

United States, Memorandum of Law: The Use of Lasers as Anti-Personnel Weapons

[Source: Doswald-Beck, L. (ed.), *Blinding Weapons: Reports of the meetings of experts convened by the International Committee of the Red Cross on Battlefield Laser Weapons 1989-1991*, Geneva, International Committee of the Red Cross, Annex C, 1993, pp. 367-371]

N.B. As per the [disclaimer](#), neither the ICRC nor the authors can be identified with the opinions expressed in the Cases and Documents. Some cases even come to solutions that clearly violate IHL. They are nevertheless worthy of discussion, if only to raise a challenge to display more humanity in armed conflicts. **Similarly, in some of the texts used in the case studies, the facts may not always be proven;** nevertheless, they have been selected because they highlight interesting IHL issues and are thus published for didactic purposes.

[...]

September 29, 1988

MEMORANDUM OF LAW

Subject: use of lasers as antipersonnel weapons

1. *Summary.* This memorandum considers the legality of the use of a laser as an antipersonnel weapon. It concludes that such use would not cause unnecessary suffering when compared to other wounding mechanisms to which a soldier might be exposed on the modern battlefield, and hence would not violate any international law obligation of the United States. Accordingly, the use of antipersonnel laser weapons is lawful.
2. *Background.* Department of Defense Instruction 5500.15 requires that a weapon or munition undergo a legal review during its development and prior to acquisition to ensure that the weapon or munition in question complies with the international law obligations of the United States. This review is to be conducted by the Judge Advocate General of the Service sponsoring the weapon/munition. This memorandum does not constitute a review of a particular weapon, but addresses a basic question regarding the legality of the use of lasers for antipersonnel purposes. This memorandum has been coordinated with the International Law Divisions of the Offices of the Judge Advocates General of the Navy and Air Force, each of which concurs in its contents and conclusion.
3. *Previous Opinions.* Each of the Judge Advocates General has proffered opinions relating to the legality of lasers. Navy [...] opinions concluded that injury to combatants secondary or ancillary to the use of a laser for rangefinding, target acquisition, or other antimateriel purposes is lawful, and that blindness per se could not be a basis for concluding that a laser violates the law of war prohibition against weapons that may cause unnecessary suffering. Opinions by the Air Force [...] concluded that the use of lasers to produce flash effects (the temporary induction of a visual impairment) to combatants would not violate the law of war obligations of the United States. While they did not have a direct impact on the contents or conclusions of this memorandum, related legal opinions prepared by a close ally of the United States and another agency of the United States were considered, as were threat briefings regarding the actions, programs, and possible intent of potential opponents of the United States.
4. *Law of War.* No specific rule prohibits laser weapons. In fact, antipersonnel weapons are designed specifically to kill or disable enemy combatants and are not unlawful because they cause death, disability, pain or suffering. This principle is tempered by the law of war obligations of the United States relating to the legality of weapons or munitions, contained in the Annex to Hague Convention IV Respecting the Laws and Customs of War on Land of October 18, 1907 [...]. In particular, article 23(e) prohibits the employment of arms, projectiles, or material calculated to cause unnecessary suffering. There is no internationally accepted definition of unnecessary suffering. In fact, an anomaly exists in that while it is legally permissible to kill an enemy soldier, in theory any wounding should not be calculated or intended to cause unnecessary suffering. In endeavouring to reconcile the two, in considering the customary practice of nations during this century, and in acknowledging the lethality of the battlefield for more than a century, certain factors emerge that are germane to this opinion:
 - a. No legal obligation exists or can exist to limit wounding mechanisms in a way that permits lawful killing while requiring that wounds merely temporarily disable, that is, that the effects of wounds do not extend beyond the period of hostilities, and
 - b. In considering whether a weapon may cause unnecessary suffering, it must be viewed in light of comparable wounding mechanisms extant on the modern battlefield rather than viewing the weapon in isolation.
 - c. The term unnecessary suffering implies that there is such a thing as necessary suffering, i.e., that ordinary use of any militarily effective weapon will result in suffering on the part of those against whom it is employed.
 - d. The rule does prohibit deliberate design or alteration of a weapon solely for the purpose of increasing the suffering of

those against whom it is used, including acts what will make their wounds more difficult to treat. This is the basis for rules against poisoned weapons and certain small calibre hollow point ammunition.

