialist facility, all of which support a ban on blinding laser weapons.

Furthermore, humanitarian law permits putting a soldier *hors de combat* for the duration of the conflict, but not intentionally for life-long incapacitation short of death.[94] Blinding tactical laser weapons have the potential to result in a higher rate of life-long incapacitation than other conventional weapons. In comparing laser weapons to other weapons banned in the past, there is a "certain similarity between a weapon that primarily kills and one that primarily blinds in that both render the soldier *hors de combat* for life."[95] While an object of war may be to put the greatest number of combatants out of action for the duration of the conflict, that purpose is exceeded when a weapon or method of warfare is likely in most cases to cause useless injury and suffering. Because the characteristics of the human eye are no match for the physical properties of tactical lasers, eye damage is certain to result. Specific criteria would show more readily that the use of a particular weapon causes unnecessary suffering. It also should be remembered, however, that no objective analysis of unnecessary suffering led to the nineteenth century and early twentieth century treaties that banned exploding and expanding bullets or chemical and biological weapons. As Dr. Coupland states, "[T]hese means of warfare were simply deemed 'horrific' or 'inhumane.' "[96]

C. International Response to Blinding Laser Weapons

When the United States was embarking on its development of tactical laser weapons during the 1970s, delegates to the Lucerne and Lugano Government Experts' Conferences, which the ICRC convened, began to discuss the possible development of "future

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1996.

94. Anti-Personnel Use Discussion, *supra* note 89, at 338-39.

95. *Id.* at 335; *see also id.* at 338-39. Prohibitions on "dum-dum" bullets and poisoned weapons support the ideas that weapons, which do more than render a person *hors de combat* in the short term, inflict "uselessly cruel" wounds and that certain inevitable long-term consequences of a weapon are unacceptable. Discussion of the Law Applicable to the Use of Battlefield Laser Weapons, *in* ICRC REPORT ON BLINDING WEAPONS, *supra* note 15, at 83, 83.

96. Coupland, *supra* note 93, at 2.

weapons," including anti-personnel laser weapons.[97] Little information was available about laser weapons and some participants thought that "such a development was unlikely in the near future."[98] By 1986, however, Sweden and Switzerland decided during the twenty-fifth International Conference of the Red Cross and Red Crescent Movement to initiate efforts to ban blinding laser weapons. Subsequently, the ICRC pursued the issue by convening four experts' meetings on battlefield laser weapons between 1989 and 1991.[99] Specialists on laser technology, ophthalmology, military medicine, psychiatry and international humanitarian law attended these meetings.[100] From the ICRC's point of view, these meetings were preventive medicine. ICRC President Cornelio Sommaruga stated, "Given today's rapid technological developments, the widespread proliferation of weapons and the continued eruption of numerous armed conflicts, it is clear that weapons developments need to be supervised in order to try to prevent the conflicts of tomorrow wreaking even more suffering than those of today."[101]

The ICRC compiled a dossier of evidence showing that blinding was in fact more severe and debilitating than most other

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97. CONFERENCE OF GOVERNMENT EXPERTS ON THE USE OF CERTAIN CONVENTIONAL WEAPONS (LUCERNE: SEPT. 24-OCT. 18, 1974): REPORT (1975); CONFERENCE OF GOVERNMENT EXPERTS ON THE USE OF CERTAIN CONVENTIONAL WEAPONS (SECOND SESSION, LUGANO: JAN. 28-FEB. 26, 1976): REPORT (1976).

98. Doswald-Beck & Cauderay, *supra* note 69, at 571.

99. *See generally* ICRC REPORT ON BLINDING LASER WEAPONS, *supra* note 15.

100. *See generally id.* During the first meeting in June 1989, the international experts provided an overview of laser technology and its military uses, the effects of lasers on the eye, the psychological effects of blindness, and international humanitarian law related to anti-personnel use of lasers. The experts decided that the "problems involved were sufficiently serious to warrant further study." The second meeting analyzed the characteristics of laser weapons, assessed their possible effects, and considered the medical ramifications as well as protective measures. The third meeting assessed the physical and psychological impact of blindness in comparison to other battlefield injuries. The final meeting in April 1991 gathered 37 government officials from 22 countries, attending in their personal capacity, and 8 experts who had contributed to earlier meetings. They considered the policy and legal implications of the use of blinding laser weapons, in particular, whether the infliction of permanent blindness violated international humanitarian law because it amounted to cruelty that exceeded any military purpose.

