
| RESEARCH ARTICLE

Armed Drones as Emerging Military Technology: Reviewing Strategic and Security Implications

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| ABSTRACT

Armed drones have become a prominent feature of contemporary warfare, yet their strategic significance cannot be explained by technological characteristics alone. This article presents a thematic narrative review of the literature on armed drones as an emerging military technology, with particular attention to military innovation, diffusion and proliferation, organizational adoption, capability formation, and broader strategic and security consequences. The review focuses primarily on scholarship published from the post-2001 expansion of armed drone warfare through 2026. The literature reveals a clear shift in the central questions guiding research. Early studies were dominated by debates over whether drones represented a new Revolution in Military Affairs and by concerns surrounding targeted killing, remote warfare, and the political costs of force. Subsequent research turned toward diffusion and proliferation, asking why drones spread, which actors acquire them, and whether wider access alters the distribution of military power. More recent work has focused increasingly on the organizational and doctrinal conditions under which technological access is converted into effective military capability. Across these debates, possession alone proves to be an inadequate measure of military significance. Organizational capacity, learning, integration, doctrine, networks, and supporting structures shape whether drone technologies can be employed effectively and sustained over time. Their diffusion to armed non-state actors further illustrates the uneven relationship between technological access and strategic effect. What ultimately shapes the security consequences of drone proliferation is not access alone, but the uneven capacity of states and non-state actors to translate technological access into organized, sustainable, and strategically relevant military capability.

| KEYWORDS

Armed drones; Military technology; Military innovation; Drone proliferation; Capability formation; International security

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1. Introduction

Armed drones have become one of the most visible expressions of technological change in contemporary warfare. Yet the prominence of the technology has repeatedly encouraged a misleading shortcut: treating the presence of drones as evidence of transformation in itself. The history of unmanned aviation is considerably older than the post-9/11 period, but the arming of remotely piloted aircraft and their integration of intelligence, surveillance, and reconnaissance (ISR) with precision strike brought drones to the centre of debates over military technology, the conduct of war, and international security (Kindervater, 2017; Franke, 2017). The early literature was strongly shaped by the circumstances of this emergence. Because the United States employed armed drones extensively for targeted killing and counterterrorism, scholarship initially concentrated on questions such as civilian harm, casualty aversion, sovereignty, accountability, and the political costs of using force (Boyle, 2013; Kreps, 2016).

That debate soon became wider. Armed drones spread to a growing number of states, new suppliers entered the market, and unmanned systems began to appear in conflicts far removed from the model of U.S. counterterrorism. Research consequently

shifted toward diffusion and proliferation: why actors seek drones, which states are able to acquire them, and whether wider access changes the distribution of military power (Fuhrmann & Horowitz, 2017; Kreps et al., 2018; Horowitz et al., 2020). This literature also complicated the assumption that proliferation is simply the product of declining technological barriers. Gilli and Gilli (2016), for example, distinguish the spread of hardware from the industrial, infrastructural, and organizational requirements needed to produce and adopt more sophisticated forms of drone warfare. The resulting distinction—between possessing a platform and possessing an effective military capability—has become increasingly important.

At the same time, the claim that drones represent a new Revolution in Military Affairs (RMA) has been subjected to sustained criticism. Calcara et al. (2022) find little evidence that current-generation drones independently shift the offense–defense balance, erase established power asymmetries, or eliminate the continuing importance of close combat. Their argument does not render drones insignificant; it locates their effects within a broader system of force employment. Kreps and Lushenko (2023) push the debate toward a more qualified position. They argue that both advocates and sceptics have tended to overstate their cases: military technologies can produce consequential changes without satisfying an exceptionally demanding definition of “revolution.” More recently, Hutto and Rogers (2026) reject the revolutionary/evolutionary divide itself as a false dichotomy, showing that the effects of drone employment vary with the type of conflict, political objectives, technological capabilities, and the context in which they are used.

The war in Ukraine has sharpened this reorientation. Kunertova (2023) argues that earlier security-studies debates were excessively preoccupied with high-end platforms and strategic effects, while paying insufficient attention to the enabling functions and cumulative tactical value of small, relatively low-tech drones. Plichta and Rossiter (2024) similarly shift attention toward inexpensive one-way attack systems and what they call affordable mass precision, arguing that low-cost technologies can produce tactical gains and, under some conditions, strategic effects. The lesson is not that cheaper drones have replaced more sophisticated systems. Rather, the category “drone” now encompasses technologies with markedly different costs, functions, users, and strategic possibilities.

This development has also changed how the relationship between technology and military effectiveness is understood. Boyle (2026) characterizes tactical and operational drones as an architectural innovation: their importance lies in how they can reconfigure relationships among elements of combined arms rather than in the properties of an isolated platform. Rogers et al. (2026) reach a related conclusion from the perspective of full spectrum drone warfare. Large-scale acquisition alone is insufficient; effective employment depends on cross-domain integration and doctrinal adaptation. The debate has therefore moved from asking whether drones are intrinsically transformative toward examining the organizational and strategic conditions under which technological possibilities are translated into military effects.

This shift provides the organizing problem for the present review. Armed drones are treated here as an emerging military technology not because unmanned aircraft are historically new, but because the technologies, modes of employment, patterns of diffusion, and relationships with autonomy and other military systems remain in rapid development. The article asks: How has the literature explained the strategic and security implications of armed drones, and under what conditions does access to drone technology translate into effective military capability and wider strategic effects? It synthesizes scholarship on technological transformation, diffusion and proliferation, organizational adoption, battlefield effectiveness, coercion and escalation, and the growing employment of drones by armed non-state actors. Its central proposition is that technological access does not translate mechanically into military power. Between the two lie processes of adoption, adaptation, integration, and capability formation that shape both battlefield outcomes and broader consequences for international security.

2. Review Approach and Scope

This article adopts a narrative review approach. Its purpose is not to provide an exhaustive inventory of everything published on drones, but to synthesize the principal debates that bear directly on the strategic and security implications of armed drone technology. The working corpus draws on roughly sixty independently examined works and chapters, including peer-reviewed journal articles, academic monographs, edited volumes, book chapters, doctoral research, and a limited number of specialist studies where they make a substantive contribution to debates on military innovation or contemporary drone warfare. The review concentrates primarily on literature published from the emergence of contemporary armed drone warfare after 2001 through August 2026. Earlier works are included selectively where they provide the theoretical or historical foundations for debates on military innovation, the Revolution in Military Affairs, technological diffusion, and organizational adoption. Sources were identified iteratively through searches in Google Scholar and publisher and journal websites, supplemented by backward reference tracing from major reviews, handbooks, monographs, and frequently cited studies already included in the corpus. Searches used combinations of terms related to armed drones, drone warfare, UAVs and RPAs, diffusion and proliferation, military innovation, adoption, organizational adaptation, military capability, armed non-state actors, coercion, and escalation. Because this is a narrative rather than systematic review, the search did not follow a fixed PRISMA-style protocol. The corpus was expanded until additional searches and reference tracing primarily returned studies already represented in the working corpus or contributions that did not introduce a distinct argument to the thematic clusters relevant to the review question.

