The Influence of Suicide Drones on the Nature of Modern Warfare

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Abstract

The Influence of Suicide Drones on the Nature of Modern Warfare provides a comprehensive overview of the significant disruptions caused by suicide drones, also known as loitering munitions, in modern warfare. These unmanned aerial vehicles (UAVs) carry explosives for precision attacks and hover above target zones before striking. This research examines how both state and non-state actors have expanded their use of suicide drones, altered established warfare doctrines, and created new challenges for air-based defence and strategic deterrence. The research combines qualitative content analysis, military reports, open-source intelligence, and specific conflict-based case studies to understand the impact of suicide drones in conflicts such as the Russia-Ukraine war, Hamas-Israel conflicts, and Hezbollah operations. The analysis includes data on drone strikes, casualties, damage statistics, and economic efficiency compared to traditional Air Force systems. The study highlights the legal challenges posed by these drones, particularly concerning International Humanitarian Law (IHL) and the Geneva Conventions. The paper concludes by emphasizing the need for immediate international regulations to prevent the misuse of suicide drones and ensure responsible deployment. Without global governance mechanisms, the unchecked spread of these drones could destabilize international security.

Keywords:
Suicide, drones, loitering munitions, modern warfare, drone technology, Artificial Intelligence.

Introduction

Modern warfare is undergoing a revolutionary transformation with the development of suicide drones, formally known as loitering munitions. These UAVs combine surveillance functions with strike capabilities by delivering explosives and executing target-destructive crashes (Martin, 2023). According to Hecht (2022), suicide drones surpass conventional missile tactics because they maintain presence above combat zones, allowing them to alter their flight patterns and engage

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enemy targets only after reaching optimal advantage points. This unique ability enables suicide drones to excel in contemporary warfare scenarios, particularly in asymmetric conflicts where adversaries utilize technology to address military power imbalances (Karadeniz et al., 2024).
Suicide drones play a crucial role in warfare and are driven by artificial intelligence. Advances in AI and automation have enhanced the autonomous functions of these systems, reducing the need for human oversight. AI-powered drones harness their processing capabilities to analyse vast amounts of battlefield data during combat, identify targets, and make rapid decisions (Molenkamp, Weerdesteijn & Smeulers, 2024). The increased autonomy in combat operations raises ethical and legal accountability concerns due to the lack of human operators. Adhering to international humanitarian law becomes challenging as the decision-making process in the kill chain no longer involves humans (Hamourtziadou, 2024).

This study aims to address the following research questions:

1. What are the strategic advantages of suicide drones in modern warfare?
2. What are the implications of suicide drone proliferation for future conflicts?
3. What ethical and legal considerations surround the use of suicide drones?

The researcher will utilize three main theoretical perspectives to evaluate these issues. According to the Revolution in Military Affairs (RMA) theory, suicide drones are transforming warfare by altering military strategies and tactics while restructuring formal military units. Chaari (2021) found that the Revolution in Military Affairs offers insights into drone warfare, highlighting their capacity for precise strikes and reduced reliance on traditional combat forces (Massicot, 2023). This theory illustrates how drone technology empowers dissatisfied forces to contend with the sophisticated military systems of their adversaries. Suicide drones provide affordable weapon systems for insurgencies and smaller nations to target valuable enemy assets, thereby shifting the military dynamics of conflict (Ambodo et al., 2021). Asymmetric Warfare Theory explains how weaker actors utilize drones to combat stronger militaries, while the ethical and legal issues related to suicide drone deployment are examined through Just War Theory and International Humanitarian Law (IHL). Questions regarding the legitimacy of drone warfare focus on proportionality in use, civilian threats, and legal obligations, creating a demand for international regulations to guide their use.

The paper begins with a literature review of existing research on suicide drones, including additional insights regarding military usage and combat effects. The subsequent section outlines the research approach of this investigation, which merges case studies with qualitative analysis of military reports. This section evaluates the strategic importance, operational capabilities, and challenges posed by suicide drones in operational contexts. The paper concludes by presenting key findings and recommending essential policies to address the risks and benefits of loitering munitions.

