The Dehumanization of International Humanitarian Law: Legal, Ethical, and Political Implications of Autonomous Weapon Systems

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ABSTRACT

In the future, a growing number of combat operations will be carried out by autonomous weapon systems (AWS). At the operational level, AWS would not rely on direct human input. Taking humans out of the loop will raise questions of the compatibility of AWS with the fundamental requirements of international humanitarian law (IHL), such as the principles of distinction and proportionality, as well as complicate allocation of responsibility for war crimes and crimes against humanity.

This Article addresses the development toward greater autonomy in military technology along three dimensions: legal, ethical, and political concerns. First, it analyzes the potential dehumanizing effect of AWS with respect to the principles of distinction and proportionality and criminal responsibility.

Second, this Article explores, from an ethical perspective, the advantages and disadvantages of the deployment of AWS independent of legal considerations. Authors from various fields have weighed in on this debate, but oftentimes without linking their discourse to legal questions. This Article fills this gap by bridging these disparate discourses and suggests that there are important ethical reasons that militate against the use of AWS.

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Third, this Article argues that the introduction of AWS alters the risk calculus of whether to engage in or prolong an armed conflict. This alteration is likely to make that decision politically more palatable and less risky for the political decision makers.

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I. INTRODUCTION

In a seminal article in 2000, Theodor Meron, the former President of the International Criminal Tribunal for the former Yugoslavia, expressed his hope that the direction of international humanitarian law could undergo a development toward conducting combat in a more humane fashion.[1] This assessment was based on the inroads that were made—maybe only apparently—in the aftermath of the human rights tragedies in Rwanda and the former Yugoslavia. Particularly, Meron's hope was based on the installation of international criminal tribunals in the 1990s. Since the publication of Meron's article, numerous new conflicts have broken out. The assumptions underlying warfare have been put into question. The

1. *See generally* Theodor Meron, *The Humanization of Humanitarian Law*, 94 AM. J. INT'L L. 239 (2000).

face of modern conflict has undergone considerable change, best evidenced by the rise of "asymmetric warfare."[2]

The technology used in armed conflict has developed significantly, increasingly allowing certain types of combat operations to be carried out from a distance. This is certainly true for the much-debated use of unmanned aerial vehicles (UAVs), commonly referred to as drones. UAVs have taken on a variety of roles in the military: their use ranges from carrying out reconnaissance missions, to carrying out armed attacks.[3] The operators for these missions are very often located thousands of miles away and conduct these missions via remote control.[4] Militaries around the world use or develop these capabilities not only with respect to UAVs, but also with respect to sea and land warfare. Regardless of whether such systems operate in the air or outer space, at sea, or on the ground, current versions of unmanned systems (UMS) share one characteristic: they operate with direct human input and human operators make the very large majority of tactical decisions.

More fundamental changes are underway with the current generation of UAVs, and these changes represent a stepping-stone toward higher degrees of autonomy. A recent report by the U.S. Department of Defense (DoD) specifically states that "the level of autonomy should continue to progress from today's fairly high level of human control/intervention to a high level of autonomous tactical behavior that enables more timely and informed human oversight."[5] This means that, unlike current systems that operate in an automated manner, future systems will not only follow pre-determined routes or hit a pre-programmed target, but will also operate in a manner that allows the systems to select and acquire a target, choose a route to reach the target area, decide whether to

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2. Steven Metz, *Strategic Asymmetry*, MIL. REV., July–Aug. 2001, at 23, 24 (explaining widely adopted definitions of asymetric warfare); DEP'T OF DEF., REPORT OF THE QUADRENNIAL DEFENSE REVIEW § II (1997) (discussing asymmetric means and challenges); Kenneth F. McKenzie, Jr., *The Revenge of the Melians: Asymmetric Threats and the Next QDR* (McNair Paper No. 62, 2000) (providing an in-depth history and definition of asymmetric warfare).

3. P.W. SINGER, WIRED FOR WAR 36–37 (2009) [hereinafter SINGER, WIRED].

4. See *infra* notes 26-31 for a more detailed description of the current use of UAVs.

5. DEP'T OF DEF., FY 2009–2034 UNMANNED SYSTEMS INTEGRATED ROADMAP 27 (2d ed. 2009) [hereinafter FY 2009–2034 UNMANNED SYSTEMS]. For a report giving UMS a more independent role, but mindful of the potential consequences of letting UMS make lethal decisions, see UNITED STATES AIR FORCE, UNITED STATES AIR FORCE UNMANNED AIRCRAFT SYSTEMS FLIGHT PLAN 2009–2047 41 (2009) [hereinafter USAF FLIGHT PLAN 2009–2047], *available at* http://www.govexec.com/pdfs/072309kp1.pdf [http://perma.cc/HT7M-ESFP] (archived Sept. 22, 2014) ("Authorizing a machine to make lethal combat decisions is contingent upon political and military leaders resolving legal and ethical questions.").

deploy weapons, and, if so, decide which weapon system to deploy.[6] Thus, AWS[7] are designed to carry out missions with considerably less human input than is the case today.

If and when these technological developments will come to fruition is a matter of debate among technologists and experts from other fields, and is crucial to this Article. There are several reasons supporting the prediction that autonomy will increase in a number of areas beyond the military realm, in such disparate fields as transportation, logistics, medicine, as well as the care of children and the elderly. Factors enabling the development of autonomous systems include the establishment of an industry devoted to conducting research and development, a push by investors within this industry, and a proliferation of ideas for how to put autonomous systems to use.[8] This will likely be an incremental development, rather than a sudden appearance of AWS in tomorrow's battle space.[9] Whether it is "inevitable and relatively imminent"[10] remains to be seen.

These developments have the potential to change the assumptions on which IHL is based and alter fundamentally the

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6. FY 2009–2034 UNMANNED SYSTEMS INTEGRATED ROADMAP, *supra* note 5, at 33–37.

7. AWS are sometimes referred to, inter alia, as "lethal autonomous robotics" or "killer robots." *See, e.g.*, UNITED NATIONS INSTITUTE FOR DISARMAMENT RESEARCH, FRAMING DISCUSSIONS ON THE WEAPONIZATION OF INCREASINGLY AUTONOMOUS TECHNOLOGIES 3 (2014), *available at* http://www.unidir.org/files/publications/pdfs/framing-discussions-on-the-weaponization-of-increasingly-autonomous-technologies-en-606.pdf [http://perma.cc/MMR3-FFM2] (archived Sept. 22, 2014) ("An initial hurdle to constructive dialogue on autonomy in weapon systems is that different assessments are made by different States, producers and experts as to where a specific technology sits on the autonomy spectrum. This is compounded by uncertainty surrounding how the object under consideration is labelled: 'drones', 'robots', autonomous weapon systems', 'killer robots', 'lethal autonomous robotics', lethal and non-lethal' semi- and fully autonomous weapons systems, 'supervised autonomy' and other terms."). Technically speaking, the term "systems with autonomous capabilities" is the more apt term, as one can envision weapon systems in which not all elements are acting autonomously.

8. *Rise of the Robots*, ECONOMIST, Mar. 29, 2014, at 13, *available at* http://www.economist.com/news/leaders/21599762-prepare-robot-invasion-it-will-change-way-people-think-about-technology-rise [http://perma.cc/4BCR-TSKJ] (archived Sept. 27, 2014).

9. This type of development is not at all surprising, given that similar technology in the civilian realm is moving in a similar direction. John Markoff, *A Trip in a Self-Driving Car Now Seems Routine*, N.Y. TIMES, May 14, 2014, http://bits.blogs.nytimes.com/2014/05/13/a-trip-in-a-self-driving-car-now-seems-routine/?_php=true&_type=blogs&_r=0 [http://perma.cc/V284-REJD] (archived Sept. 22, 2014); Kenneth Anderson & Matthew C. Waxman, *Law and Ethics for Robot Soldiers*, POL'Y REV. 2–4 (forthcoming 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2046375 [http://perma.cc/F9DL-3WQH] (archived Sept. 22, 2014). *But see* Noel E. Sharkey, *The Evitability of Autonomous Robot Warfare*, 94 INT'L REV. RED CROSS 787, 788–90, 797 (2012) [hereinafter Sharkey, *Evitability*].

10. Gary E. Marchant et al., *International Governance of Autonomous Military Robots*, 12 COLUM. SCI. & TECH. L. REV. 272, 276 (2011).

perceptions of armed conflict.[11] Part II of this Article retraces the development toward AWS and differentiates future generations of AWS from systems that are currently deployed. Part III analyzes the compatibility of AWS with some fundamental principles of IHL, namely the principle of distinction, the principle of proportionality, and personal responsibility. Part III then argues from a legal perspective that, given current technology, AWS could be employed in only a very narrow set of situations Parts. IV and V provide context to the legal consideration and deal with the ethical[12] and political[13] ramifications of the deployment of AWS, respectively. Through widespread use of AWS, personal responsibility may be diluted to the point that deterrent effects—with respect to not only individual decisions over a particular mission but also the decision whether to engage in armed conflict—may be significantly reduced. Part VI contains concluding observations, and recommends that fully autonomous systems not be deployed until the country developing a particular system has ascertained that the legal requirements under international law have been met and that the ethical and political issues have been satisfactorily answered in ways that would generally be supported by the international community.

II. THE ROAD TO AND DEGREES OF AUTONOMY

A. *Historical Development*

The end of the nineteenth century saw the first efforts to develop UMS. Among the first to develop UMS was Nikola Tesla, who patented and built the first remotely operated boat capable of carrying an ordinance.[14] Tesla's invention was ahead of its time by almost a century and was never put into service.[15] Subsequent developments included the so-called Kettering Bug, a pilotless

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11. Int'l Comm. of the Red Cross, *International Humanitarian Law and the Challenges of Contemporary Armed Conflicts*, 31LC/11/5.1.2 (Oct. 2011), *available at* http://www.rcrcconference.org/docs_upl/en/31IC_IHL_challenges_report._EN.pdf [http://perma.cc/RMQ5-9UUP] (archived Sept. 22, 2014). For a brief discussion on the use of international humanitarian law as opposed to alternative terminology such as law of war or law of armed conflict, see *infra* note 73and accompanying text.

12. *See infra* Part IV.

13. *See infra* Part V.

14. U.S. Patent No. 613,809 (filed July 1, 1898), *available at* http://patimg1.uspto.gov/.piw?docid=00613809&SectionNum=1&IDKey=CC2FDFC0AEA9&HomeUrl=http://patft.uspto.gov/netacgi/nph-Parser?Sect2=PTO1 [http://perma.cc/NK9R-5GPZ] (archived Sept. 27, 2014).

15. LAURENCE R. NEWCOME, UNMANNED AVIATION: A BRIEF HISTORY OF UNMANNED AERIAL VEHICLES 13–14 (2004) ("Calling it a 'telautomaton,' Tesla promoted it as a new form of torpedo. Its implications were lost on the military and press attendees at the exposition, who dismissed it as a trick of no protactical judgment.").

biplane that was capable of carrying explosives and was developed in the aftermath of World War I[16] and Goliath, a cable-operated tracked vehicle carrying an explosive ordinance that was deployed by the German military in WW II.[17] It became clear at the time that UMS would be developed for more widespread use in future combat operations. According to U.S. Army Air Corps General Henry "Hap" Arnold, while World War II was characterized by "heroes flying around in planes," future combat operations "may be fought by airplanes with no men in them at all."[23]

Arnold's vision would not come to fruition for another half century. In the interim, innovations such as the Global Positioning System (GPS) in the area of telecommunication made possible the development of devices that are operated from increasing distances. This led to the development and subsequent widespread use of UMS—first as airborne vehicles, followed by land-based and naval devices.[24] The modern incarnations of UAVs were first used in combat operations in the 1980s. During operations in Lebanon's Bekaa Valley in 1982, the Israel Defense Forces deployed UAVs in two distinct roles: for intelligence purposes, and for use as decoys.[25]

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16. LT. KENDRA L.B. COOK, THE SILENT FORCE MULTIPLIER: THE HISTORY AND ROLE OF UAVS IN WARFARE 2 (2007), *available at* http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4161584&userType=inst. [http://perma.cc/ZZ27-GMML] (archived Sept. 22, 2014) (discussing the contract between Charles Kettering and the United States Army for development of an unmanned aircraft). Because of reliability issues, the Kettering Bug too was never deployed in combat. *Id.* (reporting that its longest successful flight was only sixteen miles); John DeGaspari, *Look, Ma, No Pilot!*, 125 MECHANICAL ENGINEERING, no. 11, November 2003, at 42 (suggesting that although the "bug" was never deployed in combat, it spurred interest in UAVs); NEWCOME, *supra* note 15, at 29 (providing a lengthy flight history of the bug); DIANA G. CORNELISSE, SPLENDID VISION, UNSWERVING PURPOSE: DEVELOPING AIR POWER FOR THE UNITED STATES AIR FORCE DURING THE FIRST CENTURY OF POWERED FLIGHT 22 (Helen Kavanaugh-Jones ed., 2002) (noting that the unreliability of the bug was particularly concerning when flying over Allied troops).

17. Jon Guttman, *Goliath Tracked Mine*, 28 MIL. HISTORY, no. 2, July 2011, at 23 (recounting the Goliath's initial production in Spring 1942). Setting off the explosive destroyed the vehicle and because of its short range and slow speed, it was not widely used. It nevertheless served as the precursor of more modern incarnations of radio-controlled vehicles. P. W. Singer, *Drones Don't Die*, 28 MIL. HISTORY, July 2011, at 66, 67 [hereinafter Singer, *Drones*] (noting that the effectivness of the Goliath "was limited . . . by its low speed, poor ground clearance and vulnerability to small-arms fire").

23. Lawrence Spinetta, *The Rise of Unmanned Aircraft,* AVIATION HISTORY, Nov. 10, 2010, *available at* http://www.historynet.com/the-rise-of-unmanned-aircraft.htm [http://perma.cc/EN5V-B8XH] (archived Sept. 22, 2014).

24. *Id.* (recounting the fast progression of innovative developments in UMS deployed by the military).

25. Ralph Sanders, *An Israeli Military Innovation: UAVs*, 33 JOINT FORCE Q. 114, 115 (2003) (detailing how UAVs gathered the electronic frequencies of radars and subsequently emitted dummy signals in battlespace); ELIZABETH BONE & CHRISTOPHER C. BOLKCOM, UNMANNED AERIAL VEHICLES: BACKGROUND AND ISSUES 2 (2004) (noting how the traditional roles of reconnaissance and surveillance have been greatly expanded).

The use of UAVs accelerated after 1990 and has risen since then. This is true with respect to the absolute number of UAVs in operation, the level of expenditures, the number of combat operations carried out by UAVs, and the number of countries using, developing, or acquiring them. According to one source, the number of UAVs that the U.S. has in operation has risen from 167 in 2002 to over 7,000 in 2012.[26] The expenditures for UAVs by the U.S. military alone have also risen sharply in roughly the same time frame. Expenditures for UAV procurement and development amounted to $667 million in 2001 and rose to $3.9 billion in 2012.[27] There is little doubt that this figure will continue to increase in the future, given the apparent proclivity of lawmakers to expand the use of unmanned systems. In 2000, Congress set forth that "[i]t shall be a goal of the Armed Forces to achieve the fielding of unmanned, remotely controlled technology such that—(1) by 2010, one-third of the aircraft in the operational deep strike force aircraft fleet are unmanned; and (2) by 2015, one-third of the operational ground combat vehicles are unmanned."[28] While those targets will not be met, particularly for ground combat vehicles, there has been substantial progress towards those objectives. In a similar fashion, countries around the world are slated to increase their expenditures for UAVs from $6 billion to more than $11 billion by 2020.[29]

The use of UAVs in combat situations has increased over the years as well. While the first generation of UAVs was used for intelligence purposes, newer iterations of UAVs now regularly fly armed combat missions. The most prominent of these operations have

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26. Thomas J. Billitteri, *Drone Warfare*, 20 CQ RESEARCHER, no. 28, August 2010, at 653, 656 ("In recent years the U.S. military has spent billions of dollars to expand its fleet of unmanned planes, which has gone from 167 aircraft in 2002 to more than 7,000 now."); JEREMIAH GERTLER, CONG. RESEARCH SER., U.S. UNMANNED AERIAL SYSTEMS 2 (2012) ("DOD's unmanned aircraft inventory increased more than 40-fold from 2002 to 2010."). For an overview of the legal and policy questions surrounding UAVs, see generally 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., INF. & SCI. 73 (2008).

27. GERTLER, *supra* note 26 ("The FY2001 investment in UAS was approximately $667 million. For FY2012, DOD has asked for $3.9 billion in procurement and development funding with much more planned for the outyears.").

28. Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, Pub. L. No. 106-398, § 220 (2000). This action was followed up by a legislative requirement for the Department of Defense to provide periodic roadmaps, the latest of which was released in 2013. DEP'T OF DEF., FY 2013–2038 UNMANNED SYSTEMS INTEGRATED ROADMAP (2013), *available at* http://www.defense.gov/pubs/DOD-USRM-2013.pdf [http://perma.cc/5XPT-K7KX] (archived Sept. 22, 2014).

29. TEAL GRP. CORP., WORLD UNMANNED AERIAL VEHICLE SYSTEMS: MARKET PROFILE AND FORECAST 1 (2011); Press Release, Teal Grp. Corp., Teal Group Predicts Worldwide UAV Market Will Total $91 Billion in Its 2014 UAV Market Profile and Forecast (July 17, 2014), http://tealgroup.co/index.php/about-teal-group-corporation/press-releases/118-2014-uav-press-release [http://perma.cc/H8CU-WS9H] (archived Oct. 25, 2014).

taken place in the so-called War on Terror in Afghanistan and a range of other countries.[30] The prevalence of UAVs is summed up by one industry executive who stated in the context of the military operations in Iraq and Afghanistan that "every second of every day, 40 Predator-series aircraft are airborne worldwide, while the hours that various UAVs by the Air Force are in operation has more than tripled between 2006 and 2009, . . . standing at 295,000 hours per year."[31] While this number has since declined, the steady rise of funding for UAV research and use of UAVs in combat operations is unlikely to be halted in the near future.

