

MAINTAINING COMMAND AND CONTROL (C2) OF LETHAL AUTONOMOUS WEAPON SYSTEMS: LEGAL AND POLICY CONSIDERATIONS

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I. INTRODUCTION

There exists a tremendous volume of scholarship and debate addressing the law of armed conflict¹ and autonomous weapon systems. Most of the arguments focus on their inherent legality and the adequacy of existing law to regulate these systems.

The United States has long maintained that autonomous weapon systems are *not* prohibited *per se* by the law of armed conflict. The U.S. considers that such advances in technology can enhance compliance with the law and reduce harm to the civilian population during armed conflict. Weapon systems with advanced levels of autonomy could reduce misidentification of military targets, better detect potential collateral damage, and prove more distinct in target engagement. Additionally, and of particular interest to this Article, the U.S. government and other governments around the world have implemented policies and procedures that regulate the acquisition, development, testing, and employment of autonomous weapon systems to ensure their compliance with the law of armed conflict.

This Article is designed to provide a practical approach to the legal debate surrounding lethal autonomous weapon systems and their employment in armed conflict. It suggests that existing U.S. regulations, policies, and processes established for the procurement, development, legal and policy review, and ultimately, use of these weapon systems, ensure compliance with the law of armed conflict. This Article concludes that the existing law of armed conflict, coupled with responsible state policy and practice, provide sufficient command and control, also known as C2, to ensure the legal and responsible use of lethal autonomous weapon systems in armed conflict.²

II. WHAT IS AUTONOMY?

The confluence of autonomy, artificial intelligence, and international law is wrought with confusion, making communication about trends involving autonomy in weapons, and their impact on international law, particularly challenging.³ This is true even if we disassociate the technology

1. The law of armed conflict is also known as international humanitarian law or the law of war.

2. CHAIRMAN, JOINT CHIEFS OF STAFF, DEPARTMENT OF DEFENSE DICTIONARY OF MILITARY AND ASSOCIATED TERMS, 40 (2020) [hereinafter DOD DICTIONARY] (“[C]ommand and control—The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Also called C2.”).

3. Paul Scharre & Michael C. Horowitz, *An Introduction to Autonomy in Weapon Systems* 4 (Feb. 2015) (Working Paper) (Ctr. for a New American Security), <https://www.jstor.org/stable/resrep06106>.

from a weapon system or the law. “Even setting aside the notion of weapons for a moment, the term ‘autonomous robot’ conjures up wildly different images, ranging from a household Roomba to the sci-fi Terminator.”⁴ While the United States Department of Defense (DoD) is not necessarily concerned with house cleaning, nor is there an army of Terminator-like machines standing at the ready for combat deployment, the DoD has a keen interest in advanced technologies and their current and future impacts on combat operations. U.S. government entities such as the Joint Artificial Intelligence Center⁵ (JAIC) and the Defense Innovation Board⁶ (DIB) were established to ensure the United States remains a leader in technology and weapon systems. The missions of these organizations include harnessing the potential game-changing power of artificial intelligence (AI)⁷, and to provide independent advice and recommendations on innovative means to address future challenges through the prism of three focus areas: people and culture, technology and capabilities, and practices and operations.⁸ Specifically focusing on autonomy, the Autonomy Community of Interest (COI)⁹, supported by the Office of Technical Intelligence, noted in a 2015 assessment:

U.S. and foreign technology and capability development is pushing existing human-machine systems to the edge of their abilities by introducing extreme timescales, high levels of complexity, severe risk to warfighters, and increasing costs. While these trends and the challenges they pose to the U.S. Department of Defense (DoD) do not appear likely to abate, autonomy has the potential to enable U.S. forces to break out of current limitations by allowing systems to understand the environment, to make decisions, and to act more effectively and with greater independence from humans. In doing so, autonomy can augment or replace humans to enhance performance, to reduce risk to warfighters, and to decrease costs.¹⁰

The COI provides an optimistic, yet possibly very real view of the potential of autonomy in combat operations. But to understand the COI’s vision, one must understand the spectrum of autonomy.

4. *Id.*

5. See Joint Artificial Intelligence Center, <https://dodcio.defense.gov/About-DoD-CIO/Organization/JAIC/> (last visited Nov. 1, 2020) [hereinafter JAIC].

6. See Defense Innovation Board, <https://innovation.defense.gov/About1/> (last visited Nov. 1, 2020) [hereinafter DIB].

7. JAIC, *supra* note 5.

8. DIB, *supra* note 6.

9. See Defense Innovation Marketplace, <https://defenseinnovationmarketplace.dtic.mil/communities-of-interest/autonomy/> (last visited Nov. 1, 2020).

10. U.S. DEP’T OF DEF., TECHNICAL ASSESSMENT: AUTONOMY, iii (2015), https://defenseinnovationmarketplace.dtic.mil/wp-content/uploads/2018/02/OTI_TechnicalAssessment-AutonomyPublicRelease_vF.pdf.

Autonomy is the ability of a machine to perform a task without human input.¹¹ It is distinct from automation, which is simply using a machine to perform a particular process, while autonomy describes a system capable of operating independently for some period without direct human intervention.¹² Determining a system's degree, or amount, of autonomy is important for understanding the challenges and opportunities that come with autonomous systems.¹³

In October of 2016, the Joint Chiefs of Staff, Joint Concept for Robotic and Autonomous Systems (JCRAS), defined autonomy as:

[t]he level of independence that humans grant a system to execute a given task. It is the condition or quality of being self-governing to achieve an assigned task based on the system's own situational awareness (integrated sensing, perceiving, analyzing), planning, and decision-making. Autonomy refers to a spectrum of automation in which independent decision-making can be tailored for a specific mission, level of risk, and degree of human-machine teaming.¹⁴

There are three basic dimensions of autonomy: the type of task the machine is performing; the relationship of the human to the machine while performing that task; and the sophistication of the machine's decision-making when performing the task. These dimensions are independent, and a machine can be "more autonomous" by increasing the amount of autonomy along any of these spectrums.¹⁵ There are degrees of autonomy within these tasks, or dimensions, that dictate the human-machine relationship.

The first degree is semi-autonomous operation in which the machine performs a task and then waits for the human user to take an action before continuing. The system can sense the environment and develop a course of action, but the system cannot continue without human approval. This degree of autonomy is also known as "human *in* the loop."¹⁶ An automobile collision warning system¹⁷ is an example of a semi-autonomous system. In supervised autonomous operation, or "human *on* the loop," the machine can sense,

11. Scharre & Horowitz *supra* note 3, at 5.

12. Linell A. Letendre, *Lethal Autonomous Weapon Systems: Translating Geek Speak for Lawyers*, 96 INT'L L. STUD. 274, 278 (2020).

13. Scharre & Horowitz, *supra* note 3, at 5.

14. ANDREW FEICKERT ET AL., CONG. RESEARCH SERV., R45392, U.S. GROUND FORCES ROBOTICS AND AUTONOMOUS SYSTEMS (RAS) AND ARTIFICIAL INTELLIGENCE (AI): CONSIDERATIONS FOR CONGRESS 2 (2018).

15. PAUL SCHARRE, ARMY OF NONE: AUTONOMOUS WEAPONS AND THE FUTURE OF WAR 27-8 (2018).

16. *Id.* at 28-9 (*emphasis added*).

17. Schlomo Zilberstein, *Building Strong Semi-Autonomous Systems*, in PROC. OF THE TWENTY-NINTH AAAI CONF. ON A.I., at 4088 (2015).

decide, and act on its own once put into operation, but a human user can observe the machine's behavior and intervene to stop the action if necessary.¹⁸ Supervised autonomous robotic surgery¹⁹ is an example of a supervised-autonomous system. In the last degree, fully autonomous operation, the system can sense, decide, and act without human intervention. The human is “out of the loop” in that the machine operates without communicating back to the human user.²⁰ A Roomba vacuum²¹ is an example of a fully autonomous system.

