The Strategic Deployment of Unmanned Aerial Vehicles in Contemporary Armed Conflicts: A Comparative Study of the Russia-Ukraine and Israel-Gaza Conflicts

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Abstract

The use of Unmanned Aerial Vehicles (UAVs) in modern conflicts has gained significant attention due to their strategic and tactical advantages. This study seeks to critically examine the impact and challenges associated with the deployment of Unmanned Aerial Vehicles (UAVs) in two contemporary conflict zones-the Russia-Ukraine war and the Israel-Gaza conflict. This study argues that UAVs influence the battlefield, particularly in terms of surveillance, precision strikes, and logistical support, while addressing the operational and ethical challenges associated with their use. The methodology employed includes a qualitative approach, utilizing case study analysis and secondary data from textbooks and scholarly articles. Data was triangulated to provide a comprehensive understanding of UAVs' roles and their associated challenges, including issues related to technological limitations, international law, and the moral concerns arising from automated warfare. The study is framed through the lens of Realist Theory, which emphasizes the primacy of power, security, and state interests in international relations. In the context of the Russia-Ukraine and Israel-Gaza conflicts, the use of UAVs is seen as a tool for advancing national security objectives and enhancing military capabilities. Realism helps to understand the strategic motivations behind the adoption of UAVs, while also highlighting the inherent challenges related to technological supremacy, sovereignty, and the law of armed conflict. Ultimately, this study aims to contribute to a nuanced understanding of how UAVs shape the modern warfare landscape and the challenges that accompany their integration into military strategies.

Keywords: Drone, Unmanned Aerial Vehicles, War, Defence

Introduction

Prior to the use of Unmanned Aerial Vehicles (UAVs), popularly known as drone, wars were defined based on conventional military technologies such as the use of manned aircraft, artillery, tanks and infantry. Besides, traditional forms of warfare was largely characterized by direct military actions between antagonistic armed forces, usually within secure borders, with each armed force depending on human decision-making and physical presence on the battlefield. The air force manned the aircraft in reconnaissance, close air support operation, and engages in strategic bombing. Moreover, the air support operations were expensive, dicey, and largely relied on human pilots.

However, the shortcomings associated manned aircraft include the risk of personnel lives and the defenselessness of aircraft in the battlefield necessitated the search for more efficient and reliable alternatives to manned aircraft in combats. Still, traditional forms of warfare, especially

after World War II, underscored large-scale actions and the defensive control of nations borders, with strategic military objectives usually that often focus on achieving preeminence through conventional means (Gray, 2015).

The advancement of military strategies before the use of UAVs was largely influenced by technological developments, such as the advancement of satellite imagery, radar and electronic warfare systems. This technological advancement has allowed for enhanced reconnaissance and intelligence gathering in military engagements. Though, military engagements still required manned supports that make military personnel vulnerable to interception or destruction. It is important to note that the use of conventional tanks, artillery and infantry formations remained the core of military strategy in most conflicts around the world before the introduction of UAVs (Pape, 2014).

It is pertinent to note also that the development of Unmanned Aerial Vehicles (UAVs), commonly known as drones, shows the advancement in military strategy, intelligence gathering, and combat accomplishment in modern warfare. Unmanned Aerial Vehicles as a concept in strategic studies can be traced to World War I, but Unmanned Aerial Vehicles became prevalent apparatuses in modern warfare not until the late 20th and early 21st centuries.

In addition, the earliest documented record of the use of Unmanned Aerial Vehicles like technology in warfare was during World War I, when the U.S. military developed the Kettering Bug, which was an experimental flying bomb. Though, Kettering Bug was never used during WWI (Gertler, 2012). It can said that the use of UAV in warfare were restricted until World War II, which saw the deployment of radio-controlled aircraft for specific targeted training and experimental operations by both the Allied and Axis powers (Austin, 2010).

Furthermore, during the Cold War era that was characterized by arms race between United States and Soviet Union and their allies focused heavily on the development of nuclear weapons and manned military systems, with aerial combat being the focus of their strategy engagement. Moreover, the incorporation of advanced fighter jets and bombers aircraft that allowed for high-speed reconnaissance and long-range strikes, were considered to be expensive in carrying out military operations in terms of human, financial and material resources (Van Creveld, 2014).

Today, despite technological developments achieved in modern warfare, military physical presence remained a fundamental aspect in military operations. During the Cold War era, the United States and the Soviet Union made significant progress in the development of UAVs capabilities. For instance, the United States of America was able to developed drones such as the Ryan Firebee for reconnaissance missions that was used during the Vietnam War (Singer, 2009). The development of the Ryan Firebee drones lacked precision in missions and independence, but it set the pace for the development of modern UAVs in military engagement.