B. *Remote Control and Automation as Stepping-Stones Toward Autonomy*

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30. For the controversy surrounding the use of UAVs in the elimination of known terrorists and terrorist suspects, see Peter Finn, *A Future for Drones: Automated Killing*, WASH. POST, Sept. 19, 2011, at A01 (demonstrating that UAVs remove any human discrimination during targeting); Siobhan Gorman, *Drones Evolve Into Weapon in Age of Terror*, WALL ST. J., Sept. 8, 2011, at A6 (explaining how the drone program has greatly expanded under the Obama administration). *See generally* Ryan Vogel, *Drone Warfare and The Law of Armed Conflict*, 39 DENVER J. INT'L L. & POL'Y 101 (2010) (providing a lengthy analysis of drone warfare including history, implications in international law, and pervasive sources of criticism); PETER BERGEN & KATHERINE TIEDEMANN, *Washington's Phantom War: The Effects of the U.S. Drone Program in Pakistan*, 90 FOREIGN AFFAIRS, no. 4, 2011, at 12 (describing the controversy surrounding U.S. drone strikes in Pakistan and prospective challenges for reform).

For the debate about use of drones and targeted killing, see United Nations, Human Rights Council, Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, ¶¶ 28–92, U.N. Doc. No. A/HRC/14/24/Add.6 (May 28, 2010) [hereinafter Alston, Special Rapporteur] (discussing legal issues surrounding targeted killings); United Nations, Human Rights Council, Report of the Special Rapporteur on the Promotion and Protection of Human Rights and Fundamental Freedoms While Countering Terrorism, Ben Emmerson, ¶¶ 21–74 U.N. Doc. No. A/HRC/25/59 (Mar. 11, 2014) [hereinafter Emmerson, Special Rapporteur] (focusing on drone strikes during armed conflict and its civilian impact); United Nations, Human Rights Council, Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, Christof Heyns, ¶¶ 26–126, U.N. Doc. No. A/HRC/23/47 (Apr. 9, 2013) [hereinafter Heyns, Special Rapporteur] (focusing on lethal autonomous robotics and the protection of life). *See generally* NILS MELZER, TARGETED KILLING IN INTERNATIONAL LAW (2008) (providing an analysis of several facets of targeted killings); Mary Ellen O'Connell, *The International Law of Drones*, 14 ASIL INSIGHTS, no. 36, November 12, 2010 (reviewing the history of drones deployed by the U.S. and addressing international law concerns and the future of drone strikes); David Kretzmer, *Targeted Killing of Suspected Terrorists: Extra-Judicial Executions or Legitimate Means of Defence?*, 16 EUR. J. INT'L L. 171 (2005) (analyzing the implications of targeted killings in international law with emphasis on U.S. attacks in Yemen and Israeli practices); Orna Ben-Naftali & Keren R. Michaeli, *"We Must Not Make a Scarecrow of the Law": A Legal Analysis of the Israeli Policy of Targeted Killings*, 36 CORNELL INT'L L.J. 233 (2003) (focusing on Israeli policy to highlight the controversy surrounding targeted killings).

31. *Rise of the Drones: Unmanned Systems and the Future of War*: *Hearing Before the Subcomm. on Nat'l Sec. and Foreign Affairs of the Comm. on Oversight and Gov't Reform*, 111th Cong. 61–62 (2010) (statement of Michael S. Fagan, Chair, Unmanned Aircraft Systems Advocacy Comm., Ass'n for Unmanned Vehicle Sys. Int'l).

UAVs, as a subset of UMS, are only a stepping-stone toward greater autonomy. It is important to distinguish between different levels of autonomy, at least for conceptual purposes.[32] The different types of unmanned systems can be usefully grouped into three different categories, although these classifications are more realistically described as existing on a spectrum that moves from human-controlled systems towards full autonomy: remotely operated systems, automated systems, and systems that operate autonomously.[33] The distinctions among the categories serve an

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32. There is a confusing lack of clarity in the use of terminology with respect to remotely operated, automated and autonomous systems. The designations used here are not necessarily shared by other commentators or organizations, although there appears to emerge general agreement as to the delineations of the content of the different categories.

33. For a more fine-grained differentiation, see Lisa Jo Elliott & Bryan Stewart, *Automation and Autonomy in Unmanned Aircraft Systems*, *in* INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS 99–122 (Richard K. Barnhart, Stephen B. Hottman, Douglas M. Marshall & Eric Shappee eds., 2011). For a useful and detailed distinction between automation and autonomy, see William C. Marra & Sonia K. McNeil, *Understanding "The Loop": Regulating the Next Generation of War Machines*, 36 HARV. J.L. & PUB. POL'Y 1139, 1149–60 (2013).

Different classifications or designations exist in the literature on AWS. A similar terminology to the one used here is employed by Alan Backstrom & Ian Henderson, *New Capabilities in Warfare: An Overview of Contemporary Technological Developments and the Associated Legal and Engineering Issues in Article 36 Weapons Reviews*, 94 INT'L REV. RED CROSS, no. 886, Summer 2012, at 483, 487 ("Automated and autonomous weapon systems need to be distinguished from remotely operated weapon systems."); Darren M. Stewart, *New Technology and the Law of Armed Conflict*, *in* INTERNATIONAL LAW AND THE CHANGING CHARACTER OF WAR, INTERNATIONAL LAW STUDIES 271 (Raul A. Pedrozo & Daria P. Wollschlaeger eds., vol. 80, 2011) (providing a lengthy analysis of the fast progression of AWS and the accompanying adaption of the law of armed conflict).

Largely commensurate with the distinctions drawn here are the definitions employed by the U.S. DoD and Human Rights Watch, which were released in close proximity with one another. Directive 3000.09, Autononomy in Weapon Systems 13–14 (Dep't of Def. 2012) [hereinafter DoD Directive], *available at* www.dtic.mil/whs/directives/corres/pdf/300009p.pdf [http://perma.cc/E9YB-JPNH] (archived Sept. 22, 2014) (defining, among other terms, "autonomous weapon system," "human-supervised autonomous system," and "semi-autonomous weapon system"); HUMAN RIGHTS WATCH, LOSING HUMANITY: THE CASE AGAINST KILLER ROBOTS 2 (2012), *available at* http://www.hrw.org/sites/default/files/reports/arms1112ForUpload_0_0.pdf [http://perma.cc/C3NJ-XTDW] (archived Sept. 22, 2014) (dividing robotic weapons into three categories: "Human-*in*-the-Loop Weapons," "Human-*on*-the-Loop Weapons," and "Human-*out-of*-the-Loop Weapons"). While the differences in the definitions themselves are not large, neither the designation of all iterations of all UMS as "autonomous," nor the use of the term "robot" appear accurate to convey what characterizes systems in each of these categories. Fully remote-controlled or automated systems do not possess any appreciable degree of autonomy, therefore making the term meaningless. The term robot is overly broad and is not amenable to the differentiations necessary for a fruitful debate. One result of the designation of all of the categories—remotely-operated, automated and autonomous—as some form of autonomy is the claim that "autonomous weapons . . . already exist." This is only the case if, as the author does, one subscribes to the broad definition of autonomy used in the DoD Directive. *But see* Allyson Hauptman, *Autonomous Weapons and the Law of Armed*

important purpose, namely to separate the existing weapon systems—which are either automated or remotely operated—from those future systems that will function in an autonomous manner. Complicating this distinction is the fact that unmanned systems may operate in more than one, or indeed all three, operating modes. Confusingly, a number of authors use the terms *autonomy* and *automation* interchangeably, without realizing that each category implies a different set of legal and ethical questions. Human operators are much more closely tied to the decision-making loop in the case of remotely operated and automated systems.[34]

Proponents generally cite as advantages of UMS, over manned alternatives, that they allow for conducting missions over a longer time period and have more precise targeting, which can lead to a reduction in civilian casualties, although this outcome is not assured.[35] Moreover, the use of UMS reduces the risks to a military's own troops. However, UMS critics point out that the widespread use of such systems can lead to information overload. The amount of information available makes it difficult to separate information that is necessary from that which is not.[36] Furthermore, some claim that the increased physical and emotional distance inherent in certain variants of UMS lead to a higher likelihood of attacks taking place.[37] Finally, there are reports that the decreased risks to one's own soldiers encourage certain missions that would have previously been deemed too risky.[38] While the current generation of UMS retains the

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Conflict, 218 MIL. L. REV. 170, 170 (2013) (defining an AWS as one that "once active, can select and engage a target without further intervention by a human operator."). Indeed, it could be argued that the definition by the DoD is counterproductive for argumentative purposes. Under its definition, all weapon systems, whether remotely operated, automated, or autonomous, can be designated as autonomous.

34. A similar distinction is drawn by the International Committee of the Red Cross. Red Cross, *Contemporary Armed Conflicts*, *supra* note 11, at 38–40 (distinguishing between remote controlled weapons systems, automated weapons systems, and autonomous weapons systems). For a similar view regarding the distinction between remotely-operated and automated systems on one hand, and AWS on the other, with respect to different legal and ethical considerations, see Stewart, *supra* note 33, at 289 (distinguishing the implications for accountability arising from remotely controlled and automated systems versus autonomous systems).

35. Jack M. Beard, *Law and War in the Virtual Era*, 103 AM. J. INT'L L. 409, 423–24 (2009) (suggesting that virtual techonlogies are redefining success in warfare by making casualties less avoidable); FY 2009–2034 UNMANNED SYSTEMS, *supra* note 5, at 7–15 (describing the general benefits of increasingly autonomous systems); RONALD C. ARKIN, GOVERNING LETHAL BEHAVIOR IN AUTONOMOUS ROBOTS 192–212 (2009) (providing illustrative graphics to depict how the technology and its operators could potentially discriminate targets).

36. SINGER, WIRED, *supra* note 3, at 395–96 (observing that information presented through a virtual medium can lead an operator to lose touch with reality).

37. *Id.* (referencing several studies that show how disconnection and distance create an environment in which atrocities are psychologically easier to commit).

38. Peter Asaro, *How Just Could a Robot War Be?*, *in* FRONTIERS IN ARTIFICIAL INTELLIGENCE AND APPLICATIONS: CURRENT ISSUES IN COMPUTING AND PHILOSOPHY 50, 56–58 (Adam Briggle, Katinka Waelbers, & Philip Brey eds., 2008) (drawing a parallel between gaining public approval for airstrikes in Kosovo and Iraq and the ease

strong involvement of human decision-making, there are already developments underway to have one set of operators be responsible for a number of UMS.[39] But for now, the current generation of UMS is still characterized by a clear line of responsibility establishing who is responsible for carrying out an attack.

Remotely operated systems—referred to as "semi-autonomous systems" by the DoD,[40] and systems with a "human in the loop" by Human Rights Watch (HRW)[41]—have been in existence for some time. However, the extent of their use has greatly increased over recent years, evidenced by the number of combat operations in Afghanistan and elsewhere.[42] The most well-known examples of UAVs that are currently being deployed in large numbers are the MQ-1 Predator and the MQ-9 Reaper. Both systems are important in surveillance and combat support mode, but increasingly carry out armed combat missions. It is that use of these systems that has garnered the strongest public debates.[43] Most of these systems are operated from ground bases via satellite links, sometimes at a considerable distance. Remotely operated systems also exist in land-based and naval versions. Land-based systems are oftentimes used to detect explosive ordinance. In contrast, UAVs have been used extensively in a variety of missions, including reconnaissance, surveillance, and target acquisition.[44] Marine systems also exist, but while their area of operation has the advantage of not being subject to

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with which leaders could craft propaganda to begin a robot-centric offensive); Patrick Lin, George Bekey & Keith Abney, *Robots in War: Issues of Risk and Ethics*, *in* ETHICS AND ROBOTICS 49, 62 (Rafael Capurro & Michael Nagenborg eds., 2009).

39. FY 2009–2034 UNMANNED SYSTEMS, *supra* note 5, at 7, 28 (establishing levels of performance desired to achieve unmanned solutions in the future).

40. The DoD definition is as follows: "[a] weapon system that, once activated, is intended to only engage individual targets or specific target groups that have been selected by a human operator." DoD Directive, *supra* note 33, at 14.

41. HRW defines this category as follows: "[r]obots that can select targets and deliver force only with a human command." HUMAN RIGHTS WATCH, *supra* note 33.

42. Alan S. Brown, *The Drone Warriors*, 132 MECHANICAL ENGINEERING, no. 1, Jan. 2010, at 22, 24–25 (reporting the exponential growth in unmanned aerial vehices and ground robots used by the U.S. in Iraq, Afghanistan, and Pakistan). *See generally* MATT J. MARTIN & CHARLES W. SASSER, PREDATOR: THE REMOTE-CONTROL AIR WAR OVER IRAQ AND AFGHANISTAN: A PILOT'S STORY (2010).

43. Jane Mayer, *The Predator War – What are the Risks of the C.I.A.'s Covert Drone Program?*, THE NEW YORKER, Oct. 26, 2009, at 36. In the wider context of targeted killing and its international legal implications, see Alston, Special Rapporteur, *supra* note 30 (discussing legal and policy issues surrounding targeted killings).

44. Elizabeth Quintana, *The Ethics and Legal Implications of Military Unmanned Vehicles* 1 (British Computer Society Occasional Paper, 2008), *available at* http://www.rusi.org/downloads/assets/RUSI_ethics.pdf [http://perma.cc/K8XK-Q7AD] (archived Sept. 22, 2014) (stating that the majority of UAVs "are used for surveillance, reconnaisance and target destination"). For an overview of U.S. ground UMS, see FY 2009–2034 UNMANNED SYSTEMS, *supra* note 5, at 31 (establishing the specific performance attiributes for the ground domain).

physical land barriers, underwater communication remains a hurdle for widespread adoption.[45]

Automated systems have similarly been deployed for quite a long time. They are referred to as either "human in the loop"[46] or a "human-supervised autonomous system."[47] Automated systems function in a self-contained manner once deployed, at least for some of their critical functions, but rely on specific information programmed either prior to or during deployment. They subsequently follow those parameters, deviating only on the basis of newly programmed information. More modern examples include automated sentry guns, sensor-fused ammunition, and most cruise missiles.[49] More advanced incarnations include Counter-Rocket, Artillery, Mortar systems (C-RAM systems), of which both naval and land-based systems are in use. Moreover, some surveillance systems, such as the Global Hawk, can fall into the automated system category if they follow a pre-programmed flight path.[50] Capable of staying in the air for over thirty hours and flying at altitudes up to 65,000 feet, the Global Hawk carries out surveillance missions in either an automated or remote controlled fashion.[51] While such systems do not require a human to command them, there is often very considerable human involvement both prior to deployment and by way of oversight during a mission. However, once a mission is underway, automated systems are capable of independently detecting the target or threat they were designed to counter and engage the target following one or more specified characteristics.

One could consider mines to fall under the category of AWS as mines are built to respond to certain characteristics, such as proximity, contact, strong magnetic signal, and / or weight. Mines, however, do not act autonomously within the parameters of the definition laid out above, nor those currently proffered by the DoD or HRW. Mines fall arguably into the category of automated weapons

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45. Quintana, *supra* note 44, at 6 (suggesting that, because radio frequency is short, it is nearly useless underwater and that the alternative of sonar is not substantially better).

46. HRW defines them as "[r]obots that can select targets and deliver force under the oversight of a human operator who can override the robots' actions." HUMAN RIGHTS WATCH, *supra* note 33.

47. The DoD defines this category as "[a]n autonomous weapon system that is designed to provide human operators with the ability to intervene and terminate engagements, including in the event of a weapon system failure, before unacceptable levels of damage occur." DoD Directive, *supra* note 33, at 14.

49. Stewart, *supra* note 33, at 276 (separating the technologies into categories and providing the current state of the evolution of each); Quintana, *supra* note 44, 1–2 (describing "[t]he largest and most capable operational UAVs"); ARKIN, *supra* note 35, at 10–27 (providing photographs and descriptions of each of these technologies).

50. Stewart, *supra* note 33, at 276 (describing Global Hawk as a UAS whose flight commands usually do not require a human operator).

51. Quintana, *supra* note 44, at 1–2.

that react to a particular trigger but have no mechanism that would allow them to make discretionary decisions.[52]

The final category consists of AWS, which are referred to by the DoD as "autonomous weapons systems"[53] and by HRW as a "human out of the loop weapon."[54] Unlike remote controlled systems and automatic systems, AWS do not depend on human input immediately prior to, or during, their use. There are at least two characteristics that define the notion of autonomy in the specific context of AWS. First is the ability to operate independently and engage targets without being programmed to specifically target an individual object or person. This includes the capability to react to a changing set of circumstances, and requires that the rules of IHL be "translated" into machine code. The second, interrelated, aspect is the capability to make discretionary decisions. The actions of AWS are therefore, in contradistinction to automated systems, predictable only within the range that they were programmed. The definitions provided by both the DoD and HRW do not include this crucial element.[55] Deciding which targets to engage, as well as how and when to carry out an attack, would be left to the AWS's software that is programmed to deal with a myriad of situations and changing sets of circumstances.[56] While there is still some human involvement prior to sending AWS on a mission (e.g., fueling and arming), AWS will be able to carry out missions with a much higher degree of independence than automated systems.[57]

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52. This is true even for advanced naval mines, such as the Mark 60 Captor system. The weapon is designed to react to particular sonar signatures even in the (unlikely) scenario in which a friendly force may have captured the opposing side's naval vessel. MK 60 Encapsulated Torpedo (CAPTOR), FED'N OF AM. SCIENTISTS, MIL. ANALYSIS NETWORK, http://fas.org/man/dod-101/sys/dumb/mk60.htm [http://perma.cc/P9M8-8Y5J] (archived Oct. 25, 2014).

53. The DoD defines AWS as "[a] weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation." DoD Directive, *supra* note 33, at 13.

54. HRW defines AWS as "[r]obots that are capable of selecting targets and delivering force without any human input or interaction." HUMAN RIGHTS WATCH, *supra* note 33.

55. *See supra* note 33 and accompanying text. A report by the government of the United Kingdom, while not using the term discretion, uses a similar distinction. U.K. DEP'T OF DEF., JOINT DOCTRINE NOTE 2/11 – THE UK APPROACH TO UNMANNED AIRCRAFT SYSTEMS ¶ 205 (2011) [hereinafter UK DoD JOINT DOCTRINE] (providing a table that compares an automated system with an autonomous system).

56. Whether or not it will be possible to program AWS in a way that allows them to operate in conformity with the existing rules of international humanitarian law—specifically the requirements of the principles of distinction and proportionality—remains to be seen. For a more detailed analysis, see *infra* Part III.B–C.

