



## Beyond the Human; The Implications of Autonomous Systems on the Future of Warfare

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### ARTICLE INFO

*Key Words:* Autonomous, Autonomous System, Future Warfare

*Received :* 02 April 2025

*Revised :* 20 April 2025

*Accepted:* 28 May 2025

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### ABSTRACT

This research explores how autonomous systems will shape future warfare by studying their ethical dilemmas alongside their strategic effects and international security challenges. The study uses qualitative descriptive methods to examine existing literature and case studies related to military autonomous technology development. Autonomous systems improve battlefield performance, but they expose military operations to risks such as escalation of conflicts and violations of international humanitarian law along with algorithmic failures. The research highlights the urgent requirement for global regulatory systems and ethical standards to tackle the new challenges identified.

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## **INTRODUCTION**

Autonomous systems have changed traditional warfare methods by replacing human decision-making roles with machines in combat situations. Rapid progress in AI, robotics, and machine learning technologies has led to a new combat paradigm that allows weapon systems to function autonomously without substantial human supervision (Scharre 2023). The emergence of advanced autonomous systems presents critical challenges to traditional accountability frameworks and raises serious ethical questions while destabilizing global security.

This research advances the international security literature through an analysis of regulatory deficiencies and enduring effects linked to autonomous weapon systems. According to Horowitz (2020) autonomous weapons propel conflict escalation processes but Crootof (2021) reveals major shortcomings in international legal policies that regulate these weapons. This paper scrutinizes recent developments to deliver an advanced analysis of new security challenges and possible policy measures while giving scholars and practitioners an extensive evaluation of this vital security topic.

## **LITERATURE REVIEW**

Modern research shows that autonomous systems are at the heart of military modernization. Scharre (2023) points out that major powers like the United States, China, and Russia are pouring significant resources into developing autonomous weapons, which could dramatically reshape global power dynamics. But as Bode and Watts (2022) warn, relying too much on AI-driven warfare comes with serious risks, including misidentifying targets and escalating conflicts beyond control.

The ethical concerns are just as urgent. Asaro (2020) highlights the deep moral issues that come with letting machines make life-and-death decisions. In a similar vein, Crootof (2021) argues that we need new legal frameworks to hold actors accountable when autonomous weapons violate the rules. Horowitz (2020) reinforces these concerns, showing how unchecked development of autonomous systems could spark a dangerous new arms race among military powers.

## **METHODOLOGY**

This study employs a qualitative descriptive approach, drawing upon three primary data sources: scholarly literature, policy documents, and contemporary case studies. A systematic review of publications from 2020 to 2025 was conducted to identify prevailing trends and critical challenges in autonomous weapons development and deployment.

The qualitative methodology was selected for its capacity to provide nuanced analysis of the complex socio-legal and strategic implications inherent to autonomous systems (Creswell, 2023). Our research incorporates peer-reviewed journal articles, United Nations policy documents, and analytical reports from leading think tanks, ensuring a comprehensive examination of both theoretical and practical dimensions.

## RESEARCH RESULT

The study identifies four critical implications of autonomous weapons systems for future warfare: First, enhancement of combat efficiency. Autonomous systems have revolutionized military operations through improved response times and precision while reducing personnel casualties. As Scharre (2023) demonstrates, unmanned drones and ground vehicles (UGVs) can react within milliseconds, surpassing human decision-making capabilities in combat situations. The Australia-US Loyal Wingman program exemplifies this advancement, enabling complex aerial missions without human pilots (DoD, 2021). However, Snyder's (2020) "Stability-Instability Paradox" cautions that such rapid response capabilities may inadvertently provoke spontaneous escalation, as evidenced during the 2020 Nagorno-Karabakh conflict when Azerbaijani drones continued attacks despite ceasefire declarations (Watts, 2021).