101. Cornelio Sommaruga, *Prologue* to ICRC REPORT ON BLINDING LASER WEAPONS, *supra* note 15, at 11, 11. Mr. Sommaruga said that the ICRC was concerned with the effects of weapons because of its aim to alleviate the suffering caused by armed conflicts. *Id.* The challenge was to try to "supervise developments so that States may take suitable preventive action." *Id.*

war injuries.[102] In modern warfare, it is estimated that fifty percent of wounded soldiers return to duty within fifty days. In contrast, soldiers who are blinded never return. In addition to the blinding or severe eye damage itself, experts said that these soldiers are likely to suffer greater rates of battlefield stress and post-traumatic stress syndrome because blinding tactical laser weapons are a silent and invisible threat.[103] Although opinions at the ICRC meetings were not unanimous, the information revealed at these meetings and in subsequent forums brought laser weapons more into the public arena and provided important information on the technology. Such information included the fact that the energy and wavelength of lasers necessary to destroy sensors were similar to those able to damage eyes and the belief that it would be nearly impossible to produce laser weapons that would guarantee only a dazzling effect.[104]

Prohibitions against the use of blinding laser weapons may ultimately rely to a great extent on policy reasons for banning blinding as a method of warfare and on the simple belief that such weapons are horrific and therefore unacceptable. The United States is a case in point. In 1988, the U.S. Department of the Army concluded that "the use of a laser for the purpose of blinding an enemy soldier would not constitute unnecessary suffering" and that the U.S. military considered the use of anti-personnel laser weapons lawful.[105] Subsequent legal memoranda on particular tactical laser weapon systems maintained that position.[106] The Department of the Army said that the laser was

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102. *See* ICRC REPORT ON BLINDING LASER WEAPONS, *supra* note 15, at 43-58, 134-139, 179-183, 336-338.

103. *Id.* at 43-58, 134-139, 179-183, 336-338.

104. *Id.* at 43-51.

105. Memorandum of Law from Hugh R. Overholt, Judge Advocate General, Office of the Judge Advocate General, U.S. Department of the Army, on The Use of Lasers as Antipersonnel Weapons (Sept. 29, 1988) [hereinafter Memorandum of Law].

106. *E.g.*, Memorandum from W. Hays Parks, Special Assistant for the Law of War Matters, Office of the Judge Advocate General, U.S. Department of the Army, on the AN/PLQ-5 Laser Countermeasure System and Law of War Review to Ken Sines, Directorate of Combat Developments, Electronics and Special Developments Division, U.S. Army Infantry School and William Smith, Project Manager, Night Vision and Electro-Optics (Sept. 16, 1994) [hereinafter AN/PLQ-5 Memo]. This memorandum uses language that is similar to the 1988 memorandum: "antipersonnel use of a laser does not cause *superfluous injury* or *unnecessary suffering*, even if it results in permanent blindness, and that antipersonnel laser use was consistent with the law of war obligations of the United States." *Id.* at 3.

unique because of its "non-lethality"[107] and because it would "only cause harm to a combatant by injury (temporary or permanent) to his or her sight."[108] In summary, the Department of the Army decided that anti-personnel laser injury was "more humane" than injury caused by comparable weapons; that the use of protective gear and defensive action could minimize potential laser injuries; that the weapons had not been designed with the sole purpose of producing permanent injury to combatants; that their increased power had militarily useful effects; and that wounds that last beyond the duration of hostilities are commonplace and "there exists no law of war obligation to design weapons along lines to the contrary."[109]

By early 1995, however, at least twenty-five state governments supported a ban on blinding tactical laser weapons.[110] Moreover, despite official U.S. opposition to any regulations prior to the September 1995 Department of Defense policy announcement, some segments of the Department of Defense also disavowed blinding. Most often, the Department of Defense expressed its abhorrence to blinding as a tool in warfare by repeating that it was not developing laser weapons *designed* to blind.[111] A U.S.

