

# LETHAL AUTONOMOUS WEAPONS SYSTEMS (LAWS): CONDUCTING A COMPREHENSIVE WEAPONS REVIEW

*By Michael W. Meier\**

## I. INTRODUCTION

Beginning in November 2012 with the publication of the Department of Defense (DoD) Directive 3000.9, *Autonomy in Weapons Systems*,<sup>1</sup> and *Losing Humanity*,<sup>2</sup> by Human Rights Watch, lethal autonomous weapons systems (LAWS) have become an issue of national and international attention. With almost daily articles and commentary, including letters by notable scientists, debating the advantages and disadvantages of developing and fielding these systems,<sup>3</sup> the public has become generally more aware of the issues related to autonomy, but it has often had to filter through the highly sensationalized terms and visualizations used by some—think references to “killer robots” and movie trailer clips of James Cameron’s 1984 science fiction thriller “The Terminator.”<sup>4</sup> Issues with the media aside, consideration about weapons with automated functions has received serious attention at the international level through the framework of the Convention on Certain Conventional Weapons (CCW).<sup>5</sup> LAWS have been the subject of two

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\* Michael Meier is an Attorney-Adviser, Office of the Legal Adviser, Political-Military Affairs, United States Department of State since June 2009. The views expressed in this paper are those of the author in his personal capacity and should not be understood as representing those of the Department of State or any other United States government entity. Prior to joining the State Department, Mr. Meier served a military career as a Judge Advocate that began when Mr. Meier entered active duty in 1986 until retirement in 2009. Special thanks go to Ms. Katherine Baker, Mr. Matthew McCormack, and Dr. Mary Schumann for their invaluable assistance in making this a much better paper.

1. U.S. DEP’T OF DEF., DIR. 3000.09, AUTONOMY IN WEAPONS SYSTEMS (Nov. 21, 2012) [hereinafter DOD DIRECTIVE 3000.09].

2. See *Losing Humanity: The Case Against Killer Robots*, HUM. RTS. WATCH (Nov. 2012), [https://www.hrw.org/sites/default/files/reports/arms1112\\_ForUpload.pdf](https://www.hrw.org/sites/default/files/reports/arms1112_ForUpload.pdf) (discussing the use of fully autonomous weapons and implications in protecting human rights).

3. See *Ethical Autonomy Project, Bibliography*, CTR. FOR A NEW AM. SEC. (July 16, 2015), <http://www.cnas.org/sites/default/files/Ethical%20Autonomy%20Bibliography%20-%20as%20of%2016%20July%202015.pdf> (providing an extensive list of law review articles, newspaper articles, and editorials related to lethal autonomous weapons systems).

4. THE TERMINATOR (Pacific Western 1984).

5. U.N. Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be deemed to be Excessively Injurious or to have Indiscriminate Effects, Oct. 10, 1980, 1342 U.N.T.S 137, 163. It was adopted in 1980 and entered into force in 1983. *Id.* The Convention on Certain Conventional Weapons (CCW) was negotiated under the auspices of the United Nations in 1979 and 1980 and builds upon long-standing rules related to armed conflict, including the principle of distinction and the prohibition of weapons that are deemed to be excessively injurious or have indiscriminate effects. *Id.* There are five protocols to CCW, including non-detectable fragments (Protocol I); Mines, Booby-traps and Other Devices as

informal meetings of experts at the CCW in Geneva, Switzerland.<sup>6</sup> Even though there is no agreement on what LAWS are, most of the discussions have focused on whether there should be a ban or moratorium on the development and fielding of LAWS.<sup>7</sup> While there remain many divergent views with respect to autonomous weapons, the one thing that is clear is this debate will continue for the foreseeable future—and it should continue as States, non-governmental organizations, and others really begin to understand the serious issues that exist beyond the hype.

One aspect of this discussion that could have a tangible and beneficial impact is the legal review of weapons systems. The United States proposed, as an interim step, that States could begin work on a document setting forth “best practices” for conducting a comprehensive weapons review with respect to LAWS.<sup>8</sup> Building from questions raised in the CCW discussion, this paper will look at what is necessary to conduct a comprehensive weapons review with respect to LAWS and what questions those conducting the review must consider in determining whether such a system will comply with the laws of war.

## II. OVERVIEW OF THE DISCUSSION IN THE CONVENTION ON CERTAIN CONVENTIONAL WEAPONS

The first meeting of informal experts in the CCW took place on May 13–16, 2014, and was chaired by Ambassador Jean-Huges Simon-Michel of France with a

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amended on 3 May 1996 (Amended Protocol II); Incendiary Weapons (Protocol III); Blinding Lasers (Protocol IV); and Explosive Remnants of War (Protocol V). *Id.* at 168–72; Additional Protocol to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects (Protocol IV, entitled Protocol on Blinding Laser Weapons), July 30, 1998, 2024 U.N.T.S. 163, 167; Protocol on Explosive Remnants of War to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects (Protocol V), Nov. 28, 2003, 2399 U.N.T.S. 100, 126.

