Technology and Military Diffusion: Assessing the Impacts on Military Effectiveness

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What ultimately enables armies to prevail on the battlefield? Competing hypotheses have been advanced to explain the sources of military doctrine, and the debate remains unsettled regarding the relative weight of material, organizational, and sociological variables in shaping doctrinal outcomes. At the core of this debate lies a fundamental question: how can one account for both the divergences and the convergences in the doctrinal development of military organizations? Some armies, when confronted with dire battlefield prospects, demonstrate remarkable resilience—launching counteroffensives and resisting the temptation to capitulate—while others disintegrate rapidly. Why are some forces able to maintain cohesion under extreme adversity whereas others collapse? Why did the North Vietnamese army, despite suffering vastly higher casualties, withstand the technologically superior United States military? Conversely, why did the French army in 1940—defending its homeland as in 1914—crumble in six weeks, suffering fewer than 100,000 combat deaths but losing over two million prisoners, while the army of 1914 endured staggering early losses yet recovered and fought on for years? (Castillo, 2014).

Two enduring imperatives in wartime are cost reduction and the cultivation of organizational agility. These imperatives underpin the necessity of continuous adaptation. Armies that fail to innovate are prone to defeat, even under materially advantageous conditions. History offers multiple illustrations: the United States in Vietnam, Iraq, and Afghanistan; Russia in Ukraine; Israel in Lebanon; or France in Mali. A recurrent lesson emerges: the inability to innovate translates into operational ineffectiveness and structural capability gaps. Yet, like all bureaucracies, military institutions often display a strong inertia and resistance to change. The scholarly literature on innovation and military diffusion has largely examined why and how states pursue new technologies, doctrines, and practices, emphasizing material constraints, organizational cultures, and broader sociological dynamics. Neorealist perspectives in particular argue that diffusion stems from systemic security pressures: states adopt innovations to preserve survival, and success depends on their ability to allocate sufficient resources. The organizational and financial capital required for adoption ultimately conditions national choices, which aggregate to shape systemic patterns of diffusion and, consequently, the balance of power.

In many national contexts, defense innovation unfolds within a formalized process: national security priorities are assessed, defense policies are revised, and restructuring efforts reshape military institutions. Crises, however, can dramatically alter the pace and trajectory of change. Russia's decision to invade Ukraine in February 2022 exemplifies how war can accelerate doctrinal and organizational transformation. Armed forces remain highly responsive to the evolving geostrategic environment and to the shifting character of warfare, including domestic political and societal conditions. Ultimately, military organizations operate under a dual imperative: they must (1) guarantee operational effectiveness in adapting to strategic change, while (2) remaining embedded within, and responsive to, the broader societal norms and values of the polity they serve. It is precisely the tensions generated by this dual framework—between military necessity and societal legitimacy—that have become increasingly visible in the post–Cold War era, and which continue to shape debates on the future of military effectiveness.

Civil-Military Tensions and the Limits of Doctrinal Change: Understanding the Mechanisms of Military Change

Particularly in democratic societies, the military institution often appears out of step with the wider society, as contemporary culture has eroded the traditional "warrior ethos" by devaluing martial values. In modern operational environments—where the support and perception of local populations can be decisive—the use of violence may not only be inappropriate but even counterproductive. As General Walter D. Kerwin noted in the 1970s, "the values necessary to defend society are often in contradiction with the values of society itself. To be an effective servant of the people, the military must focus not on the values of our liberal society, but on the hard values of the battlefield." This tension highlights structural constraints that limit military freedom of action: the imperatives of victory often collide with liberal norms. Since the armed forces remain bound by the decisions of civilian leaders and by the broader values of society, the very rationality of doctrinal change is deeply affected (Hamel, 2023).