Literature Review

Historical Evolution of Suicide Drones

Suicide drones, or loitering munitions, have emerged as a low-cost solution for precision strikes, addressing the drawbacks associated with traditional missiles and manned operations. These systems began to surface at the end of the twentieth century, with the Harpy drone being an earlier model developed in the 1980s to engage and neutralize enemy air defences (Ahmad, Rahim & Aziz, 2024). It was designed to hover over a target area and independently strike radar systems, illustrating the feasibility of integrating aerial surveillance with attack capabilities. This innovation laid the groundwork for the future development of loitering munitions, emphasizing accuracy and functionality.

In contrast to standard missiles that follow set paths, suicide drones can make in-flight adjustments, making them highly effective in dynamic combat situations. Chaari (2021) found that operators can reposition by simply loitering or hovering in their assigned area to better assess changing conditions before executing a strike at the optimal moment. For instance, products like the Switchblade 300, utilized by the United States military, can hover for several minutes prior to executing an accurate strike, thereby minimizing unnecessary harm and enhancing operational success rates.

Advancements in suicide drone technology have also been enabled by improvements in artificial intelligence (AI). Soltys's (2023) study indicates that target recognition algorithms, low and high-level flight automation, and confident decision-making can be achieved with AI, allowing drones to operate and evolve mainly without human intervention. These advancements have improved operational efficiency and introduced new avenues for their application. Consequently, suicide drones have become essential in modern warfare, providing a combination of cost-effectiveness, precision, and adaptability that continues to reshape military strategies and tactics.

Military Strategy and Tactical Evolution

Aqueous Iranian and North Korean producers have perfectly showcased their suicide drone capabilities through continuous applications among various non-state actors. Hamas has conducted multiple successful launches of loitering munitions in recent times, while Hezbollah possesses similar weaponry as part of its arsenal, targeting military installations and equipment. At the frontier between Israel and Hezbollah operates drones for intelligence gathering and launching military attacks against Israel's Defence Forces (Molenkamp, Weerdesteijn & Smeulers, 2024). Hamas utilized suicide drones during its confrontation with Israel. As part of their 2021 conflict tactics, Hamas developed explosive-equipped drones, which allowed them to surpass Israeli defensive measures and strike crucial facilities.

Russia has extensively used Iranian Shahed-136 drones to attack Ukraine's infrastructure, disrupting power grids and supply lines. These drones are a low-cost alternative to expensive missile systems, enabling swarm attacks that overwhelm Ukrainian air defenses (Kim, Park & Lee, 2024). As of 2023, according to data from the RAND Corporation, Russia has launched over 2,000 Shahed-136 drone attacks against Ukraine, targeting critical energy infrastructure and urban centres (Massicot, 2023). Meanwhile, Ukraine has countered with Western-supplied Switchblade drones, targeting Russian command posts and armoured vehicles. The effectiveness of suicide drones in this war underscores their ability to prolong conflicts by allowing both sides to maintain offensive capabilities at lower costs (Kunertova, 2023).

Non-state actors have increasingly embraced suicide drones as a force equalizer. Hamas and Hezbollah have used UAVs to bypass traditional defences and strike Israeli military targets. At the same time, Houthis in Yemen have launched suicide drones against Saudi Arabia and commercial shipping in the Red Sea. Hamas launched over 150 explosive UAVs against Israel in 2021, with a 40% interception rate by the Iron Dome, as seen in the U.N. Autonomous Weapons Report of 2023. The low cost and easy access to drone technology enable these groups to challenge more advanced militaries, fuelling concerns about terrorist organisations acquiring and weaponising UAVs (Molenkamp, Weerdesteijn & Smeulers, 2024).

Suicide drones enable weaker actors to counter superior military forces. Non-state actors and smaller states can neutralize tanks, artillery, and air defences without requiring expensive aircraft or trained pilots (Schmitt, Gibbons-Neff & Ismay, 2022). Using drones in Nagorno-Karabakh and Ukraine demonstrates how they can offset traditional airpower disadvantages. Unlike manned aircraft, drones eliminate the risk to pilots. They can also be deployed in high-risk environments where fighter jets may be vulnerable to air defenses, ensuring persistent surveillance and strike capability in contested airspace (Martin, 2023).

