
INTERNATIONAL LAW STUDIES

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U.S. NAVAL WAR COLLEGE



Emerging Technologies and LOAC Signaling

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91 INT'L L. STUD. 621 (2015)

Volume 91

2015

Published by the Stockton Center for the Study of International Law

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I. INTRODUCTION

Advances in technology have always, it seems, been weaponized when the opportunity presented itself. As U.S. Deputy Secretary of Defense William J. Lynn, III, once said, “Few weapons in the history of warfare, once created, have gone unused.”¹ Similarly, in President Harry Truman’s radio

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The thoughts and opinions expressed are those of the author and not necessarily of the U.S. government, the U.S. Department of the Navy or the U.S. Naval War College.

1. John D. Banusiewicz, *Lynn Outlines New Cybersecurity Effort*, U.S. DEPARTMENT OF DEFENSE (June 16, 2011).

address to the American people after the atomic bomb was dropped on Hiroshima, he stated “Having found the bomb we have used it.”² This is especially true if the weapons have proven to be (or are projected to be) extremely effective.³ In many cases, the production and employment of these weapons has proceeded, despite attempts to regulate the advancing technology based on fears concerning its effects. As Professor Watts has detailed in his article in this same volume concerning the susceptibility of weapons to legal regulation, the crossbow and various firearms provide interesting illustrations.⁴

In the case of the crossbow, despite the effort of the Lateran Council of 1139,⁵ members of the Council were unable to prevent the widespread production and use of the crossbow.⁶ The practical concern that the weapon allowed a peasant, who was traditionally of little value as a fighter, to kill a knight, an asset of great value and a major investment in training and equipment, was insufficient to create a viable legal prohibition that survived the vote that was taken to sustain it.⁷ Once developed and in the arsenal, the crossbow proved too useful to constrain through legal regulation.

With respect to firearms, in addition to various attempts to limit particular types,⁸ Japan’s attempts to proscribe the whole category of firearms from its society failed after only a short period of time.⁹ The effectiveness of the new technology was too great for a nation to resist its benefits, particularly in the face of competitor nations who embraced the technology to their great advantage.

While the persistence of new weapons has generally been the case throughout history, there are examples of exceptions where weapons were

2. Harry S. Truman, U.S. President, Radio Address to the American People (Aug. 9, 1945), available at <http://www.pbs.org/wgbh/americanexperience/features/primary-resources/truman-japanwarn/>.

3. See Sean Watts, *Regulation-Tolerant Weapons, Regulation-Resistant Weapons and Law of War Development*, 92 INTERNATIONAL LAW STUDIES 540 (2015).

4. *Id.* at 566–74.

5. See generally Harold E. Harris, *Modern Weapons and the Law of Land Warfare*, 12 MILITARY LAW AND LAW OF WAR REVIEW 7, 9 (1973).

6. Martin van Creveld, *The Clausewitzian Universe and the Law of War*, JOURNAL OF CONTEMPORARY HISTORY 403, 416 (1991).

7. See W.T. Mallison Jr., *The Laws of War and the Juridical Control of Weapons of Mass Destruction in General and Limited Wars*, 36 GEORGE WASHINGTON LAW REVIEW 308, 316 (1967) (discussing the continued use of the crossbow after the ban).

8. See Watts, *supra* note 3, at 568–74.

9. NOEL PERRIN, GIVING UP THE GUN: JAPAN’S REVERSION TO THE SWORD 1543–1879 (1979), cited in Watts, *supra* note 3, at 568.

developed (or were in the process of development) and then proscribed in whole or in part. Examples include the use of lightweight exploding projectiles,¹⁰ bullets that expand on impact,¹¹ the use of poisonous gases and bacteriological weapons,¹² landmines¹³ and chemical weapons.¹⁴ But even in these “successful” cases, the law generally did not evolve to proscribe these weapons until States had employed them and had time to determine the legalities of their use on the battlefield. In other words, the most effective use of the law to regulate weapons often requires time for them to be developed and employed, and the impact of their use reviewed.¹⁵

As Professor Watts points out, there have also been efforts throughout history to ban new or novel weapons that are based on emerging technology or concepts and that are soon to be produced and employed.¹⁶ Though blinding lasers were successfully limited very early on in their development,¹⁷ other examples of this proactive regulation are extremely limited.

10. Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, Nov. 29/Dec. 11, 1868, 18 Martens Nouveau Recueil (ser. 1) 474, 138 Consol. T.S. 361; Watts, *supra* note 3, at 569.

11. Hague Declaration (IV, 3) Concerning Expanding Bullets, July 29, 1899, 26 Martens Nouveau Recueil (ser. 2) 1002, 187 Consol. T.S. 459; Watts, *supra* note 3, at 569–71.

12. Protocol for the Prohibition of the Use in War of Asphyxiating Poisonous or Other Gases, and of Bacteriological Methods of Warfare, June 17, 1925, 26 U.S.T. 571, 94 L.N.T.S. 65; Convention on the Prohibition of Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, Apr. 10, 1972, 26 U.S.T. 583, 1015 U.N.T.S. 163; Watts, *supra* note 3, at 602–4.

13. Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction, Sept. 18, 1997, 2056 U.N.T.S. 211; Protocol [II amended to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects] on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices as amended on 3 May 1996, 2048 U.N.T.S. 133; Watts, *supra* note 3, at 580–85.

14. Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, Jan. 13, 1993, 1974 U.N.T.S. 45; Watts, *supra* note 3, at 596–602.

15. W. Michael Reisman, *Rasul v. Bush: A Failure to Apply International Law*, 2 JOURNAL OF INTERNATIONAL CRIMINAL JUSTICE 973, 973 (2004) (Where the author writes, “[b]ecause modern specialists in violence constantly seek new and unexpected ways of defeating adversaries, the codified body of the law of armed conflict always lags at least a generation behind.”); Watts, *supra* note 3, at 613–15.

16. Watts, *supra* note 3, at 612–13.

17. Protocol [IV to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to

As he notes, the newness or “novelty” of a weapon system is one of the primary factors in determining and predicting the weapon’s susceptibility to regulation, and argues that “[a]t present, a ‘wait and see’ approach seems to prevail with respect to prospective or early regulation of novel military technology.”¹⁸

Professor Watt’s assertion that the “wait and see” approach is prevalent with new technologies is likely to be seriously tested in the upcoming decades. With the onset of emerging technologies in the twenty-first century, the international community is on the verge of developing weapons that will dramatically change the character of the modern battlefield. The emergence of cyber operations, the military application of nanotechnology, innovations in and increased accessibility of virology, advances in robotics (including autonomous weapons) and artificial intelligence, and the development of directed energy weapons and other weapons created through science fiction-like technology will likely result in new or “novel” weapons systems.¹⁹

Some efforts have already been made to determine the application of the law to emerging technologies,²⁰ and there have already been calls for the outright ban of some developing weapons.²¹ As States and other actors in the international community proactively consider the emergence of these new weapon systems and potential attempts to regulate or even preclude future development, they should look to the law of armed conflict (LOAC) as a means of guiding their deliberations. Inherent in LOAC is a signaling function which provides significant input to States as new weapons are considered, discussed, debated, created and employed.²²

This signaling function is somewhat unique to LOAC, particularly within the paradigm of international law, since it is so heavily dependent on State practice. LOAC specifically, and public international law more generally, develop based on consensual agreements between States and, in the

Have Indiscriminate Effects] on Blinding Laser Weapons art. 1, Oct. 13, 1995, 1380 U.N.T.S. 370; Watts, *supra* note 3, at 587–90.

18. Watts, *supra* note 3, at 612.

19. See generally Eric Talbot Jensen, *The Future of the Law of Armed Conflict: Ostriches, Butterflies, and Nanobots*, 35 MICHIGAN JOURNAL OF INTERNATIONAL LAW 253 (2014).

20. See, e.g., TALLINN MANUAL ON THE INTERNATIONAL LAW APPLICABLE TO CYBER WARFARE 15–18 (Michael N. Schmitt ed., 2013).

21. HUMAN RIGHTS WATCH, LOSING HUMANITY: THE CASE AGAINST KILLER ROBOTS (2012), available at http://www.hrw.org/sites/default/files/reports/arms1112ForUpload_0_0.pdf.

22. Jensen, *supra* note 19.

absence of codification, also on the practice of States when done with a sense of legal obligation.²³ As States develop new technologies, they will look to existing law and the current practice of other States in order to determine how best to apply current law to changing circumstances. In other words, LOAC rules and principles that guide the use of existing weapons also serve the purpose of signaling rules and principles to nations that will guide their decisions on what new technologies to weaponize and how to do so in a way that ensures compliance with the laws of war. For example, as will be discussed in greater detail below, as States consider the future use of robotics on the battlefield, the existing LOAC rules and principles signal to those States how to develop robotics in a way that will allow their lawful use as opposed to some methods of development that would produce weapon systems that could not comply with LOAC constraints.

I have argued elsewhere that “[a]s the LOAC evolves to face anticipated future threats, its signaling function will help ensure that advancing technologies comply with the foundational principles of the LOAC and that future armed conflicts remain constrained by law.”²⁴ A review of history demonstrates the prudence of this approach, and teaches that the international community should resist calls for overregulating or banning new technologies prematurely in order to allow LOAC to serve its signaling function of providing appropriate and adequate guidance as States move forward in developing advanced weapons based on emerging technologies.

This article will first look at historical examples of attempts to prematurely regulate or ban weapons that used emerging technologies, based on claims that the law as it then existed would be insufficient to control their use. In these cases, time proved that the warnings of impending catastrophe were ill-founded. The article will then discuss how the law evolved to develop a signaling function that acts as a sufficient restraint on the devel-

23. See Statute of the International Court of Justice art. 38, June 26, 1945, 59 Stat. 1055, 33 U.N.T.S. 993, which states:

1. The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:
 - a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting states;
 - b. international custom, as evidence of a general practice accepted as law;
 - c. the general principles of law recognized by civilized nations;
 - d. subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.

24. Jensen, *supra* note 19, at 316–17.

opment of emerging technologies. As States effectively apply the LOAC signaling function to weapons development, even those using new and novel emerging technologies, it will guide the development of these weapon systems to ensure legal compliance and also signal when an evolution in the law is necessary to adequately regulate their use on the modern battlefield.