Source selection was guided by substantive relevance rather than by a single disciplinary boundary. Priority was given to studies addressing armed drones in relation to military innovation, diffusion and proliferation, organizational adoption, doctrinal and operational integration, battlefield effectiveness, coercion, escalation, the political costs of force, and the development of capabilities by armed non-state actors. Technical studies concerned only with engineering performance fall outside the scope of the review. The same applies to purely legal or ethical treatments unless their arguments bear directly on the strategic employment, political constraints, or security consequences of drone warfare. Studies of unarmed systems are considered where ISR, surveillance, targeting, networking, or other functions are integral to the formation and employment of armed drone capability.

The literature is organized thematically rather than by individual authors or fixed schools of thought. This follows the organizing logic identified by Franke (2017), who treated the developing drone literature through its principal themes, debates, and controversies rather than through established theoretical camps. The present review extends that logic to a literature that has since become both larger and more differentiated. It moves from debates over technological transformation to diffusion and proliferation, then to adoption and integration, before assessing battlefield, strategic, and security consequences and the growing role of non-state actors. This arrangement is deliberate: it allows the review to examine not simply whether drones are available or widely distributed, but how technological access may—or may not—be converted into effective and repeatable military capability.

3. Armed Drones as an Emerging Military Technology

3.1 Conceptualizing Armed Drones

Calling armed drones an emerging military technology does not imply that unmanned aviation lacks a history. Kindervater's historical work traces unmanned systems through early pilotless weapons, Cold War reconnaissance, and the later emergence of the Predator. What became distinctive in contemporary drone warfare was the convergence of two longer military trajectories: the growing importance of surveillance and knowledge production, and increasingly dynamic practices of targeting and killing. Kindervater (2015, 2017) captures this convergence through the concept of lethal surveillance. The contemporary drone is therefore better understood as a particular configuration of existing and developing technologies than as an invention that appeared suddenly after 2001.

Hall (2024) pushes this historical argument further through the British Larynx program. Her study shows that weaponized pilotless airpower was already being explored in the interwar period, including live-munition trials in Iraq in 1929. The case is especially useful for the present review because the military concept preceded the technological conditions required to make it reliable: guidance, accuracy, engine reliability, and radio control remained serious constraints. The history therefore reinforces a distinction that recurs throughout the later literature—between the existence of a compelling technological concept and the capacity to turn it into an operationally effective military system.

This distinction also matters when drones are located within the wider field of military robotics. Armed drones are not synonymous with autonomous weapons. Scharre and Horowitz (2015) distinguish the remotely piloted systems normally associated with drone warfare from weapon systems capable of selecting and engaging targets without further human intervention. Horowitz (2016) similarly warns against reducing the much wider debate over military robotics and autonomy to the highly visible practice of targeted drone strikes. Drones can incorporate increasing levels of automation while remaining under human control in critical functions. The trajectory toward autonomy is therefore relevant to their future development, but analytically it should not be projected backward onto all armed drones.

What made drones particularly attractive to early accounts of military transformation was their combination of persistence, remote operation, surveillance, precision, and reduced physical exposure of operators. Singer's (2009) influential account of military robotics helped popularize the language of a coming robotics revolution, while subsequent work placed drones within wider debates over the RMA and information-intensive warfare. Yet even relatively sympathetic accounts contained an implicit qualification: the military significance of a platform depends on the wider system in which it is embedded. This point has increasingly moved from the margins to the centre of the literature.

3.2 From the Drone Revolution to a Conditional Transformation

The most influential sceptical intervention is Calcara et al. (2022). Against claims that drones generate an offensive advantage, reduce established military asymmetries, and make close combat less important, they develop the concept of an enduring hide-finder competition in air warfare. Their analysis of Libya, Syria, and Nagorno-Karabakh finds that drones remain vulnerable to countermeasures and require supporting capabilities and skilled personnel. In their formulation, effectiveness depends on mastery of a broader modern system of force employment in air warfare, not on possession of the platform alone. Drones can matter greatly, but they do not independently produce the revolutionary effects often attributed to them.

That argument, however, does not close the debate. Kreps and Lushenko (2023) contend that both the revolutionary and sceptical camps set the terms too starkly. Calling drones "magic bullets" clearly exaggerates their effects, but demanding that a technology fundamentally reorder world politics before considering it consequential creates an equally unrealistic standard.

Their middle position is important because it separates military significance from the strongest possible definition of an RMA. A technology may alter costs, opportunities, or patterns of military action without becoming the sole determinant of victory. Developments in Ukraine reinforce this argument while also revealing a weakness in earlier versions of the debate. Kunertova (2023) argues that security studies had been too focused on large platforms and high-level strategic claims, missing the cumulative importance of small drones as enabling technologies. Their value often comes from reconnaissance, target acquisition, adjustment, and the tighter connection of sensors with other forms of firepower rather than from independent strike capacity. In this sense, the emerging transformation is less spectacular than the language of “revolution” suggests, but potentially more pervasive: inexpensive systems can become embedded in routine military practice and alter how other capabilities are employed.

Plichta and Rossiter (2024) push the same reassessment in another direction. Their concept of affordable mass precision challenges a literature traditionally centred on expensive, sophisticated military UAVs. One-way attack drones combine lower cost and scalability with precision effects, creating the possibility that technologies previously associated with limited inventories can be employed in much greater numbers. They do not claim that such systems are universally revolutionary. Tactical advantages can under some circumstances scale into strategic effects, particularly when they impose sustained costs or strike targets beyond the immediate battlefield.

3.3 Beyond “Revolutionary or Evolutionary?”

The most useful recent contributions increasingly treat the original dichotomy as the wrong question. Hutto and Rogers (2026) explicitly describe the division between revolutionary and evolutionary interpretations as a false dichotomy. Reassessing conflicts in Ukraine, Ethiopia, and the Saudi–Houthi war, they argue that the effect of drone employment depends on the type of war, the political objectives being pursued, and the particular drone capabilities available. Drones can be ordinary in one context and highly consequential in another. The point is not to split the difference between proponents and sceptics, but to identify the scope conditions under which technological effects vary.

Boyle's recent argument moves even further from a platform-centred view. Tactical and operational drones, he argues, are best understood as an architectural innovation because they reconfigure relationships among existing elements of combined arms. Their effects emerge through adaptation. Where organizations successfully exploit them, drones can alter survivability, battlefield scope, and tempo; where opponents adapt symmetrically, the same technology may contribute to stalemate rather than decisive advantage (Boyle, 2026).

Schulzke (2022) places this move within a broader account of twenty-first-century military innovation. His analysis treats contemporary change across technological, organizational, and strategic dimensions rather than locating transformation in an isolated platform. This wider framing is consistent with the emerging drone literature: the significance of a technology depends on how it interacts with organizational practices and strategic purposes, not simply on the novelty of the system itself. The emerging literature therefore offers a more convincing interpretation than either technological determinism or categorical scepticism. Armed drones are potentially transformative, but unevenly and conditionally so. Their importance derives from changing combinations of surveillance, precision, affordability, scale, connectivity, and automation, while their actual military significance depends on how these possibilities are incorporated into organizations and strategies. The debate over the RMA consequently leads to a different problem. Before asking what drones do to war or international security, it is necessary to ask who gains access to which kinds of drone technology, through what processes, and under what constraints. That is the question of diffusion and proliferation.