57. For an early stage of development, see Finn, *supra* note 30, at A01 (describing a demonstration in Fort Benning, Georgia in which automated, unpiloted planes confirmed tarp targets and stating that "[t]he demonstration laid the

III. LEGAL CHALLENGES TO AUTONOMOUS WEAPON SYSTEMS

Part III analyzes the legal challenges presented by the introduction of AWS to the two main principles in IHL, namely the principle of distinction and the principle of proportionality. While the former may be amenable to a certain degree of quantitative analysis, there are serious uncertainties as to whether the same is true for the latter, at least for the foreseeable future. In addition, it will be necessary to establish clear lines of accountability when AWS are deployed in order to avoid a system of organized irresponsibility.[58] This Part begins with a brief introduction to the principles of distinction and proportionality within the wider framework of IHL, followed by a discussion of both principles in greater detail. Lastly, this Part will examine individual responsibility.

A. *Introduction*

IHL has developed over more than a century with a two-fold aim: on the one hand the protection of civilians from combat[59] and of soldiers from unnecessary suffering and cruelty;[60] on the other hand allowing activities to attain military objectives to go forward. The principle of distinction and the principle of proportionality have evolved from this process and reflect the tension between these opposite goals. The former embodies the necessity of differentiating military personnel and militarily significant targets from civilians and civilian objects, particularly those essential for civilians to survive.[61] The principle of proportionality embodies the requirement that any attack which could have adverse consequences for civilians must have a military objective which is not excessive with regard to the potential civilian harm.[62]

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groundwork for scientific advances that would allow drones to search for a human target and then make an identification based on facial-recognition or other software.").

58. States wishing to deploy AWS will also have comply with the requirements of Protocol I, Article 36, which mandates that each State Party determine whether the employment of a new weapon, means or method of warfare that it studies, develops, acquires or adopts would, in some or all circumstance, be prohibited by international law. Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), June 8, 1977, art. 36 [hereinafter AP I] ("In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.").

59. The most relevant of these treaties is the 1949 Geneva Convention IV.

60. 1949 Geneva Conventions I, II and III.

61. See further section III., B., below.

62. See further section III., C., below.

AP I entered into force in 1978 and currently has 174 states parties, constituting an overwhelming majority of countries.[63] This includes many states which can be expected to manufacture or possess AWS, including China, France, Germany, Russia, and the United Kingdom. Some key states, most notably the United States, India and Israel, are not parties to AP I. Because both principles are not only codified in AP I, but are also well established rules of customary international law, the status of these countries as non-parties is less significant than it first appears. This is confirmed by consistent statements by U.S. officials affirming the customary law nature of many, though not all, provisions of AP I.[64] Indeed, the U.S. has incorporated similar or identical language to the relevant provisions of AP I into its military manuals, including those pertaining to the principles of distinction and proportionality.[65] Moreover, notwithstanding a few highly controversial incidents, the U.S. for some time has routinely required that proposed targeting decisions for precision-guided munitions and "drone strikes" to be considered by military lawyers, largely to assure that the actions in a particular case are consistent with international law.[66]

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63. See for the ratification / accession status United Nations Treaty Collection, Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the protection of victims of international armed conflicts (Protocol I), https://treaties.un.org/Pages/showDetails.aspx?objid=08000002800f3586

64. Michael J. Matheson, *Session One: The United States Position on the Relation of Customary International Law to the 1977 Protocols Additional to the 1949* Geneva Conventions, 2 AM. U. J. INT'L. L. & POL'Y 419, 426 (1987); William Taft, *The Law of Armed Conflict After 9/11: Some Salient Features*, 28 YALE J. INT'L L. 319, 323 (2003) (pointing out that "[t]he U.S. military, in its actions since 9/11, has assiduously adhered to the traditional rules associated with the use of military force" including "elements of the Additional Protocols of 1977, including Articles 48 to 52 and Article 57".). In 2010, then-Legal Advisor to the U.S. State Department Harold Hongju Koh made similar statements before the Annual Meeting of the American Society of International Law. Harold Hongju Koh, The Obama Administration and International Law, Mar. 25, 2010, http://www.state.gov/s/l/releases/remarks/139119.htm (stating that "[i]n U.S. operations against al-Qaeda and its associated forces-- including lethal operations conducted with the use of unmanned aerial vehicles-- great care is taken to adhere to these principles in both planning and execution, to ensure that only legitimate objectives are targeted and that collateral damage is kept to a minimum." For reasons that led the U.S. to not ratify AP I, see Abraham D. Sofaer, *The U.S. Decision Not to Ratify Protocol I to the Geneva Conventions on the Protection of War Victims,* 82 AM. J. INT'L. L. 784 (1988).

65. Christopher Greenwood, *Customary Law Status of the Protocols, in* HUMANITARIAN LAW OF ARMED CONFLICT: CHALLENGES AHEAD 93, 102-03 (Astrid J. M. Delissen & Gerard J. Tanja eds., 1991). See also fn. 88-90 and accompanying text, below.

66. James A. Burger, *International Humanitarian Law and the Kosovo Crisis: Lessons Learned or to be Learned*, 837 INTERNATIONAL REVIEW OF THE RED CROSS 129 (2000); Center for Law and Military Operations (CLAMO), Law and Military Operations in Kosovo: 1999-2001, Lessons Learned for Judge Advocates, 59, http://www.loc.gov/rr/frd/Military_Law/pdf/Lessons-Learned_Kosovo.pdf.

A number of authors argue that the current body of IHL is insufficient to capture the challenges that AWS present; however, it is not always clear on what basis such arguments are made.[67] Throughout its history, IHL has shown a considerable capability to adapt its functional rules to meet challenges presented by newly developed weapon systems. IHL contains general principles and generally applicable rules to a variety of weapon systems, rather than focusing on one individual technology. The existing rules of IHL are capable of responding to AWS, despite considerable differences in opinion that exist in interpreting these rules.

Article 48 AP I describes the general principle of protecting civilians in armed conflict. It posits: "In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives."[68] Subsequent provisions contain more specific rules and provide further details as to both the principle of distinction and the principle of proportionality. Moreover, both principles are testament to the requirements that combat be carried out in a humane fashion and military action only be taken as far as militarily necessary.

The tension between military necessity and humanity is one of the main characteristics of IHL.[69] There is considerable disagreement

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67. For authors staking out a position that the current legal framework is inadequate, see ARKIN, *supra* note 35, at 72; Hin-Yan Liu, *Categorization and Legality of Autonomous and Remote Weapons Systems*, 94 INT'L REV. RED CROSS 627, 629 (2012); Marchant, *supra* note 10 (suggesting that the development of autonomous decision-making ability in robots creates moral issues that the current body of international law cannot adequately address). *See generally* ARMIN KRISHNAN, KILLER ROBOTS: LEGALITY AND ETHICALITY OF AUTONOMOUS WEAPONS (2009) (contending that the rate of robotic techonology will render current international law largely inoperable).

Others consider the existing framework as adequate. Markus Wagner, *Taking Humans Out of the Loop: Implications for International Humanitarian Law*, 21 J.L., INFO. & SCI. 155, 159–62 (2011) [hereinafter Wagner, *Humans*] (using existing legal frameworks regarding the principles of distinction and proportionality to analyze the impact of autonomous technology); Stewart, *supra* note 33, at 289 (agreeing that the law will evolve to meet the pressing requirements of a new era of autonomous weaponry); Marco Sassòli, *Autonomous Weapons and International Humanitarian Law: Advantages, Open Technical Questions and Legal Issues to be Clarified*, 90 INT'L L. STUD. 308, 323 (2014) (rejecting that IHL is inadequate to address autonomous weapons and the need for a new category of rules). Authors within the latter group differ as to the application of the existing rules of IHL to AWS.

68. AP I, *supra* note 58, art. 48.

69. *See generally* Michael N. Schmitt, *Military Necessity and Humanity in International Humanitarian Law: Preserving the Delicate Balance*, 50 VA. J. INT'L L. 795 (2010) (examining the current state of military necessity, its future, and the balance it must strike with International Humanitarian Law); Stewart, *supra* note 33, at 272.

as to where the balance should be struck on the continuum of military necessity and humanity. There is also disagreement as to what degree extant circumstances—including advances in military technology, the acceptability of civilian casualties in the court of public opinion,[70] and potentially more fundamental changes in the role of state sovereignty[71]—should influence military decisions.[72] These discussions are evidence of a development away from a military-centric approach toward one that increasingly takes humanitarian considerations into account.[73]

AWS would have to be able to execute their combat operations in full compliance with these rules. This requires the conversion of these legal rules into a digital format, which the computer applies to a given situation. It is not clear whether computers, which are very capable of computing quantitative assessments by design, are also capable of making qualitative assessments in the changing environments they may face during highly fluid conflict situations. Notwithstanding impressive advances in cognitive technologies, it

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70. *See, e.g.*, WESLEY K. CLARK, WAGING MODERN WAR: BOSNIA, KOSOVO, AND THE FUTURE OF COMBAT 444 (1st ed. 2001). Clark notes that restrictive rules of engagement in the 1999 Kosovo conflict meant that "[t]he weight of public opinion was doing to us what the Serb air defense system had failed to do: limit our strikes." *Id.*

71. Prosecutor v. Tadic, Case No. IT-94-1-T, Appeals Chamber Decision on the Defence Motion for Interlocutory Appeal on Jurisdiction, ¶ 97 (Oct. 2, 1995) (providing examples of why international legal rules have emerged to regulate armed conflict solely within a state); Prosecutor v. Delalic, Case No. IT-96-21-A, Appeals Chamber Judgment, ¶ 172 (Feb. 20, 2001) (stating that there should be no distinction between two legal regimes that commit the same egregious acts, regardless of the nature of the conflict).

72. Originally conceived in the Preamble of the Convention Respecting The Laws and Customs of War on Land, July 29, 1899. See the so-called Martens Clause: "Until a more complete code of the laws of war is issued, the High Contracting Parties think it right to declare that in cases not included in the Regulations adopted by them, populations and belligerents remain under the protection and empire of the principles of international law, as they result from the usages established between civilized nations, from the laws of humanity, and the requirements of the public conscience." International Convention with Respect to the Laws and Customs of War on Land, July 29, 1899 [1901] ATS 131 [hereinafter War on Land]. *See also* Theodor Meron, *The Martens Clause, Principles of Humanity, and Dictates of Public Conscience*, 94 AM. J. INT'L L. 78, 79 (2000).

73. *See generally* Meron, *supra* note 1 (providing an in-depth account of the increased focus on human rights in humanitarian law). This may already be evident by the change in designation that this legal field has undergone—from "law of war" to "law of armed conflict" and now "international humanitarian law." For a discussion on the different uses of the terms, see Eyal Benvenisti, *Human Dignity in Combat: The Duty to Spare Enemy Civilians*, 39 ISR. L. REV. 81, 83 (2006) (proposing that the tension between the two concepts has the positive affect of leading actors towards humanitarian ideals); *see also* David Luban, *Military Necessity and the Cultures of Military Law*, 26 LEIDEN J. INT'L L. 315, 316 (2013) (describing the two conceptions of law as fundamentally different). Given the widespread and large-scale atrocities in recent conflicts (e.g., Cambodia, Somalia, the former Yugoslavia, Sierra Leone, Afghanistan and the Congo) it is not entirely obvious that armed conflict becomes more humane.

remains to be seen whether the principle of distinction and the principle of proportionality can be encoded into digital format.[74]

Moreover, programs underlying AWS will also have to allow for different degrees of combat intensity while remaining within the IHL framework. Programs would have to be constructed in a way to conform to such a policy change.[75] Recent action in Afghanistan may serve as an example, as pressure from the Afghan government, after a series of military actions that included the targeting of civilian objectives, caused the U.S. military to change its tactics.[76]

B. *The Principle of Distinction*

According to the principle of distinction, military action must distinguish between combatants and civilians as well as between military and civilian objects. Distinguishing between a person and an object that possesses a military character—as opposed to an object that is of a civilian character—is the first step in deciding whether a person or object can be lawfully targeted. IHL is based on the assumption that an individual who is not a combatant is a civilian. This assumption is incorporated in the 1868 Declaration of St. Petersburg, the earliest international instrument in the field of international humanitarian law.[77] Subsequent codifications—including the Hague Convention Respecting the Laws and Customs of

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74. On the potential for machine learning in this context, see Backstrom & Henderson, supra note 33, at 493–94 (creating a hypothetical technology that can process distinction to illustrate the future possibilities).

75. C.J. Chivers, *A Changed Way of War in Afghanistan's Skies*, N.Y. TIMES, Jan. 16, 2012, at A1 (proposing that, as the use of air power continues to change during the Afghan conflict, aerial drones are an integral part of a successful war effort and must be used intelligently to avoid irreversible political backlash).

76. Michael N. Schmitt, *Targeting and International Humanitarian Law in Afghanistan*, 39 ISR. Y.B. HUM. RTS. 307, 312 (2009) [hereinafter Schmitt, *Targeting*] For news report about this change, see Carlotta Gall, *Afghan President Assails U.S.-Led Airstrike That He Says Killed 95*, N.Y. TIMES, Aug. 24, 2008, at A6 (illustrating this principle with a report regarding a U.S. airstrike and subsequent accounts that were inconsistent). These developments have contributed to a dramatic increase in the NATO forces' demand for UAVs and critical UAV surveillance capabilities. David Ignatius, *What a Surge Can't Solve in Afghanistan*, WASH. POST, Sept. 28, 2008, at B7 (noting that Secretary of Defense Robert Gates has pushed for a major increase in ISR assets in Afghanistan); Anna Mulrine, *Drones Fill the Troops Gap in Afghanistan*, U.S. NEWS & WORLD REP., Sept. 25, 2008, at 30 (reporting an increase of 12,000 additional troops and high demand for UAVs).

77. The preamble states: "[T]he only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy." Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, St. Petersburg, Dec. 11, 1868 [hereinafter St. Petersburg Declaration].

War on Land through its annex[78] and the additional protocols to the 1949 Geneva Conventions[79]—reaffirmed this rule.

Article 48 AP I contains this idea explicitly, and subsequent provisions refine this rule by outlawing the targeting of individual civilians[80] unless they take a direct part in hostilities[81] or target historic monuments, works of art, or places of worship.[82] Moreover, AP I prohibits not only attacks on civilians or objects of a civilian nature, but also attacks on objects that are "indispensable to the survival of the civilian population," the natural environment, and "installations containing dangerous forces."[83]

Military objectives are considered to be those that by "nature, location, purpose, or use make an effective contribution to military action and whose total or partial destruction, capture, or neutralization, in the circumstances ruling at the time, offers a definite military advantage."[84] Only when both the specific characteristic (i.e., the "nature, location, purpose or use make[s] an effective contribution to military action") and the damage or neutralization offers a military advantage at the time may an object be considered *military* under AP I. Each of these elements has been further clarified,[85] and is not necessarily static, but rather dynamic.[86]

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78. War on Land, *supra* note 72 (providing for the distinction between lawful and unlawful targets; for example, Article 25 states that "[t]he attack or bombardment, by whatever means, of towns, villages, dwellings, or buildings which are undefended is prohibited."). Allusions to the principle of distinction are prevalent throughout the preamble, for example, "[t]hinking it important, with this object, to revise the general laws and customs of war, either with a view to defining them with greater precision or to confining them within such limits as would mitigate their severity as far as possible," and "these provisions, the wording of which has been inspired by the desire to diminish the evils of war, as far as military requirements permit, are intended to serve as a general rule of conduct for the belligerents in their mutual relations and in their relations with the inhabitants." *Id.* pmbl.

79. AP I, *supra* note 58, art. 48 ("In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.").

80. *Id.*, art. 51(2) ("The civilian population as such, as well as individual civilians, shall not be the object of attack. Acts or threats of violence the primary purpose of which is to spread terror among the civilian population are prohibited.").

81. *Id.*, art. 52(3) ("Civilians shall enjoy the protection afforded by this section, unless and for such time as they take a direct part in hostilities.").

82. *Id.*, art. 53 (providing that it is prohibited "(a) to commit any acts of hostility directed against the historic monuments, works of art or places of worship which constitute the cultural or spiritual heritage of peoples; (b) to use such objects in support of the military effort; (c) to make such objects the object of reprisals.").

83. *Id.*, arts. 54, 55, 56 (providing for the "[p]rotection of objects indispensable to the survival of the civilian population," "[p]rotection of the natural environment," and "[p]rotection of works and installations containing dangerous forces").

84. *Id.*, art. 52(2).

85. CLAUDE PILLOUD ET AL., COMMENTARY ON THE ADDITIONAL PROTOCOLS OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949 ¶¶ 2020–24 (1987).

This means that the military advantage that objects possess will have to be reassessed constantly.

In addition, AP I contains provisions that prohibit certain methods of attack, namely those that are by their nature indiscriminate.[87] These rules are an expression of the idea that underlies IHL, i.e. that an attacker must not only distinguish between civilian and military targets, but do so with weaponry that is not indiscriminate. Therefore, if all that is available for an attack is a weapon system that is designed to destroy a large-scale target, the attack can only be carried out in a fashion that adheres to these principles.

The International Court of Justice (ICJ) found, in its *Nuclear Weapons* advisory opinion, that the principle of distinction not only forms part of treaty law, but has also found entry into customary international law. It stated that "a great many rules of humanitarian law applicable in armed conflict are . . . fundamental to the respect of the human person and 'elementary considerations of humanity'."[88] The Court appears to have elevated the principle of distinction to the level of *jus cogens* when it considered it to "constitute [an] intransgressible principle . . . of international customary law."[89] While there is some opposition to this finding, there is little doubt that the principle of distinction has attained the status of customary international law.[90]

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86. Markus Wagner, *Autonomy in the Battlespace: Independently Operating Weapon Systems and the Law of Armed Conflict*, *in* INTERNATIONAL HUMANITARIAN LAW AND THE CHANGING TECHNOLOGY OF WAR 99, 112 (Dan Saxon, ed., 2012) ("The element of use makes clear that IHL incorporates a dynamic element in that civilian objects may become mlitary targets if they are being used by the enemy for military ends.").

87. AP I, *supra* note 58, art. 51(4) stating:

> Indiscriminate attacks are prohibited. Indiscriminate attacks are: (a) those which are not directed at a specific military objective; (b) those which employ a method or means of combat which cannot be directed at a specific military objective; or (c) those which employ a method or means of combat the effects of which cannot be limited as required by this Protocol.

88. Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226 ¶ 79 (July 8).

