

# Chapter Four

## Autonomy in the Battlespace:

### Independently Operating Weapon Systems and the Law of Armed Conflict

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#### I. Introduction

Over the last years, the military landscape has undergone considerable changes. Not only are we witnessing changes with regard to the adversaries that fight one another – consider the rise of what has been labeled ‘asymmetric warfare’.<sup>1</sup> Moreover, the methods and means of armed conflict have undergone significant modifications with more, and potentially more transformative, changes yet to come.

The most obvious of these modifications already is well underway – and has come under some scrutiny. So-called Unmanned Aerial Vehicles (UAVs) have taken on a vast and increasing number of reconnaissance missions. A smaller number of missions perform armed attacks, with the operators of either type of mission connecting to their aircraft via satellite link from thousands of miles away.<sup>2</sup> Similar changes have been made by militaries around the world not only with respect to UAVs, but also regarding sea and land warfare. All of these examples – whether they operate in the air, on sea or on the ground – share one characteristic. These Unmanned Systems (UMS) are the visible piece of a network that – at least until this point – still operates with direct human input.

Building on these first steps towards greater autonomy for weapons systems, the next generations of UMS are designed to operate wholly independently from human input. A 2009 report about the use of UMS in future combat

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1 Steven Metz, ‘Strategic Asymmetry’ (July-August 2001) 1 *Military Rev* 23-24. See also Kenneth F. McKenzie, ‘The Revenge of the Melians: Asymmetric Threats and the Next QDR’ (McNair Paper 62, Institute for National Strategic Studies, National Defense University 2000); William S. Cohen, *Report of the Quadrennial Defense Review* (1997) 4.

2 See Part II.2 below for a more detailed description of the current use of UAVs.

*Dan Saxon (ed.), International Humanitarian Law and the Changing Technology of War.*

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published by the United States Department of Defense 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’.<sup>3</sup> From target selection to acquisition and the decision whether to employ a particular weapons system at a particular moment in time, Autonomous Weapons Systems (AWS) are designed to be in a position to carry out their missions in an autonomous fashion.

This changes the assumptions on which international humanitarian law (IHL) is based and has the potential to alter fundamentally the perceptions of the law of armed conflict. The paper addresses this development in the context of the dehumanization of IHL. In a first step, it retraces the history of autonomous weapons and differentiates future generations of Autonomous Weapon Systems (AWS) from the current generation of weapons (II). It subsequently addresses the potential effect of AWS with respect to two cornerstones of IHL: the principle of distinction and the principle of proportionality. It argues that from a legal perspective, AWS can be employed only in the rarest of circumstances in light of the legal constraints inherent in these two principles. Thus, their potential deployment is limited to such an extent as to render them useless (III). Part IV contains concluding observations.

## II. The Road to and Degrees of Autonomy

### *1. Historical Development*

Serious attempts at creating unmanned weapon systems have been made since the end of the 19<sup>th</sup> century. Nikola Tesla constructed and patented the first remotely operated boat capable of carrying an ordinance, though the device was never put into service.<sup>4</sup> The so-called Kettering Bug, a pilotless bi-plane car-

3 United States of America, Department of Defense, ‘FY 2009-2034 Unmanned Systems Integrated Roadmap’ (2009) 27 <<http://www.acq.osd.mil/psa/docs/UMSIntegratedRoadmap2009.pdf>> accessed 3 February 2011. For a report envisioning a more independent role for UMS, 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’ (2009) 41 <<http://www.govexec.com/pdfs/072309kpr.pdf>> accessed 12 March 2012.

4 Nikola Tesla, ‘Method and Apparatus for Controlling Mechanism of Moving Vessels or Vehicles’, US Patent No 613,809 (United States Patent Office, filed July 1, 1898) <<http://patimg1.uspto.gov/piw?Docid=00613809&homeurl=http%3A%2F%2Fpatft.uspto.gov%2Fnetacgi%2Fnph-Parser%3Fsect2%3DPTO1%2526sect2%3DHI%2526p%3D1%2526u%3D%2Fnethtml%2FPTO%2Fsearch-bool.html%2526r%3D1%2526f%3DG%2526l%3D50%2526d%3DPALL%2526S1%3D0613809.PN.%2526OS%3DPN%2F613809%2526RS%3DPN%2F613809&PageNum=&Rtype=&SectionNum=&idkey=NONE&Input=View+first+page>> accessed 16 March 2012.

rying explosives and developed after WW I, also was never deployed because of reliability issues.<sup>5</sup> The German army deployed a land-based cable-operated device during WW II called Goliath, although it too was not considered to be a successful system.<sup>6</sup> Nevertheless, some predicted at the time that unmanned systems would be put to widespread use at some point. US Army Air Corps General Henry H. Arnold stated that while his war may have been fought by ‘heroes flying around in planes’, future wars ‘... may be fought by airplanes with no men in them at all’<sup>7</sup>

In hindsight, this prediction was premature, but the advances in remotely-operated systems through innovations in advanced navigation and communications technologies, as well as the necessary satellite communication abilities, allowed for a sharp increase of the use of UMS, first in the air and increasingly on the ground and in marine environments as well. Beginning in the 1970s, remotely operated airplanes were used on a regular basis when Israel used UAVs for the first time in Lebanon’s Bekaa Valley.<sup>8</sup> Further development was slow until the 1990s after which the number of models of UAVs has risen steadily. The number of airborne UMS deployed by the United States military has risen from 167 in 2002 to over 7,000 today.<sup>9</sup> At the same time, the expenditures for procurement and development funding for UAVs for the US military alone rose from US\$ 667 million to US\$3.9 billion between FY 2001 and FY 2012.<sup>10</sup> This number can be expected to rise significantly given the apparent procliv-

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- 5 Kendra L. B. Cook, ‘The Silent Force Multiplier: The History and Role of UAVs in Warfare’ (2007) Aerospace Conference, 2007 IEEE 1, 2. See also 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), History Office, Aeronautical Systems Center, Air Force Materiel Command 2002); John DeGaspari, ‘Look, Ma, No Pilot!’ (2003) 125:11 *Mechanical Engineering* 42; Laurence R. Newcome, *Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles* (American Institute of Aeronautics and Astronautics, Inc. 2004).
  - 6 Jon Guttman, ‘Goliath Tracked Mine’ (2011) 28:2 *Military History* 23, 23; P. W. Singer, ‘Drones Don’t Die’ (2011) 28 *Military History*, 66, 66 (Dennymite), 67 (Kettering Bug), 67–68 (Goliath).
  - 7 Lawrence Spinetta, ‘The Rise of Unmanned Aircraft’ (*HistoryNet.com*, 10 November 2010) <<http://www.historynet.com/the-rise-of-unmanned-aircraft.htm>> accessed 12 March 2012.
  - 8 Ralph Sanders, ‘An Israeli Military Innovation: UAVs’ (2002/2003) 33 *Joint Force Quarterly* 114; Elizabeth Bone & Christopher C. Bolkcom, *Unmanned Aerial Vehicles: Background and Issues* (Novinka Books, 2004) 2.
  - 9 Jeremiah Gertler, *U.S. Unmanned Aerial Systems* (Congressional Research Service, 2012) 2. See also CQ Researcher, ‘Drone Warfare – Are Strikes by Unmanned Aircraft Unethical?’ 20:18 *CQ Researcher*, 653, 656.
  - 10 Gertler (n 9).

