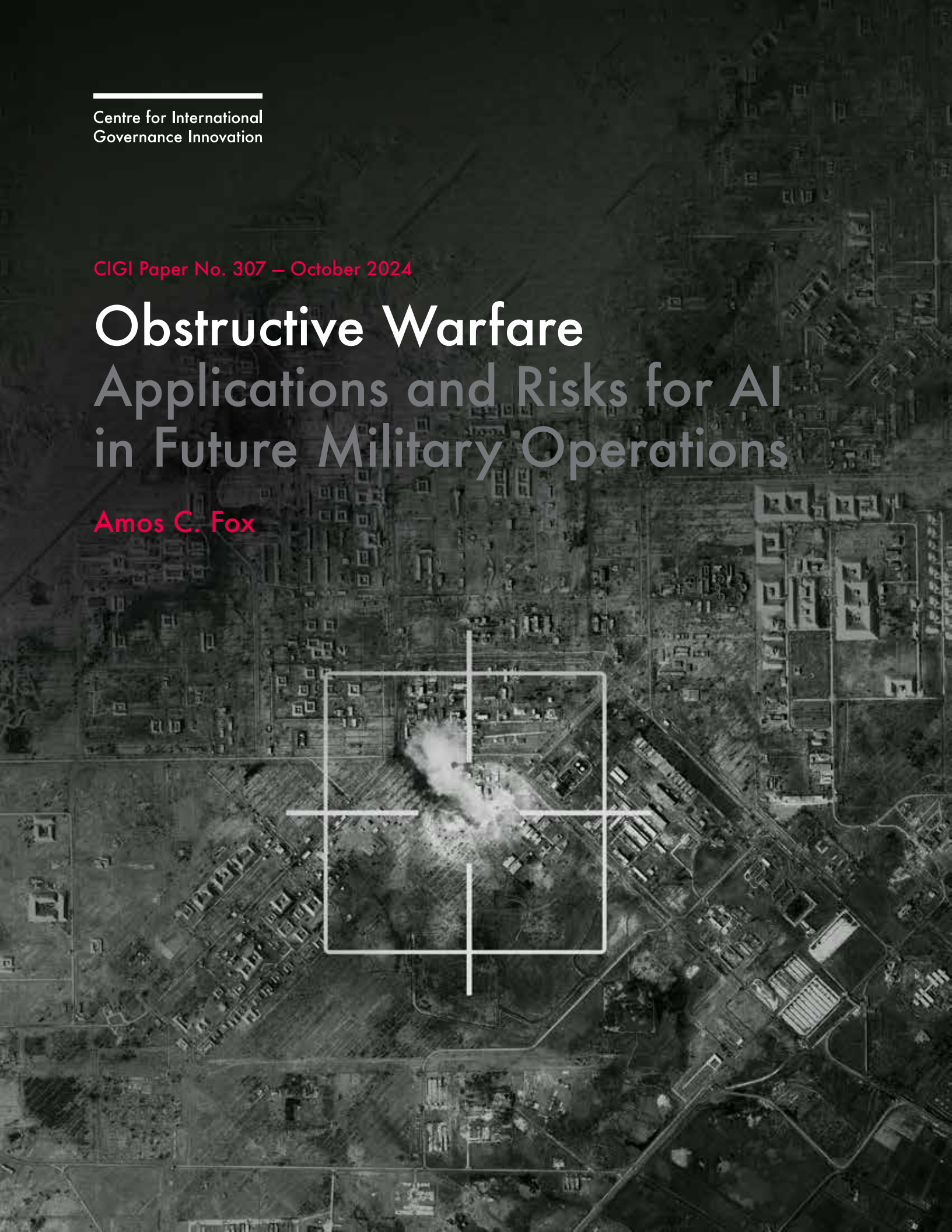
Centre for International
Governance Innovation

CIGI Paper No. 307 – October 2024

Obstructive Warfare
Applications and Risks for AI in Future Military Operations

Amos C. Fox



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About the Author

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Executive Summary

Artificial intelligence (AI) provides seemingly limitless potential for applications in contemporary and future armed conflict. Optimistic futurists claim that AI might transform war into a sanitized situation in which civilian casualties and collateral damage can be almost zeroed out from the battlefield. These futurists also posit that AI can amplify the speed at which military leaders and policy makers can gain situational understanding and make prudent decisions at the pace of information. In doing so, futurist theory predicts that militaries, using dual-use cyber and spaced-based remote and deep-sensing capabilities, will make "kill chains" that provide an asymmetric advantage over potential adversaries; thus, whoever masters the kill chain concept will dominate future wars.

More conservative estimates suggest that AI can open new horizons in war and warfare, but not to the extent advocated by many optimistic futurists. This paper sides with this more conservative perspective by asserting that AI's transformative impact on the future of war will fall short of the predictions of futurists. The futurists' vision of future war, and their advocacy of stand-off warfare, is incompatible with the fundamental and inherent challenges of land war.

Coupled with the increasing number of network, global and geospatial sensors, AI will provide policy makers and military leaders with massive amounts of information. But this excess of information, while seemingly a valuable asset, is equally a vulnerability. Strategic actors understand that increased battlefield and global sensing will also work to deceive sensing and inject incorrect data into an adversary's information network. Moreover, AI's contributions to battlefield and global sensing will make movements on future battlefields increasingly deadly for armed forces; as a result, military forces will likely embrace positional warfare and revert to operating in and around urban areas, where both state and non-state forces will cause more civilian casualties and collateral damage in future wars.

Therefore, policy makers, military leaders and scholars should anticipate AI increasingly contributing to data pathway warfare, in which combatants use information in innovative ways to overcome remote, deep and battlefield sensing capabilities. AI's ability to make the battlefield more transparent for policy makers and military leaders might result in both military and non-state military forces adopting positional warfare to offset the advantages that AI-enabled sensing provides to combatants. Policy makers, military leaders and scholars should also anticipate an increase in urban warfare as combatants — both state and non-state — seek to offset the potential speed that AI might bring to sensor-to-shooter kill chains. When viewed collectively, these transformative aspects of AI will potentially result in longer conflicts; attritional wars, with increased civilian casualties and collateral damage; and munitions shortages, if industrial bases are not retooled to keep pace with the potential speed of future kill chains.