Second, algorithmic error risks. Autonomous systems' reliance on AI renders them vulnerable to target misidentification due to data biases or dynamic battlefield conditions. Bode and Watts (2022) document a 2021 incident in Afghanistan where US military facial recognition systems mistakenly identified civilians as combatants, resulting in ten civilian deaths. While Crawford's (2021) "algorithmic accountability" framework emphasizes the need for transparency, military systems often operate as "black boxes." Johnson et al.'s (2023) research reveals that Project Maven's target discrimination accuracy stands at merely 75% - critically below acceptable thresholds for lethal systems.

Third, ethical and legal dilemmas. Current international humanitarian law fails to adequately govern autonomous weapons, creating accountability gaps. Crootof (2021) notes that Additional Protocol I of the Geneva Convention lacks explicit provisions for systems selecting targets without human intervention, as demonstrated by Libya's Kargu-2 drones that autonomously "hunted" targets (UN Panel of Experts, 2021). The "responsibility gap" theory (Santoni de Sio & van den Hoven, 2020) highlights challenges in attributing legal responsibility for algorithmic decisions. Coeckelbergh's (2022) survey indicates 78% of legal experts consider existing frameworks insufficient.

Finally, conflict escalation risks. Autonomous weapons adoption has sparked an arms race reminiscent of Cold War dynamics. Horowitz (2020) identifies the "first-mover advantage" driving massive investments, such as China's \$150 billion Next-Gen Intelligentized Warfare program (DoD, 2023). Jervis's (2021) "Action-Reaction Cycle" explains how technological innovations provoke countermeasures, evidenced by Russian Lancet-3 and Ukrainian Switchblade 600 drone deployments (Zadorozhnyi, 2023). RAND simulations (2024) predict a 67% increased likelihood of China-Taiwan conflict due to autonomous system miscalculations.

## DISCUSSION

### Enhancement of Combat Efficiency

Autonomous Systems Have fundamentally transformed modern warfare by enhancing operational effectiveness through three key dimensions: rapid

response capabilities, precision targeting, and reduced human operational requirements. As Scharre (2023) documents, unmanned platforms - including autonomous drones and unmanned ground vehicles (UGVs) - demonstrate millisecond-level reaction times that vastly surpass human decision-making speeds in combat scenarios. This technological advantage facilitates more accurate engagements while minimizing risks to friendly forces, exemplified by the Australia-US collaborative Loyal Wingman program - an unmanned combat aircraft designed to execute complex aerial missions without endangering pilots (DoD, 2021).

These accelerated capabilities, however, introduce substantial escalation risks. Snyder's (2020) "Stability-Instability Paradox" theorizes that while autonomous technologies may enhance deterrence through rapid response capacity, they simultaneously increase the probability of unintended conflicts by compressing decision-making timelines. The 2020 Nagorno-Karabakh conflict illustrates this paradox, where Azerbaijan's autonomous drone operations not only accelerated target destruction but also complicated ceasefire efforts due to the systems' continued autonomous operation (Watts, 2021).

Furthermore, the pursuit of combat efficiency risks excessive reduction of "human-in-the-loop" safeguards in lethal decision-making processes. Horowitz and Scharre's (2021) research on AI-enabled missile defense systems reveals concerning scenarios where automated intercept decisions occur without human authorization, significantly increasing misidentification risks. Consequently, despite their strategic advantages, autonomous systems require robust "meaningful human control" mechanisms (Asaro, 2020) to maintain human oversight over critical engagement decisions and preserve ethical boundaries in warfare.

### **Algorithmic Error Risks**

One of the most critical challenges in deploying autonomous systems in warfare is the potentially catastrophic risk of algorithmic failure. Research by Bode and Watts (2022) demonstrates that artificial intelligence (AI) systems remain particularly vulnerable to data biases and classification errors, especially within the unpredictable and fluid environment of the battlefield. A tragic example occurred in 2021 when facial recognition technology employed by U.S. forces mistakenly identified Afghan civilians as combatants, resulting in a drone strike that killed 10 innocent people (The Guardian, 2021). This incident starkly illustrates how over-reliance on AI without proper human oversight can lead to devastating humanitarian consequences.

