Small Drones, Big Limits: A Smarter Drone Strategy

Description

Editorâ??s Note: this article is being republished with the permission of Small Wars Journal as part of a republishing arrangement between IWI and SWJ. The original article was published on 09.22.2025 and is available here.

image

Introduction

Recently, U.S. Secretary of Defense Pete Hegseth signed a memorandum, delivered via quadcopter drone, designed â??*to put legions of small, inexpensive drones into the hands of warfighters who need them*.â?• The decision came weeks after both Ukrainian and Israeli forces launched covert quadcopter attacks against key targets deep within Russia and Iran, respectively. The Pentagon, and the U.S. Army in particular, has doubled down on drones and other robotics in recent months, even placing quadcopter drones and robot dogs front and center during the Armyâ??s 250th birthday parade in Washington, D.C.

Although the United States has long been the world leader in producing high-end drones such as the MQ-9 Reaper, RQ-4 Global Hawk, and MQ-25 Stingray, a recent U.S. Army exercise in Alaska highlights persistent shortcomings in how the Army employs and defends against small quadcopter drones. American-made drones largely failed to perform in Ukraine, with Silicon Valley executives admitting their products were â??fragileâ?• and unable to overcome Russian jamming. Worse yet, many doubt American manufacturers can produce enough drones, especially considering Chinaâ??s dominance of the quadcopter market.

The U.S. Army will likely spend millions, if not billions of dollars, on drones and drone defenses as it aims to achieve domain dominance by 2027. As one analyst put it, â??Everyone wants to win the Armyâ??s big drone contract, get their billion-dollar check and go retire on an island somewhere.â??

Yet while quadcopter and One-Way Attack drones might dominate headlines in Ukraine, their success rests on a unique set of battlefield conditions that may not apply to a future war involving U.S. troops. Although small drones have a place within the U.S. Armyâ??s arsenal, larger conventional weapons

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

systems will likely form the center of ground combat for the foreseeable future. Instead of focusing on offense, the Army should prioritize defense, both in combat zones and on U.S. bases. Officials should also be wary that with dozens of firms seeking access to defense dollars, the absence of a clear procurement vision risks inviting fraud, waste, and abuse.

The Emerging Drone Battlefield

Experts have long warned that the reduced costs and proliferation of drones might allow smaller nations and non-state actors to tilt the playing field against American air power. The past decade has seen no shortage of examples. Islamic State militants used explosive quadcopter drones in Iraq as early as 2016. Less than two years later, assassins used similar devices in a failed attempt on Venezuelan President Nicolas Maduroâ??s life. More recently, Iranian-backed militant groups, including Yemenâ??s Houthis and Iraqâ??s Kataib Hezbollah, have repeatedly attacked U.S. forces in the Middle East with One-Way Attack (OWA) drones, including a recent incident that killed three U.S. service members in Jordan.

However, it was the 2020 war between Armenia and Azerbaijan over Nagorno-Karabakh that served as a true wake-up call for observers. Azerbaijani forces, equipped with Turkish-made Bayraktar drones and Israeli HAROP loitering munitions, routed Armeniaâ??s military in just six weeks. Less than two years later, Ukrainians deployed a slew of drones, including Bayraktars, Switchblades, and quadcopters against the Russian army during the initial campaign against Kyiv. As the war has evolved, experts estimate that drones now account for up to 70% of casualties in Ukraine. As one battlefield commander put it, â??You can hide from artillery, [but drones] are a different kind of nightmare.â?•

Context Matters

Context is critical in understanding the role of drones on these modern battlefields. Although one expert from the Center for Strategic and International Studies acknowledged the role of One-Way Attack drones and loitering munitions in destroying significant amounts of Armenian military equipment during the 2020 Nagorno-Karabakh War, he also stipulated that Armenian air defenses were obsolete, and even then, still managed to down several Azerbaijani drones. The same report also credits a military-wide modernization system for Azerbaijanâ??s victory. Additionally, although Azerbaijan initially used drones during the beginning of the conflict, many of these were used to destroy air defense systems, allowing manned aircraft to operate with impunity. Finally, the report also notes that Armenia contributed to its own defeat through its lackluster performance and obsolete equipment. Although the importance of OWA drones is certainly evident, conventional manned systems still played

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

a decisive role.

