Accountability in Warfare: Navigating the Legal Challenges of Lethal Autonomous Weapons Systems (LAWS) Deployment in Recent Conflict Zones

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction: Research Question & Significance

In the realm of modern warfare, the continuous rise of lethal autonomous weapon systems (LAWS) calls for a vigorous debate that not only involves technological innovation but also invokes international laws and policies. These systems which are capable of selecting and engaging targets without human intervention are reshaping the dynamics of military strategy and raising profound ethical and legal questions. The real-world consequences are vast and immediate, as evidenced by the 2003 invasion of Iraq where the accidental shooting down of two friendly aircraft by the U.S. Army's Patriot air defense system resulted in the tragic loss of three allied service members (Scharre, 2018). This incident, stemming from a combination of a known technical flaw and outdated equipment necessitates a thorough examination of accountability and responsibility within existing legal frameworks. More recently, autonomous weapon systems have been a major topic of discussion as conflicts arise in Ukraine and Gaza leading to a lot of discussions regarding civilian protection in those warzones.

The significance of this inquiry lies in its global implications; as LAWS continue to redefine the conduct of warfare, it is international law that serves as the cornerstone for safeguarding humanitarian standards and ensuring accountability. In this paper, I aim to shed light on the conflict at hand and examine the current landscape of international law governing the use of LAWS and how it might fail to address the gaps that exist in our current understanding. Thus, the research question of this paper is: *How adequate are existing international laws in addressing and preventing civilian casualties when LAWS are employed in modern conflicts, especially in Ukraine?*

Sociotechnical Situation

As warfare technologies evolve, they inherently trigger legal and ethical reassessments. This has been the case from the crossbow to the development of gunpowder and now the emergence of artificial intelligence-driven systems. These systems, known as lethal autonomous weapon systems (LAWS), are capable of operating with varying levels of human oversight. Although autonomous weapons technology is still in its early stages, several militaries and private companies are currently developing and testing weapons with the goal of achieving full autonomy in the near future. For instance, Russia has been performing tests on autonomous tanks on Syrian battlefields while the U.S. has successfully tested swarms of drones, with the UK following suit. Additionally, China has been developing unmanned submarines to carry out kamikaze attacks on enemy vessels (*Autonomous Weapons Market Share, Growth, Analysis by 2030*, 2021).

Key industry players, including BAE Systems, Lockheed Martin, Northrop Grumman, and others, are innovating in areas like armed drones, smart vehicles, and autonomous naval vessels. These technologies allow for operation in high-risk or inaccessible areas, leveraging advancements such as 5G telecommunications. According to the *Autonomous Weapons Market Share, Growth, Analysis by 2030* (2021) economic efficiencies are also undeniable; for example, the operation of an autonomous ship could reduce daily costs from $700,000 to $20,000. These manufacturers often claim precision, efficiency, and reduced risk to human soldiers as key benefits of adopting autonomous systems as they are designed to detect, identify, and engage targets without human intervention, using algorithms that can process data at speeds unattainable by human operators. However, in the disordered reality of warfare, where scenarios are quite unpredictable, the performance of LAWS can diverge significantly from controlled testing environments. For example, the reported deployment of LAWS in conflict zones such as Ukraine underscores the

urgency to address the blurred lines between combatants and civilians and the challenges of attributing accountability for the actions of autonomous systems.

Nations with robust technological industries view LAWS as a continuation of military innovation that supports strategic defense capabilities. In contrast, countries with less developed technological infrastructures may see LAWS as a disruptive force that could destabilize their limited military capabilities. As shown in the table below, there is a significant global disparity in positions concerning the preemptive ban of LAWS, with some nations advocating for a ban due to ethical concerns and others opposing it due to strategic interests. For instance, countries like Austria and Bolivia support a preemptive ban, aligning with a view that emphasizes humanitarian concerns. Meanwhile, powers such as the United States and Russia oppose such a ban, likely considering the strategic advantages and defensive capacities these systems offer ("International Discussions Concerning Lethal Autonomous Weapon Systems," 2021).