While the idea of fully autonomous machines has inspired excitement and intrigue for decades, a system's increase in complexity and autonomy is often coupled with the user's inability to fully understand the system's processes. “‘Autonomous’ is often used to refer to systems sophisticated enough that their internal cognitive processes are less intelligible to the user, who understands the task the system is supposed to perform, but not necessarily *how* the system will perform the task.”²² This concept is similar to “commander's intent” in the military environment.²³

For example, a Marine commander communicates the mission and the goals of that mission to her platoon, but, like the autonomous system, the Marines in the platoon have flexibility in *how* they execute that mission. Of course, both the platoon and the system operate within pre-defined parameters. In addition to the mission order and intent of the commander, the Marines must comply with the law of armed conflict, applicable rules of engagement, and other orders and standing operating procedures organic to an operational unit. Likewise, an autonomous system's program in a self-driving car, for example, may include geographic restrictions, safety mechanisms to trigger positive human control, and cyber hacking protections.²⁴ While the self-driving car and the Marine platoon have flexibility in the execution of their respective missions, both are guided by “rules” or “intent” to better accomplish that mission. As should be apparent,

18. SCHARRE, *supra* note 15, at 29 (2018) (*emphasis added*).

19. See Azad Shademan et al., *Supervised Autonomous Robotic Soft Tissue Surgery*, 8 SCIENCE TRANSLATION MEDICINE 337 (2016).

20. SCHARRE, *supra* note 15, at 30 (2018) (*emphasis added*).

21. Zilberstein, *supra* note 17, at 4088, 4090 (2015) (noting that a Roomba vacuum could revert to semi-autonomous mode if it becomes trapped and requires human intervention).

22. SCHARRE, *supra* note 15, at 31 (2018) (*emphasis added*).

23. DOD DICTIONARY, *supra* note 2, at 41 (“[C]ommander's intent is defined as a clear and concise expression of the purpose of the operation. The desired military end state that supports mission command provides focus to the staff, and helps subordinate and support commander's act to achieve the commander's desired results without further orders, even when the operation does not unfold as planned”).

24. BILL CANNIS, CONG. RESEARCH SERV., R45985, ISSUES IN AUTONOMOUS VEHICLE TESTING AND DEPLOYMENT, at 11, 17, 22 (2020).

both autonomous systems and military units are subject to established levels of C2. The same holds true for *autonomous weapon systems*.

III. AUTONOMY IN WEAPON SYSTEMS

Definitions abound for autonomous weapon systems among the international legal and policy communities,²⁵ but States have struggled to agree on a common definition.²⁶ While it is not necessary, or even prudent, to develop a universal definition, it is important to identify characteristics common to the systems in question in order to understand how these characteristics impact compliance with the law of armed conflict.

The United States re-issued Department of Defense Directive 3000.09 in 2017 to further develop Department policy for the development and use of autonomous and semi-autonomous weapon systems.²⁷ The Directive also provides guidelines to minimize the probability and consequences of failures in autonomous and semi-autonomous weapon systems that could lead to unintended engagements.²⁸ The policy defines an “autonomous weapon system” as:

[a] weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation.²⁹

The Directive defines “human supervised autonomous weapon system” as a system that is designed to provide human operators with the ability to intervene and terminate engagements, including in the event of a weapon system failure, before unacceptable levels of damage occur.³⁰ As discussed above, this is also known as “human *on* the loop.”³¹

Turning to “human *in* the loop,” the Directive provides more detail in its definition of a “semi-autonomous weapon system” and defines it as:

[a] weapon system that, once activated, is intended to only engage individual targets or specific target groups that have been selected by a

25. Christopher M. Ford, *Autonomous Weapons and International Law*, 69 S. CAR. L. REV. 413, 418 (2016).

26. KELLEY M. SAYLER, CONG. RESEARCH SERV., IF11150, DEFENSE PRIMER: U.S. POLICY ON LETHAL AUTONOMOUS WEAPON SYSTEM (2019).

27. U.S. DEP'T OF DEFENSE, DIR. 3000.09, AUTONOMY IN WEAPON SYSTEMS, ¶ 1 (MAY 8, 2017) [hereinafter DODD 3000.09].

28. *Id.* at 13-14.

29. *Id.*

30. *Id.* at 14.

31. SCHARRE, *supra* note 15, at 29 (*emphasis added*).

human operator. This includes: Semi-autonomous weapon systems that employ autonomy for engagement-related functions including, but not limited to, acquiring, tracking, and identifying potential targets; cueing potential targets to human operators; prioritizing selected targets; timing of when to fire; or providing terminal guidance to home in on selected targets, provided that human control is retained over the decision to select individual targets and specific target groups for engagement.³²

Other states, including the United Kingdom and China, also define autonomous systems. However, the DoD Directive is considered the best and most commonly cited definition for autonomous weapon systems.³³ The U.K. Ministry of Defense includes such a definition in its 2018 Joint Doctrine Publication 0-30.2, Unmanned Aircraft Systems, and defines an autonomous weapon system as:

[a]n autonomous system [that] is capable of understanding higher-level intent and direction. From this understanding and its perception of its environment, such a system is able to take appropriate action to bring about a desired state. It is capable of deciding a course of action, from a number of alternatives, without depending on human oversight and control, although these may still be present.³⁴

Unlike the United Kingdom's more conservative approach to the definition, China took an aggressive stance at the 2018 Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapon Systems (GGE) meetings.³⁵ China did not propose a definition, but submitted a Position Paper to the GGE, noting their views on the characteristics of lethal autonomous weapon systems (LAWS), as follows:

LAWS should be understood as fully autonomous lethal weapon systems. ... In our view, LAWS should include but not be limited to the following 5 basic characteristics. The first is lethality, which means sufficient pay load (charge) and for means to be lethal. The second is autonomy, which means absence of human intervention and control during the entire process of executing a task. Thirdly, impossibility for termination, meaning that once started there is no way to terminate the device. Fourthly, indiscriminate effect, meaning that the device will execute the task of killing and maiming regardless of conditions, scenarios and targets. Fifthly evolution, meaning

32. DODD 3000.09, *supra* note 27, at 14.

33. Rebecca Crootof, *The Killer Robots Are Here: Legal and Policy Implications*, 36 CAR. L. REV. 1839, 1847 (2015).

34. UNITED KINGDOM MINISTRY OF DEFENCE, JOINT DOCTRINE PUBLICATION 0-30.2: UNMANNED AIRCRAFT SYSTEMS at 13 (2018).

35. *See* Rep. of the 2018 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, U.N. Doc. CCW/GGE.1/2018/3 (Oct. 23, 2018) [hereinafter CCW/GGE.1/2018/3].

that through interaction with the environment the device can learn autonomously, expand its functions and capabilities in a way exceeding human expectations.³⁶

Chinese use of these decidedly narrow factors—no human intervention and control during the *entire* process, impossibility of mission termination, and indiscriminate targeting—signals Beijing’s desire to exclude only those weapon systems with advanced levels of autonomy that would seemingly violate the law of armed conflict. According to these Chinese characteristics, a system that involves even limited human involvement, with the capability for distinction between legitimate and illegitimate targets, and includes on-board fail safes, would not be considered a lethal autonomous weapon system.³⁷ When considering the Chinese definition against the backdrop of their 2018 support³⁸ to the Campaign To Stop Killer Robots,³⁹ it seems that both are merely symbols, while the Chinese are implicitly legitimizing the development of semi-autonomous or fully autonomous weapon systems.⁴⁰ China also expresses fears of an arms race, while simultaneously investing heavily in the development of autonomous weapons.⁴¹ The Chinese definition would only impact weapon systems that, by their nature,⁴² would presumably violate the law of armed conflict, and their pledge to the Campaign to Stop Killer Robots is limited to the unlikely use of those weapons. China clearly sets the bar far too low for autonomy in weapon systems, ignoring important technical and legal distinctions among different levels of human involvement.⁴³ This series of ostensibly inconsistent

36. China, *Position Paper*, ¶3 U.N. Doc. CCW/GGE.1/2018/WP.7 (Apr. 11, 2018).

37. Elsa Kania, *China’s Strategic Ambiguity and Shifting Approach to Lethal Autonomous Weapon Systems*, LAWFARE (Apr. 17, 2018, 3:17 PM), <https://www.lawfareblog.com/chinas-strategic-ambiguity-and-shifting-approach-lethal-autonomous-weapons-systems>.