Extensive drone use during the Russia-Ukraine War also stems from several unique circumstances. First, despite over three years of fighting, neither side has achieved air superiority. Manned fighter aircraft play a relatively minor role in the conflict compared to U.S. operations, so drones assume a role usually reserved for larger, manned aircraft equipped with more powerful munitions. Second, although many commentators are quick to note that drones cause approximately 70% battlefield casualties today, some experts attribute this less to a revolution in warfare and more to the shortages of artillery ammunition and attrition of howitzers within the Ukrainian forces. Finally, Russiaâ??s use of larger OWA drones, such as the Iranian-made Shahed-136, likely emerged due to Ukrainian attacks on the Black Sea Fleet, hampering Russiaâ??s ability to launch more sophisticated Kalibr cruise missiles. Even then, Ukrainian air defenses have still managed to destroy the majority of Russiaâ??s Shaheds, which travel at one-third the speed and have less than one-tenth the payload of a World War II-era German â??Buzz Bombâ?•. Indeed, for many smaller countries and non-state actors, drones are a stopgap solution, compensating for financial constraints, personnel shortages, or the attrition of more capable platforms.

Small Drones, Big Limitations

Jakub Jajcay, a former Slovak Army officer who recently spent six months volunteering as a drone operator with the Ukrainian military in Donbass, wrote about his experience using First-Person View (FPV) drones in an article titled, â??I Fought in Ukraine and Hereâ??s Why FPV Drones Kind of Suckâ?• The author laid out serious limitations inherent to the current generation of FPV drones. These devices are usually quadcopters, often armed with explosive devices. A camera transmits first-person aerial video back to its controller, who either drops a munition or flies the drone into the target kamikaze-style. Ukrainian officials believe these drones are responsible for the majority of casualties on the battlefield.

For context, although American-made drones can be highly capable, often with night vision cameras and global positioning systems (GPS) receivers, they can be very expensive. A complete system for the handheld sailplane Raven drone, consisting of three air vehicles, two ground control stations, and other accessories, costs the U.S. government nearly a quarter of a million dollars. The Black Hornet, a ten-inch-long helicopter equipped with infrared cameras and GPS guidance, sells for almost $200,000 per system, according to publicly available sources (the company would not return a request for pricing information). This cost could not only discourage wide-scale procurement, but also make commanders reluctant to train with expensive systems that could be lost or result in an extensive investigation.

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

The recent Pentagon memorandum urges the services to procure large numbers of cheap drones. Unfortunately, cheap drones are, by nature, cheap. Jajcay estimates in his article that nearly 20% of Ukraineâ??s FPV drones failed to take off due to technical or mechanical problems, while others failed in flight or upon detonation. Ukraineâ??s inexpensive FPV drones generally lack the features of higher-end American drones. For instance, most do not come equipped with night vision cameras, rendering them ineffective for 8 to 12 hours each day. Many also lack GPS receivers for moving-map displays, forcing operators to navigate either by memory or with paper maps. This approach might work well for an army fighting on its soil and in static front lines, but itâ??s less of a viable solution for an army advancing into enemy territory.

Jamming from both sides further limits FPV drone employment. Jajcay estimates that FPV drones could only fly during a few short windows per day. With a limited number of radio frequencies available, commanders often compete to launch and control their own drones. Jajcay estimated nearly 30% of Ukrainian drone sorties failed due to Russian jamming, while Ukrainian jammers precluded their own drone operations for significant portions of the day. Terrain, weather, and obstacles often interfere with a droneâ??s radio signal, making them challenging to operate, especially in hilly terrain or at very low altitudes, such as when they are close to their target. Ukraineâ??s well-publicized FPV drone attack on Russian bomber bases succeeded partly because Russia did not have jammers emplaced.

Recently, both sides have begun equipping FPV drones with fiber-optic cables to circumvent jamming. This improves control, video quality, and range (reportedly up to 40 kilometers). However, the cable limits a droneâ??s maneuverability and makes drones susceptible to, of all things, having their cable cut by a pair of scissors. Some Ukrainian commanders report a two-month waiting list for fiber optic cable, while Russia likely procures its cable from Chinese companies.