5. *Recent negotiations.* Law of war provisions to regulate or prohibit laser weapons have been considered over the past fifteen years; none have been accepted by the community of nations. Separate weapons discussions were held in conjunction with the 1974-1977 Diplomatic Conference on Humanitarian Law. Although the issue of laser weapons was raised by a small number of nations, all weapons questions were deferred save and except incorporation of article 23(e) of the Annex to Hague IV of 1907 into article 35 (2) of the 1977 Protocol I additional to the 1949 Geneva Conventions for the Protection of War Victims. At the subsequent United Nations Conference on Certain Conventional Weapons, held in Geneva from 1978 to 1980, the subject of regulation of laser weapons was again raised by a very small minority of nations but, owing to lack of support, was not actively pursued. In the course of the XXV International Conference of the Red Cross (Geneva, October 1986), Sweden and Switzerland offered a resolution condemning the blinding effect of laser weapons; that resolution enjoyed little support, was strongly resisted by some nations, and was not adopted by the conference. In April 1988 Sweden again endeavoured to raise the issue, though in substantially modified form. It acknowledged the legality of the use of lasers to produce flash effects to combatants; accepted the lawfulness of the use of lasers for rangefinding, target acquisition, and similar military purpose; and also accepted the legality of blinding of enemy combatants incidental to the use of a laser for the above-cited purposes. Sweden's most recent effort proposed to prohibit use of lasers as antipersonnel weapons per se. This proposal, offered first on an informal basis to delegates to the United Nations Committee on Disarmament in Geneva on 18 April 1988, and subsequently to the United Nations Special Session on Disarmament III in New York in June, 1988, met with no success in either instance. This history not only indicates a lack of international support for any prohibition or regulation on the use of lasers as antipersonnel weapons, but simultaneously serves as an acknowledgement of the legality of such use under the current law of war ; were such use illegal per se, no further regulation would be necessary. That said, however, it is beneficial to consider laser weapons and their effects in the context of the current law of war to understand the basis for their legality.
6. *Lasers.* Lasers operate in a wide variety of wavelengths and exposure durations. The susceptibility of the human eye and skin is dependent on a number of physical and operational factors, including the output characteristics of the laser source and the conditions of the atmosphere between the laser and the target (rain, sleet, snow, fog, dust) [...] which can cause considerable attenuation or reduction of the light intensity at the target. If the target is the human eye or skin surface, the laser may produce minimal effect at low levels, from veiling glare or dazzle to the eye or the bare perception of warmth on the skin, to the most severe effects of severe eye and skin burns. At high levels of laser irradiation the damage mechanism which predominates is a thermal phenomenon, [...]. The human eye is particularly susceptible to laser light in the visible and near infrared portions of the electromagnetic spectrum [...]. Laser light incident on the cornea in this wavelength region (commonly referred to as in-band to the eye) is focused to a very small retinal spot increasing the energy per unit area on the retina by a factor of 100,000 times. At these levels the high concentration of light is sufficient to produce irreversible damage [...]. At these high levels of laser irradiation the effects on the human eye may be the appearance of a large retinal burn with accompanying haemorrhage into the portion of the eye behind the lens. As the incident laser energy is reduced, the haemorrhage is no longer a factor and the size of the retinal burn diminishes. As the laser exposure level falls below the threshold for retinal burn, the effect is one of bright light exposure producing a dazzle or glare phenomenon. In general the factors of importance in laser-induced trauma of the eye follow those of exposure to any intense light source, including the sun. [...] Lasers can produce corneal burns, retinal burns and flash effects. The degree of injury is related to the operation characteristics of the laser source and the condition of the atmosphere which determines the amount of energy reaching the eye and the eye itself. Eye factors may include the direction of the eye with reference to the laser, the age of the individual, and the degree of pupillary dilatation or light collection and adaptation level (for lasers operating in the visible or near infrared). Not all individuals exposed to incident laser irradiation will be permanently blinded. Those lasers which produce wavelengths in the ultraviolet and the infrared are known as out-of-band and produce mainly surface effects to the eye (cornea and lens) and skin. These effects may vary from large corneal burns to deep, full thickness skin burns.
7. *Issue.* This memorandum is not concerned with skin burns. Incendiary weapons have been in use by most nations throughout the history of war. Attempts at prohibiting or regulating their use against enemy combatants were specifically rejected by national delegations attending the 1978-1980 United Nations Conference on Certain Conventional Weapons. Neither is it concerned with eye injury not of a permanent nature, as it would be compatible to and generally less damaging than other conventional wounding mechanisms. The fundamental issue with which this review is concerned is whether the use of a laser for the purpose of blinding an enemy soldier would constitute unnecessary suffering. The conclusion is that it would not.
8. *Rationale.* Blinding is no stranger to the battlefield. Records on eye injury to U.S. military personnel in World War I and II, Korea, and the Vietnam War reveal that permanently disabling eye wounds have resulted from bomb, shell, and hand grenade fragments, bullets, landmines, other mechanisms, poisonous gas, and battlefield debris such as dirt, rocks, and glass. Like lasers, eye injury caused by these mechanisms does not necessarily result in death or permanent blindness. Unlike lasers, however, injury from each of these mechanisms frequently results in death; therefore anti-personnel laser injury is more humane than injury caused by comparable weapons. While some laser injury can lead to permanent blindness, the extent of injury is subject to the myriad of factors previously listed. As with defense against chemical agents or conventional munitions, potential laser injuries can be minimized with the utilization of appropriate protective equipment and defensive actions. The weapons under consideration have not been designed with the sole purpose of producing permanent injury to combatants. As with other weapons, even were a laser developed that would, in most cases, cause a permanently disabling wound, it is lawful because its increased power has militarily useful effects, such as increased range