Figure 1

Nation Stances on Preemptive LAWS Ban

Support		Oppose[b]	Other[c]
Algeria	Guatemala	Australia	China
Argentina	Holy See	France	
Austria	Iraq	Germany	
Bolivia	Jordan	Israel	
Brazil	Mexico	New Zealand	
Chile	Morocco	Russia	
Colombia	Namibia	South Korea	
Costa Rica	Nicaragua	Spain	
Cuba	Pakistan	Turkey	
Djibouti	Panama	United Kingdom	
Ecuador	Peru	United States	
Egypt[a]	Uganda		
El Salvador	Venezuela		
Ghana[a]	Zimbabwe[a]		

Source: CRS consolidation of data from multiple sources.
Notes: CCW discussions on LAWS exclude existing weapons systems. Therefore, States Parties consider any potential LAWS ban to be preemptive.

a. State is not party to the CCW.
b. States that oppose a preemptive LAWS ban do not necessarily share the same alternative approach to managing LAWS.

Regulatory efforts, spearheaded by various international bodies, aim to create frameworks that can accommodate the unique challenges posed by LAWS. However, achieving consensus is complicated by the contrasting priorities and ethical thresholds of different nations, as well as by the varying interpretations of *jus in bello* (law in war) principles. These principles which are a fundamental part of international humanitarian law (IHL) govern the conduct of armed conflict. It originates from a long tradition of customary law, dating back centuries, and has been formalized in various international treaties and conventions, most notably the Geneva Conventions (*Jus in Bello - Jus Ad Bellum*, 2014). As a result, the need for regulation that encapsulates the rapid pace of technological innovation and respects the principles of human rights warfare is more pressing than ever.

Literature

The dialogue on the regulation of lethal autonomous weapon systems (LAWS) introduces a vigorous debate concerning technology, ethics, and international law. One of the main arguments is advocating for the preemptive alignment of LAWS' development with existing international legal frameworks. This approach is not just about ensuring compliance but also about embedding ethical considerations into the core design of these systems, thereby acknowledging the complex treaties and customary laws that guide their deployment. This could be accomplished by directly programming the conditions of the various treaties into the weapons systems. For instance, if the system is operating in China it would have to first check if the action it is about to perform i.e. launching an attack on a base conforms with any treaties enacted in China. This is much easier said than done because with a variety of international treaties put in place, it becomes quite complex to investigate what regulates lethal weapons let alone autonomous ones. Additionally, even programming these treaties and laws into the different autonomous systems proves to be quite

the challenge as the system must discern between combatants and non-combatants effectively, raising questions about their ability to adhere to the principles of distinction, proportionality, and responsibility that are central to *jus in bello*.

The principles of *jus in bello* serve as the ethical backbone of military conduct within conflicts. The first principle of discrimination requires the distinction between legitimate enemy targets and non-combatants, ensuring that only those actively involved in warfare are engaged. The principle of proportionality evaluates the extent of force used, ensuring that the violence inflicted is in accordance with military objectives and avoids any unnecessary destruction and suffering. Lastly, the principle of responsibility places the moral burden of war actions on those engaged in combat, challenging the notion of blind obedience to commands (*Just War Theory*, n.d.). The table below aims to outline the key regulatory requirements for the use of force with regards to *jus in bello* principles.

Table 2

Regulatory Requirements for the Use of Force by LAWS in Context of Jus in Bello

Requirement	Description	*jus in bello* Principle	Associated Challenges
Built-in Compliance	LAWS must incorporate international law and ethical considerations starting from the design phase.	Distinction, Proportionality	Complexity in translating legal requirements to software code.
Customary International Law	LAWS must adhere to established international customs, regardless of treaty ratification.	Humanity, Military Necessity	Difficulties in discerning applicable norms due to the varied and complex international agreements.
Article 36	States are required to review each new weapon system for	Precautions in Attack	Determining whether LAWS can make

	legality, including the delivery systems.		independent decisions in targeting.
Prohibition of Unnecessary Suffering	Weapons causing unnecessary suffering are banned.	Unnecessary Suffering	Evaluating LAWS for compliance with this prohibition while tracing back why an algorithm misused force.
Autonomous Targeting Decisions	If LAWS are to make autonomous targeting decisions, they must satisfy legal requirements and correctly discern between combatants and civilians.	Precautions in Attack, Distinction	Current technology may not meet these requirements without human oversight.

Alarmingly, 26% of humans killed in Pakistan from drone strikes between 2004 and 2012 were civilians. Those deaths were caused by drones that were operated by humans (Sehrawat, 2017). This failure to distinguish between combatants and non-combatants goes against the standard of distinction specified above; thus, roboticists like Ronald C. Arkin (2010) argue that if autonomous weapon systems are trained effectively such deaths would not occur. These systems have the potential to act more "humanely" on the battlefield potentially eliminating the need for a "shoot-first, ask questions later" attitude. Yet, there is no sufficient data to prove that this is the case indeed. Because of LAWS' reliance on algorithms and real-time complex calculations, however, supporters argue these systems use force more proportionally than a human which can help in reducing overall civilian casualties as well (Krishnan, 2009).

