

War and Technology: An Approaching Military Revolution?

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Historically, technological change has altered how battles are fought but has not overturned the fundamental principles of war. However, three considerations may now represent an actual revolution: the recourse to tactical nuclear weapons, the development of software for “multi-domain operations,” and the prospect of general artificial intelligence. The organization of militaries and the use of force need to be rethought in this light.

politique étrangère

Since the industrialization of Europe in the mid-19th century, most commentators have shaped their visions of future war through the prism of technological innovation. At first, this trend was modified by strategic thinkers who, while accepting that the development of new weapons and their mass production with precision tools were changing tactics, argued for an underlying continuity in the principles of war and the strategies which shaped it. Before the First World War, Ferdinand Foch cited Napoleon when he taught at the École de guerre and Julian Corbett’s ideas on maritime strategy, propounded at the Royal Naval College in Greenwich, drew their evidence from the age of sail.

The world wars of the first half of the 20th century gave the materialists the edge. New technologies –the airplane and the submarine– took war into new dimensions, in the sky and under the sea, and the internal combustion engine promised revolutionary change on land. Within a decade after 1945, the dropping of the two atomic bombs had convinced most Americans that not even strategy could be exempt from the impact of scientific innovation. For Carl von Clausewitz, writing between 1815 and 1830, the principal precipitants of change in warfare had been social

and political; for his post-1945 successors, they were physical and massively destructive.

Perhaps the most extraordinary feature of today's debates about future warfare is the almost complete absence of nuclear weapons and their effects. The focus is less on weapons and more on their enablers: drones, cyber and electronic warfare, and artificial intelligence (AI). They will deliver real-time intelligence, persistent surveillance, precision targeting, near-instantaneous reaction times, and enhanced lethality. The recurrent principles of "conventional war" (to use the vocabulary of the Cold War) seem about to be upended. Surprise will be impossible; the concentration of force will invite obliteration; the focus on the offensive, taking the initiative and mobility may all be called into question. Land warfare –as in Ukraine's defense of its territory against Russia's invasion– looks likely to be protracted and indecisive, with defense enjoying an advantage that will favor positional warfare. Airpower, the instrument for unlocking maneuver in the Second World War and thereafter, looks set to consolidate these trends rather than surmount them. Indeed, in Ukraine, a mix of manned aircraft, unmanned systems and precision-guided ballistic missiles has become the dominant factor leading to stalemate.

The zealots who make the case for innovative technologies present new systems as wonder weapons, which function perfectly in all weathers and conditions. They don't. The handlers of first-person view drones cannot see through mist and rain to guide them onto their targets, and thermal imaging does not help in the identification of people in the dark at ranges over about a thousand meters. Extremes of both heat and cold degrade the functioning of machinery. The lapse of time before drones hit their targets and the small payloads of many make their performance in some respects inferior to artillery shells –an older technology but the dominant killer in both world wars.

The performances of new weapons have rarely matched the expectations they have generated over the long term. Even if they have, no armed force is a *tabula rasa*. It must mix the new with the old and adapt obsolescent equipment to fresh roles. China's ambition to complete the modernization of the People's Liberation Army by 2035 rings hollow: modernization is a rolling process, not a fixed point. A state has also to reckon with a disobliging enemy, one who is adaptable and flexible, and who may emulate the new technology or at least adjust his tactics to neutralize its threat. He will respond to offensive capabilities with defense and evasion: that might mean counter-drones, interceptors and air

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defenses, all of which are based on new technologies, but he could also simply take cover or go underground.

As a result, the historical experience of the impact of new technologies on war has been more evolutionary than revolutionary, largely because specific systems have to be incorporated into the broader context of war as a whole and alongside other capabilities. While armed forces seek to match each other in peace, they strive for asymmetry in war. Three factors could change this dynamic.