Introduction

This paper introduces a new theory of warfare — obstructive warfare — to sidestep the wide-ranging sensationalism associated with today's new and emerging technology and instead provide an alternative assessment, based in causal logic, for how AI can be used in military operations. Obstructive warfare is anchored in the belief that all land wars carry with them a set of nearly unavoidable challenges, which are outlined later in this paper. Military forces cannot overcome these challenges solely with "attacks from above," nor can battlefield transparency prevent these challenges from materializing. The challenges of land war often cause states to fight wars positionally, or through the purposeful use of movement in combination with location(s) to dislocate an adversary's strength, accentuate one's own power and generate favourable situational warfighting asymmetries to defeat or destroy the adversary (Fox 2017, 18). Considering positional warfare's proclivity for force-oriented military operations that use movement, location and the application of power (i.e., military firepower), it is easy to understand how this type of warfare accelerates wars to an attritional character.

The goal of obstructive warfare is to avoid the nearly unavoidable: that is, it seeks to deny an adversary's ability to use "attacks from above." This is accomplished by assailing the opponent as forward as possible and operating so prominently

within the adversary's data networks that the opposing military force spends its time trying to make sense of data and address command decision-making challenges. The forward-facing attacks are not just traditional shaping — or preparatory — activities, but deliberate, planned operations oriented on confounding the adversary's data-processing capability and disrupting the speed at which the adversary wants to operate. Moreover, mobile autonomous systems, which are discussed later, execute these data and tempo operations in conjunction with deliberate kinetic (i.e., military firepower) attacks. Viewed collectively, three pathways — data, tempo and kinetic — animate obstructive warfare: it uses the three pathways to defeat an adversary well before they can engage in close combat with land forces. Put another way, the goal is to obstruct a military force's capacity to operate positionally, or to at least cause them to fight positionally in terrain that provides no tactical, operational or strategic value, and at great cost.

Obstructive warfare is a theory in which states can harness the transformative potential of AI for military operations and subsequently avoid the perils of positional warfare, attrition and long and costly wars. It focuses on the functionality of new technology, and not that technology's nomenclature or taxonomy; the purpose is to identify where the technology's function fits within applied armed conflict. As a result, obstructive warfare is based on the assessment that systems such as drones, long-range fires, associated sensors and other like-minded technology reflect modern updates to the tools and technology that facilitate attacks from above. The phrase "attacks from above" is used throughout this paper as a noun to bypass the nomenclature of new and emerging technology and instead focus on that technology's functionality.

Depending on how one classifies attacks from above and battlefield transparency, these approaches have been a constant in war since the First World War, with the tools and methods evolving over time (Owen 2023, 26; *Frontline Podcast* 2022; Isbell 1993, 147). Attacks from above and battlefield transparency are relative to the technology of the day, and not a measure against future technology. This is why obstructive warfare focuses on amalgamated-system functionality instead of technologies in isolation from one another, or the euphoria of titillating drone-strike videos on social media (Rogers 2023, 73).

The attacks from above strategy, however, aligns with how policy makers and senior military leaders want to use force today, which is to limit the commitment of their own land forces, yet be able to strike adversary military forces in distributed locations across the globe (Skove 2024). As US General Officers James Rainey and Laura Potter write, "A military force able to immediately link these sensors to extended-range weapons capable of precisely hitting moving targets will have a distinct advantage over any adversary" (Rainey and Potter 2023). Moreover, Rainey and Potter, among many others, insist that utilizing small, dispersed forces with limited presence on the battlefield is the way to counter attacks from above (ibid.). This method of operating — utilizing attacks from above in conjunction with capping the commitment of one's own forces — is referred to elsewhere and in this paper as stand-off warfare (Fox 2024a; McDermott and Midgett 2021, 38–39).

Dan Wright (quoted in Kosloff 2024), Christian Brose (2019), John Antal (2023a) and other leading proponents of stand-off warfare assert that an AI revolution is coming. The combination of stand-off warfare and AI will allow militaries to operate with global visual transparency and at speeds that exceed human comprehension, striking remotely from almost anywhere in the world. Somewhat ironically, Rainey echoes this supposition and (inadvertently) suggests that positional warfare and stand-off warfare are the answers to battlefield transparency, stating that "when you're maneuvering, it's going to be to emplace fires… if it's an Army formation, their big advantage is going to be fires: rockets, cannons, joint fires, attack helicopters" (Skove 2024). Multidomain operations doctrine, project convergence as well as the slew of other sensor, precision and long-range strike-centric concepts dominating military, academic and policy discussions, clearly demonstrate stand-off warfare's stranglehold on the topic.

Nonetheless, the wars of the twenty-first century demonstrate an alternative reality, and perhaps one that is more realistic than stand-off warfare's vision of the future. Wars of the future will remain fights over territory. These contests for control of land will continue to be fought by armies, or at least amalgamated forces fighting on land. When attacked from the sky, military forces will seek refuge in the land — whether that be in bunkers, trenches or urban areas. Attacks from the sky are empirically proven to be less effective against land

forces hiding beneath the surface of the land, or in urban terrain (Allen 1995, 22; Rowland, Speight and Keys 1996, 8–10; Hughes 1995, 31). To that end, Patrick Allen (1995, 22) states that, "The air-to-ground assessment processes need to be sensitive to the posture and type of the attacked units." In order to win in future wars, Western militaries will require robust and resilient land forces that can address the unique challenges of land warfare, while capitalizing on the technological advantages available to Western military forces.

These robust and resilient land forces are not, however, the status quo land forces of today. Robotics, AI-enabled combat and command and control systems, and human-machine integrated teams should be used in the future operating environment. This is a commonly accepted idea today, at least in many Western militaries and among defence analysts (Shaikh 2024; Watling 2024a, 15–16; 2023, 163–72; Owen 2023; Ahern 2022). This paper will proceed by providing a detailed account of stand-off warfare and its limitations. This will help to establish the scale and scope that AI can reach as it pertains to military operations. Next, this paper examines the realities of land wars. This is done to illustrate the discontinuities between the logic of land wars and the theories and practical outcomes of stand-off warfare. The purpose of this examination is to demonstrate that AI's potential impact in future military operations does not reside in improving long-range strike and sensing technology, but rather in providing military forces with tools to effectively fight on land against other land forces. In doing so, however, land forces need new strategies, concepts, doctrines and organizations to fully unlock AI's potential. This potential resides in how AI helps militaries master data and tempo, not necessarily in the increased precision that it can bring to a High Mobility Artillery Rocket System (HIMARS) strike. The paper then proceeds to examine AI's potential across the DOTMLPF-P/I spectrum (doctrine, organization, training, materiel, leadership and education, personnel, facilities and policy/interoperability), focusing on the doctrine, organization, policy and interoperability variables. Finally, the paper concludes with a set of recommendations for policy makers, scholars and practitioners. These recommendations move beyond common observations to instead approach the subject with the aim of overcoming stand-off warfare and addressing the challenges of land war, among other related ideas.