ity of lawmakers to expand the use of unmanned systems.<sup>11</sup> Globally, the total expenditures for military UAVs – including research and development as well as procurement – are expected to increase significantly from the current levels of roughly US\$ 6 billion annually to more than US\$ 11 billion by 2020.<sup>12</sup>

In addition to the increase in the number of vehicles and government expenditures during recent years, the use in combat of UAVs has steadily increased as well. First used almost exclusively in a surveillance role, as was the case in Kosovo, UAVs have increasingly taken on combat roles as evidenced most prominently in the conflict in Afghanistan as well as other countries.<sup>13</sup> According to industry lobbyists, the importance of UAVs is considerable: ‘... 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, then standing at 295,000 hours per year.’<sup>14</sup>

11 In 2000, Congress affirmed 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.’ See P.L. 106-398, ‘Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001’, section 220. 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 2009. Department of Defense, ‘Unmanned Aircraft Systems Roadmap 2005-2030’ <[http://www.fas.org/irp/program/collect/uav\\_roadmap2005.pdf](http://www.fas.org/irp/program/collect/uav_roadmap2005.pdf)> accessed 13 January 2011.

12 Teal Group Corporation, *World Unmanned Aerial Vehicle Systems* (2011) 2.

13 For the controversy surrounding the use of UAVs in the elimination of known terrorists and terrorist suspects, Peter Finn, ‘A Future for Drones: Automated Killing’ *Washington Post* (Washington, D.C., 19 September 2011) A01; Siobhan Gorman, ‘Drones Evolve Into Weapon in Age of Terror’ *The Wall Street Journal* (New York, 8 September 2011) at A6; Ryan Vogel, ‘Drone Warfare and The Law of Armed Conflict’ (2010-2011) 39 *Denver J of Intl L and Policy* 101; Peter Bergen & Katherine Tiedemann, ‘Washington’s Phantom War’ (2011) 90 *Foreign Affairs* 12. For the debate about use of drones and targeted killing, see Philip Alston, *Study on Targeted Killings – Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions* (No. A/HRC/14/24/Add.6); David Kretzmer, ‘Targeted Killing of Suspected Terrorists: Extra-Judicial Executions or Legitimate Means of Defence?’ (2005) 16 *European J of Intl L* 171; Nils Melzer, *Targeted Killing in International Law* (OUP 2008); 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’ (2003) 36 *Cornell Intl L J* 233; Mary Ellen O’Connell, ‘The International Law of Drones’ (2010)14:36 *ASIL Insights* 1.

14 See Michael S. Fagan, ‘Rise of the Drones: Unmanned Systems and the Future of War’ (Statement, Chair, Unmanned Aircraft Systems (UAS) Advocacy Committee Association for Unmanned Vehicle Systems International (AUVSI) before the House Oversight and Government Reform Subcommittee on National Security and Foreign Affairs, 23 March 2010).

These figures show that there has been a steady – and accelerating – increase in the use of UAVs over the last years. However, it is important to distinguish between different levels of autonomy, at least for conceptual purposes. For the purposes of this article, the different types of unmanned systems are grouped into three different categories: remotely-operated systems, automated systems and systems which actually function autonomously. The distinction serves an important purpose, namely to separate the existing weapon systems which are either automated or remotely operated from those that function in an autonomous manner. Each of these categories implies different legal questions as there is not only a longer track record of the automated and remotely operated weapons, but unlike autonomous weapon systems, there is also a human operator in the loop.<sup>15</sup> The distinction is complicated by the fact that unmanned systems may operate in more than one and indeed all three operating modes.

## 2. *Variations of Autonomy: From Remote Control and Automation to Autonomy*

As noted above, it is crucial to distinguish between different degrees of autonomy. While these differentiations are difficult to maintain in certain situations given the ability of different weapon systems to operate under each category, it is important to remember that each subset faces different challenges.

Remotely-operated systems are, as shown above, not new. Their use, however, has greatly proliferated, as evidenced by the combat operations in Afghanistan.<sup>16</sup> Examples of systems currently in operation include the MQ-1 Predator and MQ-9 Reaper, which are capable of carrying weapons and carry out combat missions. These vehicles have generated the strongest public debates.<sup>17</sup> Most such systems are operated from ground bases and communicate over satellite with their ground stations, sometimes at a considerable distance. In addition to these larger aerial systems, a considerable variety of smaller vehicles exist that are designed to be ‘man portable’, typically performing short-distance reconnaissance missions and operated by ground forces from portable

15 A similar distinction is drawn by the International Committee of the Red Cross, see International Committee of the Red Cross, ‘International Humanitarian Law and the Challenges of Contemporary Armed Conflicts’ (31IC/11/5.I.2, 2011) 38 et seq.

16 Matt J. Martin & Charles W. Sasser, *Predator: The Remote-Control Air War over Iraq and Afghanistan A Pilot's Story* (Zenith Press, 2010); Alan S. Brown, ‘The Drone Warriors’ (2010) 132:1 *Mechanical Engineering* 22, 24-25.

17 See only Jane Mayer, ‘The Predator War – What are the Risks of the C.I.A.’s Covert Drone Program?’ *The New Yorker* (New York, 26 October 2009) 36. See also in the wider context of targeted killing and its international legal implications, Alston (n 13).

devices.<sup>18</sup> Land based systems are often used for explosive ordinance detection (EOD), although increasingly Unmanned Ground Vehicles (UGVs) are used for reconnaissance, surveillance and target acquisition.<sup>19</sup> Marine systems are also in operation, though submarine vehicles face additional hurdles communicating under water.<sup>20</sup> It has been argued that the use of remotely-operated UMS allows for longer reconnaissance and more precise targeting and thus a reduction in civilian casualties.<sup>21</sup> Reports also exist, however, that the use of remotely-operated systems – and thus, the violence of war – increases because the reduction of the risk to one’s own soldiers allows for attacks that otherwise would not have been launched.<sup>22</sup> Other criticisms have centered on the potential for information overload as well as the fact that the physical and emotional distance that is created by remotely-operated systems may lead to an increased propensity of attacks.<sup>23</sup> This type of system retains human involvement in the decisions of whether and how to attack, although one operator may command more than one vehicle at a time.<sup>24</sup> Thus, in this scenario, the line of responsibility for the attack remains clear.

Automated systems have similarly been deployed for several generations. Unlike remotely-operated systems, they do not involve a human operator during the actual deployment, but rather the necessary data is fed into the system prior to deployment of the system. Early examples of such systems are the V-1 and V-2 rockets fired by the German military at the United Kingdom during WW II.<sup>25</sup> More modern examples include automated sentry guns as well as sensor-

18 Elizabeth Quintana, ‘The Ethics and Legal Implications of Military Unmanned Vehicles’ (Royal United Services Institute for Defence and Security Studies) 2 <[http://www.rusi.org/downloads/assets/RUSI\\_ethics.pdf](http://www.rusi.org/downloads/assets/RUSI_ethics.pdf)> accessed 1 February 2011.

19 *ibid.* For an overview of US ground UMS see United States of America, Department of Defense (n 3) 133.

