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Article 36 Weapons Review & Autonomous Weapons Systems: Supporting an International Review Standard

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**ARTICLE 36 WEAPONS REVIEWS &
AUTONOMOUS WEAPONS SYSTEMS:
SUPPORTING AN INTERNATIONAL
REVIEW STANDARD**

RYAN POITRAS*

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I. INTRODUCTION

Rapidly advancing drone technology in the past decade has made it increasingly possible for the world's militaries to field advanced weapons systems that operate with limited direct human involvement and risk to the weapons' users.¹ Although this decrease in direct human control can theoretically provide tangible military benefits for those utilizing such "autonomous weapons systems" (AWS), the minimal levels of human involvement and risk have raised controversy over a myriad of ethical and legal issues.² While some have argued that the legal and ethical problems surrounding AWS necessitate a complete international ban on their production and use, others have contended that they can be effectively controlled and regulated through the existing framework of international law.³

1. See Michael Schmitt & Jeffery Thurnher, "Out of the Loop": *Autonomous Weapon Systems and the Law of Armed Conflict*, 4 HARV. NAT'L SEC. J. 231, 237 (2013) (predicting this trend from a review of U.S. Joint Forces Command and Department of Defense studies, plans, and roadmaps that are anticipating larger amounts of AWS use in the future).

2. See, e.g., Markus Wagner, *The Dehumanization of International Humanitarian Law: Legal, Ethical, and Political Implications of Autonomous Weapons Systems*, 47 VAND. J. TRANSNAT'L L. 1371, 1400 (2014) (writing about the tension between increased levels of autonomy and the difficulties in assigning responsibility for violations of international law).

3. See, e.g., Rick Noack, *Stop the Rise of the 'Killer Robots,' Warn Human*

One proposed method to regulate AWS use is through the creation of an international standard of a rigorous and comprehensive weapons review process based on Article 36 of Additional Protocol I (AP I) to the Geneva Conventions.⁴ In order for such an AWS regulatory regime to be effective, the national weapons review processes of technologically advanced countries, such as the United States (U.S.), would have to be compliant with AP I's provisions. This Comment determines that the weapons review process of the U.S., based on publicly available information, functions as an effective regulatory mechanism over AWS and is consistent with AP I's requirements. Because of its compliance with AP I's requirements, the U.S. weapons review process can regulate AWS effectively despite the fact that the U.S. is not a signatory to AP I, and can help create an effective international standard based on Article 36.

First, this Comment will lay out the background of AWS and Article 36 weapons reviews and will discuss the international legal issues implicated in such weapons reviews. Second, it will introduce the publicly available U.S. weapons review process. Third, this Comment will analyze the publicly available U.S. AWS weapons review process to evaluate its compliance with AP I's legal principles. Last, this Comment will discuss several recommendations that could help ensure that the U.S. AWS weapons review process is compliant with AP I.

II. BACKGROUND

This Part will first describe the basic characteristics of AWS and some of the criticisms leveled against AWS. It then introduces Article 36 reviews, addresses AP I's applicability to the U.S., and discusses the Article 36 weapons reviews analysis. Last, this Part will introduce

Rights Advocates, WASH. POST (Nov. 16, 2017), https://www.washingtonpost.com/news/worldviews/wp/2017/11/16/stop-the-rise-of-the-killer-robots-warn-human-rights-advocates/?utm_term=.1a06fe870150 (describing the Campaign to Stop Killer Robots' lobbying for a preemptive AWS ban at the United Nations).

4. Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I) art. 36, June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Article 36] (mandating that signatories to the treaty are obligated to study, develop, acquire, adopt, or review new weapons according to international law).

the U.S. AWS policy directive and weapons review process.

A. INTRODUCING AWS AND THE DEBATES OVER THEIR LEGALITY

In Directive 3000.09, the U.S. Department of Defense (DoD) defines AWS as:

A weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapons 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.⁵

AWS use is expected to increase in the future as advancing levels of automation require more highly automated countermeasures.⁶ Today, the U.S. does not use anything that is considered a fully autonomous offensive weapon, but rather uses automated defensive weapons and weapons that retain some measure of human control.⁷ Many analysts predict, however, that advancements in technology will lead to the adoption of increasingly autonomous systems, bringing more attention to the legal and ethical issues AWS pose.⁸

AWS have been targets of criticism by several NGOs, academics,

5. U.S. DEP'T OF DEF., DEPARTMENT OF DEFENSE DIRECTIVE 3000.09, AUTONOMY IN WEAPONS SYSTEMS (Glossary) (Part II—Definitions) (2012) [hereinafter DOD DIRECTIVE 3000.09].

6. See Jack Beard, *Autonomous Weapons and Human Responsibilities*, 45 GEO. J. INT'L L. 617, 618–19 (2014) (providing U.S. military officials' public statements supporting the idea that AWS will become a critical component of future military operations).

7. See Wagner, *supra* note 2, at 1382 (describing the U.S. military's use of remotely operated systems such as UAVs and other automated systems that rely on human-input before or after deployment).

8. See James Farrant & Christopher Ford, *Autonomous Weapons and Weapon Reviews: The UK Second International Weapons Review Forum*, 93 INT'L L. STUD. 389, 390–91 (2017) (reviewing the Second International Weapon Review Forum [SIWRF], where State representatives discussed their AWS weapon review responsibilities, and assessing some of the debates from the meetings of the United Nations Certain Conventional Weapons Convention [CCW] which discussed preemptively banning AWS); see also John Markoff, *Report Cites Dangers of Autonomous Weapons*, N.Y. TIMES (Feb. 28, 2016), <https://www.nytimes.com/2016/02/29/technology/report-cites-dangers-of-autonomous-weapons.html> (expressing concerns that AWS will be vulnerable to design flaws and manipulation by adversaries).

and scientists who are concerned that AWS could be uncontrollable and thus illegal under international law.⁹ These concerns reflect skepticism that the advanced artificial intelligence (AI) software, which AWS could potentially use to independently select and engage targets, can be capable of performing consistently with international humanitarian law (IHL).¹⁰ Others are more optimistic that AWS can be adapted into the IHL framework and believe that AWS could actually reduce collateral damage to civilians.¹¹

B. AP I & ARTICLE 36 WEAPONS REVIEWS

The obligation to review new weapons systems for their international legality dates back to the 1868 St. Petersburg Declaration, which required its contracting parties to review weapons' development "to conciliate the necessities of war with the laws of humanity."¹² Today, AP I's signatories are obligated to conduct national weapons reviews in accordance with Article 36 of AP I.¹³ Article 36 requires that whenever a new weapon, means, or method of warfare is studied, developed, acquired, or adopted by a state, the state must review the weapon to ensure that the weapon's use is not prohibited by AP I or any other rule of international law applicable to

9. See Jerry Kaplan, *Robot Weapons: What's the Harm?*, N.Y. TIMES (Aug. 17, 2015), <https://www.nytimes.com/2015/08/17/opinion/robot-weapons-whats-the-harm.html> (discussing the call from scientists for a global ban on offensive AWS that can attack targets without a human decision); see also HUMAN RIGHTS WATCH, LOSING HUMANITY: THE CASE AGAINST KILLER ROBOTS 1–2 (2012), https://www.hrw.org/sites/default/files/reports/arms1112ForUpload_0_0.pdf [hereinafter LOSING HUMANITY] (calling for an international ban on lethal AWS and arguing AWS would pose significant threats to civilians).

10. See Wagner, *supra* note 2, at 1388 (noting the uncertainty that computers using AI will be able to make the transition from conducting quantitative assessments to making qualitative assessments in rapidly changing combat environments).

11. See Kenneth Anderson et al., *Adapting the Law of Armed Conflict to Autonomous Weapons Systems*, 90 INT'L L. STUD. 386, 393 (2014) (arguing that AWS can reduce civilians' risks by making targeting more accurate and by removing human emotional inputs from firing decisions).

12. See Thompson Chengeta, *Are Autonomous Weapons Systems the Subject of Article 36 of Additional Protocol I to the Geneva Conventions?*, 23 U.C. DAVIS J. INT'L L. & POL'Y 65, 68 (2016).

