ARTIFICIAL INTELLIGENCE AND INTERNATIONAL HUMANITARIAN LAW: REGULATING AUTONOMOUS WEAPONS ON THE BATTLEFIELD.

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Abstract - The swift progress of artificial intelligence has resulted in the development of Autonomous Weapon Systems (AWS), which raises pressing legal and humanitarian issues. This article assesses whether International Humanitarian Law (IHL) sufficiently governs AWS by utilizing a doctrinal legal approach to four fundamental principles: distinction, proportionality, precaution, and accountability. Additionally, it explores international regulatory efforts under the UN Convention on Certain Conventional Weapons (CCW). The analysis indicates that AWS face challenges in fulfilling legal criteria due to technological limitations, unpredictability, and dispersed responsibility. While states concur on the relevance of IHL, geopolitical rifts have obstructed the establishment of binding regulations. The article concludes that enhancing Article 36 weapons reviews, clarifying legal interpretations, and promoting regulatory initiatives are crucial for ensuring accountability and safeguarding civilians in future conflicts.

Keywords: Artificial Intelligence, International Humanitarian Law, Autonomous Weapons, Legal Regulation, Accountability, Civilian Protection

INTRODUCTION

Advancements in artificial intelligence and robotics are transforming the nature of contemporary warfare. A particularly notable development is the emergence of Autonomous Weapon Systems (AWS) machines that can identify and engage targets with little to no direct human oversight.[1] Once deemed speculative, these technologies are now becoming increasingly viable due to significant progress in machine learning, sensor technology, and military automation.[2]Their possible use has ignited vigorous discussions among nations, legal experts, and humanitarian groups, as AWS challenge established legal and ethical principles embedded in the regulations governing armed conflict.

International Humanitarian Law (IHL) serves as the main legal framework that governs the conduct of hostilities. It is founded on principles that assume human judgment

especially distinction, proportionality, precaution, and accountability, which are essential for safeguarding civilians and minimizing unnecessary suffering during armed conflict.[3] The incorporation of autonomous decision-making into vital targeting processes prompts the inquiry of whether current IHL standards can adequately regulate AWS, or if further regulatory frameworks are necessary. This inquiry has become particularly urgent as technological progress outstrips legal and policy adaptations, leading to potential accountability voids and humanitarian threats.[4]

This article investigates the adequacy of the existing International Humanitarian Law (IHL) framework in governing Autonomous Weapon Systems (AWS). It employs a doctrinal legal approach, scrutinizing pertinent treaty provisions, customary norms, state practices, and academic discourse. Section 2 delineates the technological advancements of AWS and highlights the initial legal issues linked to their emergence. Section 3 applies fundamental IHL principles to AWS, evaluating both doctrinal and operational obstacles. Section 4 assesses current international regulatory endeavors, including discussions within the UN Convention on Certain Conventional Weapons (CCW) and the varying positions of states. Section 5 concludes by integrating the findings and suggesting measures such as enhancing Article 36 weapons reviews, clarifying interpretive guidance, and advancing regulatory initiatives to guarantee accountability and the protection of civilian in future armed conflicts.

1. The Emergence of Autonomous Weapon Systems: Technological and Legal Overview

The emergence of autonomous weapon systems (AWS) signifies a pivotal point in the progression of warfare. These technologies leverage advancements in artificial intelligence, robotics, and military automation, allowing weapon systems to function with greater autonomy from human control.[5]This section delineates the primary technological features of AWS, explores their historical evolution, assesses their present deployment status, and underscores the preliminary legal challenges they pose under international law.