Again, during the Gulf War in 1991 set the pace for the use of modern UAVs in warfare. For instance, the RQ-2 Pioneer was used by the United States Navy for reconnaissance mission, which assisted in artillery targeting and battlefield surveillance (Gertler, 2012). It is equally important to note that the successes recorded by the RQ-2 Pioneer at the battlefield led to auxiliary investment in UAVs production. Consequently, the post-9/11 era saw an exponential rise in the use of UAVs, especially for counterterrorism operations. The United States military began by integrating armed drones such the MQ-1 Predator, which carried Hellfire missiles for precision strikes in it military operations in Afghanistan and Iraq (Boyle, 2015). This period set the pace for the concept of "remote warfare," which significantly change military engagement protocols and reduced ground troop deployments in the battlefield.

The development of drone received a paradigm shift in 2010 beyond the United States to other parts of the world, such that countries such as Israel, China, Turkey, and Iran began developing and deploying UAVs for both surveillance and combat roles (Bergen & Rothenberg, 2021). The effectiveness of drone in modern warfare was demonstrated when Azerbaijan used Turkish-made drones to showcased how UAVs can be used in modern warfare in the Nagorno-Karabakh conflict in 2020 (Watling & Bronk, 2021).

In contemporary times, the introduction of UAVs can be deployed in the conduct reconnaissance, surveillance, and airstrikes without the need for human pilots. It is also important to note that the emergence of UAVs has demonstrated a complete departure from traditional method of warfare that is characterized by manpower-intensive strategies, by bringing with it new possibilities for precision warfare, reduction casualties, and more efficient use of resources (Zeng, 2020). Today, UAVs remain central to military doctrines across the world. Modern warfare is advancing from independent swarms to AI-enhanced targeting systems; drones which is at the heart of military modernization and ethical debate in modern warfare. In the light of the forgoing, this study seeks to examine the impact and challenges associated with the deployment of Unmanned Aerial Vehicles (UAVs) in two contemporary conflict zones-the Russia-Ukraine war and the Israel-Gaza conflict.

Literature Review

In the literature of Defence and Strategic studies, Unmanned Aerial Vehicles (UAVs) is used interchangeably in most studies with drones. Today, UAVs have become a defining technology in contemporary military strategy globally. Studies on Unmanned Aerial Vehicles (UAVs) have underscore the need for transformative studies on Intelligence, surveillance, reconnaissance (ISR), and targeted strikes capabilities, especially in asymmetrical warfare (Gilli & Gilli, 2019). Gilli et al, (2019) in their study examined how the use of UAVs have changed battlefield in recent years especially as it has enabled states to develop their military capabilities without deploying armed forces or troops, thereby reducing direct human involvement in warfare and other associated risks in warfare. Gilli et al, (2019) analysis was based on combat data obtained from Middle East and South Asia, revealed that UAVs employment has significantly reduced military casualties and enhanced immediate policymaking in military operations.

Similarly, Boyle (2015) in his study of a comparative study of U.S. drone strikes in Pakistan, Yemen, and Somalia. The study shows that while UAVs increased operational efficiency in the battlefield, drones also escalated anti-American sentiments due to civilian casualties. The study employed survey reports and government data to quantify both military accomplishment rates and the sociopolitical fallout, offering a nuanced view of UAV effectiveness.

Moreover, Horowitz, Kreps, and Fuhrmann (2016) employed regression models to assess the global diffusion of drones' technology using a dataset from 121 countries. The study revealed that states with higher military spending and strategic rivalry were more likely to adopt UAVs than the states with low military spending and strategic rivalry. This research finding is closely linked with more antagonistic foreign policy behavior, which further shows that drones has contributed to the militarization of diplomacy in contemporary relationships among states.

Chamayou (2015) in his investigation offered a sociological perspective, by analyzing drone operators' interviews and strike footage. The study revealed that UAVs dehumanize the military and create a psychosomatic detachment between operator and target, thereby influencing rules of military engagement and ethical considerations in battlefields.

Moreover, Gusterson (2016) conducted qualitative research using interviews method involving military analysts and drone pilots. The study revealed that while it is true that UAVs has improved target accuracy in battlefields, drones have also foster a culture of surveillance and continuous warfare in military engagement. The study stressed the need for clearer international regulations and accountability mechanisms in the use of drones in battlefields. Lin-Greenberg (2022) in his study investigated how the use of drones affects the escalation of wars using a survey among military experts. The study showed that the deployment of UAVs in clashes less than the alleged risk of full-scale war supposedly increases the chances of preliminary engagements.