13. See Article 36, *supra* note 4, at 21.

that state.¹⁴ Article 36 reviews focus on a weapon's "normal or expected use" and states are not required to predict all possible misuses of the weapon.¹⁵ Article 36 does not specify how a state is to implement these reviews, leaving the procedural formation of these reviews to each nation.¹⁶ It is a matter of debate whether Article 36 is customary international law that binds non-signatories, like the U.S., with some arguing that Article 36 is binding on all states as a "faithful and responsible" application of international legal obligations.¹⁷

1. Article 36's Applicability to the U.S.

The U.S. may be obligated to comply with AP I's requirements under customary international law.¹⁸ AP I's purpose was to codify international law protecting victims of international armed conflicts and to further develop such law.¹⁹ Many AP I provisions are widely recognized as codifications of existing customary law, and the U.S. has noted that many AP I principles such as the prohibitions against weapons causing superfluous injury and indiscriminate weapons are binding customary law even on non-signatories.²⁰ AP I's provisions are increasingly recognized as customary principles, as evidenced from the growing numbers of AP I ratifications.²¹ Because of this

14. *See id.*

15. Vincent Boulanin, *Implementing Article 36 Weapon Reviews in Light of Increasing Autonomy in Weapon Systems* 4 (SIPRI Insights on Peace & Sec., No. 2015/1, 2015), <https://www.sipri.org/sites/default/files/files/insight/SIPRIInsight1501.pdf> (noting that all weapons can be misused in ways that would be prohibited).

16. *See 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*, 88 INT'L R. RED CROSS 931, 948–49 (2006), https://www.icrc.org/eng/assets/files/other/irrc_864_icrc_geneva.pdf [hereinafter *IRRC Guide*].

17. *See LOSING HUMANITY*, *supra* note 9, at 21–22 (noting the International Committee of the Red Cross's statement from 1987 raising alarms about the risks of partly autonomous weapons).

18. *See id.* at 21 (expressing the viewpoint of some international legal experts that Article 36 has become customary law that is binding on all states).

19. *See* Fausto Pocar, *To What Extent is Protocol I Customary International Law?*, 78 INT'L L. STUD. 337, 338 (2002).

20. *See, e.g.*, U.S. DEP'T OF DEF., OFFICE OF THE GEN. COUNSEL, LAW OF WAR MANUAL § 6.4.1 (2016) [hereinafter U.S. LAW OF WAR MANUAL] (highlighting the prohibition's applicability to all types of weapons and not just automated weapon systems).

21. *See* Pocar, *supra* note 19, at 350–51; *see also* Wagner, *supra* note 2, at 1385

broad acceptance of many AP I principles as customary law, even by the U.S., certain AP I provisions can be binding on the U.S. even though it is not an AP I signatory.²²

Since the U.S. has not officially expressed a legal view regarding the customary law status of all of Article 36's provisions,²³ it is debated whether the U.S. has accepted all of Article 36's requirements as customary law.²⁴ Those arguing that the U.S. has accepted Article 36's provisions as customary law often point to the country's extensive practice of undertaking reviews in which AP I's provisions are merely "the starting point in the process."²⁵ Expressing a contrary view, others remark that it is unclear that Article 36 reflects customary law because although Article 36's provisions themselves are not controversial, some states like the U.S. dispute the obligation to comply with them.²⁶

Despite Article 36's ambiguous customary law status, there is ample evidence of U.S. compliance with the specific provisions of Article 36 that are implicated in AWS reviews. When treaties to which the U.S. is a party ban specific weapons, the U.S. generally follows those prohibitions.²⁷ Additionally the U.S. adheres to the customary

(noting that 174 states have become parties to the AP I, constituting the vast majority of nations).

22. See Pocar, *supra* note 19, at 338 (postulating that states make the law binding by applying it).

23. See Anderson et al., *supra* note 11, at 398 n.27 (noting that Article 36 is widely regarded as customary law with respect to "legal reviews of new means of warfare before their use is generally considered"). The views of some of this article's authors are highly persuasive due to their professional experiences as U.S. national security officials. *Id.*

24. Kenneth Anderson & Matthew Waxman, *Law and Ethics for Autonomous Weapons Systems: Why a Ban Won't Work and How the Laws of War Can*, HOOVER INST. 10 (Apr. 9, 2013), <https://www.hoover.org/research/law-and-ethics-autonomous-weapon-systems-why-ban-wont-work-and-how-laws-war-can> (noting that the U.S. Defense Department's rejection of proposed new weapons is in line with Protocol I's provisions).

25. *Id.*

26. See Darren Stewart, *New Technology and the Law of Armed Conflict*, 87 INT'L L. STUD. 271, 283 (2011).

27. See, e.g., U.S. LAW OF WAR MANUAL § 19.2.1, *supra* note 20 (listing examples of such law of weapons treaties to which the U.S. is a party including The Hague IV Convention, the 1949 Geneva Conventions, the Convention on Certain Conventional Weapons, and various arms control agreements such as the Biological

rules of the Law of Armed Conflict (LOAC) by acknowledging in its military manuals that using such forbidden weapons constitutes war crimes.²⁸ U.S. military manuals also prohibit weapons that cause unnecessary suffering or superfluous injury, a prohibition the U.S. military has explicitly stated is binding.²⁹ Various U.S. military manuals have similarly acknowledged the legal status of AP I's prohibitions against indiscriminate weapons³⁰ and weapons that cause unnecessary, long-term environmental damage.³¹

Although the U.S. has not ratified AP I,³² its actions broadly comply with many of AP I's provisions. For instance, the U.S. has long maintained highly-developed and formalized processes for reviewing new weapons' legality in a manner consistent with Article 36's requirements.³³ Thus, for this Comment's purposes it is useful to refer to Article 36's legal principles when evaluating the U.S. AWS weapons review processes.

Weapons Convention).

28. See, e.g., U.S. NAVY/U.S. MARINE CORPS/U.S. COAST GUARD, THE COMMANDER'S HANDBOOK ON THE LAW OF NAVAL OPERATIONS, NWP 1-14M/MCWP 5-12.1/COMDTPUB P5800.7A §§ 6.1.1, 6.2.6 (2007), http://www.jag.navy.mil/documents/NWP_1-14M_Commanders_Handbook.pdf [hereinafter U.S. NAVAL COMMANDER'S HANDBOOK]. The Naval Commander's Handbook, although not a compilation of customary law, provides strong indications of a norm's customary status. See Schmitt & Thurnher, *supra* note 1, at 234 n.9.

29. See, e.g., U.S. NAVAL COMMANDER'S HANDBOOK § 5.3.4, *supra* note 28 ("The law of armed conflict prohibits the use of arms . . . calculated to cause unnecessary suffering to combatants.").

30. See, e.g., *id.* § 9.1.

31. See *id.* § 8.4 ("Destruction of the natural environment not necessitated by mission accomplishment and carried out wantonly is prohibited."). *But see* Pocar, *supra* note 19, at 348–49 (arguing that the obligation to protect the natural environment had no clear precedent in customary law when AP I was drafted).

32. See George H. Aldrich, *Prospects for the United States Ratification of Additional Protocol I to the 1949 Geneva Conventions*, 85 AM. J. INT'L L. 1, 3–5, 20 (1991) (explaining that the Reagan Administration's rationale for not submitting the Protocol to the Senate for its ratification was rooted in the belief that several of AP I's provisions were flawed in their construction and could benefit terrorist organizations).

33. See Anderson & Waxman, *supra* note 24, at 10.

2. Article 36 Weapons Reviews Elements

States conducting Article 36 weapons reviews must consider the AP I's general principles of IHL.³⁴ Article 36 reviews are typically conducted under a three-step analysis.³⁵ First, a state must determine whether a weapon's use is prohibited or restricted by a specific treaty to which the state is a party or by customary law.³⁶ Second, the reviewing state must examine the weapon's compatibility with AP I's general rules and with customary law.³⁷ Third, if there are no relevant treaties or customary rules, a state must consider the weapon in light of the "Martens Clause," which under its broadest interpretation requires actors in an armed conflict to use weapons consistently with the "principles of humanity" or "the dictates of public conscience."³⁸

Applying the Article 36 weapons review framework to AWS, a review must first consider whether there is a rule that bans or restricts AWS use in a specific weapons treaty to which the state is a party or in international customary law.³⁹ Weapons law generally prohibits some specific weapons, restricts when other weapons may be used, provides for prescriptive action for some weapons, and provides some technical requirements for other weapons.⁴⁰ Because such rules do not exist for AWS, an Article 36 AWS weapons review analysis moves forward to step two to consider the AWS' intended use.⁴¹

Under step two, there are three AP I principles that are generally viewed as requirements in AWS weapons reviews: 1) whether the

34. See Boulanin, *supra* note 15, at 5.

35. See *id.*; see also *IRRC Guide*, *supra* note 16, at 938–39.

36. See *IRRC Guide*, *supra* note 16, at 938, 941–42 (providing examples of weapons that are specifically prohibited or restricted by treaty, including poisonous weapons, biological weapons, and chemical weapons).