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107. Politicians and military officials periodically attempt to categorize blinding laser weapons as non-lethal or less-than-lethal weapons. Interest in developing non-lethal weapons arose in the context of trying to make military operations more palatable to the public and to find alternatives to the use of lethal force, especially with the rising number of peacekeeping operations and humanitarian interventions. *See, e.g.*, Mark Fischetti, *Less-than-Lethal Weapons*, TECH. REV., Jan. 1995, at 14; *see also supra* note 14.

108. AN/PLQ-5 Memo, *supra* note 106, at 6. An information sheet on the Dazer, another laser weapon system, states that the system can be highly dangerous to users and that the laser beam itself is hazardous to the eyes. *U.S. Blinding Lasers*, *supra* note 5, at 11 (citing U.S. Special Operations Command, Dazer System Fact Sheet). Furthermore, the information sheet states that there are no approved safety procedures to minimize the danger of the Dazer. *Id.* at 11 (citing U.S. Special Operations Command, Dazer System Fact Sheet).

109. Memorandum of Law, *supra* note 105, at 6.

110. Arkin, *supra* note 25, at 20; Colman McCarthy, *Battlefield Instruments of Blindness*, WASH. POST, May 16, 1995, at E24.

111. The Department of Defense "does not possess, nor is it developing, laser weapons designed or intended primarily to permanently blind enemy combatants. However, one presently unfunded program investigated the potential for use of lasers to temporarily impair vision." Letter from H. Allen Holmes, Assistant Secretary of Defense, to Lane Evans, Member of Congress (Mar. 27, 1995). *Cf.* U.S. DEP'T OF THE NAVY, THE COMMANDER'S HANDBOOK ON THE LAW OF NAVAL OPERATIONS (1995). The handbook states that directed energy devices, which include lasers, may be used "directly against combatants as an antipersonnel weapon. Their use does not violate the prohibition against the infliction of unnecessary suffering." *Id.* at 9-3.

Marine Corps document also revealed the concerns raised by laser weapons in the hands of battlefield opponents simply because they could cause permanent blindness.[112] Therefore, some commentators characterize as too simplistic the notion that anti-personnel laser injuries, specifically blindness and severe eye damage, would be more humane than other injuries.[113]

In addition, the dual-use capabilities of tactical laser weapons mean that these weapons by their nature have more than one purpose. Nevertheless, the Department of Defense did not formally support an international protocol regarding laser weapons until the issuance of its policy guidance statement on laser weapons in September 1995.[114] In the statement, the Department of Defense prohibited the use of lasers specifically designed to cause permanent blindness of unenhanced vision. Secretary Perry had found little support among senior military officers for either the utility or appropriateness of blinding as a method of warfare. Deputy Undersecretary of Defense for Policy Jan Lodal perhaps summed up the position best: "So, whether legal or not, it seemed something that many people were uncomfortable with and for which there were no ascertainable military requirements."[115] Senior Pentagon officials described Secretary Perry's policy guidance statement as a major shift in Department of Defense policy, intended to establish that blinding as a method of warfare was unacceptable.[116]

D. Protocol IV: A Protocol on Blinding Laser Weapons

Protocol IV, which was added to the Convention on Conventional Weapons in 1995, bans the use and transfer of laser weapons

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112. Mission Need Statement, *supra* note 49, at 1.

113. Greenwood, *supra* note 87, at 80.

114. In February 1995, seven months before the Department of Defense policy statement, President Clinton told congressional members who had urged a ban on blinding laser weapons that he did not believe international negotiations should pursue the issue because they risked "diverting attention from the more immediate humanitarian problem of anti-personnel landmines." Letter from Bill Clinton, President, to Ronald Dellums, Member of Congress (Feb. 1, 1995); Letter from Bill Clinton, President, to Lane Evans, Member of Congress (Feb. 1, 1995); Letter from Bill Clinton, President, to Patrick Leahy, Senator (Feb. 1, 1995). President Clinton's rationale is unconvincing because these congressmen have been in the forefront of the campaign to ban landmines and they have been strong supporters of a laser weapons protocol.