Before progressing further, it is important to note that this article deals only with the law, and not the myriad policy, moral and ethical reasons that might exist for regulating or banning weapon systems. The current debate on lethal autonomous weapon systems (LAWs) provides an appropriate example. While there may be many reasons why individuals and States may object to the development of these weapons, and those reasons may prove decisive and result in a ban, LOAC is not a good basis for this argument.²⁵ As said by the Greek delegation to the Certain Conventional Weapons Convention Meeting of Experts in April 2015, “to argue that LAWs comply or do not comply with IHL at this stage would amount to an oracle of Delphi. What is left then is basically an ethical question, not a legal one.”²⁶

II. HISTORY AND LESSONS LEARNED

Claims that developing weapons systems are, first, not capable of being regulated and, second, will be unable to comply with LOAC are not new. In fact, the twentieth century saw many such claims. In the vast majority of cases these claims were ultimately shown to be unfounded. In some cases, many of which are mentioned above, upon deliberate consideration, nations banded together to limit or ban specific weapons, sometimes for legal reasons, but mostly for practical battlefield reasons. This Part provides several examples of premature claims to overregulate or ban emerging weapon systems, beginning with balloons.²⁷ The attempts to regulate were prema-

25. Michael N. Schmitt, *Autonomous Weapon Systems and International Humanitarian Law: A Reply to the Critics*, HARVARD NATIONAL SECURITY JOURNAL (Feb. 5, 2013), <http://harvardnsj.org/wp-content/uploads/2013/02/Schmitt-Autonomous-Weapon-Systems-and-IHL-Final.pdf>.

26. CCW Meeting of Experts on Lethal Autonomous Weapons Systems, Geneva, Apr. 13–17, 2015 (statement by Greece, Discussion on Possible Challenges to International Humanitarian Law (IHL) due to Increasing Degrees of Autonomy (Apr. 15, 2015)), [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/57BE5752511D3E40C1257E290046FB97/\\$file/2015_LAWS_MX_Greece_IHL.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/57BE5752511D3E40C1257E290046FB97/$file/2015_LAWS_MX_Greece_IHL.pdf)).

27. *See generally* Joel Hood, *The Equilibrium of Violence: Hegemon Sovereignty* (2014) (unpublished manuscript) (on file with author).

ture because the rules and principles of LOAC were sufficient, when properly applied by States, to signal to States how the weapons should be developed to ensure they were LOAC compliant.

A. *Balloons*

The 1899 Hague Peace Conference was convened at the request of the Russian Tsar, Nicholas II, and addressed several new technologies, including balloons, asphyxiating gases and dum-dum bullets.²⁸ At the time, balloons were an emerging technology and their use on the battlefield was the subject of military experimentation. As the conference convened, there had been a great deal of discussion, and even uproar, about the use of balloons in warfare, including allegations that they could not be used in a manner that would comply with LOAC. The original proposal before the conference was to completely ban the launching of projectiles from balloons and other similar new methods because of their potential risk to civilians.²⁹ After much discussion among the delegations, the outright ban was rejected and a temporary moratorium in the form of a declaration was accepted to give time to study the future potential use of balloons.³⁰ As argued by the Dutch delegate, the delegates were uncertain “as to how to proceed in light of the astonishing ‘progress of science’ which resulted in the realization of devices ‘hitherto beyond belief.’”³¹ The declaration prohibited launching projectiles from “balloons or other similar new methods” for five years³² to provide time for the weapons to be developed and States to more fully understand the application of the technology. The topic was scheduled to be reconsidered at the next Hague conference.

28. Watts, *supra* note 3, at 569–71.

29. Matthew Lippman, *Aerial Attacks on Civilians and the Humanitarian Law of War: Technology and Terror from World War I to Afghanistan*, 33 CALIFORNIA WESTERN INTERNATIONAL LAW JOURNAL 1 (2002); Bonnie Docherty, *The Time Is Now: A Historical Argument for a Cluster Munitions Convention*, 20 HARVARD HUMAN RIGHTS JOURNAL 53, 56–57 (2007).

30. Declaration (IV, 1) to Prohibit for the Term of Five Years, the Launching of Projectiles and Explosives from Balloons, and Other Methods of Similar Nature, July 29, 1899, 32 Stat. 1839, 26 Martens Nouveau Recueil (ser. 2) 994, available at <https://www.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=C372920FFD61039AC12563CD00516126>.

31. Lippman, *supra* note 29, at 6 (quoting Hamilton DeSaussure, *The Laws of Warfare: Are There Any?*, 5 INTERNATIONAL LAWYER 527, 530 (1971)).

32. Declaration (IV, 1), *supra* note 30, para 1.

The Second Hague Peace Conference occurred in 1907 and continued the focus on regulating emerging technologies, including aerial bombardment from balloons. After much discussion, the temporary moratorium on aerial bombardment was renewed “for a period extending to the close of the [next] Peace Conference,”³³ again providing time for continuing evaluation. Several countries, including Germany, Russia and France, did not sign the declaration,³⁴ and the then-anticipated third Hague conference never occurred due to the onset of World War I (WWI). Furthermore, because of the reciprocal nature of the Hague restrictions, the aerial bombardment provisions were not deemed enforceable during WWI, which led not only to significant military aerial attacks during the war, but also to increased regulation afterwards.