A broad range of socio-political transformations—both within the international system and across domestic economic and social structures—has progressively challenged traditional perspectives on the nature of war, vital interests, and prevailing notions of security and threat. Operational challenges and new technologies have historically acted as primary drivers of wartime innovation. As Farrell and Terriff (2002) argue, Major Military Change (MMC) occurs when technological innovation converges with organizational restructuring, new concepts of warfare, and revised visions of future conflict. Military change unfolds through three interrelated processes: innovation (the development of new technologies, strategies, and force structures), adaptation (adjusting existing military means and methods), and emulation (adopting practices through imitation of other military organizations). Whether a change is "major" or "minor" depends not only on the process but also on its long-term strategic outcome (Farrell & Terriff, 2002, pp. 5–6).

In peacetime, military innovators face the task of articulating what Stephen Rosen has termed a "new theory of victory"—an interpretive framework anticipating what the next war will look like and how it can be won (Rosen, 1991, p. 20). This theory provides the conceptual foundation for subsequent organizational and financial reforms. It requires systematic reflection on the evolving character of war, the identification of emerging military regimes, and the integration of these insights into state strategic practices. Such theorizing, a distinct intellectual enterprise, precedes the bureaucratic transformation of abstract ideas into concrete doctrine and operational concepts.

This capacity depends largely on the intellectual and organizational work of military staffs engaged in strategic thought and operational art. Yet it cannot be assumed. As Hamel (2023) emphasizes, military organizations are state bureaucracies, and policymakers operate within constraints that often inhibit doctrinal or organizational change. Military thought and practice thus remain at once autonomous from, embedded within, and subordinated to the wider society in which they are situated. While war is inherently political, the relationship between political objectives and military means is rarely synchronized. As a result, armed forces frequently fail to adapt—conceptually and operationally—for reasons beyond their direct control, with significant consequences on the battlefield.

Military Diffusion and Globalization: An Asymmetric Process of Strategic Rebalancing

Innovation—technological and otherwise—remains one of the primary drivers of warfare. From the perspective of hegemonic stability theory, the development of war has historically resembled a "pack" dynamic in which followers emulate a small number of pioneers, since "there is an historical tendency for the military and economic techniques of the leading state or empire to be diffused to other states in the system" (Gilpin, 1981, pp. 176–177). Globalization and technological progress further facilitate and accelerate this process. First, dual-use technologies such as computing and software capabilities are not capital-intensive and therefore pose relatively low barriers to entry for new actors. Second, because commercial markets generally innovate at a faster rate than the defense sector, cutting-edge technologies are more easily accessible to a broader range of actors. Third, given the high level of integration in the global economy, recipients of foreign direct investment can leverage externally developed technologies and expertise to produce advanced military capabilities. In short, in the era of globalization, technology inevitably spreads and eventually becomes available to potential adversaries. This helps explain why military technologies tend to diffuse rapidly and broadly across the international system.

Systemic accounts, however, note the diversity of responses among international actors confronted with major military innovations. When a breakthrough begins to demonstrate its significance, states react in different ways: through adoption, countermeasure development, alliance formation, or neutrality. A range of factors—strategic,

organizational, and political—shapes these choices, thereby determining the mechanisms by which military power diffuses within the international system (Goldman & Eliason, 2003, p. 9). As both a product of socialization and of competitive dynamics, diffusion—defined as "the introduction, application, and institutionalization of new technologies and practices" (Goldman & Eliason, 2003, p. 397)—produces convergence: the major weapons of principal competitors tend to resemble one another worldwide. Yet this raises a central question: why do only some innovations spread widely and reshape international politics?

The literature on diffusion in military affairs has focused on three key issues: how the process is defined, what causes it, and what patterns and effects it produces. Contrary to the neorealist view of diffusion as a straightforward process of emulation—where weaker states simply copy the behaviors and practices of stronger ones—empirical research shows that the mechanisms of diffusion are far more complex and contingent. Only a handful of military innovations diffuse both quickly and broadly. Weapons systems can spread through arms sales, commercial development of dual-use technologies, or imitation; yet the doctrines designed to integrate these weapons into operational practice rarely diffuse as quickly or easily. Scholars generally agree that "hardware" (weapons and technologies) is comparatively easy to acquire, whereas "software" (attitudes, doctrines, organizational structures, tactics, and related intangible factors) is far more difficult to develop and implement. The diffusion of military power is therefore mediated by a complex interplay of societal, cultural, institutional, organizational, bureaucratic, individual, doctrinal, and historical forces that shape both the pace and scope of innovation.