37. See Boulanin, *supra* note 15, at 5.

38. See *id.* at 5–6; see also Tyler Evans, Note, *At War with the Robots: Autonomous Weapons Systems and the Martens Clause*, 41 HOFSTRA L. REV. 697, 713–14 (2013) (contrasting the broadest interpretation of the Martens Clause with its narrowest reading, which stands for the proposition that previously existing customary law norms are not proscribed by positive treaty provisions).

39. See Farrant & Ford, *supra* note 8, at 407.

40. See Bill Boothby, *How Will Weapons Reviews Address the Challenges Posed by New Technologies?*, 52 MIL. L. & L. WAR REV. 37, 44 (2013).

41. See Michael Meier, *Lethal Autonomous Weapons Systems (Laws): Conducting a Comprehensive Weapons Review*, 30 TEMP. INT'L & COMP. L.J. 119, 127 (2016).

AWS' intended use inherently causes unnecessary suffering or superfluous injury; 2) whether the AWS is inherently indiscriminate; and 3) whether the AWS might be expected to cause widespread, long-term, and severe damage to the natural environment.⁴² Some have insisted that additional considerations such as proportionality, precautions in attack, and the Martens Clause are required elements.⁴³ However, because of the general consensus surrounding the rules in steps one and two, they will be the only rules this Comment uses to evaluate the U.S. AWS weapons review process.⁴⁴ Unlike the steps one and two rules, which are applicable in all weapons reviews, the Martens Clause considerations from step three are only meant to apply in "cases not covered by [AP I] or by other international agreements."⁴⁵ Because the Martens Clause applies only in treaty law's absence, and weapons' legality is already governed by many sources of treaty law, it appears to be an irrelevant consideration in AWS weapons reviews and will not be considered in this Comment's analysis.⁴⁶

The following three AP I rules listed in step two are considered established principles of customary law.⁴⁷ First, a weapon causes unnecessary suffering or superfluous injury if its normal use produces injuries that are disproportionate to the military advantages gained.⁴⁸ This rule generally prohibits weapons that are designed to deliberately increase the injuries or suffering of targeted individuals beyond the level of military necessity⁴⁹ and the intentional wounding or killing of

42. See Farrant & Ford, *supra* note 8, at 407–08 (describing a consensus that three AP I rules, as well as the rule from step one, are necessary in Article 36 reviews but acknowledging that some commentators have suggested others); see also Meier, *supra* note 41, at 126 (describing an additional fifth consideration of whether there are any likely future developments in LOAC that could affect the weapon being reviewed).

43. See *IRRC Guide*, *supra* note 16, at 945.

44. See Farrant & Ford, *supra* note 8, at 408. Unlike the steps one and two rules, there was disagreement about step three's necessity and it appears to be controversial. *Id.* at 407–08.

45. See Schmitt & Thurnher, *supra* note 1, at 275 n.146.

46. See *id.* at 275.

47. See Jean-Marie Henckaerts, *Study on Customary International Humanitarian Law*, 99 AM. SOC'Y INT'L L. PROC. 423, 426–27 (2005).

48. See Boothby, *supra* note 40, at 42.

49. See U.S. LAW OF WAR MANUAL § 6.6.3, *supra* note 20.

incapacitated or surrendering combatants.⁵⁰ Second, the prohibition against indiscriminate weapons bans weapons that inevitably behave indiscriminately, meaning that they cannot be directed at specific military objectives or their effects cannot be controlled.⁵¹ Third, the rule prohibiting environmental damage bans weapons that are intended to cause long-term environmental damage and prejudice the health of the target's population.⁵²

The third and final step in an Article 36 review is to review the weapon's compatibility with the Martens Clause, although this step is more controversial.⁵³ At the UK Second International Weapon Review Forum, some participants argued that Martens Clause review is unwarranted because the "general revulsion of certain conduct during a conflict does not create a separate legal criterion for the regulation of a weapon."⁵⁴ Because of the lack of consensus regarding whether the Martens Clause is required, it is unlikely to become part of an international review standard. Accordingly, the Martens Clause will not be considered in the following analysis.

C. THE U.S. WEAPONS REVIEW PROCESS AND AWS POLICY

1. *The U.S. AWS Policy*

Under the U.S. Law of War Manual, each U.S. military branch must review new weapons, means, and methods of warfare to ensure their consistency with IHL's requirements.⁵⁵ Since 1974, the U.S. DoD has

50. See Chengeta, *supra* note 12, at 89–90 (clarifying that killing the wounded, or continuously wounding them, causes unnecessary suffering).

51. See Boothby, *supra* note 40, at 43 (describing indiscriminate attacks as when weapons are used that cannot be directed at specific objectives or when it is a weapon's nature to target military and civilian objects without distinction).

52. See *id.* at 43–44 (acknowledging that while the prohibition's criteria have not been clearly defined, the terms "widespread, long-term and severe" are clearly cumulative); *id.* at 44 n.22 (explaining the prohibition's focus on long-term effects, usually over a duration of decades).

53. See *IRRC Guide*, *supra* note 16, at 945 (arguing that the Martens Clause effectively addresses evolving military technologies and should be considered in Article 36 reviews). *But see* Schmitt & Thurnher, *supra* note 1, at 275–76 (pointing out that the Martens Clause is not required in Article 36 AWS reviews because it only applies when there is no relevant treaty law).

54. See Farrant & Ford, *supra* note 8, at 408.

55. See U.S. LAW OF WAR MANUAL § 6.2, *supra* note 20 (requiring weapons to

issued a series of directives implementing this weapons review policy.⁵⁶ The U.S. Law of War Manual notes that LOAC does not prohibit autonomy in weapons systems and lists DoD Directive 3000.09 as the country's governing AWS policy.⁵⁷ DoD Directive 3000.09 directs each U.S. military branch to review AWS compliance with IHL during their development or acquisition.⁵⁸ Besides listing the legal requirements for AWS reviews, DoD Directive 3000.09 also describes the U.S. military's AWS policies.⁵⁹ DoD Directive 3000.09 applies to the "design, development, acquisition, testing, fielding, and employment" of AWS.⁶⁰

DoD Directive 3000.09 explains that it is U.S. policy that "[AWS and semi-AWS] shall be designed to allow commanders and operators to exercise appropriate levels of human judgment over the use of force."⁶¹ Semi-AWS are defined as weapons that use autonomy to engage targets, but which retain human control over targeting decisions.⁶² Specific review procedures are required, including hardware and software verification and validation (V&V); realistic system developmental and operational testing and evaluation (T&E); and training, doctrine and tactics, techniques and procedures (TTPs).⁶³ Reviews are conducted before both formal AWS development and fielding.⁶⁴ Semi-AWS are authorized to apply lethal and non-lethal force and must be designed so that the weapon does not engage targets

meet U.S. requirements and to also be consistent with the law of war).

56. *See id.* § 6.2 n.7 (listing DoD Directive 5000.01 as the current DoD directive mandating weapons reviews); U.S. DEP'T OF DEF., DEPARTMENT OF DEFENSE DIRECTIVE 5000.01, THE DEFENSE ACQUISITION SYSTEM E1.1.15 (2003) (requiring DoD officials to review the consistency of new weapons with applicable domestic law, weapons treaties to which the U.S. is a party, and international agreements).

57. *See* U.S. LAW OF WAR MANUAL §§ 6.5.9, 6.5.9.4, *supra* note 20.

58. *See* DoD DIRECTIVE 3000.09 (2)(a)(1), *supra* note 5 (establishing the applicability of the directive).