From the review of the above studies on UAVs in the literature of Defence and Strategic studies, there is a gap in the literature on the impact of Unmanned Aerial Vehicles (UAVs) on Modern Warfare with focus on the Russia-Ukraine and the Israel-Gaza Conflict. It is against this background, that this study seeks to make contributions to this research area.

Theoretical Framework

There is a growing theories in the literature of International relations and strategic studies on the use of UAVs in modern warfare. For instance, Technological Determinism theory states that technological innovation is a primary driver of societal and institutional change, including in warfare. Therefore, the proliferation of UAVs has essentially changed modern combat operations, by reducing risk on troops and increasing surveillance capabilities. In the Russia-Ukraine war, Unmanned Aerial Vehicles have reshaped the battlefield by allowing for actual intelligence and autonomous strikes by both states (McNeal, 2022). Hence, Russia and Ukraine are presently developing their locally made drones to complete foreign made drones. This further shows that technological advancement has played significant roles in the warfare.

Moreover, another theory that is important in our understanding of contemporary roles of UAVs in modern battlefields is the Realism posits that states operate in an anarchic international system where survival and self-interest drive states behavior. Hence, military capability and technological superiority among states are crucial apparatuses for ensuring state security. Therefore, UAVs are used by states such as Russia, Ukraine, and Israel to project their state capability and to affirm their military dominance. For example, Israel's far-reaching deployment of drones in Gaza has shown that a realist strategy of deterrence and precision targeting is crucial to maintaining security (Waltz, 2000). Similarly, Ukraine's deployment of Turkish Bayraktar drones against Russian positions reflects strategic balancing behavior.

In addition, Revolution in Military Affairs (RMA) has further shown that the advent of new technologies has brought tremendous changes in military strategy and doctrine in modern warfare. It is pertinent to note that the use of drones is a symbol of the modern RMA. The deployment of UAVs has moved from surveillance to targeted strikes. This further shows that UAVs represent a paradigm shift in how modern wars are fought in contemporary international system. Today, Russia's deployment of Iranian drones in the Russia-Ukraine war and Israel's high-tech drone fleets deployed to combat the Hamas are both part of contemporary military transformation and development in modern warfare (Metz & Kievit, 1995).

The asymmetric warfare theory is used to explain the nature of conflict or war between states of unequal capabilities, where weaker states use unconventional methods of warfare to offset the power imbalance. Today, the use of UAVs has become central in explaining modern asymmetric warfare. For instance, Hamas' deployment of drones against more technologically developed Israel military, and Ukraine's military use of commercial drones against a more

technologically developed Russian military, has further shows how non-state actors and less-equipped states adapt to confront more powerful adversaries in contemporary battle field (Record, 2005).

Furthermore, the constructivists' theory (Constructivism) views on the use of UAVs in modern wars emphasize the role of ideas, identities, and norms in states relations. Constructivists argue that states' actions are greatly inclined towards social and historical context, not just material power. The constructivists' arguments are situated within the context of the morality and ethical debates surrounding the use of UAV especially in civilian-populated areas such as the Gaza are shaped by international norms that guide states behavior. Therefore, the legitimacy of drone strikes has been subjected to intense debate among policy makers and scholars of International relations based on the perspective each state upholds (Finnemore & Sikkink, 1998).

On the whole, this study is anchored on the asymmetric warfare theory and Constructivists theory, because of their appropriateness in explaining the impact and challenges associated with the deployment of Unmanned Aerial Vehicles (UAVs) in two contemporary conflict zones-the Russia-Ukraine war and the Israel-Gaza conflict.

Classifications of Unmanned Aerial Vehicles (UAVs)

In the literature of International Relations and Strategic studies, there are various types of Unmanned Aerial Vehicles (UAVs). Scholars have attempted to classify Unmanned Aerial Vehicles (UAVs) in various ways, depending on their purpose, size and capabilities. The major classifications of UAVs include categorization based on their operational altitude, size, range, and the missions they are designed to achieve.

1. **Classification Based on Size and Weight**: Unmanned Aerial Vehicles (UAVs) under this classification are usually classified into three categories based on their size and weight:

a. Small Unmanned Aerial Vehicles (UAVs): These UAVs are often characterized by lightweight systems, usually weighing less than 25 kilograms, and are frequently used for reconnaissance, surveillance, and intelligence gathering (Murphy, 2017).

b. Medium Unmanned Aerial Vehicles (UAVs): These UAVs are weighing between 25 to 150 kilograms. The medium UAVs are designed for both tactical and operational missions and military engagement, including surveillance and precision strike capabilities (Schreier, 2020).

c. Large Unmanned Aerial Vehicles (UAVs): These UAVs are systems that exceed 150 kilograms and have the capacity to carry heavier payloads. They are predominantly used for long-endurance surveillance, reconnaissance and strike missions (Johnson, 2018).