6. *Background – Lethal Autonomous Weapon Systems*, UNOG, [http://www.unog.ch/80256EE600585943/\(httpPages\)/8FA3C2562A60FF81C1257CE600393DF6?OpenDocument](http://www.unog.ch/80256EE600585943/(httpPages)/8FA3C2562A60FF81C1257CE600393DF6?OpenDocument) (last visited Mar. 1, 2016).

7. Human Rights Watch and the Campaign To Stop Killer Robots, for example, called for preemptive bans on the development and use of autonomous weapons. Statement, Stephen Goose, Director, Arms Division, Human Rights Watch, Statement by Human Rights Watch to the Convention on Certain Conventional Weapons Informal Meeting of Experts on Lethal Autonomous Weapons Systems (May 13, 2014), [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/6CF465B62841F177C1257CE8004F9E6B/\\$file/NGOHRW\\_LAWS\\_GenStatement\\_2014.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/6CF465B62841F177C1257CE8004F9E6B/$file/NGOHRW_LAWS_GenStatement_2014.pdf); Statement, Mary Wareham, Human Rights Watch, Campaign to Stop Killer Robots Statement to the Convention on Certain Conventional Weapons Informal Meeting of Experts on Lethal Autonomous Weapons Systems (May 13, 2014), [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/33AFAF2B1AFFFB3CC1257CD7006AAB67/\\$file/NGO+Campaign+Killer+Robots+MX+LAWS.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/33AFAF2B1AFFFB3CC1257CD7006AAB67/$file/NGO+Campaign+Killer+Robots+MX+LAWS.pdf).

8. Statement, Michael W. Meier, U.S. Delegation Opening Statement, The Convention on Certain Conventional Weapons (CCW) Informal Meeting of Experts on Lethal Autonomous Weapons Systems (Apr. 13, 2015), [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/8B33A1CDBE80EC60C1257E2800275E56/\\$file/2015\\_LAWS\\_MX\\_USA+bis.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/8B33A1CDBE80EC60C1257E2800275E56/$file/2015_LAWS_MX_USA+bis.pdf) (detailing the United States’ suggestion for establishing a policy process and methodology to mitigate the risk of LAWS).

mandate to discuss “the questions related to emerging technologies in the area of lethal autonomous weapons systems.”<sup>9</sup> The substantive sessions addressed the legal, technical, ethical, and operational and military aspects of LAWS.<sup>10</sup> In the session on legal aspects, States examined whether LAWS could, at the current state of technology (or people’s lay understanding of technology), comply with existing international law, in particular international humanitarian law (IHL), including the 1949 Geneva Conventions, the Martens Clause, and customary international law.<sup>11</sup> States and legal experts stressed that any development and use of LAWS would need to comply with IHL and there were divergent views regarding whether it would be possible for LAWS to comply with the rules, especially given the current state of technology.<sup>12</sup> This may explain why current weapons systems are not highly and comprehensively automated (only select functions are automated), particularly in situations where automation does not provide improvements over human performance.

The requirement to conduct legal reviews to ensure systems are capable of being used in compliance with international law with respect to the development of new weapons, such as LAWS, was also discussed.<sup>13</sup> The issues of transparency and information exchange on best practices were raised by delegations.<sup>14</sup> The Chairman also suggested that “the implementation of weapons reviews, including Article 36 of Additional Protocol I (1977) to the Geneva Conventions was . . . an area where more discussion could be valuable.”<sup>15</sup>

In April 2015, a second informal meeting of experts on LAWS, chaired by Ambassador Michael Biontino of Germany, was convened under the same

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9. These “informal experts” included several individuals specializing in the technical, legal, sociological/ethical, and military/operational issues surrounding LAWS. United Nations Office at Geneva, Convention on Certain Conventional Weapons, *Report of the 2014 Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS)* ¶ 1, CCW/MSP/2014/3 (June 11, 2014), [http://www.unog.ch/80256EDD006B8954/\(%20httpAssets\)/350D9ABED1AFA515C1257CF30047A8C7/\\$file/Report\\_AdvancedVersion\\_10June.pdf](http://www.unog.ch/80256EDD006B8954/(%20httpAssets)/350D9ABED1AFA515C1257CF30047A8C7/$file/Report_AdvancedVersion_10June.pdf) [hereinafter *2014 Chairs Report*]; see *2014 Meeting of Experts on LAWS*, Presentations and Statements from the Meeting of Experts, UNOG, [http://www.unog.ch/\\_80256ee600585943.nsf/\(httpPages\)/a038dea1da906f9dc1257dd90042e261?OpenDocument&ExpandSection=1#\\_Section1](http://www.unog.ch/_80256ee600585943.nsf/(httpPages)/a038dea1da906f9dc1257dd90042e261?OpenDocument&ExpandSection=1#_Section1) (listing various participants and providing their prepared remarks).

10. *2014 Chairs Report*, *supra* note 9, ¶ 1.

11. *Id.* ¶ 26.

12. *Id.* ¶ 27.