against other sensors. Some laser injury may lead to permanent blindness. The issues are whether the intentional use of a laser for the purpose of blinding necessarily should be considered as causing unnecessary suffering in that its effect, if permanent, outlasts the duration of the hostilities, and whether permanent blindness can or should be regarded as more severe than other forms of permanent disability. The following addresses these matters. Permanent blinding, again, is not unique to lasers, nor is a permanently disabling wound a remote occurrence in modern war. Many wounds lead to permanently disabling effects. Modern weapons are not designed to temporarily incapacitate. 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. The prohibition contained in article 23(e) of the Annex to Hague IV limiting the employment of arms, projectiles, or material calculated to cause unnecessary suffering must be balanced against the necessity for destructive power adequate to meet a variety of threats at a variety of ranges and in a variety of circumstances, such as combatants in bunkered positions or armoured vehicles, or at extended range. The lawful attack of enemy combatants inevitably will cause – and has caused – vast numbers of permanently disabling wounds, including blindness. U.S. Government disability tables regard permanent blindness as equal to but not greater than other forms of permanent disability. Proposals to conclude that the use of a laser to intentionally blind would result in unnecessary suffering would lead to a contradiction in the law in that a soldier legally could be blinded ancillary to the lawful use of a laser rangefinder or target acquisition lasers against materiel [sic] targets, but could not be attacked individually. Thus enemy soldiers riding on the outside of a tank lawfully could be blinded as the tank is lased incidental to its attack by antitank munitions; yet it would be regarded as illegal to utilize a laser against an individual soldier walking ten meters away from the tank. No case exists in the law of war whereby a weapon lawfully may injure or kill a combatant, yet be unlawful when used in closely related circumstances involving other combatants.

1. *Conclusion.* For the foregoing reasons, it is concluded that the use of lasers as antipersonnel weapons would not cause unnecessary suffering nor otherwise constitute a violation of the international legal obligations of the United States. Accordingly, the use of a laser as an antipersonnel weapon is lawful.

HUGH R. OVERHOLT

Major General, USA

The Judge Advocate General

Prepared by:

W. Hays Parks,

Chief, International Law Team,

International Affairs Division,

Office of the Judge Advocate General of the Army,

Washington D.C. (USA)

Coordinated with:

Lieutenant Colonel B.M. Carnahan,

JAGC, USAF,

International Law Division,

Office of the Judge Advocate General,

Department of the Air Force (AF-JACI).

Captain W.M. Schachte, Jr.,

JAGC, USN.

Major W.F. Warriner, USMC,

International Law Division,

Office of the Judge Advocate General,

Department of the Navy (NJAG-10).

