AUTONOMOUS WEAPONS SYSTEMS: A COMING LEGAL "SINGULARITY"?

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Abstract

Military robotics has long captured the popular imagination in movies, books, and magazines. In recent years, this technology has moved from the realm of science fiction to reality. The precursors to truly autonomous weapons, the so-called "drones," have generated a great deal of discussion. Few authors, however, have applied current law to the developing technology of autonomous military robots, or "autonomous weapon systems." The treatment of such subjects in the ethics, robotics, and popular literature has generally assumed that autonomous systems either fit perfectly into existing legal regimes or threaten long-standing paradigms. This Article demonstrates that neither assumption is correct. Rather, the introduction of autonomous military robots will require adapting well-established legal principles in the law of war as well as domestic accountability mechanisms to this new technology. A key adjustment that must be made is the introduction of a military-created standard of operation for autonomous systems. This standard will set how such robotic systems may be used in accordance with the law of war. The establishment of such a standard operating procedure would also address accountability concerns by helping to establish a standard of care below which liability may be imposed on the human commanders of autonomous military robots.

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I. INTRODUCTION

"There's an incoming plane, unknown type," says the robot. Its human master, a U.S. sailor, looks at the screen and, in the heat of the moment, concludes the plane must be an Iranian F-15. The sailor tells the robot to defend the ship. The robot obeys, firing a surface-to-air missile. The missile finds its target and destroys it. The target, however, is not an F-15. It is a civilian airliner with hundreds of innocents on board. This scenario is not something out of a movie. It happened on July 3, 1988. The robot was the Aegis Combat System, the ship was the U.S.S. *Vincennes*, and the airliner was Iran Air Flight 655.[1]

In recent years, there has been passionate debate over the use of unmanned weapons systems, especially Unmanned Aerial Vehicles (UAVs) like the Predator "drone."[2] However, a great deal of the commentary is surprisingly uninformed about the realities of current UAV technology; UAVs

1. *See* P.W. SINGER, WIRED FOR WAR 124–25 (2009) (discussing the misidentification of the Iranian passenger jet). There is some confusion about the precise cause of the *Vincennes* incident. A U.S. government investigation concluded that the fault did not lie with the data produced by the Aegis system, but with the communication between the system and its human operators. The sailors were tracking an incoming aircraft, Flight 655, but may have been correlating it with data from another plane which was in fact an Iranian fighter. *See generally* U.S. DEP'T OF DEFENSE, INVESTIGATION REPORT: FORMAL INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE DOWNING OF IRAN AIR FLIGHT 655 ON 3 JULY 1988, at 6–7 (1988), *available at* http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA203577.

2. *See, e.g.*, Tony Rock, *Yesterday's Laws, Tomorrow's Technology: The Laws of War and Unmanned Warfare*, 24 N.Y. INT'L L. REV. 39, 43 (2011) (noting the controversy surrounding the legality of drone strikes and whether they may be considered assassinations or extrajudicial killings); Ryan Vogel, *Drone Warfare and the Law of Armed Conflict*, 39 DENV. J. INT'L L. & POL'Y 101, 102 (2010) (exploring whether the use of drones "violates the *jus in bello* principles of proportionality, military necessity, distinction, and humanity . . .").

are mostly remotely piloted aircraft and not "robots" as often described in the media.[3] Automated systems like the Aegis have been around for several decades.[4] There is a strong trend in current military technology to develop more fully automated robotic systems.[5] Indeed, some see increasingly automated robotic weapons as a coming "revolution in military affairs" akin to the introduction of nuclear weapons.[6] Many commentators claim that such systems may pose serious challenges to existing legal regimes, especially the international law of armed conflict (LOAC).[7] Some fear that Autonomous Weapon Systems (AWSs) will operate in a lawless zone where the LOAC does not apply, a sort of legal "singularity."[8] Others foresee the need for a "revolution in military legal affairs" to address the problems with autonomous or near-autonomous weapons.[9]

This Article aims to fill a gap in the current literature by examining in detail how current law applies to AWS. There are two widely-accepted legal problems facing AWS: an international law problem—the LOAC standards—and a principally domestic law problem—accountability.[10] Both problems must be addressed in order to ensure that AWS may be fully and legally used. The LOAC problem does not stem from any inadequacy of the current law. Rather, the technology must mature further before it can be used in an unlimited, autonomous manner while respecting the LOAC. However, in order for the designers of military robots to know when their systems are legally sufficient, standards must be established.[11]

These standards need not take the form of a new international treaty. Rather, internal government standards that dictate the design specifications and methods of use for AWSs could address the LOAC problems raised by opponents. To the extent that opponents highlight the lack of accountability

3. *See, e.g.*, Jason Falconer, *Top 10 Robots of 2012*, GIZMAG (Jan. 10, 2013), http://www.gizmag.com/top-ten-robots-2012/25726/ (mistakenly describing UAVs as robots); *see also* Ed Darack, *A Brief History of Unmanned Aircraft: From Bomb-Bearing Balloons to the Global Hawk*, AIRSPACEMAG.COM (May 18, 2011), http://www.airspacemag.com/multimedia/A-Brief-History-of-Unmanned-Aircraft.html (detailing the development of unmanned military aircraft).

4. Darack, *supra* note 3.

5. Noel Sharkey, *The Ethical Frontiers of Robotics*, 322 SCI. 1800, 1801 (2008).

6. Ronald Arkin, *Military Robotics and the Robotics Community's Responsibility*, 38 INDUS. ROBOT (2011), *available at* http://www.emeraldinsight.com/journals.htm?issn=0143-991X&volume=38&issue=5&articleid=1943625&show=html. The term "revolution in military legal affairs" was coined by then-Col. Charles Dunlap, Jr. in *The Revolution in Military Legal Affairs: Air Force Legal Professionals in 21st Century Conflicts*, 51 A.F. L. REV. 293, 293 (2001).

7. *See, e.g.*, Gary Marchant et al., *International Governance of Autonomous Military Robots*, 12 COLUM. SCI. & TECH. L. REV. 272, 315 (2011) (describing potential regulatory solutions to the problems caused by Autonomous Weapon Systems).

8. *See, e.g.*, HUMAN RIGHTS WATCH, LOSING HUMANITY: THE CASE AGAINST KILLER ROBOTS 1 (2012) ("[S]uch revolutionary weapons would not be consistent with international humanitarian law and would increase the risk of death or injury to civilians during armed conflict."). In astrophysics, a singularity is a point in space-time where the laws of physics no longer apply. James John Bell, *Exploring the "Singularity,"* 37 FUTURIST 193, 193 (2003). This concept fits well with the fears some articulate about drones and autonomous systems.

9. SINGER, *supra* note 1, at 407.

10. *See* ARMIN KRISHNAN, KILLER ROBOTS: LEGALITY AND ETHICALITY OF AUTONOMOUS WEAPONS 92–95, 103–05 (2009) (describing problems caused by AWSs).

11. In discussing AWSs, I will consider a hypothetical system, discussed *infra* Part II, that incorporates currently available technology and certain technologies currently under development.

for AWSs, they are largely discussing accountability gaps that exist with regard to current technology as well.

The relevant difference in terms of accountability between AWSs and current military technology is the lack of a standard of care. Once this standard is established, existing accountability mechanisms would apply as well to AWSs as they do to other military technology. Thus, the solution is the same for both problems—the creation of standards for the use of AWSs. These standards will inform combatants when AWSs will be allowed to be deployed, how they ought to be used, and provide a standard of care against which liability and culpability may be judged.

In order to show that AWSs can be sufficiently governed by existing law, this Article first sets out the current state of AWS technology and the most relevant developments in artificial intelligence (AI) and weapon design. Next, I review the relevant principles of the LOAC and analyze each principle for what I consider the legally required design features of AWSs. The LOAC sets the standards for what is acceptable in terms of discrimination and proportionality, but the roboticists must make their systems meet these standards. For example, because of the principle of discrimination, for AWSs to perform targeting on their own, they would need sensors capable of distinguishing between a civilian carrying a weapon and a combatant. Finally, this Article examines the accountability problems of AWSs, first by analyzing common philosophical objections and then by looking to current law on civil and criminal liability for military weapons systems. I conclude that the accountability problems with AWSs will be largely the same as they are for current weapons, except that AWSs currently lack a standard of care. Thus, to the extent that existing accountability mechanisms are adequate, they will be adequate to govern AWSs once a standard of care can be established. This standard of care could be established through internal military regulations. For example, the regulations could set AWS's flight ceilings or other mission parameters to limit destruction to the intended target. Other regulations could address what design features are required to use AWSs legally. Such standards will dictate when and how AWSs can be deployed freely as well as establish a standard of care that may form the basis of legal accountability.[12]

II. THE TECHNOLOGY

A. Robotics and Automation in General

There are three important terms that must be defined before any discussion of AWSs: robot, autonomy, and (artificial) intelligence. First, what is a robot? The term "robot" itself is based on the Czech word "*robota*,"

12. Issues such as the morality of using AWSs or the implications for the use of force of these systems generally are important to consider, but beyond the scope of this Article. It is, however, important to note that concerns about state versus state unmanned wars are premature, given the low survivability of current unmanned systems. Kine Seng Tham, Enhancing Combat Survivability of Existing Unmanned Aircraft Systems 48–49 (Dec. 2008) (unpublished M.A. thesis, Naval Postgraduate School) (on file with author).

meaning serf or slave.[13] The term came into being with Karel Capek's 1921 play R.U.R. (Rossum's Universal Robotics).[14] Today, a robot is defined as "a mechanical creature which can function autonomously."[15] Robots generally have three functions: *sense*, meaning receiving information from various sensors; *plan*, meaning "taking in information" and "producing one or more tasks"; and *act*, meaning "producing output commands to motor actuators."[16]

What makes AWSs unique among weapons and different from today's "drones" is that they are fully autonomous.[17] Unfortunately, the term "autonomous" remains highly ambiguous.[18] In this Article, autonomy is the measure of "relative independence" of the robot or weapon.[19] There are, broadly speaking, three levels of autonomy: tele-operation (*e.g.*, the Reaper and Predator drones), automated (*e.g.*, the Global Hawk surveillance drone), and fully autonomous (*e.g.*, the Aegis Combat System).[20]

Tele-operation—meaning operated by a human remotely[21]—is the oldest form of unmanned system. Attempts to produce remotely operated weapons date at least to World War I.[22] Most currently deployed military robots fall into this category. For example, the Predator or Reaper "drones" much discussed today are tele-operated.[23] Generally, the MQ-1B Predator and the MQ-9 Reaper are operated from a remote ground station by one pilot and one sensor operator.[24]

The next level of autonomy is "automated"[25] or "semi-autonomous."[26] An automatic system operates "within preprogrammed parameters without the requirement for a command from a human."[27] For example, the intelligence, surveillance, and reconnaissance UAV known as the Global Hawk would be more accurately described as automatic because its "flight commands are controlled by onboard systems without recourse to a human operator."[28] Generally, a human may still monitor the robot to ensure nothing goes wrong and to review the robot's actions.[29] For instance, a "pilot" simply tells the

13. SINGER, *supra* note 1, at 66.
14. ROBIN R. MURPHY, INTRODUCTION TO AI ROBOTICS 2 (2000).
15. *Id.* at 3.
16. *Id.* at 5.
17. Robert Sparrow, *Killer Robots*, 24 J. APPLIED PHIL. 62, 70 (2007).
18. RONALD C. ARKIN, GOVERNING LETHAL BEHAVIOR IN AUTONOMOUS ROBOTS 37 (2009).
19. *See* SINGER, *supra* note 1, at 74 (defining autonomy as the relative independence of a robot and explaining that "autonomy is measured on a sliding scale from direct human operation at the low end to what is known as 'adaptive' at the high end").
20. SINGER, *supra* note 1, at 124; Darren M. Stewart, *New Technology and the Law of Armed Conflict*, 87 INT'L L. STUD. 271, 276 (2011).
21. MURPHY, *supra* note 14, at 28.
22. SINGER, *supra* note 1, at 46.
23. Stewart, *supra* note 20, at 276.
24. *MQ-1B Predator*, U.S. AIR FORCE (Jan. 5, 2012), http://www.af.mil/information/factsheets/factsheet.asp?id=122; *MQ-9 Reaper*, U.S. AIR FORCE (Jan. 5, 2012), http://www.af.mil/information/factsheets/factsheet.asp?id=6405.
25. Stewart, *supra* note 20, at 276.
26. MURPHY, *supra* note 14, at 33.
27. Stewart, *supra* note 20, at 276.
28. *Id.*
29. *See* MURPHY, *supra* note 14, at 33 (explaining that shared control semi-autonomous systems allow humans to relax but still require some monitoring).

UAV where to go and gives it waypoints, a mission file to complete, and general parameters for reporting back to higher headquarters.[30]

Finally, the highest level of autonomy may be called "true" or "full" autonomy.[31] A fully autonomous system "decides on its own what to report and where to go."[32] Additionally, it may be able to learn and adapt to new information.[33] Generally, the more intelligent a system is, the more autonomous it may be.[34] In this context, intelligence means "the ability of a system to behave appropriately in an uncertain environment."[35] There are substantial debates in the robotics community regarding the likelihood of highly intelligent systems ever being developed.[36] Currently, "dumb" systems capable of operating autonomously exist. For example, the Aegis Combat System—the one at issue in the *Vincennes* accident—has a "casualty" mode that identifies, targets, and engages incoming threats.[37] Normally, this system allows the human operator to veto decisions.[38] In "casualty" mode, however, it is capable of fully autonomous operation.[39]

In the context of military robotics, autonomy should be considered in light of the existing command and control structure—just because a pilot is "autonomous" does not mean that he or she can operate without orders. Similarly, even a fully autonomous system would have to follow orders from higher headquarters. The fully autonomous systems discussed in this Article would largely take the role of the pilot or vehicle operator. Robotic systems that are currently deployed all retain a "human in the loop," where a human operator can veto the decision of the machine.[40]

Robots are different from other machines in another way—they are often seen as having agency, even when their autonomy or intelligence is relatively low.[41] This endowment of robots with agency is reflected in military robotics.