20 Quintana (n 18) 6.

21 See United States of America, Department of Defense (n 3) 7–15 for general benefits of increasingly autonomous systems; Jack M. Beard, ‘Law and War in the Virtual Era’ (2009) 103 *AJIL* 409; Ronald C. Arkin, *Governing Lethal Behavior in Autonomous Robots* (CRC Press, 2009) 205–236.

22 Peter Asaro, ‘How Just Could a Robot War Be?’ in Adam Briggles and others (eds), *Current Issues in Computing and Philosophy: Frontiers in Artificial Intelligence and Applications* (IOS Press, 2008) 61 et seq; Patrick Lin and others, ‘Robots in War: Issues of Risk and Ethics’ in Rafael Capurro & Michael Nagenborg (eds), *Ethics and Robotics* (AKA, 2009) 62.

23 P. W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-first Century* (Penguin Press, 2009) 395–396.

24 United States of America, Department of Defense (n 3) 7, 28.

25 Singer (n 23) 47–48.

fused ammunition.<sup>26</sup> Moreover, surveillance systems, such as the Global Hawk, fall into this category.<sup>27</sup> Capable of staying in the air for over 30 hours and flying at altitudes of up to 65,000 ft, it conducts surveillance missions in either an automated or remote control fashion.<sup>28</sup> While such systems do not require a human to command the weapon system, often there is very considerable human involvement prior to deployment. Once that process is complete, however, these systems are capable of independently detecting the threat they are designed to counter and fire or detonate following certain cues. It is these cues that raise legal and ethical concerns with these systems, thereby implicating the principle of distinction, which requires one to distinguish between military and civilian objects.<sup>29</sup>

The final category consists of autonomous weapon systems. AWS, unlike remotely-operated systems and automated systems, do not depend on human input either during or immediately prior to their deployment. What distinguishes their functioning is the ability to independently operate, identify and engage targets without being programmed to target a specific object. While there is still some human involvement prior to sending an AWS on a mission (eg refueling and arming), an AWS can carry out a mission with a much higher degree of independence and indeed autonomy.<sup>30</sup> Decisions about which targets to engage and how and when to conduct an attack would be left to the software which, ideally, has been programmed in such a manner as to address a myriad of situations and a changing set of circumstances. Whether it will be possible to program such systems in a way that enables them to conform to the existing rules of IHL – specifically the requirements of the principles of distinction and proportionality<sup>31</sup> – remains to be seen.

Unlike remotely-operated and automated systems, to date AWS have not been deployed in combat. However, AWS represent a major shift, not only in how wars will be fought, but also in how we conceive of armed conflict. As long as humans conduct combat, human sacrifice plays a crucial role in the extent to which a polity (at least in democratic States) is willing to support the decision to remain engaged in armed conflict. That element could over time become considerably diminished although the prospects of it disappearing entirely are slim.

26 Quintana (n 18) 1; Arkin (n 21) 10-27; Darren M. Stewart, 'New Technology and the Law of Armed Conflict' in Raul A. Pedrozo & Daria P. Wollschlaeger (eds) *International Law and the Changing Character of War, International Law Studies Vol 87* (US Naval War College, 2011) 271, 276.

27 Stewart (n 26).

28 Quintana (n 18) 1-2.

29 For a more detailed discussion, see Part III.2 below.

30 For an early stage of development, see only Peter Finn, 'A Future for Drones: Automated Killing' *Washington Post* (Washington, D.C., 19 September 2011) A01.

31 For a more detailed analysis, see Part III.2 (discussing distinction) and Part III.3 (discussing proportionality) below.

Their introduction into the modern battlespace may make it considerably more complicated to assign responsibility to the action taken by an AWS – an aspect that AWS do not share with either remotely operated or automated systems. As discussed below, whether to assign responsibility to the programmer, to the decision-makers who allowed AWS to be used in the military, to the commanding officers on a tactical or strategic level, or the soldiers that actually deploy them is a question that must be addressed.

### III. Legal Challenges to Autonomous Weapon Systems

The main challenges facing AWS from a legal perspective are twofold: on one hand, AWS will have to comply with the principle of distinction, and on the other hand, they must perform the equally, if not more demanding task, of complying with the principle of proportionality. Other provisions in Additional Protocol I will also be applicable, such as article 36, which mandates that prior to the deployment of any weapon system, each State Party has to 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 circumstances, be prohibited by international law.<sup>32</sup> This section, following a brief introduction locating these principles within IHL, focuses on (1) the principle of distinction, (2) the principle of proportionality, and (3) attempts to outline the challenges that the introduction of AWS into any combat roles brings about.

#### 1. Introduction

IHL has been developed in great detail in a number of areas, including the types of weapons that are permissible for use in armed conflicts and the types of targets that are legitimate.<sup>33</sup> While a number of other aspects of IHL impact the use of unmanned systems, this section focuses on the rules that apply to both international and non-international armed conflict.<sup>34</sup> By doing so it will

32 Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (adopted 8 June 1977, entered into force 7 December 1978) 1125 UNTS 3 (Additional Protocol I) (hereinafter ‘API’).

33 Gary D. Solis, *The Law of Armed Conflict: International Humanitarian Law in War* (CUP, 2010) 38 et seq.

34 This approach may be considered to be inadequate by some as it does not take account of all the constraints that are in place to attempt to curb unwanted behavior. See Marchant and others for a different perspective, focusing on constraints such as ‘... military doctrines, professional ethical codes, and public “watch-dog” activities ... that might pertain to the present governance dilemma regarding military robotics’ with less of an emphasis on the applicable rules of international law. Gary E. Marchant and others, ‘International Governance of Autonomous Military Robots’ (2011) *The Columbia Science and Technology L Rev* 272, 290.



also attempt to delineate whether the current rules of IHL are sufficient to deal with the paradigm embodied by AWS. If the functional approach taken by the body of IHL – ie one that does not focus on a single weapon systems or technology – is adequate to deal with this new paradigm, then there may not be a need for a new legal framework.<sup>35</sup>

The basic premise applicable with respect to the two principles in question is laid down in article 48 of Additional Protocol I:

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.

This very general and abstract rule is fleshed out in subsequent provisions, comprising the cornerstone of the protection of civilians in IHL – the principles of distinction and proportionality. Both are important elements and function as counterpoints to military necessity in an attempt to temper unmitigated use of force. Furthermore, there is an underlying element that permeates IHL that will be dealt with subsequently, namely that combat be carried out in a humane fashion.

The following analysis takes account of IHL as it can be described today. It has been described as a tension between the elements of military necessity and humanity.<sup>36</sup> There is considerable disagreement about where the balance should be struck between these two core principles. Different views also exist as to the degree extant circumstances such as advances in military technology, the acceptability of civilian casualties in the court of public opinion<sup>37</sup> and potentially more fundamental changes – for example, in the role accorded to State

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35 For authors who take a position that the current legal framework is inadequate, see Arkin (n 21) 72; Marchant and others (n 34) 272; Armin Krishnan, *Killer Robots: Legality and Ethicality of Autonomous Weapons* (Ashgate, 2009). See also the contribution of David Akerson, 'The Illegality of Offensive Lethal Autonomy', in this volume, Akerson argues that similar to blinding weapons, which were prohibited on the basis of their repulsive nature, offensive AWS warrant a similar positive prohibition.

