

Chapter XIII

Modern Technology and the Law of Armed Conflict at Sea

by
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Most of the existing written legal rules for the conduct of armed conflict at sea were adopted before the development of oil propulsion for warships, radar, electric torpedoes, naval aircraft, aircraft carriers, nuclear-propulsion submarines and many other modern naval platforms and systems. These systems and weapons have been in naval inventories for decades. A comprehensive discussion of how these elements of modern technology interact with the law of armed conflict at sea would necessarily involve an analysis of each of these developments and its impact on the relevant norms of the law of armed conflict. It is not the purpose of this chapter, however, to examine each of these in detail. The weapons systems and naval platforms that found their way into naval inventories prior to and during World War II have found an uneasy peace with the traditional rules. It is rather the purpose of this chapter to review the norms for the conduct of armed conflict at sea as they may affect and be affected by technological development, and to examine briefly how current norms may impact on some of the more exotic systems that have become a part of naval inventories within recent decades or are under development and likely to become part of them in the near future.

The occasion for this review is the recent publication of *The Commander's Handbook on the Law of Naval Operations* (NWP 9),¹ the U.S. Navy's official manual on operational law, including the law of naval warfare. As such, the *Handbook* represents the official position of the United States with respect to the legality of the deployment and employment of weapons in armed conflicts at sea. The principal provisions of the *Handbook* relevant to this issue are found in Chapter 8, "The Law of Naval Targeting," Chapter 9, "Conventional Weapons and Weapons Systems," Chapter 10, "Nuclear, Chemical and Biological Weapons," and Chapter 11, "Noncombatant Persons." Several aspects of these subjects are addressed in detail in other chapters of this book—naval targeting in Chapter IX by Sally V. and W. Thomas Mallison, nuclear, chemical and biological weapons by Howard S. Levie in Chapter XI, and noncombatant persons by Frits Kalshoven in Chapter

X. Jon L. Jacobson addresses the particular problem of submarine compliance with the law of armed conflict in Chapter VIII, and Thomas Clingan addresses mine warfare in Chapter XII. It is not the purpose of this chapter to repeat what is said in those chapters but rather to attempt to synthesize the impact that internationally accepted rules have on the acquisition, retention, or employment of weapons using exotic or innovative technology. In order to do so I shall first determine the content of the applicable rules. I shall then proceed to analyze specific weapons and weapons systems in light of these rules.

History and Content of the Rules

The basic norm of the humanitarian law of armed conflict is that the right of parties to adopt means and methods of warfare is not unlimited. This norm is included in several international instruments² and, additionally, has been generally recognized as having attained binding force as customary international law.³

Flowing from this basic norm are a number of more specific rules setting forth the limits which are generally applicable to the means and methods of armed conflict. Like the basic norm, they are a part of customary international law and in most cases have also been included in one or more international instruments. Although stated somewhat differently from instrument to instrument, they include the following principles:

- The distinction between combatants and non-combatants must be recognized.⁴
- Non-combatants may not be made the object of direct attack.⁵
- The methods or means of attack of a combatant (or legitimate military target) may not have indiscriminate effect.⁶
 - As a necessary corollary to the preceding principle, weapons which by their nature are incapable of being directed specifically against military targets and therefore put combatants and non-combatants at equal risk are forbidden because of their indiscriminate effect.⁷
 - Even where an attack is directed specifically at a legitimate military target, if the incidental effect on non-combatants is disproportional to the value of the military target, then the attack may not be made.⁸
 - The methods and means of attack may not be such as to cause superfluous injury or unnecessary suffering.⁹
 - A combatant may not kill or wound an enemy who has surrendered, laid down his arms or no longer has a means of defense.¹⁰
 - The methods and means may not include treachery or perfidy.¹¹

Some would include in this list the employment "of methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment."¹² This principle made its first appearance in humanitarian law in Additional Protocol I in 1977, and can hardly be said at this time to represent customary international law. The

Government of the United States does not recognize this prohibition as part of customary international law.¹³

Section 8.1 of Chapter 8 of the *Handbook* states these general principles in slightly different terms, as follows:

1. The right of belligerents to adopt means of injuring the enemy is not unlimited.
2. It is prohibited to launch attacks against the civilian population as such.
3. Distinctions must be made between combatants and noncombatants, to the effect that noncombatants be spared as much as possible.¹⁴

The *Handbook* then admonishes:

These legal principles governing targeting generally parallel the military principles of object, mass, and economy of force. The law requires that only objectives of military importance be attacked but permits the use of sufficient mass to destroy those objectives. At the same time, unnecessary (and wasteful) collateral destruction must be avoided to the extent possible and, consistent with mission accomplishment and the security of the force, unnecessary human suffering prevented. The law of naval targeting, therefore, requires that all reasonable precautions must be taken to ensure that only military objectives are targeted so that civilians and civilian objects are spared as much as possible the ravages of war.¹⁵

During the period of the last century and a quarter there has been a series of attempts in the international arena to translate these general norms into specific prohibitions against the development or employment of particular weapon systems that advancing technology has brought into the armaments of the armed forces of many nations. These efforts have met with only limited success.

The first attempt was in the St. Petersburg Declaration of 1868,¹⁶ which contained a prohibition on the use, in time of war, of any projectile of less than 400 grams which “is either explosive or charged with fulminating or inflammable substances.”¹⁷ In other words, only artillery shells, not small caliber bullets, which presumably would only be directed against humans, may contain an explosive or incendiary charge. The possibility of future prohibitions was contemplated.¹⁸

This initiative was followed up in 1899 at the Hague by three Declarations, the first prohibiting the use of bullets that expand or flatten on piercing the human body (“dum-dum” bullets).¹⁹ The second prohibited the discharge of projectiles and explosives from balloons.²⁰ The third prohibited projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases.²¹ The first of these implemented the general norm against weapons that caused superfluous injury or unnecessary suffering. The second implemented the general principle against weapons having an indiscriminate effect, and the third was under the umbrella of both of these general principles.

The Hague Conference of 1907 dealt explicitly with several aspects of naval warfare. The conventions adopted at the conference included one governing the conduct of naval bombardment.²² A second, dealing with contact mines,²³

required, *inter alia*, that unanchored contact mines should automatically disarm themselves within one hour of the time the person launching the mine ceases to control them and that anchored contact mines should become harmless when they have broken loose from their moorings.²⁴ Included within the contact-mine Convention was a requirement that torpedoes should be rendered harmless when they have missed their target.²⁵ These restrictions were acceptable to the conferees because they were obviously in the interest of the powers that had the technology to develop such weapons since free-floating mines and torpedoes were just as much a hazard to friendly forces as enemy. Also the technology to implement these prohibitions was in hand.

The technologically advanced nations were, however, unwilling to renounce the benefits of technology which might be of benefit to them. As stated by Antonio Cassese, "Whenever it has turned out that a means of destruction was really effective, states have refrained from outlawing it."²⁶ He echoes a statement by the United States representative at the 1899 Peace Conference, who said:

The general spirit of the proposals that have received the favorable support of the subcommission is a spirit of tolerance with regard to methods tending to increase the efficacy of means of making war and a spirit of restriction with regard to methods which, without being necessary from the standpoint of efficiency, have seemed needlessly cruel. . . .