The affordability and accessibility of suicide drones have enabled terrorist organisations to acquire UAV capabilities. Groups like ISIS, Hamas, and Hezbollah have modified commercial drones for attacks, raising global security concerns (Molenkamp, Weerdesteijn & Smeulers, 2024). The black market for drone components has expanded, making regulation difficult. The proliferation of suicide drones blurs traditional lines of accountability in conflicts. Countries like Iran and Turkey provide drones to proxy forces, enabling deniable warfare (Schmitt, Gibbons-Neff & Ismay, 2022). This ambiguity increases the risk of regional escalation and unintended military engagements.

Legal and Ethical Considerations

Previous research highlights the various ethical concerns related to suicide drones, particularly regarding civilian casualties. Among the ethical issues surrounding suicide drones, one that stands

out is the high levels of civilian deaths they often cause. A study by Saeed and Spagat (2021) indicates that these systems are primarily used for surgical strikes, and as we know, in actual combat situations, terrain conditions significantly impact operations. It becomes increasingly challenging to distinguish between combatants and civilians. For instance, suicide drones may be deployed in urban areas or near civilian infrastructure, leading to a high likelihood of civilian casualties. Analysing various conflicts, including the Russia-Ukraine war, shows that drones have targeted infrastructure with dense civilian populations, exacerbating the humanitarian crisis.

The rise of suicide drones raises additional ethical questions regarding the incorporation of AI technology. A study by Hecht (2022) points out that the autonomous operation of drones through AI introduces issues regarding decision-making authority, as the technology is advanced enough to make complex decisions without human oversight. For example, if an AI-driven drone identifies a civilian as a target and kills her, who is held accountable? These concerns are amplified when drones operate autonomously since there is a disconnect between the human operators and the outcomes of their actions. Furthermore, one must consider the psychological effects of suicide drones on both operators and their targets. The lack of direct physical interaction due to drone systems diminishes operators' empathetic responses to their actions, creating ongoing insecurity and unrest among individuals in potential drone-targeted areas. This psychological impact is particularly harmful in prolonged conflicts where drone usage is prevalent.

As a result, the availability and deployment of suicide drones have surged more quickly than the development of international laws to regulate them. The existing laws of armed conflict, such as the Geneva Convention, were not designed to address the unique challenges posed by loitering munitions. Consequently, numerous questions arise regarding their legality, particularly concerning targeting and proportionality (Kunertova & Herzog, 2024). For instance, international humanitarian law mandates that military operations differentiate between active combatants and non-combatants; however, due to the almost autonomous nature of many suicide drones, they may lack the precise decision-making capabilities needed to comply with these principles.

Current efforts to regulate drone warfare have proven ineffective, as proposed regulations often lack mandatory enforcement. International organisations strive to address the legal gaps related to drone warfare, yet none of their initiatives have resulted in enforceable agreements. In 2013, the U.N. Human Rights Council Report urged states to provide greater transparency regarding drone operations, but it contained no provisions for enforcing these requests. During the 2019 Group of Governmental Experts (GGE) on Lethal Autonomous Weapons Systems (LAWS) meeting, discussions on human oversight of autonomous weapons occurred, yet no enforceable agreements materialized. The International Committee of the Red Cross issued recommendations in 2022 to ban autonomous lethal drones, but existing international law still lacks enforceable regulations. Such gaps in legal oversight allow both state and non-state actors to operate suicide drones with

questionable accountability, posing threats to human rights and contributing to unpredictable conflict escalation.

A study by Sangarasivam and Sangarasivam (2021) reveals that this lack of regulation also creates opportunities for exploitation, particularly by non-state actors and certain rogue states. These drones can be produced and launched at a minimal cost, making them easily accessible for both state and non-state entities, including terrorist organisations. Such accessibility raises concerns regarding their potential use in unlawful and brutal ways, such as attacking civilian infrastructure or conducting assassinations that may violate international laws and exacerbate geopolitical tensions. Consequently, no clear framework exists for determining when and how these operations should be conducted. More importantly, there are significant loopholes in accountability for all drone usages. Violations or incidental casualties raise the question of who is responsible: manufacturers, end-users, or commanding officers. A study by Kim et al. (2024) indicates that these accountability gaps hinder efforts to hold responsible parties accountable for their actions and discourage similar conduct in the future.