13. *Id.* ¶ 29 (discussing the need for legal reviews when developing new weapons technologies).

14. *Id.*

15. *2014 Chairs Report*, *supra* note 9, ¶ 29.; see Protocol Additional to the Geneva Conventions of 12 August 1949 and relating to the protection of victims of international armed conflicts (Protocol I) (with annexes, Final Act of the Diplomatic Conference on the reaffirmation and development of international humanitarian law applicable in armed conflicts dated 10 June 1977 and resolutions adopted at the fourth session) art. 36, June 8, 1977, 1125 U.N.T.S. 21 (discussing that under Article 36, if new weapons, means, or methods of warfare become available, then that Party has a duty to ensure that it is not violating the treaty or other international law).

mandate language as the 2014 session.<sup>16</sup> This meeting intended to build upon the work from the previous year by delving deeper into the issues surrounding the legal, technical, ethical, and operational and military aspects of LAWS.<sup>17</sup> The legal weapons review process was discussed in the session devoted to challenges to IHL due to increasing degrees of autonomy.<sup>18</sup> In his report, Ambassador Biontino noted that whether LAWS could comply with IHL would depend on the type of weapons system and the specific tasks and context in which the weapon would be used.<sup>19</sup> Increased autonomy and complexity of the weapons systems would affect the predictability of that system; concern was expressed that deploying a weapons system with unpredictable effects would increase the risk that such a system would not conform with IHL.<sup>20</sup> Accordingly, a rigorous legal weapons review is necessary to ensure that LAWS could be used consistent with IHL.<sup>21</sup> The report also noted “the ICRC [International Committee of the Red Cross] encourages States to establish a mechanism for a review process and stands ready to advise States on these matters.”<sup>22</sup>

There was wide support for States to implement legal weapons reviews to ensure that new weapons systems could be used consistent with IHL.<sup>23</sup> The experts presenting on legal weapons reviews stressed the importance of implementing the review process in a good faith manner.<sup>24</sup> In particular, the review process should include consideration of the intended use of such weapons systems, including testing LAWS in the intended operational environment.<sup>25</sup> One proposal sought transparency in the process and requested that States share their legal weapons review procedures with other CCW States Parties.<sup>26</sup> States also expressed concern about the legal weapons review process, questioning whether all States had the necessary technical expertise to effectively implement the weapons review process.<sup>27</sup> Other States asked whether legal weapons reviews—which are done at a national level and would arguably apply different standards—would be sufficient to build trust and confidence that LAWS could be used consistent with IHL.<sup>28</sup> The

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16. See United Nations Office at Geneva, Convention on Certain Conventional Weapons, *Report of the 2015 Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS)* ¶ 1, CCW/MSP/2015/3 (June 2, 2015), [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/587A415BEF5CA08BC1257EE0005808FE/\\$file/CCW+MSP+2015-03+E.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/587A415BEF5CA08BC1257EE0005808FE/$file/CCW+MSP+2015-03+E.pdf) [hereinafter *2015 Chairs Report*].

17. *Id.* ¶ 9.

18. See *id.* ¶ 11(e) (offering an overview of the presenters on this issue and the specific topics they addressed).

19. *Id.* ¶ 51(b)(ii).

20. *Id.* ¶ 51(b)(iii).

21. *Id.* ¶ 51(b)(v).

22. *2015 Chairs Report*, *supra* note 16, ¶ 51(b)(v).

23. *Id.* ¶ 53.

24. *Id.* ¶ 54.

25. *Id.* ¶ 35.

26. *Id.* ¶ 54.

27. *Id.* ¶ 55.

28. *2015 Chairs Report*, *supra* note 16, ¶ 55.

U.S. Delegation proposed that CCW should, as an interim step to the LAWS discussion, begin work on an outcome document that details a comprehensive weapons review process that would apply if a State were considering the development or acquisition of LAWS.<sup>29</sup> Such a best practices document would assist in a common understanding and approach. While applicable to all weapons systems, the process would also help identify any specific issues related to evaluating LAWS.<sup>30</sup>

In November 2015, the States Parties to the CCW agreed to continue the discussion on LAWS in 2016.<sup>31</sup> The mandate essentially remains the same, except that “[t]he meeting of experts may agree by consensus on recommendations for further work for consideration by the Fifth Review Conference.”<sup>32</sup> As the Campaign to Ban Killer Robots notes, “[t]his is an improvement, as it implies the experts group is working toward a concrete outcome and that work will continue after the Review Conference.”<sup>33</sup>

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29. Statement, Michael W. Meier, Head of Delegation, U.S. Delegation Closing Statement and the Way Ahead to the Convention on Certain Conventional Weapons (CCW) Informal Meeting of Experts on Lethal Autonomous Weapons (LAWS) (Apr. 17, 2015), <https://geneva.usmission.gov/2015/05/08/ccw-laws-meeting-u-s-closing-statement-and-the-way-ahead/>.