Adoption Capacity and Power Hierarchies: The Role of Financial Intensity and Organizational Capital

Diffusion/adoption theory posits that once states have registered an innovation, the spread of military power is determined primarily by two variables: financial intensity and organizational capital. Financial intensity refers to the level of investment required to develop and sustain an innovation, while organizational capital reflects the bureaucratic capacity of a state to restructure itself along the lines dictated by the innovation and to adapt to emerging strategic and operational realities (Horowitz, 2010, pp. 45–49). Together, these two factors shape whether a state can successfully adopt new military technologies.

History demonstrates that states often struggle to translate technological advantages on the battlefield into enduring strategic victories. New technologies only realize their full potential when embedded in new processes and executed through novel organizational structures. Thus, only those states that establish institutional arrangements enabling governments to exploit emerging technologies are able to emerge as dominant powers within the international system. The last five centuries of world history have been punctuated by successive revolutions in military technology. Those nations that mastered these revolutions—whether through naval innovations, mechanized warfare, or nuclear weapons—gained the capacity to reshape the global order (Boot, 2006).

Specific innovations have profoundly influenced the distribution of power, alliance patterns, and even the likelihood and duration of wars. The determinant of success lies in whether the financial and organizational requirements of a given innovation align with the capacities of the adopting state. For example, carrier warfare demanded extremely high levels of both financial and organizational capital. Nuclear weapons required extraordinary financial investment but relatively modest organizational adaptation. Suicide terrorism, by contrast, involved minimal financial costs but placed enormous demands on organizational capacity. Innovations in surface fleet warfare required mid-range commitments on both dimensions. As Horowitz notes, "the higher the financial intensity and organizational capital required to implement the innovation, the slower its diffusion at the systemic level and the lower the probability that a state will attempt to adopt it" (Horowitz, 2010, p. 49).

Financially intensive innovations tend to reinforce existing power hierarchies, while low-cost innovations pose greater risks to established powers by lowering entry barriers. Organizationally demanding innovations are more likely to generate enduring advantages for first movers compared to those that impose fewer structural requirements. In this sense, the diffusion of military innovations reshapes the strategic environment both through the distribution of systemic responses and through the first-mover advantages they confer. Yet, as history also shows, capacity to adopt innovation does not automatically translate into battlefield effectiveness.

Beyond Resources: Cohesion, Will to Fight, and Organization as Keys to Effectiveness

The resilience of Ukrainian forces has surprised many observers. The will to fight and unit cohesion on the battlefield have long been central concerns in research on military effectiveness. As numerous theorists have emphasized, the Greek commander Xenophon already recognized the primacy of will in war, remarking that "it is not numbers or strength that bring victory in war, but whichever army goes into battle stronger in soul, their enemies cannot withstand them" (Taylor, 2003, p. 32). For centuries, thinkers from Thucydides and Sun Tzu to Machiavelli and contemporary political scientists have sought to move beyond purely material explanations—such as the idea that larger armies with superior weaponry inevitably prevail—to incorporate non-material factors. Cultural, ideational, political, and social forces also shape the outcomes of wars and battles. Groups draw strength from motivation, while organizational structures and unit composition influence cohesion. Cohesion itself has two aspects:

1. Endurance refers to the capacity of an army "to remain disciplined and able to operate as the likelihood of victory decreases." When confronted with battlefield setbacks, can an army remain a coherent and effective fighting force? Do soldiers continue to fight and obey orders, or do mutinies, mass desertions, and refusals to fight occur?
2. Battlefield performance, by contrast, denotes the "willingness of units to fight with determination and flexibility." Determined units respond to setbacks, high casualties, or prolonged bombardment by continuing to resist, sustaining morale, and even launching counterattacks. Flexible units resist panic, reconstitute broken formations, and improvise when plans collapse or communications with higher command are severed.