Stand-Off Warfare and the Limitations of Technology

The war in Ukraine has provided the defence and security studies community, which includes the North Atlantic Treaty Organization (NATO) as well as Western states and militaries, with ample opportunity to observe large-scale, technologically advanced combat operations between two industrialized states. Early in the conflict, many commentators were trying to be the first to be pronounced "right" in their loud and grandiose predictions regarding technology's revolutionary impact on the operating environment and the tactics of warfare therein (Antal 2023b, 13). Many of these technophiles were the same commentators who made similar pronouncements regarding how the technology and tactics of the 2020 Nagorno-Karabakh War had revolutionized future armed conflict by making operating environments increasingly challenging to navigate.

The thrust behind the majority of these commentators' arguments is that long-range fires and drones, united with precision strike, have revolutionized how reconnaissance and strike work together, creating kill chains or kill webs (Defense Advanced Research Projects Agency 2020). Their theory posits that if a combatant can properly integrate and tune their reconnaissance-strike complex to the operating environment's variables — which includes the threat actor(s), physical terrain and temporal considerations — then they can quickly gain the upper hand against adversaries who operate with more traditional means and methods (Brose 2019, 126–29). This idea is just another iteration of putting new labels on old wine. For instance, the "quality of firsts" — see first, understand first, act first, finish decisively — was the central idea behind the US Army's 2001 *Concepts for the Objective Force*. This document served to define "how the Army will meet the Nation's requirements today and into the future" (Office of the Chief of Staff 2001, ii). The US Department of Defense's (DoD's) 2006 document, *Major Combat Operations: Joint Operating Concept*, was also rooted in this "novel" idea (US DoD 2006, vii). The quality of firsts, which was itself a rebranding of John Boyd's observe-orient-decide-attack concept, is the conceptual father of the early 2000s rapid dominance and today's convergence

concept (ibid., iv). Each of these phrases represents another generation using the same basic idea to make the same basic point, which is that stand-off warfare can overcome battlefield transparency.

In bygone eras of military thought, this line of logic led to now discredited theories such as John Warden's five rings theory, which was used in 1991 in Iraq during Operation Desert Storm, and the deep strike doctrine used by the US Army during Operation Iraqi Freedom. Both the five rings theory and deep strike doctrine hinged on the belief that sensors, aerial attacks, precision strikes and long-range fires would:

- eliminate hostile land forces;
- obviate the need for the commitment of large-scale friendly land forces;
- usher in an era of short and decisive wars; and
- reduce civilian casualties and collateral damage on future battlefields (Warden 1995, 40–56; Gordon and Trainor 2006, 523).

Collectively, this theory of warfare can also be identified as stand-off warfare.

In short, the belief coming into the twenty-first century was that a rebooted approach to stand-off warfare, in which the newest sensors, enhanced aircraft, improved drones (armed and unarmed) and more precise, longer range and faster fires would breathe fresh air back into the lungs of these dying ideas (Ullman and Wade 1996, 20–23). The United States' wars in Afghanistan and Iraq were supposed to advance stand-off warfare, with their early emphasis on light footprints and heavy reliance on reconnaissance-strike linkages. However, uncooperative local populations, competing third-party actors and the basic fog and friction of war caused those conflicts to quickly devolve into insurgencies that exceeded the scale and scope of stand-off warfare's mandate, while also highlighting the significant shortcomings in the concept's theoretical foundation.

The Nagorno-Karabakh conflict, however, brought hope back to the proponents of stand-off warfare: Azeri sensors, drones and precision strike seemingly made quick work of Armenian land forces operating in mountainous terrain and urban areas (Shaikh and Rumbaugh 2020). Seizing on the Azeris' lopsided victory over the Armenian forces, commentators were again quick to make declarations about kill webs and how war's future operating environment was forever changed because stand-off warfare had now been realized (*The Economist* 2020).

The problem with much of the commentary emerging from Nagorno-Karabakh, however, was that it did not account for strategic, operational and tactical variables of war and warfare. Instead, the commentary used titillating YouTube and TikTok videos to illustrate the effectiveness of singular drone strikes, while failing to demonstrate how aspects such as terrain, the lack of appropriate Armenian air defence or other factors such as poor Armenian tactics contributed to the success that was shown in these videos. Nonetheless, it is imperative to note that stand-off warfare is engineered to solve a specific type of military problem: tightly packed military formations that are easily identified from above, moving in densely grouped formations along predictable lines of travel. This is what the international community witnessed unfolding between Azerbaijan and Armenian military forces in Nagorno-Karabakh in 2020. Another example of this situation was the infamous "Highway of Death" from the 1991 Iraq War in which American airpower slaughtered retreating Iraqi land forces along Highway 1 (Apple 1991). Yet, when removed from these specific examples, the geometries and physics of stand-off warfare break down and yield marginal results.

The outset of the Russo-Ukrainian War in early 2022 echoed many of stand-off warfare's successes in Nagorno-Karabakh. This is because the Ukrainian battlefield in early 2022 had not yet expanded and so stand-off warfare's tactics fit the scale and scope of the battlefield. Ukrainian sensors detected Russian armoured columns, which meandered along just a handful of routes into neighbouring Ukraine. Ukrainian sensors passed on their information on Russian troop movement to their armed drones and other forces, which subsequently decimated those Russian columns (Khurshudyan, Ilyushina and Khudov 2022). Meanwhile, Kyiv's small air defences, gleaning information from their Western partners, crippled Russian air forces at the conflict's outset (Entous and Schwirtz 2024). AI advocates used this situation as a key lesson from which further AI advancement might emerge (Lushenko 2023; Klare 2023; Husain 2021, 58).

Yet the conflict quickly turned sour for Ukraine and relatively profitable for Russia: by the summer of 2022, it had become a relative stalemate. By

that point, Russia had all but solidified its hold on the Donbas region and reinforced its position in Crimea. More importantly, Russian forces had taken possession of the "land bridge to Crimea," or the oblasts that link the Donbas to Crimea.

The nominal drone revolution of Nagorno-Karabakh and early phase of the Russo-Ukrainian War had given way as electronic warfare and anti-aircraft defence proved effective in neutralizing many of the most sophisticated and successful drones of this period (Shoaib 2023). Large medium-altitude long-endurance (MALE) drones, such as the Turkish manufactured TB-2 Bayraktar, have generally been sidelined since the conflict's early days, and replaced by small, dual-use first-person view (FPV) drones (Kofman 2024). MALE drones are key to stand-off warfare thanks to their range, flight time and weapons payload, whereas FPV drones are more of a close fight weapon system. Advocacy for AI has made little headway in arguing for how to break these kinds of deadlocks.