4. Diffusion and Proliferation of Armed Drones

The debate over whether drones are revolutionary leads naturally to a prior question: who actually acquires them, and why? Early commentary often treated proliferation as almost self-evident. Boyle (2013), writing during the rapid expansion of the U.S. drone campaign, warned of a developing “race for drones” as other states sought technologies that appeared to offer surveillance and strike capabilities at lower political and financial cost than traditional airpower. Franke (2017) likewise noted that the literature was gradually moving beyond its initial U.S.-centred focus as more states—and increasingly non-state actors—began to employ unmanned systems. Yet subsequent research has made the proliferation story more complicated. Drones have spread widely, but the process is neither uniform nor well captured by simply counting platforms.

4.1 Why Do Armed Drones Proliferate?

Fuhrmann and Horowitz (2017) provide one of the clearest frameworks for explaining this variation. Rather than treating proliferation as the mechanical consequence of technological availability, they locate it within a broader debate over interests versus capacity, or willingness versus opportunity. States may desire drones because they face particular security problems, but desire alone does not determine whether they can field them. Their cross-national analysis finds that security threats matter: states experiencing more terrorism are more likely to pursue advanced UAVs and armed-drone programs, while territorial disputes are associated with greater interest in advanced surveillance systems. Domestic political institutions also shape

incentives. Democracies and autocracies appear more likely than mixed regimes to pursue armed UAVs, although for potentially different political reasons (Fuhrmann & Horowitz, 2017).

Kreps, Fuhrmann, and Horowitz (2018) broaden this argument by organizing the principal explanations for drone proliferation around operational incentives, technological availability, regime type, and emulation. Operational usefulness matters because the value of persistence, surveillance, and remote strike varies according to the security problems states confront. Supply conditions matter as well. Many underlying technologies are dual-use, and commercial availability can reduce barriers for some systems, while the most advanced platforms remain more difficult to acquire and operate. Emulation adds a further mechanism: states may respond not only to immediate security needs but also to the demonstrated behavior of other military powers and to the political flexibility that drone use appears to provide.

Later evidence reinforces the need to treat these factors dynamically. Horowitz, Schwartz, and Fuhrmann (2020) distinguish explicitly between pursuit and possession and show that the drivers of proliferation can change over time. Their time-series analysis finds that regime type had little effect before 2011, but that non-democracies became significantly more likely to pursue and obtain armed drones thereafter. The authors attribute this shift to interacting supply- and demand-side shocks, particularly the emergence of China as a willing supplier to states that faced tighter access to U.S. systems. Their analysis also gives greater weight to status-seeking: states seeking international prestige were more likely to pursue armed drones, although status did not predict possession in the same way. This distinction is analytically important. Wanting a technology, beginning a program, and actually acquiring an operational system are different stages of proliferation.

4.2 Diffusion Is Uneven

The strongest challenge to simple proliferation narratives comes from Gilli and Gilli (2016). Their central objection is directed at the assumption that military hardware diffuses easily in an era of globalization and dual-use technology. They distinguish between a platform challenge and an adoption challenge. Developing advanced systems requires specialized knowledge, experience, industrial facilities, and testing capacity; employing them effectively also requires organizational and infrastructural support. Their evidence shows that even wealthy and technologically advanced states have struggled with some categories of combat-effective drones.

This argument does not imply that drones are failing to proliferate. It changes what should be meant by proliferation. The category "drone" contains systems with very different technological and organizational requirements, and their rates of diffusion therefore differ sharply. Treating a small tactical UAV, an armed medium-altitude platform, and a highly integrated long-range ISR system as instances of a single transferable capability obscures more than it reveals. Gilli and Gilli's contribution is precisely to move the debate from the visibility of hardware to the conditions under which particular military innovations can actually be produced and adopted.

Kreuzer's (2024) ten-year reassessment of drone diffusion strengthens this distinction. Looking back at predictions made in his earlier dissertation (Kreuzer, 2014) during the first wave of drone scholarship, he finds that the diffusion of large, strategically oriented drone systems has remained more limited than many early accounts anticipated, while smaller tactical drones have spread much more widely and have become important force multipliers. His central point is that drones should be understood as an umbrella category encompassing different aircraft, mission sets, organizational requirements, and doctrines. The diffusion of one type therefore tells us little about the diffusion of another. This helps reconcile apparently contradictory claims in the literature: drones can be both widely accessible and organizationally demanding, depending on which systems and forms of employment are under examination.

4.3 From Proliferation to Access

Taken together, this literature replaces the image of a simple global "drone race" with a more differentiated account of military-technology diffusion. Security threats create demand, suppliers and technological capacity shape opportunity, political institutions alter incentives, and status can motivate pursuit. But none of these mechanisms operates uniformly across time or across categories of unmanned systems. Fuhrmann and Horowitz's distinction between willingness and capacity, Horowitz, Schwartz, and Fuhrmann's separation of pursuit from possession, and Gilli and Gilli's emphasis on platform and adoption challenges all point toward the same analytical caution: the spread of technology should not be equated with the spread of equivalent military power.

This is particularly important for an international-security analysis of emerging military technology. Proliferation changes who may gain access to capabilities once concentrated among a smaller group of actors, but access alone says little about the quality, sustainability, or strategic significance of what has been acquired. The relevant analytical sequence therefore cannot end with possession. It must ask what happens after acquisition: whether organizations can absorb the technology, adapt doctrine and operating practices, connect new systems to existing structures, and convert technical availability into effective military capability. That is the problem to which the next section turns.

5. From Access to Military Capability: Adoption, Integration, and Innovation

5.1 Adoption Capacity: Why Access Is Not Enough

The proliferation literature establishes that acquisition is uneven. It does not, however, explain what happens after a military organization obtains a new technology. This distinction is central to Horowitz's (2010) adoption-capacity theory. A military innovation is not simply a new piece of equipment. Horowitz defines major military innovations in terms of changes in the conduct of warfare that improve the efficiency with which capabilities are converted into power. Adoption therefore depends on more than interest in a technology or the ability to purchase it. Financial intensity shapes whether an actor can mobilize the resources required for adoption, while organizational capital captures its capacity to accommodate the organizational changes associated with the innovation. These can include changes in recruitment, training, experimentation, doctrine, and established ways of fighting (Horowitz, 2010).

The distinction matters because military organizations are not infinitely flexible. Horowitz explicitly rejects the assumption that a state which wants an innovation will necessarily be able to adopt it. Organizational barriers may prevent effective adoption even where financial resources and political commitment are present. His later work on artificial intelligence sharpens this point by distinguishing technological innovation from military innovation. The former may create a new technical possibility; the latter requires meaningful changes in organizational behavior and in how a military fights so that capabilities can be translated more effectively into power (Horowitz, 2018). From this perspective, technological diffusion is only the beginning of military change. Gilli and Gilli (2016) bring this problem directly into the drone literature. Their ecosystem challenge consists of two analytically distinct requirements: the platform challenge, concerning the ability to develop or acquire a combat-effective system, and the adoption challenge, concerning the organizational and infrastructural support necessary to employ it. Their warning that drones are not stand-alone platforms is especially important. A narrow focus on acquisition can therefore exaggerate diffusion by counting hardware without asking whether the organizational ecosystem needed to make that hardware militarily useful has also spread. The consequence is a substantial gap between access to a platform and the ability to reproduce the military effects associated with its most capable users.