89. *Id.*; *see also* Declaration on Respect for Human Rights in Armed Conflicts, G.A. Res. 2444 (XXIII), ¶ 1(c), Sept. 24, 1968–Dec. 21, 1968, U.N. Doc. A/7433; GAOR, 23d Sess., Supp. No. 1748 (1968) (predating the additional protocols and affirming "[t]hat distinction must be made at all times between persons taking part in the hostilities and members of the civilian population to the effect that the latter be spared as much as possible"); DINAH SHELTON, INTERNATIONAL LAW AND "RELATIVE NORMATIVITY" 159, 166 (Malcolm D. Evans ed., 2d ed. 2006); Meredith Hagger & Tim McCormack, *Regulating the Use of Unmanned Combat Vehicles: Are General Principles of International Humanitarian Law Sufficient?*, 5 J.L., INFO. & SCI. 74 (2012). The Eritrea-Ethiopia Claims Commission arrived at a similar conclusion. Eritrea Ethiopia Claims Commission: Partial Award, 45 I.L.M 396, 417, 425 (2006).

90. W. Hays Parks, *Air War and the Law of War*, 32 A.F. L. REV. 1, 174 (noting that there is "general agreement" in the international community about the principle of distinction); Taft, *supra* note 64, 323 (stating that the September 11 atttacks "clarified

However, putting these principles into practice is challenging. This relates most often to targets that are not only civilian in nature, but also serve a military purpose. Examples of such dual-use targets include bridges as well as broadcasting or energy networks.[91] Individuals have differences in opinion over what constitutes a legal target under the principle of distinction, and it is far from clear whose analysis should be used to formulate a code that would eventually determine the appropriateness of an attack. The importance of finding an answer to this question is even greater given the complex environments of today's conflicts.[92] Military and civilian objects in today's battle spaces are increasingly intertwined, making the principle of distinction ever more crucial.

AWS must be able to determine whether a particular target is civilian or military.[93] This would have to be determined in an abstract and *a priori* fashion. When there is doubt over whether a person or object is a lawful target, it is presumed to be a civilian.[94] AWS will have to be accordingly programmed to abort missions in such instances. AWS would only be allowed to attack after a sufficient number of pre-programmed characteristics have been reconciled with targets that are deemed legal under the principle of distinction. Importantly, this type of analysis is largely based on quantitative data (shape, size, etc.). Given recent advances in technology, it does not appear unrealistic that such a mechanistic matching may indeed be possible with the required degree of accuracy for targets such as tanks or larger military and radar installations.[95] The task becomes

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for the world community the elemental considerations of humanity that lie at the heart of the law of armed conflict").

91. Christine Byron, *International Humanitarian Law and Bombing Campaigns: Legitimate Military Objectives and Excessive Collateral Damage*, *in* Y.B. INT'L HUMANITARIAN L. 183–86 (Michael N. Schmitt, Louise Arimatsu & Tim McCormack eds., vol. 13, 2010) (discussing, *inter alia,* electricity grids as dual use objects); Marco Sassòli, *Legitimate Targets of Attacks Under International Humanitarian Law* 7–8 (Harvard Program on Humanitarian Policy and Conflict Research, Background Paper, 2003) (discussing power grids, factories, lines of communication, and bridges as potentially useful for military purposes, even where separate military infrastructures exist).

92. Michael N. Schmitt, *War, Technology, and The Law of Armed Conflict*, *in* THE LAW OF WAR IN THE 21ST CENTURY: WEAPONRY AND THE USE OF FORCE, INTERNATIONAL LEGAL STUDIES 137, 148–49 (Anthony M. Helm ed., vol. 82, 2007) [hereinafter Schmitt, *War, Technology, and the Law of Armed Conflict*].

93. John S. Canning, Chief Engineer, Naval Surface Warfare Center, Presentation at Third Annual Disruptive Technology Conference, *A Concept for the Operation of Armed Autonomous Systems on the Battlefield* (2006), *available at* http://www.dtic.mil/ndia/2006disruptive_tech/canning.pdf [http://perma.cc/R2DE-GZG4] (archived Sept. 16, 2014) (proposing a mandate that UAVs would not target humans, but only weapon systems). While this may minimize the risk for civilians somewhat, it is unclear how this would alleviate the problem of, for example, wrongly targeting someone carrying a rifle for safety reasons or for hunting purposes.

94. *See* AP I, *supra* note 58, art. 50(1), art. 52(3) (regarding civilians and civilian objects, respectively); *see also* PILLOUD, *supra* note 85, ¶¶ 1911–21 (1987).

95. Wagner, *Humans*, *supra* note 67, at 161. For a similar view, see Michael N. Schmitt & Jeffrey S. Thurnher, *"Out of the Loop": Autonomous Weapon Systems and*

even easier if the target being attacked is in a remote land location, on the high seas, or outer space.

The situation is much more problematic when determining whether an individual constitutes a military target. Not only would AWS have to be able to distinguish civilians from military personnel, but it must also decide if a civilian is taking a "direct part in hostilities."[96] These situations are challenging for humans to judge, and it does not appear that the necessary contextual analysis is amenable to easily programmable quantitative assessments at this time. Some, therefore, suggest that AWS should only be allowed to operate in situations in which no civilians or civilian objects could be endangered.[97] While this sounds attractive initially, it is questionable whether this is the purpose for which AWS were designed.

The following example illustrates the difficulty in making determinations using the principle of distinction. During a counter-insurgency operation in a village, soldiers receive information that combatants may be hiding inside a house. Unbeknownst to the soldiers, no insurgents are present. Inside of the home, boys are playing with a ball. The children kick the ball towards the gate as the soldiers enter the main door. The male inhabitants of this area carry a dagger called the *kirpan*[98] for purely religious reasons. One of the parents watching the children realizes that the children are in danger and tries to warn them by screaming in their direction to stay away from the gate. This type of situation is relatively easy to interpret for humans; while the inhabitants could be interpreted as a threat—two quickly approaching targets carrying weapons with another potential target running toward the gate in an agitated manner—the children

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the Law of Armed Conflict, 4 HARV. NAT'L SEC. J. 231, 246 (2013) (noting that "the inability of the weapons systems to distinguish bears on the legality of their use in particular circumstances"). Note, however, that specifically with respect to Article 51(4)(c) API, there has been considerable controversy since it arguably contains elements of proportionality, and thus, may not be merely a quantitative assessment. *See generally* Stefan Oeter, *Methods and Means of Combat*, *in* THE HANDBOOK OF INTERNATIONAL HUMANITARIAN LAW 119, 201 (Dieter Fleck ed., 2d ed. 2008).

96. AP I, *supra* note 58, art. 51(3). *See generally id*. art. 50 (negatively delineating civilians); Sharkey, *Evitability*, *supra* note 9, at 788–89 (discussing the inability of autonomous robots to discriminate between combatants and non-combatants as an ethical issue, and delineating ways in which autonomous robots are limited in their ability to comply with the principle of distinction).

97. Schmitt & Thurnher, *supra* note 95 ("What has been missed in much of the dialogue so far is that even an autonomous weapon system that is completely incapable of distinguishing a civilian from a combatant or a military objective from a civilian object can be used lawfully in certain environments. Not all battlespaces contain civilians or civilian objects.").

98. DORIS R. JAKOBSH, SIKHISM 60 (2012) (stating that the *kirpan* is viewed as a ceremonial sword and can be a few inches or up to three feet long, representing the Sikh struggle against injustice and oppression); Rishi Singh Bagga, *Living by the Sword: The Free Exercise of Religion and the Sikh Struggle for the Right to Carry a Kirpan*, 2 MOD. AM. 32 (2006) (focusing on the "conflict between American anti-weapons regulations and a Sikh's duty to carry the kirpan").

would likely be seen as chasing after a ball and not as posing a threat.

It is unclear whether AWS could interpret this situation similarly. One could argue that it would be possible to ensure that AWS would not consider the children as legitimate targets by programming the AWS to not attack individuals below a certain height, or to understand that in a particular geographic area males carry a dagger as a cultural symbol and not a weapon. However, certain distinctions far surpass the abilities of today's robotics, at least at this stage: distinguishing a weapon from a cultural or religious symbol; distinguishing the agonized face of a person in fear for her or his children from a threatening face; distinguishing children playing from threats.[99] Although humans and AWS alike may make mistakes, it is clear that distinction analysis is highly context-dependent in some situations. This type of analysis does not rely on quantitative data—as is the case with the distinction between a tank and a school bus—but rather requires qualitative analysis.

C. *The Principle of Proportionality*

Similar to the principle of distinction, the principle of proportionality is designed to provide protection to the civilian population during times of armed conflict. With respect to compliance by AWS, the principle of proportionality creates potentially even greater challenges than the principle of distinction. Unlike portions of the distinction analysis, proportionality cannot be defined in the abstract. The particular circumstances of the attack matter more for the principle of proportionality than for the principle of distinction.[100] Proportionality entails balancing competing goals: the anticipated direct military advantage and the prevention of excessive civilian casualties or damage.

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99. Naomi Cahn, *Poor Children: Child "Witches" and Child Soldiers in Sub-Saharan Africa*, 3 OHIO ST. J. CRIM. L. 413, 418 (2006) (stating that similar situations include children that are forced to carry weapons and who, for a system flying at even low altitude, may look like combatants, and that other innocuous behavior could include an individual carrying a rifle for hunting or protective purposes).

100. WILLIAM H. BOOTHBY, WEAPONS AND THE LAW OF ARMED CONFLICT 79 (2009) ("[W]hat is proportionate can only meaningfully be determined in relation to an attack on a particular occasion, perhaps at a specific time, using particular weapons and specified attack profiles."); OLIVER O'DONOVAN, THE JUST WAR REVISITED 62 (2003) ("Methods of conflict . . . may expand upwards on the scale of destructiveness in proportion to the scale of the threat they are likely to meet."); YORAM DINSTEIN, THE CONDUCT OF HOSTILITIES UNDER THE LAW OF INTERNATIONAL ARMED CONFLICT 131 (2d ed. 2010) (discussing instances in which civilians are used to shield military objectives and stating that "the appraisal whether civilian casualties are excessive in relation to the military advantage anticipated must make alloweances for the fact that – if an attempt is made to shield military objectives with civilians – civilian casualties will be higher than usual.").

The principle of proportionality dates back to St. Thomas Aquinas. He introduced the principle of double effect, which contained an early version of the principle of proportionality.[101] Grotius took the idea further with a more advanced version of the proportionality principle when he stated that, for the sake of saving many, one "must not attempt anything which may prove the destruction of innocents, unless for some extraordinary reason."[102] The Declaration of St. Petersburg contained similar language, finding that "the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy . . . [T]his object would be exceeded by the employment of arms which uselessly aggravate the sufferings of disabled men, or render their death inevitable."[103]

Throughout the twentieth century, a number of international instruments contained precursors to the principle of proportionality.[104] The adoption of AP I in the late 1970s codified the principle and found more widespread acceptance,[105] without using that particular language. However, the principle is reflected in numerous provisions of AP I, specifically in Article 51(5)(b) and Article 57(2).

Article 51(5)(b) AP I specifically states:

> 5. Among others, the following types of attacks are to be considered as indiscriminate:
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> . . .

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101. T.A. CAVANAUGH, DOUBLE-EFFECT REASONING: DOING GOOD AND AVOIDING EVIL 2, 180–81 (2006) ("In the theory of just war that may be traced back to Cicero via Augustine and Aquinas, one finds criteria to evaluate going to war (*jus ad belum*) and criteria to evaluate conduct in war (*jus in bello*)."); Thomas M. Franck, *On Proportionality of Countermeasures in International Law*, 102 AM J. INT'L L. 715, 723 (2008) (providing an earlier example of precursors to the principle).

102. HUGO GROTIUS, ON THE LAW OF WAR AND PEACE 321 (A.C. Campbell trans., Batoche Books, 2001) (1625) ("Though there may be circumstances, in which absolute justice will not condemn the sacrifice of lives in war, yet humanity will require that the greatest precaution should be used against involving the innocent in danger, except in cases of extreme urgency and utility.").

103. St. Petersburg Declaration, *supra* note 77.

104. William J. Fenrick, *The Rule of Proportionality and Prtocol I in Conventional Warfare*, 98 MIL. L. REV. 91, 95–98 (1982) ("[A]lthough Protocol I contains the first reasonably explicit codification of the rule of proportionality, earlier treaties and related documents contain some provisions which are relevant to the subject."); Franck, *supra* note 101, at 723–24 (referencing earlier documents and agreements that provided foundation for the codfication of the rule of proportionality); Judith Gail Gardam, *Proportionality and International Law*, 87 AM. J. INT'L L. 391, 394 (1993) (discussing the origins of proportionality and stating that "[t]he doctrine of proportionality was part of the Christian theory of the just war.").

105. Bernard L. Brown, *The Proportionality Principle in the Humanitarian Law of Warfare: Recent Efforts at Codification*, 10 CORNELL INT'L L.J. 134, 136 (1976) (discussing efforts at codification of the proportionality principle in the 1970s).

> (b) an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.[106]

While the rationale for this provision is to protect civilians against non-discriminatory attacks, the inclusion of the term "excessive," to denote the potential disproportionality of an attack, has led to discussions of how an attack may comply with this provision.[107] Trying to define the term in the abstract has proven to be impossible. This is not surprising, given the potential for constant change in the relevant factors:[108] on the one hand, there is the concrete and direct military advantage; on the other hand, there is the requirement to limit the incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof. In order to alleviate these concerns, Article 57(2) AP I requires that military commanders take precautions in order to avoid or minimize incidental loss of life, injury to civilians, and damage to civilian objects.[109] An attack in which there is civilian loss of life, injury, or damage, would be "excessive in relation to the concrete and direct military advantage anticipated."[110] Because of the use of the same

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106. AP I, *supra* note 58, art. 51(5).

107. Fenrick, *supra* note 104, at 97 (stating that the terms "excessive" and disproportionate" are more or less interchangeable). Moreover, a number of countries reportedly held the view that the incorporation of the principle of proportionality was merely a codification of existing customary law. *See id.* at 104.

108. GARY D. SOLIS, THE LAW OF ARMED CONFLICT: INTERNATIONAL HUMANITARIAN LAW IN WAR 273 (2010).

109. AP I, *supra* note 58, art. 57(2)(a)(ii).

110. *Id.* art. 57(2)(a)(iii). The full provision reads:

> (a) those who plan or decide upon an attack shall:
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> (i) do everything feasible to verify that the objectives to be attacked are neither civilians nor civilian objects and are not subject to special protection but are military objectives within the meaning of paragraph 2 of Article 52 and that it is not prohibited by the provisions of this Protocol to attack them;
>
> (ii) take all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event to minimizing, incidental loss or civilian life, injury to civilians and damage to civilian objects;
>
> (iii) refrain from deciding to launch any attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated;
>
> (b) an attack shall be cancelled or suspended if it becomes apparent that the objective is not a military one or is subject to special protection or that the attack may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated;

terminology as in Article 51(5)(b) AP I, attempts to define the obligation incumbent upon military commanders in the abstract have not been successful. Rather, this determination must be made on a case-by-case basis. The choice of wording in both provisions is a result of the aforementioned tension between gaining military advantage and protecting the civilian population. It has been suggested that the discrepancy between the direct military advantage anticipated and the loss of life, injury, and damage to civilian objects must be *clearly* disproportionate.[111] However, the wording of both provisions does not support the inclusion of this element, and it is unclear what the insertion of such a requirement adds. It does nothing to solve the problem and tilts the scale against the protection of the civilian population or civilian objects.

The proportionality principle weighs the incidental loss of civilian life or damage to civilian objects against the anticipated result of an attack at the time it was initiated (rather than the actual outcome in hindsight).[112] Neither of these elements is static; both are potentially subject to change. As one commentator puts it, "[t]he more nebulous the military objective is, the greater the need for caution in use of the weapons likely to cause 'excessive' collateral damage to civilians or civilian objects."[113] Moreover, these factors are difficult to quantify, as the quantities that are being measured—civilian losses and military advantage—are dissimilar.[114] Because of that, "it is not possible to establish any reasonably exact proportionality equation between them."[115]

This has led some authors to claim that the principle of proportionality is too vague a concept, and proportionality would only be implicated when "acts have occurred that are tantamount to the direct attack of the civilian population."[116] While this result may be unsatisfactory for some, this tension was succinctly spelled out by the Prosecutor of the International Criminal Tribunal for the Former Yugoslavia in a report released in 2000.[117] The report addressed the difficulty of applying the principle of proportionality, stating "[o]ne cannot easily assess the value of innocent human lives as opposed to

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(c) effective advance warning shall be given of attacks which may affect the civilian population, unless circumstances do not permit.

111. JEAN-MARIE HENCKAERTS AND LOUISE DOSWALD-BECK, CUSTOMARY INTERNATIONAL HUMANITARIAN LAW 47 (2005); SOLIS, *supra* note 108, at 274.

112. DINSTEIN, *supra* note 100, at 120.

113. *Id.*

114. Fenrick, *supra* note 104, at 102.

115. *Id*.

116. Parks, *supra* note 90, at 173; *see also* Schmitt, *Targeting*, *supra* note 76.

117. International Criminal Tribunal for the Former Yugoslavia, *Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia*, 39 I.L.M.1257, ¶¶ 48–52 (June 8, 2000) ("The main problem with the principle of proportionality is not whether or not it exists but what it means and how it is to be applied.").

capturing a particular military objective."[118] Similar statements can be found by academic authors[119] as well as other international and domestic tribunals.[120]

Contrary to distinction analysis, proportionality assessment is almost entirely a qualitative exercise.[121] While some authors question whether this involves a subjective analysis,[122] it is generally agreed that it is virtually impossible to assign numeric values to military targets as well as civilian damage in the abstract.[123] Thus, despite voices to the contrary,[124] the value of destroying a radar installation at a particular moment is impossible to determine *a priori*. It is therefore impossible to predict how many civilians it is proportional to kill in an attack on that installation.[125] Technology such as the

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118. *Id.* ¶ 48.

119. *See, e.g.*, DINSTEIN, *supra* note 100, at 120–21 ("[S]ome commentators confuse the term 'excessive' with 'extensive'. This is a misreading of the text.").