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30. *See* SINGER, *supra* note 1, at 74 (describing the difference between human-assisted, human delegation, human-supervised, and mixed initiative robotic spy planes).

31. *See id.* (describing a "fully autonomous" robotic spy plane).

32. *Id.*

33. *Id.*

34. RĂZVAN V. FLORIAN, CTR. FOR COGNITIVE & NEURAL STUDIES, AUTONOMOUS ARTIFICIAL AGENTS 24–31 (2003), *available at* http://www.coneural.org/reports/Coneural-03-01.pdf. The meaning of the term "intelligence" in the field of robotics and elsewhere is fraught with debate. *See, e.g.*, SHANE LEGG & MARCUS HUTTER, DALLE MOLLE INST. FOR ARTIFICIAL INTELLIGENCE, A COLLECTION OF DEFINITIONS OF INTELLIGENCE 2 (2007), *available at* http://www.idsia.ch/idsiareport/IDSIA-07-07.pdf (discussing a number of different definitions of intelligence).

35. JAMES S. ALBUS & ALEXANDER M. MEYSTEL, ENGINEERING OF MIND: AN INTRODUCTION TO THE SCIENCE OF INTELLIGENT SYSTEMS 6 (2001).

36. *See, e.g.*, Robert Sparrow, *Building a Better WarBot: Ethical Issues in the Design of Unmanned Systems for Military Applications*, 15 SCI. ENGINEERING ETHICS 169, 171 (2008) (describing past predictions of AI development as "overly optimistic"). *Contra* Ronald Arkin, The Case for Ethical Autonomy in Unmanned Systems 1 (unpublished article), *available at* http://www.cc.gatech.edu/ai/robot-lab/online-publications/ Arkin_ethical_autonomous_systems_final.pdf (positing that "autonomous robots will ultimately be deployed").

37. SINGER, *supra* note 1, at 124.

38. *See id.* ("The human sailor could override the Aegis computer in any of its modes.").

39. *Id.*

40. *See id.* at 124–25 (recounting AI developers' and military officers' repeated insistence that humans remain involved in controlling robots).

41. J. Young et al., *What Is Mixed Reality, Anyway? Considering the Boundaries of Mixed Reality*, *in*

P.W. Singer tells a story about one young soldier in Iraq who mourns the "passing" of "Scooby-Doo," a remotely operated bomb disposal robot known as a PackBot.[42] He did not want to settle for a replacement PackBot; he "wanted Scooby-Doo back."[43] The legal significance of this endowment of agency is not yet clear. It may suggest that some proposals to punish robots themselves for their bad acts could find more support than one might expect.[44] This endowment of agency may, however, be merely a new expression of common anthropomorphism.

Currently, robotic technology has a substantial shortcoming that affects robots' ability to both sense and plan that roboticists call the "brittleness" problem.[45] Unexpected and uncertain circumstances have often proven to be the greatest weakness of otherwise intelligent robots.[46] Given the highly ambiguous and complex nature of the battlefield, an AWS unable to deal with the unexpected will be of limited utility.[47] Indeed, it is reasonable to suspect that some of the unanticipated problems will include not only environmental factors, such as civilians on the battlefield, but also "[e]nemy adaptation, degraded communications . . . cyber attacks . . . and 'friction' in war."[48] In order to be flexible and deal with the unexpected, in other words, to be truly intelligent, the system needs to be able to learn.[49] However, learning algorithms can produce highly unpredictable results and therefore may not be desirable in military robots.[50]

The brittleness problem poses other problems for operating an autonomous system on the ambiguous battlefield. To be truly autonomous, robots will have to "make their own [accurate] observations through their sensors," in the midst of "massive ambiguity and noise."[51] However, current "machine vision [technology] may give reasonable performance [in one context], and fail in a different situation."[52] Indeed, as recently as four years ago, the largest technical challenge for aerial AWSs was designing a system

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MIXED REALITY AND HUMAN-ROBOT INTERACTION 1, 8 (2011).

42. SINGER, *supra* note 1, at 337–39. Interestingly, iRobot is a company bridging the civilian-military robotics gap. It produces both military "bots" like the PackBot, but also makes perhaps the most ubiquitous civilian non-industrial robot, the "Roomba." *See Vacuum Cleaning*, IROBOT, http://store.irobot.com/category/index.jsp?categoryId=3334619 (last visited Jan. 22, 2013) (indicating that iRobot sells the Roomba). Companies like iRobot make the discussion of legal accountability much broader than can be treated *infra* Part V of this Article. What these technological realities mean for the civilian world has not yet been much discussed.

43. SINGER, *supra* note 1, at 338.

44. *See, e.g.*, KRISHNAN, *supra* note 10, at 105 (describing the possibility of holding robots legally accountable for their behavior).

45. Michael Anderson et al., *A Self-Help Guide for Autonomous Systems*, 29 AI MAG. 67, 67 (2008).

46. *Id*.

47. *See* Stewart, *supra* note 20, at 282 (explaining the inability of even the "most gifted programmer" to develop autonomous robots capable of functioning effectively in the "fog of war").

48. Paul Sharre, *Why Unmanned*, 61 JOINT FORCES Q. 89, 92 (2011).

49. *See* Anderson et al., *supra* note 45, at 67 (introducing a proposal that robots be programmed to "learn" from their mistakes, the way humans do, in order to function more effectively).

50. ARKIN, *supra* note 18, at 144.

51. Jeffery Johnson, Robotics in the Evolution of Complexity Science 11 (May 21, 2004) (unpublished report), *available at* http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.125.4158&rep=rep1&type=pdf.

52. *Id.*

that would not run into other flying objects.[53] Thus, two out of three parts of what robots "do"—*sense* and *plan*—are beset by brittleness problems. These technological shortcomings have important implications for how AWSs may be used and may inhibit their ability to engage in autonomous targeting.

B. Military Robotic Technology in Development

Despite these limitations, the U.S. Department of Defense (DoD) and militaries around the world are dedicated to developing more fully autonomous weapons systems.[54] "A significant proportion, perhaps even the majority, of contemporary robotics research is funded by the military."[55] Indeed, there are at least seven U.S. government labs currently working on some unmanned systems research projects.[56] Some, such as the Defense Advanced Research Projects Agency, are working to bridge the gap "between fundamental discoveries and their military use."[57] Congress itself has directed the military branches to dedicate themselves to unmanned systems.[58] In 2007, the U.S. Government intended to spend at least $24 billion on unmanned systems through 2013.[59]

Autonomy is seen as inevitable for a number of reasons, but foremost because autonomous systems have quicker reaction times than the best human could have.[60] The ability to fight autonomously from the air may be in the not-so-distant future—approximately four to fourteen years out, according to the U.S. Air Force.[61] AWSs, however, will not be limited to the air, but will also operate on the land and at sea.[62] For example, BAE Systems and Carnegie Mellon University have produced a prototype of a lethal unmanned ground vehicle for the Marine Corps called the Gladiator Tactical Unmanned Ground Vehicle.[63]

Further, current trends in UAV technology are diversifying in terms of size and manner of use. For instance, one of the new ideas in UAV technology is the "swarm," where a large number of small UAVs operate in concert to perform designated missions.[64] The swarm model has the advantages of being

53. U.S. DEP'T OF DEF., UNMANNED SYSTEMS ROADMAP 2007–2032, at 43 (2007) [hereinafter UNMANNED SYSTEMS ROADMAP].

54. Stewart, *supra* note 20, at 280.

55. Sparrow, *supra* note 36, at 169.

56. *See* UNMANNED SYSTEMS ROADMAP, *supra* note 53, at 30–37 (listing laboratories and their current unmanned systems research projects).

57. *Id.* at 34.

58. *See id.* at 6 (explaining that Congress created goals to make one-third of aircraft in operational deep strike force and one-third of the Army's Future Combat Systems operational ground combat vehicles to be unmanned by 2010 and 2015 respectively).

59. *Id.* at 10. This 2007 figure includes costs of research, development, testing, and deployment.

60. SINGER, *supra* note 1, at 127.

61. U.S. AIR FORCE, UNMANNED AIRCRAFT SYSTEMS FLIGHT PLAN 50 (2009).

62. *See, e.g.*, ARKIN, *supra* note 18, at 15 (detailing how West Virginia University has used its Fire Ant Robot for aerial and ground tests); Brendan Gogarty & Meredith Hagger, *The Laws of Man Over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air*, 19 J. L. INFO. & SCI. 73, 92–94 (2008) (explaining how AWS technologies work underwater).

63. ARKIN, *supra* note 18, at 14.

64. SINGER, *supra* note 1, at 233.

terrifying to enemy forces, adaptive enough to continue with the mission despite the destruction of some of the robots, and far more intelligent as a group than the individual components would be.[65] With the swarm model of UAVs, it is clearly impractical to have each UAV controlled by a separate operator. One potential drawback of this model would be that, because of the complexity of such a system, it could be highly unpredictable.[66]

While the hardware and strategies are undergoing rapid development, perhaps the most significant research is being conducted on the software underlying AWSs. Ronald Arkin, a professor at Georgia Tech University, is working on the development of ethical AWSs.[67] In 2009, Prof. Arkin published *Governing Lethal Behavior in Autonomous Robots*, a book that lays out how such a robot could be programmed to follow ethical and legal rules such as the LOAC and the rules of engagement (ROE).[68]

There are four components of Arkin's ethical robot: (1) an ethical governor; (2) an ethical behavioral control; (3) an ethical adaptor; and (4) a responsibility advisor.[69] The core of Arkin's system is the ethical governor. The ethical governor is a series of algorithms that determine whether a lethal response is ethical based on preset rules that constrain lethal action.[70] Lethal action is presumed impermissible, unless there is a specific rule saying that with a given set of inputs, the AWS may fire.[71] These rules are based on formalized logical statements of the LOAC and mission-specific ROE, which can be set by a commander before deploying the AWS.[72] This translation of legal principles and rules into an algorithm-compatible rule has yet to be achieved.[73] Without something akin to Arkin's ethical governor or the development of methods to use "stupid" AWSs, AWS operating in a fully autonomous mode would be neither useful militarily nor legal to operate.[74]

Such advancements are most important for the use of AWS in an offensive or attack capacity.[75] Assuming that AWSs would supplement, not replace, human combat forces, any robot that cannot distinguish between targets may be highly prone to friendly fire incidents. "Dumb" robots such as the MK 15 Phalanx Close-In Weapons System may nevertheless be useful in a

65. KRISHNAN, *supra* note 10, at 57; SINGER, *supra* note 1, at 234–35.

66. SINGER, *supra* note 1, at 235.

67. Faculty Profile for Ronald Arkin, GA. TECH COLL. OF COMPUTING, http://www.cc.gatech.edu/aimosaic/faculty/arkin/ (last visited Jan. 22, 2013).

68. ARKIN, *supra* note 18, at xvii.

69. *Id.* at 125.

70. *Id.* at 127–28.

71. *See id.* at 94 (explaining that the ideal is a rule to the effect of "do not engage a target until obligated to do so consistent with the current situation, and there exists no conflict with the [Laws of War] and ROE"); *id.* at 98 ("An underlying assumption will be made that any use of lethality by the autonomous unmanned system is prohibited by default, unless an obligating constraint requires it and it is not in violation of any and all forbidding constraints.").

72. *See id.* at 99–102 (explaining how ethical rules can be encoded in modal logic so that computers can formally derive specific ethical actions from those rules).

73. *See id.* at 98 (acknowledging that the development of ethical systems in autonomous unmanned units is still in a preliminary stage).

74. *Id.* at 45. The problems with this approach are discussed in more detail *infra* Part IV.

75. *See id.* at 37 (describing autonomy in the context of AWSs as the ability to select targets and attack).

defensive role.[76] Some, such as John Canning, have suggested that dumber AWSs may be able to target signatures of enemy weapons and thereby get around the problems that Arkin faces.[77] The centrality of an ethical-governor type system to the deployment of AWSs may explain why the DoD has been very supportive of robotics research such as Prof. Arkin's.[78]

Militaries are enticed by AWSs for several reasons. First, an AWS would be able to stay on station for much longer than a manned vehicle.[79] Second, they can perform dull, dirty, and dangerous missions that human combatants may prefer to avoid.[80] Most importantly, AWSs would be militarily useful if they can successfully compress the targeting process.[81] An aerial AWS that could go through the entire targeting process on its own in a very short time would mean that ground forces could call in air support that arrives quickly, but still follow the legal and policy requirements of the targeting process.[82] Given the interest and the myriad benefits of AWSs, there is a strong incentive to find legal ways to deploy AWSs given current technological shortcomings and focus research on those problems that most inhibit the use of AWSs.

III. THE LAWS OF ARMED CONFLICT: PRINCIPLES

There is no treaty specifically governing the use of unmanned systems or AWSs.[83] However, like all other weapon systems, unmanned vehicles and AWSs are subject to the general principles of the LOAC.[84] There are four key principles of the LOAC: military necessity, distinction, proportionality, and humanity.[85] Additionally, it is commonly accepted that the LOAC assume individuals may be held accountable for violations.[86] These principles are derived from treaties such as the Hague Convention of 1907, the Geneva Conventions of 1949, and the 1977 Additional Protocols to the Geneva

76. PowerPoint: John Canning, Panel Discussion, *Ubiquitous Platform to PlayStation Disruptive Technologies* at the Third Annual Disruptive Technology Conference: "A Concept of Operations for Armed Autonomous System" (Sept. 6–7, 2006), *available at* http://www.dtic.mil/ndia/2006disruptive_tech/canning.pdf.