30. *Id.* The statement, in part, provided as follows:

We have heard much discussion this week on weapons review and the requirement, especially for those States Parties to Additional Protocol I to the Geneva Conventions under Article 36, and for all other States under customary international law, to conduct a legal review of all new weapons systems. Our delegation has also provided information on how the United States conducts our own weapons review. We believe that this is an area upon which we should focus as an interim step as we continue our consideration of LAWS. That would allow the CCW to achieve something concrete and beneficial, while we can advance further the discussion of issues that were raised this week. The United States would like to see the Meeting of High Contracting Parties agree to begin work on an interim outcome document that sets forth what is entailed by a comprehensive weapons review process, including the policy, technical, legal and operational requirements that would apply if a state were developing LAWS. In addition to LAWS, we believe such a document would assist in common understanding and approach while applicable to all weapons systems. We remain flexible on what form such a document might take, but we believe it could be a political declaration, similar to what certain states agreed to with MOTAPM, or our preference, a “best practices” document, or even a combination of both. To be clear, we believe the existence of such a declaration or “best practices” document would not endorse the development of LAWS; it would require States to commit to conduct a thorough weapons review if that State is considering developing LAWS. Such a document would be a concrete step towards enhancing consistency and quality for the weapons review process.

*Id.*

31. *See CCW Meeting Takes forward Mandate on LAWS and Paves the Way for 2016 Fifth Review Conference*, UNODA: U. N. OFFICE FOR DISARMAMENT AFFAIRS, <http://www.un.org/disarmament/update/20151117/> (last visited Feb. 26, 2016) (expressing expectations for the 2016 Fifth Review Conference of the CCW).

32. *Id.*

33. *More Talks in 2016 But Little Ambition*, CAMPAIGN TO BAN KILLER ROBOTS (Nov. 13, 2015), <https://www.stopkillerrobots.org/2015/11/noambition/>.

### III. REQUIREMENTS UNDER INTERNATIONAL LAW FOR REVIEW OF NEW WEAPONS

The question then turns to what such a best practices document would need to contain and what criterion those involved in a weapons review should consider when conducting a comprehensive weapons review. In his book, *Weapons and the Law of Armed Conflict*, Bill Boothby notes that all States are bound by the “customary elements of weapons law,” and therefore are obligated to ensure that in acquiring or developing new weapons that they comply with those laws.<sup>34</sup> For States that are party to Additional Protocol I to the Geneva Conventions, there is an explicit obligation in Article 36 to conduct such a weapons review.<sup>35</sup> For those States that are not a party to Additional Protocol I, such as the United States, Boothby notes that there is “an applied obligation” to conduct such review as noted by the practice of certain states prior to the adoption of Additional Protocol I.<sup>36</sup> The ICRC, in its 2006 *Guide to the Legal Review of New Weapons, Means and Methods of Warfare*, also takes the view that the requirement to assess the “legality of all new weapons, means and methods of warfare . . . is arguably one that applies to all States, regardless of whether or not they are party to Additional Protocol I.”<sup>37</sup>

Article 36 to Additional Protocol I 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.<sup>38</sup>

While Article 36 mandates that a review take place, it does not set forth any particular format for such a review.<sup>39</sup> Article 36 leaves it up to the individual States, as a national matter, to conduct the review and determine whether the new weapon or means or method of warfare is prohibited by international law.<sup>40</sup> However, even though those States that are parties to Additional Protocol I are obligated to conduct a review under Article 36, evidence suggests that most States do not appear to have such a system or actually comply with their legal obligation.<sup>41</sup> While it is impossible to get an accurate number, in 2006 the ICRC published its guide on weapons review and it mentioned the United States, the United Kingdom, Belgium, the Netherlands, Norway, Sweden, Australia, Canada,

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34. WILLIAM H. BOOTHBY, *WEAPONS AND THE LAW OF ARMED CONFLICT* 341 (2009).

35. *Id.*

36. *Id.*

37. 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] (emphasis added).

38. 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].

39. BOOTHBY, *supra* note 34, at 343.

40. *Id.*

41. *Id.* at 341.

France, and Germany as States that had developed a weapons review system.<sup>42</sup> In November 2015, the Stockholm International Peace Research Institute noted “only a limited number of states (12 to 15) are known to have a weapon review mechanism in place.”<sup>43</sup>

For those States that actually conduct a review, Article 36 does not impose any obligation to publish the results.<sup>44</sup> Civil society and the ICRC often seek greater transparency in the weapons review process, but there are also often valid national security reasons for keeping the results of the review confidential.<sup>45</sup> For example, weapon reviews may also contain protected proprietary information.<sup>46</sup> As Boothby points out, a proper legal review will “discuss its construction, design, control mechanisms, destructive characteristics, intended circumstances of use and intended military effect in some detail.”<sup>47</sup> States, as well as the manufacturers of the weapons, will be reluctant to publish such findings where adversaries and competitors may use such information to their military or economic advantage.<sup>48</sup>

#### IV. WEAPONS REVIEW IN THE UNITED STATES

The United States is not a Party to Additional Protocol I to the Geneva Conventions; however, as set forth in the recently published DoD Law of War Manual, the DoD’s long-standing policy requires a legal review of the intended acquisition of a weapon system to ensure its development and use is consistent with IHL.<sup>49</sup> This policy predates adoption of Additional Protocol I.<sup>50</sup> Each military service has issued regulations implementing this policy.<sup>51</sup> The legal review of the acquisition or procurement of a weapon system should occur at an early stage of the acquisition process to ensure its legality under IHL, domestic law, and

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42. *Id.*

43. Vincent Boulanin, *Implementing Article 36 Weapon Reviews in the Light of Increasing Autonomy in Weapons Systems*, SIPRI INSIGHTS ON PEACE & SECURITY (Stockholm Int’l Peace Research Inst., Solna, Sweden), Nov. 2015, at 1, 17.