120. *See, e.g.*, HCJ 769/02 Pub. Comm. Against Torture in Isr. v. Gov't of Isr. [Dec. 11, 2005], slip. op. ¶ 46, *available at* http://elyon1.court.gov.il/Files_ENG/02/690/007/a34/02007690.a34.pdf [http://perma.cc/54EG-AQ4W] (archived Sept. 28, 2014) ("[W]hen hostilities occur, losses are caused. The state's duty to protect the lives of its soldiers and civilians must be balanced against its duty to protect the lives of innocent civilians harmed during attacks on terrorists. That balancing is difficult when it regards human life."). *See generally* Robin Geiß, *Land Warfare*, *in* MAX PLANK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW.

121. Tony Gillespie & Robin West, *Requirements for Autonomous Unmanned Air Systems set by Legal Issues*, 4 INT'L C2 J., no. 2, 2010, at 1, 13 (reasoning that the principle of proportionality "clearly highlights the difference between quantitative and qualitative decisions and the need for human decision-making").

122. *See, e.g.*, Sassòli, *supra* note 67, at 332 (stating that critics view making a proportionality determination as involving "subjective judgments"). Even those who are generally more enthusiastic about the use of AWS in armed conflict admit to the highly context-specific nature of proportionality assessments, although then continue to claim that such evaluations are "not in principle impossible." Schmitt & Thurnher, *supra* note 95, at 256–57.

123. Robert Sparrow, *Building a Better WarBot: Ethical Issues in the Design of Unmanned Systems for Military Applications*, 15 SCI. & ENGINEERING ETHICS 169, 178 (2009) (positing that "decisions about what constitutes a level of force *proportionate to the threat* posed by enemy forces are extremely complex and context dependent and it is seemingly unlikely that machines will be able to make these decisions reliably for the foreseeable future"); BOOTHBY, *supra* note 100, at 233 ("There is . . . at present no known mechanical decision-making technology that can address essentially qualitative factors, such as risks to civilians.").

124. Prosecutor v Stanislav Galić, Case No. IT-98-29-T, Separate and Partially Dissenting Opinion of Judge Nieto-Navia, ¶ 104 (Int'l Crim. Trib. for the Former Yugoslavia Dec. 5, 2003), http://www.icty.org/x/cases/galic/tjug/en/gal-so031205e.pdf [http://perma.cc/D9GZ-W9Y5] (archived Sept. 18, 2014) (turning to the question of whether a campaign purposefully targeting civilians in Sarajevo was conducted, and stating that "I recognize the potential for such a discussion, in its mathematical abstraction of the underlying human suffering, to be misinterpreted as trivializing the individual stories of hardship and sorrow told by every resident of Sarajevo who testified before the Trial Chamber.").

125. Franck, *supra* note 101, at 729 ("High on the list of problems encountered in devision secondary rules applying the principle of proportionality to combat-related events, as Michael Schmitt points out, is the 'apples and oranges' phenomenon: the 'inherent diffuclty of valuation.'"); DINSTEIN, *supra* note 100, at 133 ("There is no

collateral damage estimate (CDE) may be helpful in determining the amount of damage that may result from a particular weapon in a given situation, but it "fails to answer what constitutes excessive collateral damage and otherwise does not incorporate a fully integrated targeting analysis that applies IHL in the first instance."[126] While such technology could be incorporated into AWS, it would therefore not solve the basic problem of the relational proportionality analysis required by IHL, as even its proponents implicitly admit.[127] Because there are—often constantly changing—variables on both sides of the equation, and the balancing of values depends on the individual making the calculation, the proportionality principle is by its nature subjective and not easily amenable to an agreed upon checklist.[128] This difficulty exists not only for the evaluation of risk to civilians or civilian objects, but also for the evaluation of anticipated military advantage in a given situation. In order to properly assess this quantity, AWS would have to be able to evaluate the "concrete and direct military advantage anticipated"[129] at the time an attack takes place.

The proportionality principle debate brings into doubt whether it will be possible in the near future (if ever) to write computer code which will adequately perform such a highly context-dependent analysis. There are several challenges, as proportionality analysis takes place in various stages. The difficulty of measuring qualitative information not only factors into target selection and the means and methods of attack, but also impacts how to engage a particular target. Thus, some of the most salient questions that will need to be addressed are whether AWS can make the initial decision to attack, whether AWS can decide which type of weapon to use, and how AWS can engage a target under the principle of proportionality. These

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objective possibility of 'quanitfying the factors of the equation', and the process 'necessarily contains a large subjective element'.").

126. Jason D. Wright, *'Excessive' Ambiguity: Analysing and Refining the Proportionality Standard*, 94 INT'L REV. RED CROSS 820, 833 (2012) (referencing the importance of bearing in mind that such systems are generally used not for the determination of whether an attack is proportionate, but at what level decisions over whether to attack or not have to be made).

127. Michael N. Schmitt, *Autonomous Weapon Systems and International Humanitarian Law: A Reply to the Critics*, HARV. NAT'L SECURITY J. FEATURES 1, 20 (2013) [hereinafter Schmitt, *Autonomous*], http://harvardnsj.org/wp-content/uploads/2013/02/Schmitt-Autonomous-Weapon-Systems-and-IHL-Final.pdf [http://perma.cc/8UQU-Z2VP] (archived Sept. 28, 2014) (noting that "given the complexity and fluidity of the modern battlespace," it is unlikely machines will be "programmable to perform robust assessments of a strike's likely military advantage" in the near future).

128. This subjective interpretation of the provision has been criticized as allowing for abusive justifications which are ultimately hard, if not impossible, to disprove. Cassese, for example, at the time argued for an objective standard and while the standard may have been desirable, the wording of Article 51 AP I does not contain such a more objective reference. ANTONIO CASSESE, *Means of Warfare: The Traditional and the New Law*, *in* THE NEW HUMANITARIAN LAW OF ARMED CONFLICT 161, 175 (Antonio Cassese ed., 1979).

129. AP I, *supra* note 58, art. 51(5)(b).

questions require a relative weighing and balancing of oftentimes shifting values.

With respect to target selection, a program would have to be designed that is capable of handling a very large number of decisions. If a system is to be truly autonomous, it is not enough to program individual scenarios. Rather, it is necessary to code decision rules that are capable of making decisions while weighing a myriad of factors. Concerning the means to be employed, AWS would have to determine the effect of each weapon under any given circumstance. CDE may be helpful in this regard, although it does not analyze what available weapons or means would cause the least amount of suffering while achieving the same goal. Though seemingly easy in the abstract, this determination is much more difficult in reality due to constantly shifting circumstances and the close proximity of civilians in modern battle spaces.

As pointed out above, there is no clear formula for these determinations.[130] Even after a considerable passage of time and a considerable amount of discussion, there is no agreement over how proportionality analysis could work in the abstract. Therefore, it is dubious that a quantitative analysis would be capable achieving acceptable results.

D. *AWS and Individual Responsibility*

More often than not throughout the history of organizational responsibility, it was the individuals fighting or guarding the front lines—but almost never their superiors—that were held accountable for their actions, even if their participation was only part of a larger system. This was often true for military operations as well as for police action. A recurring problem in these instances was that direct participants in criminal acts often held positions with relatively little power, yet those that designed the system were regularly able to evade criminal responsibility. This changed somewhat with the Nuremberg and Tokyo tribunals after World War II, when a number of high-level officials were prosecuted.[131] Yet even in more modern times, this phenomenon persists. There are many reasons why holding individuals responsible for crimes committed in the battle space is important. While a foundational idea of armed conflict is that—unlike in times of peace—wounding or killing other individuals is permissible, egregious behavior is nevertheless barred on the

130. Backstrom & Henderson, *supra* note 33, at 492 (discussing the proportionality determination and the lack of a clear, determinative formula); Sassòli, *supra* note 67, at 334 (providing more elaborate discussion and analysis of the precise guideline language).

131. *See generally* Parks, *supra* note 90.

grounds of reciprocity, deterrence, and morality.[132] Some commentators have argued that because of the difficulty of justifiably holding an individual criminally responsible, it would be unethical to use AWS in warfare.[133]

The introduction of AWS creates at least two paradoxes. First, those who plan a military operation are further removed from actual combat and have less influence than they previously had.[134] Additionally, one must consider the code upon which AWS base their decisions. It is unclear how this challenge will play out in future combat operations in which it can be presumed that breaches of IHL will continue to take place.[135] A second paradox lies in the inherent tension between increased levels of autonomy—one of the hallmarks of AWS that distinguishes them from remotely operated or automated systems—on the one hand, and the difficulty of assigning responsibility on the other. Further distancing human combatants from the battle space—not only physically, but also psychologically and temporally—only exacerbates the problem.[136]

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132. *See generally* Henry M. Hart, Jr., *The Aims of the Criminal Law*, LAW & CONTEMP. PROBS. 401 (1958).

133. Robert Sparrow, *Killer Robots*, 24 J. APPLIED PHIL., no. 1, 2007, at 62, 66 [hereinafter Sparrow, *Killer Robots*] ("If . . . it turns out that no-one can *justly* be held responsible for the actions of these systems, then it will be unethical to use them in war."); Heyns, Special Rapporteur, *supra* note 30 ("If each of the possible candidates for responsibility identified above is ultimately inappropriate or impractical, a responsibility vacuum will emerge, granting impunity for all LAR use.").

134. There have been documented problems of UAVs operators mistakenly attacking friendly forces. In the 2006 Israeli invasion of Lebanon, an Israeli drone attacked Israeli ground troops. There have also been at least two occasions in the U.S. war in Afghanistan where drones have been used to target individuals who, because they stood out among other individuals because of their height, were mistaken to be Osama bin Laden. Stanford Law School International Human Rights and Conflict Resolution Clinic & NYU School of Law Global Justice Clinic, Living under Drones: Death, Injury and Trauma to Civilians from US Drone Practices in Pakistan, September 2012, 13 and John Sifton, A Brief History of Drones, The Nation, February 7, 2012, available at http://www.thenation.com/article/166124/brief-history-drones (September 24, 2014). *See generally* SINGER, WIRED, *supra* note 3.

135. For a contrary view, see ARKIN, *supra* note 35, at 30–31 ("It is not my belief that an autonomous unmanned system will be able to be perfectly ethical in the battlefield, but I am convinced that they can perform more ethically than human soldiers are capable of."); Tami Davis Biddle, *Air Power*, *in* THE LAWS OF WAR: CONSTRAINTS ON WARFARE IN THE WESTERN WORLD 140, 141 (Michael Howard, George J. Andreopoulos & Mark R. Shulman eds., 1994) (suggesting that the emergence of more accurate bombing capabilities might lead to a convergence of "ethics and efficiency" that could "bolster the prospects for adherence to international norms"); Schmitt, *War, Technology, and the Law of Armed Conflict*, *supra* note 92, at 163.

136. M.L. Cummings, *Creating Moral Buffers in Weapon Control Interface Design*, IEEE TECH. & SOC'Y MAG., Fall 2004, at 28, 29 (noting that "the impact of computer-control on a user's sense of autonomy and moral responsibility" has "become a topic of considerable ethical interest").

While military planners insist that a human will remain in the loop,[137] it is apparent that the current mode of remotely operating vehicles will be replaced by less direct oversight mechanisms. Several models project that a team of operators will no longer command individual combat vehicles, but rather be responsible for a much larger force. These plans are due to projected budget constraints and their technical feasibility.[138]

However, a problem arises where an operator does not have time to directly oversee a particular action that an AWS has determined to take. In such instances, the question of criminal responsibility is especially acute. Similarly, there is an issue where the actions of AWS lead to the commission of what would otherwise be considered a war crime. This is not to say that AWS will "go rogue" in the sense of contravening specific directions.[139] If a weapon system with autonomous capability were to contravene specific directions, its use would be illegal under the rules of IHL. For example, imagine an autonomous weapon system firing at a target despite its civilian nature or in a situation in which soldiers have been wounded to such an extent that they are no longer capable of fighting. The system may have been programmed to act in such situations for a variety of reasons: the cost of watching over the soldiers was too high, compared to the utility of system in other parts of the battle space, or to instill fear in onlookers.[140] Moreover, it is possible that AWS malfunction, which can happen to any weapon or weapon system. Likewise, AWS are open to tampering or other interferences. However, this is an analysis of those complex situations where the determinations of AWS are made on the basis of the underlying code and result in unforeseen consequences.[141] The Report of the Special Rapporteur on

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137. UK DoD JOINT DOCTRINE, *supra* note 52, ¶ 520 (discussing "[t]he role of the human in the loop"); SINGER, WIRED, *supra* note 3, at 123–24 ("[P]eople speak in such absolute terms and use the phrase 'man will always stay in the loop' so often that it ends up sounding more like brainwashing than analysis.").

138. USAF FLIGHT PLAN, *supra* note 5, at 41 (stating that "[i]ncreasingly humans will no longer be 'in the loop' but rather 'on the loop' – monitoring the execution of certain decisions. Simultaneously, advances in AI will enable systems to make combat decisions and act within legal and policy constraints without necessarily requiring human input."); M.L. Cummings, *Operator Interaction with Centralized Versus Decentralized UAV Architectures*, *in* HANDBOOK OF UNMANNED AERIAL VEHICLES 977 (Kimon P. Valavanis & George J. Vachtsevanos ed., forthcoming 2015) (discussing the costs and large-scale feasibility of unmanned aerial vehicle use by military personnel).

139. Sassòli, *supra* note 67, at 326; Schmitt & Thurnher, *supra* note 95, at 242 (stating that robots "will not 'go rogue'").

140. Sparrow, *Killer Robots*, *supra* note 133 (providing additional rationales, such as "the robot . . . seeking to revenge the 'deaths' of robot comrades recently destroyed in battle"). Given the purported a-emotionality of AWS, this type of rationale would require the very aspect that the proponents contend AWS do not have and make them superior to humans, i.e. emotions such as revenge.

141. *See infra* note 195 (noting that some measure the potential performance of AWS against this situation).

extrajudicial, summary, or arbitrary executions, correctly stated that "[a]rmed conflict and IHL often require human judgement, common sense, appreciation of the larger picture, understanding of the intentions behind people's actions, and understanding of values and anticipation of the direction in which events are unfolding."[142]

As mentioned earlier, there are marked differences between AWS on the one hand, and remotely operated and automated systems on the other. Regarding the latter, human input remains a crucial element. AWS operate in an autonomous manner. Remotely operated and automated systems retain the possibility to assign individual responsibility. AWS are built on self-selecting and self-determining systems, as the "premise underpinning automation is that the operation of the relevant device is capable of being accurately predicted based on the programming and commands inputted."[143]

One of the most important challenges posed by the introduction of AWS into the modern battle space is how to establish individual responsibility. Most legal systems require the showing of intent,[144] with some others adding a requirement of showing individual guilt. With that in mind, a range of actors should be assessed to determine whether command responsibility applies. Importantly, the "composite nature of [lethal autonomous robots] technology and the many levels likely to be involved in decisions about deployment" could "result in a potential accountability gap or vacuum."[145] In order to avoid what may also be called a system of organized irresponsibility, it will be necessary to determine—before or concomitant with further development, and certainly before any potential deployment—who can be held responsible under what circumstances. A DoD directive attempts to avoid organized irresponsibility by requiring that "[p]ersons who authorize the use of, direct the use of, or operate autonomous and semi-autonomous weapon systems must do so with appropriate care and in accordance with the law of war, applicable treaties, weapon system safety rules, and applicable rules of engagement."[146] While this approach is laudable, it does not clearly address a fundamental aspect of fully autonomous systems—namely, that a system's course of action is not necessarily completely

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142. Heyns, Special Rapporteur, *supra* note 30, ¶ 55.

143. Stewart, *supra* note 33, at 290.

144. Dan Saxon, *Closing the Accountability Gap: Individual Criminal Responsibility and Autonomous Weapon Systems* (forthcoming 2014) (on file with author); *see also* Jack M. Beard, *Autonomous Weapons and Human Responsibilities*, 45 GEO. J. INT'L L. 617, 649 (2014) (detailing that "customary international law" recognizes a mens rea standard requiring knowledge).

145. Heyns, Special Rapporteur, *supra* note 30, ¶ 77. Others are more sanguine, contending that even though "a human might not be in control of a particular engagement does not mean that no human is responsible for the actions of the autonomous weapon system. . . . A human must decide how to program the system." Schmitt, *Autonomous*, *supra* note 127, at 33.

146. DoD Directive, *supra* note 33, at 3.

predictable for the operator. If a system is designed in a manner that is fully predictable, then it is arguably not autonomous as the term is properly understood and defined by the DoD directive itself.[147]

Setting aside the very reasonable objection against holding non-humans responsible, one could try to hold the program or the AWS itself responsible. At least some commentators foresee this "distant future once robots become more sophisticated and intelligent."[148] In this context, AWS may be the cause of harm,[149] yet it is questionable to attribute blame to an entity that does not possess moral agency.[150] For most legal systems, criminal culpability requires some form of moral agency, which does not exist in the case of AWS.[151] Additionally, a traditional deterrence rationale does not apply to AWS. They can neither be punished nor possess any form of moral agency.[152] As one author puts it, attempting to impute moral agency

147. Spinetta, *supra* note 23 (recalling the definition of the directive and noting that the directive limits the use of AWS in a way that that they "may be used to apply non-lethal, non-kinetic force such as some forms of electronic attack, against material targets"). It thus echoes earlier statements, pointing out that "[f]or a significant period into the future, the decision to pull the trigger or launch a missile from an unmanned system will not be fully automated, but it will remain under the full control of a human operator." FY 2009-2034 UNMANNED SYSTEMS, *supra* note 5, at 10.

148. KRISHNAN, *supra* note 67, at 105.

149. Alex Eliseev, *Army Deaths Investigated; Separate Probes Will Determine How Nine Soldiers Were Killed in Training*, STAR, Oct. 15, 2007 (reporting the killing of nine South African soldiers by an automated gun in 2007); *War of Words After Army Base Horror*, SUNDAY TRIBUNE, Oct. 14, 2007, at 2.

150. Heyns, Special Rapporteur, *supra* note 30, ¶ 76 ("Robots have no moral agency and as a result cannot be held responsible in any recognizable way if they cause deprivation of life that would normally require accountability if humans had made the decisions. Who, then, is to bear the responsibility?"); Sassòli, *supra* note 67, at 324 (opining that commanding autonomous weapons is "a case of direct responsibility" and that the presence of an autonomous decision-making capactiy does not "break[] the causal chain allowing attribution and responsibility").