36 Stewart (n 26) 271, 272; Michael N. Schmitt, 'Military Necessity and Humanity in International Humanitarian Law: Preserving the Delicate Balance' (2010) 50 *Virginia J of Intl L* 795, 795.

37 See, for example, Wesley K. Clark, *Waging Modern War* (Public Affairs, 2001) 444 (noting 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').

sovereignty<sup>38</sup> – may influence the determination of this balance.<sup>39</sup> Indeed, the tendency in interpreting this area of the law appears to move away from a military-centric approach and towards one that takes humanitarian considerations into account to a greater extent than ever before.<sup>40</sup> This may already be evident from the change in designation that this legal field has undergone – from ‘law of war’ to ‘law of armed conflict’ and now ‘international humanitarian law’.<sup>41</sup> This is somewhat counterintuitive given the large-scale atrocities that the international community has witnessed in places such as Cambodia, Somalia, the former Yugoslavia, Sierra Leone, Afghanistan and the Congo – all of which have seen civilians being the focus of military action.

There are numerous other rules that may further impact the conduct of military personnel, such as the Rules of Engagement (‘RoE’) of a particular army. These may differ over time as evidenced by the varied RoE in place during different conflicts or during the same conflict. The behavior of any AWS would have to replicate such changing rules – assuming that the RoE remain within the permissible framework of the IHL. This means that AWS have to be programmed to conform to different levels of aggressiveness, all of which have to be commensurate with the applicable rules of IHL. A recent example of such a change occurred in Afghanistan when, due to pressure from the Afghanistan government and after a number of strikes that targeted civilian objectives, military forces changed their behavior considerably.<sup>42</sup> Any software program

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38 *Prosecutor v Tadic* (Appeals Chamber Decision on the Defence Motion for Interlocutory Appeal on Jurisdiction) ICTY-94-1 (2 October 1995) para 97. Similarly, *Prosecutor v Delalic* (Appeals Chamber Judgment) IT-96-21-A (20 February 2001) para 172.

39 Originally conceived in the Preamble of the Convention Respecting The Laws and Customs of War on Land, 29 July 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 (adopted 29 July 1899, entered into force 4 September 1900) [1901] ATS 131. See also Theodor Meron, ‘The Martens Clause, Principles of Humanity, and Dictates of Public Conscience’ (2000) 94 AJIL 78.

40 Theodor Meron, ‘The Humanization of Humanitarian Law’ (2000) 94 AJIL 239.

41 Solis (n 33) 20-27.

42 See generally Michael N. Schmitt, ‘Targeting and International Humanitarian Law in Afghanistan’ (2009) 39 Israel Ybk on Human Rights 307, 312 et seq. For a theoretical exposition of how legal rules may change over time, including in the context of the LOAC, see Anthony D’Amato, ‘International Law, Cybernetics, and Cyberspace’ in Michael N. Schmitt & Brian T. O’Donnell (eds), *Computer Network Attack and International Law, International Law Studies Vol 76* (US Naval

employed would have to be constructed so as to conform to such policy decisions, which may vary considerably under different circumstances, and may be subject to change within the same conflict scenario.<sup>43</sup>

UMS must be able to operate in light of the principle of distinction as well as the principle of proportionality. This means that the applicable rules must be converted into a digital format that a computer applies in a given situation. Computers are traditionally better at dealing with quantitative than with qualitative assessments. While there have been impressive advances in cognitive technologies, it remains an open question whether the principles of distinction and proportionality can safely be entrusted to a digital code. This is even more important in light of the fact that related technological advances are only in their infancy and are not able to take account of considerations that are multifaceted and that require careful evaluation and weighing of a plethora of factors, including their relative weight in any given situation.

## 2. *The Principle of Distinction*

The principle of distinction mandates that any military action must distinguish between combatants and civilians as well as between military and civilian objects. This distinction between a person and an object that possesses a military character as opposed to one that is of a civilian character therefore is of crucial importance. Importantly, IHL operates under the assumption that an individual who does not qualify as a combatant is to be considered as a civilian. This bedrock principle of IHL was already incorporated into the earliest IHL instrument the 1868 St. Petersburg declaration.<sup>44</sup> It subsequently found inclusion into the Hague Convention Respecting the Laws and Customs of War

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War College, 2002) 59. For a news report about this change, see Carlotta Gall, 'Afghan President Assails U.S.-Led Airstrike That He Says Killed' *The New York Times* (New York, 24 August 2008) A6. These developments have contributed to a dramatic increase in the NATO forces' demand for UAVs and critical UAV surveillance capabilities. See David Ignatius, 'What a Surge Can't Solve in Afghanistan' *The Washington Post* (Washington, D.C., 28 September 2008) 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' *US News & World Reports* (Washington, D.C., 25 September 2008) 30.

43 C.J. Chivers, 'A Changed Way of War in Afghanistan's Skies' *The New York Times* (New York, 16 January 2012) A1.

44 Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight (adopted 11 December 1868, entered into force 29 November/11 December 1868) 138 Consol TS 297 (St. Petersburg Declaration). The preamble states partially that:

[...] That the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy [...].

on Land through its annex,<sup>45</sup> and finally into the additional protocols to the 1949 Geneva Conventions. Additional Protocol I, applicable in international armed conflicts, as well as Additional Protocol II, applicable in non-international armed conflicts, contain the principle of distinction.

Article 48 of Additional Protocol I enshrines the general rule of distinction by outlawing the targeting of individual civilians<sup>46</sup> unless they take a direct part in hostilities,<sup>47</sup> the targeting of historic monuments, works of art or places of worship.<sup>48</sup> Moreover, subsequent provisions of Additional Protocol I prohibit not only attacks on civilians or objects of a civilian nature, but go further by prohibiting attacks on objects that are ‘... indispensable to the survival of the civilian population’, as well as the natural environment and ‘installations containing dangerous forces’.<sup>49</sup> In addition, Additional Protocol I contains provisions that prohibit certain methods of attack, namely those that are by their nature indiscriminate.<sup>50</sup>

These rules are contained in treaty law and are generally held to form part of customary international law as well. For example, the ICJ’s *Nuclear Weapons Advisory Opinion* considered the principle of distinction to be among ‘... a great many rules of humanitarian law applicable in armed conflict [that] are ... fundamental to the respect of the human person and “elementary considerations of

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45 Convention (IV) Respecting the Laws and Customs of War on Land and its Annex: Regulations concerning the Laws and Customs of War on Land (adopted 18 October 1907, entered into force 26 January 1910) [1910] ATS 8.

Allusions to the principle of distinction are prevalent throughout the preamble. For example:

Thinking 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.

or

... [T]hese 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.

46 API (n 32) art 51(2).

47 *ibid* art 52(3).

48 *ibid* art 53.

49 *ibid* arts 54, 55 and 56, respectively.