77. *Id.*

78. *See* ARKIN, *supra* note 18, at xii (explaining reasons why the DoD has supported robotics research by noting that "up to this time there was no mention of the use of robotics to reduce the number of ethical infractions that could potentially lead to a reduction in *noncombatant* fatalities.").

79. *See* John J. Klein, *The Problematic Nexus: Where Unmanned Combat Air Vehicles and the Law of Armed Conflict Meet*, CHRONICLES J. ONLINE (2003), *available at* http://www.airpower.au.af.mil/airchronicles/cc/klein.html ("[AWSs] promise to dramatically revolutionize combat operations.").

80. *See, e.g.*, *id.* ("[I[f unmanned aircraft are designed with an identification and targeting capability commensurate with that of manned aircraft, then they should in general operate at lower altitudes than manned aircraft . . . [increasing] the probability of correct target identification and consequently minimiz[ing] the potential for collateral damage and incidental injury.").

81. The targeting process is described in further detail *infra* Part III.

82. Current Air Force doctrine suggests that going through the various stages of the targeting process simultaneously would be effective. U.S. AIR FORCE, AIR FORCE DOCTRINE DOCUMENT 2-1.9: TARGETING 6–17, 47 (2006).

83. Marchant et al., *supra* note 7, at 289.

84. *Id.*

85. LT. COL. JEFF BOVARNICK ET AL., U.S. ARMY, LAW OF WAR DESKBOOK 139 (2011) [hereinafter LOW DESKBOOK]. There are many different ways to divide up the principles that form the core law of armed conflict. I have chosen the division used by the U.S. military.

86. *See id.* at 179 (discussing war crimes and command responsibility).

Conventions as well as from Customary International Law and persuasive opinions of the various international criminal tribunals.[87]

A. Military Necessity

The principle of military necessity states that military commanders must act in a manner necessary for advancing military objectives and ensure that their action is not otherwise prohibited by the LOAC.[88] A legitimate military objective is one that "offers a definite military advantage."[89] This principle recognizes the legitimate interest in ending hostilities through victory.[90] However, "[u]nnecessary force cannot be used, so wanton killing or destruction is illegal."[91] Further, "[m]ilitary necessity does not admit of cruelty—that is, the infliction of suffering for the sake of suffering."[92] Additionally, certain objects, such as "cultural property," *e.g.*, monuments of cultural significance and medical facilities, are protected from attack unless misused by the enemy.[93] Military necessity is mentioned in many LOAC treaties, but "arises predominantly from customary international law."[94] This concept forms a vital part of several of the following legal principles.

B. Distinction or Discrimination

The principle of distinction, sometimes called the principle of discrimination, is "the grandfather of all principles."[95] This principle requires combatants to direct their attacks solely at other combatants and military targets and to protect civilians and civilian property.[96] Though simple in theory, difficulties often arise with this principle in practice. Some targets, such as bridges or power grids, "can be classified as both being civilian in nature as well as possessing a military purpose."[97]

Indiscriminate attacks are prohibited.[98] Indiscriminate attacks are those that are not directed at a military object, or "[e]mploy a method or means of combat the effects of which cannot be directed . . . [or] limited as required."[99] The distinction principle also requires that defenders must distinguish

87. *See* U.S. ARMY, THE LAW OF LAND WARFARE app. a, pt. vi (1956) (discussing treaties related to land warfare). *See generally* LOW DESKBOOK, *supra* note 85 (relying on treaties, customary international law, and learned opinions on the interpretation of the LOAC).

88. LOW DESKBOOK, *supra* note 85, at 140.

89. *Id.*

90. *See* Marchant et al., *supra* note 7, at 296 (discussing the benefits of a speedy end to hostilities).

91. Tony Gillespie & Robin West, *Requirements for Autonomous Unmanned Air Systems Set by Legal Issues*, 4 INT'L C2 J. 1, 9 (2010).

92. U.S. WAR DEP'T, GENERAL ORDERS NO. 100, THE LIEBER CODE OF 1863 ¶ 16 (1863). This part of the military necessity principle also forms part of the principle of humanity.

93. LOW DESKBOOK, *supra* note 85, at 151–52.

94. *Id.* at 140.

95. *Id.* at 154.

96. *Id.*

97. Markus Wagner, *Taking Humans Out of the Loop: Implications for International Humanitarian Law*, 21 J. L. INFO. & SCI. 155, 160 (2011).

98. *Id.* at 160–61.

99. LOW DESKBOOK, *supra* note 85, at 154.

themselves from civilians and "refrain from placing military personnel or materiel in or near civilian objects or locations."[100]

C. Proportionality

The principle of proportionality is derived primarily from the 1977 Additional Protocol I.[101] This principle "requires that damage to civilian objects . . . not be 'excessive in relation to the concrete and direct military advantage anticipated.'"[102] Therefore, to engage in a proportionality analysis, combatants must attempt to determine what the likely collateral damage to civilians and civilian objects would be in any attack on a military target. If no civilians or civilian objects are in reasonable danger, however, then no proportionality analysis is needed.[103]

When judging a proportionality analysis ex post, one employs a "reasonable commander" standard, meaning that "one must look at the situation *as the commander saw it* in light of all known circumstances."[104] To assist in this analysis in an air-to-ground attack, today's commanders can use programs like the unfortunately named "Bugsplat" to predict the effect of a particular munition on a given target, taking into account the surrounding environment and terrain.[105]

D. Humanity

The principle of humanity limits the ability of combatants to adopt certain "means of injuring the enemy."[106] It is forbidden to inflict "suffering, injury, or destruction not actually necessary for the accomplishment of legitimate military purposes."[107] Therefore, it is often called the principle of "unnecessary suffering."[108] There are three parts of this principle: (1) it prohibits use of "arms that are per se calculated to cause unnecessary suffering;" (2) it prohibits use of "otherwise lawful arms in a manner that causes unnecessary suffering;" and (3) the above prohibitions only apply when the unlawful effect is specifically intended.[109] Additionally, all weapons used by U.S. Armed Forces are reviewed ex ante by The Judge Advocate General (TJAG), the chief military lawyer, for whichever service is developing the weapon.[110] During TJAG's review, he or his designee will focus on whether

100. *Id.* at 155.
101. Wagner, *supra* note 97, at 162.
102. *Id.* (quoting Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, 8 June 1977, 1125 U.N.T.S. 3).
103. LOW Deskbook, *supra* note 85, at 155.
104. *Id.* at 156 (emphasis in original).
105. Bradley Graham, *Military Turns to Software to Cut Civilian Casualties*, WASH. POST, Feb. 21, 2003, at A18.
106. LOW DESKBOOK, *supra* note 85, at 157.
107. Gillespie & West, *supra* note 91, at 10.
108. *See* LOW DESKBOOK, *supra* note 85, at 157 (using the term "principle of unnecessary suffering and humanity").
109. *Id.*
110. *Id.* at 157–58.

the weapon will per se cause unnecessary suffering, likely uses of the weapon, and whether the weapon is specifically prohibited by any treaty provision, such as the 1868 ban on small exploding projectiles.[111]

E. The Laws of Armed Conflict Applied: The Targeting Process

The principles outlined above do not exist in a vacuum, but must be applied in the field. These principles as well as the strategic and policy objectives of the campaign are applied in part through a complex process called "targeting."[112] In the context of air-to-ground targeting there are two types: deliberate and dynamic.

Deliberate targeting is planned ahead of time.[113] First, the target, for instance a building used as a Taliban meeting place, is identified. Targeteers (targeting specialists) pore over maps and data on the target, gathered from a variety of intelligence sources.[114] They engage in a process called "collateral damage mitigation." In this process, the targeteers analyze information about the time of year, the hour of attack, the type of building being targeted, and the surrounding buildings to produce an estimate on where civilians are most likely to be present.[115] They take into account the types of munitions available, including their likely blast radius and effect.[116] They then choose the munition and angle of attack that will best achieve the objective, while minimizing likely civilian casualties.[117] A senior commander, designated ex ante, sets the level of acceptable civilian casualties.[118] A target will only be approved if the anticipated collateral damage is less than that level.[119] AWSs would fit into the deliberate targeting framework without having to change much, if anything. The autonomy of the weapon system would merely take over the autonomy of the pilot. The designation of the target and the approval to attack it would remain with the commander.

Dynamic targeting, by contrast, is time sensitive and the decision process is compressed.[120] Targets engaged through this process are usually fleeting.[121]

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111. Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, Dec. 11, 1868, 138 Consol. T.S. 297, *available at* http://www.icrc.org/ihl.nsf/FULL/130; LOW DESKBOOK, *supra* note 85, at 158.

112. *See* U.S. AIR FORCE, *supra* note 82 (describing targeting).

113. *Id.* at 17.

114. It has been said that "military intelligence is the basis of operations." David Thomas, *U.S. Military Intelligence Analysis: Old and New Challenges*, *in* ANALYZING INTELLIGENCE 143 (Roger George & James Bruce eds., 2008). Yet, most of "the information obtained in War is contradictory, a still greater part is false and by far the greatest part is of a doubtful character." GEN. CARL VON CLAUSEWITZ, ON WAR 49 (Feather Trail Press 2009). Since the old adage of data analysis, "junk in, junk out," holds true for military targeting as it does in other data-reliant systems, if intelligence misidentifies a particular target, you can have the most accurate and discriminating weapon in the world and still cause astounding collateral damage.

115. Gregory McNeal, The U.S. Practice of Collateral Damage Estimation and Mitigation 14–15 (Nov. 9, 2011) (unpublished), *available at* http://ssrn.com/abstract=1819583 (discussing factors that alter population density).

116. *Id.*

117. *Id.* at 14–15, 20.

118. *Id.* at 25.

119. *Id.* at 27. If it is above this level, the attack must be approved by the National Command Authority, *i.e.*, the President and the Secretary of Defense. *Id.* at 27–28.

120. U.S. AIR FORCE, *supra* note 82, at 46.

For instance, if a ground unit needs close air support to repel an enemy attack, the targeting process would probably be "dynamic." It is in these situations that AWSs may be most useful. The steps taken in dynamic targeting are largely the same as those during deliberate targeting.[122] These two processes differ mostly in the speed with which the steps are taken.[123]

IV. REQUIREMENTS FOR AUTONOMOUS WEAPONS SYSTEMS UNDER THE LAWS OF ARMED CONFLICT

In this Section, I will apply the principles developed in Section III to the technology currently available, highlight its shortfalls, and suggest both guidelines for use given current limitations and areas where technological development will need to progress before AWSs will be militarily functional and legally permissible under the LOAC principles of military necessity, discrimination, proportionality, and humanity. As part of the discussion of the principle of humanity, I will conduct a brief review of the legality of current AWSs in light of the LOAC principles. The hypothetical AWS being assessed here is an UAV. I assume that the system is outfitted with the latest available sensors and that the designers want autonomy in these systems in order to conduct the entire targeting process (identifying the target, deciding to engage it, and launching the missile) onboard the aircraft.

A. Military Necessity

Assessing military necessity is a delicate, judgment-based decision undertaken by a commander.[124] To decide whether an AWS could obey the mandate of military necessity, one must ask whether it can identify military targets and then assess whether the destruction of the target "offers a definite military advantage."[125] The destruction of enemy forces and materiel generally would meet this test; therefore, the question of whether an AWS could meet the requirements of military necessity becomes a question of whether it can meet the requirements of discrimination.[126] If the AWS cannot identify whether the target is military or civilian, including whether the target is a cultural object or medical facility, it cannot determine whether the target's destruction would be militarily necessary.[127]

Assuming that sensor technology and the software improves to the point that an AWS could identify a target as military or civilian, it could probably meet the strict legal requirements of military necessity. The AWS, however,

121. *Id.* at 48.
122. *Id.* at 46.
123. *Id*.
124. *See, e.g.*, LOW DESKBOOK, *supra* note 85, at 141 (discussing the "Rendulic Rule," in which a commander cannot be made liable for a mistake in war regarding a decision based on sufficient conditions).
125. *Id.* at 140.
126. *See id.* at 154 (describing the principle of "Discrimination or Distinction").
127. Possible solutions to this problem are discussed more in the Discrimination/Distinction section, *infra* Part IV.b.

would still have to be under the control of a human commander.[128] Military necessity is a context-dependent, value-based judgment of a commander (within certain reasonableness restraints) applied through the targeting process outlined above.[129] The AWS would not be operating in a vacuum, but as part of an overall military campaign. Therefore, as suggested by Prof. Arkin's model, the AWS would have to be capable of following different levels of ROE decided by the combatant commander.[130] ROE can require techniques such as escalation of force, where an authorized entity (be it machine or man) must begin with non-lethal techniques such as warning shots before escalating to direct lethal engagement.[131] An AWS should be able to follow such rules.

As with many complex systems, an AWS will likely fail at one point or another.[132] It can be difficult to quickly determine what went wrong, even for slightly less complex machines such as the F-22.[133] Thus, any AWS should be able to fail safely.[134] This requirement exists because military necessity requires the avoidance of wanton destruction.[135] That is, there has to be some hard-wired response to something the robot cannot deal with under its current parameters. However, designing systems that fail safely can be extremely difficult.[136] At the moment, one of the solutions for malfunctioning UAVs is to shoot them down.[137] Clearly, better solutions must be developed. Proposals for AWSs that fail safely include design features such as automatically returning to base if a critical system were damaged.[138]

B. Discrimination/Distinction

The inability to discriminate between combatants and civilians is perhaps the greatest hurdle to the legal deployment of AWSs.[139] At the moment, there

128. *See* Gillespie & West, *supra* note 91, at 9–10 (describing the design requirements for who or what is doing the controlling).