44. Protocol I, *supra* note 38, art. 36.

45. See BOOTHBY, *supra* note 34, at 343 (discussing how weapons checks should act as a form of internal review and how an adversary getting ahold of these reviews could use them to the publishing nation’s detriment).

46. *Id.*

47. *Id.*

48. *Id.*

49. OFF. OF GEN. COUNSEL, U.S. DEP’T OF DEF., DEP’T OF DEF. LAW OF WAR MANUAL, § 6.2 (2015), [http://www.dod.mil/dodgc/images/law\\_war\\_manual15.pdf](http://www.dod.mil/dodgc/images/law_war_manual15.pdf) [hereinafter DOD LAW OF WAR MANUAL].

50. *Id.* § 6.2.3.

51. See, e.g., DEP’T OF ARMY, REGULATION 27-53, REVIEW OF LEGALITY OF WEAPONS UNDER INTERNATIONAL LAW (1979); SEC’Y OF THE NAVY, INSTRUCTION 5000.2E, DEP’T OF NAVY IMPLEMENTATION & OPERATION OF THE DEFENSE ACQUISITION SYSTEM AND THE JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM (2011); DEP’T OF THE A.F. INSTRUCTION 51-402, LEGAL REVIEWS OF WEAPONS AND CYBER CAPABILITIES (2011) [hereinafter A.F. INSTRUCTION 51-402].

international law, including the research and development phase.<sup>52</sup>

The weapons review should consider three questions to determine whether the acquisition or procurement of weapon system is prohibited. The first question to be answered is whether there is a specific rule of law, whether as a treaty obligation or viewed as customary international law, prohibiting or restricting the use of the weapon.<sup>53</sup> Second, if there is no specific prohibition or restriction, then the review should determine whether the weapon's intended use is calculated to cause superfluous injury.<sup>54</sup> Finally, the third question is whether the weapon is inherently indiscriminate.<sup>55</sup> Part of the calculus of such a weapons review is to delineate whether there are legal restrictions on the weapon's use that is specific to that type of weapon or whether other practical measures are needed, such as training or rules of engagement specific to the weapon.<sup>56</sup> In short, context and specific intended use matter, and this well-accepted approach to weapons legal review applies equally to autonomous weapons.<sup>57</sup>

#### V. APPLICATION OF THE WEAPONS REVIEW

In contrast to the DoD's weapons review process, Bill Boothby's review process has five questions that need to be answered in order to properly conduct a weapons review. As discussed above, the DoD's weapons review process should consider three questions.<sup>58</sup> Bill Boothby's recommended weapons review process incorporates the three questions considered by DoD, but he includes two additional questions.<sup>59</sup> Boothby's first additional question is whether the weapon is intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.<sup>60</sup> The second question is whether there are any likely future developments in the law of armed conflict that may be expected to affect the weapon subject to review.<sup>61</sup> These five questions are applicable for States Parties to Additional Protocol I to the development or acquisition or any new weapons or means or method of warfare, including LAWS.<sup>62</sup>

For States that are considering development or fielding of LAWS, especially since no such system has yet been developed or fielded, several other policy

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52. See, e.g., A.F. INSTRUCTION 51-402, *supra* note 51, § 1.5.1.

53. See, e.g., *id.*, § 3.1.1.

54. See, e.g., *id.* § 3.1.2.1.

55. See DOD LAW OF WAR MANUAL, *supra* note 49, § 6.2.2 (listing questions to be considered in a legal review of weapons); see also A.F. INSTRUCTION 51-402, *supra* note 51, § 3.1 (listing the stages of the legal review).

56. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.2.2.

57. See *id.* (discussing how other considerations outside of the explicitly listed test would be helpful in determining compliance with laws of war).

58. *Id.*

59. BOOTHBY, *supra* note 34, at 345–46.

60. *Id.* at 346.

61. *Id.*

62. See *id.* at 340–44 (discussing the obligation for States to review new weapons systems which would by default cover LAWS).

questions should be addressed. For example, what risk assessments need to be conducted? What methods are used for testing and evaluation and how would the system be validated? Should there be different verification or test methods if the weapons system incorporates autonomy? This next section will review the five questions that need to be answered for a comprehensive weapons review with respect to LAWS.