[I]t is the efficacy that we have wished to safeguard, even at the risk of increasing suffering, were that indispensable.²⁷

This remains the prevailing attitude among technologically advanced states and has been reflected in their negotiating positions in more recent conferences.

In the period between World Wars I and II, diplomatic attempts to prohibit or restrict specific weapons were limited to two weapons or methods of warfare—poison gas and the submarine²⁸—not surprisingly means and methods of warfare employed first and most effectively by the defeated powers. The 1925 Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare²⁹ prohibits the use of asphyxiating, poisonous or other gases and extends that prohibition to the use of bacteriological methods of warfare. The Protocol has received wide acceptance, currently being in effect for 135 states.³⁰

The force of these prohibitions is somewhat weakened by the large number of reservations which declare that the Protocol shall cease to be binding on the reserving state as to enemy states whose armed forces or allies fail to respect the prohibition.³¹ The United States is among those reserving.³² In light of the combined effect of the large number of parties and the large number of reservations, it is generally accepted that this Protocol bars only the "first use" of poisonous gas or bacteriological weapons.³³

The efforts to deal with the legality of employment of submarines in naval warfare are the subject of a separate chapter in this volume and will not be dealt with in this essay.³⁴

The post-World War II efforts to put limitations on the use of certain weapons have to a large extent been conducted within the context of disarmament, which is beyond the scope of this essay, but one of them resulted in a convention prohibiting bacteriological weapons. That is the 1972 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction.³⁵ Drafted by the Committee on Disarmament, this convention, going beyond the prohibitions of use included in the 1925 Geneva Protocol, obligates each State Party:

[N]ever in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

1. microbial or other biological agents or toxins whatever their origins or method of production of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
2. weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.³⁶

Parties are also required to destroy or divert to peaceful purposes any stocks they may already have and may not transfer such agents to any recipient or “assist, encourage, or induce any state, group of states, or international organization” to manufacture or acquire them.³⁷

The Committee on Disarmament’s initial approach was to include chemical weapons in the prohibition, but this proved impossible.³⁸

The Convention entered into force in 1975 and has been rapidly and widely accepted. As of January 1, 1989, it had 110 parties.³⁹

The most significant recent demonstration of the reluctance of states to commit to specific bans was in the Geneva Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts, convened under the sponsorship of the Government of Switzerland, which met in annual sessions from 1974 through 1977. At that conference, although one of the standing committees was charged with examining proposals for restrictions on specific weapons, and the ICRC attempted to assist the process by convening conferences of experts in 1974 and 1976, no specific bans emerged. Subsequently, a United States spokesman stated:

[T]here was a considerable measure of agreement on a detailed set of regulations to govern the recording of [land] minefields, the use of [land] mines in populated areas, and the prohibition of certain types of especially inhumane booby trap devices.

Useful work was also done on the subject of napalm and other incendiary weapons. However, it was clear at the end of the conference that large gaps still remained between those who wanted to prohibit incendiaries generally, and those (including the major

Western military powers) who were prepared to accept substantial restrictions on the use of flame weapons in populated areas but were not prepared to give up battlefield uses of the weapons.⁴⁰

The conference did, however, take two actions that might be considered useful with respect to specific bans. The first was the adoption of an article of additional Protocol I mandating a system of national legal reviews of new weapons systems before they are produced or acquired.⁴¹ The second was the adoption of a resolution calling on the United Nations to convene a follow-up conference on the prohibition or restriction of certain conventional weapons by 1979.⁴²

The requirement for the system of national legal review is found in article 36 of Additional Protocol I, which provides:

In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or any other rule of international law applicable to the High Contracting Party.

Several important points should be noted about article 36. First, the article applies only to “new” weapons. It may, however, also apply to a “new use” (method) of an old system. Second, the state party’s determination that a new weapon, means or method of warfare is prohibited would not mean that the state is prohibited from acquiring or possessing the weapon. A nation may, for example, stockpile weapons it determines to be prohibited for use as an instrument of reprisal (provided, of course, that weapon is not absolutely prohibited by some absolute rule against acquisition or retention (*e.g.*, biological weapons)). Third, the state is to examine whether a weapon would be prohibited either because it is inherently unlawful in any form of employment (*e.g.*, indiscriminate effect) or only in “some” circumstances. The conferees recognized that any weapon could be misused in a way that is illegal. The purpose of the national evaluation is to analyze the weapon in terms of its “normal or expected use.”⁴³ Fourth, the applicable standards for review are the terms of Additional Protocol I itself (primarily article 35) or “any other rule of international law applicable to the High Contracting Party.” This presumably includes the customary rules of the law of armed conflict as well as treaties. And finally, the determination of legality *vel non* is a national determination. It does not establish a standard that must be applied by other states; there is no requirement that it be published.⁴⁴

Article 36 might be regarded as a bridge between the general prescriptive norms established by Article 35 and the enforcement of prohibitions or restrictions on specific weapons or methods of warfare. Some states wished to establish an international body with authority to monitor and draw up lists of weapons or methods of use that fell within the proscription of article 35.⁴⁵

Other states felt that this would put the Conference into the field of disarmament, a subject beyond its competence.⁴⁶

The article as adopted is a compromise between these two points of view. It was an international application of procedures already in place in several states, and for that reason it could command wide support from Western military powers. Under Department of Defense Instruction 5500.15 the United States, for example, had established a program in 1974 that stated a policy that:

All actions of the Department of Defense with respect to the acquisition and procurement of weapons, and their intended use in armed conflict, shall be consistent with the obligations assumed by the United States Government under all applicable treaties, with customary international law, and, in particular, with the laws of war.⁴⁷

The Instruction placed responsibility on each Military Department to ensure that the Judge Advocate General of the Department would review all weapons intended to meet a military requirement to determine whether they were consistent with the above-quoted criteria. This review was to be conducted "prior to the award of an initial contract for production" and "at such subsequent stages in acquisition or procurement as the Judge Advocate General concerned determines it is appropriate."⁴⁸ The Judge Advocates General are required to maintain permanent files of opinions issued by them.⁴⁹ Each of the military departments has implemented this Instruction by internal regulations detailing how and when these reviews shall be conducted.⁵⁰

As to the second outcome of the 1977 Conference dealing with specific bans (the Resolution calling for the United Nations to convene a follow-up conference), the United Nations responded by convening two sessions of a Preparatory Conference in 1978 and 1979 and a United Nations Diplomatic Conference on Prohibitions or Restrictions of Use of Certain Conventional Weapons Which May Be Deemed to be Excessively Injurious or to Have Indiscriminate Effects, which met in 1979 and 1980. The latter produced a 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.⁵¹ The operative portions of the convention are contained in three Protocols, the first prohibiting use "of any weapon the primary effect of which is to injure by any fragments which in the human body can escape detection by x-rays."⁵² The second contains prohibitions and restrictions on the use of land mines, booby traps and other devices.⁵³ The third deals with incendiary weapons.⁵⁴ It does not prohibit the use of incendiary weapons such as napalm against military objectives, but it prohibits making "the civilian population as such, individual civilians or civilian objects the object of attack by incendiary weapons."⁵⁵ It also prohibits making a military objective within a concentration of civilians the object of attack by air-delivered incendiary weapons; and prohibits such attacks by non-air-

delivered weapons except when the objective is clearly separated from the non-military objects and “all feasible precautions” are taken to limit the incidental harm to civilians and civilian objects.⁵⁶