5.2 Integration, Battle Networks, and Organizational Change

Recent military-innovation scholarship develops this argument beyond the initial act of adoption. Jensen, Whyte, and Cuomo (2022) examine the relationship between information, organizational dynamics, and military power through the historical development of military information technologies. Their central caution is consistent with Horowitz but places greater emphasis on integration: technological discovery does not automatically produce innovation, because established institutions, patterns of information exchange, tacit knowledge, and ideas about operational problems shape how new technologies are incorporated into doctrine and force structures. Their account of the global battle network, including the armed Predator, is particularly useful for drone scholarship because it directs attention from an individual aircraft toward the wider informational and organizational arrangements through which surveillance, decision-making, and military action are connected.

This is a significant conceptual move. If a drone is viewed primarily as a platform, capability appears to reside in the object itself. If it is understood as one component of a battle network, the relevant unit of analysis changes. The important question becomes whether the organization can connect a new system to existing processes of information exchange, command, and employment. Jensen et al. (2022) therefore complement adoption-capacity theory: Horowitz helps explain why organizations vary in their ability to absorb disruptive innovations, while Jensen and colleagues illuminate how information technologies acquire military significance through organizational integration.

Evidence from the drone literature points in the same direction. Calcara et al. (2022) find that drones do not independently generate the battlefield effects commonly associated with a drone revolution. Their effectiveness depends on their place within a broader system of force employment and on the ability of organizations to combine platforms with supporting capabilities and skilled personnel. The analytical implication reaches beyond air warfare. The military value of a technology is relational: it depends on what an organization can connect it to, how it employs it, and how an adversary responds.

King's (2024) examination of autonomous drone swarms reinforces this caution at the more advanced end of the technological spectrum. He rejects the assumption that autonomous swarms will operate as self-sufficient capabilities, stressing their continuing dependence on other weapon systems. The significance of autonomy, then, should not be inferred from the sophistication of an individual system. Even increasingly autonomous technologies remain embedded in wider military organizations and force structures.

5.3 From Platforms to Military Capability

The newest drone literature makes the access–integration distinction still more explicit. Rogers et al. (2026) argue that the emerging Third Drone Age cannot be understood as the accumulation of ever larger numbers of unmanned platforms. Their concept of full spectrum drone warfare (FSDW) treats future drone warfare as a systems problem involving the integration of heterogeneous uncrewed systems. In their framework, two variables are decisive: mature cross-domain uncrewed teaming and effective doctrinal adaptation. The opposite condition—advanced hardware combined with outdated doctrine—is described as “tech without strategy.” Mass acquisition, in other words, can coexist with organizational failure.

Scharre (2026) reaches a related conclusion from the perspective of rapidly diffusing commercial technologies. He argues that drones and artificial intelligence are eroding the possibility of sustained technological monopolies and shifting the source of advantage toward organizational adoption. Under these conditions, the critical question is less which actor first develops or acquires a technology than which military can adopt it, scale it, integrate it into command structures and doctrine, and adapt its employment more effectively. This updates the earlier adoption literature for an environment in which access barriers may fall quickly while effective military capability remains uneven.

This argument is closely related to Boyle's (2026) description of tactical and operational drones as an architectural innovation. Their potentially transformative effects do not derive solely from improvements in an isolated weapon. They arise from changes in relationships among existing capabilities and from the ways military organizations reorganize their practices around new systems. The same logic helps explain why technological advantages may be temporary: adaptation by competitors can reduce or reverse the advantages initially created by innovation.

Taken together, these studies suggest a more precise way of connecting emerging military technology to military power. Access and possession are necessary but analytically insufficient categories. Technologies must be absorbed by organizations, incorporated into doctrine and information structures, connected to complementary capabilities, and converted into practices that can be sustained and repeated. Not every actor that possesses a similar platform will therefore possess an equivalent capability. Nor should the sophistication of the technology itself be treated as a reliable proxy for strategic effect.

For this review, the intervening process can be understood as capability formation: the movement from technological access through adoption and integration toward a usable military capability. This formulation synthesizes rather than replaces the concepts used in the literature. Horowitz provides the logic of adoption capacity; Scharre shows why effective adoption becomes even more consequential as access barriers fall; Jensen et al. show the importance of organizational dynamics and battle networks; Calcara et al. locate effectiveness within a wider system of force employment; and the most recent drone literature places doctrinal adaptation and systems integration at the centre of future advantage. The implication for international security is substantial. Emerging technologies alter distributions of military power not simply when they spread, but when actors differ in their ability to convert technological access into effective capability. Once that conversion occurs, the next question is what such capabilities do to the use of force, coercion, escalation, and strategic stability.

6. Strategic and Security Implications of Armed Drones

6.1 Risk, Political Costs, and the Use of Force

Once drone technology has been converted into an operational capability, its strategic significance depends on how it changes the costs and political conditions of using force. One of the most persistent arguments in the literature is that armed drones reduce a particular cost that has traditionally constrained military action: the exposure of one's own personnel to physical danger. Schulzke (2022) places this development within a much longer history of attempts to create distance between attackers and targets. What is distinctive about drones is not distance alone, but the possibility of combining distance with persistence and precision while separating the fate of the platform from that of the operator. This creates the prospect of military action with substantially reduced immediate risk to the user.

That technological characteristic has often been linked to a lower political threshold for the use of force. Yet the relationship is less automatic than early accounts sometimes implied. Public-opinion research provides a useful corrective. Alparone, Kantorowicz, and Klein (2025), extending earlier work on attitudes toward drone strikes, find that respondents in Italy, Poland, and Germany were more supportive of drone strikes than of deploying paratroopers. At the same time, giving respondents additional information about the reduction of military casualties did not produce a corresponding increase in support, even though respondents clearly understood that drone use reduced risks to their own forces. Ethical and moral framing, by contrast, significantly reduced support. The political advantage of low-risk warfare is therefore real but conditional. Removing one source of domestic constraint does not remove public sensitivity to the legitimacy, proportionality, or morality of military action. Schulzke's broader account helps explain why this still matters strategically. His concept of degradation describes military action pursued for limited political objectives while minimizing the commitment and exposure of one's own forces. Such operations seek restrained rather than decisive victories and can be attractive precisely because they avoid some of the burdens associated with protracted conventional warfare (Schulzke, 2022). Armed drones fit comfortably within this wider shift toward limited, scalable, and politically manageable uses of force. Their significance, in this sense, lies not in making war costless, but in widening the range of circumstances in which political leaders may regard limited military action as usable.

6.2 Coercion, Deterrence, and Escalation

The same reduction in costs complicates traditional arguments about coercion. Conventional coercion theory has often treated costly signals as more credible because states demonstrate resolve by accepting risks to blood, treasure, or reputation. Zegart (2018) asks whether armed drones undermine that logic. Her answer is that low-cost threats can under certain conditions remain credible, particularly when one actor possesses armed drones and the target does not. She identifies three mechanisms: sustainability of operations, certainty of precision punishment, and the imposition of large relative costs. Drones can permit a

coercing state to sustain operations for longer, threaten repeated precision punishment, and shift the distribution of costs sharply against the target.