38. *Convergence on Retaining Human Control of Weapon Systems*, CAMPAIGN TO STOP KILLER ROBOTS (Apr 13, 2018), <https://www.stopkillerrobots.org/2018/04/convergence/> (noting that China’s support for a ban is limited to the *use* of fully autonomous weapon systems).

39. See CAMPAIGN TO STOP KILLER ROBOTS, <https://www.stopkillerrobots.org/learn/> (last visited Sep. 24, 2020).

40. Kania, *supra* note 37.

41. ZELIN LIU & MICHAEL MOODIE, CONG. RESEARCH SERV., IF11294, INTERNATIONAL DISCUSSIONS CONCERNING LETHAL AUTONOMOUS WEAPON SYSTEMS (2019).

42. U.S. DEP’T OF DEF., LAW OF WAR MANUAL ¶ 5.6.6.1 (rev. ed. Dec. 2016) [hereinafter U.S. DoD MANUAL]; U.S. DEP’T OF THE ARMY & U.S. MARINE CORPS, FM 6-27/MCTP 11-10C, THE COMMANDER’S HANDBOOK ON THE LAW OF LAND WARFARE ¶¶ 2-30, 2-40-44 (Aug. 2019) [hereinafter FM 6-27]; see generally 1 CUSTOMARY INTERNATIONAL HUMANITARIAN LAW 29 (Jean-Marie Henckaerts & Louise Doswald-Beck eds., 2005) [hereinafter ICRC CUSTOMARY LAW STUDY].

43. Crootof, *supra* note 33, at 1847.

approaches suggests that China is maintaining strategic ambiguity about the legality of autonomous systems while it pursues its military goals.⁴⁴

Regardless of the differences among States on how they characterize lethal autonomous weapon systems, the design, acquisition and use of these systems must first be lawful under the law of armed conflict.

IV. WEAPONS REVIEWS AND AUTONOMOUS WEAPON SYSTEMS

An initial constraint to the fielding and use of autonomous weapon systems is the obligation for States to review the lawfulness of new weapons by examining the primary purpose or range of circumstances for which the weapon was designed.⁴⁵ As is the case with any new weapon, if an autonomous weapon system cannot comply with the fundamental customary rules of warfare, procuring or using such a weapon would be unlawful. The weapons review obligation found in Article 36 of Additional Protocol I to the Geneva Conventions provides:

In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to *determine whether its employment would, in some or all circumstances, be prohibited* by this Protocol or by any other rule of international law applicable to the High Contracting Party.⁴⁶ (emphasis added)

States Party to Additional Protocol I are obligated by treaty to conduct a review in compliance with this provision. For States not Party to Additional Protocol I, the requirement for weapons review “is arguably one that applies” because the underlying customary international law prohibitions against the use of unlawful means and methods of warfare form the underlying basis of the rule.⁴⁷ The rule, however, does not provide specifics with regard to the format for the review nor the parameters of such a review. The aim is, nonetheless, to determine “whether the employment of a weapon for its normal or expected use would be prohibited under some or all circumstances.”⁴⁸

44. LIU & MOODIE, *supra* note 41.

45. U.S. DoD MANUAL, *supra* note 42, ¶¶ 6.3.1, 6.6.3.4, 6.7.2.

46. Protocol Additional to the Geneva Conventions of 12 August 1949 and Relating to the Protection of Victims of International Armed Conflicts art. 36, June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Protocol I].

47. INT’L COMM. OF THE RED CROSS (ICRC), 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 4 (Jan. 2006) [hereinafter ICRC Guide].

48. INT’L COMM. OF THE RED CROSS (ICRC), COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949 art. 36 ¶ 1469 (Yves Sandoz et al. eds., 1987) [hereinafter Commentary on the Additional Protocols].

While the United States is not Party to Additional Protocol I, it has a long-established policy to conduct comprehensive weapons reviews.⁴⁹ In fact, the U.S. policy predates Article 36 of Additional Protocol I.⁵⁰ Weapons reviews under both Article 36 of Additional Protocol I and U.S. policy require a legal determination that any weapon system's design and intended use are not inherently indiscriminate nor are they calculated to cause superfluous injury.⁵¹ The review also requires a determination whether the weapon is already prohibited by a disarmament treaty obligation or other rule of customary international law.⁵²

The fundamental customary rules of warfare found in the law of armed conflict that underly the weapons review obligation first appeared in the preamble to the 1899 Hague Convention⁵³ and is also codified in the 1977 Additional Protocol I of the Geneva Conventions.⁵⁴ Prominent among these is the superfluous injury rule found in Article 35(2) of Additional Protocol I, which prohibits the employment of any weapon "of a nature to cause superfluous injury or unnecessary suffering."⁵⁵ While the United States has not ratified this treaty, the rule is considered customary international law and is referenced in treaties the United States is party to, such as the 1899 and 1907 Hague Regulations,⁵⁶ and in U.S. manuals such as the DoD Law of War Manual.⁵⁷ The United States considers the phrase "calculated to cause superfluous injury" a more accurate reflection of customary international law, and focuses "on the design and intended purpose rather than every remote possibility of weapon injury."⁵⁸ Nonetheless, the rule prohibits weapons designed or used in a way that unnecessarily increase the suffering of those attacked beyond what is justified by military necessity.⁵⁹

49. U.S. DOD MANUAL, *supra* note 42, ¶ 6.2.

50. *Id.* ¶ 6.2.3.

51. *Id.* ¶ 6.2.2.

52. Rep. of the 2019 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, ¶ 17, U.N. Doc. CCW/GGE.1/2019/3 (Sept. 25, 2019), <https://undocs.org/en/CCW/GGE.1/2019/3> [hereinafter 2019 GGE Report on LAWS].

53. Laws and Customs of War on Land (Hague, II), preamble, July 29, 1899, 32 Stat. 1803, T.S. 403 [hereinafter 1899 Hague Regulations].

54. Protocol I, *supra* note 46, art. 35(2), 51(4)(b), 51(5)(b).

55. *Id.* art. 35(2).

56. 1899 Hague Regulations, *supra* note 53; Laws and Customs of War on Land (Hague, IV) art. 23, Oct. 18, 1907, 36 Stat. 2277, T.S. No. 539.

57. U.S. DOD MANUAL, *supra* note 42, ¶ 6.2.2.

58. *Id.* ¶ 6.6.1; *see also* William H. Boothby, WEAPONS AND THE LAW OF ARMED CONFLICT 49 (2d ed. 2016) (citing W. Hays Parks, *Conventional Weapons and Weapons Reviews*, 8 Y.B. INT'L HUM. L. 55, 86-87 n.123 (2005)).

59. U.S. DOD MANUAL, *supra* note 42, ¶ 6.6.2.

The second fundamental prohibition—inherently indiscriminate weapons—derives from the principles of distinction and proportionality, which the United States, as noted in the DoD Law of War Manual, considers customary international law.⁶⁰ In other words, weapons that cannot be directed at a military objective or whose effects cannot be limited as required by the law of armed conflict are prohibited. The customary distinction rule is reflected in Article 51(4)(b) of Additional Protocol I and states that “indiscriminate attacks are ... those which employ a method or means of combat which cannot be directed at a specific military objective.”⁶¹ The customary proportionality rule is reflected in Article 51(5)(b) banning attacks in which the expected collateral damage is excessive compared to the direct military advantage anticipated.⁶²

These fundamental obligations are likely immaterial in determining whether lethal autonomous weapon systems are unlawful by its nature. Being autonomous, by itself, does not unnecessarily increase suffering. The superfluous injury rule is focused on the nature of the injury, not on whether a system can autonomously select and engage a target without human intervention. It would only be relevant if the autonomous system used means that would violate the superfluous injury rule, such as creating fragments intended to penetrate the human body that are undetectable by x-ray.⁶³

The focus of the indiscriminate weapons prohibition is determining whether the employment of lethal autonomous weapon systems is expected to be indiscriminate in *all* circumstances. If the weapons review determines the specific autonomous weapon system being tested cannot under any circumstances be directed at a lawful target, or its effects cannot comply with the rule of proportionality, the platform would be unlawful by its very nature. Yet, it seems illogical that a lethal autonomous weapon system could ever be banned *per se* even if it were unable to distinguish between military objectives and civilians or civilian objects. If that weapon was employed in an area without civilians or civilian objects, it would be unlikely that the

60. *Id.* ¶ 6.7.