FPVs still require trained human operators. Jajcay noted it takes about five weeks to train a drone operator, and current technology allows them to control only one aerial vehicle at a time. Both Russia and Ukraine have experimented with using machine learning and artificial intelligence to help drones navigate, designate, and attack targets. However, fully autonomous systems are likely years away, according to an analysis from the Institute for the Study of War. Indeed, machine learning and AI-programmed drones will likely struggle to tell friend from foe in a variety of situations. For instance, armies may use similar equipment, as Russia and Ukraine do. Combatants may also install unusual modifications such as anti-drone canopies or construct unconventional vehicles, making it difficult for AI and Machine Learning technology to properly identify targets. Finally, many non-state actors use commercial pickup trucks, most famously the Toyota Hilux, as armed â??technicals,â?• further blurring the distinction between combatants and non-combatants.

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

Finally, FPV drones are relatively slow and carry smaller payloads than manned aircraft and artillery. Conventional weapons, including mortars and artillery, also conduct strikes faster than quadcopters and can do so unconstrained by jamming, poor weather, or nighttime conditions. These constraints suggest that the prevalence of drones in the Russia-Ukraine War is the product of specific conditions.

U.S. Army Drone Challenges

The U.S. Army will face its own challenges in implementing drones. With so much money at stake, and with promises to achieve â??domain dominanceâ?• in the next two years, the potential for fraud, waste, and abuse is real. In the rush to buy drones, the Army must fight the temptation to purchase everything and anything it can get its hands on, especially considering that few, if any, American manufacturers can keep up with demand. A piecemeal approach to procurement could lead to dozens of drone models, each with differing parts and control mechanisms, especially if the Pentagon goes forward with its plan to allow local commanders to either procure them off the commercial market or 3D print them. Manufacturers have little incentive to standardize controls and interfaces, which could mean an operator trained on one model might be unable to fly another. Additionally, it could compound efforts to repair or procure spare parts for a large, diverse fleet of small systems.

Of course, there is no one-size-fits-all requirement for battlefield drones. Some drones may be used for long-term surveillance, others for strike roles. Nevertheless, each acquisition will force the Army to choose between costs and capability. The recent M-10 Booker light tank program is a cautionary tale. Initially envisioned as a light, air-droppable tank to support troops, the Booker gained weight through â??requirements creepâ?• until it hit 38 tons â?? too heavy to drop from the air or cross bridges, but too thinly-armored to go toe-to-toe with main battle tanks.

FPV drones face a similar dilemma. Too cheap, and they might be prone to failure or be ineffective on the battlefield. Too expensive, and the Army may hesitate to buy them in quantity, let alone treat them as disposable. Commanders may also avoid training with costly systems for fear of losing them, triggering investigations, or even forcing soldiers to reimburse the loss.

Another challenge is preventing swarms of small quadcopters from colliding with manned aircraft. Proponents might envision each squad leader launching a drone on demand to peek over a hill or to attack a tank. This runs counter to the careful coordination needed to prevent fatal conflicts between fighter jets, helicopters, artillery, missiles, paratroopers, bombs, and drones. Cheap drones without critical safety features, especially explosive ones, could be just as hazardous to friendly forces as they are to the enemy. Jamming could disrupt not only drone controls but also radio communications with manned aircraft, a hazard difficult to replicate during stateside training. One collision could force the Army to rethink mass drone integration dramatically.

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

Finally, the Army must avoid prematurely cutting existing programs and force structure on the assumption that drones will fully replace legacy systems. While drones may eventually perform reconnaissance, strike, transport, and even medical evacuation, removing current capabilities without tested replacements is risky.

Some analysts have compared the rise of drones with that of the aircraft carrier during Pearl Harbor, which eventually made the battleship obsolete. But perhaps a more relevant analogy comes from a Washington Post article (some language slightly edited):

â??Tanks charged dug-in infantrymen on a far-flung battlefield. Forty of the 50 tanks were knocked out, thanks to a cheap, inexpensive weapons system. That engagement, and others like it, inspired many military commentators around the world to declare the tank as dead as the cavalry horse. These cheap new weapons, they said, have returned the military advantage to the defense. But U.S. Army leaders are now making a life and death bet that these commentators are wrong. They are spending more money than ever before on a new tank; experimenting with a new type of armored division built around it, making the tank the deadliest weapon on the battlefield. Army leaders conceded in a series of interviews that the war demonstrated that an infantry armed with a smart weapon could knock out a tank almost as easily as a rifleman could shoot the horse out from under the cavalryman.â?•