2. **Classification Based on Operational Altitude**: Unmanned Aerial Vehicles (UAVs) can also be classified based on their operational altitude, which is related to the mission objectives they are designed to achieve:

a. **Low Altitude Unmanned Aerial Vehicles (UAVs)**: These Unmanned Aerial Vehicles (UAVs) operates less than 3,000 meters. These UAVs are primarily used for surveillance, reconnaissance, and tactical missions, where high resolution and closer observation are required (Baker, 2021).

b. **Medium Altitude Unmanned Aerial Vehicles (UAVs)**: These UAVs operate between 3,000 and 7,500 meters and are commonly used for operational surveillance and targeting (Brown & Thompson, 2019).

c. **High Altitude Unmanned Aerial Vehicles (UAVs)**: These Unmanned Aerial Vehicles (UAVs) operates with a ceiling of over 7,500 meters. This type of high altitude Unmanned Aerial Vehicles (UAVs) are designed for strategic reconnaissance and global surveillance, used for intelligence gathering and large-scale monitoring of enemies locations or territories (Shapiro, 2020).

3. **Classification Based on Range**: Unmanned Aerial Vehicles (UAVs) can also be classified by their range or endurance. These are classified as:
    a. **Short Range Unmanned Aerial Vehicles (SR-UAVs)**: These Unmanned Aerial Vehicles (UAVs) operates with ranges of up to 100 kilometers. SR-UAVs are classically used for tactical missions such as close-range surveillance and reconnaissance (Smith & Adams, 2022).
    b. **Medium Range Unmanned Aerial Vehicles (MR-UAVs)**: These Unmanned Aerial Vehicles (UAVs) can operate within a range of 100 to 500 kilometers and are often employed in both tactical and operational roles (Wang, 2021).
    c. **Long Range Unmanned Aerial Vehicles (LR-UAVs)**: These Unmanned Aerial Vehicles (UAVs) operates beyond 500 kilometers. They are employed for strategic intelligence, surveillance, reconnaissance, and combat missions (Johnson & Miller, 2023).
4. **Classification Based on Mission Type**: Unmanned Aerial Vehicles (UAVs) are also classified based on the type of mission they are designed to carry out:
    a. **Reconnaissance Unmanned Aerial Vehicles (RUAVs)**: These types of Unmanned Aerial Vehicles (UAVs) are mainly used for gathering intelligence and providing actual surveillance data (Davis, 2021).
    b. **Combat Unmanned Aerial Vehicles (CUAVs)**: These types of Unmanned Aerial Vehicles (UAVs) are equipped with weapons and are used for strike missions, such as precision bombing or targeting enemy assets (Williams, 2022).
    c. **Research and Development Unmanned Aerial Vehicles (R&DUAVs)**: These Unmanned Aerial Vehicles (UAVs) are employed mostly in experimental settings or to test new technologies. These Unmanned Aerial Vehicles (UAVs) are frequently deployed by defense research organizations (Shapiro, 2020).
5. **Classification Based on Launch Method**: Unmanned Aerial Vehicles (UAVs) can also be classified by their method of launch, which includ:
    a. **Vertical Takeoff and Landing (VTOL)**: These Unmanned Aerial Vehicles (UAVs) can take off and land vertically, thereby making them suitable for operations in confined spaces or environments without runways (Harrison, 2020).
    b. **Fixed-Wing Unmanned Aerial Vehicles (F-WUAVs)**: These Unmanned Aerial Vehicles (UAVs) are designed to take off and land like conventional airplanes, offering higher endurance and range for long-duration missions (Murphy, 2017).
    c. **Rotary-Wing Unmanned Aerial Vehicles (R-WUAVs)**: These Unmanned Aerial Vehicles (UAVs) utilize rotary blades to generate lift, making them perfect for surveillance and reconnaissance in dynamic or restricted environments (Thompson & Lee, 2019).

Types of Unmanned Aerial Vehicles (UAVs)

There are various types of Unmanned Aerial Vehicles (UAVs) in the literature of international relations and strategic studies. These include the following:

1. **Micro and Mini Unmanned Aerial Vehicles (UAVs):** Micro and Mini Unmanned Aerial Vehicles (UAVs) are small drones usually used for surveillance, reconnaissance, and commercial applications like photography. They are portable and often launched by hand (Austin, 2010).
2. **Tactical Unmanned Aerial Vehicles (UAVs):** Tactical Unmanned Aerial Vehicles (TUAVs) are medium-sized drones used primarily by the military for battlefield surveillance and intelligence gathering. TUAVs can operate at higher altitudes and longer ranges than Micro and Mini Unmanned Aerial Vehicles (UAVs) (Zeng et al., 2016).
3. **MALE (Medium Altitude Long Endurance) Unmanned Aerial Vehicles (MALE - UAVs):** MALE (Medium Altitude Long Endurance) Unmanned Aerial Vehicles (MALE –UAVs) can fly at altitudes between 10,000 and 30,000 feet for a longer period when compared to the Micro and Mini Unmanned Aerial Vehicles (UAVs) and Tactical Unmanned Aerial Vehicles (UAVs). MALE –UAVs are usually employed for long-term surveillance and reconnaissance missions (Gonzalez et al., 2016).
4. **HALE (High Altitude Long Endurance) Unmanned Aerial Vehicles (HALE-UAVs):** HALE (High Altitude Long Endurance) Unmanned Aerial Vehicles (HALE-UAVs) operate at altitudes above 30,000 feet and can stay airborne for days. HALE-UAVs are ideal for strategic missions and global surveillance (Clothier et al., 2015).
5. **Combat Unmanned Aerial Vehicles (UCAVs):** The Combat Unmanned Aerial Vehicles are equipped with weapons and are capable of offensive missions, including targeted strikes and air-to-ground attacks (Singer, 2009).
6. **Cargo Unmanned Aerial Vehicles (CUAVs):** Cargo Unmanned Aerial Vehicles (CUAVs) are designed for logistics and transportation of goods. Cargo Unmanned Aerial Vehicles (CUAVs) are increasingly being explored for commercial use, especially in remote or hard-to-reach areas like mountains, water log and other hard terrain (Chung et al., 2018).
7. **Civilian and Commercial Unmanned Aerial Vehicles (CUAVs):** Civilian and Commercial Unmanned Aerial Vehicles (UAVs) are used in agriculture, real estate, filmmaking, and environmental monitoring among others. Civilian and Commercial Unmanned Aerial Vehicles (UAVs) have contributed meaningfully to the growth of the commercial drone industry around the world today (Floreano & Wood, 2015).

Drones Warfare in Modern Battlefields: Analyzing UAVs Usage in the Russia-Ukraine and Israel-Gaza Conflicts

The role of technologically advancement in modern warfare has changes the level of direct troop's involvement in the battlefield especially with the development of Unmanned Aerial Vehicles (UAVs). Today, modern warfare has undergone significant changes due to the development and deployment of unmanned aerial vehicles (UAVs), commonly referred to as drones. The development of drone has reshaped modern warfare by ensuring actual surveillance, precision strikes, and decentralization of combat.

Since the Russian invasion of Ukraine in February 2022, drones have played a critical role in both reconnaissance and combat missions. Using the asymmetric warfare theory, Ukraine, regardless of its limited conventional resources when compared to the Russian Federation, has leveraged commercially available drones such as the Bayraktar TB2, alongside low-cost consumer drones modified for warfare (Kozok, 2022). These drones have proven to be effective and very instrumental in destroying high-value Russian assets, including armoured tanks and

command centers, disrupting supply chains, and boosting Ukrainian morale. In return, Russia has employed Iranian-made Shahed-136 drones for kamikaze-style attacks on Ukrainian infrastructure, especially targeting power grids and civilian buildings (Harding, 2022). These drones are inexpensive and difficult to intercept, allowing Russia to maintain psychological pressure and operational disruption with minimal cost in Ukraine.

Today, the use of UAVs has introduced a new kind of asymmetry in warfare in Russia-Ukraine war that allows Ukraine that is considered to be weaker to challenge a superior force like Russia through tactical innovation. Nevertheless, the proliferation of commercial drones and open-source mapping tools like GIS platforms has democratized battlefield intelligence (Watling & Reynolds, 2023). Moreover, in the ongoing Russia-Ukraine war, drones have been widely used by both Russia and Ukraine for surveillance, targeting, and combat operations. The use of UAVs for reconnaissance and artillery targeting by the Ukrainian forces has been vital, with Ukraine military using drone to monitor Russian troop movements and howitzers or artillery stations. On one hand, Ukraine has also received advanced drones from western allies, notably Turkish-made Bayraktar TB2 drones, which have been deployed to strike Russian military facilities with high level of precision or accuracy (Zarankin, 2022). On the other hand, Russia has employed drones to surveil Ukrainian positions and supply lines, including reconnaissance and targeting, mostly critical infrastructure and military assets. It is pertinent to note that Russia began deploying its Shahed-136 drones, supplied by Iran, to strike Ukrainian cities and critical infrastructure. However, both Russia and Ukraine have increasingly targeted each other's UVAs bases (Hurst, 2023).