Nuclear Weapons

The first would be the actual use of nuclear weapons. If they were employed only in a tactical role, as Russia has threatened in Ukraine, they might not be seen as crossing a threshold. Ukrainians, after all, responded to Russia by saying that the effects would be little different from those they had already suffered in cities like Mariupol. During the Cold War, both the North Atlantic Treaty Organization (NATO) and the Warsaw Pact in the 1960s similarly thought that they might have to use tactical nuclear weapons to supplement conventional forces. The recognition of that necessity gave their possible employment credibility and so simultaneously fed both defense and deterrence. Crucially tactical and theatre nuclear weapons demonstrated that their owners were ready to escalate.

That was not the response in February 2022 of either NATO or –particularly– the United States to Russia after its full-scale invasion of Ukraine. They did not threaten to escalate but stressed deterrence by denial. So has the Trump administration’s 2026 National Defense Strategy. Deterrence by denial has not checked Russia. Instead, the reluctance to threaten escalation suggested that the West was itself deterred. The effect has been to weaken the credibility of deterrence. Politically, nuclear weapons are presented as a weapon of last resort and so defensive in their purpose, but the very nature of strategic nuclear weapons delivered by ballistic missiles is offensive. Workable deterrence has to incorporate risk by embracing escalation.

If the world is witnessing a return to inter-state war and anticipating inter-continental war, it has to treat nuclear weapons not as a subject that is too difficult to discuss but as strategic assets, so integrating them with other capabilities. Now, if ever, the world confronts the circumstances that make nuclear weapons relevant.

Integrated Warfare

The second, and the less ethically difficult, dynamic that could change war in “revolutionary” ways is that promised by the “system of systems”. The phrase dates back to the 1990s, but its application to what are called multi-domain operations is imminent. The aim is to use software to integrate effects across the battlespace jointly, from land, sea, air and space; to do so within minutes and even seconds; and to have the ability to react down to the lowest level of command in ways that flatten the decision-making hierarchy. Fires, enabled by real-time intelligence and directed by precision guidance, will have convergent effects without the need to concentrate troops, thereby preventing them from becoming targets and revealing their intentions. The cost of software is lower and politically easier than the difficulties of reintroducing conscription. The renewed possibility of major war raises the need for mass but also for force regeneration in a protracted conflict and, as several European states recognize, both are only achievable through compulsory military service. Systemic adaptation therefore postpones difficult decisions in societies now accustomed to professional armed forces and unfamiliar with the idea that defense is a civic obligation. Furthermore, keeping reserves fully trained and mobilizable is complex; software updates, by comparison, can be nearly instantaneous.

General Sir Roly Walker, appointed the chief of the British army’s general staff in 2024, declared his intention to double the army’s lethality without increasing its numbers. The following year, the United Kingdom’s strategic defense review said its lethality could be tripled. In a recent exercise, the U.S. Army aimed to take out 1,500 targets a day.

Artificial Intelligence

Nuclear weapons are a system inherited from the past; tripling lethality is a current target. The promise of artificial intelligence –the third dynamic– lies mostly in the future. AI’s capacity to process large quantities of big data at speed is central to the intelligence which underpins the vision of integrated firepower. Currently, AI is no better than the inputs created by humans that it harvests from the internet. It gives answers to the problems that confront its programmers but does so on the basis of probabilities, not of true understanding, empathy or ethics. If built up from specialized sources, it can deliver quickly actionable intelligence in short order: the Israeli Defense Force has used it to real effect against Hamas. However, much of the information that is stored in search engines online is inaccurate or biased. The more that generalization is true, and the more

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that AI sweeps up – and the more indiscriminate its methods for doing so, the more AI can expose its users to algorithms that could mislead and, if acted on, cause disaster.¹

For the moment, the need for discrimination keeps human judgement in the loop. But the capacity of AI to change the conduct of war –and to do so by the end of the 2020s– goes, in the view of its proponents, far further. Artificial general intelligence (AGI), elements of which are already in operation, can outperform human cognitive abilities because it can trawl information from across the disciplinary spectrum and teach itself to improve the quality of its outputs. It could even imitate those qualities which we see as essentially human, giving it the ability to form judgements which would be better founded than more subjective individual responses and do so much faster and with far greater accuracy than the human brain.