The study of military effectiveness has advanced considerably. Scholars have investigated the martial weaknesses of dictatorships (Castillo, 2015), the battlefield virtues of democracies (Reiter & Stam, 2002), the links between civil-military relations and the preparation and conduct of hostilities (Brooks, 2008), and the critical importance of the "modern system of force employment." According to Biddle (2004), armed forces are more likely to succeed on the contemporary battlefield when they adopt specific organizational practices: decentralized command, open communication, merit-based promotion, and rigorous, realistic training. The modern system does not guarantee victory, but functions as a causal mechanism linking regime type and material resources to combat capability. Organizational-level variables thus shape both unit-level effectiveness and aggregate military power. After initial failures in planning, organization, command, and intelligence, Moscow quickly began learning from its mistakes (Baldor, 2022).

A shared conclusion in this literature is skepticism toward the realist claim that states build and optimize their militaries simply to face external threats, and that military power can be measured by counting soldiers or tanks. Morale is as decisive as material resources, and the values defended by an army can boost motivation and cohesion. Napoleon famously quipped that "God is on the side of the big battalions," but also insisted that "in war, morale is to the physical as three to one" (Greene, 2007). With motivated soldiers, he claimed, he could defeat armies three times his size. Military power is therefore more than the accumulation of material resources; it is the product of how states mobilize, allocate, and employ those resources, and how forces are commanded and used in the field. Tactical and political levels intersect: organizational choices, officer competence, and domestic stability all affect battlefield outcomes.

Although the modern system represents an optimal approach to tactical effectiveness, many states do not adopt it. Why, then, are only a few armies skilled enough to implement it? Since the system of force employment varies across states, scholarship has focused on national-level variables: regime type, civil-military relations, organizational culture, and "military inequality" within armed forces (Lyall, 2020). A particularly influential argument stresses rulers' fear of military coups. Where internal threats outweigh external ones, regimes often prioritize coup-proofing over battlefield effectiveness (Talmadge, 2015). Civil-military relations can thus shape combat effectiveness: frictions may lead to flawed strategic assessments, undermining flexibility and survivability on the battlefield. Authoritarian leaders often compromise officer competence by promoting loyalty over merit, restricting initiative, and limiting training, all to reduce coup risks (Pollack, 2002; Talmadge, 2015). Yet these measures carry a heavy cost, leaving armies poorly equipped to fight conventional wars. In such cases, fear of domestic threats directly undermines battlefield

performance, leading to military failure.

Technology as Promise and Illusion: Between Real Transformations and Strategic Myths

Technology evolves constantly, and in doing so it transforms the character of war. Politics, economics, ideology, culture, strategy, tactics, and philosophy have all shaped the conduct of war, yet no factor has had as profound an impact on its evolution as technology. It is not only military practices and organizations that are reshaped by scientific and technological advances, but also the wider political, economic, and social environments in which armed forces operate. Technology should not be understood merely as an artifact; rather, it embodies systems of knowledge and the prerogatives of elites, who articulate national interests and arbitrate the instrumental means through which they are pursued (Latour, 1999, p. 214). As Deleuze and Guattari famously observed, "we are sociotechnical animals, and every human interaction is sociotechnical" (2003, p. 397).

In this sense, the Revolution in Military Affairs (RMA) of the 1990s stimulated the *technoscientific imaginary* of the West (Marcus, 1995), heightening confidence in its ability to shape a new world order. Post–Cold War defense cuts reinforced reliance on technology in wartime, as smaller armies sought to leverage technological superiority to compensate for reduced mass. The RMA also contributed to the social construction of what Martin Shaw has described as "riskless war" (Hamel, 2021, p. 6), in which Western states could strike from afar with minimal risk to their soldiers.

Throughout history, technological innovation has been central in determining battlefield outcomes. From gunpowder (ninth century) to armored ships (1860s), machine guns (1890s), aircraft and tanks (1920s–30s), aircraft carriers and radar (1930s–40s), and nuclear weapons (1940s–50s), successive breakthroughs reshaped the conduct of war. Each of these innovations had profound consequences. Yet history is also marked by long periods of technological stagnation punctuated by episodes of revolutionary change. Naval technology, for instance, remained largely static in Europe from 1560 to 1850, illustrating the longue durée of stability. But the Industrial Revolution radically altered this pattern, accelerating technological change across all domains, including war (Bousquet, 2009).