61. Protocol I, *supra* note 46, art. 51(4)(b).

62. *Id.* art. 51(5)(b).

63. U.S. DOD MANUAL, *supra* note 42, ¶ 6.11; *See also* SCHARRE, *supra* note 15, at 258 (arguing that the prohibition on weapons intended to cause unnecessary suffering, has little bearing on autonomous weapons).

weapon would be considered inherently indiscriminate,⁶⁴ such as a naval engagement on the high seas or a land engagement in an uninhabited desert.⁶⁵

Some critics go so far as to claim that the rapid developments in robotics and autonomous technology indicate that it is only a matter of time before fully autonomous weapons become an inhumane reality.⁶⁶ Human Rights Watch, in their 2012 report, *Losing Humanity: The Case Against Killer Robots*, claims that, “... robots with complete autonomy would be incapable of meeting international humanitarian law standards. The rules of distinction, proportionality, and military necessity are especially important tools for protecting civilians from the effects of war, and fully autonomous weapons would not be able to abide by those rules.”⁶⁷ It is clear that Human Rights Watch believes that fully autonomous weapon systems are *per se* illegal, but that belief is not supported by the law or their use.⁶⁸ There is a blurring of the distinction between the law of armed conflict’s prohibition on weapons *per se* and on the *use* of otherwise lawful weapons.⁶⁹ Additionally, as Professor Michael Schmitt notes, “... some of the report’s legal analysis fails to take account of likely developments in autonomous weapon systems technology or is based on unfounded assumptions as to the nature of the systems.”⁷⁰ There also exists an assumption that the users of these systems will also forsake their obligations under the law. This assumption is false.

The Campaign to Stop Killer Robots advances arguments similar to Human Rights Watch, calling for a legally binding instrument to prohibit the development, production, and use of weapons systems that select and engage targets based on sensor processing or are inherently unacceptable for ethical or legal reasons.⁷¹ But what are those “legal reasons?” What is “inherently unacceptable” under the law of armed conflict?

64. *Id.* ¶ 6.7.2; see also Michael N. Schmitt & Jeffrey S. Thurnher, *Out of the Loop: Autonomous Weapon Systems and the Law of Armed Conflict*, 4 HARV. NAT’L SEC. J. 231, 246 (2013).

65. Michael N. Schmitt, *Autonomous Weapon Systems and International Humanitarian Law: A Reply to the Critics*, HARV. NAT’L SEC. J. 1, 11 (2013).

66. *Losing Humanity: The Case Against Killer Robots*, HUMAN RIGHTS WATCH (Nov. 19, 2012), <https://www.hrw.org/report/2012/11/19/losing-humanity/case-against-killer-robots> [hereinafter *LOSING HUMANITY*].

67. *Id.*

68. See *infra* discussion Part V, about the Harpy, HARM, C-RAM, and the LRASM.

69. Schmitt, *supra* note 65, at 2.

70. *Id.* at 3.

71. Campaign to Stop Killer Robots, *Commentary for the Convention on Conventional Weapons Group of Governmental Experts on lethal autonomous weapon systems*, 4 (May 20, 2020), http://www.article36.org/wp-content/uploads/2020/06/KRC_CommentaryCCW_20May2020.pdf.

Commentators universally agree that the law of armed conflict applies to the use of autonomous weapons.⁷² There is also consensus that the law does not prohibit such weapons, and government attorneys and academic scholars alike stress that a ban of autonomous weapon systems is at best misguided as a matter of law, policy, and military mission accomplishment.⁷³ Most notably, weapon systems enabled with autonomy are currently being lawfully employed by the United States and other countries, clearly demonstrating that this class of weapon is not inherently unlawful.⁷⁴

U.S. policy also requires additional review by senior DoD officials for the development or fielding of autonomy in weapon systems to ensure rigorous standards of performance, capability, reliability and effectiveness.⁷⁵ This policy, Department of Defense Directive 3000.09, *Autonomy in Weapon Systems*, reflects long-standing U.S. practices for developing and acquiring existing weapon systems that include autonomy, and sets guidelines to minimize the probability and consequences of failures in these systems and unintended engagements.⁷⁶ Prior to fielding an autonomous weapon system, senior level review will ensure system capabilities, human-machine interfaces, doctrine, tactics, techniques, and procedures (TTPs), and training have demonstrated the capability to allow commanders and operators to exercise appropriate levels of human judgment in the use of force in the employment of these systems. In addition, the Directive provides for specific hardware and software verification and validation, as well as realistic system development and operational tests and evaluations. The Directive requires that autonomous systems:

- (a) Function as anticipated in realistic operational environments against adaptive adversaries.

72. INT'L COMM. OF THE RED CROSS, INTERNATIONAL HUMANITARIAN LAW AND THE CHALLENGES OF CONTEMPORARY ARMED CONFLICTS 36-40, REP. NO. 31IC/11/5.1.2 (Oct. 2011), <https://www.icrc.org/en/doc/assets/files/red-cross-crescent-movement/31st-international-conference/31-int-conference-ihl-challenges-report-11-5-1-2-en.pdf>; see Ford, *supra* note 25, at 427.

73. Schmitt & Thurnher, *supra* note 64, at 233.

74. Crootof, *supra* note 33, at 1873; SCHARRE, *supra* note 15, at 50 (The Israeli Harpy loitering munition and the U.S. High-speed Anti-Radiation Missile (HARM) are examples of weapon systems with autonomous features).

75. DoDD 3000.09, *supra* note 27, ¶ 4(d) at 3 (explaining “[a]utonomous or semi-autonomous weapon systems intended to be used in a manner that falls outside the policies in subparagraphs 4.c.(1) through 4.c.(3) must be approved by the Under Secretary of Defense for Policy (USD(P)); the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)); and the CJCS before formal development and again before fielding in accordance with the guidelines in Enclosure 3, References (b) and (c), and other applicable policies and issuances”).

76. *Id.* at 1.

(b) Complete engagements in a timeframe consistent with commander and operator intentions and, if unable to do so, terminate engagements or seek additional human operator input before continuing the engagement.

(c) Are sufficiently robust to minimize failures that could lead to unintended engagements or to loss of control of the system to unauthorized parties.⁷⁷

In addition, weapon systems must be readily understandable to trained operators and provide traceable feedback on system status.⁷⁸ The Directive also requires commanders to use autonomous weapons in a manner consistent with its design, intended purpose, weapon system safety rules, the laws of armed conflict, and rules of engagement.⁷⁹ Thus, a determination on the legality of LAWS turns on how it is employed within the specific parameters of its intended use.

V. AUTONOMOUS WEAPON SYSTEMS AND THE LAW OF ARMED CONFLICT

Legal arguments against the use of autonomous weapon systems are often centered around kinetic engagements involving fully autonomous systems against persons in urban or other complex environments.⁸⁰ While these arguments have merit in a vacuum, States have long understood that operational context is important with respect to the legality of employing weapon systems, particularly those with autonomous functions.

The law of armed conflict continues to be a living, breathing body of law rather than a static set of concepts, repeatedly adapting to changing and uncertain circumstances such as those found in the employment of autonomous technologies.⁸¹ The autonomous weapons' legal debate must be centered around the law of armed conflict's core principles of distinction and proportionality, and the related precautions in attack.⁸²

77. *Id.* ¶ 4(1) (a)-(c), at 2.