This example illustrates two important points. First, the attempts to enforce a ban on the use of an effective and easily weaponized technology did not survive the onslaught of war. Nations quickly recognized the effectiveness of aerial bombardment, including the use of balloons, and determined that they could effectively employ this emerging technology in compliance with existing LOAC. Second, the nations at the conference recognized that they had insufficient information concerning the new technology to warrant an all-out ban, but rather opted to provide a legal pause to study the future uses of the weapon system and determine if legal compliance was possible. If legal compliance was possible, there would be no reason for a ban. The determination of whether legal compliance would be possible would be based on an analysis of the capabilities of the developing technology, in light of current LOAC rules and principles. Not only would the potential legality of using the emerging technology be judged against current LOAC, but LOAC would also be the barometer by which the development of future weapons would be guided. If balloons could be developed in a way that complied with LOAC, their development could proceed. If not, their proposed development would have to be adjusted or discontinued.

In the wake of WWI, the international community determined that despite the carnage wrought in that war, particularly from new technologies,

33. Convention (XIII) concerning the Rights and Duties of Neutral Powers in Naval War, 3 Martens Nouveau Recueil (ser. 3) 713, 205 Consol. T.S. 395, entered into force Jan. 26, 1910.

34. THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907, at 237 (James B. Scott ed., 1918) (cited in Hood, *supra* note 27).

the appropriate response was not to ban these weapons, but to submit them to more detailed regulation. As Telford Taylor has written,

the enormous carnage of World War I stimulated public demand for measures to prevent a recurrence of such slaughter and destruction. Military and diplomatic interest was rekindled in the use of multinational treaties not only to limit armaments, but also to govern their use. The airplane, the submarine, and poison gas had profoundly affected the conduct of the war, and it was to these relatively new weapons, largely untouched by the Hague Conventions, that attention now turned.³⁵

Subsequent legal developments have been documented elsewhere,³⁶ but only in the case of poisonous gas did the nations of the world resort to an outright ban. In the other cases, LOAC was able to not only evolve and adapt to the uses of these weapons, but also signal to States key principles concerning the future development and employment of these weapons in a way that complied with LOAC.

B. *Submarines*

Submarines had also been a topic of discussion at the 1899 Hague Conference. As with balloons, the proposal for an all-out ban was not accepted.³⁷ Submarines were again discussed during the 1907 Convention, but nothing was ultimately done in terms of regulation. In other words, despite States' knowledge that submarines would be used in the next conflict, no agreement was reached with respect to regulating or banning submarine operations. Instead, the nations of the world left their operations to be governed by existing customary law.

Serious discussion about submarines next arose during the Washington Naval Conference in 1921. During the conference, Lord Balfour, who was the British delegate, called for a prohibition on submarines. He argued:

Is there any man who doubts that if they are once let loose to deal with merchantmen their powers will not in the stress of war be abused in the future as they have been so grossly abused in the past? . . . I do not think, as I have already indicated, that it is the fighting use of the submarine

35. TELFORD TAYLOR, *THE ANATOMY OF THE NUREMBERG TRIALS* 19 (1992).

36. See generally Watts, *supra* note 3.

37. *THE HAGUE CONVENTIONS AND DECLARATIONS OF 1899 AND 1907*, *supra* note 34, at 283, 328 (cited in Hood, *supra* note 27).

which is really before us now. The question before us now is whether you are going to encourage an instrument of war which, if it be encouraged, if indeed it be permitted at all, will undoubtedly be used in the illegitimate destruction of commerce.³⁸

When it became apparent that the majority of States did not agree with this proposal and that ultimately the conference was going to take no action on the issue of submarines, Lord Balfour and the British delegation went on record saying, “[T]he use of submarines, whilst of small value for defensive purposes, leads inevitably to acts which are inconsistent with the laws of war and the dictates of humanity, and the delegation desires that united action should be taken by all nations to forbid their maintenance, construction, or employment.”³⁹

By the 1930s, the discussion had turned from banning submarines to regulating them through legal agreement. The requisite legal agreement among States was often based on accepted principles of custom, without any specific reference to the unique aspects of the emerging technology that submarines represented. For example, in Article 22 of the London Treaty the drafters chose to apply international law standards to submarines similar to those applied to surface vessels. It states:

The following are accepted as established rules of international law:

- (1) In their action with regard to merchant ships, submarines must conform to the rules of International Law to which surface vessels are subject.
- (2) In particular, except in the case of persistent refusal to stop on being duly summoned, or of active resistance to visit or search, a warship, whether surface vessel or submarine, may not sink or render incapable of navigation a merchant vessel without having first placed passengers, crew and ship's papers in a place of safety. For this purpose the ship's boats are not regarded as a place of safety unless the safety of the passengers and crew is assured, in the existing sea and weather

38. NAVAL WAR COLLEGE, INTERNATIONAL LAW DOCUMENTS: CONFERENCE ON THE LIMITATION OF ARMAMENT 74 (1923), *available at* <https://archive.org/details/internationallaw1921nava> [hereinafter CONFERENCE ON THE LIMITATION OF ARMAMENT].