Artificial intelligence (AI) broadly encompasses the ability of machines to execute tasks that usually necessitate human intelligence such as perception, reasoning, and decision-making.[6] In the context of the military, AI is progressively incorporated into systems for surveillance, target identification, and decision support.[7]A significant distinction is made between automated and autonomous systems. Automated systems operate based on pre-established responses to specific stimuli, while autonomous systems possess the capability to analyze data and make decisions that are contextually relevant, often with minimal or no direct human oversight.[8]

There is currently no universally recognized legal definition for autonomous weapons; however, authoritative organizations have offered working definitions. The United Nations Group of Governmental Experts (GGE) characterizes AWS as systems that, "once activated, can select and engage targets without further human intervention."[9] A central theme in ongoing discussions is the concept of "meaningful human control," which underscores the necessity for humans to maintain sufficient oversight over essential functions related to the application of force, thereby ensuring legal and ethical accountability.[10] Scholars contend that the extent and quality of human participation in decision-making processes will influence whether AWS can align with international humanitarian standards.[11]

1.1 Historical Evolution of Autonomous Weapon Technologies

The rise of AWS is more accurately characterized as a gradual progression rather than an abrupt technological advancement. Initial examples can be traced back to automated defensive systems created during the latter part of the Cold War, including the U.S. Navy's Phalanx Close-In Weapon System and the Israeli Iron Dome, both of which had the ability to autonomously detect and intercept incoming threats.[12] While these systems functioned within limited parameters and required human oversight, they illustrated the potential for swift, machine-driven targeting in high-velocity scenarios.

Beginning in the 1990s, enhancements in computational capabilities, sensor technology, and algorithmic complexity facilitated the creation of increasingly sophisticated unmanned and semi-autonomous systems, notably loitering munitions and armed drones.[13] By the early 2000s, nations like the United States and Israel were actively exploring autonomous target engagement technologies.[14] For instance, Israel's Harpy loitering munitions is capable of autonomously identifying and neutralizing radar emitters without additional human intervention, whereas Russia's Uran-9 ground combat vehicle has showcased limited autonomous functionalities.[15] These advancements hint at the future direction towards fully autonomous systems that can function in contested environments with minimal human supervision.

1.2 Current State of Development and Use

In recent years, the development of AWS has gained momentum owing to the dual-use characteristics of AI technologies. Advances in machine learning, image recognition, and robotics for civilian applications are swiftly being repurposed for military use.[16] Prominent military nations including the United States, China, Russia, Israel, South Korea, and Turkey are making substantial investments to incorporate AI into their command, control, and targeting frameworks as part of extensive modernization initiatives.[17]

While fully autonomous lethal systems have not yet been deployed on a large scale, the technical obstacles are gradually being overcome.[18] Systems exhibiting varying levels of autonomy are already operational for surveillance, target acquisition, and defensive missions.[19] This development has heightened discussions in multilateral platforms such as the Convention on Certain Conventional Weapons (CCW), where nations and experts are addressing the humanitarian, legal, and strategic implications of the growing autonomy in weapon systems.[20]

1.3 Initial Legal Considerations

International law has historically mandated that new weaponry undergo a legal assessment before being deployed. Article 36 of Additional Protocol I to the Geneva Conventions requires states to ascertain whether the use of a new weapon would contravene international law.[21]The application of this obligation to Autonomous Weapons Systems (AWS) presents unique challenges. In contrast to conventional weapons, autonomous systems may exhibit unpredictable behavior due to the intricate and opaque nature of AI algorithms, thereby complicating evaluations of adherence to legal principles such as distinction and proportionality.[22]

The International Committee of the Red Cross (ICRC) and a multitude of legal scholars have underscored that while International Humanitarian Law (IHL) remains technologically neutral, its successful implementation relies on human judgment and accountability factors that AWS could potentially undermine.[23] Some nations assert that current legal frameworks possess sufficient flexibility to accommodate emerging technologies, while others argue that the unprecedented autonomy of these systems necessitates additional norms or even the establishment of new treaties.[24] These discussions highlight why the regulation of AWS has become one of the most urgent challenges in modern international law.

2. APPLYING INTERNATIONAL HUMANITARIAN LAW TO AUTONOMOUS WEAPONS: PRINCIPLES AND CHALLENGES

International Humanitarian Law (IHL) aims to reconcile the demands of military necessity with the need for humanitarian protection in times of armed conflict.[25] The regulations it encompasses are neutral with respect to technology and are applicable irrespective of the weaponry utilized.[26] Nevertheless, the emergence of autonomous weapon systems (AWS) introduces complexities to the practical enforcement of fundamental IHL principles by removing human judgment from essential targeting responsibilities.[27] This section explores four fundamental principles such as distinction,

proportionality, precaution, and accountability, and assesses the ways in which AWS undermine their execution in combat scenarios.