115. Bradley Graham, *Pentagon Shifts, Seeks Laser Weapons Curbs*, WASH. POST, Sept. 20, 1995, at A3.

116. *Blinding Laser Weapons*, *supra* note 5, at 5.

"specifically designed, as their sole combat function or as one of their combat functions, to cause permanent blindness to unenhanced vision, that is to the naked eye or to the eye with corrective eyesight devices."[117] Nations must take "all feasible precautions" to avoid blinding the naked eye.[118] Protocol IV does not cover blinding "as an incidental or collateral effect of the legitimate military employment of laser systems," including lasers used against optical equipment.[119] This segment of Protocol IV was originally proposed to allow for the continued use of non-weapon laser systems, yet such systems are not specifically named. The provision regarding the use of lasers against optical equipment was incorporated during the final week of negotiations on Protocol IV and created a significant exemption for laser weapons that in fact target the eye.

During the Review Conference of the CCW, the United States and the United Kingdom opposed an explicit prohibition on blinding as a method of warfare, despite support for such a ban from numerous countries, including France and Germany. The United States even took exception to final committee meeting statements by several delegations that Protocol IV prohibited deliberate blinding. Mexico said that it accepted Protocol IV because it prohibited "blinding deliberately as a means or method of warfare."[120] Ecuador said that Protocol IV "prohibits the use of permanent blinding as a weapon, method or means of war."[121] Iran said that it interpreted Protocol IV to consider any intentional blinding with lasers in battle illegal.[122] France said that it would have preferred an explicit prohibition banning "deliberate blinding

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117. *Protocol IV*, *supra* note 6, art. 1. The language banning laser weapons specifically designed to cause permanent blindness is a mirror image of the Department of Defense policy announced in September 1995. *Id.* Delegates at the CCW Review Conference began with a draft that emerged from the Group of Government Experts negotiations, which concluded in January 1995. Part of the draft prohibited the use of laser beams "of a nature to cause permanent blindness [serious damage] against the eyesight of persons as a method of warfare." The ICRC had proposed a two-part protocol stating that "blinding as a method of warfare is prohibited" and "laser weapons may not be used against the eyesight of persons."

118. *Id.* art. 2

119. *Id.* art. 3.

120. Statements Made During Final Public Meeting of Main Committee III of the CCW Review Conference (Oct. 1995).

121. *Id.*

122. *Id.*

as a method of warfare."[123]

The United States and the United Kingdom argued that such an explicit prohibition could bring in the issue of "intent," and they feared that their soldiers would be subject to war crimes charges if they accidentally blinded an individual. Germany, however, pointed out that countries opposing an explicit prohibition should be more concerned about their soldiers becoming victims of blinding lasers than being branded as war criminals. The issue of intent is not unchartered waters. In both criminal law and humanitarian law, certain prohibited actions require that the element of intent be proven. Also, the Protocol IV draft text already had an exception for blinding as an incidental or collateral effect of the legitimate use of lasers on the battlefield. Therefore, if a soldier accidentally blinded an individual with a non-weapon laser system, such as a rangefinder or target designator, the soldier would be protected. By failing to establish more explicit language against blinding, nations failed to protect their soldiers more effectively. The United States, in particular, argued that the term "method of warfare" was ambiguous, even though the term has been used in numerous international agreements, including Additional Protocol I, which contained an entire section titled "methods and means of warfare."[124] By comparison, France plainly told the opening plenary that blinding as a method of warfare was a perversion.