129. *See, e.g.*, LOW DESKBOOK, *supra* note 85, at 141 (discussing the reasonable commander standard known as the "Rendulic Rule").

130. ARKIN, *supra* note 18, at 81.

131. *Id.*

132. *See* Gogarty & Hagger, *supra* note 62, at 122 ("UVs, especially UAVs, have proven reasonably unreliable and subject to faults, errors and accidents.").

133. David Axe, *Oxygen Losses Ground Stealth Fighter, Again*, WIRED (Oct. 21, 2011, 5:35 PM), http://www.wired.com/dangerroom/2011/10/stealth-fighters-grounded/.

134. Gillespie & West, *supra* note 91, at 10.

135. *Id.* at 9.

136. Sharre, *supra* note 48, at 92.

137. Robert Wall, *USAF Splashes One Reaper*, AVIATION WEEK (Sept. 14, 2009, 2:57 PM), http://www.aviationweek.com/Blogs.aspx?plckBlogId=Blog:27ec4a53-dcc8-42d0-bd3a-01329aef79a7&plckController=Blog&plckBlogPage=BlogViewPost&newspaperUserId=27ec4a53-dcc8-42d0-bd3a-01329aef79a7&plckPostId=Blog%253A27ec4a53-dcc8-42d0-bd3a-01329aef79a7Post%253A32530e23-3fa1-4379-8f67-3f785feb01fd&plck.

138. Maryann Lawlor, *Combat-Survivable Unmanned Aircraft Take Flight*, SIGNAL ONLINE (Mar. 2003), http://www.afcea.org/content/?q=node/281. Of course, the problem with this solution would be that it provides an obvious countermeasure that enemies could use, something already in the mind of enemies like Iran. *See, e.g.*, Thomas Erdbrink, *Iran Demands Apology From U.S. for Drone Flight*, WASH. POST, Dec. 14, 2011, at A13 (discussing Iran's claim to have hacked a captured RQ-170 Sentinel).

139. *See* Noel Sharkey, *Grounds for Discrimination: Autonomous Robot Weapons*, 11 RUSI DEFENCE SYSTEMS 86, 87 (2008) (describing the humanitarian issues facing AWSs).

is no suite of sensors "up to [the] challenge" of discrimination.[140] The problem lies partially in the lack of a clear definition of civilian.[141] It is extremely difficult to correctly identify targets on the battlefield. One study found that up to 70% of all civilian casualties caused by U.S. forces were cases of mistaken identity.[142] Thus, it is insufficient to program an AWS with the ethical limit of "do not target civilians," because the AWS needs to be able to determine who is a civilian.[143] If it cannot meet this requirement, the identification of targets will have to remain with a human commander.[144]

This inability to define civilian is the greatest weakness in Prof. Arkin's ethical model. Arkin's model requires the ethical governor to determine whether the target is civilian or combatant with a pre-set degree of certainty that Arkin labels "λ."[145] Arkin proposes various ways to increase λ including "reconnaissance by fire," where the AWS would fire near, but not at the potential target in an effort to elicit a hostile response.[146] It is unclear, however, how the AWS can determine various degrees of certainty.

Another solution to the discrimination problem has been proposed by John Canning, an engineer at the Naval Surface Warfare Center.[147] He proposed that unmanned systems should target enemy weapons, as opposed to the enemies themselves.[148] This proposal may work well for weapons such as tanks and other vehicles that may give off a distinctive signature and are only operated by combatants. For example, current anti-radiation missiles, such as the AGM-88 HARM, are able to automatically target Surface to Air Missile systems based on their emitted radar signal.[149] However, enemy personnel may prove a much more significant challenge. A fully-autonomous AWS would not only have to distinguish between a man carrying an AK-47 and a man carrying a walking stick, but between a non-combatant carrying an AK-47 and a combatant carrying the same weapon.[150]

One method of target identification that may be possible even with today's technology is conduct-based targetability.[151] Combatants may target those who have demonstrated hostile intent or committed a hostile act.[152] An

140. *Id.*

141. *Id.*

142. McNeal, *supra* note 115, at 13.

143. *Id.*

144. Although the above statistic makes clear that humans do not identify targets perfectly, relying on a human commander to make these calls is preferable in that identification can be highly context-specific and dynamic. Such uncertainty will likely better be dealt with by humans for the foreseeable future.

145. ARKIN, *supra* note 18, at 59–60.

146. *Id.* at 60.

147. Canning, *supra* note 76.

148. *Id.*

149. *AGM-88 HARM*, FED'N AM. SCIENTISTS: MIL. ANALYSTS NETWORK (Apr. 23, 2000, 7:24 AM), http://www.fas.org/man/dod-101/sys/smart/agm-88.htm.

150. In some parts of the world, such as Afghanistan, firearms are ubiquitous and therefore any AWS without a man in the loop would have to be able to contextualize what it was sensing. *See generally* Mark Sedra, *Afghanistan Programme Seeks to Reduce the Rule of the Gun*, RUSI HOMELAND SECURITY & RESILIENCE MONITOR, Apr. 2005, at 10 ("Although most of the heavy weaponry in Afghanistan has been accounted for, small arms remain ubiquitous in the country.").

151. "Targetability" in this context means that a given target may be legally engaged.

152. LOW DESKBOOK, *supra* note 85, at 143.

AWS may be better able to determine the origin of a shot or missile based on projecting its trajectory back to the source than determine on its own whether a given individual would fit a status-based category. For instance, an unmanned ground vehicle may be able to incorporate systems like the "Boomerang" that can detect a shooter's position.[153] An autonomous UAV may be able to use gunfire detection systems currently in development to pinpoint targetable individuals.[154]

Additionally, if there were ever a battlefield where no civilians were reasonably thought to be present (an unlikely scenario), then a commander may be able to legally unleash an AWS in that area, even if it were not capable of distinguishing between combatant and civilian.[155] This scenario highlights an important distinction that is often overlooked in the discussions of UAVs and AWSs: many weapons cannot themselves distinguish between a combatant and civilian, but so long as they can be used in a way that distinguishes between the two, they may be legally used in that manner.[156] Even if AWS became a little smarter, geographic, mission-specific limitations would be advisable. Prof. Arkin proposes including geographic limitations into the mission parameters for his "ethical" AWS.[157] Such programmed restraints might be necessary given that geographic information is key to accurate collateral damage mitigation.[158]

C. Proportionality

The problem of proportionality assessment for AWSs arises from the same distinction issue that underlies many legal and technological hurdles facing AWSs.[159] Combatants must take feasible precautions to minimize damage to civilian lives and property.[160]

In Arkin's model, the AWS relies on a "proportionality optimization algorithm," which "maximizes the number of enemy casualties while minimizing unintended noncombatant casualties."[161] However, without an ability to estimate the number of civilians or the number of combatants likely to be affected by a given attack, it is impossible to determine whether the attack would be proportionate. Fortunately for AWSs, this responsibility may

153. Andrew White, *Fighting Fire With Fire: Technology Finds a Solution to Sniper Attacks*, JANE'S INT'L DEFENCE REV., June 2009, at 52–54, *available at* http://boomerang.bbn.com/docs/jane_june2009.pdf.

154. *See id.* at 53 ("We can migrate this technology to air vehicles, unmanned surface vessels . . . .").

155. Klein, *supra* note 79 (discussing the use of "kill box" restrictions to geographically limit AWS operations).

156. *See Rule 71. Weapons That Are by Nature Indiscriminate*, INT'L COMM. OF THE RED CROSS, http://www.icrc.org/customary-ihl/eng/docs/v1_cha_chapter20_rule71 (last visited Jan. 22, 2013) (explaining that it is only weapons that are per se incapable of being used in a discriminate way that are unlawful).

157. ARKIN, *supra* note 18, at 47.

158. McNeal, *supra* note 115, at 26 (discussing the importance of geography-linked population density data). This kind of programming restriction is different than the range restrictions proposed by others. Whereas the range restrictions would take the form of a legal restriction, this proposed programmatic restriction relates to the current limitations of the technology. As the sensor and data processing technology advances, such restrictions may no longer be necessary.

159. Gillespie & West, *supra* note 91, at 12.

160. *Id.*

161. ARKIN, *supra* note 18, at 187.

remain with the commander. Proportionality is largely a qualitative, subjective decision.[162] The commander can assess the situation and authorize (or not authorize) the release of a given class of weapon on the proposed target, using assessments from the AWS sensors, programs like Bugsplat,[163] and other available intelligence to make his or her decision. Thus, even if AWSs cannot conduct proportionality assessments on their own, they may still be able to function legally in some situations. Of course, this solution is problematic in that it reduces the ability of the AWS to compress the targeting process into a shorter time period. Nevertheless, keeping a human in the loop may be necessary if AWSs are to be utilized, at least insofar as proportionality judgments are concerned.[164]

D. Humanity

AWSs are, quite simply, not designed to "cause unnecessary suffering," therefore, they would meet the per se requirements of the humanity principle.[165] Indeed, they are designed precisely to minimize unnecessary suffering both of friendly troops and civilians.[166] Of course, they may not be used in a way to cause unnecessary suffering.[167] For instance, they may not be equipped with fragmentation weapons whose fragments are not detectable by x-ray.[168] Absent some addition like impermissible fragmentation weapons, however, the principle of humanity, ironically, may be the least problematic LOAC principle for AWSs.[169]

E. Current Opposition to Autonomous Weapons Systems

Despite the fact that AWSs will not likely be making fire/no fire decisions in the near to medium term, there are already some groups calling for international accords to ban such systems.[170] The most prominent of these groups is called the International Committee for Robot Arms Control

162. Gillespie & West, *supra* note 91, at 13.

163. *See supra* Part II (explaining that robots can be programmed to use specific information in determining whether lethal response is appropriate, and that some of that information can be set by a commander before the AWS is deployed).

164. Klein, *supra* note 79, at 6 (arguing that UAVs should keep humans in "the identification and targeting decision cycle" for now).

165. *See* LOW DESKBOOK, *supra* note 85, at 157 (explaining the "principle of unnecessary suffering or humanity").

166. ARKIN, *supra* note 18, at 212 (discussing his hope that his research would help minimize civilian casualties).

167. LOW DESKBOOK, *supra* note 85, at 157.

168. *See id.* at 158 (discussing examples of illegal weapons that cause unnecessary suffering).

169. There are some concerns that by taking a human out of the cockpit or the driver's seat one makes war more likely since it is less costly. This logic, however, could be applied to any advance in military technology. A B-2 is nearly impossible to shoot down when paired with American air superiority, yet it has not been shown to make war more likely. *See B-2 Spirit Bomber*, NORTHROP GRUMMAN, http://www.as.northropgrumman.com/products/b2spirit/index.html (last visited Jan. 25, 2013) (explaining that the B-2 is one of the "most survivable aircraft in the world"). It remains to be seen whether unmanned systems will in fact have some greater effect on the international use of force than other advances in military technology.

170. Marchant et al., *supra* note 7, at 298.

(ICRAC).[171] The ICRAC was founded in 2009 by roboticist Noel Sharkey, physicist Jürgen Altmann, bioethicist Robert Sparrow, and philosopher Peter Asaro.[172] Many of its suggestions are eminently reasonable. For example, forbidding unmanned systems from carrying nuclear weapons and making decisions on when to release them[173] would clearly be a reasonable restriction. Other suggestions, however, such as limiting the range of UAVs,[174] seem unlikely to affect its stated goals and contrary to the technological trends. One of the principal benefits of UAVs is their ability to travel far from their base and remain on station longer than manned aircraft. Therefore, attempting to limit the range of these systems would be directly contrary to their military advantage. Further, it is questionable whether any international instrument that purports to ban all AWSs would ever be adopted by states.[175] It may be more effective to integrate concerns and requirements of the LOAC in the design and deployment of AWSs. The next few sections examine the legal requirements of weapons systems and the technological innovations the law will require.

It is important to note that although this paper concentrates principally on U.S. perspectives and U.S.-based developments, the United States is far from the only country working on developing advanced unmanned systems and AWSs.[176] Indeed, proliferation is one of the most prominent concerns amongst those opposed to the development of advanced unmanned platforms.[177] While this concern may be appropriate for low-tech UAVs, which some of the more sophisticated insurgent groups have harnessed,[178] AWSs are out of the reach of any power except a limited number of states for the foreseeable future.[179]

F. The International Legality of Autonomous Weapons Systems

AWSs may not be used in fully autonomous modes yet and likely will not be able to be used in that mode for a number of years. Until roboticists can master the brittleness, vision, and recognition problems, AWSs will not be able to conduct either distinction or proportionality analyses.[180] Thus, these functions must be left to the human commanders and targeteers. However, AWSs may be used in semi-autonomous (or automatic) modes where they engage targets previously identified by a commander who can conduct the

171. ICRAC, http://icrac.net/ (last visited Jan. 25, 2013).

172. Marchant et al., *supra* note 7, at 298.

173. *Statements*, ICRAC, http://icrac.net/statements/ (last visited Jan. 25, 2013).

174. *Id*.

175. *See* Marchant et al., *supra* note 7, at 305 (noting how states may be reluctant to enact a ban on the use of militarized autonomous vehicles).

176. Stewart, *supra* note 20, at 280–81 (noting that Israel, China, and the United Kingdom are the other principal developers of unmanned vehicle technology).

177. *See* Scott Shane, *Coming Soon: The Drone Arms Race*, N.Y. TIMES, Oct. 8, 2011, at SR5 (discussing how foreign militaries and terrorist groups may obtain drone technologies).