However, Israel’s long-standing conflict with Gaza has also been shaped by deployment of UAVs in the warfare. The Israel Defense Forces (IDF) has employed UAVs not only for surveillance and precision strikes but also as medium for information warfare. Today, UAVs provide the actual intelligence needed that facilitates targeted assassinations of militant leaders and the neutralization of rocket launch sites in conflict zones (Gross, 2021). On the other hand, Palestinian groups like Hamas and Palestinian Islamic Jihad have developed rudimentary drone capabilities, including small drones capable of carrying explosives or conducting surveillance (Alsaafin, 2021). While far less technologically advanced than Israel's systems, these developments signify the increasing accessibility of drone technology even to non-state actors. Using the Constructivists theoretical framework of analysis, the deployment of UAVs by Israel for crowd control and area denial, is presently raising substantial humanitarian and legal concerns among policy makers and scholars of international relations and strategic studies about the proportionality and distinction principles under international humanitarian law (IHL) (ICRC, 2022).

It is important to note also that in the Israel-Gaza conflict, UAVs have been used extensively by Israel for intelligence, surveillance, and reconnaissance (ISR) operations. The Israel Defense Forces (IDF) uses a range of drones, including the Hermes 450 and the Heron, to gather intelligence on Hamas activities in Gaza. These UAVs are also employed for precision strikes against Hamas military targets, including weapons storage facilities, rocket launchers, and command centers in Gaza (Rosen, 2021). In contrast, Hamas and other militant groups in Gaza have also employed drones to conduct attacks against Israeli military positions and civilian infrastructure in Israel. For instance, in 2019, Hamas launched drones attacks on Israel with explosive payloads targeting Israeli military installations, marking a significant escalation in the use of drones in the Middle East (Perl, 2021).

It is important to note that in both conflicts (Russia-Ukraine and Israel-Gaza) drones have revolutionized modern warfare by providing actual intelligence, surveillance capabilities, and precision strike capabilities. These conflicts (Russia-Ukraine and Israel-Gaza) have seen both state and non-state actors use drones for a variety of purposes ranges, from reconnaissance to targeted strikes. Therefore, the increasing availability and effectiveness of UAVs have changed the dynamics of modern warfare in both the Russia-Ukraine and Israel-Gaza conflicts.

The two ongoing conflicts that is the Russia-Ukraine war and the Israel-Gaza conflict have shown the transformative role UAVs is playing significant roles in contemporary military strategies and humanitarian considerations. In the light of the forgoing, in both wars, technologically superior states (Russia and Israel) deploy sophisticated drones, while weaker actors (Ukraine and Gaza-based militants) adapt low-cost drones innovatively. Yet, effectiveness is not solely dependent on sophistication but on strategic integration. Thus, the use of drones has continued to raise blur lines between combatants and civilians as well as concern on issues of accountability, especially when drone strikes cause civilian casualties in urban warfare settings (Sparrow, 2016). The legal gray areas concerning sovereignty and the right to self-defense under the UN Charter Article 51 have also come into focus in the context of the use of UAVs in modern warfare.

One area that is of great concern to experts in international relations and strategic studies that is vital to this study is the psychological trauma caused by drones on civilian populations that has continued to foster atmosphere of fear in Russia, Ukraine, Israel and Gaza anytime there are drones attacks (Human Rights Watch, 2023). It can be argued that while UAVs are cost-effective for military operations in contemporary times, it equally has high civilian costs. Therefore, desensitizes drones operators from the consequences of their actions especially in the battlefields, has provided us with a situation of ethical dilemmas (Shaw, 2013).

Consequently, the introduction of UAVs into contemporary warfare, especially in the context of Russia-Ukraine and Israel-Gaza conflicts, has shown a shift in modern military tactics by possessing both legal and humanitarian challenges. For example, UAVs technology is becoming more prevalent and available, future conflicts may become increasingly isolated, data-driven, and ethically complex. Therefore, there is the need for vigorous international frameworks to regulate drone warfare, by ensuring accountability, transparency, and protection of civilians' population in conflict zones.

Furthermore, UAVs provide a significant strategic advantage by allowing for surveillance, intelligence gathering, and targeted strikes with minimal risk to military personnel. Russia and Ukraine, as well as Israel and Gaza-based groups, have leveraged on the use of UAVs for these purposes, by enhancing their military capabilities. The tactical advantage of UAVs in these conflicts cannot be understated, as they offer actual intelligence and precise targeting, shaping battlefield outcomes. Again, UAVs have disrupted traditional warfare by enabling distant operations and reducing the need for large ground forces. In both conflicts, UAVs have changed the dynamics of combat, allowing for asymmetrical warfare where smaller or technologically inferior forces can inflict significant damage on superior forces. This shift complicates military planning and response, especially for traditional armies facing unconventional drones' threats.