In contrast, University of Notre Dame Professor of Law O'Connell (2023) feels the growing necessity to maintain meaningful human control over LAWS to ensure that the use of force remains within the bounds of international humanitarian law. While algorithms could be

more accurate and respond with a proportional use of force, humans love to control things and, as a result, are more comfortable with another human making a mistake rather than risking the chance that a machine does. The absence of a dedicated treaty on LAWS and the call for international consensus reflect a broader uncertainty and the urgent need for a regulatory framework to reconcile technological innovation's rapid pace with legal obligations.

Theoretical/Conceptual Framework

The theoretical lens through which this research will examine the sociotechnical scenario is Actor-Network Theory (ANT). ANT will provide the structural model for examining the interactions among human actors—military commanders, AI developers, policymakers, soldiers, and operators—and non-human actors, such as autonomous robots, policy documents, and international treaties. This framework will dissect the alignments within the network, revealing the mutual shaping of technology and society.

Within this network, each actor affects and is affected by other actors in the network. Military commanders who act as the authoritative figures here not only make critical decisions about the deployment of autonomous military technology but also influence the direction of its development through their operational needs and feedback. Their decisions cascade through the network, affecting the design parameters that AI developers prioritize, the operational protocols that soldiers would follow in the field, and the regulatory considerations that policymakers must address. Thus, they sit at the top of the hierarchy along with policymakers who play a crucial role in crafting the laws and regulations that both advance and constrain the development and use of AI in military contexts. The policies they create are affected by the technology itself, the strategic objectives of military commanders, and the practical realities faced by soldiers on the ground.

These policies are very much reactive to and shaped by the actions and feedback of the other actors in the network.

AI developers implement not only their technical expertise but also attempt to embed the ethical and legal policies passed by policymakers and governments into the design cycle of the system. The algorithms and decision-making capabilities they program into these systems carry with them some implicit values and norms, which can have far-reaching effects on the operation of these robots and, consequently, on the outcomes in real-world scenarios. Soldiers and operators also play a vital role in the network by bringing in their firsthand experience. Their interactions with any autonomous system provide critical data points that can affirm or challenge the assumptions held by commanders, developers, and policymakers. As a result, they have a hand in the evolution of the technology and the legal frameworks that govern.

Methods

The approach adopted for this research involved an exhaustive review of secondary literature which encompasses scholarly articles, official reports, and international treaty documents. The sources selected were vetted for their relevance to the main themes of the study which include LAWS, international legal frameworks, and various debates regarding the complexities of regulating such technologies. Scholarly articles were primarily sourced from reputable defense and security journals, some reports were drawn from authoritative bodies such as the International Committee of the Red Cross (ICRC) and the United Nations. The existing legal landscape was pulled from documents such as the Geneva Conventions and the Convention on Certain Conventional Weapons (CCW). Case studies, the cornerstone of this research, were meticulously chosen for their empirical data on LAWS usage in conflict zones like Ukraine. These case studies provide concrete examples of LAWS in operation and their real-world implications

on warfare conduct and the legal challenges. Additionally, articles and books written by military officers who have experience in the field with such systems were prioritized to provide more insightful viewpoints. Given the recency of these events, most sources had to be published within the last two years to be more relevant to the issue at hand.

As for the analysis portion of the research, the selected literature was examined through the principles of *jus in bello*—distinction, proportionality, and necessity (*Jus in Bello - Jus Ad Bellum*, 2014). Additionally, ANT was applied as an analytical lens to map the interactions between human and non-human actors within the LAWS network. Sources excluded did not directly address LAWS and only had broader discussions on artificial intelligence without any specific military applications. The research utilized a comprehensive search strategy utilizing databases such as JSTOR, IEEE, and reputable news sources. Keywords for the research included "lethal autonomous weapon systems," "international law," "military AI," "*jus in bello*," and "civilian casualties in Ukraine."