59. *See id.* (1)(b) (establishing guidelines meant to "minimize the probability and consequences of failures" in AWS that could lead to "unintended engagements").

60. *See id.* (2)(a)(2), (2)(b) (excluding cyberspace systems, unarmed and unmanned platforms, unguided munitions, laser or wire-guided munitions, mines, and unexploded ordnance).

61. *See id.* (4)(a).

62. *See id.*

63. *See id.* (Enclosure 3)(1)(a)(1–5), (Enclosure 3)(1)(b)(1–6).

64. *See id.*

that were not authorized by a human operator.⁶⁵ AWS are limited to interceptions of time-critical or saturation attacks in situations of local defense, or to apply some forms of non-lethal electronic attacks.⁶⁶ AWS attacks must be human-supervised and AWS are not permitted to select humans as targets in such attacks.⁶⁷ All AWS or semi-AWS uses falling outside of these specifically described uses must be authorized by the U.S. military command and are subject to the review guidelines of DoD Directive 3000.09.⁶⁸

DoD Directive 3000.09 lists the explicit goals of the U.S. AWS policy. Various testing methods are used to ensure that AWS function as expected in operational environments, such as by introducing the weapons into realistic operational environments to face adaptive adversaries like those expected on the battlefield.⁶⁹ The U.S. seeks to ensure that its AWS either function in the timeframe intended by the operator or that they check back with human supervisors before continuing operations.⁷⁰ Measures are taken to ensure that AWS do not fall under the control of unauthorized parties,⁷¹ and that AWS can be supervised and controlled using the human-machine interface.⁷² DoD Directive 3000.09 also requires those operating and commanding AWS to do so with “appropriate care and in accordance with the law of war, applicable treaties, weapon system safety rules, and applicable rules of engagement.”⁷³

65. *See id.* (4)(c)(1).

66. *See id.* (4)(c)(2–3).

67. *See id.* (asserting that AWS can apply non-lethal and non-kinetic force against material targets).

68. *See id.* (4)(c)(2–3) (mandating approval by the Under Secretary of Defense for Policy; the Under Secretary of Defense for Acquisition, Technology, and Logistics; and the Chairman of the Joint Chiefs of Staff for such unauthorized uses).

69. *See id.* (4)(a)(1)(a).

70. *See id.* (4)(a)(1)(b) (making a goal of the AWS review process to stop AWS from operating outside of their engagement parameters to prevent unintended attacks).

71. *See id.* (4)(a)(2) (affirming that AWS hardware and software be designed with safeties, anti-tamper mechanisms, and information assurance systems).

72. *See id.* (4)(a)(3) (insisting that the human-machine interface be understandable, that it provides useful feedback on the AWS status, and that it provides procedures for the operator to toggle AWS functions).

73. *See id.* (4)(b).

2. U.S. Army Review Policy

The U.S. Army review process is applied to AWS weapons reviews in addition to DoD Directive 3000.09.⁷⁴ The Army's review process requires all weapons under development and procurement to be consistent with customary law.⁷⁵ In the Army's review process, a Judge Advocate General (JAG) officer coordinates with the Material Developer multiple times during development to ensure that the weapon is legal and to receive necessary information about the system.⁷⁶ The Material Developer is expected to provide the JAG officer with a general description of the weapon, its mission, and to conduct experiments on the weapons' effects.⁷⁷ The JAG officer conducts the review at all stages, and has the broad authority to request further legal review and information at later stages of development if deemed appropriate.⁷⁸ The Army review process calls for any weapon under development or acquisition to be subjected to legal review.⁷⁹

3. U.S. Navy Review Policy

The U.S. Navy's weapons review process explicitly requires reviewing JAG officers to ensure that the "intended use of such weapons or systems is consistent with domestic and international law."⁸⁰ Like the U.S. Army review process, weapons are reviewed before both development and initial production.⁸¹ The Navy's

74. See generally U.S. DEP'T OF THE ARMY, ARMY REGULATION 27-53, REVIEW OF LEGALITY OF WEAPONS UNDER INTERNATIONAL LAW (1979) [hereinafter ARMY REGULATION 27-53].

75. See *id.* (4)(a)(1-3) (listing specifically the following treaties: the Hague Convention No. IV Respecting the Laws and Customs of War on Land of 1907; the Geneva Protocol on the Prohibition of the Use in War of Asphyxiating, Poisonous, or other Gases, and of Bacteriological Methods of Warfare of 1925; and the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological and Toxin Weapons and on their Destruction of 1972).

76. See *id.* (5)(b)(2-5).

77. See *id.*

78. See *id.* (6)(c)(1-3).

79. See *id.* (7).

80. See U.S. DEP'T OF THE NAVY, SECRETARY OF THE NAVY INSTRUCTION 5000.2E, 1.6. REVIEW OF THE LEGALITY OF WEAPONS UNDER INTERNATIONAL LAW AND REVIEW FOR COMPLIANCE WITH ARMS CONTROL AGREEMENTS 1.6.1 (2011) [hereinafter U.S. NAVY REVIEW POLICY].

81. See *id.* 1.6.1(a)(1).

weapons review process specifically calls for the JAG officer to consider several specific LOAC issues,⁸² including whether the weapon causes unnecessary suffering, whether the weapon is indiscriminate in effect, and whether there is a specific rule of law or treaty that prohibits the weapon's use.⁸³

The JAG officer is delivered a complete description of the system in commonly understood language.⁸⁴ This description includes information such as the weapon's parts list; how the weapon functions; its required manning level; and whether the weapon is self-propelled, mounted, attached to a platform, or portable.⁸⁵ The weapon's concept or method of employment is also provided and such information must be detailed enough to exactly describe how the weapon will be used.⁸⁶ Information about the weapon's accuracy and its impact on the human body and other material objects is transmitted.⁸⁷ Any further information, testing data, and pertinent conclusions are always available for the JAG officer's consideration during the review.⁸⁸

4. U.S. Air Force Review Policy

The U.S. Air Force's weapons review process delegates to a JAG officer the responsibility to ensure that all weapons being developed or acquired are consistent with LOAC and domestic law.⁸⁹ JAG officers are supervised to ensure that new weapons are reviewed at the "earliest possible stage," and the JAG officer is given information about the weapon's accuracy and lethal characteristics.⁹⁰

82. *See id.* 1.6.1(a)(2).

83. *See id.* 1.6.1(a)(2)(a-c) (facilitating review by requiring the command initiating the review to deliver a memorandum addressing the weapon's planned use and functions).

84. *See id.* 1.6.1(a)(2)(c).

85. *See id.* 1.6.1(a)(2)(c)(1).

86. *See id.* 1.6.1(a)(2)(c)(2).

87. *See id.* 1.6.1(a)(2)(c)(3-4) (specifying that when considering a weapon's accuracy, it must be compared to similar weapons that have already been reviewed).

88. *See id.* 1.6.1(a)(2)(c)(5).

89. *See* U.S. DEP'T OF THE AIR FORCE, AIR FORCE INSTRUCTION 51-402, LEGAL REVIEW OF WEAPONS AND CYBER CAPABILITIES 1.1.1. (2011) (noting a different process for Special Access Programs weapons, which are reviewed in coordination with the General Counsel) [hereinafter AIR FORCE INSTRUCTION 51-402].

90. *See id.* 1.5.1.

Upon the JAG officer's request, Air Force personnel are required to provide the weapon's general description, its intended use, and its reasonably anticipated effects of employment.⁹¹ The scope of a weapon's reasonably anticipated effects of use includes all relevant tests, computer modeling, laboratory studies, and technical analysis that can contribute to the JAG officer's assessment.⁹² During the review, the JAG officer must consider whether a specific rule of law prohibits or restricts the weapon's use, whether the weapon causes superfluous injury, and whether the weapon is indiscriminate in effect.⁹³

III. ANALYSIS

This Comment will now apply the four Article 36 principles to the AWS policies and weapons review processes of the U.S. military branches to evaluate whether their AWS weapons review processes comply with Article 36's requirements. This analysis will consider 1) whether the U.S. weapons review processes require reviewing officers to check for weapon prohibitions in existing treaties to which the U.S. is a party and in customary law, 2) whether they apply the prohibition against weapons causing unnecessary suffering and superfluous injury, 3) whether they apply the prohibition against indiscriminate weapons, and 4) whether they apply the prohibition against weapons that cause long-term damage to the environment.