Her survey of foreign military officers reinforces the argument. Respondents did not uniformly interpret the absence of risk to personnel as evidence of weak resolve; a substantial majority instead regarded the ability to fight without risking troops as a sign of commitment. Zegart therefore challenges the assumption that threat credibility must derive from costly signaling alone. This does not establish that drones are generally superior instruments of coercion. Her analysis is explicitly conditional and is strongest where there is an asymmetry in drone possession. The broader implication is narrower but important: emerging military technologies can alter the relationship between cost and credibility that underpins established theories of coercion. Escalation presents a similarly ambiguous picture. Lin-Greenberg (2022) distinguishes between the effects of remotely piloted aircraft on conflict initiation and on escalation after an initial confrontation. His concept of remote-controlled restraint suggests that the destruction of an uninhabited platform generates weaker instrumental and emotional incentives for retaliation than the loss of an inhabited aircraft. Comparative wargames and a survey experiment with military officers support this logic. The implication is counterintuitive. A technology that may make the initial use of force easier by reducing the risk to personnel may, after a platform is lost, also dampen pressures for subsequent escalation. Drones are therefore not uniformly escalatory or stabilizing. Their effects vary across different stages of a crisis.

Taken together, Zegart and Lin-Greenberg point to a wider revision in the strategic literature. The political value of drones does not arise only from their ability to strike targets. It also comes from how they alter the distribution of risk, the credibility of threats, and the meaning of losses during crises. Those effects are relational: they depend on who possesses the capability, what kind of adversary is targeted, and how decision-makers interpret the costs involved.

6.3 Tactical Effectiveness and Strategic Consequences

A second major divide in the literature concerns the difference between tactical efficiency and strategic effectiveness. Boyle's (2013) critique remains central because it directly rejects the assumption that a low-cost, low-risk strike must also be strategically successful. Much of the early debate, he argues, measured effectiveness through body counts or the elimination of individual targets. Such measures capture only one side of the strategic ledger. Drone campaigns can simultaneously produce political effects that weaken the wider objectives they are intended to serve, including damage to the perceived competence and legitimacy of partner governments, anti-American sentiment, and new recruitment opportunities for militant organizations. Kreps (2016) reaches a closely related distinction from a broader assessment of armed-drone technology: tactical success does not by itself establish strategic success. The ability to identify and eliminate a target may demonstrate operational effectiveness, but it does not determine whether a campaign reduces terrorism or advances longer-term political objectives. Her discussion also separates technical precision from discrimination, since accurate delivery of a weapon cannot compensate for errors in identifying or classifying the target.

Boyle's analysis of Pakistan illustrates the mechanism particularly clearly. Repeated strikes may communicate that the targeted government cannot control or defend its own territory, thereby creating a visible sovereignty and legitimacy problem for local authorities. Boyle consequently insists on separating the immediate success of killing or disrupting a target from the long-term political consequences of a campaign. This distinction should remain fundamental in assessing armed drones. Precision at the point of attack is not the same as precision in political effect.

Schulzke's concept of degradation reaches a compatible conclusion from a different direction. Limited remote operations may be deliberately designed not to produce decisive victory but to weaken opponents, alter a balance, or achieve narrow objectives while reducing the intervener's commitment. Such strategies may be politically attractive precisely because they avoid the costs of decisive warfare. Yet their strategic logic is correspondingly limited. They make it easier to employ force for bounded purposes, but they do not remove the difficulty of translating military pressure into durable political outcomes.

This tension explains why the strategic literature cannot be reduced to the question of whether drones are effective weapons. They often are effective at the tasks for which they are employed. The harder question is whether those tasks serve the political objective that defines strategic success. The answer varies sharply across contexts.

6.4 Sovereignty, Hierarchy, and International Order

The consequences of drone warfare also extend beyond individual campaigns. Drones and Global Order was explicitly organized around this broader problem, arguing that the literature had moved through studies of proliferation, effectiveness, and legal or ethical consequences without adequately addressing the implications of remote warfare for the legitimacy of global order.

Lushenko, Bose, and Maley (2022) frame drone warfare as generating contradictions across both structural and normative dimensions of international society, including the diffusion of military capabilities, sovereign equality, and the laws and norms governing armed conflict. Crucially, they do not treat these consequences as uniformly destructive: under some conditions, drone warfare may also reinforce aspects of global order.

Williams (2022) develops the structural side of this argument through hierarchy in international society. Drones, in his account, are not merely military instruments acquired for utilitarian reasons. Their use can reproduce hierarchical relations among states and interact with existing distinctions between great powers and other members of international society. The significance of the

technology therefore lies partly in the social and political order in which it is embedded, not simply in shifts in the number or quality of platforms.

This order-level perspective also clarifies why sovereignty remains central. Boyle's account of Pakistan shows how repeated remote strikes can undermine the authority and credibility of governments that appear unable to prevent external uses of force on their territory. The broader volume edited by Lushenko and colleagues takes the argument further by treating sovereignty, hierarchy, and legitimacy as interconnected features of the international order rather than as isolated legal questions. Its concluding chapter calls for a fourth wave of drone scholarship concerned with precisely these system-level effects and the contradictions generated by expanding remote warfare (Blaxland et al., 2022).

The strategic and security implications of armed drones are therefore best understood as layered rather than singular. At one level, drones alter the costs and risks attached to military action. At another, they can affect coercive bargaining and crisis escalation. Their tactical advantages may or may not translate into political success, and repeated use can reshape perceptions of sovereignty, hierarchy, and legitimate force. These effects are neither universally stabilizing nor inherently destabilizing. They depend on the capability that has been formed, the political objectives for which it is used, the adversary's response, and the wider normative and institutional setting. As drone capabilities diffuse beyond state militaries, this problem becomes more complex still. The next section turns to armed non-state actors, for whom access to relatively inexpensive and dual-use systems has opened new pathways to military capability and, potentially, new forms of asymmetry.

7. Armed Non-State Actors and the Changing Distribution of Military Capability

7.1 Commercial Diffusion and New Pathways to Non-State Capability

The diffusion of drone technology to armed non-state actors poses a harder question than simple proliferation. It is tempting to interpret the spread of commercially available and dual-use systems as evidence that traditional military asymmetries are eroding. The literature reviewed here suggests a more qualified conclusion. Drones can lower important barriers to aerial surveillance, targeting, and strike, but their effects depend on the kind of actor acquiring them, the pathway of acquisition, and the organizational capacity available to turn access into sustained military practice.

Berti's (2016) analysis is useful precisely because it warns against treating non-state armed groups (NSAGs) as a homogeneous category. Hezbollah, Hamas, and Islamic State may all fall under the same broad label, yet they differ sharply in political organization, social embeddedness, territorial control, governance functions, and relationships with states. Some operate simultaneously as armed organizations, political actors, and providers of social services; others pursue very different forms of socio-political authority. These distinctions matter for technology adoption because the resources and organizational structures available to absorb military technologies vary with the character of the organization itself.

Commercialization has nonetheless widened the entry points. Chávez and Swed (2024) argue that violent non-state actors have acquired a form of reliable low-end airpower through the maturation of commercial drone technology. Early adoption was concentrated among relatively capable groups, but the expansion of affordable and increasingly sophisticated commercial systems widened access across a far more diverse range of actors. Their most common use remains ISR, yet the same platforms can support target acquisition, propaganda, disruption, and weaponized attacks. The implication is not that non-state actors have acquired an equivalent substitute for state airpower. They have gained access to functions that were previously harder, more costly, or more dangerous to obtain.

7.2 Organization, Learning, and Uneven Capability Formation

Access, however, does not explain the large variation in outcomes. DeVore, Stähli, and Franke's (2019) study of Hezbollah is particularly important here because it shifts attention from spectacular technological breakthroughs to incremental innovation. Hezbollah's military development, they argue, was driven largely by continuous experimentation and bottom-up learning among field commanders, combined with organizational mechanisms that allowed successful innovations to diffuse through the organization. The lesson is broader than the Hezbollah case: formidable non-state capabilities may emerge through repeated organizational learning rather than through a single discontinuous technological leap.

