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The (Erroneous) Requirement for Human Judgment (and Error) in the Law of Armed Conflict

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I. INTRODUCTION

One of the most intriguing and important discussions in international law today is the potential impact of emerging technologies on the law of armed conflict (LOAC). This conversation has developed in many ways and in many fora, including academic journals and conferences, statements by governments, and assertions by nongovernmental organizations. Among those discussions, perhaps the most significant has taken place between States and other invited participants as part of the meetings of States Parties to the Convention on Certain Conventional Weapons (CCW).¹

Adopted in 1980, this Convention² has provided an active forum for member States to consider the application of weapons in armed conflict and has produced several important protocols limiting the use of various means and methods of warfare.³ In 2013, the States Parties turned their attention to emerging technologies,⁴ including lethal autonomous weapons and artificial intelligence.⁵ While these discussions have not resulted in an additional protocol or even a consensus approach on how to address these challenges, the discussions have provided an invaluable perspective on national approaches to the application of the LOAC to these technologies.

Because one of the likely characteristics of these advanced weapons would be the ability to make decisions implicating life and death on the bat-

1. See David Kaye & Steven A. Solomon, *The Second Review Conference of the 1980 Convention on Certain Conventional Weapons*, 96 AMERICAN JOURNAL OF INTERNAL LAW 992 (2002).

2. 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, Oct. 10, 1980, 1342 U.N.T.S. 137.

3. Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices as Amended on 3 May 1996, May 3, 1996, 2048 U.N.T.S. 93; Protocol on Blinding Laser Weapons, Oct. 13, 1995, 1380 U.N.T.S. 370; Protocol on Explosive Remnants of War 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, Nov. 28, 2003, 2399 U.N.T.S. 100; Convention on Cluster Munitions, May 30, 2008, 2688 U.N.T.S. 39.

4. See Meeting of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Final Report, ¶ 32, U.N. Doc. CCW/MSP/2013/10 (Dec. 16, 2013).

5. See Chris Jenks, *The Gathering Swarm: The Path to Increasingly Autonomous Weapons Systems*, 57 JURIMETRICS JOURNAL 341 (2017).

tlefield, these discussions have highlighted a fundamental question concerning the LOAC: does the law regulating armed conflict require human input in selecting and engaging targets or can that decision be made without human input? For Parties to Additional Protocol I to the 1949 Geneva Conventions (AP I),⁶ this question might be formulated as whether the law is designed to provide the “best application possible” of the LOAC or the “best application humanly possible”? Put differently, are humans an integral part of LOAC application such that future weapons must, as a matter of law, incorporate human input into lethal decision making or does the possibility that advanced technology may produce fewer LOAC violations than humans in the same circumstances allow, or even require, States to pursue the development of these technologies for selecting and engaging targets?

Recent discussions have varied widely on this topic, including many voices that argue “meaningful human control” should be a necessary element of any research and development on advanced weapon systems that would have the capability of lethal decision making.⁷ At least some of those voices argue that the requirement for human decision making is a legal requirement and comes from the LOAC.⁸

In contrast, this article argues that international law is currently unclear on this point and therefore does not require a human decision for selecting and engaging targets to be legal. Rather, the law requires that the targeting decision maker, whether a human, machine, or human-machine team, be able to apply fully and comply with the LOAC. Even in its strictest application, potentially applicable to Parties to AP I, the LOAC requires the decision maker to “minimiz[e] incidental loss of civilian life, injury to civilians and damage to civilian objects.”⁹ Thus, to the extent that weapon systems

6. Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, June 8, 1977, 1125 U.N.T.S. 3 [hereinafter AP I].

7. See, e.g., Merel Ekelhof, *Autonomous Weapons: Operationalizing Meaningful Human Control*, HUMANITARIAN LAW & POLICY (Aug. 15, 2018), <https://blogs.icrc.org/law-and-policy/2018/08/15/autonomous-weapons-operationalizing-meaningful-human-control/>.

8. Netta Goussac, *Safety Net or Tangled Web: Legal Reviews of AI in Weapons and War-Fighting*, HUMANITARIAN LAW & POLICY (Apr. 18, 2019), <https://blogs.icrc.org/law-and-policy/2019/04/18/safety-net-tangled-web-legal-reviews-ai-weapons-war-fighting/>; International Committee of the Red Cross, *Towards Limits on Autonomy in Weapon Systems*, Statement to the Convention on Certain Conventional Weapons (CCW) Group of Governmental Experts on Lethal Autonomous Weapons Systems (Apr. 9, 2018), <https://www.icrc.org/en/document/towards-limits-autonomous-weapons> [hereinafter ICRC, *Towards Limits on Autonomy in Weapon Systems*].

9. AP I, *supra* note 6, art. 57(2)(a)(ii).

use technological advances, such as machine learning or artificial intelligence, to select and engage targets, those systems must be capable of fully applying the LOAC, including minimizing civilian deaths and injury and damage to civilian objects.

Further, it naturally follows that if weapon systems using technological advances can make decisions that are LOAC compliant then there is no legal proscription to their employment on the battlefield. Because the future capabilities of machine learning and artificial intelligence are still an open question, those technologies should be researched and developed with the potential of being fully implemented by States. In addition, to the extent that such systems become consistently better at implementing LOAC provisions than humans, States should be required, to the extent feasible, to procure and employ such systems.

In making this argument, the article focuses on state practice. Because States are the primary actors in the international community and their practice among the most important sources of international law, it is their statements and actions that should capture our attention.

A few caveats before proceeding. This article does not address ethical¹⁰ or technological considerations concerning the use of autonomous weapon systems. It recognizes that States can limit the use of machine learning or artificial intelligence in the use of force based on such considerations if they choose to do so.¹¹ These limiting actions, as well as other options, are certainly available if States are inclined to take such actions.¹² However, in the

10. For one view of some of these ethical considerations, see INTERNATIONAL COMMITTEE OF THE RED CROSS, *ETHICS AND AUTONOMOUS WEAPON SYSTEMS: AN ETHICAL BASIS FOR HUMAN CONTROL?* (2018) [hereinafter ICRC, *ETHICS AND AUTONOMOUS WEAPON SYSTEMS*]. For example, the ICRC argues, “It is precisely anxiety about the loss of human control over weapon systems and the use of force that goes beyond questions of the compatibility of autonomous weapon systems with our laws to encompass fundamental questions of acceptability to our values.” *Id.* at 1.

11. See Elke Schwarz, *The (Im)Possibility of Meaningful Human Control for Lethal Autonomous Weapon Systems*, HUMANITARIAN LAW & POLICY (Aug. 29, 2018), <https://blogs.icrc.org/law-and-policy/2018/08/29/im-possibility-meaningful-human-control-lethal-autonomous-weapon-systems/> (“[W]e should avoid conflating the legal concept with the possibility to retain moral agency for life and death decisions with LAWS.”).

12. For example, the ICRC states,

It is clear that ethical decisions by States, and by society at large, have preceded and motivated the development of new international legal constraints in warfare, and that in the face of new developments not specifically foreseen or not clearly addressed by existing law, con-

absence of such actions, nothing in the current LOAC precludes developing and employing weapons systems that use machine learning or artificial intelligence to select and engage targets.

With these points in mind, this article proceeds as follows. Part II briefly demonstrates the potential issues that emerging technologies may have on the application of the LOAC by presenting States with weapon systems capable of applying lethal force with limited or no human interaction. Part III describes various views on the legal requirement of human involvement in the LOAC, with particular attention to State positions as announced in the discussions by States Party to the 1980 CCW. This Part also describes national measures, such as weapons review processes that are already in place and can continue to be used to adjudicate the legality of weapons using machine learning and artificial intelligence. Part IV will argue that it is entirely too early to determine whether these technologies may or may not be able to eventually apply force in a way that reduces civilian casualties and LOAC violations. Declaring them unlawful now would prevent States from researching and developing technologies that may lead to greater LOAC compliance. Such action would certainly not result in long-term benefits to potential participants in, and victims of, armed conflict. Part V concludes.

II. THE RISE OF TECHNOLOGY

Throughout history, emerging technologies have had a significant impact on the conduct of hostilities. The development of the longbow, gunpowder, and mechanized warfare are examples of how advances in weapon systems and accompanying tactics can be the difference between victory and defeat.¹³ Often, as new technologies emerge, calls for their ban or the creation of significant legal restraints on their development quickly follow.¹⁴ Key examples include efforts to ban or restrain the use of gunpowder, the hot air balloon, submarines, nuclear weapons, and cyber tools. In some cases, these bans or

temporary ethical concerns can go beyond what is already codified in the law. This highlights the importance of not reducing debates about autonomous weapon systems, or other new technologies of warfare, solely to legal compliance.