2.1 The principles of distinction

The principle of distinction is fundamental to International Humanitarian Law (IHL), which obliges conflicting parties to consistently differentiate between combatants and civilians, directing their operations solely against legitimate military targets. Article 48 of Additional Protocol I to the Geneva Conventions enshrines this principle, stating that "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."[28] This principle assumes a degree of contextual awareness, situational understanding, and moral judgment that has traditionally been the responsibility of human decision-makers on the battlefield.

However, Autonomous Weapon Systems (AWS) encounter significant challenges in emulating these capabilities. Their target-recognition algorithms depend on sensor data and pre-set parameters that may not adequately address the dynamic and ambiguous nature of actual combat scenarios particularly in cases involving irregular combatants, human shields, or swift civilian movements.[29]As Sharkey points out, "machines cannot reliably distinguish between a combatant picking up a weapon and a civilian running for safety," which underscores the potential for indiscriminate or incorrect targeting.[30] The lack of transparency in many machine learning systems further complicates adherence to these principles, as their internal decision-making mechanisms are frequently opaque and challenging to assess retrospectively.[31]

State practice bolsters these apprehensions. For instance, the Netherlands' Article 36 weapons review highlights that effective human oversight is essential to guarantee adherence to the principle of distinction, emphasizing that Autonomous Weapons Systems (AWS) cannot autonomously meet this obligation given the existing technological landscape.[32] Collectively, these legal documents, expert evaluations, and state practices reinforce the understanding that AWS pose considerable obstacles to the application of the distinction principle as mandated by International Humanitarian Law (IHL).

2.2The Principle of Proportionality

The principle of proportionality serves as a crucial constraint on the conduct of hostilities in accordance with International Humanitarian Law (IHL). It forbids attacks that are anticipated to result in incidental civilian harm deemed excessive when compared to the specific and direct military advantage expected. Article 51(5)(b) of Additional Protocol I enshrines this principle, stating that an attack is considered indiscriminate if it "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."[33] This assessment of proportionality inherently necessitates a context-sensitive evaluation, incorporating legal standards, operational realities, and ethical considerations.[34]

Autonomous Weapon Systems (AWS) encounter significant obstacles in adhering to this principle. In contrast to human combatants, AWS function based on algorithms that analyze sensor data and follow pre-defined decision-making criteria, which means they lack the qualitative capacity to balance civilian harm against the expected military benefit.[35] As Michael Schmitt points out, proportionality assessments involve "value-laden judgments that require human appreciation of context," a capability that current AI systems cannot emulate.[36]Likewise, Scharre highlights that proportionality entails intricate, often ambiguous evaluations such as assessing what constitutes "excessive" collateral damage that remain outside the realm of machine reasoning.[37]

Historical events related to automated defense systems underscore the operational dangers of eliminating human judgment from proportionality evaluations. During the Iraq War in 2003, Patriot missile batteries functioning in semi-autonomous modes mistakenly identified friendly aircraft as enemy threats, leading to the downing of a British Tornado jet and a U.S. Navy F/A-18 Hornet.[38] These incidents were attributed to the systems' inability to accurately differentiate between friend and foe and to properly contextualize battlefield information, highlighting how automated decision-making can result in disproportionate consequences.[39]

Legal experts and institutional representatives have reiterated these apprehensions. The International Committee of the Red Cross (ICRC) has cautioned that "proportionality assessments necessitate distinctly human judgment and cannot be entrusted to machines," emphasizing the risks associated with the use of AWS in rapidly changing environments where civilian casualties may be unpredictable.[40] State practices also demonstrate caution: Article 36 weapons reviews carried out by countries such as the Netherlands and the United Kingdom have stressed that meaningful human oversight is crucial for adherence to proportionality standards.[41]

Collectively, these legal frameworks, operational experiences, and academic evaluations suggest that AWS presently do not possess the ability to reliably perform proportionality assessments as mandated by International Humanitarian Law (IHL). This shortcoming raises significant concerns regarding whether their deployment in intricate combat scenarios can align with the principle of proportionality.