Although focused on eliminating Russian leadership and command posts, Ukrainian precision strike has proved ineffective at best, and truly little more than a distraction at worst (Gady and Kofman 2024, 16–17). It has also done next to nothing to curtail Russian military operations or allow Kyiv's forces to retake any of their confiscated land (Barnes et al. 2023). By the same token, long-range strike, such as US-provided HIMARS and Army Tactile Missile Systems (ATACMS), have proven effective at killing exposed static forces, but ineffective in terms of the larger outcome of any battles or campaigns or the war overall. It is therefore questionable to suggest that AI-infused stand-off warfare might improve future outcomes in a similar situation.

Russian precision strike, on the other hand, has been missing from the discussion altogether, which is likely due to the Kremlin's seemingly indiscriminate targeting of civilians alongside military forces. This indiscriminate targeting of civilians, in addition to other coordinating factors, led the International Criminal Court (2023) to issue an arrest warrant in 2023 for Russian President Vladimir Putin. Russian precision strike's failure to truly stand out on the battlefield might also be the result of Ukraine's tight-lipped reporting of their own casualties, which helps prevent Western open-source observers from identifying when and where precision strike is used and how effective those strikes truly are.

Once the Kremlin realized that the February 2022 blitz on Kyiv and Kharkiv had failed, Russian forces withdrew from those axes and redeployed forces to reinforce their holdings in the Donbas, the land bridge to Crimea, and Crimea itself (Barnes et al. 2023). They built a defensive line along that lengthy perimeter, thus fundamentally altering the war's dynamic from one of mobile warfare to one of positional warfare (Zaluzhny 2023). Russian land forces were no longer on the move, meaning that they were not as exposed and mobile, avoiding travel on easily identifiable roads. As a result, the Kremlin forced Kyiv's theory of victory to change from defeating a mobile Russian army (an easier proposition) to retaking territory from a relatively static and defending Russian land army (a much more challenging proposition). AI's ability to assist is important to discuss here. Like any data processing system, AI works better when data is easy to spot. Forces operating from concealed positions and using deception tools to further obfuscate their detectability render AI far less useful than it would be otherwise. Thus, when examining how to use AI in military operations, one important consideration is to maximize its use on the front end of engagements and in such a way as to prevent a conflict from evolving from mobile to positional warfare. This idea is covered in more detail in later sections of this paper.

In military situations such as these, it is imperative to remember that stand-off warfare quickly outlives its utility and that winning in this operating environment boils down to a simple heuristic: namely, that it takes a land force to defeat a land force (Fox 2024a, 13–14). This is not to say that this land force cannot be one in which the latest technology, such as robotic formations and human-machine integrated teams, are standard practice. But stand-off warfare quickly hits diminishing returns against forces intent on holding ground.

Reflections on Stand-Off Warfare in the Russia-Ukraine War

The Russo-Ukrainian War has demonstrated that major battles and campaigns among resilient land forces, supported by joint services, are how large-scale wars between industrialized countries are won and lost. Armies provide the fulcrum upon which all military operations pivot and a state's policy outcomes in wars hinge. The battle of Kyiv, including the battle of Hostomel Airport, was a decisive early battle that delivered an outsized impact on the strategic and political course of the war (Collins, Kofman and Spencer 2023). Ukraine's ability to blunt Russia's assault in the conflict's dawn by a variety of means and methods (conventional, unconventional and irregular), retake Hostomel Airport, retain Kyiv and reinforce the arteries leading into and out of the city with additional land forces and artillery determined a successful outcome (ibid.).

Ukraine's use of brute force unravelled Russia's finesse-oriented, manoeuvre-centric, stand-off warfare approach in the war's initial phase. Battles such as Mariupol, Bakhmut and Avdiivka followed suit. Kyiv's land forces, supported by joint services operating in and from all domains, have continued to fight both valiantly and brutally against Russian land forces for usurped territory. As US and NATO support increased Ukraine's ability to strike the Russian army from afar, a traditional front emerged as the Russian army dug bunkers, trenches and further defensive fortifications from the Donbas to Crimea to offset the effectiveness of US-NATO-supplied long-range precision strike (Zaluzhny 2023).

Since the Russian army has transitioned to a defensive posture and positional warfare to hold the land that it has taken from Ukraine, the conflict is now characterized not by deft assaults of sweeping manoeuvre, but instead by blistering battles of pulverizing attrition (Gady and Kofman 2024, 7–8). Positional warfare and attrition are not anomalies, nor are they the effect of bad tactics, poor armies or maladapted generalship (Fox 2024b). In reality, positional warfare and attrition are the causal outcome of two features of modern and future warfare: attacks from above and the logic of land wars (Fox 2021, 1–3). AI's potential for future military operations resides in its ability to prevent positional warfare and resulting attrition from emerging. But first, it is important to closely examine "attacks from above" to understand how that concept fuels positional warfare.

Attacks from Above

The phrase "attacks from above" is another way to think about stand-off warfare because it articulates the latter's character at the end of contact closest to an adversary military force. Attacks from above today can be counted as any artillery bombardments (including ground-launched missiles and rockets), drone strikes, air-launched effects and any other long-range, top-down-oriented precision strikes. Instead of viewing the drone or precision strike in isolation, this mental model puts the technology in its proper environmental context and illustrates that it is not revolutionary, per se, but instead another milestone on warfare's evolutionary pathway (Rothenberg 2015, 442–45).

Sustained attacks from above, whether from 1914, 1944 or 2024, always generate the same response from ground forces — they go underground. The infantrymen of the First World War avoided artillery and primitive aerial bombardment through the use of an elaborate trench system. In the Second World War, mobility was often used to bypass attacks from above. When that was not possible, ground forces used trenches, bunkers and other fortifications to protect themselves from aerial attack, much like both Russian and Ukrainian land forces today.

Most technologists and futurists emphasize a kitschy integration of AI in both stand-off warfare and attacks from above. Technologists and futurists envision AI as being able to generate near-perfect information about an adversary; precisely attack targets on the ground; attack targets on the ground with a range of remote (i.e., beyond the range of direct fire contact) autonomous and semi-autonomous systems; and do so at a pace that exceeds the enemy's ability to cope.