The Conference, although unable to agree on a protocol on the subject of small calibre weapons, adopted a resolution calling for further research on the wounding effects of small calibre weapon systems and urging governments “to exercise the utmost care in the development of small-calibre weapons systems, so as to avoid an unnecessary escalation of the injurious effects of such systems.”⁵⁷

The Convention entered into force in 1983, but the United States has not become a party to it. In a statement made at signature, the United States made a Declaration which included the following statement:

As indicated in the negotiating record of the 1980 Conference, the prohibitions and restrictions contained in the Convention and its Protocols are of course new contractual rules (with the exception of certain provisions which restate existing international law) which will only bind States upon their ratification of, or accession to, the Convention and their consent to be bound by the Protocols in question.⁵⁸

The second Protocol, dealing only with methods of land warfare, is beyond the scope of this essay. The first Protocol, of course, is a specific ban of a particular weapon, and, if applicable, would bar employment of such a weapon by a combatant. It is interesting to note that despite the U.S. declaration that the prohibitions and restrictions of the Protocols are contractual and bind states only upon their becoming parties to them, the *Handbook* takes the position that “using materials that are difficult to detect or are undetectable by field x-ray equipment, such as glass or clear plastic, as the injuring mechanism in military ammunition is prohibited, since they unnecessarily inhibit the treatment of wounds.”⁵⁹ The *Annotation*⁶⁰ does not cite the 1980 Protocol I as authority for this proposition, and since it is included in a paragraph entitled “Unnecessary Suffering,” it must be presumed that the authors of the *Commander’s Handbook* considered the use of such materials as contrary to the general principle against inflicting unnecessary suffering.

Some commentators have been critical that the conferences held in the decade of the 70’s did not make more progress in establishing prohibitions on specific weapons, means or methods of warfare. Antonio Cassese, for example, has said that confining the prohibitions to general principles has two major disadvantages: first, “they are couched in very vague terms” and second, “[t]heir application is left to the belligerents concerned.”⁶¹ As a result, he says, a belligerent who believes his enemy is using an illegal means, can only resort to reprisals or a threat of prosecution of those responsible as war criminals.⁶² Echoing the comments at and after the Hague Conferences, he concludes that the ultimate question then comes down to one of power. He says:

[W]hether this kind of reaction can produce any real effect actually depends on how strong the belligerent resorting to it is. Ultimately, therefore, the implementation of the general principles on weapons turns on the military strength of the belligerent; strong States can dodge the bans without fear. The only "sanction" against them is to resort to world public opinion.⁶³

But Cassese also recognizes the inadequacies of specific bans. The principal one he points out is that prohibitions always lag behind new weapon development. Thus, a technologically advanced nation can always develop a new weapon, perhaps equally or more cruel, to replace one that is specifically banned.⁶⁴ "As a result," he says, "the gap between technologically developed States and less advanced countries could be widened. . . ."⁶⁵

What can we then conclude from this review of authority as to the limitations that will apply to a state, particularly a technologically advanced state such as the United States, when it makes a decision as to the acquisition or employment of a naval weapon that its technology is capable of producing or in evaluating the legality of one produced or used by an adversary?

Of the general principles listed earlier, it is to be noted that most of them apply to the manner of employment of weapons—that is, targeting, which is dealt with in another chapter of this book.⁶⁶ Only three would prohibit use of the weapon itself, irrespective of how it is used. These three are:

- a weapon may not have indiscriminate effect;⁶⁷
 - a weapon may not be such as to cause superfluous injury or unnecessary suffering;⁶⁸
- and
- a weapon may not be one that could only be used in a treacherous or perfidious mode.⁶⁹

Specific bans are applicable in a few cases:

- unanchored automatic contact mines must be designed so as to be rendered harmless one hour after they are no longer under control;⁷⁰
- anchored contact mines must be designed so as to become harmless when they break away from their moorings;⁷¹
- torpedoes must be designed to become harmless when they have missed their mark;⁷²
- a state may not resort to "first use" of poisonous gas;⁷³
- bacteriological weapons, or their means of delivery, cannot be developed, produced, stockpiled or otherwise acquired or retained.⁷⁴
- a state may not use any weapon the primary effect of which is to injure by fragments which in the human body can escape detection by x-rays.⁷⁵

Having reviewed both the general and specific limitations that may apply when new technology is converted into weapons, we can now proceed to analyze the effect these limitations may have on the acquisition, retention or employment of specific weapons systems that have recently come into national armament stocks or that are under development. In conducting this analysis, I shall single out a few weapon systems that have, in the minds of some, raised questions of their legality without attempting to be comprehensive. In addition, I shall use as primary exemplars American

systems. I shall also, where appropriate, see how these weapons are treated in the *Commander's Handbook on the Law of Naval Operations* (NWP 9) and express at least a tentative opinion as to whether NWP 9's position on the issue is justified. As a predicate for the latter task, I might reiterate what I stated in the Preface to this volume.⁷⁶

NWP 9 is what it states itself to be—a “commander’s” handbook, meant for the guidance of operational commanders and their staffs to assist them to conform their operations—peacetime as well as wartime—to the dictates of international law. It is therefore written in terms understandable to the lay person. Some might say it paints the picture too much in black and white, not recognizing the delicate shadings that reflect the actual state of the law that are so dear to the hearts of international-law scholars. It contains no footnotes for the benefit of scholars who may wish to know the source of the “rule” stated. But, as pointed out in its Preface, it is not a “substitute for the definitive legal guidance provided by judge advocates and others responsible for advising commanders on the law.”⁷⁷

For the benefit of these “judge advocates and others” who will provide fuller guidance, there is an encyclopedic “Annotated Supplement”⁷⁸ to NWP 9, prepared under the auspices of the Naval War College and the Judge Advocate General of the Navy for distribution to judge advocates having responsibility for advice to operational commanders. The *Annotated Supplement* gives a section-by-section analysis of NWP 9 with full discussion of the concepts involved and the sources of the rules stated. It will be an invaluable resource to persons who will provide advice to commanders at all levels of command as well as to scholars engaged in research.

Specific Weapons Systems⁷⁹

Over-the-Horizon Weapons Systems. One of the most significant weapon-system developments in the post-World War II era is the over-the-horizon projectile. There are many variations of such systems which are now operational or in development in the United States and other navies. Typically, in the marine environment, such weapon systems consist of a turbofan- or turbojet-propelled cruise missile armed with either a nuclear or high-explosive warhead and the associated shipboard or aircraft installations for launching and initial guidance. The missile may be launched from aircraft, or when equipped with a rocket booster motor, from surface ships and submarines. It may follow a preprogrammed cruise flight path or may be controlled during flight from the launching platform or pre-positioned guidance vessel or aircraft. Its terminal guidance may be heat-seeking, active radar homing, television monitoring, or some other system.