178. Noah Shachtman, *Iraq Militants Brag: We've Got Robotic Weapons, Too*, WIRED (Oct. 4, 2011, 1:36 PM), http://www.wired.com/dangerroom/2011/10/militants-got-robots/.

179. *See* Shane, *supra* note 177 (noting that only three nations have used UAV technology for military strikes).

180. *See infra* Part IV.B–C (discussing proportionality and discrimination aspects of AWSs).

required targeting analyses. Since AWSs cannot be legally deployed until technology matures a great deal further, calls for banning such weapons in the interim are unnecessary.[181] Prof. Sharkey was clearly mistaken in stating, "[i]f there was a political will to use [autonomous robots in warfare] then there would be no legal basis on which to complain."[182] The LOAC provide a more nuanced solution: the targeting process may not be autonomous (*i.e.*, without a human in the loop) until such time as AWSs can meet the standards set by existing LOAC principles.[183]

The sections above show that technology that meets the legal requirements for autonomous targeting is likely a long way off. To do dynamic targeting completely autonomously in the close air support example, the AWS would have to be able to: (1) identify the type of building being targeted; (2) identify friendly forces and avoid harm to them; (3) incorporate population density information and intelligence about the area being targeted; (4) know the weapons available and their likely effect, given the above; (5) analyze the best method to minimize civilian casualties; and (6) follow pre-set guidance on acceptable levels of civilian casualties.[184] There is good reason to suspect that the technology will not reach a level of intelligence sufficient to meet these requirements for a long time.[185] Using unmanned vehicles in automatic modes where a human commander, following normal targeting procedures, designates a target and the weapon to be used would largely avoid these difficulties.[186]

Nevertheless, the international community would benefit from the kind of international discussion proposed by Prof. Sharkey on the issue of standards.[187] How can we tell when AWSs are developed enough to operate on their own? One logical standard would be "no worse than humans."[188] Currently, accurate data on civilian casualties in war are extremely hard to come by.[189] Therefore, we do not know how "good" humans are at following the LOAC. Additionally, there would be problems in establishing "a reliable testing method."[190]

The unsatisfying answer may be that the military, the United States, or some group of nations simply have to decide that a given point is "good

181. *See, e.g.*, Sharkey, *supra* note 139, at 89 (arguing the deployment of AWSs should be restricted or banned until there are international considerations of how the weapons can effectively discriminate between targets).

182. *Id.* at 88.

183. *Id*.

184. *See* Gillespie & West, *supra* note 91, at 28–32 (noting requirements for cognitive capabilities of autonomous unmanned air systems).

185. *See* Sharkey, *supra* note 139, at 87 (noting massive spending by the government in order to meet the level of intelligence necessary for these requirements).

186. Thus, the emphasis on autonomy would move to compressing the "kill chain"—the steps between the designation of the target and its destruction.

187. *E.g.*, Sharkey, *supra* note 139, at 87 (discussing legal and ethical implications of autonomous weapons).

188. *See* KRISHNAN, *supra* note 10, at 110 ("[A]n [AWS] that was not as good as a human in making targeting decisions would be illegal under international law.").

189. Opinion, *The Drone Wars*, WALL ST. J., Jan. 9–10, 2010, at A12.

190. KRISHNAN, *supra* note 10, at 111.

enough." AWSs will have to be tested thoroughly to determine data points such as "differences between expected and actual" results, the ability to follow varying levels of the ROE, and the accuracy of the AWS sensors in correctly classifying various objects.[191] Once these data points have been collected, a more informed discussion on where to set the standard may begin. These standards will likely be formed first within the militaries that develop and deploy AWSs. They will be based on making AWSs militarily useful given the existing technological limitations, while respecting international LOAC obligations.

V. LEGAL ACCOUNTABILITY FOR AUTOMATED WEAPONS SYSTEMS

Once these design, deployment, and use standards are set, who may be held accountable if those standards are not met and an innocent person is injured? AWSs are complex new systems, which—despite the best efforts of designers, testers, and operators—will fail at one point or another. Accountability is an issue both in testing and on the battlefield.[192] In introducing new technology, trust in these systems is vital. An effective system of accountability where lines of responsibility are clear will be important to incentivize caution ex ante as well as to rectify unwanted injuries. To the extent that the autonomy of these new systems causes gaps in current accountability mechanisms, I argue that they can be filled through the establishment of internal military regulations and military justice procedures.

The *Vincennes* incident mentioned in the introduction demonstrates that the problems of accountability do not merely apply to AWS, but also to existing weapons systems.[193] The relatives of the civilians killed in that accident sued the United States unsuccessfully for damages.[194] This case, described in greater detail *infra*, demonstrates that current accountability mechanisms, including civil liability, are imperfect.[195] However, the question may remain: do AWSs cause even greater accountability problems than current military technologies?

When a robot fails and someone gets injured, who should be held accountable? The programmer, the commanding officer, and the machine itself have all been offered as possible answers.[196] The problem of accountability is one of the most commonly mentioned with regard to AWSs.[197] Some commentators imply that there is no one to be held

191. Gillespie & West, *supra* note 91, at 20.

192. *See* Sharkey, *supra* note 139, at 88 (explaining uncertainty regarding who to hold accountable for AWS mishaps).

193. *See supra* Part I.

194. Koohi v. United States, 976 F.2d 1328, 1328 (9th Cir. 1992).

195. *See infra* Part V.B.i.

196. Marchant et al., *supra* note 7, at 281. Conceptual objections to holding all three accountable are discussed in greater detail *infra* Part V.A.

197. *See, e.g.*, *id.* (discussing the responsibility and risks associated with deployment of lethal autonomous robots); Sparrow, *supra* note 17, at 66 ("The question I am going to consider here is who should be held responsible if an AWS was involved in a wartime atrocity of the sort that would normally be described as a war crime."); Stewart, *supra* note 20, at 289 ("[A]ny analysis will inevitably turn to the question of

accountable.[198] Others believe that the process of accountability will be largely the same as what occurs today[199] or that civilian accountability mechanisms, such as product liability actions, would be available.[200] As of yet, no commentators have analyzed in detail how current accountability mechanisms work, nor how these mechanisms would apply to AWSs. This section addresses that gap. I confront three areas of accountability: (1) general, jurisprudential, or philosophical objections; (2) civil liability; and (3) criminal liability—civilian and military. The civil and criminal liability mechanisms work in tandem to establish a framework for preventing injury ex ante, punishing wrongdoers, and compensating the injured.

While autonomous systems are unlikely to be deployed anytime soon without a human in the loop, AWSs will likely become increasingly automatic. Thus, the role of the human operator will move from pilot to commander. This shift in role will be the most probable source of any difficulty in determining accountability. Since AWSs have no human operators, existing law on command responsibility will need to take on renewed importance. The needed legal change will be in emphasis, rather than substance. The law itself has all the elements to meet this challenge.

I demonstrate that while there are some gaps in accountability when one applies current law to AWSs, they are mostly the same gaps that exist for current military technology. The additional problem posed by the autonomy of AWSs is not insurmountable. Rather, once a standard of care is established, the basic legal accountability mechanisms that apply to current technology will apply equally well to AWSs.

A. General Philosophical Objections to Liability

In the "ethics and robotics" literature, objections to holding humans accountable for the mistakes of robots often take very general forms. For instance, Prof. Sparrow suggests that it would be immoral to hold either programmers or commanders responsible for the actions of AWSs.[201] He contends that "[t]o hold the programmers responsible for the actions of their creation, once it is autonomous, would be analogous to holding parents responsible for the actions of their children once they have left their care."[202] However, what Prof. Sparrow overlooks is the long history of holding individuals accountable for the actions of others not fully within their control. There are two ancient theories of liability that could justify holding either a

accountability."); Patrick Lin, *Drone-Ethics Briefing: What a Leading Robot Expert Told the CIA*, ATLANTIC, Dec. 15, 2011, http://www.theatlantic.com/technology/archive/2011/12/drone-ethics-briefing-what-a-leading-robot-expert-told-the-cia/250060/ ("The ethics of military robots is quickly marching ahead, judging by news coverage and academic research.").

198. *See* Sharkey, *supra* note 139, at 88 (stating that there is a long causal chain of individuals associated with the development and use of the robots).

199. Andy Myers, *Legal and Moral Challenges Facing the 21st Century Air Commander*, 10 AIR POWER REV. 76, 90 (2007).

200. KRISHNAN, *supra* note 10, at 103–04; SINGER, *supra* note 1, at 410.

201. Sparrow, *supra* note 17, at 70–71.

202. *Id.* at 70.

master or the thing itself liable for injuries caused by AWSs: frankpledge (holding a group responsible for the actions of an individual)—which includes the inverse theory (command responsibility)—and deodand (holding an inanimate object responsible for injury it causes).[203]

The concept of "command responsibility" is well established in the LOAC.[204] It may be seen as a form of inverted frankpledge liability in that it holds the commander responsible for the actions of one under his command in order to encourage the imposition of discipline ex ante.[205] Under the modern iteration of command responsibility, a commander is responsible for the crimes of a subordinate where there is: "(1) senior-subordinate relationship; (2) actual or constructive notice; [and] (3) failure to take measures to prevent the crimes."[206] It was established at least as early as 1439 in the French military that officers may be held accountable for the actions of their subordinates.[207] In the United States, command responsibility was part of our earliest military regulations.[208] The 1776 Articles of War stated, similar to the modern concept, that if a military commander became aware of an abuse or violation and failed to redress it he could "be punished, by a general court-martial, as if he himself had committed the crimes or disorders complained of."[209] Thus, holding a "master" or commander responsible for the actions of an AWS, if a commander became aware of crimes or malfunction by an AWS and failed to take corrective actions, would not be at all alien to our system of justice, nor to its predecessors.

It is ironic that Prof. Sparrow compares AWSs to children, for, at Roman law, children were treated similarly to inanimate objects, slaves, and animals for purposes of tort liability.[210] For all of these entities, the owner, the master, or the parent was held liable for its actions through surrender of the offending

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203. Albert W. Alschuler, *Two Ways to Think About the Punishment of Corporations*, 46 AM. CRIM. L. REV. 1359, 1360–62 (2009).

204. *See* L.C. Green, *Command Responsibility in International Humanitarian Law*, 5 TRANSNAT'L L. & CONTEMP. PROBS. 319, 320–27 (1995) (describing the historical origins of command responsibility). Some scholars observe that the concept may have begun as early as 500 B.C. in China. Michael A. Newton & Casey Kuhlman, *Why Criminal Culpability Should Follow the Critical Path: Reframing the Theory of "Effective Control,"* 40 NETHERLANDS Y.B. INT'L L. 3, 6 (2009).

205. I say inverted because an individual is held accountable for the actions of a group, rather than the other way around. Alschuler, *supra* note 203, at 1379–80.

206. Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, 8 June 1977, 1125 U.N.T.S. 3, 43; Newton & Kuhlman, *supra* note 204, at 24.

207. Green, *supra* note 204, at 321.

208. *See* Newton & Kuhlman, *supra* note 204, at 5 ("The concept of the commander's legal responsibility became embedded in the positivist law of international treaties for the first time in the 1907 Hague Regulations." (citation omitted)).

209. Journals of the Continental Congress, Articles of War § IX, art. 1 (1776), *available at* http://avalon.law.yale.edu/18th_century/contcong_09-20-76.asp.

210. OLIVER WENDELL HOLMES, JR., THE COMMON LAW 11 (2011); Sparrow, *supra* note 17, at 74. It is not clear whether this kind of respondeat superior would be considered a frankpledge form of liability, but it seems to have similar effects and similar mechanisms—one holds the master, parent, or community largely responsible in order to deter bad acts in the first place and to ensure swift correction of error once discovered. *See* Daryl Levinson, *Collective Sanctions*, 56 STAN. L. REV. 345, 349 (2003) (comparing collective sancitioning in general to vicarious liability).

object or payment of damages.[211] This mode of liability provided a way "of getting at" the entity that caused the harm, even though the entity itself could not satisfactorily be punished.[212] In modern law, we have concepts such as respondeat superior and command responsibility, which hold individuals accountable for the actions of other autonomous beings.[213] The purpose of these theories of vicarious liability—punishing a group, or a superior, for the actions of another—goes to the heart of one of the purposes of punishment: deterrence. It is thought that by enacting these sanctions, even if you cannot directly target the wrongdoer, you can control it through those better situated to monitor the erring entity.[214]

Additionally, it is sometimes proposed that the AWS or robot itself could be held accountable under a theory of deodand liability.[215] At first, this proposal seems highly illogical. Indeed, it would have limited deterrent effects, since one robot could not be deterred by the punishment of another robot.[216] However, this concept has more historical support than one might think. Both biblical and Greek law provided for punishment and potential destruction of an offending thing itself, even if it were inanimate.[217] Oliver Wendell Holmes described this practice as part of Greece's "primitive customs."[218] However, this concept may have greater salience in the future. The fact that individuals tend to attribute agency and identity to robots,[219] regardless of whether an ethicist or philosopher would in fact describe it as a moral agent, may make concepts such as holding an inanimate object accountable for its own actions less crazy, especially as robotics continues to improve. Additionally, such liability could affect behavior of the human operators ex ante or give those injured a sense of retributive justice. Thus, deodand could be rationally applied for either utilitarian or retributive justifications.

Further, the concept of deodand continues into the modern era. For instance, there continue to be actions in rem, where the thing being sued is

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211. *See* HOLMES, *supra* note 210, at 11–13 (discussing the doctrine of *noxae deditio* as applied to inanimate objects).