78. *Id.* ¶ 4(3) (a)-(b), at 2-3.

79. *Id.* ¶ 10, at 12.

80. Ford, *supra* note 25, at 429.

81. LAURIE A. BLANK & GREGORY P. NOONE, INTERNATIONAL LAW AND ARMED CONFLICT: FUNDAMENTAL PRINCIPLES AND CONTEMPORARY CHALLENGES OF THE LAW xix (Concise ed., Wolters Kluwer 2016).

82. NATHAN J. LUCAS, CONG. RESEARCH SERV., R44466, LETHAL AUTONOMOUS WEAPON SYSTEMS: ISSUES FOR CONGRESS, at 20 (2016); Ford, *supra* note 25, at 427; Legality and the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. Rep. 226, ¶ 78 (July 8) (explaining that distinction and proportionality are the core principles that serve as the basis for international humanitarian law).

A. *Distinction*

The basic rule of distinction requires parties to an armed conflict to, at all times, distinguish between civilians and combatants and between civilian objects and military objectives and to direct attacks only against military objectives.⁸³ This rule frequently proves challenging for combatants on the field of battle, so it stands to reason that distinction requirements could also challenge the operation of autonomous weapon systems. Paul Scharre notes that distinction will not only require autonomous weapons to distinguish between discrete military and civilian targets, but also distinguish the target from other “clutter” in the environment.⁸⁴ This environmental, or geographic, aspect to the employment of autonomous systems is an important one. Existing weapon systems with autonomous functions such as the Harpy and HARM⁸⁵, and other systems like the Counter-Rocket Artillery Mortar (C-RAM)⁸⁶ system and Long-Range Anti-Ship Missile (LRASM),⁸⁷ are designed to operate in discrete environments and conduct specific missions. The commander or operator decides to employ these systems to target munitions, radars, or ships while the weapon system, using various levels of autonomy, selects *which* targets to strike. These systems’ pre-defined targets are limited to enemy radar systems, indirect fire munitions, and enemy ships, significantly limiting the possibility of violating the principle of distinction during the operation of the system. Current autonomous systems technology has not yet advanced to recognition of individual combatants or civilians, nor distinguishing civilian objects, such as a truck, from the same civilian object that is being *used* for military purposes. But that does not exclude the use of autonomous technologies in armed conflict. It simply means that, like the weapons systems mentioned above, autonomous weapon systems are constrained to environments in which they can be employed in compliance with the law of armed conflict.⁸⁸ Autonomous weapon systems that cannot

83. ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 1, r. 7; Protocol I, *supra* note 46, art. 48, 52; U.S. DOD MANUAL, *supra* note 42, ¶¶ 5.4.2, 5.5; FM 6-27, *supra* note 42, ¶ 2-16.

84. SCHARRE, *supra* note 15, at 253 (describing “clutter” as confusing objects in the environment that are not targets).

85. *Id.* at 47-48.

86. *Counter-Rocket, Artillery, Mortar (C-RAM) Intercept Land-based Phalanx Weapon System (LPWS)*, U.S. ARMY, https://asc.army.mil/web/portfolio-item/ms-c-ram_lpws/ (last visited Nov. 1, 2020).

87. *LRASM Long-Range Anti-Ship Missile*, LOCKHEED MARTIN, <https://www.lockheedmartin.com/en-us/products/long-range-anti-ship-missile.html#:~:text=LRASM%20is%20a%20long%20range%2C%20precision-guided%20anti-ship%20missile ,guidance%2C%20day%20or%20night%20in%20all%20weather%20conditions> (last visited Sep. 24, 2020).

88. Kenneth Anderson, Daniel Reisman, & Matthew Waxman, *Adapting the Law of Armed Conflict to Autonomous Weapon Systems*, INT’L L. STUD. 386, at 401 (2014).

distinguish between lawful and unlawful targets cannot be used where the two are co-located; failure to comply with this requirement could result in an indiscriminate attack and a violation of the law of armed conflict.⁸⁹

This begs the question: what if the autonomous system is able to distinguish between the military objective and civilian objects, but the system detects the potential for collateral damage in the execution of the strike? The law of armed conflict would require a commander or operator in a similar position to assess the military advantage to be gained from the attack in light of the expected collateral damage.⁹⁰ The law requires that an autonomous system operate in the same manner; in compliance with the principle of proportionality.

B. *Proportionality*

Proportionality prohibits attacks, “which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.”⁹¹ The rule of proportionality is not a balancing test, but rather a systematic approach to ensure the harm to civilian objects or persons is not excessive in relation to the concrete and direct military advantage anticipated from the attack.⁹² Making this determination is both subjective and contextual and can prove difficult for the most seasoned commanders, let alone an autonomous system.⁹³

When considering proportionality and the use of autonomous weapons, there are operational environments such as the high seas⁹⁴, uninhabited deserts, and underseas in which civilians and civilian objects are unlikely. Practically speaking, these locations would generally not require weighing the military advantage against civilian harms and would make it more likely

89. Schmitt, *supra* note 65, at 18.

90. BLANK & NOONE, *supra* note 81, at 36.

91. Protocol I, *supra* note 46, art. 51(5)(b); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 14; *see also* U.S. DOD MANUAL, *supra* note 42, at 241; *see also* FM 6-27, *supra* note 42, ¶¶ 2-71 to -76.

92. Michael N. Schmitt & Eric W. Widmar, “On Target”: *Precision and Balance in the Contemporary Law of Targeting*, 73 J. OF NAT’L SEC. L. & POL’Y 379, 405 (2014) [hereinafter Schmitt & Widmar].

93. *See* Ford, *supra* note 25, at 443.

94. U.S. NAVY, U.S. MARINE CORPS & U.S. COAST GUARD, NWP 1-14M/MCTP 11-10B/COMDTPUB P5800.7A, COMMANDER’S HANDBOOK ON THE LAW OF NAVAL OPERATIONS, §8.6 (Aug. 2017) (In the naval context, targeting is platform based on the nature of the ship (warship, auxiliary) or conduct of the vessel (such as providing intel, opposing visit and search, or breach of blockade)).

that the use of autonomous systems is in compliance with the law of armed conflict.⁹⁵ Alternatively, the use of autonomous weapons would prove more difficult in complex combat environments such as dense urban settings. Considering the complexity of such environments, it is unlikely that autonomous systems will soon be capable of assessing proportionality in a strike. However, as noted by Michael Schmitt and Jeffrey Thurnher, "... it is inappropriate to ask more of machines than the humans whom the law of proportionality was originally designed to address."⁹⁶ Autonomous systems do not have to make these judgment calls, but must be used in ways that comply with the principle.⁹⁷ Similar to the distinction approach discussed above, it stands to reason that the proportionality decision will not be delegated to a machine, but will continue to be made by the commander or operator. Autonomous weapon systems will be employed in compliance with the principle of proportionality, guided by the judgment of commander and operators, by limiting their operations to non-complex environments in which collateral damage is of minimal concern or where proper precautions can be made to reduce or eliminate collateral damage concerns.

C. *Precautions in the Attack*

The legal obligation to take precautions does not fall to the autonomous system. As Paul Scharre notes, "(m)achines are not combatants. People fight wars, not robots."⁹⁸ The DoD Law of War Manual mirrors Scharre's view,

The law of war rules on conducting attacks (such as the rules relating to discrimination and proportionality) impose obligations on persons. These rules do not impose obligations on the weapons themselves ... (or) ... 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.⁹⁹

To minimize collateral damage prior to an attack certain precautions are required.¹⁰⁰ Feasible precautions are those "practicable or practically possible, taking into account all circumstances prevailing at the time,

95. See Anderson et al., *supra* note 88, at 402.

96. Schmitt & Thurnher, *supra* note 64, at 257.

97. See SCHARRE, *supra* note 15, at 255-56.

98. *Id.* at 269.