39. *Id.* at 93.

conditions, by the proximity of land, or the presence of another vessel which is in a position to take them on board.⁴⁰

Article 22 became known as the London Submarine Protocol of 1936,⁴¹ and forty nations eventually subscribed to it.⁴² However, because of its lack of practical application to the emerging technology, it was almost completely disregarded once WWII began, with neither side of the conflict complying with the Protocol.⁴³ Nevertheless, nations did apply legal limits to submarine warfare, hearkening to existing rules of humanity and discrimination to regulate this new technology through adaptation of practical rules and customary norms to the specifics of the advanced weapon system.

So, as with balloons, the passage of time proved that existing LOAC rules and principles were sufficient to signal to States how they should employ this new weapon system. In this case, appropriately applying the principle of distinction was capable of preventing the mass atrocities envisioned by Lord Balfour.

C. *Airplanes*

Another interesting example of regulating new technologies is the advent of airplanes. As airplanes emerged as a weapon of war, similar discussions occurred as to the application of the law. As previously mentioned, aerial bombardment had been a part of the discussion at both Hague conferences, but no new rules were promulgated to control the use of aircraft. At the post-WWI 1921 Conference on the Limitation of Armament, the attendees determined that

40. Treaty for the Limitation and Reduction of Naval Armaments, Apr. 22, 1930, 112 L.N.T.S. 75, available at <https://www.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=%20openDocument&documentId=05F68B7BFFB8B984C12563CD00519417>.

41. *Procès-Verbal* Relating to the Rules of Submarine Warfare Set Forth in Part IV of the Treaty of London of 22 April 1930, Nov. 6, 1936, 173 L.N.T.S. 353.

42. *Treaties and States Parties to such Treaties*, ICRC, https://www.icrc.org/applic/ihl/ihl.nsf/States.xsp?xp_viewStates=XPages_NORMStatesParties&xp_treatySelected=330 (last visited July 13, 2015).

43. See Howard Levie, *Submarine Warfare: With Emphasis on the 1936 London Protocol*, in THE LAW OF NAVAL WARFARE: TARGETING ENEMY MERCHANT SHIPPING 28 (Richard J. Grunawalt ed., 1993) (Vol. 65, U.S. Naval War College International Law Studies).

the use of aircraft in war should be covered by the rules of warfare as adapted to aircraft, by a further conference which should be held at a later date. . . . [T]he late war had revealed the imperative necessity for the adoption of new rules of warfare, and that these new rules of warfare should be framed so as to take into account the development of the science of aeronautics and its application to war.⁴⁴

It is interesting to note that even after the assertion that the existing rules of warfare were not quite sufficient to regulate aerial warfare, States were not ready to ban the use of aircraft, a highly effective tool of warfare, but rather sought to evolve LOAC to ensure that the basic principles of war could be properly applied to this new method of warfare. This is an important lesson for our time as nations consider emerging technologies and their weaponization.

This “further conference” resulted in the 1923 Hague Rules of Aerial Warfare,⁴⁵ which though somewhat innovative, were never formally adopted, leaving only the customary rules to guide air warfare through World War II (WWII). In the aftermath of the war, the targeting rules for air warfare gained increased specificity as the international community tried to grapple with the results of aerial bombardment in WWII.

While a ban of aircraft in war and aerial bombardment might have seemed legally required by some commentators in 1899 and the subsequent decades, the passage of time and the conduct of warfare clearly demonstrated that the use of aircraft in armed conflict was not legally impermissible, but that LOAC was clearly capable, with some evolution, of regulating this “novel” method of warfare.

D. Atomic and Nuclear Weapons

Atomic and nuclear weapons provide another lens through which to look at how the law deals with emerging technologies. The use of atomic weapons in WWII and the subsequent development and evolution of nuclear weapons has led to a wide variety of attempted regulation, including limitation,⁴⁶ non-proliferation⁴⁷ and complete destruction.⁴⁸ Unlike chemical and

44. CONFERENCE ON THE LIMITATION OF ARMAMENT, *supra* note 38, at 229.

45. Hague Rules Concerning the Control of Wireless Telegraphy and Air Warfare, Dec. 11, 1922–Feb. 17, 1923, *available at* http://lawofwar.org/hague_rules_of_air_warfare.htm.

46. *See, e.g.*, Treaty on the Further Reduction and Limitation of Strategic Offensive Arms, Jan. 3, 1993, U.S.-Russ., S. TREATY DOC. No. 103-1 (1993). *See generally* David A.

biological weapons, nuclear weapons have not become subject to any general prohibition, as evidenced by the 1996 International Court of Justice (ICJ) advisory opinion concerning the legality of the threat or use of nuclear weapons.⁴⁹ After a lengthy discussion concerning why the use of nuclear weapons might violate a number of general legal principles, the ICJ notoriously admits:

Accordingly, in view of the present state of international law viewed as a whole, as examined above by the Court, and of the elements of fact at its disposal, the Court is led to observe that it cannot reach a definitive conclusion as to the legality or illegality of the use of nuclear weapons by a State in an extreme circumstance of self-defence, in which its very survival would be at stake.⁵⁰

Though not banned, States have commonly recognized that the general principles of LOAC apply to the use of nuclear weapons.⁵¹ This is significant, especially as advances in nanotechnology impact the size, destructive capability and effects of nuclear weapons. Emerging technologies will interact with nuclear weapons in a way that may remove or reduce many of the existing legal objections to use of these weapons. As developers understand LOAC and consider its implications on the evolution of nuclear weapons, it is much more likely that innovative nuclear weapons will develop within the realm of law.