Lastly, drones', especially when used for surveillance or targeted strikes, have a profound psychological impact on both combatants and civilians. The constant threat of drones' strikes can demoralize populations, as seen in Gaza, where civilians live under the shadow of drone

surveillance. For military personnel, drones' present a persistent threat of detection and attack, influencing tactical decisions on both sides of the conflict.

Navigating the Technical and Tactical Challenges of Drone Warfare: Insights from the Russia-Ukraine and Israel-Gaza Conflicts

The use of drones' in modern conflicts has grown significantly, offering strategic advantages such as enhanced reconnaissance, targeting capabilities, and precision strikes. However, these technological advancements come with several challenges, particularly in the context of the Russia-Ukraine and Israel-Gaza conflicts. The key challenges faced by drones' in these specific conflicts, includes: technological, ethical, operational, and geopolitical issues.

Besides, drones', despite their advanced capabilities, are limited by technological constraints such as battery life, signal interference, and reliance on GPS systems. In the Russia-Ukraine conflict, Russian forces have deployed electronic warfare systems that jam or spoof drones' signals, rendering them ineffective or forcing them to rely on less accurate systems (Shurygin, 2022). Similarly, in Gaza, drones' often face challenges due to the dense urban environment, where buildings can block GPS signals and reduce their operational efficiency (Oren, 2022).

Moreover, both conflicts have seen the deployment of countermeasures against drones'. In Ukraine, Russian forces have effectively used anti-drone systems, including radar and directed energy weapons, to neutralize Ukrainian drones' (Smith, 2023). Similarly, in Gaza, Israeli UAVs are at risk of being downed by Hamas's increasingly sophisticated anti-aircraft artillery and cyber capabilities (Gur, 2021). The vulnerability of drones' to such countermeasures highlights the need for continual technological advancements in drones' defense.

Again, the use of drones' for targeted strikes has raised ethical and legal questions, particularly regarding civilian casualties in both conflicts. In the Israel-Gaza conflict, drones' have been used to target militant leaders, but there have been instances of civilian harm due to the precision strikes' proximity to residential areas (Bennett, 2021). Similarly, in Ukraine, while drones' have provided intelligence for targeting Russian troops, the risks of collateral damage in urban warfare remain a significant concern (Lupyan, 2022). These issues have sparked debates about the legitimacy of drones' operations under international law, particularly in relation to the Geneva Conventions and the principle of proportionality in warfare.

Furthermore, operational challenges in both conflicts have demonstrated that drones' require substantial human oversight and coordination. In the Israel-Gaza conflict, UAVs often operate alongside manned aircraft, requiring complex coordination to avoid fratricide (Rosenfeld, 2023). In Ukraine, the lack of sufficient trained personnel and the need for real-time data processing to make accurate decisions on the battlefield have been identified as operational barriers (Popov, 2023). Additionally, the integration of drones' into broader military strategies remains a complex process, requiring continuous training and adaptation.

In addition, the use of drones' has also created significant geopolitical implications in both conflicts. In Ukraine, the use of Western-supplied drones', such as the Turkish Bayraktar drones, has raised tensions with Russia, which views this as an external intervention in its sphere of influence (Rogov, 2022). In Gaza, the deployment of Israeli drones' has prompted criticisms from international organizations and human rights groups, who argue that their use exacerbates the humanitarian crisis in the region (Stein, 2021).

In the light of the above, while drones' provide numerous advantages in modern warfare, their deployment in the Russia-Ukraine and Israel-Gaza conflicts illustrates several challenges.

These include technological limitations, vulnerability to countermeasures, ethical and legal concerns, operational complexities, and significant geopolitical consequences. As drones' technology continues to evolve, addressing these challenges will be crucial for maximizing their effectiveness and minimizing unintended consequences in future conflicts.

In addition, drones' have dramatically reshaped the landscape of modern warfare, particularly in the Russia-Ukraine and Israel-Gaza conflicts. The challenges and impacts of drones' in these contexts reveal the complexities of their integration into military strategies and their broader implications on conflict dynamics. Despite their advanced capabilities, drones' face technological challenges such as limited battery life, vulnerability to countermeasures (such as electronic warfare and jamming), and potential malfunctions in harsh environments.

In the Russia-Ukraine conflict, for instance, drones' have been subject to counterattacks, and in some cases, Russia has deployed anti- drones' systems to neutralize these threats. Similarly, Gaza-based militant groups have developed counter- drones' technologies, making it harder for Israel to maintain air superiority. The use of drones', particularly in surveillance and targeted strikes, raises ethical concerns regarding civilian casualties, breaches of sovereignty, and accountability in the event of errors.