151. *But see* Rob Sparrow, *Can Machines Be People? Reflections on the Turing Triage Test*, *in* ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS 301, 305 (Patrick Lin, Keith Abney & George A. Bekey eds., 2012) [hereinafter Sparrow, *Machines*] (stating that "[t]he use of robots in military operations has also generated a larger ethical debate about the ethics of the development and deployment of autonomous weapons systems.").

152. Colin Allen & Wendell Wallach, *Moral Machines: Contradiction in Terms or Abdication of Human Responsibility?*, *in* ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS, *supra* note 151, at 55, 62 (stating that some critics "believe that talk of morality is misguided in connection with agents that lack the potential to choose to act immorally"). *But see* SAMIR CHOPRA & LAURENCE F. WHITE, A LEGAL THEORY FOR AUTONOMOUS ARTIFICIAL AGENTS 11 (2011); Gert-Jan Lokhorst & Jeroen van den Hoven, *Responsibility for Military Robots*, *in* ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS, *supra* note 152, at 145, 149 (questioning the stance of other scholars that robots cannot be made to suffer and surmising that "if robots can be made to suffer, then they can be punished as well.").

to non-humans "offends not only the notion of the rule of law, but also the more visceral human desire to find an individual accountable."[153]

There is also the matter of how to hold AWS accountable. Even if AWS possessed intellectual abilities—apart from using algorithms to act in a discretionary manner—it is questionable whether a machine will ever be able to "suffer" from any form of punishment, whatever form that may take. One alternative may be to shut off the individual autonomous weapon system. This does not solve the problem, however, as what caused the individual system to malfunction would be prevalent in all AWS based on the same code. But the high cost of shutting down an entire fleet of AWS based on the same code makes this somewhat improbable. These considerations illustrate that holding AWS responsible is a theoretical possibility, but not a useful or feasible option.

Turning to more realistic attempts to designate responsibility, it may be possible to hold accountable the scientist or programmer who developed the software upon which the AWS relied. After all, software is the ultimate foundation of the AWS's determinations. Notwithstanding a programmer acting with *mens rea*, the programmer's action would have to be negligent. However, holding a programmer responsible for negligence may be a contentious premise given a core characteristic of autonomy: if AWS are supposed to act according to their code and in truly autonomous fashion, they must be able to make discretionary decisions. It may not be possible to predict the behavior of the AWS software in all its manifestations given the changing nature of the battle space.[154] Any potential AWS architecture will be complex in nature. The AWS code may have different origins and react differently than expected in concert, or may act differently depending on the sensor from which it receives data. Given this complexity, it may be difficult—although not impossible—to attribute responsibility to a programmer or a number of programmers.[155] Responsibility for negligence could only be established while the system is not designed to learn independently

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153. Stewart, *supra* note 33, at 291; Anthony J. Lazarski, *Legal Implications of the Uninhabited Combat Aerial Vehicle*, 16 AEROSPACE POWER J., no. 2, 2002, at 74, 81 (stressing the need for accountability).

154. ANTHONY FINN & STEVE SCHEDING, DEVELOPMENTS AND CHALLENGES FOR AUTONOMOUS UNMANNED VEHICLES: A COMPENDIUM 183 (2010) ("[T]he more intelligent the decision-making process, the harder it is likely to be to functionally establish or fully test the response of the system to repeatable or verifiable system stimuli. How then can an acquisition agency be held responsible for the actions of an IDT that it cannot fully test?"). In addition, unpredictability may be a desirable asset in certain circumstances "so as to inject a degree of flexibility or creativity into the system." *Id*. at 184.

155. Stewart, *supra* note 33, at 290 ("Neither the programming nor the command data inputted to these vehicles prior to their deployment on a particular operation will necessarily result in a specific outcome in response to any given set of circumstances; this is the essence of autonomy.").

from past behavior, or in situations where designers acted negligently in supervising the development of AWS software when it comes to discretionary decision making.[156]

Given that AWS are military tools, a natural starting point for responsibility could be the military officers who set parameters for a given engagement.[157] It is important to distinguish between direct responsibility, which arises from acts or omissions supporting the commission of IHL, and command responsibility, which involves the failure of military or civilian superiors to conduct the required oversight of their subordinates.

Traditionally, as long as a system is lawful, "[l]egal responsibility for any military activity remains with the last person to issue the command authorising a specific activity."[158] This is commensurate with the existing attribution mechanism by which the officer in charge is responsible for the aberrant behavior of a weapon system. This may be the case where a weapon system was set to a specific target and circumstances were foreseeable at the outset of the mission. However, this type of situation does not reflect the characteristics of AWS. A specific advantage of AWS over automated systems is that targets need not necessarily be preprogrammed, and the decision-making process is independent and leaves room for discretion. And so, individuals who set the parameters will be responsible for reasonably foreseeable violations of law caused by AWS. But the use of AWS creates a number of complications precisely because individuals are removed from the decision-making process. It is likely that soldiers on the front line who deploy AWS will not be able to fully assess the complexities of the software upon which AWS are built.[159] Individuals may then be held accountable for actions that they had no actual control over, a risk that grows with a higher degree of autonomy.[160]

A similar issue arises regarding the *mens rea* of an operator who sets in motion an autonomous weapon system. For criminal

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156. Sparrow, *Killer Robots*, *supra* note 133, at 70. Sparrow's view in this regard may be too narrow, as it is possible to attribute negligent behavior for not monitoring the behavior of an AWS during the learning process.

157. Heyns, Special Rapporteur, *supra* note 30, ¶ 78 (noting that "[s]ince a commander can be held accountable for an autonomous human subordinate, holding a commander accountable for an autonomous robot subordinate may appear anologous," but articulating potential setbacks).

158. UK DOD JOINT DOCTRINE, *supra* note 55, ¶ 510.

159. Beard, *supra* note 144, at 652 (noting the complexities involved with "the more advanced systems on the higher end of the continuum"); Heyns, Special Rapporteur, *supra* note 30, ¶ 78 ("It will be important to establish, inter alia, whether military commanders will be in a position to understand the complex programming of LARs sufficiently well to warrant criminal liablity.")

160. *See* Sparrow, *Killer Robots*, *supra* note 133, at 71 ("The use of autonomous weapons . . . involves a risk that military personnel will be held responsible for the actions of machines whose decisions they did not control.").

responsibility, the operator must have "intent to commit the crime, or with an awareness of the probability, in the sense of the substantial likelihood, that the crime would occur as a consequence of his/her conduct."[161] This provides for unique challenges; not only must AWS "[f]unction as anticipated in realistic operational environments against adaptive adversaries"—and therefore allow a considerable amount of flexibility—but also "[b]e readily understandable to trained operators."[162] The necessary "trust" in the capabilities of AWS therefore is a "complicated and subjective decision, one that requires a judgment about the capabilities of the system, the circumstances in which it is to be deployed, and the nature and type of operations in which the system can be expected to function appropriately."[163] The extent to which this is commensurate with the IHL requirement that a commander "take all feasible precautions in an attack" is an open question. Moreover, the deployment of AWS may constitute a war crime only if the commanding officer possessed the requisite *mens rea* at the time. This may occur where the commanding officer sends AWS into a situation for which they were not designed (i.e., in which AWS would exceed their capabilities to conform with IHL). In such a case, proving the commanding officer's responsibility appears legally unproblematic. However, it is more realistic that not all aspects of a future mission are known in advance. This type of uncertainty may make the establishment of *mens rea* difficult or impossible.

Finally, it may be possible to investigate higher-ranking military or civilian officials for their action or inaction regarding the testing of AWS. Under Article 36 AP I, for any weapon, states are under an obligation "to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party."[164] This obligation applies during the "study, development, acquisition or adoption of a new weapon, means or method of warfare."[165] The provision aims to "prevent the use of weapons that would violate international law" and to "impose restrictions on the use of weapons that would violate international law in some circumstances, by determining their lawfulness before they are developed, acquired or otherwise incorporated into a State's arsenal."[166] There is little state practice as to the precise ramifications of this provision.[167] The

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161. Saxon, *supra* note 144, at 16.
162. DoD Directive, *supra* note 33, at 2.
163. Beard, *supra* note 144, at 653.
164. AP I, *supra* note 58, art. 36.
165. *Id.*
166. Int'l Comm. of the Red Cross, *A Guide to the Legal Review of New Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1977*, 88 INT'L REV. RED CROSS 931, 933 (2006) [hereinafter ICRC, *Guide*].
167. James D. Fry, *Contextualized Legal Reviews for the Methods and Means of Warfare: Cave Combat and International Humanitarian Law*, 44 COLUM. J.

provision largely allows states to decide how they analyze "whether the employment of a weapon for its normal or expected use would be prohibited under some or all circumstances."[168] While there has been rigorous debate about the meaning of this provision,[169] the extent to which states comply with it is not clear.[170] Given the highly sensitive nature of AWS technology, it is to be expected that such a review would not be public, but rather conducted in secret.[171]

Under international criminal law, command responsibility is predicated on the establishment of conduct, by a subordinate, which amounts to a criminal act. But command responsibility only attaches in situations where the commander knew or should have known about the crime, was in a position to prevent it, and had a commensurate duty to do so.[172] The threshold for civilian superiors differs slightly in that it requires knowledge or the conscious disregard of information that "clearly indicated that the subordinates were committing or about to commit such crimes."[173] Given the high degree of complexity in decision-making processes of AWS, one suggestion consists of "military organizations putting clear rules and regulations in place to govern the employment of autonomous weapons in specific types of operations."[174] Absent such regulation,

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TRANSNAT'L L. 453, 473 (2006) (noting only "a few states" are known to perform Article 36 reviews); *cf.* PILLOUD, *supra* note 85, ¶ 1470 (pointing out that states are not obligated to publicize their review findings).

168. PILLOUD, *supra* note 85, at 424. The 2006 review by the International Committee of the Red Cross provides some guidance in this regard. *See* ICRC, *Guide*, *supra* note 166, at 20–28 (2006).

169. *Cf.* Isabelle Daoust, Robin Coupland & Rikke Ishoey, *New Wars, New Weapons? The Obligation of States to Assess the Legality of Means and Methods of Warfare*, 84 INT'L REV. RED CROSS 345, 352–54 (2002) (asserting that states should take a more rigorous and multidisciplinary approach to the review process); Justin McClelland, *The Review of Weapons in Accordance with Article 36 of Additional Protocol I*, 85 INT'L REV. RED CROSS 397, 414 (2003) (criticizing the idea that a centralized review agency could adequately implement Article 36).

170. *Cf.* Marie Jacobsson, *Modern Weaponry and Warfare: The Application of Article 36 of Additional Protocol I by Governments*, *in* THE LAW OF WAR IN THE 21ST CENTURY: WEAPONRY AND THE USE OF FORCE, INTERNATIONAL LEGAL STUDIES 183, 184–185 (Anthony M. Helm ed., vol. 82, 2007).

171. BOOTHBY, *supra* note 100, at 343 (referring to the "strong military and security reasons" for keeping such review secret from potential enemies).

172. Rome Statute of the International Criminal Court, art. 28(2)(a), July 17, 1998, 2187 U.N.T.S. 3, 106 (entered into force July 1, 2002) [hereinafter Rome Statute] (establishing conditions for the criminal responsibility of military commanders for the actions of forces under their command). *See generally* Kai Ambos, *Joint Criminal Enterprise and Command Responsibility*, 5 J. INT'L CRIM. JUST. 159 (2007). For the different evidentiary requirements under the jurisprudence of the ad-hoc tribunals for the former Yugoslavia and Rwanda on the one hand and the International Criminal Court on the other, see Saxon, *supra* note 144, at 19–25 (noting that, generally speaking, the ICC superior responsibility standard is more difficult to meet because the prosecution must prove, in addition to elements similar to those under the ad hoc tribunals, "that the superior's omission increased the risk of the commission of the crimes charged").

173. Rome Statute, *supra* note 172.

174. Beard, *supra* note 144, at 659.

establishing a sufficient degree of knowledge regarding the "misuse of complex autonomous weapon systems" may make it difficult or impossible to "justify the imposition of criminal liability for [the commander's] failure to prevent or suppress violations of the IHL framework."[175] The DoD directive provides only scant guidance, as there is unclear meaning of the term *appropriate care* when authorizing, directing, or operating the deployment of AWS.[176] While attaching responsibility to the commanders may be possible, it may be elusive in reality and thus adds to the challenges in establishing individual responsibility. Finally, liability could attach to the individual that conducted the review pursuant to Article 36 AP I. Absent evidence of intentional or negligent approval of deficient AWS, no criminal liability would arise.[177]

Another way of attaching responsibility may be to make the decisions within AWS traceable, thereby creating a path of accountability for each individual action taken by an autonomous weapon system. Proponents of this approach contend that auditability can be programmed into AWS so that every distinct decision can be traced back to the responsible individual, who may then be held accountable.[178] At this time, the extent to which this is possible is an open question, as the requisite *mens rea* may be difficult to prove.[179] A UK report shows the existing ambiguity when the report first states that "situations can arise where it is unclear whether the legal liability for inappropriate weapon release lies with the pilot, the design authority or the regulatory authority" but bases this on the assumption that "the logic of the current manned process is maintained."[180] As discussed previously, AWS follow a different

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175. *Id.*

176. DoD Directive, *supra* note 33, at 3 (requiring those who operate AWS technology to exercise "appropriate care" and follow "the law of war, applicable treaties, weapon system safety rules, and applicable rules of engagement (ROE)").

177. *Id.*

178. Heyns, Special Rapporteur, *supra* note 30, ¶ 81 (recommending the installation of recording devices into AWS, as well as the mandatory review of footage in cases of "lethal use"); Saxon, *supra* note 144, at 26–27 (suggesting that "sub-system[s] of electronic recording" integrated into AWS technology "might focus the minds of field commanders so as to avoid criminal conduct"). One such example may be found in the so-called Keel-Technology. *See* FOR THOSE WHO WANT TO LEAD RATHER THAN FOLLOW: KEEL TECHNOLOGY FOR COMPLEX PROBLEMS, http://www.compsim.com (last visited Sept. 28, 2014) [http://perma.cc/D3QC-M5A9] (archived Sept. 28, 2014) (advertising software "for putting human-like reasoning into devices and/or software applications").

179. Saxon, *supra* note 144, at 3 (asserting that this difficulty becomes particularly acute "[o]nce the speed of autonomous technology reaches levels that preclude effective human supervision and control").

180. UK DOD JOINT DOCTRINE, *supra* note 55, ¶ 510.

process with a considerably lower degree of predictability as to the behavior of the system.[181]

Relatedly, how to differentiate and assign responsibility in the multilevel system that AWS represents is unclear. All of these questions await answers at this time. The biggest worry is not that AWS may malfunction at some point, as one inevitably will, but rather to what extent the development of AWS can avoid a system of organized irresponsibility that shuffles responsibility from one actor to another without holding anyone accountable in the end.

IV. ETHICAL CHALLENGES TO AUTONOMOUS WEAPON SYSTEMS

Apart from the legal questions addressed in Part III, a set of related issues arises from ethical concerns. From its inception, the purpose of IHL was to make armed conflict more humane. That chivalristic notion may never have been realized to a desirable extent. However, discussions about AWS raise ethical questions that attempt to resolve or at least thoroughly debate the implications of deploying this new technology.[182]

Two relatively recent events that spurred ethical questions were the bombing campaigns in the Balkans in the 1990s and in Iraq in the first decade of the twenty-first century.[183] While ground forces followed the bombing campaign in Iraq, both conflicts are characterized by a considerable reluctance to deploy soldiers in ground operations. This was especially true with respect to Kosovo. In that situation, a bombing campaign against Serbia and Serbian forces in Kosovo over a few months led to the end of the conflict. The option of conducting operations "surgically," purportedly with a high degree of precision, was much more attractive for decision makers than the messy and much more dangerous action of committing ground troops. As a consequence, the operation was entirely carried out by airplanes and cruise missiles, removing attacking soldiers from harm to a considerable extent. AWS will remove humans further from the battle

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181. The report recognizes this in the paragraph immediately preceding the quoted text, stating that "[i]n reality, predictability is likely to be inversely proportional to mission and environmental complexity." *Id.*

182. *See, e.g.*, Convention on Conventional Weapons, Draft Report of the 2014 Meeting of Experts on Lethal Autonomous Weapons Systems, May 13–16, 2014, ¶ 22, *available at* www.delegfrance-cd-geneve.org/IMG/doc/Report_Draft-format4.doc [http://perma.cc/L44W-C3C2] (archived Sept. 28, 2014) (stating that "[a] significant number of interventions stressed the fact that the possibility for a robotic system to acquire capacities of 'moral reasoning' and 'judgment' was highly questionable.").

183. A similar situation arose in the attacks on Libyan military forces loyal to the government of Col. Qaddafi, where allied forces inserted no ground troops of their own, but launched a heavy bombing campaign that greatly weakened the Libyan military. David D. Kirkpatrick, Steven Patrick and Elisabeth Bumiller, Allies Open Air Assault on Qaddafi's Forces in Libya, New York Times, Mar. 19, 2011, A.

space. The deployment of AWS will no longer necessitate sending pilots on bombing campaigns to the same extent as was the case e.g. in Kosovo and thus putting one's own troops at risk. It will also no longer be necessary to employ a "pilot" for a particular drone or set of drones. Rather, AWS will operate according to their foundational code. As outlined above, the responsibility therefore shifts: to the software engineer or those who advise software engineers; to the testing units; to those overseeing a particular tactical situation; to the military commanders; or to the political leadership.

Ronald Arkin, one of the most vocal proponents of this shift toward autonomy suggests that such a development is beneficial from an ethical perspective: "This effort has an overarching goal of producing an 'artificial conscience,' to yield a new class of robots termed *Humane-oids*—robots that can potentially perform more ethically in the battlefield than humans are capable of doing."[184]

A. *Dehumanization Through Removal of Individual from the Battlefield?*

Increasing distance and separation from actions contributes to the dehumanization of killing, a dehumanization that may already occur through the use of remotely operated drones.[185] One common example is the firebombing that took place during World War II. The physical distance, and technical aspect of their tasks, removed pilots to an extent that enabled them to carry out their missions—with closer proximity to the battlefield, they might not have carried them out.[186] As distance increases, it becomes psychologically easier for individuals to commit acts that they would often otherwise be more reluctant to carry out.[187] Humans, some have claimed, have an innate reluctance to kill one another.[188] While the extent to which that is true might be debated, that reluctance has been circumvented by the physical and psychological distance brought about by long-range weapon systems. Similarly, the direct impacts of an individual's actions are decreasingly visible due to the technological nature of today's combat operations.[189] Advantages associated with the use of

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184. ARKIN, *supra* note 35, at xvi.