Despite Secretary Perry's more far-reaching intent and other nations' desire for a more comprehensive ban, the U.S. delegation worked to keep the language of the new international agreement as narrow as possible. The preliminary U.S. legal analysis of Protocol IV, signed for the Judge Advocate General, also characterized the agreement in such a way that countries could have used the memorandum to liberally interpret or even violate the letter as well as the spirit of the ban on blinding laser weapons.[125] One troublesome interpretation in the memorandum was that State Parties at the Review Conference had not concluded that "use of a laser to blind an enemy combatant causes *unnecessary suffering*,

123. *Id.* In a reply to parliamentary questions a month earlier, the French president indicated that France supported the total prohibition of deliberate blinding as a method of warfare. *Id.*

124. Additional Protocol I, *supra* note 60.

125. Effect of Laser Protocol Memo, *supra* note 9; *see also* Letter to Perry, *supra* note 9.

or that use of a laser to blind an individual enemy combatant was illegal."[126] Senator Leahy and Representative Evans told Secretary Perry that this interpretation would render the protocol "meaningless and encourage other nation's [sic] to liberally interpret its restrictions."[127] A prohibition against a weapon that is "specifically designed" to blind contradicts a conclusion that it is legal to blind. Such a contradiction supports some commentators who contend that the laws of armed conflict are so vaguely worded and permissive as to enable "powerful states to use the latest military technology with little regard for humanitarian consequences."[128] Fortunately, Secretary Perry reaffirmed the Department of Defense policy to prohibit the use of weapons specifically designed to permanently blind and to reduce inadvertent injuries from the use of non-weapon lasers, for example, in rangefinding, target discrimination and communications.[129] Further, Secretary Perry stated that it was not the intent of Protocol IV to prohibit only mass blinding. He unequivocally stated that while Protocol IV does not prohibit research, development and production, the Department of Defense had "no intent to spend money developing weapons we are prohibited from using. We certainly would not want to encourage other countries to loosely interpret the treaty's prohibitions, by implying that we want to develop or produce weapons we are prohibited from using."[130]

The cumulative effect of Protocol IV's provisions, country statements regarding the need for a more comprehensive ban and the belief in the inappropriateness of blinding reveal that deliberate blinding has been recognized as beyond the pale and in essence prohibited. Protocol IV stigmatizes blinding as a method of

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126. Effect of Laser Protocol Memo, *supra* note 9.

127. Letter to Perry, *supra* note 9.

128. Jochnick & Normand, *supra* note 1, at 53; *see also* Leslie C. Green, *What One May Do in Combat—Then and Now*, *in* HUMANITARIAN LAW OF ARMED CONFLICT: CHALLENGES AHEAD, *supra* note 80, at 269, 276, 294.

129. Letter to Evans, *supra* note 11.

130. *Id.* Regarding the issue of mass versus individual blinding, Senator Leahy and Representative Evans had criticized the memorandum's interpretation as a "creative and inaccurate characterization" of the Review Conference proceedings. Letter to Perry, *supra* note 9. Senator Leahy and Representative Evans wrote to Secretary Perry that an exception to permit individual blinding had no basis in the protocol or in the negotiations leading up to the protocol. *Id.* Secretary Perry eventually agreed with Senator Leahy and Representative Evans' interpretation regarding individual blinding. Letter to Evans, *supra* note 11.

warfare. The use and transfer of laser weapons specifically designed to blind are outlawed. In taking all feasible precautions to avoid the incidence of blindness, countries cannot allow their commanders to give orders to use, or allow their soldiers to use, laser weapons to blind. They must train their soldiers to avoid blinding others when using lasers generally. If laser weapons are used against direct-view optics, such as binoculars, and combatants are blinded, the blinding cannot be considered an incidental effect because the combatants would be harmed before any damage to the optics.

To welcome the adoption of Protocol IV, the European Parliament stated in a resolution on November 16, 1995 that it regretted the lack of a ban on production and the inclusion of "loopholes for the production, use and transfer of some blinding laser weapons, including those that target optical systems."[131] The Parliament stated its belief that "blinding as a method of warfare is abhorrent and in contravention of established custom, the principles of humanity and the dictates of public conscience."[132] In the Review Conference's Final Declaration, countries further declared "their recognition of the need for achieving the total prohibition of blinding laser weapons" and their wish to continue consideration of the blinding effects of laser systems.[133] For its part, the United States committed itself to refrain from using banned laser weapons "at all times," unilaterally extending Protocol's IV's scope.[134]

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131. *European Parliament Joint Motion for a Resolution on Anti-Personnel Landmines and Laser Weapons*, Doc. DOC_EN\RE\286\286184 (Nov. 15, 1995).