E. Cyber Weapons

Finally, the recent development and deployment of cyber weapons demonstrate the value of LOAC signaling to emerging technologies. States have taken different approaches to cyber weapons, with some calling for the ban

Koplow, *Nuclear Arms Control by a Pen and a Phone: Effectuating the Comprehensive Test Ban Treaty without Ratification*, 46 *GEORGETOWN JOURNAL OF INTERNATIONAL LAW* 475 (2015); Dakota S. Rudesill, *Regulating Tactical Nuclear Weapons*, 102 *GEORGETOWN LAW JOURNAL* 99 (2013).

47. Treaty on the Non-Proliferation of Nuclear Weapons, July 1, 1968, 21 U.S.T. 483, 729 U.N.T.S. 161.

48. *See, e.g.*, CAMPAIGN FOR NUCLEAR DISARMAMENT, <http://www.cnduk.org/> (last visited July 13, 2015).

49. Watts, *supra* note 3, at 605–7.

50. Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, ¶ 97 (July 8).

51. Watts, *supra* note 3, at 607.

of particular cyber tools⁵² and others arguing for the complete demilitarization of cyberspace.⁵³ While it is now generally agreed that the use of cyber tools in armed conflict is governed by LOAC,⁵⁴ how that is to be done is still a matter of dispute. Commentaries by experts concerning the application of the law to cyber activities covers the entire spectrum from those arguing that existing law is sufficiently flexible to respond to new cyber capabilities without need for adaptation⁵⁵ to others who argue that a whole new set of rules should be written to provide proper guidance.⁵⁶

The Naval War College was one of the first institutions to focus on this emerging issue by dedicating the entire 2002 volume of *International Law Studies* to the discussion,⁵⁷ and has hosted several conferences since then on the topic. The recently published *Tallinn Manual* has quickly become the foundational treatise on the application of LOAC to cyber weapons. However, despite its commitment to *lex lata* over *lex ferenda*, even the *Tallinn Manual* recognizes the need for the evolution of the law to adequately deal with this emerging technology. For example, most of the experts participating in its development determined that the traditional definition of “attack” was insufficient to determine when LOAC applied to cyber activities. Instead, a cyber action that affected the functionality of a cyber system might

52. John Markoff & Andrew E. Kramer, *U.S. and Russia Differ on a Treaty for Cyberspace*, WASHINGTON POST (June 27, 2009), http://www.nytimes.com/2009/06/28/world/28cyber.html?pagewanted=all&_r=0.

53. Li Zhang, *A Chinese Perspective on Cyber War*, 96 INTERNATIONAL REVIEW OF THE RED CROSS 801, 803 (2012), available at <https://www.icrc.org/eng/assets/files/review/2012/irrc-886-zhang.pdf>.

54. *Id.* at 804.

55. See, e.g., Michael N. Schmitt, *IHL Challenges Series—Part III on New Technologies*, INTERCROSS BLOG (June 17, 2013), <http://intercrossblog.icrc.org/blog/ihl-challenges-series-part-iii-on-new-technologies?rq=michael%20n.%20schmitt#sthash.p46KP470dpbs> =. Cf. Cordula Droege, *Get Off My Cloud: Cyber Warfare, International Humanitarian Law, and the Protection of Civilians*, 94 INTERNATIONAL REVIEW OF THE RED CROSS 533 (2012).

56. See, e.g., Alireza Miryousefi & Hossein Gharibi, *View from Iran: World Needs Rules on Cyberattacks*, CHRISTIAN SCIENCE MONITOR (Feb. 14, 2013), <http://www.csmonitor.com/Commentary/Opinion/2013/0214/View-from-Iran-World-needs-rules-on-cyberattacks-video>; Jody R. Westby, *We Need New Rules for Cyber Warfare*, NEW YORK TIMES (Mar. 1, 2013), <http://www.nytimes.com/roomfordebate/2013/02/28/what-is-an-act-of-cyberwar/we-need-new-rules-of-engagment-for-cyberwar>.

57. COMPUTER NETWORK ATTACK AND INTERNATIONAL LAW (Michael N. Schmitt & Brian T. O'Donnell eds., 2002) (Vol. 65, U.S. Naval War College International Law Studies), available at <http://stockton.usnwc.edu/ils/vol76/iss1/>.

also be considered an attack.⁵⁸ Nevertheless, even this evolution will take its lead from current LOAC, reliant on its signaling role.

This century of examples has illustrated that with respect to the emergence of new technologies, there is almost always a discussion about the ability of the law to properly regulate the technology. And the initial responses to these new developments often include claims that these weapon systems will resist regulation by LOAC and therefore should be banned. As the examples have shown, history teaches us that the international community should resist calls for overregulating or banning new technologies prematurely in order to allow LOAC to serve its signaling function, which will provide appropriate and adequate guidance as States move forward in developing advanced weapons based on emerging technologies. In each of these historic cases, LOAC successfully signaled to nations how to best proceed.