***A. Whether there is a specific rule, whether as a treaty obligation or viewed as customary international law, prohibiting or restricting the use of the weapon***

There is no specific rule prohibiting or restricting the use of LAWS, as IHL does not prohibit or restrict the use of autonomy in weapons systems.<sup>63</sup> For example, the United States currently uses human-supervised defensive weapon systems' autonomous capabilities designed to counter time-critical or saturation attacks.<sup>64</sup> These weapon systems include the Aegis ship defense system and the Counter-Rocket, Artillery, and Mortar system.<sup>65</sup> It can be argued that the increase in the use of autonomy in weapons systems over the past several decades enhances IHL compliance in military operations, as munitions with autonomous features allow them to be used in a more discriminate manner that can lessen collateral damage. For example, weapons that have autonomous features, such as sensor fuzed weapons that are designed with self-deactivation or self-destruction mechanisms, reduce the risk of long-term impacts on the civilian population resulting from the explosive remnants of war after cessation of hostilities.<sup>66</sup>

Although there is no specific rule prohibiting the use of autonomy in a weapons system, this does not end the analysis. It will be important for any reviewer to evaluate the intended use of the particular autonomous weapons system to determine whether a specific restriction applies. For example, a system would be prohibited if it used poison, poisonous gases or chemical weapons; biological weapons; or those that may be prohibited or restricted by the CCW, such as blinding lasers, certain types of mines or those that result in non-detectable fragments.<sup>67</sup> Once it has been determined there is no specific prohibition or restriction, the reviewer will need to determine whether the weapon is calculated to cause superfluous injury or unnecessary suffering.<sup>68</sup>

***B. Whether, in its normal or intended circumstances of use, the weapon is of a nature to cause superfluous injury or unnecessary suffering***

It is prohibited to use weapons that are calculated to cause superfluous injury

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63. See 2014 Chairs Report, *supra* note 9, ¶ 16 (discussing how IHL could be implemented).

64. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.5.9.1.

65. *Id.*

66. *Id.* § 6.5.9.2.

67. *Id.* § 6.4.2.

68. *Id.* § 6.2.2.

or unnecessary suffering.<sup>69</sup> As both Bill Boothby and the DoD Law of War Manual note, there have been various formulations for the prohibition against superfluous injury or unnecessary suffering both in treaties to which the United States is a Party and in others.<sup>70</sup> Weapons that may cause great injury, suffering, or even death are not prohibited if the weapons' effects that cause the injury are necessary to enable the operator to accomplish its military mission.<sup>71</sup> Boothby notes that the "most clear and accurate formulation of the superfluous injury and unnecessary suffering test available" comes from the original DoD weapons review Directive.<sup>72</sup> It provides:

The prohibition of unnecessary suffering constitutes acknowledgment that necessary suffering to combatants is lawful, and may include severe injury or loss of life. There is no agreed international definition of unnecessary suffering. A weapon or munition would be deemed to cause unnecessary suffering only if it inevitably or in its normal use has a particular effect and the injury caused is considered by governments as disproportionate to the military necessity for it, that is, the military advantage to be gained from its use. This balancing test cannot be conducted in isolation. A weapon's or munition's effect must be weighed in light of comparable, lawful weapons or munitions in use on the modern battlefield. A weapon is not unlawful merely because it may cause severe suffering or injury. The appropriate determination is whether a weapon's or munitions employment for its normal or expected use would be prohibited under some or all circumstances. The correct criterion is whether the employment of a weapon for its normal or expected use inevitably would cause injury or suffering manifestly disproportionate to its military effectiveness.<sup>73</sup>

A reviewer, when trying to determine whether an autonomous weapons system is lawful, will need to understand the planned use of the weapon system and the normal operating environments and circumstances in which it is intended to be used. In assessing the legality of the autonomous weapons system with respect to the legitimate military necessity, there are various factors that need to be considered.<sup>74</sup> For example, the reviewer will need to look at the system's capacity to disable or incapacitate enemy combatants, the destruction or neutralization of military material, the effectiveness of the system against certain types of targets, the availability of other weapons, the amount of munitions required, as well as the risk to the civilian population when the weapon is used for its intended purpose.<sup>75</sup>

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69. *Id.*

70. See DOD LAW OF WAR MANUAL, *supra* note 49 § 6.6.1 (noting the various definitions used for superfluous injury); see also BOOTHBY, *supra* note 34, at 345–50 (recounting the history of superfluous injury and unnecessary suffering).

71. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.6.3.

72. BOOTHBY, *supra* note 34, at 345.

73. W. Hays Parks, *Means and Methods of Warfare*, 38 GEO. WASH. INT'L L. REV. 511, 517 n.25 (2006), *quoted in* BOOTHBY, *supra* note 34, at 345–46.

74. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.6.3.1.