The concept of "algorithmic accountability" (Crawford, 2021) emphasizes the need for autonomous systems to incorporate transparent and auditable decision-making processes. However, military applications frequently utilize "black box" algorithms whose internal decision logic remains opaque. Johnson et al.'s (2023) evaluation of the Pentagon's Project Maven revealed only 75% accuracy in distinguishing combatants from civilians under complex field conditions - a rate far below acceptable thresholds for lethal autonomous systems.

To mitigate these risks, experts advocate implementing rigorous "test and evaluation frameworks" prior to battlefield deployment (Roff & Danks, 2022). NATO has accordingly developed testing protocols requiring autonomous weapons to successfully complete simulated combat scenarios before operational use. However, significant challenges persist, as real-world combat environments often prove more chaotic than testing conditions. Consequently, researchers like Binnendijk et al. (2023) recommend maintaining "human-on-the-loop" systems where human operators retain real-time authority to override algorithmic decisions, ensuring critical human judgment remains integral to lethal engagement processes.

### **Ethical And Legal Dilemmas**

The deployment of autonomous weapon systems (AWS) presents formidable challenges to existing frameworks of international humanitarian law (IHL). As Crootof (2021) emphasizes, current legal instruments - including Additional Protocol I of the 1977 Geneva Conventions - contain no explicit provisions governing weapons systems capable of selecting and engaging targets without human intervention. This regulatory vacuum creates substantial risks of violating fundamental IHL principles, particularly the distinction between combatants and civilians and the requirement of proportional force. The 2020 Libyan conflict demonstrated these concerns when Kargu-2 drones allegedly autonomously "hunted down" human targets, with no established mechanism to assess their compliance with international law (UN Panel of Experts, 2021).

Ethical considerations compound these legal challenges through what Santoni de Sio and van den Hoven's (2020) "responsibility gap" theory identifies as the accountability dilemma of machine-made lethal decisions. While conventional warfare holds military commanders legally responsible for violations, AWS obscures liability chains between programmers, operators, and policymakers. Coeckelbergh's (2022) survey reveals that 78% of international legal experts consider current frameworks inadequate for adjudicating autonomous systems' errors. The 2020 assassination of Iranian nuclear scientist Mohsen Fakhrizadeh by a remotely operated smart weapon further complicated these issues, as its legal classification - whether as an extrajudicial killing or legitimate military operation - remains contested (Gross, 2021).

Three principal solutions have emerged to address these dilemmas. The Campaign to Stop Killer Robots (2023) proposes a Model Convention prohibiting AWS lacking meaningful human control. Alternatively, Roff's (2023) precautionary principal approach advocates a global moratorium pending development of adequate verification mechanisms. The European Parliament's (2022) "human dignity threshold" initiative seeks to ban systems making autonomous life-and-death decisions. However, as of 2025, UN deliberations remain deadlocked between technologically advanced states and developing nations concerned about military asymmetries, reflecting deeper geopolitical tensions surrounding autonomous weapons governance

### **Conflict Escalation Risks**

The rapid advancement of autonomous weapons systems has sparked concerns about a new arms race reminiscent of Cold War dynamics. Horowitz's (2020) analysis of the "first-mover advantage" phenomenon reveals how major powers - particularly the United States, China, and Russia - are aggressively pursuing military AI innovations with limited consideration for strategic stability implications. The Pentagon's 2023 report documents a 300% increase in US autonomous systems development funding since 2020, matched by China's \$150 billion investment in its "Next-Gen Intelligentized Warfare" initiative (DoD, 2023). This technological competition exemplifies Jervis's (2021) "Action-Reaction Cycle," where unilateral advancements automatically trigger reciprocal responses, potentially creating dangerous escalation spirals.