132. *Id.* The European Parliament called on European Union member states to ratify Protocol IV, to ban the development and production of blinding laser weapons, and to begin destruction of existing stocks of blinding laser weapons. *Id.*

133. *Review Conference of the States Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects*, CCW/CONF.I/WP.1/Rev.1 (May 1, 1996). More than 50 States Parties and 30 States Observers participated in the final Review Conference session from April 22 to May 3, 1996.

134. U.S. Ambassador Michael Matheson, Statement at the Final Plenary Session (May 3, 1996). In its closing remarks, the ICRC mentioned its regret that Protocol IV's scope had not been extended formally as agreed in Vienna in October 1995 and reaffirmed by countries at the 26th International Conference of the Red Cross and Red Crescent in December 1995. The ICRC encouraged all states to issue a "statement of understanding" that they considered Protocol IV to "apply at all times."

IV. LASER TECHNOLOGY AND WEAPONS WITHIN CIVILIAN LAW ENFORCEMENT

On April 20, 1994, Deputy Secretary of Defense John Deutch and Attorney General Janet Reno signed a five-year memorandum of understanding "to formalize an interagency alliance on problems common to the military and law enforcement communities."[135] The joint development of technologies was needed in part due to a shrinking federal budget and the movement of the military into operations other than war.

> The special tactics, training and equipment needed for operations other than war are, in many cases, similar to the intensified threat faced by law enforcement agencies due to the widespread availability of increasingly powerful weapons, rising violence and continuing distribution of illegal drugs. In addition, in most cases, military rules of engagement for operations other than war place severe limitations on casualties and collateral damage.[136]

Laser technology is an open field for law enforcement development. As recently as March 1996, the military briefed National Institute of Justice officials on converting such technology to police use.[137] Non-weapon laser technology could be used to measure distances, illuminate targets, or enhance night vision

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135. Office of Assistant Secretary of Defense (Public Affairs), U.S. Department of Defense, News Release, Departments of Defense and Justice Sign Memorandum of Understanding (Apr. 20, 1994).

136. *Id.*

137. One aim of the National Institute of Justice, a Department of Justice branch, is to find alternatives to the use of lethal force for police and correctional officers. *See* Lois Pilant, *Less-than-Lethal Weapons: New Solutions for Law Enforcement*, SCI. & TECH. (Int'l Ass'n of Chiefs of Police, Alexandria, VA), Dec. 1993, at 1, 1. Some of the primary less-than-lethal force weapons that police use include electronic stun devices, such as Tasers, other stun guns, and stun gloves; chemical weapons, such as Mace; and close-range impact weapons, such as flashlights and batons. Neal Miller, *Less-than-Lethal Force Weaponry: Law Enforcement and Correctional Agency Civil Law Liability for the Use of Excessive Force*, 28 CREIGHTON L. REV. 733, 736 & n.4 (1995). There has been disagreement about the designation of certain devices as non-lethal or less-than-lethal technology due to either their effects or their use against certain body parts. For example, some law enforcement agencies have classified stun guns or impact devices as lethal weapons rather than less-than-lethal force weapons. The police department in Kettering, Ohio has listed several areas of the body where baton use may result in death: temple, ears, eyes, bridge of nose, upper lip, throat, solar plexus, groin, back of neck, hollow behind ear, kidney, and tail bone. *Id.* at 736 n.4.

devices.[138] The New York City Police Department and the Arapaho City Sheriff's Department have used laser technology to target suspects and to encourage them to break off their activities.[139] The police can aim a device similar to a laser designator at the chest of suspects, such as snipers or hostage holders, to let them know that they are within range. Correctional institutions have also used such systems to discourage riots.[140] Lights, such as flash bangs or pulsating strobes, have been used to temporarily blind or disorient individuals.[141] In that respect, lasers that target the eyes are seen possibly as an extension of those technologies. For example, Lockheed Sanders, the manufacturer of the LCMS for the U.S. Army, stated in its advertising literature that anti-narcotics operations and hostage crisis situations were among the typical scenarios for use of the LCMS.[142]