Its advocates believe that the United States and China will dominate the field and that, in the event of war, AGI will be so transformative and so powerful that no other power will be able to stand against them. That does not mean that lesser powers would not fight each other, but it does mean that, if they are sensible, they will be deterred from taking on the two superpowers. The danger of a major world war would lie solely in the hands of China and the United States, and in the relations between them.

Organizational Effects for Armed Forces

Both the integrated battlefield and AI are forcing organizational change on armed forces. During industrialized war, the speed of adaptation meant that the feedback loop, driven by immediate tactical experience from the bottom up, had to be as short as possible. Systems could not be tested and proven over years and decades before adoption and deployment, but had to be adapted and refined through direct application.

The core point here is more than the obvious one –that the battlefield is an unforgiving place where robust equipment that is consistently reliable may be more important than high-performance weaponry that requires constant maintenance by highly-qualified specialists and a secure supply chain of bespoke spare parts. That was already the reality of 20th century warfare. Rather, drones, cyber, AI and electronic warfare

1. Anthony King takes a more cautious approach to AI in war in his work: *AI, Automation, and War: The Rise of a Military-Tech Complex*, Princeton: Princeton University Press, 2025.

have taken that process a step further. Civilian contractors have to be deployed closer to the front line and integrated into the command chain.

The consequences for armed forces are social and hierarchical. The branch of service and the physical domain in which it acts carries less significance than it did. Those at the front line will, in many cases, be older and better qualified, a mix of uniformed service personnel and civilians, and possess specialisms that are not just narrowly military. This does not mean that physical strength and physical fitness will not still be required for many roles –and in those cases the demands are likely to be so much greater that performance-enhancing drugs and other aids will be designed to enable individuals to exceed what seem to be the limits of their natural capacities. But for others, the specialist skills will be sedentary and acquired in the laboratory or research center. The opportunities for diversity and inclusion in the armed forces will be greater –not as a result of politically correct norms but because of practical realities. Brain may be better than brawn, and adaptive skills matter more than tactics, techniques and procedures.

Command and Control

The consequences for the exercise of command should also be far-reaching. The ultimate implication is that AGI will take better decisions than humans. Despite that, the current mantra is that humans will remain in the command loop. That could result in poorer decisions and a delay in their execution, which could undermine their effectiveness. If a human does continue to have the final say, how will she or he feel about taking a decision that runs contrary to the conclusions drawn from those presented by AI's analysis of big data?

Intelligence-led command could create its own challenges, potentially swamping the general with too much information and too many alternatives, and so creating uncertainty and indecision. The ideal commander of the past was confident enough in his own judgement and was promoted precisely in order to exercise the authority that rank bestowed. But ranks could become less important than specialist knowledge and specific skills. The need to take counsel from a broad spectrum of expertise has led to bloated headquarters that, with a deepening battle zone, constitute a source of vulnerability. A century ago, the British general and tank advocate, J. F. C. Fuller, imagined using fast armored vehicles to break through the trench systems of the First World War to strike "the brain of an army", and so disable it. Drones and ballistic missiles, using electronic signals and acoustic sensors to identify command hubs at speed, have given this

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vision immediacy and the precision targeting to make it effective, not least in Ukraine.

The pressure to delegate authority down the command chain has grown in step with the expansion of theatres of war and the need to operate in multiple domains simultaneously, but it is also in danger of overloading the communications of junior commanders, connected vertically –upwards to superiors and downwards to those in their units– as well as laterally to adjacent and supporting formations. At the same time, the immediacy of command has gone up and across the civil-military divide. President Barack Obama and his staff were able to watch in real time from Washington as U.S. Seals killed Osama bin Laden in Abbottabad on May 2, 2011, just as President Donald Trump and his staff could watch the raid to capture President Nicolás Maduro in Venezuela on January 3, 2026. The potential for the politician to take tactical decisions, to employ a long screwdriver, has never been greater, but, for that to be a virtue not an encumbrance, those exercising political authority have to be more militarily, and even strategically, aware than sometimes seems to be the case.