In traditional military operations, the parties involved in target selection typically include commanders and operational personnel. However, as autonomous drones conduct battlefield operations—analysing environments, identifying targets, and executing unmanned strikes—the boundaries of responsibility become blurred. The deaths of civilians resulting from autonomous drone actions raise critical questions regarding accountability among military commanders, AI developers, states deploying the drones, and their manufacturers. Does a programming error combined with AI misjudgement constitute warfare or a violation of laws? The Geneva Conventions and International Humanitarian Law (IHL) base their targeting procedures on human operators, yet the U.N. Report on Autonomous Weapons (2023) offers evidence contrary to this principle. The increasing automation of drones creates a gap in legal oversight, allowing states and military forces to evade consequences (Kim et al., 2024).

Methodology

Research Approach

The research method combines qualitative analysis of case studies with discourse analysis to investigate the effects of suicide drones during contemporary conflicts. A thorough systematic framework must operate to obtain carefully collected data, properly select cases, and analyse them in order to understand suicide drones' effects on modern conflicts.

Case Selection Criteria

The actual effect of suicide drones emerges from fundamental analysis of recent conflicts such as the Russia-Ukraine War, Armenia-Azerbaijan Conflict, and Hamas vs Hezbollah and Houthi confrontations through media reports (The Maritime Executive, 2024). The conflicts have been

chosen since they are recent in modern warfare. These cases involve both state and non-state actors, showcasing the diverse deployment of suicide drones in asymmetric and conventional warfare. Data Sources

The research applies the PRISMA model for systematic case selection through its defined inclusion and exclusion criteria. It investigates military scenarios where suicide drones created measurable operational effects, situations where their employment altered targeting approaches during conflicts, and situations where drone countermeasures and relevant policy discussions took place. The analysis excludes research that lacks data proof and research about UAVs in general terms that fails to study loitering munitions specifically. The method to select cases specifically focuses research on suicide drones in warfare instead of general drone technology analyses.

Limitations of the Study

This investigation acknowledges constraints that scholars encounter when analysing active conflicts because operational information and classified intelligence remain out of reach. The research builds its total understanding of suicide drone deployments through a mixture of declassified materials along with verified open-source intelligence and eyewitness reports. Case Studies: Suicide Drones in Modern Conflicts

Russia-Ukraine War: Russia's Use of Iranian Shahed-136 Drones

In the Russia-Ukraine war, Russia has extensively utilized Iranian-manufactured Shahed-136 suicide drones to target critical Ukrainian infrastructure. These drones, known for their low cost and high effectiveness, have been instrumental in disrupting Ukraine's power grids, water stations, and transportation networks, causing significant disturbances for the civilian population and defense structures (Kunertova, 2023; Kim, Park & Lee, 2024). The Shahed-136 drones provide Russian forces with enhanced tactical freedom, allowing for reconnaissance and extended over-flight operations over target areas, which has overwhelmed Ukraine's air defense systems despite their modern capabilities (Schmitt, Gibbons-Neff & Ismay, 2022). Ukraine has responded to these drone attacks with Western-supplied defense systems such as the National Advanced Surface-to-Air Missile System (NASAMS) and IRIS-T missile defense systems. While these systems have effectively detected and intercepted individual drones, the sheer volume of simultaneous attacks has strained Ukraine's defensive capabilities (Ben-David, 2021).

The persistent drone assaults have compelled Ukraine to adapt by deploying mobile air defense teams and utilizing electronic warfare tactics to disrupt drone navigation systems. However, the ongoing pressure from Russian drone warfare continues to pose a significant challenge (Kunertova, 2023). Russia's utilization of Shahed-136 drones has not only reshaped the battlefield but has also complicated international diplomatic relations. Iran's role as a supplier of these advanced loitering munitions has drawn scrutiny from NATO and European governments, leading

to additional sanctions and efforts to disrupt drone shipments (Cordesman, 2023). This reliance on foreign drone technology raises questions about Russia's domestic drone production capabilities and whether it will seek to develop more indigenous loitering munitions in response to battlefield demands (Schmitt, Gibbons-Neff & Ismay, 2022). Throughout the Russia-Ukraine war, the Russian military has employed Shahed-136 suicide drones from Iran to conduct strikes against crucial Ukrainian facilities. These kamikaze drones, classified as loitering munitions, serve as a fundamental weapon in its military strategy against Ukraine, targeting energy grids, civilian assets, and logistical networks (Kunertova, 2023).