A. APPLYING ARTICLE 36 PRINCIPLES TO U.S. AWS WEAPONS REVIEWS

DoD Directive 3000.09 supplements the weapons review processes of the U.S. military branches and guides them through AWS weapons reviews.⁹⁴ This Part evaluates the U.S. weapons review processes and

91. *See id.* 2.1.1–2.1.3.

92. *See id.*

93. *See id.* 3.1.1–3.1.2.

94. *See* DOD DIRECTIVE 3000.09 (Enclosure 1)(1)(a–b), *supra* note 5 (establishing developmental policies, responsibilities, and guidelines to avoid unintended consequences that violate international law); *see also* U.S. NAVY REVIEW POLICY 1.6.1, *supra* note 80 (presenting the general weapons review process of the U.S. Navy); AIR FORCE INSTRUCTION 51-402 1.1.1, *supra* note 89 (furnishing the U.S. Air Force's general weapons review process); ARMY REGULATION 27-53

AWS policy for their consistency with Article 36's principles.

1. Weapon-Specific Treaties or Customary Law Prohibitions or Restrictions in the U.S. AWS Review Process

As required by Article 36, each U.S. military branch's weapons review process asks the reviewing JAG officers to consider whether there is a weapons treaty to which the U.S. is a party or a rule of customary law that prohibits AWS or a manner of AWS use.⁹⁵ Each U.S. military branch's weapons review process is compliant with this rule, with each process containing a provision that explicitly requires JAG officers to ensure that the weapon and its intended use are consistent with U.S. treaty obligations regulating specific weapons and customary law.⁹⁶ For example, the U.S. Army's review policy specifically lists the principles of the Hague IV Convention respecting the Laws and Customs of War on Land, the Geneva Protocol of 1927, and the Biological Weapons Convention as being vital reference points during weapons reviews.⁹⁷ DoD Directive 3000.09 is also consistent with this Article 36 principle, with its guidelines calling for JAG officers to consider the AWS compliance with customary LOAC and specific weapons treaties to which the U.S. is a party.⁹⁸ Combined, the U.S. military branches' weapons review processes and DoD Directive 3000.09 ensure that specific weapons treaties applicable to the U.S. and customary law are considered during AWS weapons reviews as required by Article 36.

(4)(a), *supra* note 74 (providing the U.S. Army's general weapons review process that is applicable to all weapons).

95. *See* Farrant & Ford, *supra* note 8, at 407–08 (listing the consensus elements of an Article 36 weapons review analysis, which consists of the rules from steps one and two discussed above).

96. *See, e.g.*, ARMY REGULATION 27-53 (4)(a), *supra* note 74 (demanding the consistency of weapons under development and procurement with U.S. obligations under all applicable weapons treaties and customary law).

97. *See id.*

98. *See* DoD DIRECTIVE 3000.09 (Enclosure 3)(b)(1), *supra* note 5 (requiring various levels of U.S. military command to ensure that JAG officers assess AWS compatibility with all applicable treaties that are binding on the U.S., the law of war, weapon system safety rules, and any applicable rules of engagement).

2. *The Prohibition Against Unnecessary Suffering and Superfluous Injury in the U.S. AWS Review Process*

The U.S. AWS weapons review processes require AWS to not cause unnecessary suffering or superfluous injury, a fundamental aspect of Article 36 compliance.⁹⁹ The U.S. Navy's weapons review process is the only U.S. military branch review process that explicitly requires a consideration of whether the weapon under review causes unnecessary suffering.¹⁰⁰ The U.S. Army's and U.S. Air Force's weapons review processes implicitly meet this requirement by requiring all weapons to be consistent with the LOAC, part of which prohibits weapons that cause unnecessary suffering or superfluous injury.¹⁰¹

The Navy's review process requires the Navy command initiating the review to send to the reviewing JAG officer a memorandum with the necessary information about the weapon's functions, including the weapon's final approved concept of operation.¹⁰² By sending the JAG officer all of the information describing the weapon's parts, its intended uses, its accuracy, and the ballistics information on how it impacts the human body, the JAG officer will have the information needed to determine whether the weapon causes unnecessary suffering or superfluous injury in its intended use.¹⁰³ This requirement ensures

99. See Farrant & Ford, *supra* note 8, at 407 (listing the prohibition against weapons causing unnecessary suffering and superfluous injury as a vital issue in Article 36 weapons reviews); see also Chengeta, *supra* note 12, at 82 (emphasizing the prohibition against unnecessary suffering and superfluous injury's importance in weapons reviews as a basic tenant of IHL, and especially in AWS Article 36 reviews, although it becomes more difficult to apply the principles to AWS).

100. See U.S. NAVY REVIEW POLICY 1.6.1(a)(2)(a), *supra* note 80 (the reviewing JAG officer must consider whether weapons cause unnecessary suffering disproportionate to their military advantage).

101. See AIR FORCE INSTRUCTION 51-402 3.1.2.1, *supra* note 89 (explicitly calling for consideration of whether the weapon is calculated to cause superfluous injury in a manner that violates The Hague Convention IV); see also ARMY REGULATION 27-53 (4)(a), *supra* note 74 (requiring all weapons under development or acquired through procurement to be consistent with both customary law and weapons treaties to which the U.S. is a party). As a fundamental principle of LOAC, it is unlikely that the U.S. Air Force and the U.S. Army do not integrate this consideration into their assessment of a weapon's legality under customary international law. Chengeta, *supra* note 12, at 85 ("The prohibition of weapons that cause unnecessary suffering is a customary international law rule.").

102. See U.S. NAVY REVIEW POLICY 1.6.1(a)(2)(a), *supra* note 80.

103. See *id.* 1.6.1(a)(2)(c)(1-4). In addition to this required information, the Navy

that the JAG officer can determine whether the AWS will injure combatants beyond militarily necessary levels or will illegally target incapacitated or surrendering combatants. Ballistics testing would show whether the AWS' use needlessly increases suffering, and the AWS' described use can help the JAG officer determine whether the AWS has the technical ability to identify valid targets and if the AWS' intended use extends to situations where such distinctions are necessary.

AWS critics often argue that AWS will be technically unable to distinguish between incapacitated or surrendering enemies and legitimate targets and will thus cause unnecessary suffering.¹⁰⁴ However, no technical barrier exists that makes it impossible for AWS to be programmed to recognize when combatants are severely injured or surrendering. Skepticism of the ability of AWS AI to conduct subjective analysis is warranted, but these technical weaknesses of AI can be managed to reduce their negative effects by using default programming and carefully crafted rules of engagement.¹⁰⁵ AWS use could also be limited to specific battlefield environments thereby minimizing concerns about their ability to distinguish between different types of human targets.¹⁰⁶

DoD Directive 3000.09 shows how the U.S. military intends to prevent AWS from causing unnecessary suffering or superfluous injury and provides sufficient safeguards if the policy is rigorously implemented as described. DoD Directive 3000.09 requires AWS

command may also send any additional information and data which could be pertinent to the JAG officer's evaluation of any LOAC issues. *Id.* 1.6.1(a)(2)(c)(5).

104. See LOSING HUMANITY, *supra* note 9, at 34–35 (discussing how determining military necessity requires a subjective analysis of the practical requirements of the potential course of action and assessment of whether the potential course of action exposes civilians to unreasonable risks).

105. See Christopher Toscano, "Friend of Humans": An Argument for Developing Autonomous Weapons Systems, 8 J. NAT'L SEC. L. & POL'Y 189, 211 (2015) (acknowledging that AI technology has not evolved to the stage where AWS are able to conduct complex subjective analysis, but pointing out that this can be overcome by careful default programming and restrictions on the use of force using rules of engagement).