Discussion

1.
 - a. Does IHL require the US to initiate a legal review of a weapon during its development to ensure that it complies with IHL? Even though the US is not party to Protocol I? ([HR, Art. 23\(e\)](#); [P I, Arts 35\(2\)](#) and [36](#)) [**See also ICRC, New Weapons**]
 - b. Which responsibilities do States have with regard to the study and development of new weapons? Which assessments must States make? Which criteria must they use in making these assessments? ([P I, Art. 36](#))
2.
 - a. Is the use of lasers as anti-personnel weapons compatible with IHL for States not party to Protocol IV to the 1980 UN Weapons Convention? Which standard is to be applied for this determination? ([HR, Art. 23\(e\)](#); [P I, Arts 35\(2\)](#)) [**See also** Protocol on Blinding Laser Weapons (Protocol IV to the 1980 Convention)] Does the use of lasers to blind enemy soldiers constitute “superfluous injury or unnecessary suffering”, which would mean that their use is prohibited by IHL? What qualifies as “superfluous injury”? As “unnecessary suffering”? Do these terms cover merely physical suffering? Or also psychological suffering? Are these objective terms? Are there objective criteria agreed upon by States Parties and applied by them to determine what constitutes “superfluous injury and unnecessary suffering”?
 - b. Is comparing a weapon with other wounding mechanisms to which a soldier might be exposed on the modern battlefield the most appropriate method for determining “unnecessary suffering”, rather than assessing the weapon and/or its use in isolation? Should a weapon’s objective effect on the victim, e.g., severity of the injury or intensity of suffering, be balanced against its military necessity? Is the determination actually a weighing up of the harm caused versus the ability to meet threats? Are these precise concepts on which to base such a determination?
 - c. If more concrete criteria should be adopted to determine what constitutes “superfluous injury and unnecessary suffering,” which criteria would you suggest? What do you think of the criteria proposed by the ICRC’s SirUS Project?

[ICRC, *The SirUS Project: Towards a Determination of Which Weapons Cause “Superfluous Injury or Unnecessary Suffering”* (Robin M. Coupland, ed., 1997), p. 23:

“[W]hat constitutes ‘superfluous injury and unnecessary suffering’ [can] be determined by design-dependent, foreseeable effects of weapons when they are used against human beings and cause: specific disease, specific abnormal physiological state, specific abnormal psychological state, specific and permanent disability or specific disfigurement (*Criterion 1*); or field mortality of more than 25% or hospital mortality of more than 5% (*Criterion 2*); or Grade 3 wounds as measured by the Red Cross wound classification (*Criterion 3*); or effects for which there is no well-recognized and proven treatment (*Criterion 4*).”]

1. Is it irreconcilable that weapons can cause death but cannot be calculated or intended to cause “superfluous injury or unnecessary suffering”? According to IHL, what is the purpose of weapons in conflict? To kill? To render an adversary *hors de combat*? Are these not different objectives? If so, is not the objective of IHL overlooked by the argument that use of a laser, even one causing blindness, is more humane than killing the soldier? Does such an argument fail to take into account the fact that conventional weapons are not always lethal? That sudden blindness also has a psychological impact? That the injury is sure to last beyond the duration of hostilities? That soldiers returning blind have an impact on the whole of society?

[See Preamble to the Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight, St. Petersburg, 29 November/11 December 1868:

“[...]

Considering:

[...]

That the only legitimate object which States should endeavour 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; ...”]

1. Would it be lawful for a soldier to be blinded ancillary to the lawful use of a laser rangefinder or target acquisition lasers against material targets? Should it be? Would it be legally inconsistent if the soldier then could not be attacked by laser individually? Does it make a difference whether the deliberate objective is to blind the soldier? (Protocol on Blinding Weapons, Art. 3; [**See [Protocol on Blinding Laser Weapons \(Protocol IV to the 1980 Convention\)](#)**])
2.
 - a. Do you agree with the US Judge Advocate General that the use of a laser as an anti-personnel weapon is lawful?

Because a laser's ability to cause blindness remains subject to a variety of factors and thus blindness does not always occur? Because protection against those factors is possible? Because the military utility of lasers outweighs the harm caused?

- b. Despite this, must not the use of lasers be deemed illegal, because they are an indiscriminate means of warfare? What if a laser were used in an area where there are civilians? Can a laser distinguish between combatants, military personnel *hors de combat*, and civilians? ([P I, Art. 51\(4\)](#))
- 3.
- a. Does not the existence of the Protocol on Blinding Laser Weapons (Protocol IV) further substantiate the US claim that IHL alone does not proscribe the use of lasers as anti-personnel weapons? Or does it solidify the international community's agreement that such use of laser weapons is contrary "to the laws of humanity, and the dictates of public conscience"? ([Martens Clause, Hague Convention IV, preambular paras 8-9; GC I-IV, Arts 63\(4\)/62\(4\)/142\(4\)/158\(4\)](#) respectively; [P I, Art. 1\(2\)](#); [P II, Preamble, para. 4](#))
 - b. Would not IHL be better served if agreements such as Protocol IV proscribed the effect on human beings, here intentional blinding, and not merely a weapon's technology? Nevertheless, is not Protocol IV at least unique in that it applies to a weapon before that weapon's effects have been observed on the battlefield?