The cost-effective Shahed-136 drones demonstrate exceptional effectiveness in missions aimed at shutting down power grids and water stations and damaging transportation networks, leading to significant disruption for Ukraine's population and defense structures. Russian forces gain enhanced tactical freedom thanks to the Shahed-136 drones, as these drones possess reconnaissance and attack capabilities and can perform extended over-flight operations over target areas (Kim et al., 2024). These drones maintain a favourable price point, enabling Russian forces to execute extensive raiding operations that exceed Ukraine's conventional defense capabilities while ensuring cost efficiency. Ukraine has implemented the National Advanced Surface-to-Air Missile System (NASAMS) and IRIS-T missile defense systems provided by Western allies to counter the Shahed-136 drone assaults. These aerial defense systems are designed to detect and intercept flying targets such as drones within short to medium ranges. However, the high number of Shahed-136 drones, alongside numerous simultaneous attacks, has overwhelmed Ukraine's operational capacity. Air defenses networks in Ukraine have struggled against the persistent Russian drone warfare tactics, which disrupt their operations despite having modern military capabilities.

Ukraine has shown successful defense against drone threats, with reports indicating continued pressure from large numbers of Russian drone assaults (Schmitt, Gibbons-Neff & Ismay, 2022). The Russia-Ukraine conflict has established suicide drones as revolutionary military weapons that provide state powers with affordability and robust attack capabilities when targeting critical infrastructure with minimal operational risks. The extensive deployment of Iranian-manufactured Shahed-136 suicide drones by the Russian military in the Ukraine war has significantly transformed the battlefield by introducing an effective and relatively inexpensive means of targeting Ukrainian infrastructure (Kunertova, 2023). Classified as loitering munitions, these drones have proven crucial to Russia's strategy of attrition, enabling sustained strikes on key military and civilian targets. Unlike traditional airstrikes that depend on costly aircraft and trained pilots, Shahed-136 drones offer a low-risk, cost-effective alternative, allowing Russia to conduct persistent attacks with minimal resource expenditure.

Non-State Actors: Hamas, Hezbollah, and the Houthis

Hezbollah, a Lebanese militant organisation, has engaged in drone warfare against Israel since it launched its drone program in 2004. The group has enhanced its capabilities to include suicide drone operations targeting Israeli military infrastructure and frontline forces. Hezbollah's strategic use of drones for surveillance and strikes has highlighted the significant threat that non-state actors pose in asymmetric warfare, even against well-equipped forces like Israel (Molenkamp, Weerdesteijn & Smeulers, 2024). The group's reliance on drone warfare reflects a broader transformation in asymmetric warfare, where non-state actors increasingly employ UAVs to challenge the military power of states (Kim et al., 2024).

Hamas' use of drones during the 2021 conflict represented a notable shift in its approach to warfare. By deploying drones in large numbers alongside rocket barrages, Hamas effectively bypassed traditional missile defence systems and targeted sensitive locations. The group's growing use of suicide drones, backed by Iranian technology and expertise, has wider geopolitical implications, challenging Israel's military dominance and raising concerns about further proliferation (Schmitt & Kershner, 2021; Cordesman, 2023). The technological sophistication of Hamas' drone program indicates a shift in its strategy, enabling it to inflict significant damage while minimizing risks to its personnel.

The Houthi movement in Yemen has emerged as a leading example of how non-state actors utilize drone warfare to achieve both strategic military and economic objectives. The group has carried out numerous drone strikes on Saudi Arabian infrastructure, including critical oil refineries, airports, and military bases. The 2019 attack on Saudi Aramco's oil facilities underscored the vulnerabilities of energy infrastructure to drone warfare and demonstrated the capacity of suicide drones to cause severe economic damage (Schmitt, 2020). Supported by Iranian technology and equipment, the Houthis have developed more advanced UAVs capable of executing precision strikes over long distances, posing a significant challenge to Saudi Arabia and its allies (Cordesman, 2023).

U.S. and Israel: Counter-Drone Technologies

The Israeli military now leads in the development of drone interception technology while operating the Iron Dome system, which retains a strong reputation for success in drone protection. The mobile air defense system, Iron Dome, is designed to defend against short-range projectiles, including rockets and artillery shells. Advanced counter-drone technology employed by Israel has successfully intercepted drones from Hamas, although it struggles to keep up with the increasing challenges posed by drone swarms and AI targeting (Ben-David, 2021). To combat drone swarms, Israel uses both electronic jamming systems and kinetic interceptors that actively target the swarms before they can inflict significant destruction.