2.3The Principle of Precaution

International Humanitarian Law (IHL) mandates that combatants must undertake all practical measures to reduce incidental harm to civilians and civilian structures.[42] This encompasses the verification of targets, the selection of warfare methods and means that mitigate risks, and the cancellation of attacks if it becomes evident that they would be unlawful.[43]

Autonomous Weapons Systems (AWS) challenge this principle because, once activated, they may function autonomously, thereby limiting the chances for human intervention to alter or terminate attacks in light of new information.[44] Incorporating precautionary actions into autonomous systems would necessitate the anticipation of an almost limitless range of battlefield scenarios, a feat that current AI technology is unable to accomplish.[45]

Moreover, the definition of what is deemed a “feasible” precaution is contingent upon context and is subject to change.[46] If military leaders are unable to fully comprehend or predict the behavior of an autonomous system, their capacity to implement precautionary measures is significantly reduced.[47] This underscores the necessity for thorough Article 36 weapons assessments, strong operational doctrines, and effective human oversight mechanisms to ensure adherence to these principles.[48]

2.4 Accountability and Responsibility

Accountability serves as a fundamental principle of International Humanitarian Law (IHL), ensuring that breaches of the law of armed conflict incur legal repercussions at both individual and state levels. According to Articles 86 and 87 of Additional Protocol I, commanders are required to prevent, suppress, and report violations committed by their subordinates, while states are held accountable for internationally wrongful acts that can be attributed to them.[49] Additionally, the Articles on Responsibility of States for Internationally Wrongful Acts (ARSIWA) stipulate that states are internationally liable for actions attributable to their organs or agents, including armed forces.[50] These

regulations are based on the premise that human actors make decisions and can be legally held accountable for their actions.

The incorporation of Autonomous Weapon Systems (AWS) into military operations complicates these established accountability frameworks. When an autonomous platform carries out an attack that leads to unlawful harm, it may be ambiguous who should be held accountable the commander who deployed the system, the programmer who created its algorithms, the manufacturer, or the state itself.[51]Given that AWS can function with minimal human oversight and may act unpredictably due to intricate machine-learning processes, attributing wrongful conduct becomes both legally and factually problematic.[52]

Scholars have referred to this issue as an "accountability gap." Rebecca Crootof posits that Autonomous Weapons Systems (AWS) introduce unprecedented forms of decision-making that do not align seamlessly with current doctrines of state or individual liability, resulting in potential infractions that are "not clearly attributable to any actor recognized by international law."[53] In a similar vein, Neha Jain argues that the existing command responsibility frameworks were crafted for hierarchical military organizations and are inadequate for addressing the decentralized, algorithm-driven actions of autonomous technologies.[54] These issues are not merely theoretical; they have been consistently highlighted in multilateral discussions.

Discussions within the United Nations Convention on Certain Conventional Weapons (CCW) Group of Governmental Experts (GGE) illustrate a pervasive concern among nations regarding responsibility gaps. Since 2017, various delegations including Austria, Brazil, and Chile have stressed the importance of maintaining human accountability for all applications of force, cautioning that the use of AWS without explicit attribution mechanisms could jeopardize the enforcement of International Humanitarian Law (IHL).[55] Conversely, technologically advanced nations such as the United States and Russia contend that the current legal frameworks are adequate, although they have not specified how responsibility would be determined in intricate situations.[56]

The International Committee of the Red Cross (ICRC) has reiterated these concerns, emphasizing that "the dispersion of roles and functions in the development and use of autonomous weapon systems risks diluting legal accountability, potentially leaving victims without effective remedies."[57]This dispersion undermines both the deterrence and redress functions of International Humanitarian Law (IHL). In the absence of clearly identifiable responsible parties, violations may remain unpunished, thereby eroding the normative strength of humanitarian law and complicating future compliance efforts.