The problem with this perspective on the integration of AI is that it fails to account for a handful of problematic features of war and warfare. First, pace and duration have thus far shown themselves to unravel many precision strike-fuelled strategies. Scholars note that this problem

will become increasingly significant if Western militaries are truly interested in operating at the speed of information (Kinsey and Ti 2023, 85). Modern war is littered with examples of how industrialized states have quickly burned through their precision systems and munition stocks at a rate that exceeds their industrial bases' ability to keep pace. Analysts from RAND make this point in their post-mortem of the air war to defeat the Islamic State in Iraq and Syria. The analysts caution that "certain precision-guided munitions were in high demand, resulting in shortages.... Strategic and political considerations require the use of precision-guided munitions, and existing stockpiles are insufficient" (Wasser et al. 2021).

This shortage had direct impact on operations in Syria and Iraq. As the battle raged to liberate Mosul from the Islamic State, the US military all but ran out of precision munitions at multiple points throughout the battle (Daniels 2017). Failing to learn from this problem, the United States repeated this mistake in providing arms and munitions to the Ukrainian armed forces in their fight to liberate their country from occupying Russian forces (Cancian 2022). Moreover, both Ukraine and Russia failed to appreciate the criticality of peacetime weapons production and surplus. As a result, both sides quickly burned through their stockpiles of weapons and munitions and had to repeatedly ask for help from other states to offset their shortcomings (Watling 2024b). Thus, unless states are willing to maintain war-footing stocks during peacetime, the risk of AI-enabled kill chains operating at the speed of information and burning through a state's on-hand and reserve stockpile of munitions in the process is high. And the risk associated with this problem increases exponentially if in burning through those munitions, the aggressor does not soundly defeat the target of their aggression.

Second, AI will likely help with information collection, sorting and prioritization, but will also face many challenges in overcoming how unique personalities impact decision making. One reason for this is that AI underperforms in applied situations, such as a battlefield, versus in lab settings (Miller and Lohn 2023, 22). Thus, the verdict regarding AI's usefulness must be weighed against the environment in which that assessment is being drawn. More value should be given to lessons and observations drawn from applied situations, such as the battlefields of Ukraine, Syria and Iraq, than those from a laboratory on the east coast of the United States or a sterilized, controlled institutional war game. The ideas outlined in this paragraph can cause AI-reliant organizations to misinterpret an adversary's actions, counteractions and reactions and, as a result, inadvertently place the AI zealot into a very poor position, tactically and/or strategically.

Third, AI should improve the fidelity at which a precision-guided munition arrives at its target. That is, AI will make the precision aspect of precision strike increasingly more accurate as future precision strike weapons and munitions will use AI to find the appropriate guidance pathway to direct the munition(s) to the target. Yet, precise target location does not necessarily mean that the target is correct, the desired effect on the target has been achieved, and precise targeting will inherently decrease civilian harm and collateral damage (Fox 2024c, 1–4). This assertion has been supported by more than 20 years of empirical evidence from conflicts around the world and in varied physical environments (i.e., urban landscapes, deserts, forests, plains and so on). *The New York Times*, for instance, released a scathing report on US targeting and strikes throughout its 20 years of war in Afghanistan (Khan 2021). Amnesty International has also documented the trouble that the United States, Russia and other states have encountered in relation to the ability of precision strikes to limit civilian harm and collateral damage.

Fourth, technologists and futurists like to posit that AI, in the form of autonomous and semi-autonomous combat systems and sensors (both active and passive), will allow forces on future battlefields to cultivate near-perfect information about their terrain and adversary (Taylor 2024). Among military circles this idea is often referred to as the transparent battlefield, or battlefield transparency (Barno and Bensahel 2022). The belief is that AI, coupled with airborne and space-based sensing capabilities, will create an unblinking eye over a battlefield. That unblinking eye, in turn, will create information dominance, producing a picture with near-perfect clarity (ibid.). When paired with additional AI-enabled information systems, information dominance will grant policy makers and military commanders with decision dominance, or the ability to make better decisions than one's adversaries due to information asymmetry (Bender 2023; Williams 2021; Freedburg 2024). All of these features of

battlefield transparency will allow a combatant to lift the proverbial fog from the battlefield and be able to perfectly engage land forces with attacks from above, obviating the utility of armies and combat systems such as tanks and infantry fighting vehicles (Johnson 2022; McFate 2019, 178). The problem with this assessment, however, is that, as with so many other predictions offered by technologists and futurists, it fails to take into consideration the fact that any belligerent, whether it be a state or non-state actor, will seek to offset an adversary's asymmetric advantages and find ways to survive in the face of overwhelming adversity. Instead of anticipating decisive military victory courtesy of AI-enabled attacks from above — whether those originate from long-range precision fires; drones; short-range, top-attack, anti-armour weapons systems or any other implement of war — both the aggressor and the onlooker must anticipate that the defender will act to protect themselves (Fox 2024d, 4–6). Seeking protection results in the defender doing four things. First, they will attempt to move out of harm's way as quickly as possible. This most often includes either seeking shelter underground (i.e., in trenches or bunkers) or in urban areas. As Anthony King (2021, 70–71), notes, urban areas provide a significant degree of assistance to forces attempting to offset military imbalances. Second, they will attempt to obfuscate the aggressor's ability to observe them and their telluric signature. In effect, this means that the defender will attempt to hide any type of military hardware, visually identifiable feature or digital signature that they have. Third, they will attempt to employ whatever means they have at their disposal to neutralize the attack. This is where directed cyberattacks, short-range air defence and other active defensive methods and tools come into the equation. The dynamic outlined here is a feature of conflict known as the "survive-win" cycle, and it presents itself in nearly every situation in which two (or more) military forces come into contact with one another (Fox 2024d, 8–9). No rational human, or human-centric military formation, will willingly sacrifice their survival in the face of bombardment. Attacks from above, whether they are enabled by AI or not, fit within the dynamics of the survive-win cycle, and, given human nature, it is unlikely that AI will obviate this cycle. In fact, as long as humans remain involved in fighting on the bloody front slope of battle, this dynamic will likely accelerate at a comparable rate to AI-enabled warfighting asymmetries (Harrison, Ahn and Adolphs 2015, 14–15).

Nonetheless, attacks from above always generate the same basic response in land forces — they go underground. Land forces will also seek refuge from attacks from above in urban areas, if they are sufficiently close to a town or city to do so. This dynamic might change in the future with the increase of human-machine integrated land forces or more roboticized armies, but that still remains to be seen. The AI and machine learning of those future systems might develop their own survival instincts and similar survival patterns to those of humans. As of now, however, there are no game-changing technologies or tactics available, only the perennial logic of land war. This logic will likely affect the use of AI in future battles. First, though, it is important to gain an appreciation for the logic of land wars before examining how AI will factor into those considerations. When viewed together, AI and the logic of land war will have important implications for DOTMLPF-P/I.[1]

The Logic of Land War

The logic of land war is simple and constant: it is almost exclusively fought for the control of territory. Even conflicts fought for the control of island states such as Taiwan should be considered land wars because, if a state such as China invades and occupies Taiwan, liberating Taiwan will require a subsequent invasion, the clearance of Chinese army forces and holding of the island. Attacks from above will not unseat Chinese military forces from the island; in fact, they will likely make these forces more challenging to eliminate as they wait out those attacks underground or in urban terrain (United States Army 2021, 8).