99. U.S. DOD MANUAL, *supra* note 42, ¶ 6.5.9.3.

100. *Id.* at 190 ¶ 5.2.3, 1022 ¶ 16.5.3; see also ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 15; see also TALLINN MANUAL 2.0 ON THE INTERNATIONAL LAW APPLICABLE TO CYBER OPERATIONS, at 476-78 (Michael N. Schmitt ed., 2nd ed. 2007) [hereinafter TALLINN MANUAL 2.0].

including humanitarian and military considerations.”¹⁰¹ What is practical or practicable is understood to be the exercise of “common sense and good faith.”¹⁰² Commanders’ decisions reflect the information available “at the time in which the attacks are decided upon or executed,” which is “a clear rejection of hindsight analysis.”¹⁰³

As such, commanders, not the systems they employ, are required to take constant care to spare the civilian population, civilians, and civilian objects from attack.¹⁰⁴ This duty obligates commanders to take certain precautions when conducting attacks to include ensuring that the object of an attack is a military objective;¹⁰⁵ taking all feasible precautions in the choice of means (weapons) and methods (tactics) of attack to avoid or minimize collateral damage;¹⁰⁶ refraining from conducting attacks which are expected to cause harm to civilians or damage to civilian objects that is excessive in relation to the direct military advantage anticipated;¹⁰⁷ suspending or canceling an attack if it becomes apparent the objective is not a military objective or the strike will violate proportionality;¹⁰⁸ if possible, providing effective advance warnings for attacks that may affect the civilian population;¹⁰⁹ and suspending or cancelling an attack if it becomes apparent the objective is not a military objective or the attack will violate proportionality.¹¹⁰

101. U.S. DOD MANUAL, *supra* note 42, at 192; *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 15; *see also* Commentary on the Additional Protocols, *supra* note 48, at 682; *see also* Schmitt & Widmar, *supra* note 92, at 400-04.

102. Commentary on the Additional Protocols, *supra* note 48, at 682; *see also* Schmitt & Widmar, *supra* note 92, at 400.

103. U.S. DOD MANUAL, *supra* note 42, at 194-95; *see also* FM 6-27, *supra* note 42, ¶ 1-27.

104. ICRC CUSTOMARY LAW STUDY, *supra* note 42, r.15; *see also* Protocol I, *supra* note 46, art. 57(1); *see also* U.S. DOD MANUAL, *supra* note 42, at 195; *see also* FM 6-27, *supra* note 42, ¶ 5-30.

105. Protocol I, *supra* note 46, art. 57(2)(a)(i); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 16; *see also* U.S. DOD MANUAL, *supra* note 42, at 185, 190; *see also* FM 6-27, *supra* note 44, ¶¶ 1-44, 2-82.

106. Protocol I, *supra* note 46, art. 57(2)(a)(ii); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 17; *see also* U.S. DoD Manual, *supra* note 42, at 191; *see also* FM 6-27, *supra* note 42, ¶¶ 2-88 to -89.

107. Protocol I, *supra* note 46, art. 57(2)(a)(iii); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 14, r. 18; *see also* U.S. DoD Manual, *supra* note 42, at 241; *see also* FM 6-27, *supra* note 42, ¶ 2-76.

108. Protocol I, *supra* note 46, art. 57(2)(b); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 19; *see also* U.S. DoD Manual, *supra* note 42, at 260; *see also* FM 6-27, *supra* note 42, ¶ 2-76.

109. Protocol I, *supra* note 46, art. 57(2)(c); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 20; *see also* U.S. DOD MANUAL, *supra* note 42, at 255-56; *see also* FM 6-27, *supra* note 42, ¶¶ 2-83 to -86.

110. Protocol I, *supra* note 46, art. 57(2)(b); *see also* ICRC CUSTOMARY LAW STUDY, *supra* note 42, r. 14, r. 19; *see also* U.S. DoD Manual, *supra* note 42, at 260; *see also* FM 6-27, *supra* note 42, ¶ 2-76.

The duty to take constant care, and to suspend disproportionate attacks, rests with the commander. Their duty continues throughout the execution of the mission. While other members of the command can also observe the duty, could an autonomous system be relied upon to take constant care and suspend an attack? Further, can these systems take feasible precautions? While Paul Scharre expresses concern over the “murky” relationship between precautions and autonomous systems, he notes that the duty to take all feasible precautions could be interpreted as requiring a human in or on the loop whenever possible.¹¹¹ However, that approach could be applied to any weapon system that, with additional safeguards, may be employed in better compliance with the law of armed conflict. There is nothing legally objectionable to an autonomous weapon system conducting a feasibility assessment, so long as the commander is reasonably certain that the system is capable of making such an analysis.¹¹²

The United States is not building weapons that are independent of human judgment.¹¹³ Autonomous weapon systems will not operate without restrictions and will be employed in compliance with the law of armed conflict.¹¹⁴ These systems will be limited to select courses of action within the employing commander’s intent, the commander’s understanding of the tactical situation, the weapon system’s performance, and the employment TTPs for that weapon. Restrictions on operation may be temporal, geographic, based on energy supply (such as battery life), or include pre-described limits on target acquisition and engagement. Accordingly, an autonomous system is never completely human-free. System designers, operators, or a commander would, at a minimum, have to program or set the system to function pursuant to specified parameters.¹¹⁵ The joint targeting process – U.S. doctrine that assists commanders in operational and tactical decision-making and overall mission accomplishment – heavily influences all of the aforementioned tactical situations, TTPs, operational restrictions, and target engagement.

VI. JOINT TARGETING PROCESS AND LETHAL AUTONOMOUS WEAPON SYSTEMS

Militaries employ force, including lethal autonomous weapon systems, through their targeting processes. In turn, these processes ensure

111. SCHARRE, *supra* note 15, at 258.

112. *See* Ford, *supra* note 25, at 450.

113. DoDD 3000.09, *supra* note 27, ¶ 4(a).

114. *Id.* ¶ 4(b).

115. Schmitt, *supra* note 65, at 4.

commanders at the strategic, operational, and tactical levels of warfare maintain control and accountability on their means and methods of engagement, to include their compliance with the law of armed conflict.¹¹⁶ Consequently, these processes directly control the manner by which autonomous weapon systems would be employed during military operations considering the purpose and range of circumstances the system was designed. While there is no comprehensive, singular targeting doctrine used by States, the U.S. joint targeting doctrine is a good example of how armed forces may use targeting procedures to manage the use of lethal autonomous weapon systems while ensuring compliance with the law of armed conflict.¹¹⁷ The U.S. joint concept applies at the joint level of command where forces and capabilities are combined from more than one branch of the armed forces under a joint force commander (JFC).¹¹⁸ Below the JFC, each branch of the U.S. armed forces applies the same principles of the joint targeting cycle to conduct their own targeting analysis within their specific domain.¹¹⁹ For example, the U.S. Army nests their targeting process focused on the land domain within the overall joint targeting process.¹²⁰

The United States defines targeting as the process of selecting and prioritizing targets and matching the appropriate response to them, considering operational requirements and capabilities.¹²¹ Within the U.S. joint targeting cycle, the guiding principles of the law of armed conflict, such as distinction, proportionality and precautions in attack, are integrated across six phases—(1) Commander's Objectives, Targeting Guidance, and Intent; (2) Target Development and Prioritization; (3) Capabilities Analysis; (4) Commander's Decision and Force Assignment; (5) Mission Planning and Force Execution; and (6) Combat Assessment. The targeting cycle is a continuous process that is initiated once planning begins for an operation and does not end until operations are over.¹²² It is an iterative process that is not time-constrained nor rigidly sequential since various phases may be conducted concurrently.¹²³

116. JOINT CHIEFS OF STAFF, JOINT PUBL'N 3-0, JOINT OPERATIONS at I, 12-14 (Oct. 2018) [hereinafter JP 3-0].

117. JOINT CHIEFS OF STAFF, JOINT PUBL'N 3-60, JOINT TARGETING (Jan. 2013), [hereinafter JP 3-60].

118. DOD DICTIONARY, *supra* note 2, at 116.

119. *See e.g.* HEADQUARTERS, DEP'T OF THE ARMY, ATP 3-60, TARGETING (2015); HEADQUARTERS, DEP'T OF THE AIR FORCE, ANNEX 3-60, TARGETING (2019).