Results & Analysis

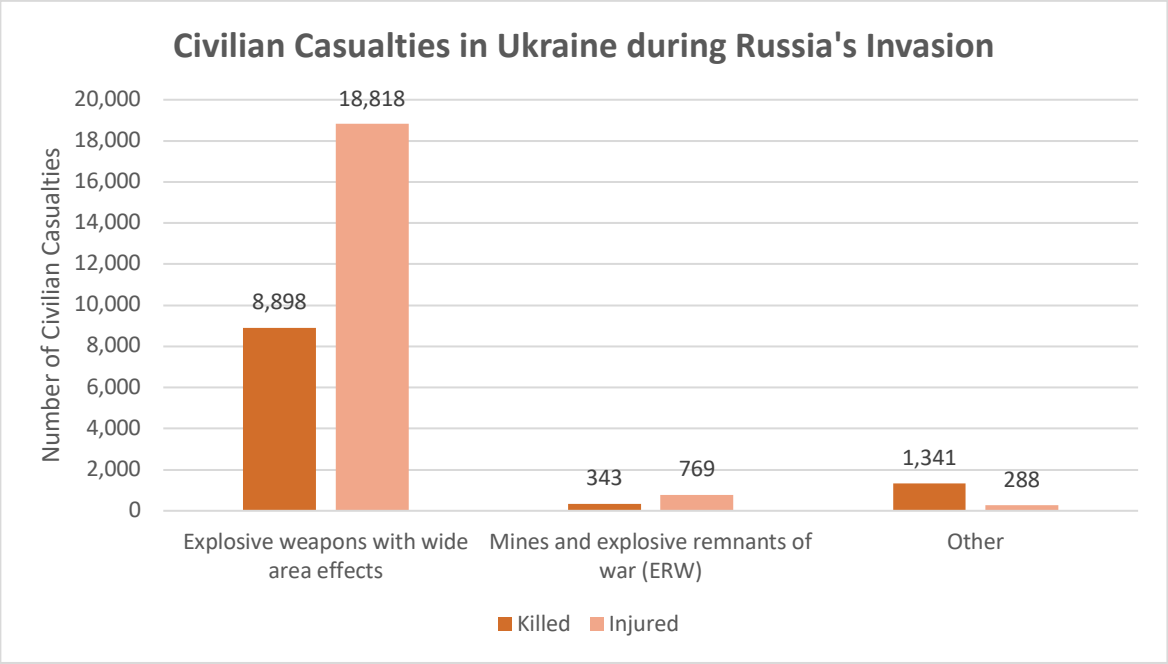
The emergence of autonomous drone use in Ukrainian defense highlights some of the recent significant developments within the realm of LAWS. This mainly comes in the form of the Saker company's drones, a company whose business was initially in drone-based vision systems for crop protection but is now developing autonomous drones for the war effort. According to a Saker spokesperson, these drones have the capability for fully autonomous operation, wherein they can identify and strike targets without any human intervention. Hambling (2023) reports that the Saker Scout has been deployed autonomously, albeit on a limited scale, in situations where radio interference or jamming impedes direct operator control. Additionally, the drones have been carrying out bombing missions; however, it remains unconfirmed whether these missions were

carried out autonomously. The spokesperson acknowledged that their current priority, however, has been the rapid deployment of a functional system capable of saving lives.

The research has also identified a significant gap in data regarding civilian casualties due to LAWS in the ongoing conflict in Ukraine. A broader view of civilian casualties due to different types of weaponry, as shown in the chart below, helps in establishing some context regarding the current situation. The chart categorizes the casualties into those caused by explosive weapons with wide area effects, mines, and explosive remnants of war (ERW), as well as other unspecified means. According to the Office of the High Commissioner for Human Rights (2024), 8,898 have been killed and 18,818 injured due to explosive weapons with wide area effects in addition to other types of weapons. As such, it is imperative to question the role LAWS may have played in exacerbating such numbers. While LAWS is not directly mentioned here, it is known that such systems can carry or deploy explosive weapons capable of wide-area effects as mentioned before. As a result, the legal frameworks that protect civilians during armed conflict must be scrutinized considering these figures.

Figure 2

Civilian Casualties in Ukraine Due to Different Weapons



The Saker Scout drones introduce several complexities in the application of *jus in bello*'s core principles—discrimination, proportionality, and responsibility—within autonomous warfare. The principle of discrimination is fulfilled in this context as the Saker Scouts can recognize 64 types of military targets (Hambling, 2023). When it comes to proportionality, the Saker Scout must have the capability to assess how much damage needs to be inflicted upon a target with regards to their previous actions and the mission at hand. The current regulatory frameworks seem ill-prepared to address how autonomous systems calculate and adapt to the proportionality of their actions in real time, especially when operating without direct human oversight. Lastly, determining where responsibility lies in the case of wrongful death or unintended damage is problematic. The diffusion of accountability—from developers and programmers to military commanders and operators—creates a moral and legal quandary that existing legal standards are also not fully

equipped to resolve. The dynamic nature of combat zones, coupled with the potential for AI misclassification, poses a challenge to the existing frameworks of international law.