The implications of the three changes in warfare will create fresh tensions in how civil-military relations have come to be conceived, especially in democracies.

Increased Lethality

These three dynamics promise combat that is more violent, not less, assuming that those doing the fighting are made of flesh and blood and are not automated and unmanned systems. Killing and its scale are the most important issues in how we imagine future war. Carl von Clausewitz began *On War* by defining it as an act of force to make the enemy do our will. If killing and wounding are taken out, what remains is not war. We may use the word to describe activities that do not involve death, but we do so as a metaphor. Without violence, war's very nature would change: it would become something else.

Many of the enablers driving current warfare initially seemed to promise war with less violence and even with none. The United States used weaponized drones in conjunction with real-time intelligence and precision guidance to remove boots from the ground and to promise that only legitimate targets would be killed and that collateral damage would be circumvented. Cyber war seemed to offer even more: the capacity to destroy state functions without the need to kill people, even if some might

die through its second-order effects. These expectations chimed in the 2010s with the conclusion reached by academics, like Stephen Pinker, Yuval Noah Harari and Azar Gat, that humans were increasingly less likely to die violent deaths, including from war. A *longue durée* calculation, which evened out spikes like the Thirty Years War, it was based on a decline in relative losses over time compared with the increase in the global population. It was a conclusion that therefore held true even for the two world wars of the 20th century.

In fact, the statistics for absolute numbers of deaths in war are much more uncertain than the conclusions of these writers admit. We lack accurate data for losses in war before 1815; civilian deaths may or may not be included; the distinction between combatant and non-combatant was rarely drawn in wars of empire; most calculations of deaths among indigenous peoples were vague; and before 1914 disease was a bigger killer in war than combat. Even the figures for Second World War deaths are uncertain. The total for all belligerents used to be put at about 45 million. By 2015, they were estimated to be 60 million and rising.²

Given the uncertainty about the total losses in the last great war to hit Europe, and one which has been more studied than any other, we should not be surprised that we are equally unsure about the actual lethality of today's wars. NATO members are precise about their death rate in Afghanistan: 7,391 military, civilians and contractors. While this is low for a 20-year war, it is important to remember that the ratio of wounded to killed was 8:1, when in the First World War it was 3:1. In other words, improving military medicine lowered the death rate. For a fuller sense of the war's lethality, we need to turn to Afghan losses, which are bigger but also approximations: nearly 70,000 from the Afghan security forces, around 100,000 Taliban and a grand total including civilians of about 500,000.³

We have no secure grasp of death rates for the war in Ukraine. Neither side, for understandable reasons, has been open about its losses. Western calculations for Russian casualties, dead, wounded and missing between

2. For the first figure see H. Michel, *La Seconde Guerre mondiale. La Victoire des Alliés (1943-1945)*, Paris: Presses universitaires de France, 1969, p. 432; for the second, R. Bessel, "Death and Survival in the Second World War", in: M. Geyer and E. Mawdsley (eds.), *The Cambridge History of the Second World War. Volume III. Total War: Economy, Society and Culture*, Cambridge: Cambridge University Press, 2015, p. 252.

3. N. C. Crawford and C. Lutz, "Human Cost of Post-9/11 Wars: Direct War Deaths in Major War Zones", Watson Institute of International and Public Affairs, September 1st, 2021, updated March 2023, available at: <https://watson.brown.edu>; C. Malkasian, *The American War in Afghanistan: A History*, Oxford: Oxford University Press, 2021, p. 450.