ICRC, ETHICS AND AUTONOMOUS WEAPON SYSTEMS, *supra* note 10, at 5 (emphasis omitted).

13. See Eric Talbot Jensen, *Emerging Technologies and LOAC Signaling*, 91 INTERNATIONAL LAW STUDIES 621 (2015).

14. See Sean Watts, *Regulation-Tolerant Weapons, Regulation-Resistant Weapons and Law of War Development*, 91 INTERNATIONAL LAW STUDIES 540 (2015).

restrictions were sought because of the alleged inability of the new weapons to comply with existing rules of armed conflict.

Generally, these cries of alarm have proven unfounded. Rather, States have taken a cautious and deliberate approach to the research and development of weapons based on emerging technologies and ensured that the weapons were employed in compliance with the LOAC.¹⁵ In the end, all of these emerging technologies were found to be capable of LOAC compliance and have been properly employed in armed conflict. Unfortunately, we are once again repeating this unhelpful process with emerging weapon systems based on automation, robotics, bio-enhancement, and artificial intelligence. Here, the proposed ban on “killer robots” provides the best example.¹⁶

As with earlier weapon systems based on emerging technologies, there is clearly a need for an open and frank discussion among States and caution as research, particularly weaponization, progresses.¹⁷ The potential significance of these technologies applied to weapons is immense. For example, Russian President Vladimir Putin has recently stated, “Artificial intelligence is the future, not only for Russia, but for all humankind. It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world.”¹⁸

As with earlier translations of emerging technologies into weapons, it is premature to ban emerging weapon systems based on existing legal constraints. Paul Scharre has rightly stated, “even the most thoughtful regula-

15. For example, in the CCW discussions, the Netherlands stated, “As long as autonomous weapon systems remain under meaningful human control, there is no reason to assume that by definition these weapons fall into one of the categories of weapons that are banned under international law.” Statement of the Netherlands delivered by Reint Vogelaar, First Secretary, Permanent Representation of the Kingdom of the Netherlands to the Conference on Disarmament at Group of Experts on LAWS, Apr. 26, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/A2E0497EE93C232AC12583CB0037813B/\\$file/5a+NL+Statement+Legal+Challenges-final.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/A2E0497EE93C232AC12583CB0037813B/$file/5a+NL+Statement+Legal+Challenges-final.pdf) [hereinafter Statement of the Netherlands].

16. See CAMPAIGN TO STOP KILLER ROBOTS, <https://www.stopkillerrobots.org/> (last visited Mar. 2, 2020).

17. For an excellent discussion of a much broader application of autonomy to weapon systems, see Chris Jenks & Rain Liivoja, *Machine Autonomy and the Constant Care Obligation*, HUMANITARIAN LAW & POLICY (Dec. 11, 2018), <https://blogs.icrc.org/law-and-policy/2018/12/11/machine-autonomy-constant-care-obligation/>.

18. *Whoever Leads in AI Will Rule the World: Putin to Russian Children on Knowledge Day*, RT (Sept. 1, 2017), <https://www.rt.com/news/401731-ai-rule-world-putin/>.

tions or prohibitions will not be able to foresee all of the ways that autonomous weapons could evolve over time.”¹⁹ The United Kingdom has advocated the same view,²⁰ which is true both in negative and positive applications, making clarity in the legal arguments especially important. History and reason dictate that the international community should take a cautious approach in placing limitations beyond existing LOAC constraints on the development and employment of advanced technologies.

An additional difficulty with current calls for a ban is the definitional uncertainty inherent in the discussion. As articulated by Chris Jenks, there is no consensus on the meaning and use of the terms “autonomy” and “artificial intelligence,” even within the CCW process.²¹ As Jenks notes, “The international community cannot even agree about what they disagree about.”²² The Polish delegation echoed this view in the CCW discussions.²³

19. Paul Scharre, *Human Judgment and Lethal Decision-Making in War*, HUMANITARIAN LAW & POLICY (Apr. 11, 2018), <https://blogs.icrc.org/law-and-policy/2018/04/11/human-judgment-lethal-decision-making-war/>.

20. UK Mission Geneva, Statement at Meeting of Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, Mar. 25–29, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/1ED3972D40AE53B5C12583D3003F8E5E/\\$file/20190318-5\(a\)_IHL_Statement.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/1ED3972D40AE53B5C12583D3003F8E5E/$file/20190318-5(a)_IHL_Statement.pdf) [hereinafter UK Statement].

We further contend that in the absence of any clearly articulated empirical evidence as to why existing regulation—including IHL—is inadequate to control developments in emerging technologies, the issue may well lie not with the processes themselves, but with the perceived ability of machines to assimilate, understand and meet the relevant extant legal and ethical standards. We argue that weapons systems that cannot meet these standards will remain incapable of legal use as set out in existing national and international normative frameworks and will not be developed, fielded and used. All states should look to ensure they meet the basic obligations already set out in the relevant articles of IHL before pressing for bespoke legislation for as-yet undefined capabilities.

21. Chris Jenks, *False Rubicons, Moral Panic, and Conceptual Cul-De-Sacs: Critiquing & Reframing the Call to Ban Lethal Autonomous Weapons*, 44 PEPPERDINE LAW REVIEW 1, 12 (2016) [hereinafter Jenks, *False Rubicons*]; see also Chris Jenks, *The Distraction of Full Autonomy and the Need to Refocus the CCW LAWS Discussion on Critical Functions* (SMU Dedman School of Law Legal Studies Research Paper No. 314, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2797247.

22. Jenks, *False Rubicons*, *supra* note 21, at 12; see also Heather M. Roff & Richard Moyes, *Meaningful Human Control, Artificial Intelligence and Autonomous Weapons* 1 (Briefing Paper for Delegates at the Convention on Certain Conventional Weapons (CCW) Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS), 2016), <http://www.article36.org/wp-content/uploads/2016/04/MHC-AI-and-AWS-FINAL.pdf>.

23. Statement of the Delegation of Poland: General Comments, 2019 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS), Mar. 25, 2019, at 1, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/5CAD5A1367E305A5C12583](https://www.unog.ch/80256EDD006B8954/(httpAssets)/5CAD5A1367E305A5C12583)

Given the disparate and uneven nature of criticism, most critics of autonomous weapons have focused their attention on the issue of selecting and engaging targets without human input.²⁴ They argue that the process of selecting and engaging targets is an inherently human process, requiring human direction. Some argue that it is a requirement of the law of armed conflict. It is to this question that this article will now turn.

III. THE REQUIREMENT OF HUMAN INVOLVEMENT

This Part catalogs the calls for a legal requirement for human involvement in the target selection and engagement process.²⁵ It will look at representative

CC004CA205/\$file/1.+GGE_LAWS_March+2019_PL+Statement_General+comments_25.03.2019.pdf (“Poland is of the opinion that we need definition or at least key characteristics of LAWS to allow regulation of the use of this kind of technology with established levels of human control policy.”).

24. For example, the ICRC has stated, “From the ICRC’s perspective, the focus must be on the functions of weapon systems that are most relevant to legal obligations and ethical concerns within the scope of the Convention on Certain Conventional Weapons, namely autonomy in the critical functions of selecting and attacking targets.” ICRC, *Towards Limits on Autonomy in Weapons Systems*, *supra* note 8.

25. Perhaps the most articulate argument for a legal requirement for human control in armed conflict has come from the ICRC. In a recent statement, the ICRC stated:

For conflict parties, human control over AI [artificial intelligence] and machine-learning applications employed as means and methods of warfare is required to ensure compliance with the law. The rules of international humanitarian law are addressed to humans. It is humans that comply with and implement the law, and it is humans who will be held accountable for violations. In particular, combatants have a unique obligation to make the judgements required of them by the international humanitarian law rules governing the conduct of hostilities, and this responsibility cannot be transferred to a machine, a piece of software or an algorithm.

These rules require context-specific judgements to be taken by those who plan, decide upon and carry out attacks to ensure: distinction—between military objectives, which may lawfully be attacked, and civilians or civilian objects, which must not be attacked; proportionality—in terms of ensuring that the incidental civilian harm expected from an attack will not be excessive in relation to the concrete and direct military advantage anticipated; and to enable precautions in attack – so that risks to civilians can be further minimized.

Where AI systems are used in attacks—whether as part of physical or cyber-weapon systems, or in decision-support systems—their design and use must enable combatants to make these judgements.

INTERNATIONAL COMMITTEE OF THE RED CROSS, *ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT: A HUMAN-CENTRED APPROACH* 7, 8 (2019), https://blogs.icrc.org/new-delhi/wp-content/uploads/sites/93/2019/06/ai_and_machine_learning_in_armed_conflict-icrc-1.pdf. [hereinafter ICRC, *ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT*].

arguments for human involvement, including the potential difficulty of establishing accountability with an autonomous system and such systems' potential lack of predictability. It also discusses how the legally required weapons review process might affect these objections. Finally, while describing the views of a broad range of actors, it focuses on what States have said on the role of human involvement with respect to the legality of autonomous weapons since it is States that make international law.