The two most prominent guided-missile systems currently in the United States Navy’s inventory are the Tomahawk Sea-Launched Cruise Missile and

the Harpoon Surface-to-Surface Missile. The former of these is a long-range (over 450 kilometer) turbofan-propelled cruise missile designed for submarine or surface ship launching against ships or land targets. The latter is a shorter range (over 90 kilometer) turbojet-propelled cruise missile designed primarily for attacks on surface ships. For land-target attacks the Tomahawk uses an inertial guidance system with advanced terrain contour matching (TERCOM) for course corrections and target acquisition. For attacks on ships, both the Tomahawk and Harpoon use inertial guidance to the vicinity of the target where active radar is switched on to detect and lock on the target.

In his 1972 article, "The Legality of Cruise Missiles,"⁸⁰ D. P. O'Connell observed that:

[T]he specific questions that should be posed [as to the legality of naval cruise missiles] are whether the existing rules of international law respecting discrimination between military and civilian targets can be observed in practice . . . , and whether the immunity of neutral shipping from attack can be respected.⁸¹

The questions remain the same today. The questions suggest, and correctly so, that the weapon itself is not *per se* illegal, but rather that the legality of its use depends on the particular circumstances prevailing at the time of the intended employment. Where the conflict is being conducted in an area where there is small likelihood that anything but legitimate targets will be present, the use of long-range surface-to-surface or air-to-surface missiles would be entirely legitimate. But as the recent experience in the Persian-Arabian Gulf war between Iran and Iraq has shown, the risk of error in identification of targets is high when the naval conflict takes place in an area in which neutral warships and shipping are intermingled in close proximity with the naval forces and merchant shipping of the contending powers. In all long-range systems of which I am aware, the initial guidance system only takes the missile to the general vicinity of the target, at which point the terminal guidance system takes over, picks out the target and self-guides the missile to it, usually through an infrared homing device or active radar acquisition and tracking. In either event, the missile's ability to discriminate between legitimate and illegitimate targets that may be in the area is limited. The legality of using such long-range weapons would depend on a balancing of the risk of harm to non-legitimate targets with the importance of the legitimate target to the accomplishment of the military mission.⁸²

The Commander's Handbook recognizes these limitations. With respect to over-the-horizon weapons, it provides:

Missiles and projectiles dependent upon over-the-horizon or beyond-visual-range guidance systems are lawful, provided they are equipped with sensors, or are employed in conjunction with external sources of targeting data, that are sufficient to ensure effective target discrimination.⁸³

CAPTOR Mine. Although mine warfare is the subject of a separate chapter herein,⁸⁴ it is appropriate to consider the CAPTOR mine briefly in this chapter as well, since it is a technologically sophisticated weapon system which has made its appearance in the last decade or so.

CAPTOR is an American antisubmarine weapon consisting of an encapsulated Mark 46 torpedo, which is anchored to the ocean floor in the same manner as a naval mine, and can be laid by either submarines or aircraft. When its acoustic detection system determines that an enemy submarine is within range, it launches the torpedo, which homes on the target.

CAPTOR thus has some of the characteristics of a mine and some of a torpedo. It would thus be subject to any specific restrictions applicable to torpedoes or mines, as well as any more general restrictions.

As we have seen, the only specific limitation on mines and torpedoes are those contained in Hague VIII.⁸⁵ Since, however, Hague VIII deals only with "automatic contact mines," its specific prohibitions and restrictions are inapplicable to CAPTOR. Its provision with respect to torpedoes is limited to a prohibition against use of "torpedoes which do not become harmless when they have missed their mark."⁸⁶ This latter provision poses no problem to the legality of CAPTOR, since all United States-designed torpedoes are designed to sink to the bottom and become harmless when they have completed their propulsion run.⁸⁷

With respect to the general prohibitions, the only one that could possibly be applicable is that prohibiting a weapon which may have indiscriminate effect. Although once laid, the CAPTOR mine is not within the control of the party that has planted it, its design incorporates features that prevent it from having indiscriminate effect. Its sensors permit it to recognize the "signatures" of enemy submarines, thus preventing it from being activated by an unintended target vessel. Once launched, the torpedo itself is "gated" to prevent it from straying outside pre-set depth parameters and becoming a danger to surface shipping that may be in the area. CAPTOR thus does not appear to fall within the prohibition against weapons having indiscriminate effect.

Although the *Commander's Handbook* does not single out CAPTOR for specific comment in its sections on naval mines⁸⁸ and torpedoes,⁸⁹ its discussion of the limitations and prohibitions on the employment of mines appears to comply with the prohibitions discussed. The *Handbook* acknowledges that "[t]echnological developments have created weapons systems obviously not contemplated by the drafters of [the 1907 Hague] rules."⁹⁰ It then adds, "Nonetheless, the general principles of law embodied in the 1907 Hague Convention continue to serve as a guide to lawful employment of naval mines."⁹¹

Directed Energy Devices. Of all the weapons systems brought forth by modern technology, the most exotic are those using directed energy devices. While evoking images of "Buck Rogers in the 25th Century" and "Star Wars," the fact is that some of these devices are already incorporated into a number of current weapon systems, primarily for such functions as range-finding, target-designating or target-illuminating. But the energy stream they emit may also directly disable enemy materiel or injure or kill enemy personnel. Because they are particularly effective in space, where their energy is not scattered or attenuated by the atmosphere or pollutants, they will comprise essential components of the United States' Strategic Defense Initiative. The United States Department of Defense has reported that the Soviet Union is developing high-energy lasers for strategic air defense, space-based anti-satellite missions, and possibly for anti-ballistic-missile defense.⁹²

"Directed energy" is a generic term embracing three technologies: lasers, high-powered microwave devices, and particle beams. All have in common the production and emission of a stream or beam of concentrated electromagnetic energy or atomic or sub-atomic particles.

Lasers emit a focused, very narrow beam of energy. In their low-energy versions, they may be used for range-finding, target-designating or target illuminating for a variety of weapon systems or to dazzle or distract an approaching watercraft or aircraft by creating a flash of light when the beam strikes the windscreen of the craft. The effect is much like that of attempting to drive an automobile directly into a rising or setting sun. Even a low-energy laser can cause retinal damage and temporary or permanent visual impairment to a person who is looking directly at the emitter, since the eye focuses the beam on a small spot on the retina. The harm is aggravated and the range of harm is extended if the person is using binoculars. In their high-energy versions, lasers can physically damage enemy materiel by the rapid buildup of intense heat on the target. They can jam or cause permanent damage to optical, electro-optical, or infrared systems.

Microwave devices propagate much like light beams but are absorbed and reflected differently. They can pass through glass, plastic and fabric with little or no energy loss and can guide on metallic objects such as wires. These devices can jam or cause permanent damage to materiel components either by disrupting electric or electromagnetic circuits or causing physical damage by rapid heat buildup.

Particle beam devices differ from lasers and microwave devices in that they actually transmit matter rather than energy. The absorption of the matter by the target creates intense heating, which can cause meltdown or destruction of components. Impact with the target may also create secondary emissions of gamma and x-rays. These devices do not appear to have much capability for current tactical application because they require an extremely high power accelerator and power source, which cannot be made

transportable. They will probably find application in anti-ballistic-missile and anti-satellite systems, a discussion of which is beyond the scope of this paper.