106. See Anderson et al., *supra* note 11, at 389–90 (discussing how current weapons systems are unable to estimate potential harm to civilians and that while some AWS exist, their use is limited to contexts where humans are able to override their operation).

designs that allow AWS commanders and operators to “retain appropriate levels of human judgment over the use of force,” as well as AWS designs that provide the capability to operators to override AWS use of force or control when force is used.¹⁰⁷ This type of oversight system is similar to the oversight systems currently used in some U.S. highly-automated weapons systems, which are not considered to be illegal under IHL.¹⁰⁸ Giving such discretion to a human operator ensures that injured combatants do not needlessly suffer at the hands of AWS, and that surrendering combatants are not attacked by AWS accidentally. Combined with the toggling capabilities described by DoD Directive 3000.09, operators can prevent AWS from causing unnecessary suffering to enemy combatants if AWS appear to be on the verge violating the law.¹⁰⁹

There are valid concerns that human operators might be unable to react quickly enough to prevent AWS from attacking injured or surrendering combatants.¹¹⁰ Some AWS may not allow for human intervention to take place before the AWS acts due to the AWS’ quick reaction time or the presence of multiple weapons systems that an operator would have to simultaneously oversee.¹¹¹ There is also some concerning evidence that even if human operators can intervene to override AWS actions, they might become psychologically disinclined to overturn the AWS decisions because they trust the AWS’ judgment more than their own.¹¹² Although these problems might seem to

107. See DOD DIRECTIVE 3000.09 (4)(a), *supra* note 5.

108. See Kenneth Anderson et al., *supra* note 11, at 389–90 (mentioning how humans are able to override and control the operation of AWS like the U.S Patriot and Phalanx systems and Israel’s Iron Dome missile system).

109. See DOD DIRECTIVE 3000.09 (2)(3)(c), *supra* note 5 (calling for the creation of procedures that allow AWS operators to activate and deactivate AWS functions).

110. See Allyson A. Hauptman, *Autonomous Weapons and the Law of Armed Conflict*, 218 MIL. L. REV. 170, 186 (2013) (discussing how it may be impossible for a human operator to override an autonomous weapon’s decisions because of a human’s slow reaction time and his or her inability to adequately monitor multiple weapons simultaneously).

111. See *id.* (describing the U.S. Navy’s C-RAM autonomous defense system and acknowledging that the weapon’s fast reaction time and multiple weapons make it difficult for human operators to take any necessary corrective actions).

112. See Rebecca Crootof, *The Killer Robots Are Here: Legal and Policy Implications*, 36 CARDOZO L. REV. 1837, 1860 (2015) (discussing operators’ psychological reluctance to override AWS’ decisions and advocating for the creation of oversight systems that ensure AWS operators have appropriate response times to

suggest that human oversight over AWS would not be effective, these problems are the result of the weaknesses in specific oversight systems, rather than an insurmountable technical barrier preventing all human oversight of AWS. It is conceivable that an AWS oversight system can be created which addresses this weakness, for example by having a preset default to consider such persons as civilians.¹¹³

DoD Directive 3000.09 minimizes the probability of AWS causing unnecessary suffering or superfluous injury by limiting their use to scenarios of local defense of manned installations and platforms and preventing AWS targeting of humans.¹¹⁴ In these scenarios it is mostly unnecessary for AWS to have the ability to distinguish between injured or surrendering enemy combatants and attacking foes, one of the frequently raised concerns about AWS as discussed above, because the AWS targets are not human.¹¹⁵ Because of humans' exclusion as valid targets, AWS would only need to be able to recognize incoming projectiles, which is a more technically realistic task, and the ability to analyze different types of human behavior or injury severity would be irrelevant.

Further, in such situations, there is a lack of alternative means to achieve the same military objectives.¹¹⁶ In situations of local defense, AWS provide an invaluable and unique military advantage due to their speed and accuracy.¹¹⁷ In time-sensitive situations of local defense, AWS' characteristics such as superior targeting speed and accuracy

consider AWS actions).

113. See Toscano, *supra* note 105, at 211–12 (discussing how although the technology behind AWS has not developed to a point where AWS have the ability to evaluate the reasonableness of their actions, military lawyers, developers, and operational professionals are currently working on this issue).

114. DOD DIRECTIVE 3000.09 (4)(c)(2)(a–b), *supra* note 5 (“Human-supervised [AWS] may be used to select and engage targets, with the exception of selecting humans as targets. . .”).

115. See Chengeta, *supra* note 12, at 91 (expressing doubt that AWS will be able to reasonably evaluate different types of human behavior and the severity of a person's injuries and arguing that only humans can make these evaluations).

116. See *id.* (listing the availability of alternative means as a factor which should be considered when making a determination of whether a weapon violates the prohibition against unnecessary suffering and superfluous injury).

117. See DoD DIRECTIVE 3000.09 (4)(c)(2), *supra* note 5 (limiting U.S. AWS use to “local defense to intercept time-critical or saturation attacks” against non-human targets).

could be the only possible way to defend manned installations or platforms from certain types of dangers, such as large numbers of incoming projectiles or other autonomous systems.¹¹⁸ These methods of use are similar to the current uses of several highly-automated weapons systems of the U.S. military like the U.S. Patriot and Phalanx anti-missile systems.¹¹⁹ These weapons are used in naval defense environments against other machines where there are few risks to civilians.¹²⁰ These weapons systems can arguably be called AWS and they serve as examples of how fully AWS could be legally used to confront otherwise insurmountable threats. In these scenarios, AWS' injuries would not be disproportionate to their military advantages, and AWS use would not violate the rule against unnecessary suffering and superfluous injury. By maintaining controls over and limiting AWS use, the U.S. AWS weapons review processes can avoid violating the unnecessary suffering and superfluous injury rule.

3. The Prohibition Against Indiscriminate Weapons in the U.S. AWS Review Process

The U.S. AWS weapons review processes ensure that AWS do not function indiscriminately in their intended use, as Article 36 requires.¹²¹ The Air Force's and Navy's weapons review processes facially comply with this rule by explicitly requiring that weapons not be indiscriminate, while the Army's review process ensures compliance by requiring that weapons be consistent with the customary LOAC, which includes the prohibition on indiscriminate weapons.¹²² Thus, the U.S. military branches' weapons review

118. See Anderson et al., *supra* note 11, at 390 (discussing the unique military benefits of automated weapons, which are more precise than human operated weapons, and which can assess, calculate, and respond more quickly than humans). In future battlefield environments, likely increases in weapons' automation suggests that increased response time will be vital to military success. *Id.* at 390.

119. See *id.* at 389–90 (discussing the U.S. Patriot and Phalanx anti-missile systems).

120. *Id.*

121. See Farrant & Ford, *supra* note 8, at 408 (listing the prohibition against indiscriminate weapons as a fundamental element of Article 36 reviews).

122. See U.S. NAVY REVIEW POLICY 1.6.1(a)(2)(b), *supra* note 80 (requiring consideration of whether the weapon can be controlled so that it can be aimed at lawful targets); see also AIR FORCE INSTRUCTION 51-402 3.1.2.2, *supra* note 89 (asking JAG officers to consider whether the weapon can be directed at identifiable

processes meet this Article 36 rule either explicitly, or implicitly by requiring compliance with LOAC.¹²³

DoD Directive 3000.09 further ensures AWS are not indiscriminate in effect.¹²⁴ By limiting AWS to situations of local defense, DoD Directive 3000.09 limits AWS to the areas necessary to defend manned installations and platforms.¹²⁵ Thus, under U.S. AWS policy AWS will not be deployed to offensively target humans and are limited to situations where they likely can be directed solely against valid military targets and would be under human supervision.¹²⁶

The U.S. AWS policy's compliance with the rule against indiscriminate weapons is dependent upon AWS' technical performance. Accordingly, DoD Directive 3000.09 takes significant steps to ensure that AWS perform as expected. DoD Directive 3000.09 seeks to ensure that AWS perform as expected through a series of

military objectives, or if not, whether the weapon affects civilian and military objects without distinction); ARMY REGULATION 27-53 (4)(a), *supra* note 74 (expecting JAG officers to ensure new weapons are consistent with U.S. weapons treaty obligations and customary international law); Chengeta, *supra* note 12, at 94 (describing the prohibition against indiscriminate weapons as being part of customary international law).

123. See U.S. NAVY REVIEW POLICY 1.6.1(a)(2)(b), *supra* note 80 (specifically prohibiting indiscriminate weapons); see also AIR FORCE INSTRUCTION 51-402 3.1.2.2, *supra* note 89 (emphasizing the need to review whether a weapon is indiscriminate when determining if the weapon is in accordance with international law and custom); ARMY REGULATION 27-53 (4)(a), *supra* note 74 (implicitly forbidding indiscriminate weapons by requiring weapons to be consistent with customary international law).