In response to the growing threat from suicide drones, both the United States and Israel have prioritized the development of counter-drone technologies. These initiatives focus on intercepting and neutralizing UAV threats before they reach critical targets. A study by Martin (2023) indicates that the U.S. military has invested in various counter-drone systems, including the Switchblade 600 loitering munition. This system is designed to intercept enemy drones and provide precise targeting against high-value threats. The Switchblade 600 is both a defensive and offensive tool, capable of neutralizing drone fleets and countering stressed air defense systems. The U.S. has also deployed directed-energy weapons, such as high-powered lasers, to disable drones in mid-flight.
Israel has been at the forefront of counter-drone technology, with the Iron Dome playing a vital role in intercepting UAV threats. Initially designed to protect against short-range rockets and artillery shells, the Iron Dome has been adapted to counter drone attacks. However, the increasing complexity of drone swarms has compelled Israel to develop supplementary countermeasures. These include electronic warfare systems that jam enemy drones' communications and navigation signals, as well as kinetic interceptors that physically destroy incoming UAVs, according to IISS. One of Israel's most recent innovations is incorporating artificial intelligence in air defense networks. AI-driven systems enhance threat detection and response times, enabling more efficient interception of drone swarms (Schmitt, 2023). Integrating AI with missile defense technology marks a crucial step in adapting to the evolving nature of drone warfare. However, as adversaries refine their drone capabilities, countermeasures must consistently evolve to stay ahead of emerging threats.

Discussion and Analysis

Strategic Impact of Suicide Drones (Advantages)

While more traditional terrorists have attempted to employ these systems, it is the non-state actors like Hezbollah and Hamas that have tried to strike military targets that have resulted in the disruption of operations against much more technologically capable enemies such as Israel. Suicide drones are capable of a viable solution for smaller actors in asymmetric conflict situations, when the conventional balance is heavily tipped towards the enemy and when a more minor actor lacks raw firepower. Likewise, smaller states can improve the deterrence of these systems to achieve a similar goal successfully. For instance, states with small or no air forces will deploy suicide drones to threaten enemy installations, vessels, or depots effectively. Therefore, the change in military power dynamics speaks volumes about the importance of loitering munitions in current conflicts. In addition, one should never underestimate the role of a psychological factor connected with the applications of drones, which creates a climate of fear and makes an opponent spend money on countermeasures.

Suicide drones have played a critical role in several conflicts. The Russia-Ukraine war is now setting an example of how suicide drones are redesigning traditional warfare systems. The Russian forces have relied on the Iranian-produced Shahed-136 drones to attack and spice up the movement

of supplies, power and populated areas in Ukraine. These drones, extended range, have been used to target power stations, water systems and means of transportation, threatening the lives of many people and deepening the humanitarian disaster. It has been economical in such a way that Russia has deployed many of them, overloading Ukraine's air defence solutions and thus relocating many of its defence assets from one position to another.

In return, Ukraine has used counter-drone methods such as radar technologies, electronic warfare equipment and short-range air defence missile systems. For example, the NASAMS and IRIS-T systems supplied by the West have played a crucial role in countering the incoming drones. They argued that while low-cost systems are easy to proliferate and challenging to counter, their experience pointed to different prospects: the high number of Shahed-136 launches exposed difficulties in sustaining an effective defence against low-cost, high-velocity threats. This has shifted the focus to the "drone-counter-drone" matrix, underlining that the pro-actors will find ways to overcome con-actors and penetrate defences as the latter will do to create better defences and counter-technologies.

Ethical Dilemmas and AI in Drone Warfare (Challenges and Ethical Considerations)

The use of suicide drones presents several challenges. Due to their ease of access and relatively low acquisition costs, the deployment of suicide drone technology is widespread, raising concerns about misuse by unscrupulous players, including rogue states, non-state actors, and even terrorist organisations. Some key factors that make these weapons simpler to use than traditional military equipment are outlined here: Drones can be constructed or purchased with minimal effort. For example, readily available commercial drones can be easily repurposed into loitering munitions, granting many resource-limited actors access to precision strike capabilities (Molenkamp, Weerdesteijn & Smeulers, 2024).