Islamic State illustrates a different pathway. Archambault and Veilleux-Lepage (2024) show that IS created a highly centralized structure for acquisition, equipment modification, and training, while integrating drones into reconnaissance, attacks, command and control, and other operations. Yet the military significance of this program should not be exaggerated. The 2024 reassessment concludes that IS drones slowed enemy advances and created tactical difficulties, but did not alter the strategic trajectory of the conflict. Nor did the IS model prove easily replicable. Its effectiveness depended on a particular combination of territory, resources, supply chains, organizational infrastructure, and political purpose.

The same case also shows that military capability can have political meaning beyond battlefield performance. Archambault and Veilleux-Lepage (2020) argue that drone imagery allowed Islamic State to present itself as exercising attributes associated with sovereignty, particularly territorial and aerial control. Drone use therefore served both combat and representational functions: it demonstrated technical competence while supporting claims to state-like authority. This is an important reminder that the utility of emerging military technologies to non-state actors cannot be measured solely by lethality.

Mutschler, Bales, and Meininghaus (2024) broaden the argument through their comparison of Daesh and the Houthis. Both used precision-strike technologies in solid warfare, linked to territorial control, and in liquid warfare, where violence is directed against networks, infrastructure, or targets beyond immediate frontlines. Their analysis also shows how acquisition pathways shape what becomes possible. Iranian support enabled the Houthis to employ longer-range systems, whereas Daesh relied more heavily on commercially available dual-use technologies combined with low-tech weapons and unconventional tactics. Technology, then, expands the repertoire of strategic options, but the scale and form of that expansion remain conditioned by sponsorship and organizational capacity.

7.3 From Asymmetry to Sovereignty and Regional Security

Milan's (2026) analysis of advanced armed drones (AADs) makes the limits especially clear. He identifies three conditions shaping non-state programs: presence, patrons, and purpose. Territorial presence is necessary but insufficient; patrons provide technology, know-how, and training; and purpose determines whether an operationally viable program produces strategic effect. Even when the first two conditions are present, strategic utility may remain limited.

This finding cuts against the strongest claims about technological equalization. Milan shows that advanced systems can make non-state actors more visible, more dependent on external sponsors, and more exposed to countermeasures. In some cases, smaller modified drones fit asymmetric warfare better than more sophisticated platforms whose logistical and organizational demands pull armed groups toward forms of dependence they are poorly positioned to sustain. The distribution of military capability is therefore changing, but not through a simple transfer of state-like power to weaker actors.

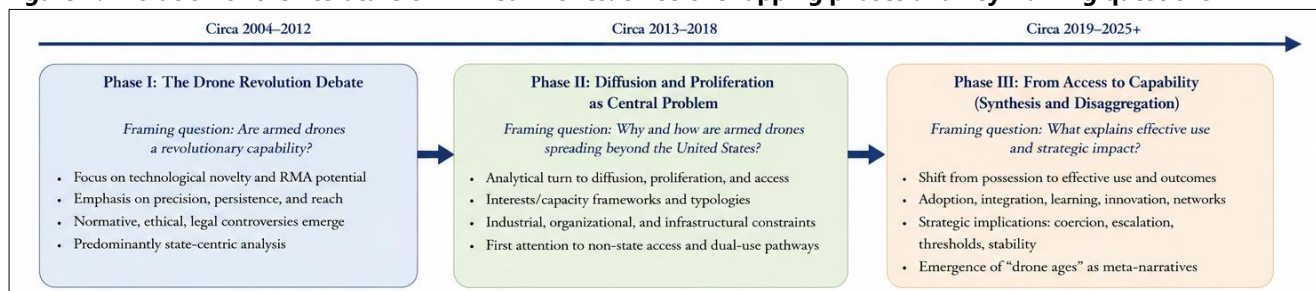
What changes is the repertoire available to them. Certain NSAGs can now observe, strike, signal, disrupt, and claim forms of control in ways that were previously more difficult. When these capabilities are embedded in larger political and regional networks, their effects extend beyond the organization itself. Wastnidge and Mabon (2024), writing on the Resistance Axis, show that actors such as Hezbollah operate within networks that are simultaneously strategic, political, ideational, and regional. Military technology therefore enters an already layered political order rather than creating one from scratch.

The broader security implication is not the disappearance of state superiority. It is the growing possibility that some armed non-state actors can convert accessible technologies into durable capabilities that complicate coercion, territorial control, sovereignty, and regional competition. The central variable is still organizational and political: who can transform access into sustained capability, for what purpose, and with what wider consequences. That question provides the bridge to the discussion that follows.

8. Discussion: From the Drone Revolution to Capability Formation

The literature on armed drones has not simply accumulated; its central question has changed. Early scholarship was largely organized around the visibility of the platform itself. The post-9/11 use of the Predator encouraged debate over remote killing, casualty aversion, legal and ethical constraints, and whether drones represented a new Revolution in Military Affairs. Kreuzer (2024) describes this as the first wave of drone literature, in which Predator-type systems were often treated as a proxy for the future of airpower and their apparent affordability encouraged expectations of rapid global diffusion. Some of these expectations were examined directly in Kreuzer's earlier dissertation on the evolution and diffusion of remotely piloted aircraft (Kreuzer, 2014). In retrospect, this literature captured an important technological shift but frequently collapsed several distinct questions into one: whether drones were novel, whether they would proliferate, and whether proliferation would redistribute military power.

Figure 1. Evolution of the literature on Armed Drones: three overlapping phases and key framing questions



Note: the three scholarly phases are the synthesis of this review, not a periodization proposed by any single author. The phases are indicative and overlapping rather than strictly sequential. The figure presents the article's synthesis of the literature, not a periodization proposed by any single author.

A second phase emerged as those assumptions encountered wider empirical variation. Research on proliferation showed that drones were not a single transferable capability. Strategic systems, tactical platforms, commercial systems, and different mission sets imposed different financial, organizational, and doctrinal requirements. Kreuzer's ten-year reassessment is especially revealing: the relatively limited diffusion of complex strategic drones coexisted with the rapid spread of smaller tactical systems that became important force multipliers. Gilli and Gilli's distinction between platform and adoption challenges, and the broader proliferation literature's separation of pursuit, possession, and effective use, shifted attention away from hardware counts toward the conditions under which diffusion actually mattered.

The empirical evolution of drone warfare reinforced this intellectual shift. Rogers (2024) distinguishes a First Drone Age, roughly 2001–2020, dominated by American and Western use of MALE systems in counterterrorism, from a Second Drone Age characterized by extensive proliferation to medium and small states as well as non-state actors. The handbook's prospective Third Drone Age points toward autonomous, swarming, and increasingly integrated systems. These "drone ages" describe changes in warfare rather than stages of scholarship, but the two trajectories interact. As the technology moved from a relatively concentrated model of remote counterterrorism toward diverse forms of state and non-state employment, research likewise moved beyond the original focus on the Predator, targeted killing, and Western risk reduction.