The relationship between war and technology has always been reciprocal: technology has been harnessed to produce new tools of war, while wars have accelerated industrialization. The Industrial Revolution unleashed the second great wave of transformation in warfare, characterized by mass production of weapons, mass mobilization of national armies, and the standardization of training, doctrine, and organization. The Second World War was the first conflict in history in which the weapons used at the end were markedly different from those employed at the outset: the atomic bomb, jet aircraft, guided missiles, and microwave radar exemplify this leap. More broadly, recent technological trends converge around five attributes: (1) greater lethality, (2) increased precision and volume of fire, (3) enhanced integration and efficiency, (4) expanded capabilities for small units to generate decisive effects, and (5) improved stealth and survivability (Chin, 2019).

Technology has always served economic as well as military ends: nations wage war in ways consistent with how they create wealth. Just as agrarian and industrial eras produced distinctive modes of warfare, the information age brings about a new form of "chaoplexic warfare" characterized by networks (Bousquet, 2009, p. 30). The RMA was expected to redefine the global "kill chain" from sensors to shooters, much as globalization reshaped supply chains. The defense community embraced concepts of "electronic battlefields" and "network-centric warfare," where networked forces could recognize, communicate, and coordinate faster than their adversaries. Cyberspace now enables cyber-mobilization, adding a new dimension to war at a distance. As Hamel (2016, p. 64) argues, contemporary "electronic levées en masse" transform both the means of participation and the purposes for which wars are fought.

In this context, information warfare has emerged as the primary operational form, shaping all other domains. It entails efforts to secure "information dominance" through cyber capabilities, social media manipulation, and cognitive targeting. Information is not merely a new domain but the connective tissue linking land, sea, air, and space, understood not in terms of "bits and bytes" but as a system of pragmatic relations between representation and referent, humans and machines, allies and adversaries (Lindsay, 2020, p. 7). The cognitive domain, exemplified in

the Russia–Ukraine war, is increasingly central: the battle to shape national, adversary, and global opinion has become integral to modern war, with private actors such as Elon Musk's Starlink or the Wagner Group playing direct roles. Emerging technologies—artificial intelligence, robotics, quantum computing, big data, 5G networks, and the Internet of Things—herald a shift from "information dominance" to "cognitive dominance." Cognitive warfare involves three interlinked battles: influencing public opinion, conducting psychological operations to demoralize the enemy, and weaponizing law to gain legitimacy. As Sun Tzu taught, the highest form of excellence is to subdue the enemy without fighting.

The Ukraine war illustrates the material limits of high-tech war. NATO states have faced major challenges in sustaining Ukraine's needs for advanced weaponry, revealing their own vulnerabilities in a prolonged, high-intensity conflict. Industrial capacity and supply chains—rare earths, semiconductors, and munitions—have become as decisive as battlefield tactics (Vershinin, 2022). Western stockpiles of precision munitions have been rapidly depleted; Lockheed Martin and Raytheon warned in 2022 that replenishing U.S. missile inventories would take years. Britain, in a war game, exhausted critical ammunition stocks in just eight days. Russia, by contrast, maintained reserves of cruise and ballistic missiles and expanded production despite sanctions.

The proliferation of drones has further disrupted assumptions about twenty-first-century great-power war. While NATO, China, and Russia had invested heavily in costly autonomous systems, the Ukraine conflict demonstrated the disruptive potential of cheap loitering munitions deployed in swarms. In this respect, technology reshapes war only when it alters the political and economic costs of sustaining conflict. Cheap drones undermine expensive air defense systems, changing the cost equation. More broadly, the outcome of protracted wars depends not only on technological sophistication but on industrial resilience and coalition resources, as in the World Wars.