In light of these developments, it is clear that existing accountability mechanisms while theoretically applicable are challenged by the unique operational and technical characteristics of Autonomous Weapon Systems (AWS). The interplay of complex algorithms, unpredictable behaviors, and decentralized decision-making structures generates legal ambiguities that current legal doctrines find difficult to address. This situation highlights the necessity for either interpretive clarification or the establishment of new normative instruments to ensure that accountability remains strong amidst technological advancements.

3. INTERNATIONAL REGULATORY EFFORTS AND DIVERGENT STATE POSITIONS

The swift advancement of Autonomous Weapon Systems (AWS) has sparked significant discussions in multilateral forums concerning the sufficiency of current legal frameworks and the necessity for supplementary regulatory actions. The primary venue for these dialogues has been the United Nations Convention on Certain Conventional Weapons (CCW), which has held specialized expert meetings on AWS since 2014.[58] These gatherings transitioned into a formal Group of Governmental Experts (GGE) in 2016, assigned with the responsibility of analyzing the legal, ethical, and security ramifications of heightened autonomy in weapon systems.[59]

3.1 CCW Process and Guiding Principles

Within the CCW framework, nations have endeavored to elucidate the application of IHL to AWS and to determine the necessity for new legal regulations. In 2019, the GGE endorsed eleven non-binding 'Guiding Principles,' reaffirming the comprehensive applicability of IHL to all weapon systems, the ongoing responsibility of states to ensure compliance, and the imperative of retaining human judgment in the application of force.[60] These principles highlight a foundational consensus regarding legal applicability; however, they do not establish definitive regulatory obligations. Scholars have noted that these guiding principles function more as a political compromise rather than a robust legal framework, leaving numerous critical issues such as the definition of 'meaningful human control' and accountability mechanisms unresolved.[61]

3.2 Divergent National Approaches

Despite a mutual recognition of humanitarian issues, nations continue to be split regarding the suitable regulatory approach. A coalition that includes Austria, Brazil, Chile, Costa Rica, and Mexico has persistently advocated for a legally binding treaty aimed at banning fully autonomous weapons and enforcing stringent regulations on partially autonomous systems.[62] These nations contend that proactive regulation is essential to uphold humanitarian values and avert destabilizing arms races.

A second faction comprising countries such as Germany, France, the Netherlands, and Sweden supports a gradual regulatory framework through political declarations or additional norms instead of an outright prohibition.[63] Their strategy focuses on preserving human oversight while allowing for technological adaptability.

In contrast, technologically advanced military nations including the United States, Russia, China, Israel, and South Korea resist the introduction of new legal frameworks, claiming that current International Humanitarian Law (IHL) offers adequate protections.[64] These countries argue that premature limitations could stifle innovation and jeopardize national security. Nevertheless, they have not elaborated on how existing legal provisions would effectively tackle accountability and proportionality issues associated with Autonomous Weapons Systems (AWS).[65]

3.3Alternative Regulatory Initiatives

Dissatisfaction with the sluggish progress of CCW negotiations has led certain stakeholders to investigate alternative avenues. In 2023, a coalition spearheaded by Austria initiated a political declaration that underscores the importance of transparency, human oversight, and international collaboration in the development and deployment of AWS.[66] Additionally, regional organizations have articulated their positions: the European Parliament has consistently advocated for a prohibition on fully autonomous weapons and has urged the European Union to take a proactive role in establishing global standards,[67] while the African Union has raised concerns regarding civilian protection and accountability, despite the fact that member states possess varying perspectives on the extent of regulation.[68]

Academic analysis indicates that these "multi-track" approaches integrating soft-law mechanisms, political pledges, and regional efforts may gradually influence customary norms and facilitate the establishment of future treaties.[69] This trend is reminiscent of earlier humanitarian disarmament initiatives, such as the Ottawa Treaty that banned anti-personnel mines and the Convention on Cluster Munitions, where normative progress occurred prior to formal legal enactment.[70]

3.4 Structural Obstacles

Despite these endeavors, the advancement towards binding regulations continues to be sluggish. Analysts point to strategic rivalries among leading powers, the consensus-driven decision-making process within the CCW, and varying evaluations of the military significance of AWS as the reasons for this stalemate.[71] Consequently, the existing regulatory void endures, even as technological advancements progress swiftly,

increasing the likelihood that legal and ethical standards will fall behind the actual conditions on the battlefield.