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February 2022 and February 2026 hovered at around one million. President Volodymyr Zelensky stated publicly that Ukrainian military losses for the same period stood at 55,000. Few believed him. Most thought the rate of identified deaths was double that and added in a further 90,000 missing.⁴ Less remarked on was the comparatively low number of Ukrainian civilian losses given the frequency of Russian drone and ballistic missile attacks on cities, although they grew 70% between 2023 and 2025. Civilian losses were far higher among Palestinians in Gaza. The Israeli Defense Force itself put total direct deaths at 70,000, most of them civilians.⁵

If armed forces are pursuing increased lethality as the way to fight future war, higher casualty rates are likely to be the norm, given the greater capacity of new technologies to inflict them. The circumstantial evidence suggests that the ability to minimize collateral damage through qualitative improvements in intelligence and precision has an inverse effect: it encourages not restraint but the use of firepower, perhaps because certainty provides a greater number of legitimate targets.

Attrition

The implications for the conduct of land warfare are profound. Military thought has long pivoted around the balance between fire and movement. Those who fire cannot easily move at the same time, and those who move rely on supporting fire to do so. At the tactical level, the symbiosis is axiomatic. At the operational level, maneuver and attrition are not seen as mutually dependent in the same way. For Americans, attrition is associated with the war in Vietnam; for the British and French, with the First World War. It leads to heavy loss of life, protracted wars, and indeterminate results. It is seen as evidence of strategic bankruptcy.

So when NATO powers look at the war in Ukraine and set out to harvest its lessons, they focus on the tactics created by new technologies more than on their operational effects and strategic consequences. NATO believes that it would not fight as the Ukrainians and Russians do because it would maneuver. An integrated air plan would control the skies to free ground forces to move, and the latter would have a survivability that neither Russia nor Ukraine has managed to achieve. The shattered hulks of their armored vehicles provide proof, on this reading, not of the tank's obsolescence but of both sides' inability to conduct joint operations.

4. *The Times*, February 6, 2026.

5. *The Guardian*, February 2, 2026 and February 19, 2026; indirect losses in Gaza added about 25,000 more.

However, not even Israel, whose defense force has prided itself –and depended– on fighting and winning short wars, has escaped protracted attritional warfare in its recent conflicts. One of the reasons for the dominance of attrition in both Ukraine and Gaza has been the need to control terrain, some of it urban and most of it readily adapted to form deep defensive zones.

War at Sea

Because of the security provided by their respective geographies, both the United States and the United Kingdom have seen war as expeditionary. They have therefore relied on sea power to project force. But similar technologies to those that affected combat on land will reduce the capacity to conduct amphibious operations. Anti-access and area-denial weapons will make opposed landings impossible, and surface vessels approaching hostile coasts are likely to be detected far out to sea. Raiding with small forces may be possible, but the real role for maritime forces in a lengthy war of attrition will be their contribution to its economic dimensions.

Naval forces charged with the defense of sea lanes and attacks on enemy trade will have to depend on cooperation with government departments used to working towards very different priorities in peacetime. Complete national sovereignty in defense procurement is today a fantasy but, as a result, commercial intelligence on the movement of goods and on the ownership of vessels, the preparations to move from just-in-time logistics to greater self-sufficiency, and the capacity to keep goods moving through war insurance and price controls will all be essential. It will also be possible: the sea remains a far less regulated space for the conduct of war than is the land.

The Laws of War

Today, the laws of war are more closely defined than they have ever been and yet the force of law in relation to war is weakening. The world now has two courts to apply the law –the International Court of Justice, which under the auspices of the United Nations (UN) Security Council can call states to account, and the International Criminal Court, which can bring individuals to trial. Moreover, the rule of law shapes public debates on strategy and shapes global attitudes to specific wars. The votes in the UN General Assembly on Russia’s invasion of Ukraine show that most states endorse the UN Charter, seeing an invasion of one state by another as illegal. Most also believe that the use of force should be proportionate. Medium-sized and smaller states treat the protections of international law

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as a form of additional security to supplement those traditionally provided by national defenses. However, the post-1945 international order on which they rely was created not by them but principally by the United States. Since the 9/11 attacks in 2001, the U.S. has increasingly seen itself as no longer a beneficiary of the multilateral order it had fostered and has gradually withdrawn from it. Under Donald Trump, the rupture has deepened.