A. *What Law Applies*

The starting point for the analysis of the legal requirements for employment of weapons that use machine learning or artificial intelligence is the determination that the LOAC applies. That it applies is mostly uncontested, at least by the States engaged in the discussions at the CCW meetings.²⁶ This legal

With respect to autonomous weapon systems, the CCW States Party have recognized that "human responsibility" for the use of weapon systems and the use of force "must be retained." Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Report of the 2018 Session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems ¶¶ 21(b), 23(f), U.N. Doc. CCW/GGE.1/2018/3 (Oct. 23, 2018).

Many States, international organizations (including the ICRC), and civil society organizations, have stressed the requirement for human control to ensure compliance with international humanitarian law and compatibility with ethical values. See, for example, Contributions from Non-Governmental Actors, 2019 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS), [https://www.unog.ch/80256EE600585943/\(httpPages\)/5535B644C2AE8F28C1258433002BBF14?OpenDocument](https://www.unog.ch/80256EE600585943/(httpPages)/5535B644C2AE8F28C1258433002BBF14?OpenDocument) (last visited Mar. 2, 2020).

Beyond the use of force and targeting, the potential use of artificial intelligence systems for other decisions governed by specific rules of international humanitarian law, such as detention, will require careful consideration of necessary human control and judgment. See, e.g., Tess Bridgeman, *The Viability of Data-Reliant Predictive Systems in Armed Conflict Detention*, HUMANITARIAN LAW & POLICY (Apr. 8, 2019), <https://blogs.icrc.org/law-and-policy/2019/04/08/viability-data-reliant-predictive-systems-armed-conflict-detention>.

26. See, e.g., Statement by Brazil, 2019 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS), Mar. 25–29, 2019, at 1–2, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/122DF2DAEE334DDBC12583CC003EFD6F/\\$file/Brazil+GGE+LAWS+2019+-+Item+5+a+-+IHL.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/122DF2DAEE334DDBC12583CC003EFD6F/$file/Brazil+GGE+LAWS+2019+-+Item+5+a+-+IHL.pdf) [hereinafter Statement by Brazil]; Statement of the Netherlands, *supra* note 15; Statement of the Delegation of Poland, *supra* note 23; EU Statement, Group of Governmental Experts, Lethal Autonomous Weapons Systems, Convention on Certain Conventional Weapons, Geneva, 25–29 March 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/EA84B3C2340F877DC12583](https://www.unog.ch/80256EDD006B8954/(httpAssets)/EA84B3C2340F877DC12583)

conclusion is not, of course, insignificant, particularly in light of the lack of formal agreement on that issue concerning cyber weapons among the members of the United Nations Group of Governmental Experts. The acceptance of this legal determination at least identifies the legal paradigm upon which to discuss the lawfulness of various weapon systems. Further, accepting that the LOAC governs the application of these weapons systems also establishes the basis for States to determine the role of humans and human decision making in the employment of weapons that use machine learning or artificial intelligence.

It is also important to note the role of States as decisionmakers on LOAC questions, and particularly on this issue of human involvement. As stated recently by the International Committee of the Red Cross (ICRC),

What is clear is that military applications of new and emerging technologies are not inevitable. They are choices made by States, which must be within the bounds of existing rules, and take into account potential humanitarian consequences for civilians and for combatants no longer taking part in hostilities, as well as broader considerations of “humanity” and “public conscience.”²⁷

CB003727F3/\$file/ALIGNED+-+LAWS+GGE+EU+statement+IHL.pdf [hereinafter EU Statement]; ICRC, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT, *supra* note 25, at 2.

27. ICRC, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT, *supra* note 25, at 2. It is important to note that for support of its use of the terms “humanity” and “public conscience,” the ICRC references a paragraph from the 1977 Additional Protocols to the 1949 Geneva Conventions known as the Martens clause (which originated in the preamble to the 1899 and 1907 Hague Conventions). *See* AP I, *supra* note 6, art. 1(2); Protocol Additional to the Geneva Conventions of August 12, 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts pmb., June 8, 1977, 1125 U.N.T.S. 609. The U.S. *Law of War Manual* notes, “The Martens clause reflects the idea that when no specific rule applies, the principles of the law of war form the general guide for conduct during war.” OFFICE OF THE GENERAL COUNSEL, U.S. DEPARTMENT OF DEFENSE, LAW OF WAR MANUAL § 19.8.3 (rev. ed., Dec. 2016) [hereinafter DOD LAW OF WAR MANUAL]. Further, Paul Ney recently stated with respect to the Martens clause, “addressing novel legal issues is less a matter of creating new principles or filling in ‘gaps’ in the law of war, than in explaining and clarifying how the existing principles of the law of war already apply to new situations.” Paul C. Ney Jr., General Counsel, U.S. Department of Defense, Keynote Address at the Israel Defense Forces 3rd International Conference on the Law of Armed Conflict (May 28, 2019), <https://www.lawfareblog.com/defense-department-general-counsel-remarks-idf-conference> [hereinafter Ney, Keynote Address].

Not only do States make choices about employing weapon systems, but they also are the primary determiners of the legality of employing such weapons and of the requirement (or not) of human involvement in that employment.

The recent statement of U.S. Department of Defense General Counsel Paul C. Ney reinforced the primacy of States to make international law.²⁸ But while States make international law, other perspectives, such as those offered by nongovernmental organizations, play an important role in shaping the discussion and informing States on important issues.²⁹ Nonetheless, it is ultimately States that make international law and therefore States that should be the focus of this analysis.

B. *Applying the Law of Armed Conflict*

Given the general acceptance that the LOAC applies and that State views on the LOAC are preeminent, there are two main arguments cloaked in LOAC terms leveled against weapon systems that use machine learning or artificial intelligence to select and engage targets—the lack of accountability for violations of the LOAC and the unpredictability of the current application of machine learning or artificial intelligence with respect to targeting. Each is discussed below.

28. Ney stated:

First, international law is law made by States and for States. Other actors, such as nongovernmental organizations (NGOs) and academics, can play an important role, but States have the primary responsibility for developing and implementing international law.

Second, the law of war must be made, in particular, by States that conduct military operations. The law of war is, foremost, law that is implemented by armed forces during military operations. States that actually conduct military operations have critical expertise and a perspective that are essential in these discussions.

A State like Israel is on the vanguard of addressing challenges in the law of war. Israel was the first to develop reconnaissance UAVs and deploy reactive tank armor, and pioneered Iron Dome. Israel has also had exceptional experience in combatting terrorism, in fighting enemies that deliberately hide behind innocents and defy the law of war.

Third, discussions on the law of war also need to be led by States, like Israel and others represented here, that are deeply committed to the rule of law and will adhere in good faith to their legal obligations. A State that has no intention of complying with its obligations will not have the desire that Israel and the United States and others have, to ensure that the law is militarily practical and strengthens humanitarian protections.

Ney, Keynote Address, *supra* note 27.

29. Statute of the International Court of Justice art. 38, June 26, 1945, 59 Stat. 1055, 33 U.N.T.S. 993; *see also* Alain Pellet, *Article 38*, in *THE STATUTE OF THE INTERNATIONAL COURT OF JUSTICE: A COMMENTARY* 731–870 (Andreas Zimmermann, Christian Tomuschat, Karin Oellers-Frahm & Christian J. Tams eds., 2d. ed., 2012).

C. Accountability

Individual criminal responsibility is an important aspect of enforcing international law. The formation of international courts and tribunals, including the International Criminal Court,³⁰ is designed to decrease the impunity with which some military leaders and armed forces members conduct their military operations. When a human is not present in or is removed from the target selection and engagement process, questions arise as to who (or what) will be held individually accountable for violations that might occur.

The ICRC³¹ and some commentators³² have noted that the requirement of accountability for law of war violations raises serious concerns for autonomous weapons and weapons that rely on machine learning and artificial intelligence. Others have argued that such concerns are not a significant legal hurdle and can be resolved through a variety of methods.³³

30. Rome Statute of the International Criminal Court, July 17, 1998, 2187 U.N.T.S. 90.

31. ICRC, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT, *supra* note 25, at 2 (“The rules of international humanitarian law are addressed to humans. It is humans that comply with and implement the law, and it is humans who will be held accountable for violations.”); *see also* ICRC, Towards Limits on Autonomy in Weapons Systems, *supra* note 8; ICRC, ETHICS AND AUTONOMOUS WEAPON SYSTEMS, *supra* note 10.

32. *See, e.g.*, Scharre, *supra* note 19; Roff & Moyes, *supra* note 22, at 1.