50 *ibid* art 51(4) states:

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.

humanity”.<sup>51</sup> Without making such an explicit reference, the Court appears to consider the principle of distinction therefore to be at the level of *jus cogens*, or at the very least, of a higher order<sup>52</sup> when it considered it to ‘... constitute intransgressible principles of international customary law’.<sup>53</sup> In addition to the ICJ, the Eritrea-Ethiopia Claims Commission found article 48 of Additional Protocol I to be an expression of customary international law.<sup>54</sup> It appears thus evident that the principle of distinction has become a rule of customary international law.<sup>55</sup>

Although the principle of distinction appears to be non-controversial, there are nevertheless a considerable number of difficulties in practice in cases where a target can be both civilian and military in nature. The most often cited example for such targets include bridges which are used for civilian purposes, but which may also be used to supply military units.<sup>56</sup> Other such installations include broadcasting stations or the energy network.<sup>57</sup> As noted above, while the

51 *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion) 1996 ICJ Rep 226, para 79.

52 For a powerful critique on a conceptual level, see Prosper Weil, ‘Towards Relative Normativity in International Law’ (1983) 77 *American J of Intl L* 413. For a counterpoint, see John Tasioulas, ‘In Defence of Relative Normativity: Communitarian Values and the Nicaragua Case’ (1996) 16 *Oxford J of Legal Studies* 85.

53 *Legality of the Threat or Use of Nuclear Weapons* (n 50) 226, para 79; Dinah Shelton, ‘International Law and “Relative Normativity”’ in Malcolm D. Evans (ed), *International Law* (2nd edn, OUP, 2006) 159, 164, 166. It is not important whether the principle of distinction has reached the status of *jus cogens*. Arguments in favor of such a finding are advanced, for example, by Jean-François Quéguiner, ‘The Principle of Distinction: Beyond an Obligation of Customary International Humanitarian Law’ in Howard M Hensel (ed), *The Legitimate Use of Military Force: The Just War Tradition and the Customary Law of Armed Conflict* (Ashgate, 2008) 161, 171.

54 Eritrea-Ethiopia Claims Commission, Western Front, Aerial Bombardment and Related Claims (2006) – Eritrea’s Claims 1, 3, 5, 9-13, 14, 21, 25 & 26, 45 ILM 396, 417, 425.

55 The fundamental nature of the principle of distinction, unlike other principles of the LOAC, has not been put into question. One commentator appears to have doubts as to the customary international law nature of the principle, raising constitutional concerns in the US context as being void for vagueness. W. Hays Parks, ‘Air War and the Law of War’ (1990) 32-1 *Air Force L Rev* 1, 174. See also William H. Taft, ‘The Law of Armed Conflict after 9/11: Some Salient Features’ (2003) 28 *Yale J of Intl L* 319, 323.

56 Marco Sassoli, ‘Legitimate Targets of Attacks Under International Humanitarian Law’ (International Humanitarian Law Research Initiative, Background Paper Prepared for the Informal High-Level Expert Meeting on the Reaffirmation and Development of International Humanitarian Law, Cambridge, 27-29 January 2003, Harvard Program on Humanitarian Policy and Conflict Research) 7-8.

57 Christine Byron, ‘International Humanitarian Law and Bombing Campaigns: Legitimate Military Objectives and Excessive Collateral Damage’ (2010) 13 *Ybk of Intl Humanitarian L* 175, 183-186.

textual basis for the distinction between civilian and military targets appears clear, realities on the ground oftentimes leave ambiguous whether a target is legitimate or not.

Furthermore, 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’.<sup>58</sup> Each of these elements can be further clarified.<sup>59</sup> The term ‘nature’ more closely describes the military significance of a particular object, which could consist of weapons, depots or command posts.<sup>60</sup> The term ‘location’ is a reference to a geographic space that has ‘... special importance to military operations’.<sup>61</sup> An example for a particular location may be a river crossing or a mountain pass, ie a place which possesses important characteristics without which a military advantage cannot be gained or is considerably harder to obtain. When an object is to be used for military reasons in the future, the object qualifies as a military objective through ‘purpose’.<sup>62</sup> Finally, ‘use’ means that the enemy is presently utilizing an object militarily.<sup>63</sup> The element of use makes clear that IHL incorporates a dynamic element in that civilian objects may become military targets if they are being used by the enemy for military ends. The weighing and balancing that must take place in these instances pursuant to article 52 of Additional Protocol I require a higher level of analysis compared to situations in which an attack would be directed only against military objectives or combatants. In analogous fashion, the same applies to individuals who, though once civilian, can potentially be considered to ‘... directly participate in hostilities’.<sup>64</sup>

This is even more important given the increased complexity posed by today’s conflicts and the conflicts of the future. As the traditional battlefield is replaced by a battlespace with a much higher degree of complexity, combat operations are no longer confined to a particular area.<sup>65</sup> Instead operations occur at different times or simultaneously in different geographical areas and by dif-

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58 See API (n 32) art 52 (2).

59 See generally Claude Pilloud and others, *Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949* (Martinus Nijhoff Publishers, 1987) para 2020 et seq.

60 *ibid* para 2020.

61 *ibid* para 2021.

62 *ibid* para 2022.

63 *ibid*.

64 See API (n 32) art 51 (3).

65 This shift from battlefield to battlespace, a development that is not particularly recent but which has gained momentum, may lead to increased requirements with respect to the principle of distinction under certain circumstances, but more importantly – and more troubling because of the higher degree of indeterminacy – the principle of proportionality.

ferent means.<sup>66</sup> In addition, what were hitherto civilian objects become increasingly used by combatants and combatants become increasingly intermingled with civilians. Thus, the distinction between military objectives and civilian objects becomes ever more crucial, and situations difficult to assess. For the purposes of AWS, it is therefore imperative to determine *a priori* how well an AWS can distinguish between civilians and civilian objects on the one hand and combatants and military objectives on the other.

In the case of AWS, this means that the underlying software must be able to determine whether a particular target is civilian or military in nature.<sup>67</sup> Moreover, the AWS must be programmed so that it takes account of the requirement that in cases of uncertainty it should abort the attack.<sup>68</sup> A number of weapons today are capable of determining – based on pre-programmed characteristics, such as shape and dimensions – a target’s military nature.<sup>69</sup> Once a sufficient number of characteristics of the target have been reconciled with the pre-programmed version, the weapon system can initiate an attack. This type of matching is mechanical and based on quantitative data. It appears that the recent advances regarding this technology will enable such systems to function with the required accuracy for certain types of targets in the near future.<sup>70</sup> With

66 Michael N. Schmitt, ‘War, Technology, and The Law of Armed Conflict’ in Anthony M. Helm (ed) *The Law of War in the 21st Century: Weaponry and the Use of Force, International Law Studies Vol 82* (US Naval War College, 2006) 137, 149. Note that the term battle space has now been adopted by the US military to denote local conflicts as well as domestic soil, including the ‘global commons’. See Joint Chiefs of Staff, ‘The National Military Strategy of the United States of America’ (2004) 5 <<http://www.defense.gov/news/mar2005/d20050318nms.pdf>> accessed 23 March 2012. See for the use of the term in the 2011 National Military Strategy, Nicholas R. Krueger, ‘The 2011 National Military Strategy: Resetting a Strong Foundation’ (2011) National Security Watch, The Institute of Land Warfare, AUSA <[http://www.ausa.org/publications/ilw/ilw\\_pubs/Documents/NSW%2011-2-web.pdf](http://www.ausa.org/publications/ilw/ilw_pubs/Documents/NSW%2011-2-web.pdf)> accessed 23 March 2012.