120. HEADQUARTERS, DEP'T OF THE ARMY, ATP 3-60, TARGETING (2015).

121. DOD DICTIONARY, *supra* note 2, at 211.

122. JP 3-60, *supra* note 117, at xii.

123. *Id.* at II-3.

Phase 1 — Commander’s Objectives, Targeting Guidance, and Intent— establishes the overall purpose of the military operation. The commander provides clear and concise guidance, to include the specific objectives of the operation and the overall desired end state. The commander’s guidance is shaped by strategic direction from the President and Secretary of Defense.¹²⁴ Phase 1 is a critical first step to ensure the targeting process validates the value and identity of military objectives and the desired effects, both lethal and non-lethal, against those objectives, with appropriate military capabilities through the subsequent phases. Underlying the commander’s guidance are both legal requirements and policy, which form the rules of engagement that delineate the circumstances and limitations U.S. forces will use to initiate and continue combat engagement with its adversaries.¹²⁵ The overall aim of the operation provides crucial context to evaluate whether potential targets are lawful military objectives and to assess the potential military advantage against those targets.¹²⁶

To better understand how this Phase will impact autonomous systems, it is important to explain the rules of engagement and their function in the targeting process. The Dictionary of Military and Associated terms defines rules of engagement as, “[d]irectives issued by competent military authority that delineate the circumstances and limitations under which U.S. forces will initiate and/or continue combat engagement with other forces encountered.”¹²⁷ Rules of engagement are the commander’s primary means of regulating force in armed conflict and those rules clearly extend to the use of autonomous systems.¹²⁸ Rules of engagement are more restrictive than the law of armed conflict, and are heavily influenced by domestic policy, operational goals, and circumstances encountered on the battlefield. They are not intended to serve as tactical or operational guidelines, but rather designed to provide boundaries on the use of force that are neither tactical control measures nor a substitute for the military judgment of commanders and operators.¹²⁹ Specific rules of engagement are a crucial tool in the responsible and legal use of autonomous systems in that these rules can restrict, for

124. *Id.* at II-3 to -4.

125. DOD DICTIONARY, *supra* note 2, at 188.

126. U.S. DOD MANUAL, *supra* note 42, ¶ 5.6; *see also* Protocol I, *supra* note 46, art. 52(2) (“Military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.”).

127. DOD DICTIONARY, *supra* note 2, at 188.

128. GARY D. SOLIS, THE LAW OF ARMED CONFLICT: INTERNATIONAL HUMANITARIAN LAW IN WAR 495 (2010).

129. INT’L AND OPERATIONAL LAW DEP’T, THE JUDGE ADVOC. GEN.’S LEGAL CTR. & SCH., U.S. ARMY, OPERATIONAL LAW HANDBOOK, 105-06 (2020).

example, a system's potential targets, geographic range, time on station, and use of munitions.

Phase 2 — Target Development and Prioritization — begins with a systematic examination of potential targets in order to identify those entities, objects or combatants, when successfully engaged, support the achievement of the commander's objectives.¹³⁰ Once the potential targets are identified, they are validated to ensure the potential targets meet the objectives outlined in the commander's guidance and comply with the law of armed conflict and the rules of engagement.¹³¹ It is here where targets are confirmed to be lawful military objectives by nature, purpose, use, location or class of persons.¹³² Autonomous systems could theoretically assist with target development, but whether that system may validate targets and target systems without human intervention would have to satisfy the legal and policy requirements analyzed herein. Once the targets are validated, they are added either to the joint target list upon which there are no target engagement restrictions or the restricted target list that detail specific restrictions on the actions authorized against it due to operational considerations.¹³³ There are numerous operational reasons to restrict actions upon a given target due to second- and third-order effects. One reason may also be the legal obligation to take feasible precautions in planning and conducting attacks.¹³⁴

Phases 3, 4, and 5 are critically important in determining whether LAWS may be employed as a suitable capability, as well as, to ensure compliance with the laws of armed conflict. The following analysis presumes there are no other non-legal considerations that constrain the use of LAWS for the particular operation. As a methodology, the joint targeting process ensures any weapon system used for engagement achieves the designated objectives of the mission, to include being lawful.

Phase 3 — Capabilities Analysis — involves evaluating available capabilities, both forces and weapon systems, to determine appropriate options to engage the targets that were validated as military objectives during phase 2. The primary purpose is to determine how the capabilities available across the joint force may be used to create the desired effects on the

130. JP 3-60, *supra* note 117, at II-5.

131. *Id.* at II-13.

132. U.S. DOD MANUAL, *supra* note 42, ¶ 5.6 (“The term military objective has been used in various treaties as a term of art to mean a person or object that may lawfully be made the object of attack.”); *see also* Protocol I, *supra* note 46, art 52(2).

133. JP 3-60, *supra* note 117, at II-13.

134. U.S. DOD MANUAL, *supra* note 42, ¶¶ 5.11, 5.11.7 (“For example, in seeking to deny an adversary the ability to use a railroad network, it may be possible to disable to railroad network just as effectively by striking the railroad lines away from inhabited areas as by striking the railroad station located near civilians.”); *see also* Protocol I, *supra* note 46, art. 57(2).

prioritized targets while minimizing collateral damage and waste of limited resources.¹³⁵

An important part of assigning capabilities against a target is weaponeering (the process of determining the specific means required to create a desired effect on a given target).¹³⁶ Assuming a lethal autonomous weapon system is an available capability within the joint force inventory, consideration of its employment will be compared against all other capabilities that may satisfy the specific requirement. Just because an autonomous weapon system may be able to create the desired effects does not mean that it will be assigned against that target. The first-, second-, and higher-order effects are identified for each of the potential capabilities in order to generate an understanding of the most efficient means to achieve the desired effects while minimizing potential negative consequences.¹³⁷

As part of this analysis, an estimation on possible collateral damage – incidental injury or death of civilians and damage or destruction of civilian objects – is produced for each potential capability, which are categorized as second-order effects. First-order effects are those against the designated target or target system. The assessment is conducted through collateral damage estimation (CDE) models that inform the targeting staff and commander on the potential collateral damage risk. Each specific capability is matched against a given target to estimate those effects. The process considers performance data on each potential asset, characteristics on the means of delivery of the effect, and operational conditions at the time of employment among other things. These estimates are situation-specific and as conditions change must be reevaluated.¹³⁸

The intent of CDE is to provide a repeatable and structured process to analyze and predict collateral damage to help inform the commander on the best option to minimize civilian harm, which is one method used to help comply with the legal obligation to take feasible precautions in planning and conducting attacks.¹³⁹ Through this process, an autonomous weapon system may or may not be the best capability to minimize civilian harm. If it is seen as a potential option to employ against a particular target, the commander must be satisfied that the autonomous system can achieve the desired effects, without sacrificing the military advantage, while causing the least amount of

135. JP 3-60, *supra* note 117, at II-13.

136. DOD DICTIONARY, *supra* note 2, at 229.

137. JP 3-60, *supra* note 117, at II-14-15.

138. *Id.* at II-15.

139. U.S. DOD MANUAL, *supra* note 42, ¶¶ 5.11, 5.11.6; *see also* Protocol I, *supra* note 46, art. 57(2).

harm to civilians and civilian objects.¹⁴⁰ If a lethal autonomous weapon system can satisfy the requirements in phase 3, then it will be an option to consider during phase 4.