33. For example, Qiang Li & Dan Xie have argued that

In the case of full autonomy of AI weapon systems without any human control, those who decide to employ AI weapon systems—normally senior military commanders and civilian officials—bear individual criminal responsibility for any potential serious violations of IHL. Additionally, the States to which they belong incur State responsibility for such serious violations which could be attributable to them.

Qiang Li & Dan Xie, *Legal Regulation of AI Weapons under International Humanitarian Law: A Chinese Perspective*, HUMANITARIAN LAW & POLICY (May 2, 2019), <https://blogs.icrc.org/law-and-policy/2019/05/02/ai-weapon-ihl-legal-regulation-chinese-perspective/>.

McFarland arrives at a similar conclusion, arguing that autonomy remains an exercise of human control and thus stating:

[T]he behaviour of the AWS is determined by that human-written software: whether and in what circumstances it should initiate an attack, how it should respond to changes in its environment and every other aspect of its behaviour (barring malfunctions). Autonomous control is therefore an exercise of human control, independently of whether any human is in a position to oversee or intervene in the operation in real time.

Tim McFarland, *Autonomous Weapons and Human Control*, HUMANITARIAN LAW & POLICY (July 18, 2018), <https://blogs.icrc.org/law-and-policy/2018/07/18/autonomous-weapons-and-human-control>.

Likewise, Ekelhof notes that there are numerous weapon systems where the trigger puller is not the person we would hold accountable for LOAC violations, such as artillery,

States have also expressed their views on whether accountability is a legal obstacle to the employment of weapons that utilize machine learning and artificial intelligence to select and engage targets on the battlefield, with many of those expressions coming as part of the CCW discussions. Some representative expressions are set forth below. Presently, however, there is no consensus that the principle of accountability serves as a legal limitation on the development and employment of such weapons.

A few States have expressed their belief that human involvement in selecting and engaging targets is legally required. One of the strongest statements of this view is from Greece. As part of the CCW process, Greece argued, “The use of any Weapon System in compliance with the provisions of International Humanitarian Law (IHL) requires a degree of human control over its use in the battlefield.”³⁴

Germany also views human control as legally required. In a recent statement to the Group of Governmental Experts, it stated,

In our view . . . the quality of human control is defined by the fact that humans must remain accountable for the weapons systems they use, as already stated in the “Possible Guiding Principles.” Accountability can only be assured as long as humans retain sufficient control over the critical functions of the weapons they operate. Humans also have to maintain the ultimate decision in matters of life and death.³⁵

air-delivered munitions, and nuclear weapons. The law requires those who decide and plan to execute an attack follow the LOAC, but that does not necessarily mean that it is the individual or individuals conducting the attack that we hold accountable. Accordingly, she argues that “meaningful human control” should be thought of as a system of “distributed control” to match current tactics and operational realities. See Ekelhof, *supra* note 7; see also Jessica Malekos Smith, *Ethics for the AI-Enabled Warfighter – the Human Warrior-in-the-Design*, THE HILL (Apr. 21, 2019), <https://thehill.com/opinion/cybersecurity/439898-ethics-for-the-ai-enabled-warfighter-the-human-warrior-in-the-design>.

34. Statement by Greece, Potential Challenges Posed by Emerging Technologies in the Area of Lethal Autonomous Weapons Systems to International Humanitarian Law, Group of Governmental Experts on Lethal Autonomous Weapon Systems (LAWS), Geneva, Mar. 25–29, 2019, at 1, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/D1B935800DF5F04DC12583CC002F3DD1/\\$file/GGE+LAWS+STATEMENT+by+GREECE+-+Challenges+to+IHL.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/D1B935800DF5F04DC12583CC002F3DD1/$file/GGE+LAWS+STATEMENT+by+GREECE+-+Challenges+to+IHL.pdf) [hereinafter Statement by Greece].

35. Statement by Germany, Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems of the Convention on Prohibition or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Geneva, Mar. 26, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/2B8E772610C0F552C12583CB003A4192/\\$file/20190326+Statement3+Germany+GGE+LAWS.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/2B8E772610C0F552C12583CB003A4192/$file/20190326+Statement3+Germany+GGE+LAWS.pdf).

Earlier German statements were less clear, calling for a “political declaration” rather than arguing for a legal requirement.³⁶

India also emphasizes the importance of having humans make decisions on targeting, but it is unclear if it views this issue as a legal requirement or simply a policy imperative. “Human control must be maintained over all weapon systems and the same should be applicable in the context of LAWS also. Maintaining human control during its entire life cycle including over critical functions is essential.”³⁷

36. *See* General Statement by H.E. Ambassador Michael Biontino, Permanent Representative of Germany to the Conference on Disarmament and Ambassador for Global Disarmament Affairs, First Meeting of the Group of Governmental Experts on Lethal Autonomous Weapons Systems, Geneva, 13 to 17 November 2017, at 2, ¶ 5, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/129E7BEB7128A000C1258249003146EE/\\$file/2017_GGE+LAWS_Statement_Germany.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/129E7BEB7128A000C1258249003146EE/$file/2017_GGE+LAWS_Statement_Germany.pdf) [hereinafter General Statement (Germany)].

At the heart of our proposal is the recommendation for a political declaration, which should affirm that State parties share the conviction that humans should continue to be able to make ultimate decisions with regard to the use of lethal force and should continue to exert sufficient control over lethal weapons systems they use. Moreover State parties should in our view recall that rules of international law, in particular international humanitarian law, are fully applicable to the development and use of LAWS (emphasis omitted).

37. Statement by India: Further Consideration of the Human Element in the Use of Lethal Force; Aspects of Human Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/36D216B42ED8D7A7C12583D2003C8598/\\$file/5+b+26+Mar+2019+afternoon.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/36D216B42ED8D7A7C12583D2003C8598/$file/5+b+26+Mar+2019+afternoon.pdf). India further stated:

The lawfulness of weapon and weapon systems itself and whether it is qualified for use in an armed conflict is determined under the principles of LAW of Armed Conflict (LOAC). To be lawful, a weapon must satisfy all the requirements i.e. the weapon must be able to discriminate between military and non-military targets, it must not cause unnecessary suffering and it must not be uncontrollable.

Autonomy in critical functions of weapon systems may be viewed from two perspectives—one that potentially such systems would be precise and accurate in targeting, not prone to human error in judgement and the corollary that human interface is necessarily compliant on the distinction, proportionality and precautions principles of IHL in carrying out any attack, though such interface may not be quite safe in execution.

Autonomy in critical functions would challenge the maintenance of combatant and commanders’ responsibility for decisions to use force, however such autonomy parameters may be made compliant to IHL during the conceptualisation, design and development of the system for its intended use.

Statement by India: An Exploration of the Potential Challenges Posed by Emerging Technologies in the Area of Lethal Autonomous Weapons Systems to International Humanitarian Law, Mar. 26, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/4C330E6B0BDD4C20C12583D2003C36AF/\\$file/5+a+26+Mar+2019+forenoon.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/4C330E6B0BDD4C20C12583D2003C36AF/$file/5+a+26+Mar+2019+forenoon.pdf).

The Indian approach is important, as many States have expressed the commitment to keep humans intricately involved in processes of target selection and engagement, but not necessarily as a legal requirement. For example, Brazil stated:

The human element is what binds autonomous systems to Humanitarian International Law [HIL], since it provides a subject for accountability. In other words, HIL is only applicable to LAWS as long as there is someone to be held accountable. Therefore, the human element is not only the essential concept in understanding the limits and challenges of weapons systems with autonomous functions, but also the element that ensure its compliance to existing norms.³⁸

Likewise, the Canadian delegation's opening statement to the 2018 meeting of the CCW Group of Governmental Experts illustrates the tension between legal requirements and policy decisions concerning human decision making and lethal autonomous weapons systems. The statement asserted, "We believe that any legal discussion about LAWS should centre on compliance with International Humanitarian Law, including the obligation for all States to ensure the lawfulness of their weapons, means and methods of warfare. These should be our constant reference points."³⁹ Further, it noted, "[a]n important part of the LAWS discussion centers on levels of human interaction with autonomous weapons."⁴⁰ It also noted that in the Canadian

38. Intervention by Brazil, 2019 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS) Mar. 25–29, 2019, at 1–2, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/EB97EA2C3DD0FA51C12583CB003AFED9/\\$file/Brazil+GGE+LAWS+2019+-+Item+5+d+-+Human+element.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/EB97EA2C3DD0FA51C12583CB003AFED9/$file/Brazil+GGE+LAWS+2019+-+Item+5+d+-+Human+element.pdf).