The result has been to lay bare the paradox on which the post-1945 order was built. It made war illegal, except in cases of self-defense (which the UN Charter defined more tightly than do its current re-interpretations), and yet it also introduced a raft of new laws, from the Geneva conventions in 1949 to the 1977 Additional Protocols, designed to ensure that, when states resorted to this illegal act, they fought in ways which were legal. The accretions to the laws of armed conflict and of international humanitarian law should have given them the weight of statute. In the minds of international lawyers they have, but they and their governments have cleaved not to international law but to what they called “the rules-based international order”. They abdicated the law’s authority for a label that has become a synonym for American dominance. That folly has now been compounded by the United States’s own rejection of the order’s implicit obligations.

The presumption of most discussions about future war is that it will be a major war between states. Such thinking may be evidence of tunnel vision. Since 1990, civil wars have been more numerous, and even more protracted, than inter-state wars. The two regularly overlap. The recent experience of wars of intervention against terrorist organizations is being forgotten, or seen as secondary, even if they remain just as likely to recur as “major war”. We are told that armed forces that prepare for the latter will be able to adapt to the former, although experience during the Cold War did not corroborate that glib assumption. Finally, we are warned of states themselves using the methods of insurgents in what are called –with staggering imprecision– hybrid wars, grey-zone wars and shadow wars. The best security against such threats is societal resilience promoted as part of national defense –ironically also a re-requisite of defense against the threat of nuclear war.

A future war might therefore not conform to the categorization of an inter-state conflict but could embrace several, and possibly all, of these elements. Once unleashed, war –driven by reciprocal hostility and a conviction as to its necessity– creates its own dynamics. In these circumstances, the world has to reinvigorate the laws of war if it is to handle

the challenges which war in its many manifestations will present. The 18th century law of nations, designed for a Europe of crowned heads whose soldiers fought as subjects, accepted war as a form of contract whose result would regulate their disputes. It therefore treated both sides as legitimate actors and so shelved the question of responsibility for causing wars.

That no longer applies. The departure point for today's global order is the legal presumption against the aggressive use of war. It legitimizes those who fight defensive wars and delegitimizes those who are the aggressors. Ukraine has collected sufficient evidence to try more Russian soldiers for war crimes than any court could handle. And yet we continue to separate the law governing war's conduct from its causation. We also differentiate the two by (broadly speaking) accusing political leaders of causing wars but holding their subordinates and foot soldiers accountable for specific war crimes in the field.

Soldiers today no longer have the right to plead superior orders as justification for war crimes: they are no longer subjects but citizens deemed to have rights and therefore also responsibilities. The wars in Ukraine and in Gaza have called into question the distinction between an illegal war and a war conducted illegally. Russian soldiers are seen as fighting illegally because they are fighting an illegal war; Israeli soldiers are fighting a legitimate war against Hamas but stand accused of breaches of international humanitarian law whose scale threatens to undermine the justice of their cause.

The laws of war are in danger of becoming self-contradictory. Why should those who serve an illegal cause benefit from their protections? Why should those fighting in a just cause be bound also to fight in ways that are just if they are engaged in a war of national survival? States who border Russia are withdrawing from the Ottawa convention on landmines for a reason that is legitimate; so that they can prepare an effective defense of their territory. The now-largely rejected principle of military necessity accepts that in war an army may have to fight as it must, not as it might like, but at its heart is the requirement that war's conduct must be proportionate in relation to its objective. If a defensive war is just, so potentially are the means to meet that end. In such circumstances, war has clear utility and is the continuation of policy by other means. Those compelled to fight it must be legally enabled to fulfil its aims, not rely on a retrospective judgement –by which time the justified party may have been defeated. That is the challenge that international law confronts in future war.