185. SINGER, WIRED, *supra* note 3, at 395–96 (quoting, *inter alia*, an army chaplain's concerns that "'as war becomes safer and easier, as soldiers are removed from the horrors of war and see the enemy not as humans but as blips on a screen, there is a very real danger of losing the deterrent that such horrors provide'").

186. *Id.*

187. DAVE GROSSMAN, ON KILLING: THE PSYCHOLOGICAL COST OF LEARNING TO KILL IN WAR AND SOCIETY 97–137 (1st ed. 1995) (discussing numerous anecdotes of killing at various ranges).

188. *Id.*

189. *Id.* at 107–10 (noting the importance of factors such as group absolution, mechanical distance, and physical distance, in reducing the emotional impact of killing); Lokhorst & van den Hoven, *supra* note 152, at 147–48 (stating that when it

AWS include lowering the number of human casualties in war by placing robots in harm's way instead of human beings,[190] decreasing the destruction associated with armed conflict through potentially more precise machines, and reducing the accidental targeting of civilians or other non-combatants if the machine is powerful and sophisticated enough to make accurate determinations. Human error is often the cause of accidentally engaging friendly forces or civilians, so removing the human element from the equation could be potentially beneficial. However, problems have been reported in the use of the current generation of UAVs. Because individuals no longer fight on the battlefield and are stationed close to home, it is psychologically difficult to separate between these spaces.[191] One can no longer leave an experience behind through the distance covered by traveling home.

AWS push this paradigm change even further. While the physical distance may not be greater, the psychological distance no longer plays a significant role. Though human operators may oversee their actions, the very essence of AWS is the ability to make decisions without direct human input and act independently. However, not all human participation is eliminated. In a more removed manner, individuals remain a part of the decision-making loop. The decision makers controlling the parameters of the software essentially determine the operation of AWS—although in an ex ante fashion and not in real time, leaving it to the software to make determinations in real time. These individuals could be far removed from the battle space in which AWS are deployed, potentially broadening the scope of those typically considered to be eligible targets in an armed conflict.

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was discovered in the wake of World War II that less than 20% of soldiers actually fired at the enemy, Army doctrine began to place more emphasis on bombings and artillery); Noel Sharkey, Killing Made Easy: From Joysticks to Politics, in ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS, *supra* note 189, at 111, 111–12 (referring to Grossman's book, and recounting similarly low hit rates in World War I and conflicts in the nineteenth century); MARTIN & SASSER, supra note 42, at 43–44. Once the target was acquired, the author claims that the enemy "was so far away and only a high-tech image on a computer screen. The moral aspects of it—that I was about to assassinate a fellow human being from ambush—didn't factor in. Not at the moment. Not yet." *Id.* Furthermore, the authors contend that there is a gap between the reality of war and the war that the operator was participating in from across the world: "The ability to kill people from such great distances, playing God, widened the gap between the reality of war and our perception of it. It was almost like watching an NFL game on TV with its tiny figures on the screen compared to being down there on the field in the mud and the blood in the rain getting your socks knocked off." *Id.* at 46–47.

190. Billitteri, *supra* note 26, at 662 (referring to a statement by Edward Barrett, director of research at the U.S. Naval Academy's Stockdale Center for Ethical Leadership, claiming that the technology must be used as it is more humane).

191. *Cf.* Jean L. Otto & Bryant J. Webber, *Mental Health Diagnoses and Counseling Among Pilots of Remotely Piloted Aircraft in the United States Air Force*, 20 MED. SURVEILLANCE MONTHLY REP. 3, 5–7 (2013) (noting that the mental health of remote pilots is no worse than that of traditional pilots).

To what extent the desire to protect human life remains sufficiently robust to avoid reducing historic gains in international humanitarian law remains to be seen. It is possible that humanitarian concerns could become significantly less important, as the adoption of AWS—over time and in an incremental manner—may endanger fewer soldiers and prevent loss of life, especially in the developed states able to afford this technology.

Some AWS proponents also claim that, when working with humans, AWS may have the ability to reduce unethical behavior by humans through reporting mechanisms.[192] They could be programmed to "independently and objectively monitor ethical behavior in the battlefield by all parties and report" observed infractions.[193] Even their presence alone is expected by some to "lead to a reduction in human ethical infractions."[194]

B. *Ethical Robots?*

There are various arguments for increasing the use of AWS so as to increase ethical behavior on the battlefield.[195] Unlike humans, AWS do not have a need to protect themselves. Because AWS are emotionless, cannot hate, cannot fear, cannot be hungry or tired, and have no survival instinct, nothing can "cloud their judgment."[196] Walzer made a related observation, namely that "[f]ear and hysteria are always latent in combat, often real, and they press us toward fearful measures[.]"[197]

Proponents argue that the use of AWS would remove the human psychological element of "scenario fulfillment." This element is believed to have contributed to the downing of Flight 655 by the USS

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192. ARKIN, *supra* note 35, at 29–30.

193. *Id.* at 32.

194. *Id.*

195. *See, e.g.*, *id.* at 29–30 (suggesting automous robots, more so than humans, are able to react quickly and more conservatively to a threat, can be better equipped, can avoid emotional judgments and cognitive biases, and can monitor human soldiers objectively); Quintana, *supra* note 44, at 13 (agreeing with Arkin, but suggesting a more comprehensive consequentialist "morality test"); Lokhorst & van den Hoven, *supra* note 152, at 148 (arguing that robots are capable of more ethical behavior because they can act to incapacitate the enemy in situations where human soldiers would have no choice but to kill); Beard, *supra* note 35, at 428–42 (arguing that the "virtual distance" created by AWS technology encourages proportional responses by "eliminating some of the key excuses that states have long used to escape responsibility for attacks that appear to cause excessive civilian casualties," such as the risks to human soldiers and uncertainties inherent in combat situations, or the limits of human senses or information-gathering abilities). For similar arguments, see Marchant, *supra* note 10, at 281–89 (discussing some of the advantages of lethal autonomous robots, but acknowledging that the the ethical issues surrounding warfare are such that "a full awareness of the risks from autonomous robots may be impossible").

196. ARKIN, *supra* note 35, at 29.

197. MICHAEL WALZER, JUST AND UNJUST WARS: A MORAL ARGUMENT WITH HISTORICAL ILLUSTRATIONS 251 (1977).

Vincennes in 1988.[198] Scenario fulfillment is a form of premature cognitive closure that leads to distortion or neglect of incoming information that contradicts preexisting belief patterns in stressful situations.[199] The official DoD report on the incident finds that "[s]tress, task fixation, and unconscious distortion of data may have played a major role in this incident" and that the personnel "became convinced [that] track 4131 was an Iranian F-14" rather than a civilian aircraft.[200] Based on this information, the operator "appears to have distorted data flow in an unconscious attempt to make available evidence fit a preconceived scenario."[201] On the basis of the AWS design, proponents argue that the system would not be vulnerable to such patterns of behavior; without the distortions stemming from scenario fulfillment, they are better capable of handling situations in which new information may be contradictory to previous information.[202] After all, in the Flight 655 case, one could imagine an autonomous ship-to-air missile with the capacity to differentiate fighter aircraft from a large commercial airplane, given the differences in physical characteristics, particularly size, so that it could abort the attack, even at the last moment.

Another argument in favor of AWS is that they will have the ability to observe a large number of relevant aspects due to their superior sensor abilities. For example, today's UAVs have a much longer "loitering time" of up to forty hours over a particular area. Even if they cannot observe everything, their abilities are certainly greater than those of their human counterparts with respect to data absorption and data analysis.[203] Data arise from multiple remote

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198. Scott Sagan, *Rules of Engagement*, *in* AVOIDING WAR: PROBLEMS OF CRISIS MANAGEMENT 443, 460 (Alexander L. George ed. 1991) (describing how personnel aboard the Vincennes incorrectly interpreted Flight 655 as descending to attack after instruments briefly identified the plane as a military aircraft); *see also* Quintana, *supra* note 44, at 13 (agreeing with Arkin that autonomous robots can avoid "scenario fulfullment" reasoning).

199. The action that led to the attack on the aircraft was furthermore attributed to (a) confusion because of the proximity of military aircraft despite the civilian aircraft having engaged its civilian transponders, and (b) a permissive interpretation of the rules of engagement, possibly influenced by an attack on a U.S. ship one year earlier, also in the Persian Gulf. Sagan, *supra* note 198, at 460–61 (noting that other commanders in the vicinity did not identify the aircraft as hostile, despite operating under the same rules of engagement, because they had correct transponder and altitude information).

200. DEP'T OF DEF., FORMAL INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE DOWNING OF IRAN AIR FLIGHT 655 ON JULY 3, 1988, at 63 (1988).

201. *Id.*

202. RONALD C. ARKIN, GOVERNING LETHAL BEHAVIOR: EMBEDDING ETHICS IN A HYBRID DELIBERATIVE/REACTIVE ROBOT ARCHITECTURE 6–7 (2011), *available at* http://www.cc.gatech.edu/ai/robot-lab/online-publications/formalizationv35.pdf [http://perma.cc/937B-YYY3] (archived Sept. 22, 2014) ("Robots need not be vulnerable to such patterns of [scenario fulfillment] behavior.").

203. *Cf.* Thom Shanker & Matt Richtel, *In New Military, Data Overload Can Be Deadly*, N.Y. TIMES, Jan. 16, 2011, at A1 (recounting serious oversights resulting from

sensors and intelligence—including humans—as part of modern network-centric warfare concepts, as well as the concurrent development of far-reaching information grids.[204] This development can be expected to continue, summed up by one commentator: "military systems (including weapons) now on the horizon will be too fast, too small, too numerous, and will create environments too complex for humans to direct."[205]

There remains a crucial question in the debate over the development and future deployment of AWS. Is it possible to devise AWS that would be responsive to the requirements of IHL, underlying ethical considerations, and the highly complex battle spaces of today? The answer is vigorously debated. Arkin suggests the creation of an "ethical governor."[206] This piece of software would determine whether a particular action by an autonomous weapon system would be unethical, and if so, alert a human operator or constrain the action that would otherwise have been carried out.[207] The ethical governor would "not involve emotion directly . . . as that has been shown to impede the ethical judgment of humans in wartime."[208] Rather, it would introduce an element, akin to guilt, which can be re-programmed—over time and not in specific situations—after a proper assessment of the system's behavior has been carried out.[209] At the initial stage, however, the role of emotions (and with it, the attribution of intentions to an action—i.e., are the children running toward a group of soldiers with what looks like a weapon truly a threat or are they chasing a soccer ball?) is diminished. The ethical governor evaluates the available options, with the guilt censor rejecting certain action as it sees fit.[210]

There are a number of principled objections against this view, one of which is recognized by Arkin himself. Arkin realizes that IHL requires a certain level of compassion, which is difficult to build into AWS.[211] To address this deficiency, he believes that abiding by the other rules of IHL creates a thick enough web of rules to establish the requisite level of compassion. However, as was shown above, the

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soldiers being unable to adequately monitor all of the information sources available to them).

204. *See generally* DEF. ADVANCED RESEARCH PROJECTS AGENCY, STO BAA 07-52, SCALABLE NETWORK MONITORING (2007), *available at* https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=b524ff8d8f7390061d4c5d5444c9e620&tab=documents&tabmode=list (soliciting proposals for, *inter alia*, novel network traffic monitoring approaches to protect Defense Department computers).

205. Thomas K. Adams, *Future Warfare and the Decline of Human Decisionmaking*, 31 PARAMETERS 57, 58 (2001).

206. ARKIN, *supra* note 35, at 127–33.

207. *Id.* at 122–23 (providing sample decision-making "architecture" for this purpose).

208. *Id.* at 118.

209. *Id.* at 125, 138–43.

210. *Id.* at 140.

211. *Id.* at 143.

widespread use of proportionality throughout IHL begs the question why these other rules exist at all if they are indeed capable of creating the web that Arkin presumes to exist.

Furthermore, while one can argue whether human problem solving in a socially complex situation should serve as a model for AWS design, experiments involving certain brain functions show human emotion to be an important element in the process of human decision making.[212] There is little doubt that human emotions have led to some horrific results in armed conflict.[213] But at the same time, emotions can play a positive role, namely through the ability to empathize.[214] In that sense, emotions play a constructive and decisive role in determining which option an individual will actually take at a given moment. For example, consider experiments with individuals that lack certain brain functions associated with emotions. The absence of these functions, associated with damage in the prefrontal cortex, would in those situations most likely lead to disastrous results. In the situation described above, a non-empathizing soldier may open fire, while a fully functional individual may have the cognitive ability and empathetic reaction to hold fire. Under Arkin's model, the AWS decision-making process would lead it to a particular course of action that may involve the use of force. But the model underlying the ethical governor is designed to block and prevent damaging behavior from occurring in this situation. The problem then becomes much clearer: the underlying assumption is that emotions do not play a role in the initial filtering process of what options are being considered.[215] Arguments that "[e]motionless robots could . . . serve as tools of repressive dictators seeking to crack down

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212. Marcello Guarini & Paul Bello, Robotic Warfare: Some Challenges in Moving from Noncivilian to Civilian Theaters, in ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS, *supra* note 151, at 129, 135–39 (citing studies from "a growing body of literature in cognitive science regarding the importance of emotions to decision making"); Susan A. Bandes, Is it Immoral to Punish the Heedless and Clueless? A Comment on Alexander, Ferzan, and Morse: Crime and Culpability, 29 LAW & PHIL. 433, 439–46 (2010). Bandes generally discusses the role of the subconscious and unconscious in human beings. Bandes argues that there is no sharp divide between the two and that our ability to exercise control over conscious decisions is largely a myth and most decision making comes from the subconscious. *See id.* at 440 ("There is increasing evidence, in fact, that very little of our information-processing and decision-making takes place on what is commonly called a 'conscious' level."). "Our conscious reasons are often post-hoc explanations rather than reflections of an actual process." *Id.* at 445.

213. *See, e.g.*, Sassòli, *supra* note 67, at 310; Schmitt, *supra* note 127, at 13.

214. It is also worth pointing out that military training has over time been conducted to reduce the amount of time that compassion can even play a role. *See* Lokhorst & van den Hoven, *supra* note 152, at 147 (referring to changes the U.S. Army made to its training regimen after World War II in order to make firing at human targets a reflexive action).

215. Guarini & Bello, *supra* note 212, at 136 (suggesting that this assumption is incorrect and that "a robot without representation of or the ability to recognize these emotional states would be at a crippling disadvantage in the battlefield").

on their own people without fear their troops would turn on them"[216] lend themselves to criticism.[217] Whether dictators will find a pliable force to quash dissent is less important than AWS being programmed to replicate emotions that are desirable within the IHL framework—such as compassion when the situation warrants it—while leaving out those emotions that lead to disastrous consequences.[218]

What should the benchmark for ethical behavior be in the first place? Arkin and others argue that AWS would be able to do the same tasks as humans in a more ethical manner. This argument relies partially on a recent (and somewhat disturbing) report published by the Surgeon General's Office in 2006 that supports the idea that unmanned combat systems may undoubtedly play a vital role in enforcing many of the ethical challenges that occur during combat.[219] According to the report, appropriate ethical behavior among soldiers and marines deployed in Operation Iraqi Freedom and Operation Enduring Freedom was questionable, despite a large number of soldiers and marines reporting that they received adequate training.[220] Some of the findings include:[221]

1. Approximately 10 percent of Soldiers and Marines report mistreating noncombatants such as, purposely damaging or destroying civilian property when not necessary or hit/kicked a noncombatant when not necessary.

2. Only 47 percent of Soldiers and 38 percent of Marines agreed that noncombatants should be treated with dignity and respect.

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216. HUMAN RIGHTS WATCH, *supra* note 33, at 4.

217. Schmitt, *Autonomous*, *supra* note 127, at 13.

218. For a situation in which a similar visceral reaction is used during combat, see U.S. DEP'T OF ARMY, FIELD MANUAL 7-21.13, THE SOLDIER'S GUIDE 1-29 to 1-31 (2004), *available at* http://armypubs.army.mil/doctrine/DR_pubs/DR_a/pdf/fm7_21x13.pdf [http://perma.cc/D5ZH-FDMU] (archived Sept. 28, 2014) (describing the ethical reasoning process the Army expects unit leaders to follow, and providing an example ethical dilemma involving a possible checkpoint bombing).

219. ARKIN, *supra* note 35, at 31–32; SINGER, WIRED, *supra* note 3, at 401 (citing a 2007 report by the U.S. Army which concluded that lethal robots could potentially be more ethical and consistent on the battlefield than human soldiers). On the question to what extent it is possible to reduce ethics to logically consistent principles, see generally WENDELL WALLACH & COLIN ALLEN, MORAL MACHINES: TEACHING ROBOTS RIGHT FROM WRONG 2–4 (2009), *available at* http://dx.doi.org/10.1093/acprof:oso/9780195374049.001.0001 [http://perma.cc/Q6NC-EBJ3] (archived Sept. 22, 2014) (discussing the possibility of "machine ethics" and seeking to place recent developments in that area in a broader philosophical context).

220. OFFICE OF THE SURGEON GEN., MENTAL HEALTH ADVISORY TEAM (MHAT) IV: OPERATION IRAQI FREEDOM 05-07, FINAL REPORT 37 (2006) (providing statistical evidence of soldiers' and marines' perceptions of battlefield ethical violations). Disturbingly, a large percentage of soldiers and marines reported that their non-commissioned officers and officers in their own unit did not make it clear that mistreatment was impermissible, with 33 percent of marines and 29 percent of soldiers responding in such a manner, respectively.

221. *Id.* at 34–41.

3. Over one-third of Soldiers and Marines reported torture should be allowed in order to save the life of a fellow Soldier or Marine or to obtain important information pertaining to the enemy.

4. 45 percent of Soldiers and 60 percent of Marines did not agree that they would report a fellow Soldier or Marine if he had injured or killed an innocent noncombatant.

5. Only 43 percent of Soldiers and 30 percent of Marines agreed that they would report a unit member for unnecessarily damaging or destroying private property.

6. Less than one-half of Soldiers and Marines would report a team member for several forms of unethical behavior.

7. 28 percent of Soldiers and 31 percent of Marines reported ethical dilemmas in which they did not know how to respond.