212. *Id.*

213. Respondeat superior is a legal doctrine whereby an employer may be held liable for the actions of an employee either through a negligence standard or strict liability. *Compare* JOHN DIAMOND ET AL., UNDERSTANDING TORTS 253 (2000), *with* Anne E. Mahle, *Command Responsibility: An International Focus*, PBS.ORG, http://www.pbs.org/wnet/justice/world_issues_com.html ("The underlying theory of the doctrine of command responsibility is simple: military commanders are responsible for the acts of their subordinates. If subordinates commit violations of the laws of war, and their commanders fail to prevent or punish these crimes, then the commanders also can be held responsible.").

214. *See* Levinson, *supra* note 210, at 349 (stating that the purpose for imposing sanctions on superiors under a theory of vicarious liability is to motivate them to monitor and control misbehaving agents).

215. *See, e.g.*, KRISHNAN, *supra* note 10, at 105 (suggesting that, in the future, more advanced robots could be penalized); *see also* Alschuler, *supra* note 203, at 1360–61 (describing historic punishment of non-humans).

216. *See* Marchant, et al., *supra* note 7, at 281 (voicing doubts on "whether a robot can be punished in a meaningful way since it is unlikely to possess any form of moral agency . . . traditional notions from criminal law such as 'rehabilitation' and 'deterrence' do not seem applicable here").

217. HOLMES, *supra* note 210, at 10–11.

218. *Id.* at 13.

219. Young et al., *supra* note 41, at 8.

inanimate property.[220] These actions are normally used to exert control over the property, for instance, in civil forfeiture proceedings.[221] Additionally, in rem proceedings are still used in a limited number of tort actions. For example, in admiralty law, someone who is injured by a ship at sea may hold the ship itself liable for his damages.[222] This would apply equally to a non-military, automated sea-going vessel.[223] If it committed a tort on the high seas, it may be itself liable. Like with a manned sea-going vessel, it would be expensive for the owners of an AWS to forfeit their property. The threat of such a loss could induce greater caution from the beginning on the part of the designers and owners of such systems.

Thus, the general philosophical objections to applying accountability either to the humans directing AWSs or to the systems themselves stand in opposition to long-standing principles of legal accountability. The legal system often holds one accountable for the actions of other entities, human or not.

B. Civil Liability and Military Entities: Current Law

It is often assumed in the literature on AWSs that product liability and similar tort actions would be available for holding someone accountable when AWSs malfunction.[224] P.W. Singer colorfully describes the parallel situation in the civilian context as "a robot vacuum cleaner . . . sucking up infants as well as dust . . . ."[225] However, it is important to remember that American AWSs will be designed, owned, and operated by the DoD, the individual branches of the armed forces, or DoD contractors. The DoD and the armed forces are components of the U.S. Government.[226] The U.S. Government, like any sovereign, is typically immune from suit unless and insofar as it waives its sovereign immunity.[227] Suing the U.S. Military or its contractors in either state or federal court would be wholly different than typical civil suits, although such suits are not impossible. Indeed, the Supreme Court has declared that "when presented with claims of judicially cognizable injury resulting from

220. In rem literally means "against the thing;" a proceeding in rem is one where the status of a thing is determined. BLACK'S LAW DICTIONARY 864 (9th ed. 2009).

221. *LII Backgrounder on Forfeiture*, LEGAL INFO. INST. (July 5, 1999), http://www.law.cornell.edu/background/forfeiture/; *see* 18 U.S.C. § 981 (2006) (describing which property is subject to forfeiture action).

222. *See, e.g.*, Harmony v. United States, 43 U.S. (2 How.) 210, 234 (1844) ("The ship is also by the general maritime law held responsible for the torts and misconduct of the master and crew thereof, whether arising from negligence or a wilful disregard of duty . . . ."); City of Riviera Beach v. Unnamed Gray, 649 F.3d 1259, 1266 (11th Cir. 2011) (describing an admiralty action for trespass in rem).

223. I say "non-military" because there are a variety of exceptions and defenses to civil liability that apply to military entities and to military contractors that are discussed *infra* Part V.B.

224. *See, e.g.*, KRISHNAN, *supra* note 10, at 104 (discussing that military equipment manufacturers are not usually held liable for defective designs, but liability is imposed in the commercial world for poorly designed robots).

225. SINGER, *supra* note 1, at 410.

226. *See About the Department of Defense*, DEP'T DEF., http://www.defense.gov/about/ (last visited Jan. 15, 2013) (describing the DoD as a cabinet-level department of the U.S. Government and the individual services as subordinate thereto).

227. *See* DIAMOND ET AL., *supra* note 213, at 243–45 (explaining that under common law governmental entities retain immunity unless waived by statute).

military intrusion into the civilian sector, federal courts are fully empowered to consider claims of those asserting such injury . . . ."[228]

This section examines the various statutes that might provide an avenue for civil liability. Understanding the current law is vital to assessing claims that AWSs will undermine our legal system and operate in a lawless zone. There are three most likely categories of plaintiff: (1) U.S. military personnel injured or killed as the result of faulty AWSs and friendly fire, (2) U.S. civilian personnel injured or killed as the result of an AWS malfunction, and (3) foreign individuals abroad injured or killed by an AWS (either intentionally, mistakenly, or through some fault in the AWS design and programming).[229] These plaintiffs might pursue claims under the Federal Tort Claims Act (FTCA),[230] the Foreign Claims Act (FCA),[231] or product liability under other federal statutes. I address federal tort law in detail because state tort claims against the government and its contractors would be governed in large part, and at times preempted, by the above statutes.[232] The most likely defendants would be the U.S. Government or a government contractor. I argue that either the government or a contractor would probably win a motion to dismiss for lack of subject matter jurisdiction or summary judgment under any of these statutes.[233] Further, I show that AWSs only change the legal analysis on the issue of "operational" negligence. Such negligence, may however, be addressed under internal military discipline.

1. The Federal Tort Claims Act

The FTCA is "a broad waiver of the federal government's sovereign immunity."[234] It puts the federal government in the same position "as a private individual in like circumstances" for purposes for tort claims.[235] Typically, substantive state tort law provides the law of decision for an FTCA claim.[236] However, "Congress may impose conditions upon a waiver of the Government's immunity from suit"[237] and has in fact enacted thirteen

228. Laird v. Tatum, 408 U.S. 1, 15–16 (1972).

229. In this section, I will deal only with questions of subject matter jurisdiction and complete defenses to liability. I do not address questions of standing, venue, how one might calculate damages, or other litigation-related issues that might arise. I also only describe assaultive torts; I do not consider damage to property, though this would obviously be another likely scenario in any lawsuit. I am considering non-citizen aliens injured by AWS on U.S. soil to be in the same category as U.S. civilians.

230. 28 U.S.C. § 2674 (2006).

231. 10 U.S.C. § 2734 (2006).

232. *Id.*; 28 U.S.C. § 2674.

233. If the court does not have subject matter jurisdiction, it must dismiss the case. FED. R. CIV. P. 12(b)(1), 12(h)(3).

234. Scott J. Borrowman, Comment, Sosa v. Alvarez-Machain *and Abu Ghraib—Civil Remedies for Victims of Extraterritorial Torts by U.S. Military Personnel and Civilian Contractors*, 2005 BYU L. REV. 371, 378.

235. 28 U.S.C. § 2674.

236. *Id.* § 1346(b) (describing the relevant law as "the law of the place where the act or omission occurred"); *see* United States v. Muniz, 374 U.S. 150, 153 (1963) (referencing Congress's intent to have substantive state tort law provide the law of decision for an FTCA claim).

237. Stubbs v. United States, 620 F.2d 775, 779 (10th Cir. 1980).

exceptions to the FTCA waiver.[238] The three relevant exceptions for military tort liability are the "foreign country" exception,[239] the "combat activities" exception,[240] and the "discretionary function" exception.[241] Where one of these exceptions applies, state tort law is preempted[242] and the U.S. District Courts do not have subject matter jurisdiction.[243] Additionally, even outside of the FTCA context, the FTCA exceptions often inform courts as to the contours of sovereign immunity and issues such as political question doctrine.[244]

At the outset, it is important to note that the first category of plaintiff mentioned above, the U.S. servicemember, is entirely precluded from suing the U.S. government for injuries incurred in the course of his or her duties.[245] The Supreme Court crafted this doctrine in *Feres v. United States*, where it held that the relationship between servicemembers and the government is "distinctively federal in character" and therefore an inappropriate subject for state tort litigation.[246] While the *Feres* doctrine may not apply to military contractors,[247] the servicemembers are also limited in the extent to which they can sue government contractors because of the various FTCA exceptions described below.

The FTCA exempts claims "arising in a foreign country."[248] Thus, any injury caused by the U.S. Government, its officers, or employees abroad could not be compensated through the FTCA. Given the reliance on the *lex loci* to provide the substantive tort law,[249] this exception makes sense. However, where an act of negligence occurs in the United States—for instance, negligent supervision—the FTCA foreign jurisdiction exception may not apply, even if the injury was suffered abroad.[250] Thus, if the AWSs were negligently

238. 28 U.S.C. § 2680 (2006).

239. *Id.* § 2680(k).

240. *Id.* § 2680(j).

241. *Id.* § 2680(a).

242. *See, e.g.*, Boyle v. United Techs. Corp., 487 U.S. 500, 511–12 (1988) (deciding that state tort law is preempted by the discretionary function FTCA exception); Saleh v. Titan Corp., 580 F.3d 1, 6 (D.C. Cir. 2009) (observing that to the extent an FTCA exception applies and state law is in material conflict, it is preempted).

243. *See* 28 U.S.C. § 2680 ("[T]he provisions of [the FTCA] . . . shall not apply to" those situations that are exempted.). Since it is the FTCA which provides jurisdiction under 28 U.S.C. § 1346(b), if an exception applies, there is no basis for jurisdiction. *See* Johnson v. United States, 170 F.2d 767, 769 (9th Cir. 1948) (describing defendant's motion to dismiss for want of jurisdiction because an FTCA exception applied). Sometimes preemption issues are presented as a defense and dealt with at a motion for summary judgment. *See, e.g.*, *Saleh*, 580 F.3d at 2, 5 (dismissing the claim through summary judgment because of the applicability of an FTCA exception).

244. *See, e.g.*, McMahon v. Presidential Airways, Inc., 502 F.3d 1331, 1356 n.22 (11th Cir. 2007) (opining that the outer limit of contractor immunity may be the political question doctrine); Koohi v. United States, 976 F.2d 1328, 1336 (9th Cir. 1992) (applying the combatant activities exception to the Public Vessels Act); McKay v. Rockwell Int'l Corp., 704 F.2d 444, 451 (9th Cir. 1983) (applying the discretionary function-based government contractor defense by analogy to the product liability context).

245. Feres v. United States, 340 U.S. 135, 146 (1950).

246. *Id.* at 143.

247. *McMahon*, 502 F.3d at 1353.

248. 28 U.S.C. § 2680(k).

249. *See* Spinozzi v. Sherator Corp., 174 F.3d 842, 844 (7th Cir. 1999) ("[T]he law applicable to a tort suit [is] the law of the place where the tort occurred . . . .").

250. *See* Orlikow v. United States, 682 F. Supp. 77, 87 (D.D.C. 1988) (deciding that negligent supervision by officers at CIA headquarters fell outside of foreign jurisdiction exception, even though the injury occurred in Canada, because the claim did not "arise in a foreign country").

operated from the United States, the foreign jurisdiction exception may not preclude subject matter jurisdiction.

Second, there is an FTCA exception for "combat activities."[251] Courts have generally looked to the specific context of the allegedly tortious conduct and its relation to ongoing combat. In *Johnson v. United States*, for instance, the Ninth Circuit decided that a Navy ship dumping waste into a harbor on its way back from the Pacific theatre of World War II did not qualify as a "combat activity."[252] The court reasoned that the ship was not "in direct connection with actual hostilities" because rather than swinging "the sword of battle," this ship was merely "returning it[self] to a place of safekeeping after all of the fighting is over."[253]

In a more recent case, the Court of Appeals for the D.C. Circuit viewed the combat activities exception far more broadly. In *Saleh v. Titan Corp.*, the court decided that the combat activities exception applied to "any claim that *arises* out of combat activities" and analogized to the broad "arising-out-of test" used in workmen's compensation claims.[254] Indeed, it described this exception as "battle-field preemption," where because "the federal government occupies the field . . . its interest in combat is always 'precisely contrary' to the imposition of a non-federal tort duty."[255] The court extended this exception to military contractors when they are "integrated into combatant activities over which the military retains command authority."[256] Therefore, an FTCA tort claim with *any* connection between combat and the tort will be preempted, at least in the D.C. Circuit. For instance, if an AWS were flying back to the United States from a combat mission for which a self-defense mode akin to the Aegis Combat System's casualty mode was set, and the AWS fired on a civilian airliner that got too close, then the combat activities exception may apply.

Applying this exception to AWSs, it appears that where the government or its contractors operate on the battlefield and in time of war, there would be no recourse to civil liability through the FTCA. Nevertheless, if the AWS were being tested domestically, went awry, and caused death or injury amongst a civilian population, an action for negligence under the FTCA may not be precluded by the combat activities exception.

The courts have had one opportunity so far to consider an accident involving AWSs in the case of *Koohi v. United States*.[257] In *Koohi*, the heirs of those killed in the *Vincennes* incident mentioned in the introduction sued the U.S. Government and the manufacturer of the Aegis system.[258] The Ninth Circuit found that the combat activities exception applied to the actions of the

251. 28 U.S.C. § 2680(j).
252. Johnson v. United States, 170 F.2d 767, 770 (9th Cir. 1948).
253. *Id.*
254. Saleh v. Titan Corp., 580 F.3d 1, 6 (D.C. Cir. 2009).
255. *Id.* at 7.
256. *Id.* at 9.
257. Koohi v. United States, 976 F.2d 1328 (9th Cir. 1992). The court did not address the applicability of the foreign jurisdiction exception, though it would appear to apply equally well to this situation.
258. *Id.* at 1330.