The United States' own experience underscores the paradox of technological warfare. Over two decades and at a cost exceeding $10 trillion, it waged high-tech wars with advanced drones, stealth aircraft, and satellite networks, only to be outmaneuvered by insurgents wielding improvised explosive devices costing a fraction of U.S. systems (Merle, 2004). Technology reduced casualties but not costs, nor did it ensure rapid or decisive victories. As a result, analysts stress that no matter how advanced, "big complex programs are useless if there are no bullets for the rifles" (RUSI, 2022). Autonomous unmanned systems may hold the greatest promise in reducing both political and economic costs by providing scalable firepower and minimizing human risk. Yet decisive technology must do more than confer temporary battlefield advantages: it must reinforce political will and economic sustainability over time.

In sum, technology and war have always been co-constitutive. But in the contemporary era, effectiveness lies not in the mere accumulation of cutting-edge tools, but in how these tools reshape the costs—and thereby the sustainability—of conflict. States that ignore the long-term political and economic implications of military technology risk discovering that advanced weapons, however effective tactically, are insufficient for strategic success.

Conclusion: The Illusion of the Decisive Battle: Between Technological Fascination and the Return of Wars of Attrition

World leaders have long been captivated by stories of decisive battles and by generals whose genius could overcome overwhelming odds. Some of the most enduring misconceptions about war date back to the Napoleonic era. The study of figures such as Frederick the Great and Napoleon—whose battle-centric approaches fostered a veneration of aggressive tactics—became central to officer training, while historians and the media produced compelling narratives around their maneuvers. This obsession with the decisive stroke reflected what Nolan has termed the *"allure of battle"*: the idea that rapid, decisive campaigns could deliver clear outcomes and durable political settlements—a future in which wars would be brief and peace enduring (Nolan, 2017). Technological progress has reinforced this fascination with decisive battle, as political and military leaders came to see technology as a means of ensuring quick, cheap, and clean victory. Yet this is largely an illusion: as the First World War revealed, after the opening battles, the rationale for fighting often becomes the need to justify the blood already shed. Great powers then grind each other down until one collapses—usually just before the other was about to do the same (Howard, 1991, p. 98).

In the modern era, the fantasy of short, decisive wars has too often led to protracted wars of attrition. Not only President Putin, but "almost everyone was wrong in assuming the war [in Ukraine] would be short—and the reason is simple: modern wars do not only engage armies; they engage entire societies and the passions of entire societies. Once blood is spilled and treasure spent, everything changes" (Nolan, 2017). Today's military environment—echoing 1914—illustrates that "contemporary military technologies favor the defender of the status quo" (Freedman, 2017, p. 8). Strategic interests continue to motivate both offensive and defensive measures, as great powers seek to mitigate threats and neutralize adversaries' advantages.

The war in Ukraine, like the protracted trench warfare of the Great War, has undermined Antoine-Henri Jomini's classical model of warfare, itself rooted in the Napoleonic assumption that wars could be resolved through a well-constructed campaign culminating in a decisive battle (Snyder, 1991, pp. 111–112). That model assumed that superior firepower and a breakthrough would allow the invader to defeat the defender's last line, seize territory, and cut vital supply lines. But without such a breakthrough, wars degenerate into long, bloody campaigns of attrition. While political objectives can sometimes be achieved through prolonged conflict, invaders generally prefer quicker alternatives. This was clearly Putin's intention at the onset of the Ukraine invasion. Short wars attract strategists precisely because they preserve the link between political objectives and organized violence before war takes on a life of its own. No leader wishes to be trapped in a grinding war of attrition in which the costs outweigh the value of the political object. Yet the danger is equally that of rapid and catastrophic defeat: national security is precarious if armed forces are vulnerable to sudden collapse. As in 1914, today's danger lies in the mistaken belief that a preemptive, disarming strike is both feasible and necessary for ensuring security (Snyder, 1991, p. 112).

Ukraine, Iraq, Afghanistan, and other recent conflicts underscore the fallacy of assuming that a first strike or superior technology guarantees quick victory. The decisive blow rarely produces the effective triumph it promises, and technology, far from predicting the outcome of wars, only offers insight into how wars may be fought (Freedman, 2017). As Nolan observes, soldiers fighting in Ukraine are acutely aware that they are engaged in what may become "a new thirty years' war, even a new hundred years' war" (Nolan, 2017).