In a separate statement, Brazil argued:

A commander will always be ultimately accountable for violations of IHL during military operations under its purview. This notwithstanding, the causal relation between the decisions and acts of the commander and operators and its effects on the battlefield must remain credible, lest we risk a dilution of the very concept of accountability as legal answerability over one's actions and choices. In other words, factual responsibility must remain commensurate with legal accountability, otherwise the human commander or operator ends up as a mere legal scapegoat in case anything goes wrong, instead of an agent which takes consequential decisions, for good or bad, and responds for them.

Statement by Brazil, *supra* note 26, at 1.

39. Opening Statement by Canada at Second Meeting of the Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS), Apr. 9–13, 2018, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/86612887B010EB33C12582720056F0C6/\\$file/2018_LAWSGeneralExchange_Canada.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/86612887B010EB33C12582720056F0C6/$file/2018_LAWSGeneralExchange_Canada.pdf).

40. *Id.*

National Defense Policy, the Canadian Armed Forces committed to “maintain appropriate human involvement in the use of military capabilities that can exert lethal force.”⁴¹

While recognizing human involvement as important in the targeting process, many States have taken the view that the desired human involvement can come at many and varied points in the weapons development and employment process. For example, Israel takes the view that human involvement does not necessarily require a human to pull the trigger, or even be involved in the targeting decision at the time of engagement.⁴² Similarly, the Netherlands argues that human involvement is legally required but allows that such involvement may come at various stages in the targeting process.⁴³

41. MINISTER OF NATIONAL DEFENCE, *STRONG SECURE ENGAGED: CANADA’S DEFENCE POLICY 72* (2017).

42. *See* Statement by Mr. Asaf Segev, Arms Control Department, Ministry of Foreign Affairs, Israel at Meeting of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, Mar. 26, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/6E67051E5B3945FEC12583E500357899/\\$file/CCW+-+GGE+LAWS+-+Israel+intervention+-+Human+Machine+Interface+-+26+March+2019.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/6E67051E5B3945FEC12583E500357899/$file/CCW+-+GGE+LAWS+-+Israel+intervention+-+Human+Machine+Interface+-+26+March+2019.pdf).

Humans will always be in charge of any process to develop and acquire LAWS, including the various phases of the research, development, programming, testing, technical and legal review, and approval of such systems. During these phases, humans will determine how LAWS will operate. Ultimately, it is the responsibility of the humans involved that the system’s use will be lawful.

As with any other weapon, the persons involved would take into account the operational scenarios, environments and circumstances in which the weapon is intended to be employed, and during development they must ensure that the algorithms and technical capabilities of the weapon make it suitable for use in these circumstances. This applies also to the legal aspect. Thus, it should be ensured that, under the circumstances in which the weapon is intended to be used, and in the way it would be authorized to be used, its future employment would comply with the Laws of Armed Conflict. As any other weapon, LAWS could be authorized for use subject to limitations and conditions.

The human who makes the decision to use the weapon is responsible that the use would comply with the Laws of Armed Conflict. If deemed necessary in order to meet the legal requirements, the human should limit the system’s operation by, for example, restricting the system’s operation to a specific perimeter or during a limited timeframe.

43. Sandra de Jonogh, Policy Officer, Ministry of Foreign Affairs, Statement of the Netherlands delivered at the Group of Experts on LAWS, Apr. 26, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/164DD121FDC25A0BC12583CB003A99C2/\\$file/5b+NL+Statement+Human+Element-final.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/164DD121FDC25A0BC12583CB003A99C2/$file/5b+NL+Statement+Human+Element-final.pdf).

The Netherlands is of the view that autonomous weapon systems should remain under meaningful human control to ensure their compliance with international law. After all, only humans can be held accountable, and therefore should have meaningful control over decisions on the use of force. In our view, meaningful human control should be understood within the context of design, development and operational use of autonomous weapons.

The United States takes a similar view in the Department of Defense's *Law of War Manual*, which states,

The law of war rules on conducting attacks . . . impose obligations on persons. These rules do not impose obligations on the weapons themselves; of course, an inanimate object could not assume an 'obligation' in any event. . . . The law of war does not require weapons to make legal determinations, even if the weapon (e.g., through computers, software, and sensors) may be characterized as capable of making factual determinations, such as whether to fire the weapon or to select and engage a target. . . . Rather, it is persons who must comply with the law of war.⁴⁴

The U.S. Department of Defense has also issued Directive 3000.09, *Autonomy in Weapon Systems*, which "[e]stablishes DoD policy and assigns responsibilities for the development and use of autonomous and semi-autonomous functions in weapon systems, including manned and unmanned platforms."⁴⁵ The Directive sets forth the appropriate level of human judgment standard, stating, "It is DoD policy that [a]utonomous and semi-autonomous weapon systems shall be designed to allow commanders and operators to exercise appropriate levels of human judgment over the use of force."⁴⁶ It further establishes that individuals who employ lethal autonomous weapons systems must do so under appropriate legal rules: "Persons who authorize the use of, direct the use of, or operate autonomous and semi-autonomous weapon systems must do so with appropriate care and in accordance with the law of war, applicable treaties, weapon system safety rules, and applicable rules of engagement (ROE)."⁴⁷

As noted in a 2019 Congressional Research Service publication, U.S. policy "does not require manual human 'control' of the weapon system, as is often reported, but rather broader human involvement in decisions about

The targeting cycle allows for human control in relation to a wide variety of tasks, such as the determination of end-states and objectives, target development, weapon selection, assessment of potential collateral damage, determination of the weapon's operational boundaries in time and space, and the assessment of the effectiveness and lawfulness of the engagement after deployment.

44. DOD LAW OF WAR MANUAL, *supra* note 27, § 6.5.9.3.

45. U.S. Department of Defense, Directive 3000.09, *Autonomy in Weapon Systems* ¶ 1(a) (2012) (Incorporating Change 1, May 8, 2017), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/300009p.pdf> [hereinafter DoD Directive 3000.09].

46. *Id.* ¶ 4(a).

47. *Id.* ¶ 4(b).

how, when, where, and why the weapon will be employed.”⁴⁸ Further, a 2018 U.S. white paper submitted as part of the CCW process argues that the term “appropriate” with respect to “appropriate levels of human judgment” is flexible and its meaning context dependent, stating:

[Appropriate] is a flexible term that reflects the fact that there is not a fixed, one size-fits-all level of human judgment that should be applied to every context. What is “appropriate” can differ across weapon systems, domains of warfare, types of warfare, operational contexts, and even across different functions in a weapon system. Some functions might be better performed by a computer than a human being, while other functions should be performed by humans.⁴⁹

Scholars have noted a similar trend among States. For example, Rebecca Crootof observes,

there is no consensus as to what meaningful human control actually requires. State X might define meaningful human control to require informed human approval of each possible action of a given weapon system (maintaining a human being—in the loop); State Y might understand it as the ability of a human operator to oversee and veto a weapon system’s actions (having a human being—on the loop); and State Z might view the original programming alone as providing sufficiently meaningful human control (allowing human beings to be—off the loop).⁵⁰

In a recent submission to the CCW Group of Governmental Experts, the United Kingdom noted its views on this topic. First, in relation to the issue of accountability discussed above, the United Kingdom clearly expresses its view that accountability does not present an issue that should have any impact on the fielding of autonomous weapon systems:

48. KELLEY M. SAYLER, CONG. RESEARCH SERV., IF11150, DEFENSE PRIMER: U.S. POLICY ON LETHAL AUTONOMOUS WEAPON SYSTEMS (2019), <https://www.a51.nl/sites/default/files/pdf/IF11150.pdf>.

49. United States, Human-Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems ¶¶ 8, 9, U.N. Doc. CCW/GGE.e/2018/WP.4, Aug. 28, 2018, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/D1A2BA4B7B71D29FC12582F6004386EF/\\$file/2018_GGE+LAWS_August_Working+Paper_US.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/D1A2BA4B7B71D29FC12582F6004386EF/$file/2018_GGE+LAWS_August_Working+Paper_US.pdf).

50. Rebecca Crootof, *A Meaningful Floor for “Meaningful Human Control”*, 30 TEMPLE INTERNATIONAL AND COMPARATIVE LAW JOURNAL 53, 54 (2016).

It is the UK's view that accountability can never be delegated to a machine or system; should a violation of IHL result from the operation of a weapon or weapon system, processes are already in place to conduct appropriate investigations and, if applicable, apportion responsibility. Legal accountability will always devolve to a human being, never a machine – increasing autonomy in weapons or weapons systems does not therefore present the risk of an accountability gap.⁵¹

Then, while acknowledging that in most circumstances human judgment “currently exceeds that of machines,” the United Kingdom allowed that certain situations already exist where machines make more accurate decisions than humans do.