67 One interesting proposal mandates that UVs would not target humans, but only weapon systems. See John S Canning, ‘A Concept for the Operation of Armed Autonomous Systems on the Battlefield’ (2006) <[http://www.dtic.mil/ndia/2006disruptive\\_tech/canning.pdf](http://www.dtic.mil/ndia/2006disruptive_tech/canning.pdf)> accessed 23 March 2012. While this may minimise the danger somewhat, it is unclear how this would alleviate the problem of, for example, someone carrying a rifle for safety reasons or for hunting purposes.

68 With respect to civilians, see API (n 32) art 50(i), with respect to civilian objects, see API (n 32) art 52(3).

69 Robert Sparrow, ‘Killer Robots’ (2007) 24 *J of Applied Philosophy* 62, 63. More recently, see Michael Lewis and others, ‘Scaling Up Wide-Area-Search Munition Teams’ (May-June 2009) 24 *IEEE Intelligent Systems* 10.

70 Note however that specifically with respect to API (n 32) art 51(4)(c) 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 Dieter Fleck (ed), *The Handbook of International Humanitarian Law* (2nd edn, OUP, 2008) 119, 201 et seq.

respect to individuals, the situation is much more problematic. Without going into the details of the debate, it would be important to program software so that a system can distinguish not only civilians and combatants, but also civilians from those that take ‘... active part in hostilities’.<sup>71</sup> While this is difficult enough for humans, it may be – at this time – impossible for an AWS, as this again requires a move away from quantitative to qualitative analysis.

One example<sup>72</sup> may be a potential counter-insurgency operation in a village where the inhabitants belong to a group which carry a dagger, the *kirpan*,<sup>73</sup> although purely for religious reasons and not as a weapon. After receiving a tip that insurgents are hiding in a home, a unit attempts to enter a home although unbeknownst to the soldiers no insurgents are present. Just as the soldiers are about to enter the compound, some boys carrying the *kirpan* are running after a ball that one of them kicked towards the gate. When the soldiers enter the compound, the father realizes the situation and screams towards the boys – in a language that the soldiers do not understand – to stay away from the gate and moves towards the gate to protect his children. One would expect that a human is able to interpret the situation in a way that indicates that these individuals are not a threat, but realizes the situation for what it is, ie two children chasing a ball. On the other hand this could also be interpreted as two quickly approaching targets carrying a weapon, with another potential target running towards the unit in an agitated and potentially threatening manner. It becomes clear that the ability to distinguish these two interpretations is crucial in combat. Differentiating a weapon from a cultural or religious symbol, recognizing the face of a person in fear for his children as opposed to someone with a threatening demeanor, distinguishing children at play from hostile persons requires cognitive abilities that – at least at this stage – far surpass the abilities of robotics. The requirements for this capability are especially demanding because human lives are at stake.

Other examples that could elicit similar erroneous responses may be children who are forced to transport weapons<sup>74</sup> and who, even for an AWS flying at

71 See generally API (n 32) art 50, which negatively delineates civilians.

72 Modeled after an example from Marcello Guarini & Paul Bello, ‘Robotic Warfare: Some Challenges in Moving from Non-Civilian to Civilian Theaters’ in Patrick Lin and others (eds), *Robot Ethics: The Ethical and Social Implications of Robotics* (MIT Press, 2012) 149, 150.

73 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. See Doris R. Jakobsh, *Sikhism* (U of Hawaii Press, 2012) 60; Rishi Singh Bagga, ‘Living by the Sword: The Free Exercise of Religion and the Sikh Struggle for the Right to Carry a Kirpan’ (May 2006) II-3 *The Modern American* 32.

74 Naomi Cahn, ‘Poor Children: Child “Witches” and Child Soldiers in Sub-Saharan Africa’ (2006) 3 *Ohio State J of Criminal L* 413, 418. This example, of course, applies not only to children, but to all civilians who are similarly forced to transport weapons and do not actively engage in hostilities.



low altitude, may look like combatants. It is also clear that situations may arise where seemingly innocuous behavior may trigger a preprogrammed attack. An individual carrying a rifle may be hunting or carrying such a weapon for protective purposes. This is not at all uncommon and while in such instances mistakes could equally be made by humans, these situations are very context dependent. Thus, already at the stage of the principle of distinction, qualitative elements become an important part of the analysis and a mere reliance on quantitative factors by AWS will not be sufficient.

### 3. *The Principle of Proportionality*

The principle of proportionality creates similar – and potentially even greater – challenges. The reason for this can be formulated as follows: proportionality is a term that cannot be defined in the abstract, but rather, the determination of whether an attack meets the requirements of the principle of proportionality depends on the particular circumstances of the attack.<sup>75</sup> This is further complicated by the fact that almost every entity, even though it may not be military in nature, can be transformed into a military object.<sup>76</sup> In this sense, AWS take the challenges currently faced by remotely-controlled and automated weapons systems considerably further: while removing the individual combatant from the battlefield is in itself problematic as evidenced by the debates surrounding drone strikes,<sup>77</sup> AWS remove a combatant from the decision-making process over a particular situation altogether. This shifts the burden of the decision-making progress. It is no longer a combatant (be it the pilot in the case of manned aircraft or the operator in remote-controlled drones) that triggers the launch of weapon, but rather, in the case of fully autonomous weapons, the decision shifts to the programming stage of the AWS system software. It is at this stage where the decisions that would otherwise be left to individuals must be made in an anticipatory fashion, including that of whether an attack is proportional.

Some of the issues likely to emerge are the following: (1) Can it be left to AWS to make decisions about whether to attack and, if so, about the selection of weapons?; (2) if the answer is affirmative, what limitations does the proportionality principle place on their use?; (3) what precautions must be taken to avoid breaches of the proportionality principle in situations that remove the decision-making process from immediate human supervision?; (4) whose judgments flow into the *a priori* determination about whether a particular attack is proportional?; and (5) can formulaic, software-compatible rules be crafted

75 See William H. Boothby, *Weapons and the Law of Armed Conflict* (OUP, 2009) 79; Oliver O'Donovan, *The Just War Revisited* (CUP, 2003) 62; Yoram Dinstein, *The Conduct of Hostilities Under the Law of International Armed Conflict* (2nd edn, CUP, 2010) 131.

76 Dinstein (n 75) 130.

77 See (n 13) above.

so that important elements in determining proportionality form part of the equation? Each of these questions will have to be answered clearly prior to the deployment of an AWS and at least at this stage it is far from certain that these conditions can be met.