A potential campaign to liberate Taiwan can be compared with the Russo-Ukrainian War's battle of Mariupol. A siege quickly developed around the Mariupol steel plant as defenders held out, while Russian aggressors sought to overtake the city (Fox 2021, 3–11). One should expect a similar dynamic to unfold in Taiwan if China invaded the island and attempted to annex that territory. On the back side, any attempt to retake Mariupol, just as any attempt to retake Taiwan from China, would require a

1 Considerations of training, materiel, personnel and facilities are omitted from this paper.

significant land operation to clear the occupying forces. Armies — whether they be state or non-state forces — fight land wars, regardless of how they have to get to the land war. And armies fight other armies in land wars, regardless of the presence or degree of combined arms or joint capabilities one combatant might possess over the other.

In considering the logic outlined above, coupled with the ideas on stand-off warfare outlined in this paper, a handful of enduring challenges of land warfare emerge. These challenges transcend the theatre of conflict and the manner in which armies travel to the land war; that is, the challenges of land warfare are relevant in both a Russo-Ukrainian-type scenario or a China-Taiwan scenario. Further, these challenges are relevant regardless of whether the armies have to conduct amphibious landings from ship to shore, airborne drops from a variety of aircraft or attacks on the ground in broad-armoured thrusts across international boundaries. These challenges, primarily identified in the Russo-Ukrainian conflict, but salient in all land wars, are listed below. The list below is not presented in order of priority, but instead as a general grouping to ensure that policy makers, military practitioners and scholars remain grounded in the principles of war when state or non-state actors fight conflicts for the physical control of territory. AI helps both sides of the coin as it pertains to the challenges of land war, which is why it is important for military forces to prevent positional warfare from taking hold. These actions can be thought of as the activities of land war:

- Armies must be capable of *taking* and/or *retaking* territory.
  - Armies must not culminate (i.e., exhaust their combat power) while taking or retaking territory.
  - Culmination during this phase makes the army prone to:
    - effective enemy counterattack; and
    - the inability to conduct effective exploitation and pursuit(s).
- Armies must be capable of *clearing* enemy armies from territory. Clearing, in this instance, means physically removing a recalcitrant and hostile military force from occupied territory.
- Armies must be capable of *holding* territory. Taking, retaking and clearing territory of hostile forces often exacts a high toll on an army, leaving it in a weakened state. Armies with small, fragile force structures experience the highest toll, and are even less likely to be able to hold on to costly gains. Resilient land forces are critical to ensuring that military forces can uphold territorial gains, whereas the tools and techniques of stand-off warfare provide only marginal returns on investment when it comes to holding territory.
- Armies must be capable of *protecting* populations.
- Armies must be capable of *encircling* a hostile force. This is the best way for an army to maximize the effects of joint firepower.
- Armies must be capable of *sealing* boundaries. If armies cannot effectively seal boundaries, then they will always be prone to invasion by hostile neighbours. Resilient land forces, not missiles and drones, are the first line of defence for ensuring proper border security.

In land war, verbs such as *take*, *retake*, *clear*, *hold* and *encircle* represent the actions one military force must take in earnest against another force, pursuant to their respective political-military objectives. Taking, retaking and clearing, for instance, involve concerted combat operations against another military force. These actions represent the direct clash of forces in a struggle between national wills, industrial bases, internal and external bases of power and the grit that each state's armed forces can bring to bear. Similarly, holding territory and sealing boundaries are not truly terrain-oriented actions, but rather ones focused on definitively defeating a hostile force intent on removing the holding force from an important piece of terrain. While the terrain is the objective, the hostile force is the mechanism through which situational success is determined. Thus, the same variables outlined above are critical — national wills, industrial bases, internal and external bases of power and the grit of one's military force.

Protecting populations is also an action oriented toward hostile military forces, which can include having sufficient military force on the ground to interdict attacks on civilians and civilian infrastructure. Protecting populations can also include actions such as providing air

defence and air cover to prevent, interdict and counterattack hostile attacks from above. Whereas the actions listed in the preceding paragraph are force-oriented, protecting populations is more system-oriented; that is, many of the actions in this category can include eliminating individual missiles, drones or hostile actors.

Land wars, which will remain the most important type of war in the future, provide many areas in which AI can be used to maximize gains and offset losses. The potential impact of AI in military operations, primarily viewed through the lens of the logic of land wars and countering attacks from above, is explored in the following sections.

The Potential Impacts of AI on Military Operations (DOTMLPF-P)

Due to its transformative potential, AI can be used to help militaries thrive in land wars and overcome many of the challenges of attacks from above. Operating under the assumption that military forces in the future will be required to take, retake, clear and hold territory, seal boundaries, encircle hostile forces and protect civilian populations, it is important to explore AI's transformative potential regarding how it can assist, or even take the lead, in military operations pertaining to land war. Because most Western militaries rely on DOTMLPF-P as a frame to design administrative and acquisitive needs in order to accomplish military missions, it is a useful model to illustrate AI's impact on future military operations. NATO, which is concerned with the interoperability of its member states, uses DOTMLPF-I. As such, this section examines AI's utility across the DOTMLPF-P and DOTMLPF-I spectra.

Doctrine

Considering the United States' leading role in Western military thought, as well as the base upon which NATO doctrine was built, multidomain operations (MDO) is currently the foundation of contemporary Western military doctrine. As a result, many Western states and NATO members are currently reconfiguring their doctrines to align with the tenets of MDO. MDO is fundamentally a fires-centric philosophy that seeks to operate in the "attacks from above" spectrum, using long-range strike, precision fires and a network of sensors and drones to generate convergence. Convergence is the synergistic effect of military operations through the networking of sensors to detect threats, identify target locations and push the resulting data through the network to allow military commanders to employ the best weapon system against the target to generate a catastrophic impact on the targeted threat (United States Army 2022, 3–4). AI provides many areas in which MDO can be enhanced, all of which are the focus today of concept and doctrine developers looking at AI's role in future military operations.