The third and current phase of scholarship is therefore better described as a turn toward integration and capability formation. Research on Ukraine, autonomous swarms, affordable mass precision, battle networks, and full-spectrum drone warfare increasingly asks how organizations combine unmanned systems with doctrine, information flows, supporting capabilities, and wider force structures. Rogers et al. (2026) make this change unusually explicit: in the prospective Third Drone Age, the central question is no longer whether actors can acquire drones, but whether they can integrate them through cross-domain uncrewed teaming and effective doctrinal adaptation. The unit of analysis has moved from the platform toward the organization and the system in which the platform is embedded.

This shift also helps reconcile earlier disagreement over whether drones are revolutionary. The strongest technological-determinist accounts overstated what possession of a new platform could accomplish. Yet categorical scepticism risks missing how cumulative adaptation can alter military practice even without producing a single decisive technological revolution. The more recent literature instead suggests conditional transformation: drones can generate important tactical, operational, and strategic effects, but those effects depend on diffusion pathways, organizational absorption, integration, adversary adaptation, and political purpose. Blaxland, Bose, and Lushenko's (2022) call for a fourth wave of drone warfare scholarship similarly pushes the field toward second- and third-order consequences for sovereignty, legitimacy, hierarchy, and global order rather than treating battlefield effectiveness as the endpoint of analysis. Their intervention widens the object of inquiry from what drones do tactically to what the normalization and diffusion of drone warfare do to the functioning and legitimacy of global order. In this fourth-wave framing, the relevant effects are not assumed to be unidirectional: remote warfare can reinforce some ordering practices while undermining others, depending on the actor, context, and political purpose. This creates a distinct research agenda beyond the earlier legal and ethical debates, centered on the higher-order consequences of repeated and increasingly distributed drone use.

A central point emerging from this literature is that the possession of a new technology does not by itself translate into military power. What matters is what happens after a technology becomes available: whether an actor can adopt it effectively, incorporate it into its organization and doctrine, and use it repeatedly in military operations. Only then can technological access produce meaningful battlefield and strategic effects. This process is far from uniform. Some actors acquire advanced systems but struggle to make effective use of them, while others are able to turn relatively simple or inexpensive technologies into useful military capabilities through learning, external support, and organizational adaptation. The experience of armed non-state actors illustrates this variation particularly well. Wider access to commercial drones and externally supplied systems has expanded their technological options, but the military results have differed considerably from one group to another.

The larger implication for international security is therefore more precise than the original "drone revolution" thesis. Emerging military technologies redistribute military power only when actors can convert access into capability. The most consequential development in the literature has been the move from asking whether drones transform war to asking who can make them transformative, under what organizational and political conditions, and with what consequences for the distribution and use of military power.

9. Conclusion

The literature reviewed in this article suggests that the strategic significance of armed drones cannot be captured by asking whether they have "revolutionized" warfare. That question dominated an important early phase of scholarship, but it increasingly obscures the processes that intervene between technological innovation and military power. Armed drones are neither inherently revolutionary nor merely another weapons platform. Their effects are conditional on who acquires them, how they are adopted, the organizational and doctrinal structures into which they are integrated, and the political purposes for which the resulting capability is employed.

This distinction becomes clearer when diffusion is separated from capability. Across the literature reviewed here, acquisition does not produce uniform military effects. Financial and organizational capacity, information flows, supporting infrastructure, doctrine,

complementary capabilities, and adaptation sit between possession and effective use. The recent turn toward networked and full-spectrum approaches sharpens the same point: mass procurement may coexist with weak military effect when systems are not integrated into broader force structures.

The strategic consequences are equally resistant to simple technological determinism. Reduced risk to operators may widen the political availability of limited force and alter coercive bargaining, but tactical efficiency does not ensure strategic effectiveness. Drone campaigns can generate political costs involving legitimacy and sovereignty even where individual strikes accomplish their immediate military objectives. At the level of international order, these effects extend to questions of hierarchy, sovereign authority, and the legitimacy of remote warfare.

Armed non-state actors make the same point from the opposite direction. Commercial availability and external sponsorship can reduce barriers to access, yet similar technologies produce markedly different outcomes across organizations. Hezbollah's incremental and organizationally diffused innovation illustrates how learning can sustain capability over time, while other cases examined in this review demonstrate the continuing importance of patrons, territorial position, organizational infrastructure, and strategic purpose.

A central finding of this review is that technology alone does not produce military power. What matters is the path from technological development and access to adoption, integration, military capability, and ultimately battlefield and strategic effects. Future research should examine the weakest-understood links in that sequence, particularly comparative capability formation across states and armed non-state actors, the integration of AI and autonomy into networked military systems, and the consequences of increasingly distributed military capabilities for sovereignty, hierarchy, and international order.

As a thematic narrative review, this article does not claim exhaustive coverage or estimate aggregate effect sizes. The corpus is primarily English-language, and source selection was thematic and iterative rather than based on a systematic coding protocol. The review may therefore underrepresent relevant scholarship published in other languages or debates not captured by the thematic clusters used here. These limitations are consistent with the article's purpose as a narrative synthesis, but they also mean that the framework developed here should be subjected to further comparative and systematic testing. Its contribution is conceptual: to shift attention from the possession of emerging military technology to the processes through which technology becomes usable military power. For international security, that is ultimately the more consequential question.

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References

- [1] Alparone, D., Kantorowicz, J., & Klein, G. R. (2025). Comparative public attitudes about drone strikes: Survey experiments in Italy, Poland, and Germany. *Foreign Policy Analysis*, 21(2), oraf003. <https://doi.org/10.1093/fpa/oraf003>
- [2] Archambault, E., & Veilleux-Lepage, Y. (2020). Drone imagery in Islamic State propaganda: Flying like a state. *International Affairs*, 96(4), 955–973. <https://doi.org/10.1093/ia/iaa014>
- [3] Archambault, E., & Veilleux-Lepage, Y. (2024). The Islamic State drone program. In J. P. Rogers (Ed.), *De Gruyter handbook of drone warfare* (pp. 243–254). De Gruyter. <https://doi.org/10.1515/9783110742039-017>
- [4] Berti, B. (2016). What's in a name? Re-conceptualizing non-state armed groups in the Middle East. *Palgrave Communications*, 2, 16089. <https://doi.org/10.1057/palcomms.2016.89>
- [5] Blaxland, J., Bose, S., & Lushenko, P. (2022). The significance—and potential—of a fourth wave of drone warfare scholarship. In P. Lushenko, S. Bose, & W. Maley (Eds.), *Drones and global order: Implications of remote warfare for international society*. Routledge. <https://doi.org/10.4324/9781003139676-13>
- [6] Boyle, M. J. (2013). The costs and consequences of drone warfare. *International Affairs*, 89(1), 1–29. <https://doi.org/10.1111/1468-2346.12002>
- [7] Boyle, M. J. (2026). How tactical and operational drones transform ground combat. *Security Studies*, 35(2), 307–339. <https://doi.org/10.1080/09636412.2026.2617883>
- [8] Calcara, A., Gilli, A., Gilli, M., Marchetti, R., & Zaccagnini, I. (2022). Why drones have not revolutionized war: The enduring hide-and-seek competition in air warfare. *International Security*, 46(4), 130–171. https://doi.org/10.1162/isec_a_00431
- [9] Chávez, K., & Swed, O. (2024). Violent nonstate exploitation of commercial drones. In J. P. Rogers (Ed.), *De Gruyter handbook of drone warfare* (pp. 313–324). De Gruyter. <https://doi.org/10.1515/9783110742039-022>
- [10] DeVore, M. R., Stähli, A. B., & Franke, U. E. (2019). Dynamics of insurgent innovation: How Hezbollah and other non-state actors develop new capabilities. *Comparative Strategy*, 38(4), 371–400. <https://doi.org/10.1080/01495933.2019.1573072>
- [11] Franke, U. E. (2017). *Drone warfare*. Oxford Bibliographies in International Relations. Oxford University Press. <https://doi.org/10.1093/obo/9780199743292-0223>
- [12] Fuhrmann, M., & Horowitz, M. C. (2017). Droning on: Explaining the proliferation of unmanned aerial vehicles. *International Organization*, 71(2), 397–418. <https://doi.org/10.1017/S0020818317000121>
- [13] Gilli, A., & Gilli, M. (2016). The diffusion of drone warfare? Industrial, organizational, and infrastructural constraints. *Security Studies*, 25(1), 50–84. <https://doi.org/10.1080/09636412.2016.1134189>