Versions of the principle of proportionality have been in existence for centuries. St. Thomas Aquinas introduced the principle of double effect, which contained an early version of the principle of proportionality.<sup>78</sup> Grotius posited that for the sake of saving many one ‘... must not attempt anything which may prove the destruction of innocents, unless for some extraordinary reason’.<sup>79</sup> The St. Petersburg declaration contained both the principles of necessity and proportionality when it stated that because the ‘... the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy ... this object would be exceeded by the employment of arms which uselessly aggravate the sufferings of disabled men, or render their death inevitable’.<sup>80</sup> Similar rules were put in place – sometimes in a binding fashion, sometimes in a non-binding fashion – until the middle of the 20th century.<sup>81</sup> But it was not until the adoption of Additional Protocol I to the Geneva Conventions of 1949 in the late 1970s that the principle of proportionality – although without using that particular language – was specifically included in a binding and wide-ranging document.<sup>82</sup>

The principle of proportionality does not find explicit mention in Additional Protocol I, but rather finds reflection in a number of provisions, most importantly in article 51(5)(b) and article 57(2). The former prohibits an attack the results of which would be excessive in relation to the anticipated military advantage. Specifically, the provision states:

5. Among others, the following types of attacks are to be considered as indiscriminate:  
[...]
- (b) an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a com-

78 T. A. Cavanaugh, *Double-Effect Reasoning: Doing Good and Avoiding Evil* (Clarendon Press; OUP, 2006) 2 et seq. and 181. For an even earlier example of precursors to the principle, see Thomas M. Franck, ‘On Proportionality of Countermeasures in International Law’ (2008) 102 *AJIL* 715, 723.

79 Hugo Grotius, *De Jure Belli ac Pacis Libri Tres* (1625) Book III, Chapter XI, para VIII.

80 St. Petersburg Declaration (n 44).

81 Franck (n 78) 723-724; William J. Fenrick, ‘The Rule of Proportionality and Protocol I in Conventional Warfare’ (1982) 98 *Military L Rev* 91, 95-98; Judith Gail Gardam, ‘Proportionality and International Law’ (1993) 87 *AJIL* 391, 394 et seq.

82 Bernard L. Brown, ‘The Proportionality Principle in the Humanitarian Law of Warfare: Recent Efforts at Codification’ (1976-1977) 10 *Cornell Intl L J* 134, 136.

ination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.<sup>83</sup>

This provision functions as a general protection for civilians against non-discriminatory attacks, but it is obviously fraught with problems through the use of the term ‘excessive’.<sup>84</sup> It is not clear what this term means in the abstract and can only be determined in the specific circumstances of a particular situation.<sup>85</sup> In order to minimize the legal exposure of commanders, article 57(2) of Additional Protocol I – itself reflective of numerous proportionality concerns – was introduced. It refers to precautions that must be taken with respect to avoiding or minimizing incidental loss of life or injury to civilians and damage to civilian objects,<sup>86</sup> and prohibits attacks for which the civilian loss of life, injury or damage would prove to be ‘... excessive in relation to the concrete and direct military advantage anticipated’.<sup>87</sup> It is again, through the insertion of the term

83 API (n 32) art 51(5)(b).

84 According to Fenrick, the terms “excessive” and “disproportionate” are more or less interchangeable. See Fenrick (n 81) 91, 97. 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 *ibid* 104.

85 Solis (n 33) 273.

86 API (n 32) art 57(2)(a)(ii).

87 API art 57(2)(a)(iii). The full provision reads:

2. With respect to attacks, the following precautions shall be taken:
  - (a) those who plan or decide upon an attack shall:
    - (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;
  - (c) effective advance warning shall be given of attacks which may affect the civilian population, unless circumstances do not permit.

'excessive' not clear what this means in the abstract, but rather has to be determined on a case-by-case basis. This choice of terms is a result of the tension mentioned above, between the competing interests during armed conflict: gaining military advantage, while protecting the civilian population.<sup>88</sup> Importantly, one has to weigh not the actual outcome of the attack, but rather the anticipated result of the attack. What must be taken into consideration therefore is the potential military advantage that could be gained in the 'mind' of the attacker.<sup>89</sup> Importantly, it may be permissible to inflict extensive civilian casualties if at the time of the attack the anticipated casualties were not excessive in relation to the anticipated concrete and direct military advantage.

This tension was observed in a 2000 report to the Prosecutor of the International Criminal Tribunal for the Former Yugoslavia (ICTY), which addressed the difficulty in applying the principle of proportionality and professed that '... [o]ne cannot easily assess the value of innocent human lives as opposed to capturing a particular military objective'.<sup>90</sup> Some have suggested that the discrepancy between loss of life / injury / damage to objects on the one hand and the direct military advantage anticipated must be *clearly* disproportionate.<sup>91</sup> The insertion of such a requirement does nothing to solve the problem – and if anything, adds further confusion as the language is simply not supportive of such an interpretation.<sup>92</sup> The fluidity that characterizes the principle of proportionality raises another question, namely whether a singular set of proportionality assessments actually exists which could be programmed. The answer to this question is obviously negative and it is clear that military com-

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88 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'. W Hays Parks (n 55) 173; Schmitt (n 42) 307, 312. For an opposing view, see Dinstein (n 75) 120–121. Problems relating to proportionality assessments in the context of targeted killings have been pointed out by Noel Sharkey, 'Death Strikes From the Sky: The Calculus of Proportionality' (Spring 2009) IEEE Technology and Society Magazine 17, 19. The idea that the principle of proportionality applies in armed conflict has been affirmed strongly by the Supreme Court of Israel. See HCJ 769/02 *Public Committee against Torture in Israel et al v Government of Israel et al*, [2006] especially 30–33, <[http://elyon1.court.gov.il/Files\\_ENG/02/690/007/02/02007690.034.pdf](http://elyon1.court.gov.il/Files_ENG/02/690/007/02/02007690.034.pdf)> accessed 23 August 2012.

89 Dinstein (n 75) 132.

90 International Criminal Tribunal for the Former Yugoslavia (ICTY), 'Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign against the Federal Republic of Yugoslavia' (8 June 2000) 39 International Legal Materials 1257 [48].

91 Solis (n 33) 274.

92 Whether reference to Article 8(2)(b)(iv) of the Rome Statute in this regard is helpful is an open question. The criminal law character of the Rome Statute would indicate otherwise. But see Solis (n 33) 274.

manders may arrive at different conclusions in different situations and would most certainly differ in their assessments from a human rights lawyer. Or, as one commentator put it, ‘... [p]roportion is an elastic concept, but not indefinitely elastic.’<sup>93</sup> While it is clear that combatants must have some discretion in deciding whether an attack is proportionate, that discretion is not unfettered.<sup>94</sup>

It is not necessary to decide this long-running debate at this point. What is important for present purposes is the question of how AWS could potentially carry out a proportionality determination. As noted above, proportionality plays a role in a variety of stages of attack:

[P]roportionality is a factor in the selection of the target. If civilian losses are inevitable, because of either the intermingling of civilian and military targets or the dual character of the target itself, these must be balanced against the military advantage ... [T]he means and methods of attack must be assessed. Some weapons are more likely to involve indiscriminate damage than others. Aerial bombardment makes the distinction between combatants and non-combatant more difficult and thus, in some circumstances, may be a disproportionate means of achieving the military objective. Finally, even if these requirements are met, the conduct of the attack itself must not be negligent and involve unnecessary civilian casualties.<sup>95</sup>

It should be borne in mind here that what was said about the principle of distinction applies equally in the case of the principle of proportionality. First and foremost, the principle of proportionality has attained the status of customary international law.<sup>96</sup> In addition, the increasing complexity of today’s battlespaces, as opposed to the battlefields of conventional wars in the past, make determinations of proportionality even more complex. As one commentator puts it, ‘... [t]he more nebulous the military objective is, the greater the need

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93 Oliver O’Donovan, *The Just War Revisited* (CUP, 2003) 62; Fenrick (n 81) 91, 102. The latter posits that ‘... [s]ince the quantities being measured, civilian losses and military advantage, are dissimilar, it is not possible to establish any reasonably exact proportionality equation between them.’ See also Gardam (n 81) 391. She points out that the law of armed conflict ‘... is based on the fundamental principle that belligerents do not enjoy an unlimited choice of means to inflict damage on the enemy. Since the entry into force of Protocol I to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, proportionality has been both a conventional and a customary principle of the law of armed conflict.’