USS Vincennes because it was firing a missile in apparent self-defense in a time of open hostilities, albeit not a declared war.[259] It concluded that "tort law, in toto, is an inappropriate subject for injection into the area of military engagements."[260] Indeed, the court declared that "no duty of reasonable care is owed to those against whom force is directed as a result of authorized military action."[261] Thus, if an AWS directed force against civilians, intentionally or not, in a combat zone, there would be no recourse to civil liability under the FTCA, even if the operator was in the United States.

Finally, the FTCA exempts "discretionary functions" from liability. This exception applies to discretionary policy decisions, such as planning for military missions[262] and the government's decisions on the design and procurement of military equipment.[263] However, "the discretionary function exception does not protect the United States from liability for operational negligence in carrying out such a mission."[264] Thus, where a B-52 bomber flew too low over North Dakota farmland and caused injury to a dairy farmer and his livestock, the United States was held liable.[265]

In the context of AWSs, the government may be liable under the FTCA if a government agent negligently causes harm during a training mission. This might occur through the negligent setting of mission parameters. For example, even with a fully autonomous system, commanders would have to set variable parameters, such as how low the aircraft could fly. If a mission commander set the height floor for the AWS's flight plan lower than existing regulations allowed, he may be liable for operational negligence.[266] The standard of care applied will depend on the context in which the injury arises. Courts may look to standards set by state law, as in *Peterson*.[267] Violations of internal regulations, such as standard operating procedures, in and of themselves, will not state a cause of action.[268] Nevertheless, they may help the court determine whether the relevant actor was in fact negligent, especially if the regulations do not relate to a vital national security function, such as the interception of incoming aircraft, or give the one implementing the regulation discretion.[269]

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259. *Id.* at 1333 n.5.

260. *Id*. at 1335.

261. *Id*. at 1337.

262. *See* Peterson v. United States, 673 F.2d 237, 240 (8th Cir. 1982) (explaining that the discretionary function exception applies to the Air Force's planning for its "training and evaluation missions").

263. *See* Boyle v. United Tech. Corp., 487 U.S. 500, 511 (1988) ("[T]he character of the jet engines the Government orders for its fighter planes cannot be regulated by state tort law . . . .").

264. *Peterson*, 673 F.2d at 240.

265. *Id*. at 241.

266. Air Force pilots have been the source of liability under the FTCA where they disobeyed squadron regulations on an altitude floor. *See, e.g.*, Musick v. United States, 768 F. Supp. 183, 187 (W.D. Va. 1991) (holding that a pilot's decision to fly below the floor set by his squadron is not protected by the discretionary function exception).

267. *Peterson*, 673 F.2d at 240.

268. Tiffany v. United States, 931 F.2d 271, 279 (4th Cir. 1991). However, where those regulations do not involve sensitive military judgment, such as regulations on DoD medical care, courts may find that they give rise to negligence per se. *See, e.g.*, Richardson v. United States, No. 5:08–CV–620–D, 2011 WL 2133652, at *4 (E.D.N.C. May 26, 2011) (concluding that an allegation of the violation of DoD medical regulations may proceed as a negligence per se action).

269. *See Tiffany*, 931 F.2d at 279 (deciding not to look to internal NORAD regulations in part because

If the plaintiff sues a contractor that manufactured or operated the AWS, he or she will also have to overcome the so-called "government contractor defense," which is based on this same FTCA exception. The Supreme Court in *Boyle v. United Tech. Corp.* held that government contractors are immune from state tort liability for products they design and build where: "(1) the United States approved reasonably precise specifications; (2) the equipment conformed to those specifications; and (3) the supplier warned the United States about the dangers in the use of the equipment that were known to the supplier, but not to the United States."[270] This immunity applies equally to situations where the plaintiff is a civilian as to those where the plaintiff is a member of the military.[271] However, where contractors are not immune from suit and the victim is a servicemember, the contractors cannot sue for indemnity from the government.[272]

Thus, a military contractor who designs an AWS in line with DoD specifications and warns the government about the shortcomings of the system would probably be able to claim the government contractor defense under *Boyle*. If, however, the contractor did not follow DoD specifications or if the contract gave the contractor substantial discretion, the contractor may be liable despite *Boyle*.[273] It would not matter for purposes of *Boyle* whether the victim was military or civilian. Thus, even if it could be shown that an AWS malfunctioned because of a design or production flaw and crashed into a civilian neighborhood during testing, the manufacturer could not be held liable, assuming the *Boyle* criteria were met.

The FTCA thus provides a possible, albeit limited, avenue for tort liability for AWS malfunctions. Given the variety of exceptions and defenses that apply to FTCA liability, the most probable plaintiff that could survive a motion to dismiss or summary judgment would be a U.S. civilian injured within the U.S. where there was some sort of operational negligence by the AWS's commander. In this context, AWSs do cause some difficulties beyond those caused by manned vehicles. The line between a discretionary function such as planning a route or mission and operational negligence would be quite thin.[274] Indeed, a court may find that if there is no pilot then there can be no operational negligence.[275] However, if there were regulations prescribing, for

they "reserve[d] a great deal of discretion for the parties who must conduct the defensive maneuvers."); *see also* Fla. Auto Auction of Orlando, Inc. v. United States, 74 F.3d 498, 502 n.2 (4th Cir. 1996) (noting that violation of federal regulations can give rise to negligence per se under state law); *Musick*, 768 F. Supp. at 187 (implying that had the pilot remained within the discretionary range provided by the regulation, his actions would have fallen within the discretionary function exception).

270. Boyle v. United Tech. Corp., 487 U.S. 500, 512 (1988).

271. *Id*. at 511.

272. Stencel Aero Engineering Corp. v. United States, 431 U.S. 666, 673–74 (1977).

273. *See* McKay v. Rockwell Int'l Corp., 704 F.2d 444, 450 (9th Cir. 1983) ("When only minimal or very general requirements are set for the contractor by the United States the [government contractor defense] is inapplicable.").

274. *See* Peterson v. United States, 673 F.2d 237, 240 (8th Cir. 1982) (explaining that the discretionary function exception protects the United States from liability for the performance of a discretionary function or duty by a government employee, but that the exception does not protect the United States from liability when a government employee negligently implements a policy decision made by a government official).

275. *See id.* ("The United States is not protected if the *pilot* operating the B-52 which flew over

instance, a certain type of flight plan and the commander who set the AWS's parameters did not follow those regulations, he might be operationally negligent.

2. Foreign and Military Claims Acts

Under the Foreign Claims Act (FCA),[276] the U.S. Government may create commissions to hear claims of foreign nationals injured by the military in countries where the armed forces "conduct substantial operations."[277] The FCA gives the Executive Branch discretionary authority,[278] which may be superseded by other agreements, such as Status of Forces Agreements.[279] Additionally, the FCA only applies to injuries and damage inflicted "incident to noncombat activities."[280] Similarly, the Military Claims Act (MCA) provides for an administrative claims remedy for civilians injured as the result of noncombat military activities within the United States.[281]

Thus, if the relevant commander decided to institute a claims commission under the FCA, it could compensate friendly civilians for damages resulting from faulty AWSs not inflicted in combat. For instance, if an aerial AWS crashed along the route to or from the battlefield and caused damage, a claims commission could compensate the injured party.[282] If this injury occurred within the United States, the injured party would likely be able to claim the administrative remedy under the MCA. Eligibility for a claim under the MCA does not require the claimant to show negligence, only that the military caused the relevant injury.[283] Thus, AWSs would be no different in this context than other weapons systems.

3. Alien Tort Statute

The Alien Tort Statute (ATS) provides for jurisdiction in the U.S. District Courts "of any civil action by an alien for a tort only, committed in violation of the law of nations or a treaty of the United States."[284] The ATS has been

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Peterson's farm was negligent in implementing the policy decisions made by Government officials." (emphasis added)).

276. 10 U.S.C. § 2734 (2006).

277. Borrowman, *supra* note 234, at 375–76.

278. Doe v. United States, 95 Fed. Cl. 546, 558 (2010).

279. *See, e.g.*, Aaskov v. Aldridge, 695 F. Supp. 595, 596 (D.D.C. 1988) ("Defendants argue, correctly, that the NATO SOFA, not the [FCA] governs all claims involving (1) official duties of the U.S. military (2) causing damage in NATO countries.").

280. 10 U.S.C. §§ 2734(a), (b)(3).

281. *Id.* § 2733.

282. *See id.* § 2734(b)(3) ("[A] claim may be allowed if it arises from an accident or malfunction incident to the operation of an aircraft of the armed forces of the United States, including its airborne ordnance, indirectly related to combat, and occurring while preparing for, going to, or returning from a combat mission.").

283. *See* Capt. Thomas J. Alford, *Close to Home: Responding to Fatal Aircraft Accidents on Private Land*, 38 REPORTER 9, 16 (2011) ("[U]nlike the FTCA, the MCA's 'noncombat activities' provision does not require that the claimant prove negligence on behalf of the government, only that the activity in question caused the claimed injury.").

284. 28 U.S.C. § 1350 (2006).

described as a "legal Lohengrin; . . . no one seems to know whence it came."[285] Tort liability for violations of the LOAC has been part of the burgeoning market in ATS litigation.[286] Although this principle is not fully established, Justice Breyer opined in *Sosa* that the ATS includes war crimes.[287] Regardless of whether certain acts by AWS would constitute war crimes under the ATS or not, the ATS does not waive sovereign immunity.[288] Therefore, absent some other waiver of immunity, a suit under ATS may not be pursued against the U.S. Government.[289]

4. Other Avenues for Product Liability Suits

While the FTCA governs the application of state tort liability, including product liability, to claims against the federal government, there are other statutes that provide for federal jurisdiction. For example, in maritime or admiralty law, statutes such as the Public Vessels Act[290] or the Death on the High Seas Act (DOHSA),[291] may allow jurisdiction. In cases brought under DOHSA, courts look to general principles of tort law.[292] Normally, one who sells a defective product is liable for injuries caused by that product.[293] However, in the realm of military products that injure servicemembers, manufacturers are only held strictly liable for defects in limited circumstances.[294] Further, the Ninth Circuit held that where the government is immune from suit, has provided "precise specifications" to which the equipment conformed, and was warned about the dangers of the equipment, the contractor who designed and supplied the equipment cannot be held strictly liable.[295] Thus, in effect, the government contractor defense and the *Boyle* standard apply in almost precisely the same way regardless of whether the suit is brought under the FTCA or another statute.

5. Political Question Doctrine

Even if a hypothetical plaintiff were to get past all of the obstacles mentioned above, he would still have to confront the political question doctrine. This doctrine, originating with the landmark case of *Marbury v. Madison*, renders "questions, in their nature political" nonjusticiable.[296] The

285. IIT v. Vencap, Ltd., 519 F.2d 1001, 1015 (2d Cir. 1975).

286. *See, e.g.*, Ali Shafi v. Palestinian Auth., 642 F.3d 1088, 1094 (D.C. Cir. 2011) (looking to Common Article 3 of the Geneva Conventions in some narrow circumstances to define the contours of an ATS cause of action).

287. Sosa v. Alvarez-Machain, 542 U.S. 692, 762 (2004) (Breyer, J., concurring).

288. Canadian Transp. Co. v. United States, 663 F.2d 1081, 1091–92 (D.C. Cir. 1980).

289. *Id.*

290. 46 U.S.C. § 31102 (2006).

291. *Id.* §§ 30301–08.

292. *See* McKay v. Rockwell Int'l Corp., 704 F.2d 444, 447 (9th Cir. 1983) (outlining the circumstances where tort liability is imposed due to the sale of consumer goods).

293. RESTATEMENT (SECOND) OF TORTS § 402A (1965).

294. *McKay*, 704 F.2d at 447.

295. *Id.* at 451.

296. Marbury v. Madison, 5 U.S. (1 Cranch) 137, 170 (1803).

Supreme Court has applied a six-factor test to decide whether a particular case raises a nonjusticiable political question.[297] Courts have found three of those factors particularly applicable to the military context: first, "an assessment of whether there has been a textually demonstrable constitutional commitment of the issue to a coordinate political department;" second, "whether there is a lack of judicially discoverable and manageable standards for resolving the question;" and third, "whether there is an apparent impossibility of a court's independent resolution of the question without expressing lack of respect due to coordinate branches of government."[298]

This doctrine has been applied to those situations where the courts are called upon to decide whether the military, or its contractors, acted negligently in matters of national defense.[299] Courts look to factors such as "the degree to which national defense interests may be implicated"[300] and whether the case will require courts to pass judgment on sensitive military judgments, such as the adequacy of military training.[301] For example, in *Aktepe v. United States*, the families of several Turkish sailors killed and injured by the mistaken firing of a missile by an allied U.S. naval vessel sued the U.S. Government.[302] The Eleventh Circuit held that determining whether the Navy conducted the drill reasonably was nonjusticiable because "[d]ecisions relative to training result from a complex, subtle balancing of many technical and military considerations, including the trade-off between safety and greater combat effectiveness."[303] Additionally, where a contractor is operating under the control of the military in a hostile environment, courts have often found the case to be similarly nonjusticiable.[304] For instance, because a suit against military contractor KBR required the court to decide whether Marines had been contributorily negligent in their placement of a wiring box in Iraq, the Fourth Circuit decided that it presented a nonjusticiable question.[305] However, where the act or omission which gives rise to the suit is not in a combat zone nor implicates sensitive national defense decisions, courts have decided not to apply the political question doctrine to either contractors or to the government.[306]

Thus, in the AWS context, if a contractor is sued for a faulty system

297. *See* Baker v. Carr, 369 U.S. 186, 217 (1962) (providing the six factors determining whether a nonjusticiable political question is at issue).