- [14] Hall, K. (2024). Experimental air power: Early British drone programs and Western violence in the interwar period. *Critical Military Studies*, 10(4), 547–561.
- [15] Horowitz, M. C. (2010). *The diffusion of military power: Causes and consequences for international politics*. Princeton University Press.
- [16] Horowitz, M. C. (2016). The ethics & morality of robotic warfare: Assessing the debate over autonomous weapons. *Dædalus*, 145(4), 25–36.
- [17] Horowitz, M. C. (2018). Artificial intelligence, international competition, and the balance of power. *Texas National Security Review*, 1(3), 36–57. <https://doi.org/10.15781/T2639KP49>
- [18] Horowitz, M. C., Schwartz, J. A., & Fuhrmann, M. (2020). Who's prone to drone? A global time-series analysis of armed uninhabited aerial vehicle proliferation. *Conflict Management and Peace Science*. Advance online publication. <https://doi.org/10.1177/0738894220966572>
- [19] Hutto, J. W., & Rogers, J. P. (2026). The drone revolution: Towards a synthesis in the drone debate. *European Journal of International Security*, 11(2), 145–165. <https://doi.org/10.1017/eis.2025.10005>
- [20] Jensen, B. M., Whyte, C., & Cuomo, S. (2022). *Information in war: Military innovation, battle networks, and the future of artificial intelligence*. Georgetown University Press.
- [21] Kindervater, K. H. (2015). *Lethal surveillance: Drones and the geo-history of modern war* [Doctoral dissertation, University of Minnesota].
- [22] Kindervater, K. H. (2017). The technological rationality of the drone strike. *Critical Studies on Security*, 5(1), 28–44. <https://doi.org/10.1080/21624887.2017.1329472>
- [23] King, A. (2024). Robot wars: Autonomous drone swarms and the battlefield of the future. *Journal of Strategic Studies*, 47(2), 185–213. <https://doi.org/10.1080/01402390.2024.2302585>
- [24] Kreps, S. E. (2016). *Drones: What everyone needs to know*. Oxford University Press. <https://doi.org/10.1093/wentk/9780190235345.001.0001>
- [25] Kreps, S. E., Fuhrmann, M., & Horowitz, M. C. (2018). Drone proliferation in the twenty-first century. In A. Gheciu & W. C. Wohlforth (Eds.), *The Oxford handbook of international security* (pp. 578–592). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198777854.013.38>
- [26] Kreps, S., & Lushenko, P. (2023). Drones in modern war: Evolutionary, revolutionary, or both? *Defense & Security Analysis*, 39(2), 271–274. <https://doi.org/10.1080/14751798.2023.2178599>
- [27] Kreuzer, M. P. (2014). *Remotely piloted aircraft: Evolution, diffusion, and the future of air warfare* [Doctoral dissertation, Princeton University]. ProQuest LLC.
- [28] Kreuzer, M. P. (2024). The diffusion of drone warfare – A ten year review. In J. P. Rogers (Ed.), *De Gruyter handbook of drone warfare* (pp. 421–436). De Gruyter. <https://doi.org/10.1515/9783110742039-028>
- [29] Kunertova, D. (2023). Drones have boots: Learning from Russia's war in Ukraine. *Contemporary Security Policy*, 44(4), 576–591. <https://doi.org/10.1080/13523260.2023.2262792>
- [30] Lin-Greenberg, E. (2022). Wargame of drones: Remotely piloted aircraft and crisis escalation. *Journal of Conflict Resolution*, 66(10), 1737–1765. <https://doi.org/10.1177/00220027221106960>
- [31] Lushenko, P., Bose, S., & Maley, W. (Eds.). (2022). *Drones and global order: Implications of remote warfare for international society*. Routledge.
- [32] Milan, F. F. (2026). Terrorist groups, advanced armed drones, and nonstate warfare. *Defence Studies*. Advance online publication. <https://doi.org/10.1080/14702436.2026.2678585>
- [33] Mutschler, M., Bales, M., & Meininghaus, E. (2024). The impact of precision strike technology on the warfare of non-state armed groups: Case studies on Daesh and the Houthis. *Small Wars & Insurgencies*, 35(7), 1123–1150. <https://doi.org/10.1080/09592318.2024.2319216>
- [34] Plichta, M., & Rossiter, A. (2024). A one-way attack drone revolution? Affordable mass precision in modern conflict. *Journal of Strategic Studies*, 47(6–7), 1001–1031. <https://doi.org/10.1080/01402390.2024.2385843>
- [35] Rogers, J. P. (2024). What is 'The Second Drone Age'? In J. P. Rogers (Ed.), *De Gruyter handbook of drone warfare* (pp. 237–242). De Gruyter. <https://doi.org/10.1515/9783110742039-016>
- [36] Rogers, J. P., Kunertova, D., Hutto, J. W., & Redmond, E. H. (2026). Doctrine in the Third Drone Age: How NATO should adapt to full spectrum drone warfare. *International Affairs*, 102(4), 1415–1424. <https://doi.org/10.1093/ia/iaag092>
- [37] Scharre, P. (2026). Losing the war of the future: How new technologies threaten America's military advantage. *Foreign Affairs*, 105(4), 8–23.
- [38] Scharre, P., & Horowitz, M. C. (2015). *An introduction to autonomy in weapon systems*. Center for a New American Security.
- [39] Schulzke, M. (2022). *Twenty-first century military innovation: Technological, organizational, and strategic change beyond conventional war*. University of Michigan Press. <https://doi.org/10.3998/mpub.11954694>
- [40] Singer, P. W. (2009). *Wired for war: The robotics revolution and conflict in the 21st century*. Penguin Press.
- [41] Wastnidge, E., & Mabon, S. (2024). The resistance axis and regional order in the Middle East: Nomos, space, and normative alternatives. *British Journal of Middle Eastern Studies*, 51(5), 954–971. <https://doi.org/10.1080/13530194.2023.2179975>
- [42] Williams, J. (2022). Hierarchy, drones, and global order in international society. In P. Lushenko, S. Bose, & W. Maley (Eds.), *Drones and global order: Implications of remote warfare for international society* (pp. 119–136). Routledge.
- [43] Zegart, A. (2018). Cheap fights, credible threats: The future of armed drones and coercion. *Journal of Strategic Studies*. Advance online publication. <https://doi.org/10.1080/01402390.2018.1439747>