94 Franck (n 78) 715, 726.

95 Gardam (n 81) 391, 407.

96 Robin Geiß, MPEPIL, *Land Warfare*, mn. 15.

for caution in use of the weapons likely to cause “excessive” collateral damage to civilians or civilian objects.<sup>97</sup>

All of these considerations refer to qualitative assessments rather than those of a quantitative nature. As some commentators observe, the principle of proportionality ‘... clearly highlights the difference between quantitative and qualitative decisions and the need for human decision-making’.<sup>98</sup> Whereas it is generally accepted that machines are good at making quantitative calculations, humans are better adapted to making these types of decisions which are by nature subjective.<sup>99</sup> As observed by a number of authors, the problem lies in the fact that it is difficult to assign a value to the destruction of, for example, a tank in exchange for the killing of civilians.<sup>100</sup> Since there are – often constantly changing – variables on both sides of the equation and since the balancing of values depends on the individual making that calculation, it is by its nature subjective.<sup>101</sup> 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<sup>102</sup> and while objectivity may have been desirable, the wording of article 51 of Additional Protocol I lacks a more objective reference.

The following example may shed light on the problem of the differing values that individuals may place on a particular element of the analysis. In this context, it should be borne in mind that it is often unclear what constitutes a breach of IHL. One author describes a situation in which a high-ranking General, after watching two hours of video footage streamed into his office on a different continent gave orders to destroy a compound. He gave the order,

97 Dinstein (n 75) 131.

98 Tony Gillespie & Robin West, ‘Requirements for Autonomous Unmanned Air Systems set by Legal Issues’ (2010) 4:2 *The International C2 Journal* 1, 13.

99 See in this regard also Sparrow, 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 (n 75) 233; Robert Sparrow, ‘Building a Better WarBot: Ethical Issues in the Design of Unmanned Systems for Military Applications’ (2009) 15 *Science and Engineering Ethics* 169, 178.

100 Dinstein (n 75) 133; Franck (n 78) 715, 729. For a different view, see the separate and dissenting opinion of Judge Nieto Navia in *Prosecutor v Stanislav Galic* (Separate and Partially Dissenting Opinion of Judge Nieto Navia) IT-98-29-T (5 December 2003) para 104 et seq.

101 Dinstein (n 75) 132; Waldemar Solf and others, *New Rules for Victims of Armed Conflicts: Commentary on the Two 1977 Protocols Additional to the Geneva Conventions of 1949* (Martinus Nijhoff Publishers, 1982) 310.

102 Antonio Cassese, ‘Means of Warfare: The Traditional and the New Law’ in Antonio Cassese (ed), *The New Humanitarian Law of Armed Conflict* (Editoriale Scientifica, 1979) 161, 175 et seq.

despite the presence of civilians, because insurgents entered and left openly carrying weapons.<sup>103</sup> The presence of insurgents should have been a signal to the civilians, according to the General, that the compound was now a legitimate – and at least according to his analysis: a legal – target. This is a good example of the problems that the principles of distinction and proportionality carry with it: if a high-ranking General may apply IHL provisions in a – at the very least – debatable manner, it is far from clear whose analysis should be used to formulate a digital code that would eventually determine the outcome of an attack in similar situations.

For AWS, proportionality considerations play a part in all of these stages as well. With respect to target selection the software would have to be designed so as to anticipate all potential decisions, either by programming them in or by designing decision rules that are capable of making such decisions with a myriad of factors to be weighed. Concerning the second element, ie the means of attack, an AWS would have to determine the type of effect each possible weapon would produce under any given circumstances. The question to be asked thus is whether there are other weapons or means available at the particular moment in time that would cause less suffering while still capable of achieving the same goal. While this may be easy in the abstract, the close proximity of civilians in modern battlespaces and the constantly shifting circumstances may make this determination much more difficult than it first appears. Finally, an AWS would have to be capable of determining not only two competing values, but also – and more importantly – their relative weight in a given situation. Not only would an AWS have to assign a value to the military advantage to be gained from a particular action, it would also have to determine what level of civilian loss is acceptable and come to a conclusion about how these different values relate to one another. In either of these determinations the lack of important information would have to trigger a veto so as to abort the mission or an AWS would have to ask for human input for determining whether, and if so, how to conduct a particular mission.<sup>104</sup>

As discussed above, there is no clear formula for any of these determinations and given that even after a considerable passage of time and a great amount of discussion, States do not agree on the meaning of these proportionality elements, it appears curious at best and potentially naïve to believe that quantitative analysis would yield the correct results. At least at this stage of technological development – and because of the problems outlined above regarding qualitative considerations in the context of proportionality considerations this may be true not only for the foreseeable future – it therefore is evident that despite the recent impressive advances in computing technology, the use of AWS would be limited to such an extent as to render them ineffective for the large majority of operations. This means that AWS that are fully autonomous

<sup>103</sup> P.W. Singer (n 23) 347-348.

<sup>104</sup> Gillespie and West (n 98) 1, 13.

may only be used in situations in which a target is remote and potential for civilian involvement is minimal, ie in cases of certainty over such circumstances at the beginning of the mission.<sup>105</sup> This in turn would preclude the use of AWS in all other situations which constitute the very large majority of cases, especially in today's more complex battlespaces. More than any other area, this aspect of the legal framework is a subjective one. Military experience as well as legal expertise is essential to decision-making in this context.

#### IV. Conclusion

While the predictions made at the end of WW II about the future of air combat were premature, the advances in computer technology has enabled the development of weapon systems that are designed to act in an autonomous manner. While uncertainties about the capabilities and the time frame for the deployment of such weapon systems exist, the inclusion of such weapon systems in the main report for the 31<sup>st</sup> International Conference of the Red Cross and the Red Crescent is indicative of the importance of this issue.<sup>106</sup> It therefore appears short-sighted to dismiss concerns about the legal – but also the ethical and political – implications of the introduction of AWS into the modern battlefield.

The technology to implement such devices is currently either available, or under development and testing. In the near future, advanced militaries will have the capability to employ AWS; the paths they choose to follow could undermine decades of IHL and human rights development unless care is taken to ensure, with a reasonable degree of certainty, compliance with international legal principles. As has become clear, this will either be difficult or impossible to achieve. The current design architecture does not build these concerns in at the front end of such projects. This leads to the question that should be asked and one to be taken more seriously. Rather than asking how and to what extent AWS can be used and to maximize their perceived utility, it may be necessary to first answer the question if such systems should be allowed to harm – and kill – humans in the first place.

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105 For a similar view, see Boothby (n 75) 233.

106 International Committee of the Red Cross (n 15) 38-40.