The article was written in 1977, and the new weapon was the AT-3 Sagger anti-tank missile, which destroyed dozens of Israeli tanks during the 1973 Yom Kippur War. But while these weapons certainly posed a threat to armored vehicles, the Commander of U.S. Army Training and Doctrine Command, Gen. Donn A. Starry, made a comment which may very well echo the emergence of drones in the 21st Century:

â??One of the great lessons of that war is that there is no single system thatâ??s going to dominate the modern battlefield. Winning requires a combination of well-trained armor, infantry, artillery, and aircraft. If you get away from the concept of a combined arms team, youâ??re liable to get yourself in trouble.â?•

Drone Defense

Although the Army is right to focus on drone offense, it must focus more attention on drone defense. To use an analogy, FPV drones are to warfare what ChatGPT is to education. Large Language Models can turn a 95% paper into a 100% paper â?? but only with significant input, and even then, youâ??ll need a 95% paper to begin with. Where ChatGPT excels, however, is by allowing a mediocre student to turn a 0% paper into a 70% paper within seconds. Leaving aside the obvious ethical issues, the latter approach provides the best product given a studentâ??s skill level and time investment.

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

Similarly, while quadcopter drones might provide the Army with an advantage, they give mid-tier powers and non-state actors a much more significant boost. Quadcopter attacks in Russia and Iran have alarmed Defense officials, as have mysterious sightings near U.S. military bases. The military has struggled to defend against small drones both in combat and over domestic installations.

The recent Alaska exercise shows that even after nearly a decade of facing adversary FPV drones, U.S. troops still face challenges in jamming and shooting them down. One drone operator reportedly hovered ten feet overhead, carrying a jar of strawberry jam to mock defenders. More recently, the military news site *Task and Purpose* called a recent field manualâ??s recommendation for tank crews to shoot down drones with specialized buckshot-style rounds from their main cannons â??a bit optimistic.â?•

The fight against quadcopters mirrors the fight against improvised explosive devices (IEDs) in Iraq. There was no single solution. The U.S. combined proactive measures, like jammers and aerial reconnaissance, with reactive ones, like heavily armored vehicles. Insurgents adapted, using â??pressure plateâ?• IEDs immune to jammers, much as both Russia and Ukraine use fiber-optic drones today to avoid radio interference.

Jammers will be part of the answer, but they must be light and portable enough for infantry to carry on long missions. A soldierâ??s average combat load has skyrocketed since the early 2000s. Every pound dedicated to jamming devices must come at the expense of some other piece of equipment. Additionally, the Army must recognize that jammers, while effective at combating enemy quadcopter drones, may also interfere with the use of friendly drones and radio communications. Additional proactive solutions might also include the anti-drone canopies currently seen on vehicles from both sides of the Russia-Ukraine War, or even simple fishing nets, as Ukraine employs.

Similarly, reactive solutions should not only be light and portable enough for the average soldier, but they should also be unobtrusive enough not to take away from an infantry soldierâ??s standard fighting power. Specialized anti-drone weapons might be effective against drones, but they are a single-use device. A recently designed smart scope intended to help Marines shoot moving targets might be an ideal solution, as it is light enough to attach to a rifle and does not interfere with the weaponâ??s primary use.

Larger one-way attack (OWA) drones, such as the Shahed 136, have become a mainstay for Russian and Iranian forces. These weapons are undoubtedly responsible for hundreds of deaths; however, they are by no means unstoppable. Although Russia launched record numbers of Shahed drones in July 2025, Ukraine still managed an interception rate of approximately 89%. Similarly, fighter jets and air defense systems from the U.S., Israel, and other nations shot down all 170 Shahed drones launched

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

by Iran against Israel in April 2024. Current OWA drones are slow, unmaneuverable, and non-stealthy, roughly equivalent in size and speed to a World War II-era target drone. Although many are rightly concerned about the use of expensive interceptor missiles against $50,000 OWA drones, Ukraine has had success countering Shaheds with weapons ranging from the 1970s-era German Gepard flak gun system to its home-grown interceptor drones.