This proliferation heightens the likelihood that one party will use drones for unlawful or reckless attacks. Eugene noted that Hezbollah has employed suicide drones against military and civilian targets, while Hamas is also recognized for using such drones; this highlights the difficulty in preventing this technology from falling into the wrong hands. Moreover, malign states can utilize suicide drones for espionage operations, targeted killings, or acts of terrorism, exacerbating global security challenges. The use of suicide drones occurs in conflict zones where distinguishing between the parties is challenging. Unfortunately, the overlap of civilian and military structures complicates target identification, leading to problematic outcomes, particularly when drones are intended for precise strikes, which can result in increased civilian casualties (Hamourtziadou, 2024).

Another significant risk is the psychological impact on civilian populations involved in conflict. This paper examines how drone strikes have become a persistent threat that disrupts normalcy,

extends conflicts, and worsens humanitarian crises in affected regions. For instance, during the Russia-Ukraine war, attacks on energy and water infrastructure by Shahed-136 drones left civilians without necessities, such as electricity and water, following the attacks. The absence of specific legal restrictions globally and the norms governing the use of suicide drones contribute to a range of legal and ethical dilemmas. The principles of existing international humanitarian law, including the Geneva Conventions, were established before sophisticated drone systems emerged and do not adequately address the characteristics of loitering munitions. This legal ambiguity stems from privacy laws that fail to clarify the legality of specific UAV operations regarding targeting, proportionality, or accountability (Kunertova & Herzog, 2024).

Deploying AI technologies in drone operations brings significant moral issues that surpass technical and legal concerns. Drone warfare faces a critical challenge as machines now determine life and death matters instead of human military commanders. The data processing capabilities of AI algorithms allow for rapid decision-making. However, these systems lack comprehension of the complexities of warfare or the human moral judgment that a fully aware technician or soldier must possess. AI systems can occasionally misidentify targets and overlook civilians, leading to unintended wartime consequences. Currently, AI systems cannot fully understand human scenarios, which raises ethical dilemmas for international law, as the law seeks to protect civilians while validating and moderating military action proportions (Kim et al., 2024).

International Law and Governance Gaps

International legal frameworks like the Geneva Conventions cannot effectively address the challenges of suicide drones. The existing frameworks were designed for conventional warfare and did not address the complexities of autonomous or semi-autonomous drone systems. This creates significant gaps in legal oversight, making it difficult to hold responsible parties accountable for unlawful drone strikes. Moreover, the lack of enforceable international regulations allows both state and non-state actors to operate suicide drones with minimal accountability. Efforts by international organisations, such as the U.N. Human Rights Council and the International Committee of the Red Cross, have not resulted in binding agreements. This regulatory void enables the misuse of suicide drones, raising threats to human rights and increasing the risk of conflict escalating. The proliferation of suicide drones also blurs traditional lines of accountability in conflicts. The ambiguity in responsibility between state operators, drone manufacturers, and deploying states complicates the prosecution of violations during war crimes. This lack of clear accountability fosters the potential for exploitation by non-state actors and rogue states, further destabilizing global security.

The Future of Drone Warfare: Policy Recommendations

Countries need to purchase next-generation counter-drone technologies while suicide drones and AI-driven attack drones expand across the globe. This includes advancing AI-powered interceptor drones to neutralize enemy UAVs autonomously, enhancing radar and sensor networks to detect

drones at long ranges, deploying electromagnetic pulse (EMP) weapons capable of disabling drone electronics, improving cyber-warfare techniques to hack and take control of enemy drones and developing rapid-response drone defense units for urban and battlefield environments. By focusing on these technological advancements, military forces can stay ahead of the rapidly evolving threats posed by drones. The use of AI in both offense and defense will likely determine the future balance of power in drone warfare.

The use of AI for suicide drone warfare provides military benefits yet comes with serious moral difficulties. Implementing AI for targeting purposes improves operational efficiency, although it creates legal complexity, reduces human control, and extends challenges for accountability systems. AI advancements in combat need immediate global rules because of their transformative effects on military warfare. When operating drones under AI enablement, ethical warfare demands that humans always control operations while drones must follow just war principles, humanitarian law, and AI ethics guidelines. Distinct binding treaties, together with oversight procedures, need to be established because this will prevent drone warfare from developing into an unregulated domain that raises ethical concerns.