In effect, MDO is the formal articulation of a stand-off warfare doctrine. However, it is heavily focused on attacks from above, while failing to account for the logic of land wars and the positional approach it inspires in response (Fox 2020, 8–10). This shortcoming in contemporary military thought must be addressed. While continuing to develop AI's role in advancing convergence, Western militaries and NATO must develop strategies, concepts and doctrine that integrate AI into the activities of land war.[2] Moreover, Western militaries and NATO must evolve the way in which they visualize and frame the conduct of military operations. To be sure, the "deep, close and rear" area construct will not be useful, nor contribute to the prevention of positional warfare, if states intend to unlock the potential benefits of AI.[3]

Western militaries and NATO must develop a doctrine that defines defeat by illustrating clear causal mechanisms and links between military activities and how those activities cause defeat. Furthermore, Western militaries and NATO must structure operations and forces to generate defeat's associated end states. For instance, defeat can be generally defined by three conditions: when engagement with a hostile military force and denying or preventing that force from taking a positional warfare position; when one military force causes the opposing force to quit the fight; and when an opposing political leader decides to end hostilities.

2 Note: "strategies, concepts and doctrine" will be referred to simply as "doctrine" henceforth.

3 See the United States army (2022) field manual for definitions of the "deep, close and rear area" construct.

Looking to the future, in which resilient AI and networks will replace increasingly fragile human-centric operations, Western militaries and NATO must appreciate that threats will be adaptive, with learning actors' first intent on survival, and second on winning (Fox 2023, 5–6). Threats in an AI-dominated future will be networked and operating from intent, not direct guidance. Militaries will likely maximize the use of autonomous systems, and these systems will increase the speed at which militaries can operate in turn. Thus, time will become an increasingly important military variable, as the interval between a sensor's identification of a target — whether that be a command post, military formation or individual combatant — and the impact of a strike on that target will likely occur at a much faster speed than in the past. And if one combatant is operating in this future AI-dominated environment, it is safe to assume that the other combatant is too. Therefore, it is important to restructure the battlespace and create military formations to accommodate this new operating environment.

Western militaries and NATO must further develop doctrines that account for autonomous systems, human-machine integrated formations and traditional military forces (i.e., human-centric formations). Autonomous systems will make their biggest contribution to military operations if they are provided space to operate independently of traditional military forces. For instance, AI-driven sensors and robotic formations should be afforded battlespace ahead of human-based forces to collect information pertaining to the enemy (both actively and passively); transmit or present information to the adversary for the purpose of deception; influence the enemy toward dispositions welcoming to one's own force; and manipulate the tempo of an opponent's operations to support the commander's scheme of operations. In the abstract, AI's transformative potential exists in tapping into the hitherto underexplored fulcrum of data, tempo and warfighting as a unified method of warfare. Doing so will offset some of the risk (and fear) associated with the employment of AI-driven autonomous and semi-autonomous systems with human-centric forces by clearly delineating where each type of force will be located on the battlefield and how their operations will mutually support one another.

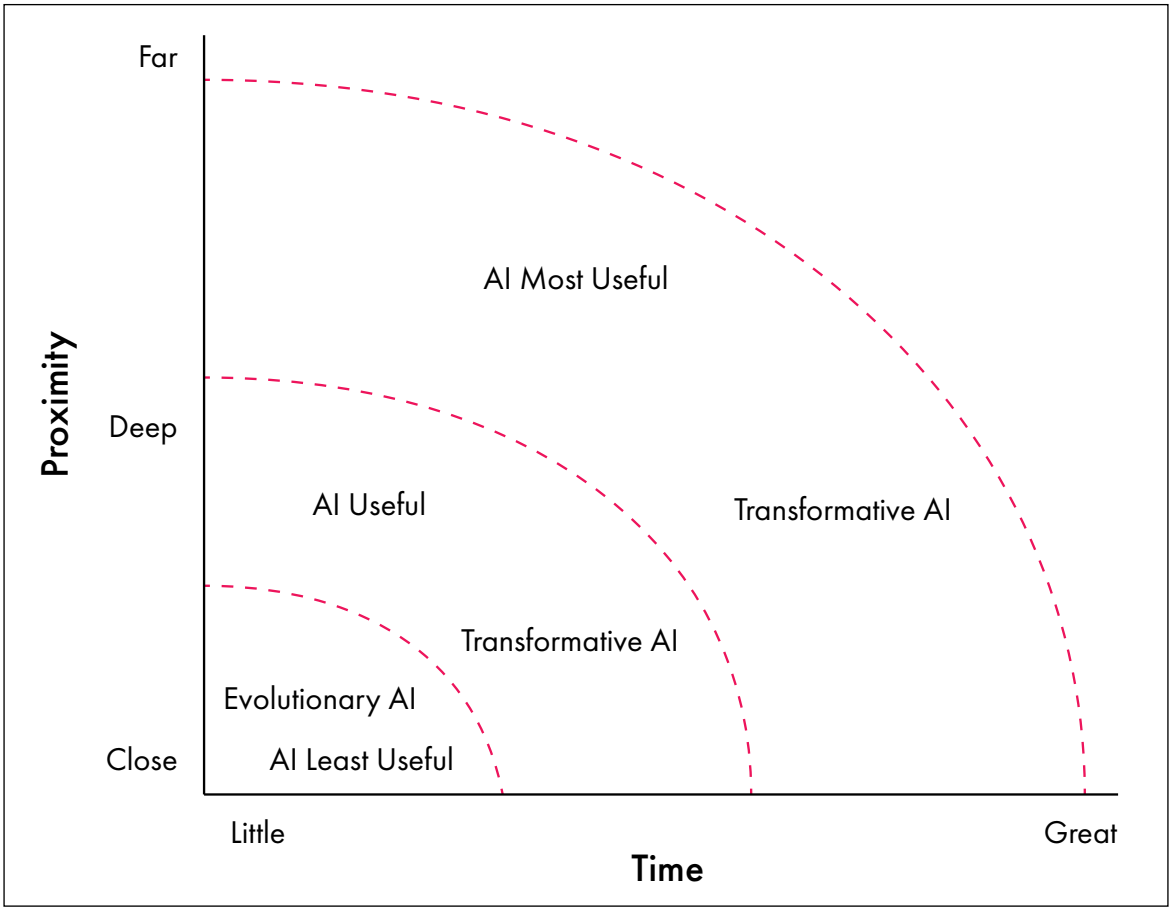
From a risk perspective, however, AI's transformative potential decreases in what militaries call the "close fight," or the area in which direct contact between land forces occurs. At a distance, military commanders and their staff have time to sift through information, make informed decisions and move large formations or resources from one place to the next. AI is useful in this space because it can assist the machines that collect and analyze battlefield data, while augmenting the staff that generate proposed plans and recommendations for a commander's approval. The goal here is to create separation on the battlefield between one's close combat forces and an attacking adversary to trigger the enemy's culmination before close combat can occur and positional warfare sets in.