References

Baldor, Lolita C. "Defense leaders say Russia learning from mistakes in Ukraine." *AP News*, 3 mai 2022.

Biddle, Stephen. *Military Power*. Princeton University Press, Princeton, 2004.

Boot, Max. *War Made New: Technology, Warfare, and the Course of History – 1500 to Today* . Penguin, New York, 2006.

Bousquet, Antoine J. *The Scientific Way of Warfare*. Columbia University Press, New York, 2009.

Brooks, Risa. *Shaping Strategy*. Princeton University Press, Princeton, 2008.

Castillo, Jasen J. *Endurance and War*. Cambridge University Press, Cambridge, 2014.

Chin, Warren. "Technology, War and The State." *International Affairs*, vol. 95, no. 4, juillet 2019, pp. 765–783.

Deleuze, Gilles & Félix Guattari. *A Thousand Plateaus*. Continuum, New York, 2003.

Farrell, Theo & Terry Terriff. *The Sources of Military Change*. Lynne Rienner Publishers, London, 2002.

Freedman, Lawrence. *The Future of War: A History*. Public Affairs, New York, 2017.

Gilpin, Robert. *War and Change in World Politics*. Cambridge University Press, Cambridge, 1981.

Goldman, Emily O. & Leslie C. Eliason. *The Diffusion of Military Technology and Ideas* . Stanford University Press,

Stanford, 2003.

Greene, Robert. *The 33 Strategies of War*. Penguin Books, New York, 2007.

Hamel, Tewfik. « La lutte contre le terrorisme et la criminalité : Un changement de paradigme ? » *Sécurité globale*, no. 5, 2016.

Hamel, Tewfik. « La technologie et le "style de guerre américain" ». *Revue européenne d'études militaires*, vol. 11, no. 1, hiver-printemps 2021.

Hamel, Tewfik. « Le dilemme de la pensée et du récit de la doctrine de contre-insurrection américaine : L'exemple du FM 3-24 », dans Vincent Cattoir-Jonville (dir.), *CEDANT ARMA TOGAE*. Harmattan, Paris, 2023, pp. 305–360.

Horowitz, Michael C. *The Diffusion of Military Power*. Princeton University Press, Princeton, 2010.

Howard, Michael. *The Lessons of History*. Yale University Press, New Haven & London, 1991.

Latour, Bruno. *Pandora's Hope*. Harvard University Press, Cambridge, 1999.

Lindsay, Jon. *Information Technology and Military Power*. Cornell University Press, Ithaca, 2020.

Lyall, Jason. *Divided Armies*. Princeton University Press, Princeton, 2020.

Marcus, George E. *Technoscientific Imaginaries*. University of Chicago Press, Chicago, 1995.

Merle, Renae. "Running Low on Ammo." *Washington Post*, 22 juillet 2004.

Nolan, Cathal J. *The Allure of Battle*. Oxford University Press, New York, 2017.

Pollack, Kenneth M. *Arabs at War*. University of Nebraska Press, Lincoln, 2002.

Reiter, Dan & Allan C. Stam. *Democracies at War*. Princeton University Press, Princeton, 2002.

Rosen, Stephen Peter. *Winning the Next War*. Cornell University Press, Ithaca, 1991.

Snyder, Jack. "Civil-Military Relations and the Cult of the Offensive – 1914 and 1984." In Steven E. Miller et al. (dir.), *Military Strategy and the Origins of the First World War*. Princeton University Press, Princeton, 1991, pp. 111–112.

Taylor, Philip M. *Munitions of the Mind*. 3e éd., Manchester University Press, New York, 2003.

Talmadge, Caitlin. *The Dictator's Army*. Cornell University Press, Ithaca, 2015.

Vershinin, Alex. "The Return of Industrial Warfare." *Royal United Services Institute (RUSI)*, 17 juin 2022.

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