75. *Id.*

***C. Whether the weapon is inherently indiscriminate, i.e., whether the weapon is capable of being used in compliance with the rule of discrimination (or distinction)***

A weapon is inherently indiscriminate if it is incapable of being used in accordance with the principles of distinction and proportionality.<sup>76</sup> Accordingly, weapons that are specifically designed to conduct attacks against civilians would be prohibited, as would those weapons that, when used, necessarily cause excessive incidental harm to the military advantage expected to be gained from its use.<sup>77</sup> It is extremely unlikely that any responsible State would intentionally develop an autonomous weapons system, or any other weapons system, that intentionally targets the civilian population. However, one of the major questions raised with respect to LAWS is whether it could be used in compliance with the principle of distinction.<sup>78</sup>

The test to determine whether a weapon is inherently indiscriminate is whether its use necessarily violates the principles of distinction and proportionality; in other words, whether the weapon's use is expected to be illegal in all circumstances.<sup>79</sup> The focus turns on the nature of the weapon in the uses for which it is designed, or the planned or intended uses.<sup>80</sup> Accordingly, the reviewer will need to consider planned uses of the system as reflected in the design documents. If the planned uses are inconsistent with the principles of distinction and proportionality then those uses need to be modified to ensure the intended use is in accordance with IHL. It is also important to note that it is necessary to consider the wide range of circumstances in which the weapon may be lawfully used before concluding such a weapon is inherently indiscriminate.<sup>81</sup>

For LAWS, there are significant technological challenges that will need to be addressed.<sup>82</sup> DoD Directive 3000.09 acknowledges these challenges, which is why, as part of the review process, the system must meet certain criteria.<sup>83</sup> For example, the Directive mandates that all autonomous systems will undergo a rigorous test and evaluation program—not only while in development but through the full life of

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76. *See id.* § 2.4 (“Proportionality may be defined as the principle that even where one is justified in acting, one must not act in way that is unreasonable or excessive. Proportionality has also been viewed as a legal restatement of the military concept of economy of force.”); *see id.* § 2.5 (“Distinction . . . obliges parties to a conflict to distinguish principally between the armed forces and the civilian population, and between unprotected and protected objects.”).

77. *Id.* § 6.7.

78. *See Losing Humanity*, *supra* note 2, at 30–31 (arguing the principle of distinction is difficult for LAWS because the systems do not possess the ability to distinguish between soldiers and civilians).

79. *See DOD LAW OF WAR MANUAL*, *supra* note 49, § 6.7.2 (noting special consideration should be given to reasonably foreseeable planned or intended uses of the weapon).

80. Kenneth Anderson et al., *Adapting the Law of Armed Conflict to Autonomous Weapons Systems*, 90 INT'L L. STUD. 386, 399 (2014).

81. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.7.2.

82. *See generally* DOD DIRECTIVE 3000.09, *supra* note 1.

83. *Id.*

the system—to ensure the system functions as intended and the potential for failure is minimized.<sup>84</sup> The weapons system must have appropriate safeguards in place to terminate activity and seek operator input should the system fail to perform as intended; and it must include robust safeties and anti-tamper measures.<sup>85</sup> These safeguards and the design parameters will need to be reviewed to ensure that the weapons system operates within its design parameters and can operate in a discriminate manner.<sup>86</sup>

***D. Whether the weapon is intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment***

The fourth question that should be considered during a comprehensive weapons review is whether the weapon is intended or may be expected to cause widespread, long-term and severe damage to the natural environment. This question is not considered as part of the weapons review process by the United States,<sup>87</sup> however, the United States is party to the Environmental Modification (ENMOD) Convention,<sup>88</sup> which prohibits using “environmental modification techniques having widespread, long-lasting, or severe effects as a means of destruction, damage or injury to another Party to the ENMOD Convention.”<sup>89</sup> The ENMOD Convention does not prohibit weapons that damage the environment, but rather that the environment cannot be used as an instrument of war.<sup>90</sup> Further, a weapon that causes incidental harm to the environment is not prohibited, as the weapon is not intended to be used as a means of destruction or damage or injury to another ENMOD party.<sup>91</sup>

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84. *Id.* at 6.

85. *Id.* at 7. *But see Losing Humanity*, *supra* note 2, at 46–47 (noting humans may not have enough time to override a computer’s decision, and further study is needed to see what level of autonomy is appropriate).

86. *See* DOD DIRECTIVE 3000.09, *supra* note 1, at 11 (directing periodic reviews of the safeguards and parameters); *see also* Michael W. Meier, U.S. Opening Delegation Statement, *supra* note 8 (discussing the approval process for LAWS).

87. *See* DOD LAW OF WAR MANUAL, *supra* note 49, § 6.10.3.1, at 354–55 (“The United States has not accepted these provisions and has repeatedly expressed the view that these provisions are ‘overly broad and ambiguous’ and ‘not part of customary law.’” Articles 35(3) and 55 of AP I ‘fail to acknowledge that use of such weapons is prohibited only if their use is clearly excessive in relation to the concrete and direct overall military advantage anticipated.’”) (footnotes omitted).

88. U.N. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, Dec. 10, 1976, 1108 U.N.T.S. 151 [hereinafter ENMOD Convention].