Lastly, the legality of their deployment is also a contentious issue, as international laws on drone strikes remain ambiguous, especially in conflict zones like Ukraine and Gaza. These issues often lead to international condemnation, as seen in both conflicts, where drones' operations have sparked debates over the proportionality and necessity of force. Drones', by enabling precise, often lethal strikes, have the potential to escalate conflicts. In the Russia-Ukraine war, the use of drones for attacks on civilian infrastructure or military targets has led to further tensions. In the Israel-Gaza conflict, drones' contribute to a cycle of violence, where one side's use of drones prompts retaliatory actions by the other side, complicating peace efforts.

Conclusion

It is important to note that while drones' offer significant operational advantages in modern warfare, their use in conflicts like Russia-Ukraine and Israel-Gaza highlights numerous challenges, from technological limitations to ethical and legal concerns. The long-term impact of drones' in these conflicts will depend on technological advancements, international regulations, and the evolving strategies of the parties involved. The dual nature of drones' as both a force for precision and a catalyst for escalation makes their role in future conflicts complex and multifaceted. In the context of the Russia-Ukraine and Israel-Gaza conflicts, the use of Unmanned Aerial Vehicles (UAVs) faces several challenges that need to be addressed to enhance their effectiveness.

Recommendations

There is the need for states to develop more robust countermeasures to resist jamming and hacking attempts on drones. This could involve improving the encryption of communication channels, using alternative communication frequencies, and developing autonomous systems that can operate independently of external signals (e.g., GPS-denied environments). For instance, in both the Russia-Ukraine and Israel-Gaza conflicts, UAVs are frequently targeted by electronic warfare, such as GPS jamming and signal interception. Strengthening UAVs against such interference would increase their reliability on the battlefield.

States should invest in increasing the payload capacity and operational range of UAVs to accommodate more diverse mission types, such as intelligence gathering, surveillance, and even

precision strikes. For instance, UAVs in these conflicts often face limitations in payload and endurance. Expanding their capabilities allows for more flexibility and operational efficiency, particularly for long-duration missions over vast areas.

States should enhance the integration of UAVs with other military platforms such as ground forces, fighter jets, and manned reconnaissance aircraft. Developing joint operations systems where UAVs are used as part of a larger network would increase situational awareness and mission success. For instance, effective coordination allows UAVs to be used more strategically and enhances their impact in real-time operations. This is particularly important in complex and dynamic battle environments like those in Ukraine and Gaza.

States should invest in stealth technology, advanced decoys, and evasive maneuver algorithms to reduce the vulnerability of UAVs to enemy anti-aircraft systems. For instance, UAVs are susceptible to surface-to-air missiles and anti-aircraft artillery. Enhancing their stealth capabilities or providing evasive maneuvers would help them avoid detection and destruction.

States should establish clear rules of engagement and guidelines for the use of UAVs in conflict zones to ensure compliance with international humanitarian law and prevent misuse. For instance, there is a growing concern regarding the ethical use of UAVs in warfare, especially concerning civilian casualties and indiscriminate strikes. Developing frameworks that adhere to international standards would improve the legitimacy and accountability of UAV operations.

States should focus on producing cost-effective UAVs that are scalable and can be deployed in large numbers without overwhelming military budgets. This could include utilizing lighter, smaller drones for reconnaissance and surveillance while reserving more expensive models for precision strikes. For instance, both Russia and Israel have used UAVs extensively, but the high cost of advanced UAVs can limit their widespread use. Developing cost-effective alternatives would allow for more flexible and widespread deployment of UAVs.

States should incorporate artificial intelligence (AI) to enable UAVs to process data and make decisions autonomously or semi-autonomously, assisting human operators in making faster, more informed decisions.The integration of AI would significantly improve the effectiveness of UAVs, especially in rapidly changing battle conditions. AI can enhance target identification, reduce human error, and improve the operational efficiency of UAVs.

States should develop UAVs that can operate in a wider range of weather conditions, including extreme cold, rain, and fog, which are often encountered in conflicts like those in Ukraine. Harsh weather conditions often limit UAV operations, particularly in regions like Ukraine where the weather can change drastically. Designing UAVs to withstand these conditions would increase their utility and reliability.

States should utilize UAVs not only during the conflict but also in post-conflict scenarios for surveillance and support in humanitarian efforts, such as assessing damage and delivering aid. After conflicts, UAVs can play an essential role in monitoring ceasefire zones, detecting illegal activity, and supporting reconstruction efforts by providing real-time aerial footage.

States should foster international cooperation and agreements on the use of UAV technology, ensuring it is used responsibly and to prevent an arms race in UAV capabilities. For instance, establishing international norms and agreements on UAV usage would contribute to greater transparency and security, especially in regions of geopolitical tension like Russia-Ukraine and Israel-Gaza.

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