124. DoD Directive 3000.09 does not explicitly list the prohibition against indiscriminate weapons as a factor which must be considered during weapon reviews, but rather indirectly ensures compliance with the prohibition by limiting AWS use to certain situations. See DoD DIRECTIVE 3000.09 (4)(c)(2)(a-b), *supra* note 5 (limiting approved AWS use to circumstances of defense of manned installations and platforms, while any other methods of use must undergo scrutiny by high level DoD officials).

125. See *id.* (2)(c)(2)(a-b).

126. See *id.* (4)(c)(2)(a-b). Besides limiting AWS use to only certain defensive situations, AWS use falling outside of such situations must be approved twice by the Under Secretary of Defense for Policy; the Under Secretary of Defense for Acquisition, Technology, and Logistics; and the Chairman of the Joint Chiefs of Staff under the same guidelines used in the typical AWS review process. See *id.* (4)(d).

V&V and T&E guidelines.¹²⁷ Although the directive does not fully explain the details of these testing methods, it does describe the analysis of emergent AWS behaviors and repeated testing after any system modifications to prevent the degradation of the AWS safety features.¹²⁸ These testing methods are meant to address some of the concerns about AWS like unanticipated emergent behavior caused by complex operational environments.¹²⁹ By requiring rigorous hardware and software V&V and operational T&E based on simulations of real operational environments, it seems likely that in the limited authorized situations of AWS use such extensive testing could ensure that AWS targeting systems do not function indiscriminately.¹³⁰ Although some might express skepticism that testing could prevent emergent behavior,¹³¹ occasional AWS failures and errors would not make them

127. *See id.* (Enclosure 2)(a–b) (stating that AWS systems go through rigorous software and technology development, analysis of unanticipated behavior, and operational and evaluation testing to help reduce dangers of the system malfunctioning).

128. *See id.* The automated regression testing tools are to be used when possible to identify any new operating states in the AWS, and if new operating states are identified then further testing will seek to understand the system's features in the new operating states. *See id.* (Enclosure 2)(b)(1). Under the policy, changes to the AWS state transition matrix may require follow-on T&E of the whole system. *See id.* (Enclosure 2)(a)(b)(2).

129. *See id.* (Enclosure 2)(a) (listing V&V and T&E as the testing methods by which AWS emergent behavior can be identified and analyzed in U.S. AWS reviews).

130. *See id.* There are admitted difficulties in ensuring that the complex software that AWS would use runs as intended, and AWS critics are rightly skeptical of the U.S. military's ability to predict how AWS software will impact their behavior. *See* Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CAL. L. REV. 513, 534 (2015) (explaining the difficulties of predicting how robots will behave because robots can behave very differently based on small differences in their software and code). A solution reached by AI may be unforeseeable to humans because it is produced by a process that substantially deviates from human cognitive processes. *See e.g.*, Matthew Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J.L. & TECH. 353, 363–67 (2016) (identifying characteristics of AI that pose particular challenges to the international legal system, especially noting the issues of foreseeability and control over AI; experts must address these issues moving forward).

131. *See* Alan Schuller, *At the Crossroads of Control: The Intersection of Artificial Intelligence in Autonomous Weapons Systems with International Humanitarian Law*, 8 HARV. NAT'L SEC. J. 379, 395 (2017) (arguing that even today's computers have so many lines of code that the identification of defects is impractical or impossible, making it clear that testing will not guarantee AWS'

indiscriminate in effect; weapons systems must not always function as expected, and occasional malfunctioning of AWS would not violate the rule.¹³² So long as these testing procedures establish that the AWS is not indiscriminate in its normal use, then the review process can be compliant with Article 36.¹³³

4. The Prohibition Against Severe, Long-Term, & Widespread Environmental Damage in the U.S. AWS Review Process

The U.S. AWS weapons review processes can ensure that AWS do not cause long-term, widespread, or severe damage to the natural environment in contravention of Article 36. The U.S. Army's weapons review process requires JAG officers to ensure that weapons do not violate customary law, explicitly mentioning treaties prohibiting toxic and poisonous weapons.¹³⁴ The U.S. Navy's weapons review process provides environmental protections by requiring weapons' consistency with the LOAC, of which environmental protections are a part.¹³⁵ The U.S. Air Force's weapons review process also requires

behavior is predictable). *But see* Anderson et al., *supra* note 11, at 395 (countering similar arguments with the response that even if not all of a software's programming is understood, a general understanding of the system's operating parameters, its general capabilities, and its limitations can still be understood). Anderson et al. emphasize the law's focus on the evaluation of whether the weapon is inherently unlawful and the conduct of the AWS commander or operator. *See* Anderson et al., *supra* note 11, at 395.

132. *See* Chengeta, *supra* note 12, at 96 (arguing that the while the rule does appear to prohibit indiscriminate weapons in some instances, it does not necessarily prohibit weapons that are rendered imprecise by unforeseeable system malfunctioning or reconfiguration of a system).

133. *See* DOD DIRECTIVE 3000.09 (Enclosure 2)(a)(b)(1–2), *supra* note 5 (describing broadly the V&V and T&E guidelines in U.S. AWS weapons reviews); Schmitt & Thurnher, *supra* note 1, at 249 (“An autonomous weapon system only violates the prohibition against weapons incapable of being directed at a lawful target if there are no circumstances, given its intended use, in which it can be used discriminately.”).

134. *See* ARMY REGULATION 27-53 (4)(a)(2–3), *supra* note 74 (listing, for example, the Geneva Protocol on the Prohibition of the Use in War of Asphyxiating, Poisonous, or other Gases, and of Bacteriological Methods of Warfare of 1925 and the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological and Toxin Weapons and on their Destruction of 1972).

135. *See* U.S. NAVY REVIEW POLICY 1.6.1(a)(2)(a–c), *supra* note 80 (discussing how the Navy examines whether there is a rule of international law or customary international law prohibiting the use of an AWS); *see also* Antoine Bouvier,

JAG officers to ensure all weapons' compliance with the LOAC and customary IHL, ensuring environmental protections.¹³⁶ Thus, the U.S. military branches' weapons review processes implicitly provide environmental protections during armed conflict by requiring weapons' consistency with the LOAC.

With specific regard to AWS, DoD Directive 3000.09's provisions could ensure that AWS do not inflict long-term damage on the environment. DoD Directive 3000.09 explicitly requires the review of AWS compliance with the LOAC, under which some environmental protections are included.¹³⁷ These customary environmental rules act to protect both the natural environment and the health interests of citizens in the environment.¹³⁸ During a review it would be possible to ensure that AWS do not have toxic components that cause long-term damage to the environment, which constitutes a significant aspect of these environmental concerns.¹³⁹ The operational requirement that AWS must "complete engagements in a timeframe consistent with commander and operator intentions and, if unable to do so, terminate engagements," could ensure that AWS do not function in a way that effectively prevents noncombatants use of the environment, in a manner similar to land mines, which prevent an area's use due to the danger they pose.¹⁴⁰ Together, each U.S. branches' weapons review process and the U.S. AWS policy can ensure that AWS do not cause long-term environmental damage. Overall, analysis of the U.S.

Protection of the Natural Environment in Time of Armed Conflict, INT'L REV. RED CROSS No. 285 (1991) (mentioning how provisions providing environmental protections in multiple assorted international treaties are now included in international customary law).

136. See AIR FORCE INSTRUCTION 51-402 3.1.1.1, *supra* note 89.

137. See DOD DIRECTIVE 3000.09 (Enclosure 3)(1)(b)(1), *supra* note 5; see also Bouvier, *supra* note 135 (arguing that environmental protections have become part of customary LOAC).

138. See Bouvier, *supra* note 135.

139. See Justin McClelland, *The Review of Weapons in Accordance with Article 36 of Additional Protocol I*, 85 INT'L REV. RED CROSS 397, 409 (2003) (stating that the main area of environmental concern in Article 36 weapons reviews would likely revolve around toxic weapon components which could contaminate the environment for a period of years).