Policy and Military Implications (Implications for Future Warfare)

Future Warfare Trends

The proliferation of suicide drones is expected to significantly shape future warfare. Due to their affordability and advanced capabilities, these drones will likely accelerate a global arms race. Countries will invest heavily in offensive and defensive drone technologies to maintain military superiority. This trend will involve major global powers and smaller nations, which can now access sophisticated deterrence tools.

The development of advanced drones could exacerbate regional tensions and conflicts. In areas like the Middle East, the acquisition of sophisticated drone systems by neighbouring countries could lead to an unstable security environment, increasing the likelihood of conflict. Non-state actors, such as Hezbollah and Hamas, have already demonstrated the potential of suicide drones to challenge state military power, raising concerns about the proliferation of drone technology to other militant groups.

Swarm technology represents another significant advancement in drone warfare. Coordinated drone swarms can perform complex missions, attacking multiple targets simultaneously or acting as distractions for more significant attacks. This capability could lead to a radical transformation in military tactics, both in offense and defense. The ability to launch and control large numbers of drones in precision operations underscores the evolving nature of future warfare.

Military Countermeasures

It is important to stress that this arms race is not only involved in the creation of drones. Investment in counter-drone technologies, such as radars, electromagnetic jammers, and directed energy

weapons, is also important. For instance, in the Russia-Ukraine conflict, both parties used several types of drones, a situation that called for the development of countermeasures. Technological development is constant as we have a cycle of attack and defence; however, it also increases the overall expense.

As adopted in future models, organisational learning, advanced sensors, and stealth technologies will also add value to drones. They might allow drones to prosecute their mission unnoticed in extremely hostile airspace—a highly problematic development for ordinary AA systems. These developments might cause another revolution within the system of armed conflicts and increase the role of both unmanned and autonomous systems. Nevertheless, such technologies come with ethical and security concerns. Unmanned aerial vehicles that are self-driven and armed elicit questions about the responsibilities of actions since the drones are programmed to accomplish a mission and do not have operators that can control the decisions of the drones. This raises important questions on violating international humanitarian law and ethical contractual use of artificial intelligence in warfare.

Recommendations for Policymakers

This study recommends the need for international regulations to manage the use and proliferation of suicide drones. Secondly, it stresses the necessity of ethical guidelines and legal frameworks to ensure responsible deployment and prevent misuse by both state and non-state actors. Today, the state must regulate the application of autonomous systems in unmanned aerial vehicles, except for areas, directions, and restrictions related to using fully autonomous targeting systems. Additionally, it calls for transparency and confidence-building measures between states to prevent an arms race an d reduce the risk of unintended escalations. Policies must focus on mitigating the destabilizing effects of drone proliferation. Neighbouring states should establish agreements on weapons control to prevent unrestricted drone races in areas where conflicts are likely to arise. Finally, the paper recommends developing next-generation counter-drone technologies, such as AI-powered interceptor drones, enhanced radar and sensor networks, and electromagnetic pulse (EMP) weapons. The military application of drone warfare will heavily depend on incorporating advanced capabilities consisting of AI systems and swarm functionalities.

Conclusion

The proliferation of suicide drones has significantly altered modern warfare, as demonstrated by their use in the Russia-Ukraine conflict. These drones combine defensive and offensive capabilities, allowing smaller forces to damage well-armed enemies. However, their accessibility and affordability make them appealing to non-state actors and terrorist groups and pose new security challenges. The rapid development of drone technology, including AI and swarming systems advancements, has outpaced current defence mechanisms. This creates a persistent struggle for state governments to develop effective counter-drone technologies, such as radar

systems, laser weapons, and electronic jamming devices. The evolving nature of drone warfare necessitates continuous improvements in defence strategies to address these emerging threats.

To maintain international stability and security, global entities must collaborate on regulating drone warfare. Establishing clear standards and enforcing rules will help prevent the misuse of suicide drones and ensure that their deployment adheres to international legal principles and human rights standards. This collaborative effort is essential to mitigate the risks posed by these advanced technologies. In conclusion, while suicide drones offer significant tactical advantages, their widespread use raises ethical, legal, and security concerns. Addressing these challenges requires a concerted effort from the international community to develop and implement comprehensive regulations and countermeasures. Only through such collaborative efforts can the potential threats posed by suicide drones be effectively managed.

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