Phase 4—Commander’s Decision and Force Assignment—is the step where the commander either approves, disapproves, or approves with modifications the planned engagements of the prioritized and validated targets using the specific means and methods vetted during the capabilities analysis. In addition to operational considerations, it is here where the legal obligation to apply the principle of proportionality is made.¹⁴¹ The consolidation of all the data and information surrounding the validated targets and the capabilities analysis, to include the CDE, as well as the broader strategy, objectives and military end state inform the commander’s decision as to whether the expected incidental harm to civilians or civilian objects would be excessive in relation to the concrete and direct military advantage anticipated to be gained.¹⁴² If an autonomous weapon system is an option verified during the capabilities analysis in phase 3, the commander may only approve its use against a designated target if reasonably convinced in good faith that the anticipated civilian collateral injury or damage is not expected to be excessive.

The commander must also be convinced that the obligation to take feasible precautions in planning and conducting attacks to reduce risk of harm to civilians and civilian objects has been met through the weaponizing and collateral damage estimation conducted during phase 3. At this point, a commander’s decision to approve a lethal autonomous weapon system against a validated target survives so long as the proportionality rule continues to be satisfied up to the point of the actual attack. If at any point during execution of the attack new information is raised concerning changes in expected civilian harm, the commander and subordinate commanders must still exercise due regard to reduce the risk of incidental harm and ensure civilian harm is not excessive in relation to the military advantage anticipated.¹⁴³ Assuming these obligations are met and will continue to be satisfied, the planned targets are transmitted to the combat forces assigned to prosecute those targets, including those units with autonomous weapons capabilities.

140. U.S. DOD MANUAL, *supra* note 42, ¶ 5.11.6; *see also* Protocol I, *supra* note 46, art. 57(2).

141. U.S. DOD MANUAL, *supra* note 42, ¶ 2.4.1.2; *see also* Protocol I, *supra* note 46, art. 51(5)(b).

142. *Id.*

143. U.S. DOD MANUAL, *supra* note 42, ¶¶ 5.10, 5.11.4; *see also* Protocol I, *supra* note 46, art. 57.

Phase 5 — Mission Planning and Force Execution — is the phase where subordinate units who control the capabilities that are to be employed against approved targets begin their own detailed planning and execution. During execution, combat operations are fluid due to changes occurring in the operational environment. To accommodate the inevitable changes, the joint targeting cycle incorporates both deliberate and dynamic targeting. Deliberate targeting refers to those planned targets that are known to exist in the operational environment with the capabilities validated to engage them during phases 2 and 3. They include scheduled targets that are to be engaged at specific times and on-call targets that have no specific delivery time.¹⁴⁴ Dynamic targeting refers to targets of opportunity that are either unscheduled or unanticipated targets. Unscheduled targets are validated targets that were not prioritized on either the joint or restricted target list during phase 2 or were not expected to be available during the current targeting cycle. Unanticipated targets are those that are unknown but appear during current operations.¹⁴⁵

Regardless of whether targets were developed through deliberate or dynamic targeting, both are subject to the process of F2T2EA: find, fix, track, target, engage, and assess during this phase.¹⁴⁶ For those planned targets approved with capabilities matched against them, this process is a method to simply confirm, verify and validate previous decisions and in some cases may require changes or cancellation. It also includes continued compliance with the legal obligation to take precautions in conducting attacks as new information may affect the proportionality assessment or overall risk to civilians or civilian objects.¹⁴⁷ For targets of opportunity that present themselves during current operations, this process provides a method for units executing attacks to quickly validate targets and match capabilities against them using similar standards as if it were conducted through deliberate planning in earlier phases. As is the case for the joint targeting cycle phases, the steps in the F2T2EA process may be accomplished iteratively and in parallel.¹⁴⁸

The find, fix and track steps involve the detection, identification and location of possible targets normally through intelligence, surveillance and reconnaissance (ISR) activities that units conduct throughout current operations. The target step is critical to the entire process as it includes the same methodologies contained in phases 2, 3 and 4. A possible target of

144. JP 3-60, *supra* note 117, at II-2.

145. *Id.* at II-2-3.

146. *Id.* at I-8, II-21.

147. U.S. DOD MANUAL, *supra* note 42, ¶ 5.11; *see also* Protocol I, *supra* note 46, art. 57.

148. JP 3-60, *supra* note 117, at II-21.

opportunity is validated as a lawful military objective, vetted to ensure effects against that target meet the objectives and criteria outlined in the commander's guidance, and certified that the engagement is not otherwise restricted.¹⁴⁹ A capabilities analysis is conducted to match available assets against the target through weaponeering and collateral damage estimation similar to phase 3. Once engagement options are formulated, recommendations are nominated for the commander responsible at this level to approve.¹⁵⁰ As is the case in phase 3, this step requires a proportionality assessment¹⁵¹ and feasible precautions to minimize harm to civilians and civilian objects.¹⁵² Once an approval decision is made, the next step is to engage. During the engage step, the attack is ordered and transmitted to the selected asset.¹⁵³ The final step of this phase is an initial assessment of the action against the target,¹⁵⁴ which supplements the continuous assessment of the effectiveness of operations in achieving the desired objectives during phase 6 of the joint targeting cycle.¹⁵⁵

For dynamic targeting using the F2T2EA process, the same constraints contained in the overall joint targeting cycle apply to ensure command and control on the employment of force. The option to employ a lethal autonomous weapon system would have to meet the same operational and legal criteria as if it were a planned engagement. Whether an autonomous system may perform any or all of the F2T2EA steps would depend on whether the system was designed, tested, and certified to do so while also complying with the law of armed conflict. At a minimum, the commander would have to be satisfied that the autonomous system is likely to cause the least harm to civilians and civilian objects without sacrificing the military advantage.¹⁵⁶ Practically, if a human-controlled capability were available that would likely cause less collateral damage, achieve the desired effects and objectives of the operation and not pose undue risk to friendly forces, the use of a lethal autonomous weapon system would be prohibited as a matter of law. Commanders are obligated to employ only those systems that meet the objectives outlined in the commander's guidance and comply with the law of armed conflict and the rules of engagement. Thus, autonomous weapons may only be lawfully employed in those situations where its use creates the

149. *Id.* at II-29.

150. *Id.* at II-29-30.

151. U.S. DOD MANUAL, *supra* note 42, ¶ 2.4.1.2; *see also* Protocol I, *supra* note 46, art. 51(5)(b).

152. U.S. DOD MANUAL, *supra* note 42, ¶ 5.11; *see also* Protocol I, *supra* note 46, art. 57.

153. JP 3-60, *supra* note 117, at II-29.

154. *Id.* at II-30.

155. *Id.* at II-31, C-6.

156. U.S. DOD MANUAL, *supra* note 42, ¶ 5.11; *see also* Protocol I, *supra* note 46, art. 57.

desired effects that are unattainable by other available capabilities that would cause less collateral damage. Indeed, the use of lethal autonomous weapon systems within the U.S. joint targeting cycle is subject to strict standards to comply with operational and legal constraints.

VII. CONCLUSION

The Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapon Systems includes this guiding principle: “(c)onsideration should be given to the use of emerging technologies in the area of lethal autonomous weapon systems in upholding compliance with IHL and other international legal obligations.”¹⁵⁷ As this Article has demonstrated, the United States has given such consideration by implementing and promoting policies and procedures that regulate the acquisition, development, testing, and employment of autonomous weapon systems to ensure compliance with the law of armed conflict.

Autonomy is not merely important, but essential for modern militaries to conduct many tasks, including identifying targets by radar or delivering precision-guided munitions.¹⁵⁸ And fast-paced growth of autonomous technologies requires ongoing development of internal U.S. policies and procedures to ensure deliberate evaluation of the risks of increased autonomy in weapon systems, as well as mitigate risks from technical, policy, and operational perspectives.

Policies and procedures like DoDD 3000.09, the U.S. joint targeting process, and rules of engagement, and commanders and operators applying appropriate levels of human judgment will continue to support the command and control necessary to ensure the legal and responsible use of lethal autonomous weapon systems in armed conflict.

157. CCW/GGE.1/2018/3, *supra* note 35, at 4.

158. Scharre & Horowitz, *supra* note 3, at 8.