As we look ahead, with specific reference to the kinds of emerging technologies that will be faced in the near future, the international community must be willing to let LOAC play its signaling function, rather than act prematurely.

III. LOAC SIGNALING

In the previous Part, it was argued that LOAC serves a signaling function sufficient to guide States as they develop advanced weapons based on emerging technologies in order to ensure they will be legally compliant. This Part will briefly describe how LOAC incorporates the signaling function as a proactive legal obligation.

The law has always required compliance with respect to the employment of weapons. Even when LOAC was underdeveloped and its power to affect the conduct of warfare much more limited than it is now, it was focused on compliance. Francis Lieber, in his famous Lieber Code,⁵⁹ noted the focus of the law on individual actions throughout the Code, particularly when he described the transition to a more civilized approach to the treatment of civilians.

58. TALLINN MANUAL, *supra* note 20, at 156–59.

59. U.S. Department of War, Instructions for the Government of Armies of the United States in the Field, General Orders No. 100, Apr. 24, 1863, *available at* <https://www.icrc.org/applic/ihl/ihl.nsf/Treaty.xsp?documentId=A25AA5871A04919BC12563CD002D65C5&action=openDocument>.

Nevertheless, as civilization has advanced during the last centuries, so has likewise steadily advanced, especially in war on land, the distinction between the private individual belonging to a hostile country and the hostile country itself, with its men in arms. The principle has been more and more acknowledged that the unarmed citizen is to be spared in person, property, and honor as much as the exigencies of war will admit.”⁶⁰

Because of the weaponry and tactics of the day, early limitations on warfare focused almost exclusively on the application of LOAC during times of actual armed conflict. LOAC signaled what could and could not be done when engaged in combat. As such, it failed to provide any emphasis on proactive measures targeting prospective compliance.

Recognizing this deficiency, States began to build into LOAC proactive duties that were triggered long before the point where the armed forces member applied force in combat. For example, the doctrine of command responsibility holds a commander criminally responsible for the actions of his subordinates under certain circumstances where he could have exercised control and prevented the wrongdoing.⁶¹ This doctrine effectively requires a commander to embark on a course of pre-conflict LOAC training, coupled with a system of accountability and rigid respect for authority in order to ensure that subordinates comply with LOAC and do not engage in conduct that would implicate the commander’s personal criminal responsibility. The emergence of this and similar principles led to recognition of the need for effective LOAC signaling long before the actual fighting broke out.

Progressively, States have imbued LOAC with a requirement to proactively incorporate the law when developing new weapons, well before they will be employed on the battlefield where a soldier would be governed by the principles of humanity and distinction. This requirement is most clearly stated in Article 36 of 1977 Additional Protocol I (API) 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 circum-

60. *Id.*, art 22.

61. Michael L. Smidt, *Yamashita, Medina, and Beyond: Command Responsibility in Contemporary Military Operations*, 164 *MILITARY LAW REVIEW* 155 (2000); GEOFFREY S. CORN ET AL., *THE LAW OF ARMED CONFLICT: AN OPERATIONAL APPROACH* 525–59 (2012).

stances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.⁶²

This obligation clearly binds States which are party to API, but according to the ICRC, it is also “arguably one that applies to all States, regardless of whether or not they are party to Additional Protocol I.”⁶³

Much has been written about this requirement which does not need to be repeated here.⁶⁴ Suffice it to say that LOAC generally obligates every State that is contemplating developing a new technology or weaponizing an existing technology to ensure that such development or weaponization complies with existing rules and principles of LOAC, particularly the proscription on weapons that might cause unnecessary suffering. In other words, as States contemplate emerging technologies, LOAC signals what is permissible and what is impermissible in weapons development.⁶⁵

Despite not being a party to API, the U.S. practice in this area is very clear. Even prior to API coming into effect, the United States required such reviews,⁶⁶ and that obligation remains today. The codification of this requirement can be found in Department of Defense Directive 5000.01, which states:

The acquisition and procurement of DoD weapons and weapon systems shall be consistent with all applicable domestic law and treaties and international agreements . . . customary international law, and the law of armed conflict (also known as the laws and customs of war). An attorney

62. Protocol Additional to the Geneva Conventions of August 12, 1949, and Relating to the Protection of Victims of International Armed Conflicts art. 36, June 8, 1977, 1125 U.N.T.S. 3; cf. Duncan Blake & Joseph S. Imburgia, “Bloodless Weapons”? *The Need to Conduct Legal Reviews of Certain Capabilities and the Implications of Defining Them as “Weapons,”* 66 AIR FORCE LAW REVIEW 157, 159, 161 (2010) (discussing the application of legal reviews to certain future and developing weapons).

63. INTERNATIONAL COMMITTEE OF THE RED CROSS, A GUIDE TO THE LEGAL REVIEW OF NEW WEAPONS, MEANS AND METHODS OF WARFARE: MEASURES TO IMPLEMENT ARTICLE 36 OF ADDITIONAL PROTOCOL I OF 1977, at 4 (2006), available at https://www.icrc.org/eng/assets/files/other/icrc_002_0902.pdf.