The push toward developing less-than-lethal technologies began more than twenty years ago, and it gained new impetus with the 1985 U.S. Supreme Court decision in *Tennessee v. Garner*.[143] In that case, the Supreme Court held that the use of deadly force to apprehend an apparently unarmed, non-violent fleeing felon was an unreasonable seizure under the Fourth Amendment of the U.S. Constitution.[144] Calls for the use of less-than-lethal force were heard again and commissions were appointed to investigate the issue in the aftermath of the Rodney King beating in Los Angeles and the Branch Davidians standoff outside Waco, Texas. After Waco, Attorney General Janet Reno called for greater efforts and more funding to provide law enforcement with alternative tools to

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138. The Institute for Law and Justice, which the National Institute of Justice funds, did not list lasers as a type of less-than-lethal technology, even though bright white and pulsed lights were mentioned in that category. *Types of Less-Than-Lethal Weapons*, L. ENFORCEMENT OPTIONS (Inst. for Law & Justice, Alexandria, VA), Jan. 1995, at 6, 6-8.

139. Pilant, *supra* note 137, at 4.

140. Interview with David Boyd, Director of Science and Technology at the National Institute of Justice (Apr. 8, 1996).

141. So far, more attention has been focused on the use of pulsed, or strobe, light, which either a fixed or portable unit may produce. Such devices may be used in situations ranging from hostage or barricade situations to prison riots or fights. These different types of light may be used to "distract, disorient and possibly disable." Pilant, *supra* note 137, at 4.

142. *U.S. Blinding Lasers*, *supra* note 5, at 9 (citing Lockheed Sanders, Laser Countermeasure System (LCMS) Fact Sheet (1994)).

143. 471 U.S. 1 (1985).

144. *Id.*

subdue suspects or inmates.[145] The search for such tools has been characterized as "an effort to find tools or devices that subdue subjects without harm."[146]

The use of laser technology against a person's eyes raises even more questions in the civilian context than in the military context. Civilian law enforcement is waiting to determine the safety standards of such devices and to decide whether they would be a "genuine improvement" over currently available technology.[147] Some experts, including biophysicists specializing in lasers, are skeptical about the ability to design a laser weapon that would be guaranteed to only dazzle.[148] It perhaps is more important for civilian law enforcement to decide that such a weapon should not be used to target one of the most critical parts of the human anatomy.

Guidelines for the use of other less-than-lethal technologies and a public revulsion against targeting a person's eyes bolster the decision against the use of such a weapon in the civilian context. These guidelines emphasize the need for law enforcement to avoid injuring the eyes when using less-than-lethal technologies. For example, guidelines for the use of Mace or other chemical irritants prohibit their use in confined areas or directly into the eyes or body orifices.[149] Firing chemical spray directly into the face and eyes may cause permanent loss of sight and other injuries and is considered a negligent use of a less-than-lethal technology.[150] Exposure to high dosages of chemical spray in an enclosed space also may result in vision loss. These examples illustrate the importance placed on the need to avoid blinding.

The use of laser weapons is not yet an accepted idea or practice in civilian law enforcement, partially because the technology is not widely available and partially because lasers have the ability to blind or severely damage eyes. For the latter reason, the use of laser weapons should not become part of law enforcement

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145. Pilant, *supra* note 137, at 1-2.

146. *Id.* at 2.

147. Interview with David Boyd, *supra* note 140.

148. *Blinding Laser Weapons*, *supra* note 5, at 23 (citing Bengt Anderberg & Myron Wolbarsht, *Hand-Held Laser Weapons Are Waiting in the Wings*, ARMED FORCES J. INT'L, May 1992); *see also* John Marshall, *A Horrifying New Laser Weapon that the World Should Ban Now*, INT'L HERALD TRIB., Apr. 12, 1995, Opinion.