Most of the discussion on the legality of directed energy devices has centered on lasers. At the 1974-77 Diplomatic Conference on Humanitarian Law, several nations attempted to bring the matter forward, but were unsuccessful. Again, at the follow-on U.N. Conference on Certain Conventional Weapons in Geneva in 1978, the subject was raised but not dealt with. At the XXV International Conference of the Red Cross in 1986, Sweden and Switzerland offered a resolution condemning the blinding effect of laser weapons, but it did not gain much support and was not adopted by the Conference. The most recent attempt of Sweden to raise the issue is summarized by the Judge Advocate General of the Army as follows:

In April 1988 Sweden again endeavored 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 purposes; 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.⁹³

Pursuant to Department of Defense Instruction 5500.15,⁹⁴ the Judge Advocate General (JAG) of the Army reviewed the legality of the use of lasers as antipersonnel weapons. In a memorandum of law, concurred in by the Judge Advocates General of the other military departments,⁹⁵ the JAG 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." The rationale for the conclusion was that blinding was "no stranger to the battlefield," since it already occurred from multiple causes; "potential laser injuries can be minimized with the utilization of appropriate protective equipment and defensive actions;" although lasers may cause permanent blindness, many injuries caused by admittedly lawful weapons also result in permanent disabling effects; the prohibition against employment of "arms, projectiles, or material calculated to cause unnecessary suffering" (Hague IV, art. 23 (e)) 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;" and finally, that prohibiting direct laser attacks on enemy combatant personnel would lead to the anomaly "that a soldier legally could be blinded ancillary to the lawful use of a laser rangefinder or target acquisition lasers but could not be attacked individually."⁹⁶

Lasers and other directed energy devices must be examined for their legality on the basis of the same criteria we have used in looking at the other weapons systems discussed earlier.⁹⁷ Of those criteria, only two appear to have possible applicability. These are that a weapon may not have indiscriminate effect, and a weapon may not be such as to cause superfluous injury or unnecessary suffering.

As to the first of these—indiscriminate effect—it would appear that directed energy devices have a higher order of discrimination than almost any other weapon, current or projected, in military arsenals. The streams of energy are highly focused and narrow; they travel at or near the speed of light and thus “hit” the target essentially at the same time they are launched, eliminating the problem of “leading” the target to obtain a hit; and since they travel in a straight line, they are essentially limited to line of sight, drastically reducing the danger to objects or persons not being targeted.

The Army JAG memorandum of law focused on the second criterion—superfluous injury or unnecessary suffering. The most severe effects on personnel produced by lasers are blindness, temporary or permanent, and, at high powers, severe skin burns. As to the former of these, the Army memorandum states:

The human eye is particularly susceptible to laser light in the visible and near infrared portions of the electromagnetic spectrum because of the focussing properties of the human cornea and lens. Laser light incident on the cornea . . . is focussed 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 by a mechanism known as photocoagulation. At these high levels of laser irradiation the effects on the human eye may be the appearance of a large retinal burn with accompanying hemorrhage into the portion of the eye behind the lens. As the incident laser energy is reduced, the hemorrhage 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.⁹⁸

The Army memorandum concludes that neither blindness nor permanent disablement on the battlefield are unique to laser weapons. The mere fact that a particular weapon causes one form of disablement rather than another is no justification for concluding that one is legal while the other is not. Further, according to the Army memorandum:

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 targets, but could not be attacked individually.⁹⁹

This final argument seems somewhat specious to me. The principle of distinction underlies many of the norms of the humanitarian law of armed

conflict. The most notable, of course, is the prohibition against making direct attacks on civilians and civilian objects while permitting injury or damage to civilian and civilian objects as an inevitable incident of attacks on legitimate military objectives. I see no anomaly in allowing incidental eye damage from use of laser range-finding or target acquisition while prohibiting lasers for the sole purpose of permanently blinding enemy combatants. It may be difficult to police the distinction made, but there is no theoretical basis for not making such a distinction.

The Army JAG memorandum only mentions skin burns in passing, pointing out that, "Incendiary weapons have been in use by most nations throughout the history of war." The memorandum also rightly points out that attempts to enjoin their use against military personnel foundered at the 1978-80 United Nations Conference on Certain Conventional Weapons. In this respect, the Army memorandum is undoubtedly correct, and there is no reason to believe that burns caused by lasers or other directed-energy weapons are any more horrible than burns caused by napalm bombs, flame-throwers or other incendiary weapons.

The *Commander's Handbook* does not specifically address directed energy devices or weapons. It does include a paragraph on incendiary weapons, stating that they are lawful provided they are employed "in a manner that minimizes uncontrolled or indiscriminate effects on the civilian population consistent with mission accomplishment and force security."¹⁰⁰

Depleted Uranium Ammunition. Depleted uranium is the metal that remains after the fissile, highly radioactive uranium has been removed to make nuclear weapons. Its high atomic weight and its extreme hardness make it the ideal material for a number of commercial applications, such as machine tool boring bars, gyroscope rotors and oil well drill collars as well as counterweights in military and commercial aircraft and keel ballast for high performance sailing yachts. Its great mass also makes it an ideal material for projectiles intended to destroy or disable the target by physical impact. The Navy's Phalanx close-in weapon system, which is designed for last-ditch defense against attacking high speed aircraft or guided missiles, uses a five-barrel Gatling gun firing several thousand 20mm depleted uranium projectiles per minute. The U.S. Air Force also uses a 30mm version as its main anti-tank weapon for its A-10 aircraft.

The question of whether the use of such projectiles breaches any norm of the law of armed conflict depends on whether they are "poisoned weapons," prohibited by article 23 of the Hague (IV) Regulations for land warfare¹⁰¹ and by the customary law of warfare at sea.¹⁰²

Depleted uranium can hardly be considered as poison, however. The radioactivity it emits is said to be less than one-seventh that of the luminous dial of a wristwatch. An Air Force source states that a man could hold a 30mm

round of depleted uranium ammunition for four and one-half hours per day forever and not exceed the permissible radiation dose. Further, its chemical toxicity is less than lead, which is a commonly used component of ballistic projectiles.

Conclusion

This admittedly selective review of some of the weapons systems brought forth under advancing technology has shown that none of the weapons reviewed can be said to be unlawful *per se*, although, like all other weapons systems, they can be employed in such a way as to make their use unlawful. Furthermore, if current technological trends continue, weapons will become more discriminating, although more highly destructive. The *Commander's Handbook*, although not dealing with each of these systems explicitly, sets forth principles that are adequate to provide guidance to commanders employing such weapons so that they may avoid using them in an unlawful manner. In addition, the legal review processes established by the Secretary of Defense and implemented by each of the Military Departments provide a mechanism for continuing oversight of the development, deployment, and employment of new, technologically advanced systems to ensure that the legal restraints on their development and use are considered by appropriate officials.

Notes

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1. *The Commander's Handbook on the Law of Naval Warfare* (NWP 9) (1987) (hereinafter *The Commander's Handbook* or *Handbook*).