Within tightly defined circumstances and in response to a specific problem, machines may make more accurate decisions than a human; outside of these circumstances, the ability of a human to apply experience and judgment to a new situation currently exceeds that of machines. We have explored such issues in our Joint Concept Note on Human Machine Teaming and in the UK's 2018 working paper. The effective teaming of human and machine can improve capability, accuracy, diligence and speed of decision, whilst maintaining and potentially enhancing confidence in adherence to IHL.⁵²

Finally, the United Kingdom argued that even an acceptance of human discretion as a principle does not amount to a prohibition on even fully autonomous weapon systems as human discretion and input can be manifested in various ways and at various times throughout the “operational lifecycle” of a weapons system.

As we pointed out in our intervention on characterisation yesterday, direct human involvement in every detailed action of a system or platform may not be practical or desirable under all circumstances. Instead a human-centred approach to autonomous technologies must take into account the operational context as well as the capabilities and limitations of the personnel deploying the weapon system. The way in which a weapon is developed and used may differ dramatically depending on whether it is to be deployed in a land, air or maritime environment and according to considerations such as the type of target it is to be deployed against, duration and distance

51. UK Statement, *supra* note 20, at 1.

52. *Id.* at 2–3.

over which the system may be required to operate and potential impact on civilians and civilian infrastructure.

Focusing solely on specific—or ‘critical’—functions or activity in the lifecycle of a weapon is unlikely to be sufficient to ensure there is human control. As was pointed out this morning, such functions may relate to navigation, survivability or situational awareness such as sensing and avoiding hazards. They may be indirectly linked to the application of lethal force, such as acquisition of a target originated by a human operator or commander. Cumulatively, all such functions will support a system’s ability to deliver the defined effect intended by the human agent – including the application of lethal force. This makes regulation or characterisation by function difficult and potentially unhelpful. Rather, it is the cumulative effect of multiple safeguards across the development and operational lifecycle that establish human control of weapon systems. Therefore, human control should be considered and exercised throughout this lifecycle and in a way that is appropriate to the operational context.⁵³

This obvious lack of consensus as to what human control even means, and when or how it should be applied, reflects deeper divisions among States concerning the actual content of the law. Deep-seated differences remain in how States view the issue of the legal requirement for human control. A recent statement by General Counsel Ney, which reiterates the U.S. position rejecting efforts to ban LAWS or establish human control as a binding legal principle, illustrates this point.

We discussed our written DoD policy directive on autonomy in weapon systems, which “[e]stablishes guidelines designed to minimize the probability of consequences of failures in autonomous and semi-autonomous weapons systems that could lead to unintended engagements.” The United States has sought, in a series of working papers, to articulate how we believe that existing law of war requirements apply to the use of autonomy in weapon systems. We have also shared our approach of using law of war principles, when no more specific rule applies, to guide our decision making on emerging technologies.

53. UK Mission Geneva, Statement at Meeting of Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, Mar. 25–29, 2019, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/85A4AA89AFCFD316C12583D3003EAB3E/\\$file/20190318-5\(d\)_HMI_Statement.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/85A4AA89AFCFD316C12583D3003EAB3E/$file/20190318-5(d)_HMI_Statement.pdf).

I would contrast the U.S. approach with that of other GGE delegations. Some delegations and many NGOs approach this issue from the perspective of seeking to promulgate a new rule. Some are advocating a ban on lethal autonomous weapons systems (LAWS). Some are advocating a new principle of “human control” over weapon systems.

These efforts seem to us to be based on incorrect factual and legal premises. Many delegations are assuming that autonomy means less control or that the development of an autonomous function in a weapon system entails a delegation of decision-making to a machine.

As we have explained in working papers and interventions, we believe these assumptions are inaccurate. As a factual matter, the use of autonomy in weapon systems has improved the degree of control that human beings exercise over the use of force.⁵⁴

In attacking the underlying “incorrect” assumptions upon which many States are making their decisions, the United States argues that uses of artificial intelligence and autonomy will make weapon systems capable of greater speed, accuracy, and precision. This increased capability, the United States argues, will result in greater protections for the civilian population.

The advantage of Artificial Intelligence and other autonomy-related emerging technologies is the use of software or machine control of the system rather than manual control by a human being. These technologies can produce greater accuracy, precision, and speed in weapon systems. These technologies can produce entirely new capabilities that are otherwise impossible. For example, the Counter-Rocket Artillery and Mortar System can fire precisely at incoming projectiles and disable them; a human gunner couldn’t do that manually.

Moreover, whether a decision is “delegated” in some sense to a machine has more to do with how the weapon is used than whether the weapon system itself has an autonomous function. A weapon with a function for selecting and engaging targets can be used without delegating any decision-making to the machine, in the sense of substituting the human’s decision with the machine’s decision. Instead, the addition of autonomous or “smart” capabilities can allow weapons to “lock on” to targets like enemy

54. Ney, Keynote Address, *supra* note 27.

tanks, warships, or aircraft, to better effectuate the intent of the commanders and operators, and reduce the risk of harm to civilians.⁵⁵

Finally, and perhaps most importantly, Ney stressed that what matters most is LOAC compliance and that the misplaced emphasis on human control may actually undercut this objective.

In the U.S. perspective, there is nothing intrinsically valuable about manually operating a weapon system as opposed to operating it with an autonomous function. For example, existing law of war treaties do not seek to enhance “human control” as such. Rather, these treaties seek, among other things, to ensure the use of weapons consistent with the fundamental principles of distinction and proportionality, and with the obligation to take feasible precautions for the protection of the civilian population. Although “human control” can be a useful means in implementing these principles, “human control” as such is not, and should not be, an end in itself. In our view, we should not be developing novel principles that stigmatize the use of emerging technologies, when these technologies could significantly enhance how the existing principles of the law of war are implemented in military operations.⁵⁶

The recounting of State views leaves little sense of what human accountability means, how it would be determined, and to what extent it is legally required as a measure of accountability. While almost everyone agrees that some form of human control is preferred, and some believe it is required, such variance in State views leaves little clarity as to what human accountability looks like and makes it clear that States do not agree that such a legal requirement currently exists. Therefore, statements declaring, “[A] weapon system beyond human control would be unlawful by its very nature,”⁵⁷ add little substance to the discussion until States can either come to agreement or develop law through practice.

Perhaps, at some future point, States will reach a consensus on how to define and ensure accountability in autonomous systems. However, it is certainly premature to pre-decide that issue by stating the potential difficulty in establishing human accountability precludes the researching, developing, and employing of autonomous weapon systems.

55. *Id.*

56. *Id.*

57. ICRC, *Towards Limits on Autonomy in Weapons Systems*, *supra* note 8.

D. Predictability

Predictability has also been raised as a concern with respect to autonomous weapons and weapon systems that will utilize artificial intelligence. For example, the ICRC has argued, “AI and machine-learning software – specifically of the type developed for ‘automatic target recognition’ – could form the basis of future autonomous weapon systems, bringing a new dimension of unpredictability to these weapons, as well as concerns about lack of explainability and bias”⁵⁸ It urged States to focus on “[w]hat level of predictability – in terms of its functioning and the consequences of its use – and reliability – in terms of the likelihood of failure or malfunction – is required” with respect to autonomy in weapon systems.⁵⁹ Some scholars have also raised a potential lack of predictability as a legal concern.⁶⁰

States have commented less on this concern than on the issues of human control and accountability. Nonetheless, some States have addressed this issue, albeit indirectly. For example, Brazil expressed concerns about how discriminatory bias might affect targeting decisions in autonomous systems:

A combatant can be incapacitated or surrender at a moment’s notice; the assessment of proportionality between the intended military goal and risks posed to civilians in an operation cannot be ascribed to computational calculations; the risk of unacceptable discriminatory bias embedded in datasets used to inform machine decision-making is all too real to be discarded or considered a minor glitch to be corrected by trial and error.⁶¹

Greece has also addressed the issue, but pointed to weapons reviews as the means to resolve this potential problem:

In this context, the main concerns arising from the potential development and use of LAWS revolves around their predictability and reliability during the operational stage. Therefore, it is of utmost importance to ensure that any new

58. ICRC, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN ARMED CONFLICT, *supra* note 25, at 3 (emphasis omitted).

59. *Id.* (emphasis omitted).

60. *See, e.g.*, Suresh Venkatasubramanian, *Structural Disconnects between Algorithmic Decision-making and the Law*, HUMANITARIAN LAW & POLICY (Apr. 25, 2019), <https://blogs.icrc.org/law-and-policy/2019/04/25/structural-disconnects-algorithmic-decision-making-law/>; *see also* Goussac, *supra* note 8.

61. Statement by Brazil, *supra* note 26.

weapon with high degree of autonomy on its critical functions will be tested during its development stage in all foreseeable scenarios of its use.⁶²

As the Greek delegation noted, the issue of predictability seems to be one of reliability as to whether the weapon systems will apply the LOAC correctly in all situations. Predictability and reliability are particular concerns for weapons that “learn” and then “select” and “target” based on that assimilated data without further input from humans. However, the delegation noted that such concerns would be resolved within the normal legal review process discussed below. In other words, a thorough and complete weapons review will address the issue of predictability.