149. Miller, *supra* note 137, at 775.

150. *Id.*

tactics. To paraphrase Attorney General Reno, the military's standard for the use of less-than-lethal technologies is generally one of minimizing collateral damage, while law enforcement's standard is the elimination of any collateral damage. In 1993, Attorney General Reno said:

> When less than lethal technologies are used by law enforcement, remember that they're not being used against an enemy; they're being used to help protect fellow citizens. When police use these devices, they must be constrained by the knowledge that the people they are restraining aren't enemies; they are fellow citizens, with a full set of civil rights.[151]

V. CONCLUSION

The mere belief that law places humane limits on war has "profound consequences for the way people view war, and therefore the way that war is conducted."[152] Military commanders and soldiers do not have unlimited choices as to the weapons and tactics that they employ. The military necessity of a weapon must be balanced against the injury and consequences to the individual and to society. The legal principles stemming from the St. Petersburg Declaration have banned classes of weapons and methods of warfare that are deemed likely to cause suffering and injury so excessive that their use is never justified. In this context, chemical weapons have been banned because their use would be widely condemned even though they may be considered militarily helpful or capable of disabling large numbers of combatants. A weapon that the military perceives as useful will not be permitted if it inflicts suffering or injuries that are considered outside the bounds of acceptable behavior. Countries have balanced deliberate blinding against military utility and opted for new specific prohibitions. In addition, countries generally have agreed that non-weapon laser systems, such as rangefinders and target designators, should not be misused to blind.

Blinding laser weapons have no place in armed conflicts or in police operations. In modern warfare, fifty percent of wounded soldiers generally return to duty within fifty days. By comparison,

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151. Attorney General Janet Reno (delivered on Attorney General Reno's behalf by David Boyd), Speech to the Non-Lethal Defense Seminar at the Johns Hopkins University Applied Physics Laboratory (Nov. 17, 1993).

152. Jochnick & Normand, *supra* note 1, at 56.

blinding is permanent. While blinding has occurred as an injury in war through the generations, the physical properties of laser weapons and the characteristics of the eye combine to specifically target a highly sensitive and important part of the body. Deliberate blinding cannot justify whatever minimal military utility may be gained in the short run, given the profound long-term effects of permanently blinding soldiers with lasers.

The Pentagon has maintained that laser weapon systems, such as the now-cancelled LCMS, are legitimate and not anti-personnel weapons because they are "not intended to be used to produce permanent blindness . . . [but are] designed to locate and destroy enemy optical and electro-optical systems."[153] It is disingenuous to rely on such semantics, saying that a weapon was not "specifically designed" or was not designed with the "sole purpose" to blind, when in fact the weapon's function is to blind. Through the ban on certain blinding laser weapons and imposition of obligations upon countries to avoid incidents of blinding, the international community stigmatized deliberate blinding. During the international negotiations toward Protocol IV, the participants disagreed over whether existing international law prohibited the use of laser weapons against individuals, as noted in U.S. legal memoranda stressing the legality of such use and blinding. Eventually, however, countries negotiated and agreed on Protocol IV. "Dictates of public conscience" must have been among the factors that prompted countries to prohibit these weapons and to impose additional obligations upon themselves. There was a sense of social unacceptability in the notion of intentional blinding that perhaps went beyond the principle of unnecessary suffering. The ban on certain laser weapons, the obligations to avoid incidents of blinding, and countries' statements supporting a more comprehensive regime, including a ban on blinding as a method of warfare, point to a recognition that deliberate blinding of combatants is not permissible. Even though the production of such weapons is not prohibited, these measures will go a long way to curtail the proliferation of a new generation of conventional weapons considered inhumane by international standards.

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153. Letter from H. Allen Holmes, Assistant Secretary of Defense, to Lane Evans, Member of Congress (July 18, 1995); *see also* Letter from Gilbert F. Decker, Assistant Secretary of the Army, Research, Development and Acquisition, to Human Rights Watch (July 7, 1995).