2. See, e.g., Institute of International Law, *The Laws of Land Warfare*, Manual Published by the Institute of International Law (Oxford Manual), September 9, 1880, art. 4, *Annuaire de l'Institut de Droit International*, v. 5, p. 156 (1880), D. Schindler & J. Toman, *The Laws of Armed Conflict: A Collection of Conventions, Resolutions and Other Documents*, 3rd ed. (Dordrecht, Netherlands: Martinus Nijhoff Publishers, 1988), p. 35 (hereinafter Schindler & Toman); Hague Convention (II) with Respect to the Laws and Customs of War on Land, July 29, 1899, Annexed Regulations, art. 22, *United States Statutes at Large*, v. 32, p. 1803 (hereinafter Hague II); Hague Convention (IV) Respecting the Laws and Customs of War on Land, October 18, 1907, Annexed Regulations, art. 22, *United States Statutes at Large*, v. 36, p. 2227 (hereinafter Hague IV); Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), June 8, 1977, art. 35, para. 1, *Official Records of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts, Geneva (1974-1977)*, v. I, p. 115 (hereinafter Additional Protocol I), Schindler & Toman, pp. 621, 644.

3. Cassese, "Means of Warfare: The Present and the Emerging Law," *Revue Belge de Droit Internationale*, v. 12, p. 143 at p. 144 (1976); International Committee of the Red Cross (Y. Sandoz et al., eds.), *Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949* (Geneva: Martinus Nijhoff Publishers, 1987), p. 390 (hereinafter *Commentary*); General Counsel, U.S. Department of Defense Letter of September 22, 1972, excerpts reprinted in *American Journal of International Law*, v. 67, p. 122 (1973) (hereinafter General Counsel, DOD, letter).

4. According to the ICRC's Commentary on Additional Protocol I, "The entire system established in The Hague in 1899 and 1907 and in Geneva from 1864 to 1977 is founded on this rule of customary law." *Commentary*, *supra* note 3, p. 598 (footnotes omitted). The rule is specifically codified in article 48 of the Additional Protocol as follows:

In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.

See also General Counsel, DOD, letter, *supra* note 3, p. 123; *Commentary, supra* note 3, p. 615.

5. This principle was codified for the first time in Additional Protocol I, *supra* note 2, art. 51, para. 2; see also art. 57, para. 1. Although the United States has not become a party to Protocol I and has expressed its intention not to do so, the United States regards many of its provisions as codifications of binding customary law. See Remarks of Michael J. Matheson, Deputy Legal Adviser, Department of State, "The United States Position on the Relation of Customary International Law to the 1977 Protocols Additional to the 1949 Geneva Conventions," *American University Journal of International Law and Policy*, v. 2, no. 2 (Fall 1987), pp. 419-436. Mr. Matheson, in his remarks, indicated that one way the United States may indicate its agreement that a particular provision of Protocol I has attained the status of customary international law is by inclusion of the principle in a military manual. *Id.*, p. 421. It should therefore be noted that the *Handbook* prohibits launching "attacks against the civilian population as such." *Commander's Handbook, supra* note 1, para. 8.1.

In an unclassified memorandum to the Deputy Assistant Secretary of Defense for Negotiations Policy, the United States Joint Chiefs of Staff forwarded a list of the articles of Additional Protocol I that should be "Recognized or Supported as Customary International Law." This list included, *inter alia*, articles 32-34 (basic principles), art. 45 (persons who have taken part in hostilities), art. 51, para. 2, and art. 52, paras. 1 and 2, except for the reference to reprisals, and art. 57, paras. 1, 2 (c), 4, and 5 (civilians). JCS memorandum MJCS-49-86, of March 18, 1986, subj: "1977 Protocols Additional to the Geneva Conventions: Customary International Law Implications" (copy in files of author).

6. This rule of customary law is codified in article 51 para. 4 (c) of Additional Protocol I, *supra* note 2.

7. Although accepted as a principle of customary international law, see General Counsel, DOD, letter, *supra* note 3, it is codified in a treaty for the first time as article 51, paragraph 4, of Additional Protocol I, *supra* note 2.

8. This principle is now codified in Additional Protocol I, *supra* note 2, art. 51, para. 5 (b).

9. Hague II, *supra* note 2, art. 23 (e); Hague IV, *supra* note 2, art. 23 (e); Additional Protocol I, *supra* note 2, art. 35, para. 2. Although Hague II and Hague IV apply explicitly only to war on land, the general principles included in those Conventions are generally regarded as a part of the customary law of the sea, and, of course, "to the extent that naval hostilities may involve the use of weapons whose principal employment is in land warfare, it is clear that the rules applicable to land forces are equally applicable to naval forces." Robert W. Tucker, *International Law Studies: The Law of War and Neutrality at Sea* (Washington: U.S. Govt. Print. Off., 1957), p. 50 and note 12.

10. Hague II, *supra* note 2, art. 23 (c); Hague IV, *supra* note 2, art. 23 (c); Additional Protocol I, *supra* note 2, art. 41. See also common article 3 of the four 1949 Geneva Conventions, which lays down minimum conditions of humanitarian conduct in cases of armed conflict "not of an international character." The texts of these Conventions are published in numerous publications. For ready reference only the U.S. Treaty Series and Schindler & Toman are listed. Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, August 12, 1949, *United States Treaties and Other International Agreements* (hereinafter cited as *U.S.T.*) v. 6, pp. 3114-3216, T.I.A.S. 3362, Schindler & Toman, *supra* note 2, pp. 373-399 (hereinafter 1949 Geneva Convention I); Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea, *U.S.T.*, v. 6, pp. 3217-3315, T.I.A.S. 3363, Schindler & Toman, *supra* note 2, pp. 401-422 (hereinafter 1949 Geneva Convention II); Convention (III) Relative to the Treatment of Prisoners of War, *U.S.T.* v. 6, pp. 3316-3515, T.I.A.S. 3364, Schindler & Toman *supra* note 2, pp. 423-493 (hereinafter 1949 Geneva Convention III); Convention (IV) Relative to the Protection of Civilian Persons in Time of War, *U.S.T.*, v. 6, pp. 3516-3695, T.I.A.S. 3365, Schindler & Toman, *supra* note 2, pp. 495-562 (hereinafter 1949 Geneva Convention IV).

11. Hague II, *supra* note 2, art. 23 (b) and (f); Hague IV, *supra* note 2, art. 23 (b) and (f); Additional Protocol I, *supra* note 2, art. 37.

12. This prohibition is found in article 35, para. 3, of Additional Protocol I, *supra* note 2.

13. Remarks of Michael J. Matheson, *supra* note 5, at p. 424. Mr. Matheson stated that the provision "is too broad and ambiguous and is not a part of customary law." *Id.*

14. *Commander's Handbook, supra* note 1, para. 8.1.

15. *Id.*

16. Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight. St. Petersburg, December 11, 1868. *American Journal of International Law (Supp.)*, v. 1, pp. 95-96 (1907), Schindler & Toman, *supra* note 2, pp. 101-103.

17. *Id.*

18. *Id.*

19. Declaration (IV, 3) Concerning Expanding Bullets. The Hague, July 29, 1899, James B. Scott, ed., *The Hague Conventions and Declarations of 1899 and 1907*, 3rd ed. (3rd ed., Carnegie Endowment for International Peace, 1918), pp. 227-28 (hereinafter, Scott, *Hague Conventions*), Schindler & Toman, *supra* note 2, pp. 109-10.