64. See, e.g., *id.*; James D. Fry, *Contextualized Legal Reviews for the Methods and Means of Warfare: Cave Combat and International Humanitarian Law*, 44 COLUMBIA JOURNAL OF TRANSNATIONAL LAW 453 (2006).

65. Neil Davison, *How International Law Adapts to New Weapons and Technologies of Warfare*, INTERCROSS BLOG (Dec. 4, 2012), <http://intercrossblog.icrc.org/blog/how-international-law-adapts-to-new-weapons-and-technologies-of-warfare?rq=neil%20davison#sthash.MLmCTUNO.dpbs=>.

66. GEOFFREY S. CORN ET AL., *supra* note 61, at 203.

authorized to conduct such legal reviews in the Department shall conduct the legal review of the intended acquisition of weapons or weapons systems.⁶⁷

Each military service has an attorney designated to do such reviews⁶⁸ who will be given detailed information on the proposed design and specifications of a new weapon, along with its intended use and capabilities. The legal adviser performing the review will compare the weapon with current LOAC for signals as to its legality, relying on prior analogous reviews, as well as carefully considering the basic rules and principles of LOAC. To the extent these reviews identify concerns, those are provided to the weapon's developer so that the weapon can be altered, corrected or abandoned.

This requirement is comprehensive and would clearly apply to all new and developing technologies that States may be considering, including truly "novel" weapon systems where there are no previous analogs with which to compare. In such cases, the legal adviser may find himself much like Harold Koh who, while serving as the Legal Adviser to the U.S. Department of State, argued that "[i]ncreasingly, we find ourselves addressing twenty-first century challenges with twentieth-century laws."⁶⁹ However, in such cases, the general principles of LOAC continue to apply and provide guidance, as contemplated in the century-old Martens Clause.

Until a more complete code of the laws of war is issued, the High Contracting Parties think it right to declare that in cases not included in the Regulations adopted by them, populations and belligerents remain under the protection and empire of the principles of international law, as they

67. Deputy Secretary of Defense, DODD 5000.01, The Defense Acquisition System ¶ E1.1.15 (2003), available at <http://www.dtic.mil/whs/directives/corres/pdf/500001p.pdf>.

68. For an example of a weapon review, see CORN ET AL., *supra* note 61, at 228–31.

69. Harold Hongju Koh, *The State Department Legal Adviser's Office: Eight Decades in Peace and War*, 100 GEORGETOWN LAW JOURNAL 1747, 1772 (2012). See also *Al-Bihani v. Obama*, 590 F.3d 866, 882 (D.C. Cir. 2010) (Brown, J., concurring) ("War is a challenge to law, and the law must adjust. It must recognize that the old wineskins of international law, domestic criminal procedure, or other prior frameworks are ill-suited to the bitter wine of this new warfare. We can no longer afford diffidence. This war has placed us not just at, but already past the leading edge of a new and frightening paradigm, one that demands new rules be written. Falling back on the comfort of prior practices supplies only illusory comfort.").

result from the usages established between civilized nations, from the laws of humanity and the requirements of the public conscience.⁷⁰

The legal adviser can also have confidence that his review in the development stage will be subjected to further legal review each time the weapon is employed. Article 82 of API, titled “Legal Advisers in Armed Forces,” states:

The High Contracting Parties at all times, and the Parties to the conflict in time of armed conflict, shall ensure that legal advisers are available, when necessary, to advise military commanders at the appropriate level on the application of the Conventions and this Protocol and on the appropriate instruction to be given to the armed forces on this subject.⁷¹

This layered legal review process creates a circular loop, which provides return signals to developers and legal reviewers, thus iteratively building compliance with LOAC. As advanced weapons enter the inventory and are utilized in combat, their use creates a body of practice that enlightens their current deployment and future development, thus enhancing the signaling role of LOAC.

IV. CONCLUSION

Emerging technologies have always presented States with opportunities to create advanced weapons. In the next decade or two, revolutionary technologies such as the emergence of cyber operations, the military application of nanotechnology, innovations in and increased accessibility of virology, advances in robotics and artificial intelligence (including autonomous weapons), and the development of directed energy weapons will likely result in new or “novel” weapons systems. Calls have already begun for a ban on the weaponization of some of these technologies, many of which use LOAC as a basis for the ban. These calls are premature. While there may be good moral, political or ethical reasons for such actions, LOAC and its system of signaling to States make such bans unnecessary from a legal perspective.

70. Convention No. IV Respecting the Laws and Customs of War on Land *publ.*, Oct. 18, 1907, 36 Stat. 2227, T.S. No. 539.

71. *See also* 1 INTERNATIONAL COMMITTEE OF THE RED CROSS, CUSTOMARY INTERNATIONAL HUMANITARIAN LAW *r.* 141 (Jean-Marie Henckaerts & Louise Doswald-Beck eds., 2005).

As history has demonstrated, LOAC signaling will provide appropriate and adequate guidance as States move forward in developing advanced weapons based on emerging technologies. As States use this signaling mechanism through appropriate weapons reviews and feedback from legal advisers, advanced weapons can continue to comply with LOAC even when based on futuristic emerging technologies.