298. Taylor v. Kellogg Brown & Root Servs., Inc., 658 F.3d 402, 408–09 (4th Cir. 2011) (quoting Baker v. Carr, 369 U.S. 186, 217 (1962)) (internal quotation marks removed).

299. *See, e.g.*, *id.* at 409 (illustrating instances where the military should not be granted broad, all-encompassing immunity for negligent actions).

300. *Id.* at 410.

301. *See* Gilligan v. Morgan, 413 U.S. 1, 9 (1973) (deciding that passing judgment on the adequacy of the Ohio National Guard's training in light of the Kent State shootings is a nonjusticiable question).

302. Aktepe v. United States, 105 F.3d 1400, 1402 (11th Cir. 1997).

303. *Id.* at 1404.

304. *See Taylor*, 658 F.3d at 410–11 (collecting cases where a court found the military dispute nonjusticiable).

305. *Id.* at 411–12.

306. *See, e.g.*, *id.* at 412 n.13 (highlighting that the case arose at a military base in a "combat theatre"); Lane v. Halliburton, 529 F.3d 548, 561–62 (5th Cir. 2008) (deciding that military contractor Halliburton's alleged fraudulent guarantees of safety to employees were justiciable).

under state law that failed to live up to the contracted-for standards, the case may be able to proceed past the question of justiciability.[307] Where, however, the case would implicate decisions of national defense—for instance, where to send the AWSs or how to deploy them—a court may decide that the political question doctrine applies and dismiss the case. How the doctrine will be applied depends entirely on the specific factual circumstances that give rise to the case. It seems clear, however, that AWSs will likely not pose much greater difficulty to this system than other weapons systems. Justiciability will depend on whether the case requires a court to pass judgment on the adequacy of military standards or regulations.

Ultimately, civil liability will apply in largely the same way to AWSs as it does to existing military technology. As the preceding overview shows, there are significant gaps in civil liability for today's military technology. AWSs will be subject to the same gaps. However, unlike what AWS opponents assert, those gaps are not unique to autonomous systems. Rather, the only element missing from civil liability as applied to AWSs is a standard of care. To establish the relevant standard, the armed forces will have to set the design specifications for AWSs consistent with the LOAC principles outlined above. Additionally, the DoD and the individual services can set a standard operating procedure for the testing and evaluation of AWSs. To the extent contractors and designers fail to meet those standards, they risk civil liability, even for AWSs.

C. Criminal Liability: Civilian and Military

The largest gap in applying current civil law to AWSs is in the area of operational negligence. It is not clear how courts would approach who may be properly held negligent in the case of deploying AWSs. It would depend on how the regulations were crafted and how the AWS caused the relevant injury. To the extent this gap persists, however, it may be filled by the application of criminal law, especially military justice. It can fill this gap because, whereas civilian courts may not be able to assess whether a sailor, soldier, marine, or airman acted reasonably or violated a regulation that involves sensitive military judgment, a military judge and jury certainly can.[308]

There are two likely crimes that designers, producers, or those who deploy AWSs would be faced with: involuntary manslaughter and negligent homicide.[309] Additionally, servicemembers may face charges of dereliction of duty or disobeying a lawful order or regulation under the Uniform Code of Military Justice (UCMJ).[310] Crimes with specific intent, such as murder,

307. *Cf.* United Air Lines, Inc. v. Weiner, 335 F.2d 379, 392–95 (9th Cir. 1964) (reviewing previous cases that demarcate the justiciability and finding that this issue should not be justiciable).

308. In considering whether to allow civil suits to proceed, especially against military contractors, some courts look to other potential avenues to reign in those contractors, including criminal liability. *See, e.g.*, Saleh v. Titan Corp., 580 F.3d 1, 8 (D.C. Cir. 2009) (considering contract and criminal law enforcement options).

309. This, of course, presumes that the victim is killed. If the victim is merely injured, there may be other charges available, but there is no crime of negligent "assault."

310. 10 U.S.C. § 892 (2006).

would not seem to apply to the AWS itself (since it cannot form intent) and would not apply to its human commander unless he directed it to kill civilians, in which case it would merely be his instrumentality and no different than any other weapon. "Many wartime atrocities are not the result of deliberate policy, wanton cruelty, or fits of anger; they're just mistakes."[311] Inasmuch as these deaths may be criminal, they would be better classified as manslaughter.

Involuntary manslaughter is a crime under state law, under federal law—if the crime is committed abroad or within the Special Maritime and Territorial Jurisdiction of the United States, and under the UCMJ.[312] Different jurisdictions define the crime differently. However, generally the elements of involuntary manslaughter are: the defendant, (1) in committing an unlawful act not amounting to a felony, or unlawfully or without due caution and circumspection committed a lawful act (2) which might produce death and (3) did cause the death of the victim.[313] Thus, where a lawful act is done without due caution, *i.e.*, negligently, and causes the death of a human being, it is involuntary manslaughter. War is inherently dangerous.[314] It may be extremely difficult to say what constitutes due caution in this context.[315]

Nevertheless, there have been cases brought for wartime neglect. For example, in 2010 a military contractor was convicted of involuntary manslaughter for firing indiscriminately at a civilian vehicle in Afghanistan.[316] The Military Extraterritorial Jurisdiction Act provides for U.S. District Court jurisdiction over DoD contractors who commit crimes abroad.[317] Thus, even if the negligent act were committed by a contractor abroad, he could be held criminally accountable.

In the armed forces, such carelessness may be more readily prosecuted and punished. Involuntary manslaughter, penalized under UCMJ Art. 119, and negligent homicide, an offense under Art. 134, have been pursued where a servicemember disregards normal safety procedures and a death results.[318] For instance, Private Luis Torres-Rodriguez was found guilty of involuntary manslaughter under Art. 119 for shooting another soldier in the head with his M-16.[319] Torres-Rodriguez's disregard of normal safety precautions provided

311. SINGER, *supra* note 1, at 397.

312. *See, e.g.*, 18 U.S.C. § 1112 (2006); UCMJ art. 119 (2012); CAL. PENAL CODE § 192(b) (West 2011); N.C. GEN. STAT. §14-18 (2012).

313. *See* 18 U.S.C. § 1112 (explaining the elements necessary for involuntary manslaughter under the federal statute).

314. *See, e.g.*, Koohi v. United States, 976 F.2d 1328, 1329–30 (9th Cir. 1992) (discussing some of the dangers inherent in war).

315. Indeed, in the *Koohi* case, the Ninth Circuit concluded that there is no caution due to civilians in a war zone. *Id.* at 1337.

316. *Contractor Sentenced to 30 Months in Prison for Death of Afghan National in Kabul, Afghanistan*, U.S. DEP'T OF JUSTICE (June 27, 2011), http://www.justice.gov/opa/pr/2011/June/11-crm-843.html.

317. 18 U.S.C. §§ 3261 *et seq.* (2006).

318. 10 U.S.C. § 919 (2006); MANUAL FOR COURTS-MARTIAL para. 83(c)(1) (2008) [hereinafter MCM]. Such cases may also be prosecuted under dereliction of duty or failure to obey a lawful regulation. UCMJ art. 92 (2012).

319. United States v. Torres-Rodriguez, 37 M.J. 809, 811–812 (N.M. Ct. Mil. Rev. 1993). The jury actually found Torres-Rodriguez guilty of murder, but on appeal this count was reduced to manslaughter for lack of mens rea evidence. *Id.* at 809, 811–12.

the requisite negligence for a finding of guilty.[320]

These standards have been applied even in war zones. In 2002, a U.S. fighter jet mistook a group of Canadian soldiers for Taliban fighters, killing four soldiers.[321] The pilot was initially charged with a variety of crimes, including dereliction of duty and involuntary manslaughter.[322] The court-martial charges against him were ultimately dropped in favor of an Art. 15 non-judicial punishment, under which he was found derelict in his duties.[323]

In the AWS context, a contractor or commander who deploys an AWS with inadequate or incorrect instructions could be charged with involuntary manslaughter. However, there would be many questions as to what caution was due. The answer would depend on what was known about the AWS, training standards, and the attendant circumstances. If it could be shown, for instance, that the commander disregarded a lawful regulation and a death resulted, he could be prosecuted for involuntary manslaughter and dereliction.[324]

Therefore, even if this kind of case would not make it past the myriad of obstacles in the way of a civil suit, a criminal charge may be more successful. That these gaps may be filled is important to the consideration of how to deploy AWSs. It shows that AWSs will not operate in a legal vacuum. Yet, the establishment of standards and regulations is necessary for this system to function properly. Once these regulations are in place, the existing system will be able to achieve the kind of internal monitoring encouraged by command responsibility principles and perhaps address some of the concerns highlighted by those opposed to AWSs.

The difference between liability as applied to current technology and AWSs is primarily in emphasis. The existing command responsibility rules will take on new importance in the AWS context. Unlike in the *Torres-Rodriguez* case or the Canadian friendly fire incident, there is no operator to hold accountable in the AWS context. However, contrary to the opinion of AWS opponents, that fact does not render the current law inapplicable. Rather, existing doctrines such as command responsibility will be able to fill that gap. To establish command responsibility for AWSs, the military services will have to create regulations that would govern the conduct of AWS commanders. To the extent commanders fail to meet those standards and damage is caused by

320. *Id.* at 811. Other prosecutions have been commenced for similar disregard of safety precautions, even in a warzone. *See, e.g.*, Travis Griggs, *Airemen* [sic] *Face Courts-Martial*, PENSACOLA NEWS J., Nov. 25, 2011, at 1C (discussing three airmen charged with dereliction of duty and negligent homicide for failing to follow safety regulations for ordinance disposal in Iraq, leading to the death of a fellow airman).

321. David Stout, *Fighter Pilot Found Guilty of Dereliction in Mistaken Bombing*, N.Y. TIMES, July 7, 2004, at A17.

322. *Id.*

323. *Id.* Non-judicial punishment permits commanders to sanction lower-level offenses without resort to courts-martial. *See* 10 U.S.C. § 815 (2006) (referencing authority of commanders to sanction lower-level offenses without resort to courts-martial).

324. *See* United States v. Ashby, No. 200000250, 2007 WL 1893626 (N.M. Ct. Crim. App. June 27, 2007) (describing a prosecution for involuntary manslaughter where a pilot flew well below regulation-allowed height and clipped an Italian ski lift, causing twenty deaths); *see also* MCM, *supra* note 318, at para. 17(c)(2) (describing possible methods of charging Art. 92 offenses).

AWSs, they may be held accountable for negligence.

VI. CONCLUSION

Having reviewed both potential avenues for civil and criminal liability as well as the international law challenges to AWSs, it is clear that while there are some gaps in current law—both international and domestic—as applied to AWSs, they are not insurmountable. The most prominent gap in the legal structure is in accountability. In civil law, most of the gaps in accountability apply to military products in general. AWSs pose slightly greater difficulty, however, in the area of operational negligence. As seen above, under both criminal and civil law, negligence is the most likely method of liability for injuries inflicted by AWSs. To be liable for negligence, a defendant must have violated a standard of care in such a way as to cause injury to another. Therefore, an important part of ensuring accountability for negligent uses of AWSs would be the establishment of standard operating procedures and training doctrine. While such documents do not establish civil liability where none exists,[325] they may be useful for courts in determining whether a reasonable person in the defendant's position would have done what he did or failed to do.

Additionally, in the military justice context, establishing a training regime and specific regulations will be vital to holding servicemembers accountable for negligent uses of AWSs. Some are worried that where there is, for instance, no pilot to be held accountable, our traditional methods of accountability break down.[326] However, if there were regulations regarding the safe deployment of AWSs, then commanders could be held accountable as pilots are today. Indeed, if regulations were developed, deploying an AWS would "merely remove[] one person from the chain of responsibility. The same process of planning and authorization would take place therefore these personnel would be similarly liable."[327]

As AWS technology develops, standards will, of course, change. However, this fact does not mean that we cannot begin to craft standards today. Indeed, the U.S. Armed Forces have already developed standard operating procedures for testing unmanned vehicles in a safe manner.[328] It is standards such as these that will help create the foundations for future accountability mechanisms in the testing and use of AWSs and allow us to set a bar below which AWSs may not be used in fully autonomous modes.

There is no doubt that many people do not like the idea of autonomous weapons.[329] Indeed, some commentators argue that the delegation of the

325. Tiffany v. United States, 931 F.2d 271, 279 (4th Cir. 1991).

326. SINGER, *supra* note 1, at 408.

327. Myers, *supra* note 199, at 90.

328. *E.g.*, U.S. ARMY, SAFE OPERATION OF WEAPONIZED UNMANNED GROUND VEHICLE SYSTEMS, TEST OPERATIONS PROCEDURE 2-2-542 (2008), *available at* http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA486983.

329. *See, e.g.*, REMOTE CONTROL WAR (CBC Documentaries 2011) (discussing criticisms of autonomous weapons).

decision to kill to a machine is inherently immoral. This Article, as it does not address the moral questions, is not prepared to answer that charge fully, yet it does show that the legal system—the way in which a community's sense of morality is brought to bear—is up to the challenges posed by the introduction of AWSs. As we adapt and learn about AWSs and their legal implications, there will undoubtedly be changes needed. As cases and mistakes arise, lawyers and injured parties will have to creatively navigate the network of legal mechanisms elucidated above. However, AWSs may not require a revolution in military legal affairs and will ultimately not prove to be the legal singularity that some fear.