Stateside base defense, however, presents a different challenge. Many U.S. military bases are the size of large cities, making them difficult to defend for an extended period. The Pentagon also has little legal authority to disable or shoot down drones that overfly U.S. bases. Recently introduced legislation could allow private citizens to bring down drones with legally purchased shotguns; however, this bill has remained stalled in a subcommittee for at least five months. Jammers, while effective, might prove politically unpopular should they interfere with civilian radio or other telecommunications traffic. A recent RAND Corporation exercise suggests that defeating drones domestically requires treating this new threat like any other form of terrorism â?? as a law enforcement problem. Even then, the exercise found several gaps among U.S. government agencies as they tried to detect and disrupt any hostile drone activity before it started.

Conclusion

Army leaders face a daunting task in predicting the future of war. As former Secretary of Defense Robert Gates fondly noted about the militaryâ??s ability to identify its next major engagement, â??Our record has been perfect. We have never once gotten it right.â?•

The Army faced a similar challenge in the 1950s. The Soviet Union detonated its first nuclear weapon in 1949. Five years later, President Dwight D. Eisenhowerâ??s â??New Lookâ?• defense program envisioned considerable cuts to the Armyâ??s role, instead relying on air and sea power â?? and especially the atomic bomb â?? to deter any attack on U.S. interests. Eisenhowerâ??s new policy sought to cut nearly 200,000 soldiers within a year. The Army responded by creating â??Pentomicâ?• divisions designed to survive on the new nuclear battlefield, only to scrap the concept just a few years later. Documents from the time show an Army grasping at new technologies. While some, such as night vision goggles, would come to fruition, others, including jet packs and jeeps armed with tactical nuclear weapons, would remain a technological curiosity. But instead of fighting against Soviet tanks in a nuclear wasteland, the Armyâ??s next war took place in a country few had ever thought of â?? Vietnam.

Today, the Army is at another generational crossroads. Coming out of the War on Terror, the Army is struggling to justify its role in a future conflict. A drone-heavy force, similar to what we see today in Ukraine, is a tempting way for the Army to reinvent itself for the 21st Century. However, without a

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.

disciplined approach, an overemphasis on drones could become the new Pentomic division.

The Army must do three things. First, determine how it will incorporate these devices and what types of drones it intends to field. Although any successful experiment will undoubtedly result in some waste, poor fielding planning risks wasting significant amounts of taxpayer money, both in unmanned systems and from the manned systems that the Army may prematurely cut. Second, despite current cries for â??lethalâ?• drones, the Army must focus more attention on drone defense than on offense. Finally, keep combined arms principles front and center. Drones might not replace human beings, but they certainly will help them succeed.

This article was originally published by Small Wars Journal

Crispin Burke is a retired Black Hawk helicopter pilot who served in Iraq from 2008-2009. He served as an Unmanned Aerial Systems Observer-Controller/Trainer at the Joint Multinational Readiness Center in Hohenfels, Germany, from 2010-2012. Following his retirement, he earned a Master of Arts in Strategy, Cybersecurity, and Intelligence from Johns Hopkins University. He is a volunteer docent at the International Spy Museum, a hobby drone pilot, and a longtime contributor to Small Wars Journal.

Main Image: U.S. Marine Corps Cpl. Brian Vile, an intelligence specialist with Marine Rotational Force â?? Darwin 24.3, operates a Skydio drone as part of a counter-unmanned aircraft systems field test at Mount Bundey Training Area, NT, Australia, July 11, 2024. The Marines and Australian Soldiers with the Robotics and Autonomous Implementation and Coordination Office, Australian Army Headquarters, used C-UAS to enhance MRF-D 24.3 Marine Air-Ground Task Force capabilities to defend against aerial attacks. Vile is a native of Pennsylvania. (U.S. Marine Corps photo by Cpl. Migel A. Reynosa)

The views expressed are those of the author and do not reflect the official position of the Irregular Warfare Initiative, Princeton Universityâ??s Empirical Studies of Conflict Project, the Modern War Institute at West Point, or the United States Government.

If you value reading the Irregular Warfare Initiative, please consider supporting our work. And for the best gear, check out the IWI store for mugs, coasters, apparel, and other items.

Date Created
2025/10/22

Â© 2025 Irregular Warfare Initiative. All Rights Reserved. IWI is a public 501(c)3 charity.