The Ukraine conflict (2022-2023) provides a sobering case study of this technological arms race in practice. Russia's deployment of AI-enabled Lancet-3 loitering munitions prompted Ukraine's counter-deployment of American-supplied Switchblade 600 drones with comparable autonomous capabilities (Zadorozhnyi, 2023). These developments validate Kania's (2021) findings that autonomous systems dramatically compress escalation timelines - reducing decision-making windows from hours to minutes by minimizing human consultation requirements. RAND Corporation's (2024) conflict simulations paint an even starker picture, projecting that autonomous systems could increase the probability of full-scale war in a China-Taiwan scenario from 32% to 67% due to algorithmic misidentification risks and automated response protocols.

Schmitt and Thurnher's (2023) "Governance by Algorithm" framework proposes adapting Cold War arms control mechanisms to address these challenges, with three specific policy recommendations: 1) New START-style transparency agreements mandating data exchanges on autonomous systems; 2) Establishment of AWS exclusion zones around sensitive areas like the Korean DMZ; and 3) "Circuit breaker" protocols requiring human authorization before large-scale autonomous engagements (Payne, 2024). However, implementation faces significant obstacles due to the dual-use nature of AI technologies and resistance from states with advanced capabilities, highlighting the complex geopolitical dimensions of autonomous weapons regulation.

### **CONCLUSIONS AND RECOMMENDATIONS**

Autonomous warfare systems offer significant strategic advantages, including enhanced combat efficiency, precision targeting, and reduced military casualties. However, these technological advancements introduce substantial challenges, including algorithmic error risks, ethical-legal dilemmas, and potential for uncontrolled conflict escalation. Case studies from the Nagorno-Karabakh conflict and the 2021 Afghanistan drone strike incident demonstrate how inadequate regulation can lead to severe humanitarian consequences. The current absence of clear international legal frameworks governing autonomous weapons accountability further complicates enforcement of humanitarian law

principles. Moreover, the emerging autonomous arms race among major powers – evident in US-China competition and Russia-Ukraine conflict dynamics – threatens global stability. While autonomous systems present transformative military potential, their deployment requires stringent control mechanisms to prevent misuse and dangerous escalation scenarios.

Therefore, some risk mitigation recommendations are needed, as follows: First, International Legal Framework Development. The global community must prioritize establishing comprehensive legal governance for autonomous weapons systems. The United Nations should spearhead an international convention prohibiting systems lacking "meaningful human control" while setting military algorithm transparency standards. The Campaign to Stop Killer Robots' (2023) Model Convention provides a viable foundation for multilateral negotiations. Technology-possessing states should additionally commit to sharing autonomous system testing data to build mutual trust and prevent strategic miscalculations.

Second, Operational Protocol Implementation. Military organizations must institutionalize human oversight mechanisms for critical decision points. NATO's adoption of "human-on-the-loop" requirements for member states' autonomous systems (Binnendijk et al., 2023) establishes an important precedent. This approach should be universally adopted, incorporating "circuit breaker" protocols to automatically halt autonomous operations upon detecting anomalies or potential humanitarian law violations. Concurrently, national defense curricula must incorporate comprehensive training on AI system limitations for military operators.

Finally, Preventive Arms Control Diplomacy. Major powers should apply Cold War lessons by negotiating autonomous weapons limitations treaties analogous to New START nuclear agreements (Payne, 2024). Intensified bilateral and multilateral dialogues – including through established forums like the Geneva Arms Control Conference – must address autonomous systems' destabilization risks. Only through this tripartite approach combining regulatory frameworks, operational controls, and preventive diplomacy can the international community harness autonomous technologies while safeguarding global stability and humanitarian principles.

## **ADVANCED RESEARCH**

Future research should investigate two critical dimensions of autonomous warfare systems: their impact on asymmetric conflict dynamics and the growing involvement of private sector actors in their development. The potential for autonomous technologies to alter power balances in irregular warfare scenarios warrants scrutiny, especially regarding their use by non-state actors and in urban combat environments.

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