CONCLUSION

This article aimed to investigate whether the existing framework of International Humanitarian Law (IHL) adequately governs the development and deployment of Autonomous Weapon Systems (AWS), In light of the swift advancements in artificial intelligence and robotics. The rise of increasingly autonomous technologies has revolutionized modern warfare, giving rise to intricate legal, ethical, and operational dilemmas.[72] Section 2 outlined the progression of AWS from primitive automated defense systems to modern technologies capable of selecting and engaging targets with minimal human intervention.[73] This technological evolution presents fundamental challenges for legal frameworks that were established with human decision-making in mind, necessitating a reevaluation of the sufficiency of current norms.

The doctrinal analysis employed four fundamental IHL principles such as distinction, proportionality, precaution, and accountability to assess AWS and their adherence to established legal standards. The results indicate systemic challenges in applying these principles to the realm of autonomous decision-making. With respect to distinction, AWS depend on algorithms and sensor data, which restrict their ability to reliably differentiate between combatants and civilians in complex, rapidly evolving situations.[74] In terms of proportionality, their lack of capacity for qualitative moral reasoning and their vulnerability to classification errors pose a considerable risk of excessive incidental harm, as demonstrated by documented targeting failures involving automated systems.[75] The precautionary principle is also under strain, as once deployed, AWS may function beyond real-time human oversight, diminishing commanders' ability to respond to changing battlefield dynamics.[76]

Accountability arguably poses the most substantial legal challenge. Current doctrines regarding command and state responsibility presuppose distinct chains of human agency.[77] In contrast, Autonomous Weapons Systems (AWS) distribute essential functions among designers, programmers, commanders, and autonomous processes, complicating the attribution of wrongful actions. Scholars have characterized this situation as an 'accountability gap,' cautioning that unlawful harm could transpire without a legally identifiable responsible entity.[78] These issues have been consistently highlighted by states and humanitarian organizations during discussions on the Convention on Certain Conventional Weapons (CCW), indicating a widespread acknowledgment that conventional liability frameworks are inadequate for addressing autonomous decision-making.[79]

At the regulatory level, international initiatives have recognized these legal challenges but remain split on the way forward. The CCW Group of Governmental Experts has established guiding principles that reaffirm the applicability of International Humanitarian Law (IHL), yet differing national stances have impeded the formulation of binding regulations.[80] Some nations support preemptive bans, while others favor gradual regulation, and major military powers argue that existing laws are adequate. Concurrent initiatives including Austria's 2023 political declaration and regional statements from the European Union and African Union demonstrate how multi-faceted strategies may slowly influence customary norms despite institutional stalemates.[81] Nevertheless, geopolitical tensions and procedural limitations persist in hindering comprehensive legal advancement.[82]

Collectively, these results reinforce the notion that although International Humanitarian Law (IHL) formally regulates the deployment of Autonomous Weapons Systems (AWS), its practical enforcement is compromised by technological intricacies, operational unpredictability, and institutional resistance. To address these deficiencies, a multifaceted approach involving interpretive, procedural, and regulatory strategies is necessary. Initially, the reviews of weapons under Article 36 should be enhanced to guarantee thorough evaluations of risks associated with autonomy.[83] Subsequently, international expert groups should formulate more explicit interpretive guidance regarding the application of the principles of distinction, proportionality, and precaution in relation to AWS. Lastly, the promotion of regulatory efforts whether through treaties, political declarations, or the gradual evolution of customary law will be vital for ensuring accountability and the protection of civilians in forthcoming conflicts.[84]

In conclusion, the discourse surrounding AWS extends beyond mere technical aspects; it embodies profound inquiries concerning the safeguarding of humanitarian principles and human moral agency amidst armed conflict. As Noel Sharkey warns, entrusting machines with life-and-death choices poses a risk to the ethical underpinnings of the law of war.[85] Therefore, it is imperative to bridge the growing divide between technological advancements and legal oversight to ensure that IHL remains both effective and credible in the twenty-first century.

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