89. DOD LAW OF WAR MANUAL, *supra* note 49, § 6.10, at 352 (citing ENMOD Convention art. 1(1)).

90. *See id.* § 6.10.3, at 353–54 (“The ENMOD Convention does not prohibit damage to the environment, but reflects the idea that the environment itself should not be used as an instrument of war.”); *see also id.* at 354 n.215 (explaining that the ENMOD convention is not an environmental protection treaty, but a convention that fills a specific niche).

91. *See id.* § 6.10.3, at 354 (“Weapons or military operations may incidentally have widespread, long-lasting, or severe effects on the environment. Such weapons and military

For States Parties to Additional Protocol I to the Geneva Conventions, Article 35(3)<sup>92</sup> and Article 55<sup>93</sup> address protection of the environment.<sup>94</sup> As part of the ICRC guide to legal weapons reviews, in order to determine whether a particular weapon, including a lethal autonomous weapons system, would cause widespread, long-term, and severe damage to the natural environment, a reviewer would need to consider whether adequate scientific studies on the effects to the environment have been conducted; the type and extent of damage to be directly or indirectly caused by the weapon; the length of time the damage is expected to last and whether it is possible to reverse the effects of the damage; the impact of the damage to the environment to the civilian population; and, whether the weapon is specifically designed to destroy or damage the environment.<sup>95</sup>

***E. Whether there are any likely future developments in the law of armed conflict that may be expected to affect the weapon subject to review***

Finally, reviewers will need to consider and keep abreast of likely future developments in the law of armed conflict that may affect the particular weapon. Accordingly, it will be important to developers and reviewers to monitor the discussions in the international community on LAWS to determine whether the discussions may affect the development of such systems, in particular those discussions within the CCW. For example, on October 16, 2015, the Campaign to Stop Killer Robots, in a statement to the United Nations General Assembly First Committee on Disarmament and International Security reiterated its call for a preemptive ban on the LAWS in the CCW.<sup>96</sup> Specifically, the Campaign:

... urge[s] all countries to develop and articulate their national policy on autonomous weapons and indicate their support for the call to preemptively ban the

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operations are not prohibited by the ENMOD Convention because the harm to the environment is incidental and not intended to be used as a means of destruction, damage, or injury to another Party to the ENMOD Convention.”).

92. Article 35(3) of Additional Protocol I to the Geneva Conventions provides, “[i]t is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.” Protocol (I), *supra* note 15, at art. 35(3).

93. Article 55 of Additional Protocol I to the Geneva Conventions provides:  
Protection of the natural environment:

(1) Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.

(2) Attacks against the natural environment by way of reprisals are prohibited.

*Id.* at art. 55.

94. *Id.* at art 35(3), art. 55.

95. ICRC GUIDE, *supra* note 37, § 1.3.4, at 19–20.

96. Statement, Mary Wareham, Coordinator, Human Rights Watch, *Campaign to Stop Killer Robots Statement to the UN General Assembly First Committee on Disarmament and International Security* (Oct. 16, 2015), [http://www.stopkillerrobots.org/wp-content/uploads/2015/10/KRC\\_StatementUNGA1\\_16Oct2015.pdf](http://www.stopkillerrobots.org/wp-content/uploads/2015/10/KRC_StatementUNGA1_16Oct2015.pdf).

weapons or take other action. . . . In our view killer robots are not “inevitable” but a ban on these weapons is. It’s just a matter of how and when we get there.<sup>97</sup>

Developers and reviewers will need to coordinate with relevant policy decision makers within their respective governments as States develop national policies with respect to LAWS to ensure that any such systems are consistent with national policies and to consider developments in the CCW.

## VI. CONCLUSION

In conclusion, the debate regarding LAWS continues to generate questions regarding the legal, technical, ethical, and military and operational issues raised by these systems. Civil society, led by the Campaign to Stop Killer Robots, seeks a new protocol in the CCW that would preemptively ban the development of LAWS.<sup>98</sup> However, amongst States and other experts, there remain many divergent views with respect to LAWS<sup>99</sup> and it is clear that this debate will continue for the foreseeable future. As the discussions continue, one aspect of this discussion that should receive additional focus is the weapons review process. An outcome document that sets forth what is necessary in a comprehensive weapons review would have a tangible and beneficial impact on the development of new weapons. Answering the five questions posed in this article would help States considering development of autonomous systems to ensure that such systems would comply with the principles and rules of IHL.

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97. *Id.* at 3.

98. *See id.* at 1–2 (promoting a new protocol including a pre-emptive ban on autonomous weapons in the CCW).

99. *See* Statement, Michael W. Meier, Head of Delegation Geneva, U.S. Mission to the United Nations and Other Int’l Orgs. in Geneva, *U.S. Delegation Closing Statement and the Way Ahead, Closing Statement Before the CCW Informal Meeting of Experts on LAWS* (Apr. 17, 2015), <https://geneva.usmission.gov/2015/05/08/ccw-laws-meeting-u-s-closing-statement-and-the-way-ahead/> (“[I]t is clear that there remain many unanswered questions and divergent views on a wide variety of issues.”).