E. Weapons Reviews

The review of “any new weapon” is a process by which States review weapons to ensure their intended use complies with the LOAC. Weapons that have undergone such a review are presumed legal and can be employed by the State’s armed forces.

State Parties to AP I have a legal obligation to conduct a legal review on new weapons and other means and methods of warfare.⁶³ The United States also conducts weapons reviews, albeit as a matter of policy since it is not a party to AP I.⁶⁴ Despite these legal obligations and policy constraints, the ICRC acknowledges that “only a limited number of States are known to have put in place mechanisms or procedures to conduct legal reviews of weapons”⁶⁵ This lack of practice and uniformity has led some commentators to conclude that a uniform standard may not be possible with respect to reviews of weapons incorporating machine learning and artificial intelligence.⁶⁶

62. Statement by Greece, *supra* note 34, at 2.

63. AP I, *supra* note 6, art. 36.

64. U.S. Department of Defense, Directive 5000.01, The Defense Acquisition System (2003) (Incorporating Change 2, Aug. 31, 2018), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/500001p.pdf> [hereinafter DoD Directive 5000.01]; DOD LAW OF WAR MANUAL, *supra* note 27, § 6.2.

65. INTERNATIONAL COMMITTEE OF THE RED CROSS, A GUIDE TO THE LEGAL REVIEW OF NEW WEAPONS, MEANS AND METHODS OF WARFARE 5 (2006), https://www.icrc.org/en/doc/assets/files/other/icrc_002_0902.pdf.

66. Dustin A. Lewis, *Legal Reviews of Weapons, Means and Methods of Warfare Involving Artificial Intelligence: 16 Elements to Consider*, HUMANITARIAN LAW & POLICY (Mar. 21, 2019), <https://blogs.icrc.org/law-and-policy/2019/03/21/legal-reviews-weapons-means-methods-warfare-artificial-intelligence-16-elements-consider/>. “Such differential approaches as to what constitutes lawful and unlawful conduct prevent normative uniformity and legal

Despite the lack of universality of the weapons review, at least some of the States with the current technological capability to develop and employ autonomous weapons (such as the United States and the United Kingdom) are among the States with a robust and well-respected weapons review process. To encourage and assist States, the ICRC has issued a very helpful guide on the conduct of weapons reviews,⁶⁷ which would certainly apply to weapons employing machine learning or artificial intelligence. In that publication, the ICRC recommends that States follow the basic elements of a weapons review under Article 36 of AP I.

The first step is to determine whether employment of the particular weapon or means of warfare under review is prohibited or restricted by a treaty which binds the reviewing State or by customary international law. If there is no such specific prohibition, the next step is to determine whether employment of the weapon or means of warfare under review and the normal or expected methods by which it is to be used would comply with the general rules applicable to all weapons, means and methods of warfare found in Additional Protocol I and other treaties that bind the reviewing State or in customary international law. In the absence of relevant treaty or customary rules, the reviewing authority should consider the proposed weapon in light of the principles of humanity and the dictates of public conscience.⁶⁸

Netta Goussac, an ICRC legal advisor, has written specifically concerning legal reviews on new autonomous weapons, arguing,

Because software is more readily modified than physical systems, the legal review requirement may arise more frequently in weapon systems relying on AI. Systems that learn from their environment and thereby change their functioning after activation would present a particular concern. In effect, a legal review conducted before the weapon is introduced would become invalid upon its deployment.⁶⁹

Others have also voiced their views on the application of weapons reviews to weapons that employ machine learning and artificial intelligence. Xi

universality and thereby preclude the establishment of a comprehensive set of agreed primary legal norms against which all weapons, means or methods of warfare must be reviewed.”

67. INTERNATIONAL COMMITTEE OF THE RED CROSS, *supra* note 65.

68. *Id.* at 11.

69. Goussac, *supra* note 8.

and Lie state, “In all circumstances, they must be employed in accordance with the principles and rules of IHL,”⁷⁰ including the weapons review process of Article 36.

States have also expressed views on the applicability of weapons reviews to autonomous weapon systems and systems that use machine learning or artificial intelligence. For example, in conjunction with the CCW process, Brazil states, “[it] acknowledges the importance of weapons reviews in order to support compliance with IHL in the use of novel weapons systems, both under Article 36 of Protocol II to the Geneva Conventions and as a corollary of customary international law.”⁷¹ Greece,⁷² the Netherlands,⁷³ the United Kingdom,⁷⁴ and the European Union have made similar statements.⁷⁵

The United States has also expressed a view on the requirement to conduct a weapons review on weapons that use machine learning and artificial intelligence. In general, the DoD *Law of War Manual* recognizes U.S. practice to conduct weapons reviews, outlines the content of those reviews, and focuses on three questions to determine the lawfulness of a weapon: (1) “whether the weapon’s intended use is calculated to cause superfluous injury”; (2) “whether the weapon is inherently indiscriminate”; and (3) “whether the weapon falls within a class of weapons that has been specifically prohibited.”⁷⁶ Moreover, even if the weapon is not prohibited, the weapons review should consider whether there are any additional legal restrictions pertaining to this type of weapon or the weapon’s intended use.⁷⁷ If any additional restrictions exist, the intended concept of employment should be reviewed to ensure consistency with these restrictions.⁷⁸

More specifically, the DoD Directive addressing autonomy in weapons systems provides “rigorous verification and validation and realistic system development and operations test and evaluation” to ensure the weapons “function as anticipated in realistic operational environments,” complete engagement as planned or terminate the engagement, and are resistant to unauthorized external control.⁷⁹ The directive goes on to mandate that a legal

70. Li & Xie, *supra* note 33.

71. Statement by Brazil, *supra* note 26.

72. Statement by Greece, *supra* note 34, at 2.

73. Statement of the Netherlands, *supra* note 15.

74. UK Statement, *supra* note 20.

75. EU Statement, *supra* note 26.

76. DOD LAW OF WAR MANUAL, *supra* note 27, § 6.2.2.

77. *Id.*

78. *Id.*

79. DoD Directive 3000.09, *supra* note 45, ¶ 4(a).

review be conducted of autonomous weapon systems used to apply lethal or non-lethal, kinetic, or non-kinetic force to ensure compliance with domestic law, treaties, customary international law, and the LOAC.⁸⁰

The applicability of a weapons review to emerging technologies such as weapons that employ machine learning or artificial intelligence seems to be accepted by a growing number of countries and the existence of a treaty-based obligation for Parties to AP I is uncontested. What that review would encompass is a matter of more detailed discussion, as illustrated by the obvious differences between what the ICRC suggests and the U.S. policy.

However, a thorough and well-designed weapons review will force States to ensure that any development or employment of weapons that use autonomous systems to select and engage targets comply with all aspects of the LOAC. Recognizing the unique aspects of weapons that use machine learning or artificial intelligence, States would have to design their review to account for the concerns raised about these weapon systems. As with all new technologies, the purpose of the weapons review is to apply the principles of the LOAC to the intended use of the weapon and to ensure that it fully complies with legal principles such as distinction and proportionality. For the review to be legally sufficient, it would have to ensure that the weapon system performs in accordance with the LOAC in all situations in which it is intended to be employed. Having acknowledged this point does not mean, however, that a new version of a weapons review is needed. Rather, the standard of a weapons review remains constant, but the rigor of the testing, evaluation, and analysis might have to increase to ensure the weapon system meets the generally accepted requirements of a weapons review.

Such a review will satisfy the concerns of not only predictability, but will also ensure that whatever the means of human control—or lack thereof—it does not prevent the autonomous system from applying force in compliance with the LOAC. Indeed, the current concerns and claims of inferred illegality should dissolve in the face of a thorough and rigorous weapons review.

Despite the urging of nongovernmental organizations and some scholars, there is a clear lack of consensus among States concerning the legal requirement for human decision making in selecting and engaging targets. This lack of consensus continues despite arguments based on a potential lack of

80. *Id.* ¶ 4(c). It does so by directing that such systems must undergo the weapons review process required by DoD Directive 5000.01. *See* DoD Directive 5000.01, *supra* note 61, at 7 (noting that ¶ E1.1.15 of Enclosure 1 details legal compliance requirements for the DoD acquisition and procurement process).

accountability and possible difficulties with predictability in the use of weapons employing machine learning or artificial intelligence.

Until the achievement of a consensus, there is no legal basis for banning or even limiting the development or employment of autonomous weapons systems. Hence, States are free to continue to research and develop such systems, with the commitment to review each system at appropriate stages in the development and employment process to ensure that the weapon can fully comply with all LOAC requirements.