20. Declaration (IV, 1) to Prohibit, for the Term of Five Years, the Launching of Projectiles and Explosives from Balloons, and Other New Methods of Similar Nature. The Hague, July 29, 1899, Scott, *Hague Conventions*, *supra* note 19, pp. 220-23, Schindler & Toman, *supra* note 2, pp. 201-05. A similar Declaration (but with the time limit extended "for a period extending to the close of the Third Peace Conference") was adopted at the 1907 Hague Conference. The latter, Declaration (XIV) Prohibiting the Discharge of Projectiles and Explosives from Balloons, but not the former, was ratified by the United States. *United States Statutes at Large*, v. 36, pp. 2439-43, Schindler & Toman, *supra* note 2, pp. 201-06. All three of the Declarations, like the Conventions themselves, were only binding if *all* parties to the conflict were contracting parties. This constituted a substantial drawback to their effectiveness unless the principles adopted constituted customary international law.

21. Declaration (IV, 2) Concerning Asphyxiating Gases, The Hague, July 29, 1899. Scott, *Hague Conventions*, *supra* note 19, pp. 225-26, Schindler & Toman, *supra* note 2, pp. 105-07.

22. Convention (IX) Concerning Bombardment by Naval Forces in Time of War. The Hague, October 18, 1907. *United States Statutes at Large*, v. 36, pp. 2351-70, Schindler & Toman, *supra* note 2, pp. 811-17.

23. Convention (VIII) Relative to the Laying of Automatic Submarine Contact Mines, The Hague, October 18, 1907. *United States Statutes at Large*, v. 36, pp. 2332-50, Schindler & Toman, *supra* note 2, pp. 803-09.

24. *Id.*, art. 1, pars. 1 and 2.

25. *Id.*, art. 1, para. 3.

26. Cassese, *supra* note 3, at p. 149.

27. Statement of the representative of the United States, Third Subcommittee, James B. Scott, ed., *The 1899 Hague Peace Conference, Proceedings of the Hague Peace Conferences, Conference of 1899* (Translation of Official Text) (New Edition) (The Hague: Martinus Nijhoff, 1920), p. 354, quoted by Cassese, *supra* note 3, at p. 149.

28. Outside the field of disarmament, the other attempt at regulation of the means or methods of warfare during this inter-war period was directed to air warfare. The Hague Rules of Air Warfare, drafted by a Commission of Jurists in 1922-23 did not attempt to prohibit or restrict specific weapons but rather confined themselves to reiteration of the general principles reflected in other instruments or in customary international law. The only reference to specific weapons is in article 18, which provides that, "The use of tracer, incendiary or explosive projectiles by or against aircraft is *not* prohibited." (Emphasis added.) It adds that this provision "applies equally to states which are parties to the Declaration of St. Petersburg, 1868, and to those which are not." Presumably this would free a state to use explosive projectiles of less than 400 grams in its combat aircraft attacking human targets on the ground, a retrogression from the humanitarian rule of the St. Petersburg Declaration.

The Hague Rules of Air Warfare were never incorporated into a legally binding international instrument but are regarded "as an authoritative attempt to clarify and formulate rules of law governing the use of aircraft in war." Schindler & Toman, *supra* note 2, at p. 207, quoting L. Oppenheim, H. Lauterpacht, ed., *International Law: A Treatise*, 7th ed. (London: Longmans. Green & Co., 1952), p. 519. The Hague Rules may be found in a number of sources, including *American Journal of International Law (Supp.)*, v. 17, pp. 245-260 (1923), and Schindler & Toman, *supra* note 2, at pp. 207-17.

29. Geneva, June 17, 1925, *U.S.T.*, v. 26, pp. 571-82, T.I.A.S. 8061, Schindler & Toman, *supra* note 2, pp. 115-27.

30. See list of parties in U.S. Dept. of State Publication 9433, *Treaties in Force: A List of Treaties and Other International Agreements of the United States in Force on January 1, 1989*, p. 311-12 (U.S. Govt. Print. Off., Washington, 1989) (hereinafter *Treaties in Force*).

31. See Schindler & Toman, *supra* note 2, pp. 121-27 for a tabulation of reservations by states.

32. See *U.S.T.*, v. 26, p. 571, T.I.A.S. 8061.

33. *The Commander's Handbook*, *supra* note 1, para. 10.3.1.

34. See Jon L. Jacobson, "The Law of Submarine Warfare Today," *supra* Chapter VIII herein.

35. April 10, 1972, *U.S.T.*, v. 26, pp. 583-665, Schindler & Toman, *supra* note 2, pp. 137-157.

36. *Id.*, art. I.

37. *Id.*, art. III.

38. See Schindler & Toman, *supra* note 2, p. 137.

39. See *Treaties in Force*, *supra* note 30, pp. 284-85.

40. Statement of Michael J. Matheson, Assistant Legal Adviser for Political-Military Affairs, U.S. Department of State, April 27, 1978, in a panel, "Should Weapons of Dubious Legality Be Developed," *Proceedings of the 72d Annual Meeting of the American Society of International Law*, p. 26 at p. 28 (1978).

41. Additional Protocol I, *supra* note 2, art. 36.

42. Resolution 22 (IV), Follow-up Regarding Prohibition or Restriction of Use of Certain Conventional Weapons, annexed to the Final Act of the Conference, *Official Records of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts*, Geneva (1974-1977), v. 1, pp. 51-52; Schindler & Toman, *supra* note 2, p. 605 at pp. 729-30.

43. See Commentary, *supra* note 3, at p. 424. quoting the Report of Committee III on this article. See also M. Bothe et al., *New Rules for Victims of Armed Conflicts* (The Hague: Martinus Nijhoff Publishers, 1982), p. 200 (hereinafter Bothe et al.).

44. Commentary, *supra* note 3, p. 424.

45. *Id.*, p. 422; Bothe et al., *supra* note 43 at p. 200.

46. *Id.*

47. U.S. Department of Defense Instruction 5500.15, Oct. 16, 1974, *Review of Legality of Weapons Under International Law*, p. 1.

48. *Id.*, p. 2.

49. *Id.*

50. Army: Army Regulation 27-53, Jan. 1, 1979; Navy: Secretary of the Navy Instruction 5711.8A, Jan. 29, 1988 (superseding previous Instruction 5711.8); Air Force: AF Regulation 110-29, Sep. 10, 1981.

51. Geneva, Oct. 10, 1980. Final Report of the Conference to the General Assembly, A/CONF.95/15, October 27, 1980, Annex I, Final Act of the Conference (hereinafter Final Report); reprinted in American Society of International Law, *International Legal Materials*, v. 19, pp. 1524-35 (1980) (hereinafter ILM), and Schindler & Toman, *supra* note 2, pp. 177-96.

52. Protocol on Non-Detectable Fragments (Protocol I), Final Report, *supra* note 51, Annex I, Appendix B, p. 9, ILM *supra* note 51, at p. 1529, Schindler & Toman, *supra* note 2, at p. 185.

53. Protocol on Prohibitions or Restrictions on the Use of Mines, Booby Traps and Other Devices (Protocol II), Final Report, *supra* note 51, Annex I, Appendix C, pp. 10-15, ILM, *supra* note 51, at pp. 1529-34, Schindler & Toman, *supra* note 2, at p. 185-89.

54. Protocol on Prohibitions or Restriction on the Use of Incendiary Weapons (Protocol III). Final Report, *supra* note 51, Annex I, Appendix D, pp. 16-17, ILM, *supra* note 51, at pp. 1534-35, Schindler & Toman *supra* note 2, at pp. 190-192.