140. See DOD DIRECTIVE 3000.09 (4)(1)(b), *supra* note 5; see also Bouvier, *supra* note 135 (using the example of unexploded mines and projectiles on WWI and WWII battlefields as an example of weapons making an environment dangerous and unfit for cultivation).

weapons review process and AWS policies shows that the U.S. AWS weapons review process can meet the requirements of Article 36 and support the establishment of an international standard.

IV. RECOMMENDATIONS

It is difficult to evaluate the U.S. weapons review processes with perfect certainty because the sensitive nature of the information involved causes a lack of transparency. However, given the information that the U.S. has publicly released, several recommendations can be made to bring the U.S. weapons review processes into greater compliance with the Article 36 international review standard.

A. STRONGER ENVIRONMENTAL PROTECTIONS

The U.S. should provide more explicit protections to the natural environment in its weapons review processes to ensure their compliance with the Article 36 standard. The U.S. does not explicitly mention environmental protections in its weapons review processes, and any consistency with this Article 36 requirement stems from the U.S. weapons review processes' provisions requiring compliance with customary law.¹⁴¹ The customary law status of this Article 36 requirement is less clear cut than the others in steps one and two, and the U.S. has expressed skepticism that extensive natural environmental protections are a part of the customary law.¹⁴² In order to ensure greater compliance with the Article 36 standard, the U.S. weapons review processes should recognize environmental protections as part of the customary law and specifically include provisions that explicitly require reviewing military lawyers to check and ensure AWS parts are non-toxic and that their intended methods of use will not cause long-term environmental damage.

141. See U.S. NAVY REVIEW POLICY 1.6.1(a)(2), *supra* note 80; see also AIR FORCE INSTRUCTION 51-402 3.1.1.1, *supra* note 89; ARMY REGULATION 27-53 (4)(a), *supra* note 74.

142. See U.S. LAW OF WAR MANUAL §6.10.3.1, *supra* note 20.

B. SHIFTING THE DEBATE ON AWS REGULATION FROM HUMAN CONTROL ISSUES TO SOFTWARE TESTING

When considering its AWS weapons review processes the U.S. should shift away from debates regarding the appropriate level of human oversight and control over the AWS and focus more on software testing. While the U.S. has already made essential efforts to guarantee that AWS will remain controlled by humans, the more technically challenging area of software testing has not been as thoroughly dealt with. Many of the military advantages of AWS would come from their having more automation and less human oversight.¹⁴³ Because AI will likely need to be utilized to allow AWS to reach their fully autonomous potential, it is important to ensure that this software can be rigorously tested to make AWS actions as foreseeable and controllable as possible.¹⁴⁴

A weapons review for AWS must show that the AWS can be reasonably expected to attack targets that humans have determined are valid.¹⁴⁵ The key to controlling AWS is ensuring that they are given tasks that they can reasonably be expected to perform.¹⁴⁶ I recommend a useful framework for developing and using AWS, developed by Alan Schuller, that allows AWS to remain controllable while also maintaining minimal levels of human oversight, which could be an effective way to consider the problem of AWS. According to Schuller, while developing and reviewing AWS, the relevant variables an AWS can expect to encounter in an uncertain environment should be catalogued.¹⁴⁷ Once these variables have been determined, then the variables the AWS can be expected to observe that are also relevant to

143. See Anderson et al., *supra* note 11, at 389–90 (describing how autonomy provides AWS with speed and accuracy).

144. See Scherer, *supra* note 130, at 363.

145. See Schuller, *supra* note 131, at 416 (arguing that while it is important for a human to make the determination that a target is a valid military objective, it is the testing and design of AWS that is the key to their legality).

146. See *id.* at 418.

147. See *id.* (stressing that because AWS will likely be technically unable to account for all battlefield variables it is crucial when programming AWS to prioritize the recognition of any environmental factors that are particularly relevant from an IHL perspective).

IHL must be defined.¹⁴⁸ Last is a determination of which of the observable and IHL-relevant variables the AWS can encounter will be affected by the AWS AI system.¹⁴⁹ From this evaluation a more limited set of variables can be identified that can be programmed to evaluate the probability of certain outcomes compared to the expected utility of particular actions.¹⁵⁰ By ensuring that AWS operate in a manner that is foreseeable and controllable, a larger emphasis on software testing in the U.S. weapons review processes will increase the probability that its AWS are compliant with the prohibitions on unnecessary suffering, superfluous injury, and indiscriminate attacks, and thus increase the weapon review processes' consistency with the Article 36 standard.

C. INCREASED FOCUS ON SITUATIONAL RESTRICTIONS FOR AWS USE

The U.S. weapons review processes and policy should place further emphasis upon situational limitations on AWS use. Because AWS may act unpredictably in some environments due to technical weaknesses, the legality of AWS is highly dependent upon the environment in which the AWS are sent to operate. AWS are specifically programmed to be reasonably expected to operate in a certain environment and deploying an AWS into an environment that it is unequipped to navigate due to a lack of understanding about the AWS' limitations could cause unpredictable AWS behavior and potential liability for its actions. To ensure that AWS' behavior is as predictable as possible, their use needs to be highly regulated and limited to the environments in which they were designed and programmed to operate. These operating environments should be environments where the AWS' technical capabilities can be reasonably expected to be successful.¹⁵¹

A procedural system where AWS authorization is subject to multiple levels of review by those who are intimately familiar with the

148. *See id.*

149. *See id.*

150. *See id.*

151. *See* Schmitt & Thurnher, *supra* note 1, at 280 (noting that the responsibility for appropriate AWS use will always remain with the AWS human operators and commanders, so that misuse of the AWS will be dependent upon their decisions to use AWS in certain environments).

capabilities and limitations of the specific AWS would be ideal and would help ensure that AWS are used in a legal manner. Because such a system could be administratively burdensome and militarily unrealistic, it could be limited to situations of future offensive AWS use where commanders might be more likely to misjudge the capabilities of the AWS to act lawfully in a given environment. By explicitly limiting AWS use to situations where AWS can be expected to be successful, the U.S. weapons review processes can be more consistent with Article 36's prohibitions against unnecessary suffering, superfluous injury, and indiscriminate attacks.

V. CONCLUSION

Analysis of the publicly available U.S. AWS policies and weapons review processes shows that the U.S. can meet the requirements of Article 36 of AP I to the Geneva Conventions. Although the U.S. is not a signatory to the AP I, its extensive weapons review practices and their consistency with Article 36's requirements make the U.S. at least arguably compliant with Article 36. Combined, the U.S. AWS policy and weapons review processes can ensure that AWS do not violate existing weapons treaties or customary law; that AWS do not cause unnecessary suffering or superfluous injury; that AWS are not indiscriminate; and that AWS do not cause long-term, widespread, and severe damage to the natural environment. If the U.S. improves its weapons review process by explicitly protecting the natural environment, focusing more resources on software testing, and rigorously reviewing the training and concepts of use for AWS, then it is possible for its AWS weapons reviews to pass the muster of an Article 36 review. These conclusions are conditional, however, on the U.S. following its public stances on AWS use. Because much of the analysis in this Comment is based upon assumptions that the U.S. will follow its policy statements in practice, deviation from these policy statements and review processes could result in AWS that would not pass Article 36's requirements.

U.S. compliance with Article 36's provisions is vital for the establishment of an international standard that effectively regulates AWS. Article 36's provisions codify several of the fundamental rules of IHL into a weapons review process framework, so that compliance with Article 36's provisions would reflect the ability of AWS to be

used consistently with the fundamental norms of IHL. If AWS are going to be used, it is crucial that their use fits within these IHL norms. Compliance with Article 36 is thus necessary to establish an international standard for AWS regulation that adapts the modern laws of war to weapons of the future.

It is of the utmost importance for AWS weapons review processes to be specifically tailored to meet the challenges of AWS. Because of expected growth in AWS technology in the future and the significant military benefits that such weapons will provide, it is likely that some countries will attempt to use AWS. With such weapons entering the battlefield, it is vital for the U.S., as a foundational supporter and advocate of IHL, to proactively shape the international legal norms surrounding AWS use so that their introduction to the battlefield does not undermine international law. Creating, implementing, and sharing weapons review processes that ensure that AWS are consistent with international law is a way for the U.S. to shape tomorrow's battlefield today.