IV. STATES SHOULD CONTINUE TO RESEARCH AND DEVELOP EMERGING TECHNOLOGIES

Given the lack of consensus on the legal regulations for the use of machine learning and artificial intelligence in weapon systems, there is currently no basis for arguing that the law prevents the research, development, and employment of these systems. Further, the attempts to declare them illegal are counterproductive. Declaring these weapons illegal now would prevent States from researching and developing technologies that may lead to greater LOAC compliance. Such restriction would certainly not result in long-term benefits to participants in and victims of armed conflict.

Some States have recognized the counterproductive nature of this approach. For example, Germany's general statement to the 2017 meeting of the Group of Governmental Experts emphasized the prematurity of the limitation on emerging technologies. As Michael Biontino argued, "Discussing the possibility of an all-encompassing regulation or even a ban as proposed by some [S]tates and civil society organisations is in our view premature at this point. These legal questions should be reconsidered at a later stage, as the technology of LAWS evolves."⁸¹

As the international community continues to seek consensus on the way forward, and as technology continues to evolve, several issues deserve increased attention. These issues include determining whether the LOAC requires the "best application possible" or the "best application humanly possible," the basis upon which to compare human and autonomous "decisions," and, assuming machine learning or artificial intelligence can increase compliance with the LOAC, whether there is a legal obligation to employ these capabilities.

81. General Statement (Germany), *supra* note 36, at 2, ¶ 6 (emphasis omitted).

A. “Best Application Possible” or “Best Application Humanly Possible”

As previously mentioned, the ICRC has asserted that the LOAC requires human involvement in the selection and engagement of targets. Goussac argues, “Human control in the use of weapon systems is inherently required by the rules of IHL, notably the rules of distinction, proportionality and precautions in attack.”⁸² Tim McFarland offered a countering view, stating:

[E]xercising meaningful human control means employing whatever measures are necessary, whether human or technical, to ensure that an operation involving an AWS is completed in accordance with a commander’s intent and with all applicable legal, ethical and other constraints. That means ensuring that autonomous systems are employed only to the extent that they can be shown to operate in a way which allows all those constraints to be met, and may or may not require that a human remain in or on the loop.⁸³

State acceptance of the ICRC view that only humans can exercise the critical elements of the LOAC has far-reaching consequences. For example, unlike the position urged by the German delegation calling for patience in regulation, if it is accepted as a matter of law that the legal standard in the LOAC is the “best application humanly possible,” then any emerging technology would have to remain subject to human control, including the recognition that these decisions will continue to be subject to human oversight and potential human error. This approach would also affect the research and development of autonomous weapons systems. There would be no reason to conduct research into and develop the capabilities of weapon systems that utilize machine learning or artificial intelligence as an alternative to human decision making because those weapons could never be deployed. The impacts on the development of artificial intelligence and machine learning would be profound. For example, this approach would likely limit any potential benefits, including possible increased compliance, which might accrue from these emerging technologies. As long as the possibility remains that as technology progresses, autonomous systems or systems utilizing machine

82. Goussac, *supra* note 8 (“Exactly the type and degree of human control over an autonomous weapon system required for legal compatibility (and ethical acceptability) is something on which the ICRC has been urging States to reach common understanding.”).

83. McFarland, *supra* note 33.

learning and artificial intelligence may outperform humans, it is counterproductive to remove that option from our future.

If, on the other hand, the LOAC requires the “best application possible” of the law,⁸⁴ meaning the most legally compliant application of the LOAC, the emphasis will be directed more at the result of the decision as opposed to who makes the decision. In this way, rather than a focus on accountability and ensuring the possibility of prosecution when mistakes occur, the focus will be on limiting mistakes.

Under a “best application possible” approach, if the international community has any belief that autonomous weapons—or artificial intelligence or weapons using machine learning—can factually apply force in a way that in at least some circumstances would result in better protections for humans, then research, development, and experimentation should continue. Instead of limiting progress, the international community should be encouraging the development of autonomous weapons that apply machine learning or artificial intelligence on the battlefield in the anticipation (or even hope) that they might be able to apply the legal requirements of IHL in a way that results in greater protections for individuals affected by armed conflict.

B. The Comparative Standard of Review

One of the most difficult issues in the “best application humanly possible” or “best application possible” debate is deciding how to quantify the analysis the debate engenders. What does “best” mean? How does the international community assess how well and how poorly humans make decisions? What is the comparative basis for deciding if weapons using artificial intelligence or machine learning can achieve a “better” application of the LOAC?

There does not appear to be any national or international methodology for accurately assessing overall performance in applying the LOAC. One measure might be the number of national and international investigations or prosecutions for violations. Another measure might be the number of allegations raised, including those raised by non-State sources. While recent work done in this area seems to indicate that there are more civilian deaths

84. Eric Talbot Jensen, *The Human Nature of International Humanitarian Law*, HUMANITARIAN LAW & POLICY (Aug. 23, 2018), <https://blogs.icrc.org/law-and-policy/2018/08/23/human-nature-international-humanitarian-law/>.

resulting from armed conflict than States initially claim,⁸⁵ it is unclear that raw data such as deaths would be dispositive in determining LOAC compliance. Such raw data—particularly without context—would not account for the increases and decreases in hostility in any given military operation over time or the environment of the hostilities such as urban or rural. In times of greater fighting intensity, particularly in urban environments, civilian casualties are likely to increase regardless of compliance with the LOAC.

Identifying how to formulate and apply this comparative standard of review has significant outcomes. If the standard is that machine learning or artificial intelligence systems must achieve a perfect or near-perfect application of the LOAC, then certain types of autonomous capabilities need not be researched and developed. However, if the standard is that the weapon system selecting and engaging targets must be able to apply the law in a way that produces even one less civilian casualty than systems based on human decision making, a number of possible autonomous weapons that utilize machine learning and artificial intelligence without real-time human involvement may now be capable of development and deployment.

C. *A Legal Requirement for Machine Learning and Artificial Intelligence*

One final consideration is a natural outgrowth of the prior discussion. If weapon systems utilizing machine learning and artificial intelligence prove to be more capable of LOAC compliance or have the potential to become so, and the legal requirement is “best application possible,” States may have a legal obligation to develop and employ such systems. As Jenks and Liivoja concluded, “Arguably, there would be a point where the constant care obligation to spare the civilian population, civilians and civilian objects would require States that have such vehicles to use them.”⁸⁶

While such an assertion is even more premature than the assertion that machine learning and artificial intelligence will never be capable of correctly applying the LOAC, the legal issue raised is worthy of discussion. The general march of technology has made weapons much more destructive, and will undoubtedly continue to do so. However, improved technology has also exponentially increased the possibilities of compliance through more exacting distinction and proportionality assessments. Here, one obvious example

85. See, e.g., Larry Lewis & Ryan Goodman, *Civilian Casualties: We Need Better Estimates—Not Just Better Numbers*, JUST SECURITY (Mar. 22, 2018), <https://www.justsecurity.org/54181/civilian-casualties-estimates-not-numbers/>.

86. Jenks & Liivoja, *supra* note 17.

is the use of precision-guided munitions rather than iron bombs, better known as “dumb bombs.” As improved technology has made better LOAC compliance possible, the pressure to apply that technology has increased.

Ultimately, if emerging technologies can provide ways to achieve increased compliance with the LOAC, States should at least be encouraged to pursue them and, potentially, depending on issues such as feasibility, be required to employ them. Regardless of which of these two approaches is taken, the international community should certainly not prevent or prohibit emerging technologies that may eventually achieve this benefit.

V. CONCLUSION

It is clear that States have not yet come to a consensus on the issue of the legal role of human decision making in LOAC compliance. Given that lack of consensus, one can only conclude that the law does not currently require a human decision for selecting and engaging targets to be lawful. Though the international community may come to such a decision, it has not yet done so. The current legal standard for weapon systems, therefore, including those currently employing machine learning and those that will employ machine learning and artificial intelligence in the future, is whether or not that system can apply the traditional principles of the LOAC, including minimizing civilian deaths and injury and damage to civilian objects.

Further, because the future capabilities of machine learning and artificial intelligence are still an open question, those technologies should be researched and developed with the potential of being fully implemented by States. Emerging technologies offer the promise of not only greater compliance with existing norms and processes, but also increased opportunities to provide protections in new and creative ways in the future.

Lastly, as the international community recognizes the benefits offered by emerging technologies, incentives to research and develop such technologies should be encouraged. Ultimately, the legal standard for weapon systems using machine learning and artificial intelligence should be the “best application possible” rather than the “best application humanly possible.” International focus on the decisions of warfare, rather than the decisionmakers, will benefit all concerned and result in greater protections for the participants in and the victims of armed conflict.