The talks at the Convention on Conventional Weapons (CCW) in Geneva, which have been ongoing since May 2014, have been a focal point for the international community's efforts to address the challenges posed by LAWS. However, these discussions have repeatedly failed to yield a substantial outcome. The consensus-based decision-making process utilized by the CCW has been identified as the primary impediment to progress; the requirement for unanimity allows for any single member country to veto proposals, effectively stalling the negotiation of any legally binding instrument (Killer Robots, 2024). As examined earlier, the major military powers are the main culprits in slowing down any progress toward any common ground. The member states of the CCW did, however, reach an agreement on November 17th, 2023, to engage in extended talks over the next two years, with the main aim of developing "a set of elements of an instrument" pertaining to LAWS. It is crucial to note that this agreement does stop short of committing states to the negotiation and adoption of any new CCW protocols (Killer Robots, 2024).

Through the lens of ANT, the Saker Scout's autonomy is a transformative force that redefines traditional military networks. The drone's AI emerges as a pivotal actor that reconfigures the roles and interactions of human operators. The feedback loops and system updates reported by the field operators are indicative of the dynamic and evolving relationship between human agents and technological agents, with each influencing the behavior and development of the other. The CCW is also a reactive part of this network where the ongoing conflicts stress the need for the convention to reach an agreement on regulation policies regarding LAWS due to the events in Ukraine. ANT necessitates a comprehensive mapping of all actors involved in the deployment of LAWS, including those affected by their operation as such the missing data on civilian casualties

illustrates the need for enhanced connectivity and visibility within this network. Furthermore, ANT provides a critical perspective on the challenges faced by existing legal frameworks when confronting the autonomous capabilities of LAWS. As technology progresses, so too must our understanding of the intricate web of relations that define their role in contemporary and future warfare scenarios.

The analysis thus far presents a picture of a world at a crossroads, with the future of warfare hanging in the balance. The ability of the international community to forge a consensus and implement effective regulations on LAWS could very well dictate future military engagements and the preservation of human dignity in combat scenarios. Acknowledging the limitations of this research, it is important to recognize the inherent challenges in examining the rapidly evolving domain of lethal autonomous weapon systems. Firstly, there is the dynamic nature of technological advancement in LAWS that outpaces the creation and implementation of international legal frameworks. This disparity means that with each new day, some of the research findings could become outdated as new developments in technology or incidents emerge. Secondly, the research heavily relies on secondary sources of data, including scholarly articles and international treaty documents so despite these sources being authoritative, they often do not provide the necessary real-time updates in conflict zones like Ukraine. There is also an apparent lack of direct statistical evidence concerning LAWS' errors or misfiring in Ukraine which limits the depth of the analysis.

Conclusion

The continuous rise of lethal autonomous weapon systems (LAWS) represents a transformative shift in the conduct of warfare, imbued with profound ethical complexities and legal challenges. This research served to illuminate the critical gaps in the current international legal frameworks, which are struggling to keep pace with the rapid advancements in military AI

technologies. The socio-technical analysis of LAWS deployment, through the lens of Actor-Network Theory, reveals a complex network of actors whose decisions and design choices carry heavy implications for the future of armed conflict.

The findings of this study implore policymakers, military strategists, and the international legal community to recognize the pressing imperative to recalibrate the preexisting approach to the regulation of LAWS. It has been shown that it is not adequate to just adapt existing treaties and conventions; however, a new, robust set of regulations must be developed that can account for the autonomy and technological sophistication of LAWS. Such frameworks should aim to preserve human dignity and adhere to the principles of *jus in bello*, even amidst the fog of war that LAWS could intensify. The new legal framework should encompass different viewpoints and disciplines to forge a comprehensive understanding of LAWS. Empirical studies focusing on the deployment of LAWS and their real-time decision-making processes are essential as well. The data needs to be publicly available as a sign of transparency and awareness of how these evolving technologies are being used in conflict zones. The situation in Ukraine is still unfolding and the continuous use of LAWS will set the precedent for future wars.

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