8. Immediate loss of a fellow Soldier or Marine during extreme violence was associated with an increase in ethical violations.

Assuming it is possible to design AWS that exceed the statistics in these findings, some argue that it would be unethical not to employ AWS that behave better than the soldiers that display such behavior.[222] One need not be a philosopher to understand the consequentialist or utilitarian argument implicit here. One need not be a deontologist in order to at least raise some issues with this approach. There is a difference between ex post facto admissions by individuals to having committed what could amount to war crimes, and a built-in *a priori* failure rate that may lead to the commission of war crimes. The former could potentially be remedied through better education prior to sending individuals into combat. Furthermore, states are under an obligation to prevent or—in the alternative—prosecute war crimes, making it possible to retroactively punish

222. ARKIN, *supra* note 35, at 33–36; George R. Lucas, *Legal and Ethical Precepts Governing Emerging Military Technologies: Research and Use*, 2013 UTAH L. REV. 1271, 1279 (2013) (arguing that the use of autonomous unmanned systems is morally obligatory if they can (1) minimize risks to human soldiers; (2) distinguish between combatants and noncombatants, and respond to threat proportionally; and (3) respect the laws of war and rules of engagement equally as well as humans do). In a similar vein, see Lokhorst & van den Hoven, *supra* note 152, at 154–55 ("From a moral point of view, the design of military robots is eminently desirable, provided that such robots are designed as transparent robots that avoid killing to the maximum extent possible, and not as inscrutable killer robots, over which we have no control."); Hauptman, *supra* note 33, at 192–95 (preferring regulation of AWS technology, because "a prohibition on autonomous weapons systems is unrealistic, and this unrealistic ban would disillusion many actors from compliance with international weapons laws completely"); Sassòli, *supra* note 67, at 310, 320; Schmitt, *Autonomous*, *supra* note 127, at 25.

offenders. Such criminal sanctions may serve as a deterrent for at least some.

In addition, this approach moves the question to an earlier moment in the design process without actually solving it. In order to determine whether an ethically problematic situation even takes place, an AWS would have to be cognizant of the ethical implications of its actions. It would have to be able to compare the ethical implications of various courses of actions and decide which is more appropriate. The dilemma thus consists of the ethical governor not being able to recognize ethically problematic situations in the first place.[223] Such a calculation may be impossible in the time period available for AWS. Or, because of the short time frame, AWS may use only insufficient information to take action.[224]

The discussion then returns to whether it is possible to punish AWS, as punishment requires moral agency.[225] Some researchers claim that the deliberative system—oftentimes overlaid by an instinctual decision-making system—is what makes humans moral agents. The ability to cognitively assess a situation allows for "structur[ing] alternative possible futures as mental representations, and then to choose our actions based on which of the representations that we wish to become our experienced reality."[226] Furthermore, some argue that the development of such a deliberative system is a requirement for moral personhood, and that the "key to moral responsibility and personhood is the possession of moral agency."[227]

V. POLITICAL CHALLENGES TO AUTONOMOUS WEAPON SYSTEMS

There are also political challenges to the development and use of AWS. The core political argument is that AWS could make it less politically costly for the leadership of a country to engage in, or prolong, armed conflict, due to decreased human sacrifice.

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223. Rob Sparrow, Machines, *supra* note 151, at 301, 304–05.

224. *Cf.* Keith Abney, *Robotics, Ethical Theory, and Metaethics: A Guide for the Perplexed*, *in* ROBOT ETHICS: THE ETHICAL AND SOCIAL IMPLICATIONS OF ROBOTICS, *supra* note 151, at 35, 43 (alluding to the works of Isaac Asimov in describing how robots' rule-based decisionmaking can lead to unintended results).

225. *Cf.* Allen & Wallach, *supra* note 152, at 62 (referring to the Kantian view that morality only has meaning to the extent one could have chosen to act immorally, but did not).

226. Abney, *supra* note 224, at 47.

227. *Id.* See also the contribution of Allen and Wallach in the same volume, for example, Allen & Wallach, *supra* note 152, at 43 (referring to same point of view described in footnote 212).

Though it is counterintuitive, one could also argue that the decision to employ more sophisticated technology carries with it a higher burden for political decision makers.[228] As Stewart puts it:

> the perverse effect for States and the senior civilian and military command echelon who promote the development and implementation of new technology as a means of 'casualty free' warfare is that they may well find themselves with nobody to stand between the actions of such autonomous systems and themselves when things go wrong."[229]

Even with incremental steps toward autonomy, the intriguing notion of casualty free warfare does not appear realistic in the near future. Human soldiers may fight alongside AWS, and their numbers may decrease relatively speaking, but an army of "robots" conducting all or even a large majority of fighting in an armed conflict is—at least at this point—not likely.

One of the dangers in relying on autonomous systems is the perception that may be created for those who would otherwise have to fight in conflicts of low or no risk. AWS therefore have the potential to lower the costs for political decision makers to engage in armed conflict.[230] This is not a matter for IHL, but it potentially reduces compliance with the *jus ad bello* requirements.[231] The political calculus would not have to take into account the number of fallen soldiers. Historically, IHL has been an anthropocentric endeavor to provide a legal framework for the inevitable human suffering during armed conflict, attempting to make it at least somewhat more humane. Taking individuals out of the equation by relying on computer software—no longer retaining individuals "in the loop" or "on the loop"—increases the potential for states to resort to force, to continue, or even to escalate a conflict, as their citizens or at least a smaller proportion thereof are no longer directly placed at risk.

This development has been going on in connection with armed conflicts through different strategies that have been employed, or

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228. Stewart, *supra* note 33, at 291 (arguing that the use of AWS will take some attention off the warzone itself and "focus greater attention on civilian leadership and military commanders at the operational or strategic level for the actions of autonomous systems").

229. *Id.* at 293.

230. *Cf.* Sarah Kreps & John Kaag, *The Use of Unmanned Aerial Vehicles in Contemporary Conflict: A Legal and Ethical Analysis*, 44 POLITY 260, 281–82 (2012) (citing the possibility that military commanders may come to see war as essentially a business, and that reduced troop losses due to the use of AWS may lead to greater acceptance of longer wars); Frank Sauer & Niklas Schörnig, *Killer Drones: The 'Silver Bullet' of Democratic Warfare?*, 43 SECURITY DIALOGUE 363, 370 (2012) (arguing that democracies are eager to use drones because they allow the transfer of many of the risks of war to the enemy but are only one step in "'the quest for bloodless war'"); Singer, *Drones*, *supra* note 17, at SR5.

231. This is even conceded by some who are otherwise generally favorably inclined towards AWS. *See, e.g.*, Sassòli, *supra* note 67, at 315 (acknowledging the problem, but also asserting that the risk of such technology encouraging "easier" wars is mitigated somewhat because they cannot yet be fought entirely by robots).

reemployed, in the last quarter century. An example is the increased reliance of developed states on bombing campaigns in the late twentieth century (e.g., the prolonged NATO bombing campaigns in the Balkans in the 1990s, the U.S./UK bombing campaigns against Iraq in 1990-91, or the bombing campaign against Libya in 2011). The relatively lower risk to armed forces made the decision to engage in conflict politically more palatable to the wider public and less risky for the politicians involved.[232]

The reduced political price if casualties to one's military personnel can be avoided is likely to become an even larger consideration subsequent to the deployment of AWS in armed conflict. At least in democracies, the loss of human life—especially the lives of fellow citizens—is a fundamental impediment to either engaging in or maintaining armed conflict. Casualties are a significant reason why armed conflicts are not more common. Sending an army of machines to war—rather than friends and relatives—does not exact the same physical and emotional toll on a population. This lowered cost may reduce the rigor with which states pursue nonviolent alternatives, thus encouraging armed conflict that may not have arisen without the option of deploying AWS and therefore avoiding the political costs that come with wartime casualties.

Some authors object to this line of argument by raising a "moral counter-objection," claiming that not operating AWS would deny protections to civilians and soldiers that would otherwise be available due to their more precise nature.[234] Whether this amounts to so-called "moral hostage-taking"[235] is uncertain. It is also not clear that the moral counter-objection addresses the argument to the extent its proponents claim. The starting point for the counterargument is the

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232. A second development was the use of private military contractors and/or mercenaries in lieu of a state's own armed forces. The full or partial replacement of a country's own soldiers with contractors from the same or different nationalities was due, in some instances, to economic considerations. The replacement was also due to the decrease in political costs that results when a state no longer needs to consider if a sufficient number of its military personnel did not return. *See generally* LAURA A. DICKINSON, OUTSOURCING WAR & PEACE: PRESERVING PUBLIC VALUES IN A WORLD OF PRIVATIZED FOREIGN AFFAIRS (2011) (examining the use of military contractors by the United States); PETER W. SINGER, CORPORATE WARRIORS: THE RISE OF THE PRIVATIZED MILITARY INDUSTRY (2003) (describing the rise of privatized warfare and accompanying practical, ethical, management, and national security implications); Markus Wagner, *The Second Largest Force: Private Military Contractors & State Responsibility* (Miami Law Research Paper Series, Paper No. 2010-10, 2010), *available at* http://papers.ssrn.com/abstract_id=1588240 [http://perma.cc/3SCC-2CJL] (archived Sept. 22, 2014) (discussing the history and definition of non-state military forces, state responsibility for their actions, and costs and benefits of their use).

234. Anderson & Waxman, *supra* note 9, at 13; *cf.* Lin, Bekey & Abney, *supra* note 38, at 57 (pointing out that the argument that autonomous robots should be banned because they make wars easier to wage implies that "we should raise barriers to war, to make fighting as brutal as possible").

235. Anderson & Waxman, *supra* note 9, at 13 n.41.

supposed precision inherent in AWS. But at this point in the development, no one knows whether AWS will be as precise as is being claimed. While AWS may achieve a high level of precision, it will take time. Others embracing the moral counter-objection have made the embellished counterargument that "we should not attempt to reduce friendly casualties, or improve battlefield medicine, or conduct any more research that would make victory more likely and quicker."[236] Rather, this Article argues as one of its central premises, and indeed its normative basis, that entering or extending armed conflict should be more costly based on the political incentives of decision makers. The counter-objection's premises are different: namely, trust in the feasibility of AWS technology,[237] belief in the desirability of the development of AWS technology, and permission for an accommodating discourse.[238] The debate therefore happens at two distinct points: the first is concerned with not allowing armed conflict to be made less costly, and the second is concerned with the desirability of using technology to the fullest extent possible in order to gain a military advantage—albeit within the limits of IHL.

VI. CONCLUSION

There is an urgent need to set standards for the deployment of AWS. In the author's view, they should not be deployed at all until the deploying country, and by extension the international community, has satisfied itself that doing so can be done consistent with the requirements of international humanitarian law. Additionally, the deploying state needs to confront the ethical and political concerns and decide whether the potential military gains and some possible humanitarian benefits of such weapons are worth the adverse consequences. Autonomous weapon systems are receiving a lot of

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236. Lin, Bekey & Abney, *supra* note 38, at 57.

237. On the vulnerability of autonomous systems, see Steve Omohundro, *Autonomous Technology and the Greater Human Good*, 26 J. EXPERIMENTAL & THEORETICAL ARTIFICIAL INTELLIGENCE 303, 308–09 (2014) (discussing problems with software bugs in general, as well as security holes, which other autonomous systems could exploit).

238. Anderson & Waxman, *supra* note 9, at 7–8 (declaring it a mistake to take a "wait-and-see" attitude toward the ethical and legal significance of autonomous robotic weapons). According to the authors, "[t]his is also the time – before ethical and legal understandings of autonomous weapon systems become hardened in the eyes of key constituents of the international system – to propose and defend a framework for evaluating them that advances simultaneously strategic and moral interests." *Id.* This idea is commensurate with the authors' approach for addressing AWS that consists of the "gradual development of internal state norms and best practices that, worked out, debated, and applied to the United States' own weapons development process, can be carried outwards to discussions with others around the world." *Id.* at 16.

attention lately.[239] The discussion follows a similar (and unfortunate) division that characterized the debate about the use of drones in targeted killings. Both opponents and proponents of drone strikes made resolute claims about their respective positions, sometimes on the basis of insufficient legal reasoning. They reached conclusions less on the basis of legal rationales, and more on policy grounds. The initial salvos in the debate about AWS show a similar tendency. Claims about "killer robots" clash with similarly absolute claims about systems that are supposedly the same as existing weapons and opinions that diminish the challenges posed by AWS. These challenges include the legal, ethical, and political issues analyzed in Parts III–V of this Article.[240]

While this debate is ultimately crucial to the legal assessments, there can be little doubt that the trend is toward increasing autonomy. With incremental steps toward autonomy, advanced militaries will very likely have the capability to employ AWS in the future. Under one narrative, AWS are nothing but a continuation of existing technology and pose few challenges.[242] Under another more plausible narrative, AWS could undermine decades of IHL and human rights development unless care is taken to ensure compliance with international legal principles through the software on which these AWS will be based. This will be difficult and potentially impossible to achieve. What makes such an endeavor especially problematic is that the applicable law is less determinate than some would like it to be. Trying to translate highly indeterminate rules into software has so far proven to be illusory; there has been no realistic plan to replicate the fundamentally qualitative assessments in a proportionality analysis of military action.

Similar challenges exist with respect to ethical questions and policy concerns. Ethical debates are vigorous, and pit those who adhere to a utilitarian vision against those who emphasize the need

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239. The continued interest is exemplified by the fact that the discussion surrounding autonomous weapons in the context of conventional weapons convention will continue in 2015. See CCW/MSP/2014/CRP.1, Meeting of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Nov. 14, 2014, para. 36.

240. One major point of division is that technological advances are capable to allow AWS to conform to the existing rules of IHL. It bears mentioning that calls for new rules appear futile and attempts to create more flexibility concerning the applicability of the existing IHL rules to AWS may be politically opportune for some, but undermine the universality of legal rules. *See supra* Part III.A–C.

242. *Cf.* Beard, *supra* note 144, at 620 (arguing that "[m]any of the risks, dangers, and challenges of future autonomous weapon systems are already present in existing, widely-deployed systems."); Anderson & Waxman, *supra* note 9, at 2 (advising the United States to recognize the "inevitable but incremental evolution of these technologies," and act to set norms for their use).

to learn lessons from important historical experiences. There is also debate about the political challenges; though some AWS proponents seem to dismiss opposing viewpoints, there are important insights that can be gleaned from AWS skeptics.

A ban on the further development and future use of AWS, demanded by a number of groups and individuals[245] but opposed by others,[246] seems unlikely in light of the dual-use nature of the technology. Above all, the debate over AWS deserves and requires a high degree of intellectual honesty and rigor. It is neither helpful to claim that AWS are unlawful per se when there are at least cogent arguments that in some circumstances they may withstand legal scrutiny, nor is it helpful to claim that humans will retain full decision-making authority at all times.[247]

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245. A coalition of groups and individuals has formed to work towards a ban on what it calls "killer robots." CAMPAIGN TO STOP KILLER ROBOTS, http://www.stopkillerrobots.org/ (last visited Sept. 14, 2014) [http://perma.cc/ZGW5-EAX9] (archived Sept. 22, 2014). Human Rights Watch's report is instructive for the views held by this coalition. *See* HUMAN RIGHTS WATCH, *supra* note 33, at 4–5 (requesting that states ban the use of autonomous weapons, and that roboticists develop a code of ethical conduct governing the weaponization of their research, on the premise that such weapons should never be allowed to be outside of human control); *see also* Peter Asaro, *On Banning Autonomous Weapon Systems: Human Rights, Automation, and the Dehumanization of Lethal Decision-Making*, 94 INT'L REV. RED CROSS 687, 708–09 (2012) ("As a matter of the preservation of human morality, dignity, justice, and law, we cannot accept an automated system making the decision to take a human life."); Sharkey, *Evitability*, *supra* note 9, at 798–99 (calling for a ban out of skepticism toward the efficacy of ethical governor software and a belief that the use of deadly force should never be totally out of human hands).

246. *See, e.g.*, Hauptman, *supra* note 33, at 194 (countering concerns that the use of AWS will diffuse responsibility for military actions and encourage states to toe the bounds of international law by arguing that this problem merely requires the enforcement of existing law, not the banning of this technology); Lucas, *supra* note 22, at 1274 (arguing that the criteria by which we should judge autonomous systems are not ethical ones, but rather safety, reliability, and conformity with international law); Marchant et al., *supra* note 10, at 314–15 (recommending the development of new "governance mechanisms" for the use of lethal autonomous robots, ranging from ethical programming to changing national policies or even the laws of war); Shane R. Reeves & William J. Johnson, *Autonomous Weapons: Are You Sure These are Killer Robots? Can We Talk About It?*, ARMY LAW 25, 29–30 (2014) (arguing that the current push to ban AWS is just as misguided as earlier attempts to ban aerial bombardment, and may have similar disasterous consequences); Schmitt, *supra* note 127, at 25 (stating that because they are capable of causing less collateral damage, "the prohibition of autonomous weapon systems would actually place civilians and civilian property at greater risk of incidental harm than if the autonomous weapon system had been available to the attacker"); Anderson & Waxman, *supra* note 9, at 7–8 (recommending continued debate over potential legal and ethical constraints on AWS, rather than an outright ban).

247. Until a few years ago, it was commonplace for defense officials to consider retaining humans in the loop as an essential component of warfare even in the future. DEP'T OF DEF., UNMANNED SYSTEMS SAFETY GUIDE FOR DOD ACQUISITION 7 (1st ed. 2007) ("In the past, mishaps would ultimately be mitigated by a human operator. Because [unmanned systems] may not have a human-in-the-loop, they possess unique safety concerns and issues."). However, a U.S. Department of Defense (DoD) report in

Given the rather large amount of uncertainty surrounding the ability to create AWS that adhere to IHL rules, all sides would do well to provide measured analyses. AWS raise questions that lend themselves to interdisciplinary inquiries—inquiries in which it is important that the participants engage across ideological lines with the underlying premises and self-understandings of each other's disciplines.

2009 predicted that the technological challenges regarding fully autonomous systems will be overcome by the middle of the century. U.S. AIR FORCE, AIR FORCE UNMANNED AERIAL SYSTEM (UAS) FLIGHT PLAN 2009–2047 7 (2009) (predicting that the Air Force will have "[u]nmanned aircraft that are fully integrated with manned aircraft across the full range of military operations" by 2047).