55. The Protocol defines "military objective, . . . so far as objects are concerned" as "any object which by its nature, location, purpose or use makes an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage." Protocol III, art. 1, para. 3. Final Report, *supra* note 51, Annex I, Appendix D, p. 16 ILM, *supra* note 51, p. 1534, Schindler & Toman, *supra* note 2, p. 190.

56. Protocol III, article 2. The prohibition against using air-delivered weapons against military targets in concentrations of civilians is based on the assumption that such weapons are less accurate than weapons delivered by other systems. One wonders, however, whether this assumption holds true in all cases with the development of so-called "smart bombs," which can be guided with great precision to their targets.

57. Final Act of the United Nations Conference on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed To Be Excessively Injurious or To Have Indiscriminate Effects, Appendix E, Resolution on Small-Calibre Weapon Systems, Geneva, October 10, 1980. Final Report, *supra* note 51, at p. 18, ILM, *supra* note 51, at p. 1536, Schindler & Toman, *supra* note 2, at pp. 197-98.

58. Schindler & Toman, *supra* note 2, p. 196.

59. *Commander's Handbook*, *supra* note 1, para. 9.1.1.

60. U.S. Department of the Navy, Office of the Judge Advocate General, *Annotated Supplement to The Commander's Handbook on the Law of Naval Operations* (Washington: 1989) (hereinafter *Annotated Supplement*). para. 9.1.1. This *Annotated Supplement* has been drafted for the guidance of Judge Advocates and others who might be required to provide detailed guidance on the interpretation and application of the rules set forth in the Handbook.

61. Cassese, *supra* note 3, at p. 147.

62. *Id.* One may wonder what action might be possible in any event.

63. *Id.*

64. *Id.*, p. 152. A good example of this is the Hague (VIII) restriction on "contact" mines. Technology has made the contact mine obsolete. Most modern mines are detonated by magnetic influence or other forms of non-contact influence. See discussion of "Captor" *infra*.

65. *Id.*

66. See Sally V. Mallison & W. Thomas Mallison, "Naval Targeting: Lawful Objects of Attack," *infra* chapter IX.

67. See *supra* note 6 and accompanying text.

68. See *supra* note 9 and accompanying text.

69. See *supra* note 11 and accompanying text.

70. See *supra* notes 23-25 and accompanying text.

71. *Id.*

72. See *supra* note 25 and accompanying text.

73. See *supra* notes 28-33 and accompanying text.

74. See *supra* notes 36-37 and accompanying text.

75. See *supra* note 52 and accompanying text.

76. Preface, *supra* p. viii.

77. "Preface," *Commander's Handbook*, *supra* note 1, p. 27.

78. See *Annotated Supplement*, *supra* note 60.

79. The descriptions of weapons and weapons systems found in the following sections have been taken from several unclassified sources, including Norman Polmar, *The Ships and Aircraft of the U.S. Navy*, 14th ed. (Annapolis, Md.: Naval Institute Press, 1987), Jane's *Weapon Systems 1988-89* (Coulson, Surrey, U.K.: Jane's Information Group, 1988) and Office of Information, U.S. Navy, *Navy Fact File*, 8th ed. (NAVSOP-3002), an official publication of the U.S. Department of the Navy. No attempt will be made to identify the specific source of each description.

80. D. P. O'Connell, "The Legality of Cruise Missiles," *American Journal of International Law*, v. 66, pp. 785-794 (1972).

81. *Id.*, at p. 785.

82. The Iraqi Government has accepted responsibility for its attack on USS STARK (FFG-31) on May 17, 1987, by two Exocet missiles fired by a Mirage F-1 aircraft. It has agreed to pay compensation to the United States for the damage to the ship and deaths and injuries to its crew. See U.S. Department of State statement of March 28, 1989, Department of State Bulletin, May 1989, v. 89, no. 2146, p. 67. The case was apparently not one of the missile being unable to discriminate between targets; rather it appears to have been a targeting error, perhaps caused by a navigation error by the pilot causing him to believe that STARK was within the declared Iranian war zone. See Staff of House of Representatives Committee on Armed Services, 100th Cong., 1st sess., Report on the Staff Investigation into the Iraqi Attack on the USS STARK, p. 10 (Comm. Print 1987). In the tanker war in the Persian-Arabian Gulf, it is generally conceded that the attacking units usually hit the targets at which they were aiming. The relevant question in that circumstance was generally, therefore, not whether the weapon could not discriminate, but rather whether the targets (tankers) were legitimate targets.

83. *The Commander's Handbook*, *supra* note 1, para. 9.7. Indiscriminate effect is defined in paragraph 9.1.2. of the *Handbook*.

84. See *supra* chapter 12.

85. Hague VIII, *supra* note 23.

86. *Id.*, art. 1 (3).

87. *The Commander's Handbook*, *supra* note 1, para. 9.3.

88. *Commander's Handbook*, *supra* note 1, para. 9.2.

89. *Id.*, para. 9.3.

90. *Id.*, para. 9.2.

91. *Id.*

92. U.S. Department of Defense, *Soviet Military Power: An Assessment of the Threat 1988*, p. 59.

93. Judge Advocate General of the U.S. Army, Memorandum of Law, "Use of Lasers as Antipersonnel Weapons," September 29, 1988, reprinted in *The Army Lawyer*, November 1988 (DA PAM 27-50-191), p. 3.

94. *Supra* note 47.

95. Army JAG memorandum, *supra* note 93. The Army JAG's memorandum also refers to previous opinions of the Judge Advocates General of the Navy and Army concluding that "injury to combatants secondary or ancillary to the use of a laser for rangefinding, target acquisition, or other antimateriel purposes is lawful, and the 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" (citing Navy JAG 5710 Ser. 103/572, dated September 4, 1984 (Confidential) and Army JAG DAJA-IA 1984/0116, dated December 24, 1984 (Secret)). The memorandum also refers to opinions by the Navy and Air Force JAGs 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" (citing Air Force JAG JACI, dated November 21, 1985 (Secret) and Navy JAG 5800 Ser 103/5356, dated February 19, 1986 (Secret)). It has been reported

that the Navy used lasers to produce flash effects to warn away approaching surface and aircraft in the Persian Gulf during the Iran-Iraq war.

96. *Id.*, p. 4.

97. See *supra* notes 65-73 and accompanying text.

98. Army JAG memorandum, *supra* note 93.

99. *Id.*

100. *Commander's Handbook*, *supra* note 1, para. 9.6.

101. Regulations Respecting the Laws and Customs of War on Land, annexed to Convention (IV) Respecting the Laws and Customs of War on Land, October 18, 1907, *United States Statutes at Large*, v. 36, pp. 2227-2309, reprinted in Schindler & Toman, *supra* note 2, pp. 63-98 at 82.

102. See Robert W. Tucker, *International Law Studies: The Law of War and Neutrality at Sea* (Washington: U.S. Govt. Print. Off., 1957), p. 50, no. 12. The *Commander's Handbook* states in paragraph 9.1.1., under the heading, "Unnecessary Suffering," that, "Poisoned projectiles . . . fall into this category [*i.e.*, causing unnecessary suffering], because there is little military advantage to be gained by ensuring the death of wounded personnel through poisoning. . . ."