In close areas, or battlespaces that lack significant amounts of geographical space between belligerents, military commanders and their staff possess very little time to make critical decisions. That lack of time may cause an actor to instinctively respond or act concerning a specific situation. In doing so, the commander and their staff forgo the benefits afforded by geographic distance and time and end up generally in a positional slugging match in which the blunt force of men, materiel and firepower point the surest path to battlefield victory. It therefore follows that in the close area, AI does not likely carry much transformative potential (see Figure 1).

This does not mean that AI has no place in close combat. AI will likely be harnessed to continue to expedite the speed of tactical activity and will (theoretically) improve the tactical efficiency upon which AI-infused militaries operate. But improved speed and enhanced efficiency may not necessarily equate to transformative quality, but may instead result in only marginal improvements on contemporary methods. Moreover, it remains to be seen how faster and more efficient tactical activity will impact the general character of war: there is a distinct possibility that it might contribute to wars of attrition.

In terms of doctrine, AI's most transformative potential lies in its ability to provide military commanders and their staff with more time — time to mobilize bases of power; allocate resources to prioritized formations; move personnel, equipment and weapons into advantageous positions; and prepare the battlespace for close-area combat. AI can help transform this mode of warfare by conducting data and tempo operations, linked with a commander's enemy force-oriented defeat pathway.

Figure 1: AI Battlespace Utility

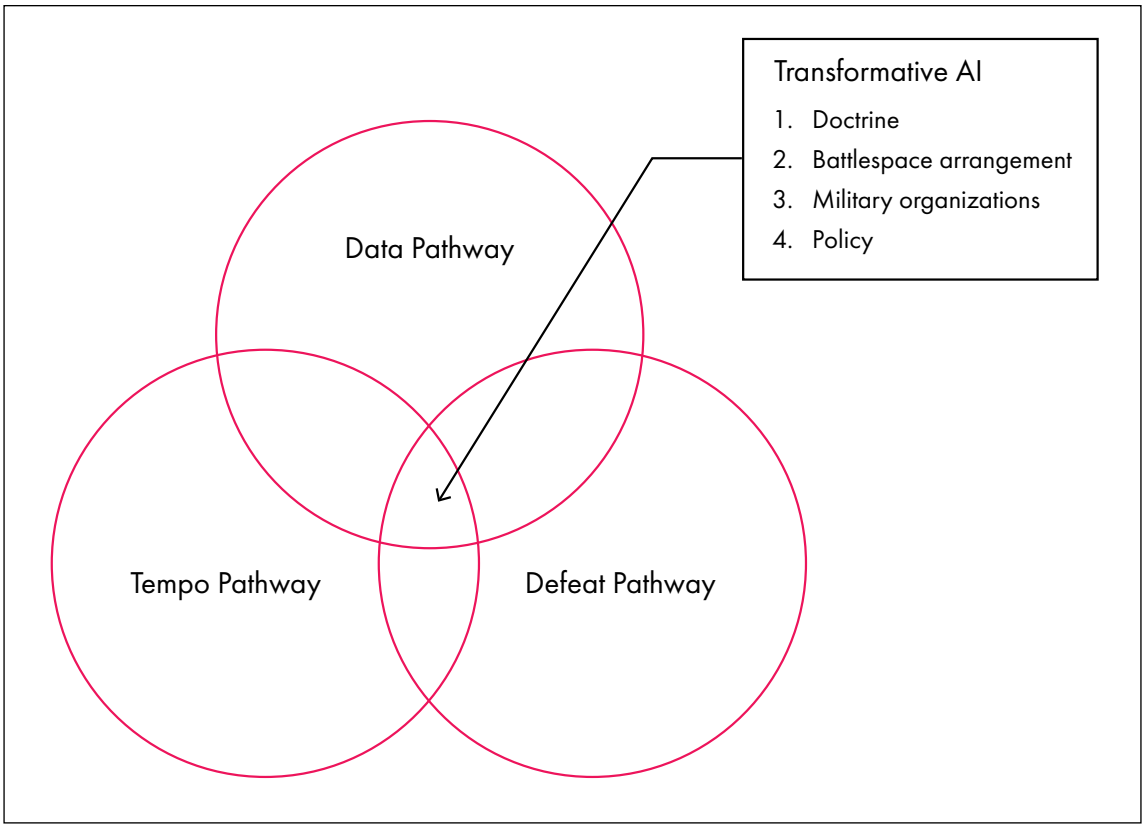


Source: Author.

In this way, data, tempo and defeat-focused operations should be seen as a collective that is focused on creating time and geographical space for a commander, enabling them to bring their sophisticated long-range firers and autonomous and semi-autonomous combat systems to bear on the battlefield. Within this model, AI's transformative potential lies in underwriting the data and tempo pathways, and subsequently creating the information to improve the defeat pathway (see Figure 2). Taking this logic a step further, if appropriately integrated across DOTMLPF-P(I), and infused across the data, tempo and defeat pathways, AI might well generate a truly novel way of warfare in the twenty-first century. The novelty here is in the introduction of a holistic view of warfare that reconfigures the battlespace's arrayal to support the data, tempo and defeat pathways, while incorporating new formations that can unlock these pathways.

Moreover, addressing AI-infused doctrine in this manner allows the policy maker, strategist and practitioner to recuse themselves of the hyperbole of presentism relating to things such as drones, long-range strike and other perceived novelties of modern war. In doing so, doctrine development can avoid becoming fixated on tactical innovation, where AI's transformative impact is limited, and instead focus on areas where AI might truly achieve transformational impacts. In addition, integrating AI-driven formations, doctrine and operations into traditional military contact zones might undercut a strategic adversary's ability to effectively implement stand-off warfare and better position military forces to appropriately address the challenges of land war.

Figure 2: Theory of Transformative AI



Source: Author.

Organization

New organizations (i.e., military formations) are critical to unlocking the transformative potential of the doctrine outlined above. Innovating military organizations to capitalize on AI's transformative potential requires more than pairing AI-enabled unmanned combat platforms with other AI-enabled unmanned combat systems, creating AI-major generals or proliferating drone swarms. Innovation must focus on how to create time and geographical separation on the battlespace through data, tempo and combat operations far forward of one's military force with the goal of providing military commanders with options, including creating opportunities for success and protecting their forces from hostile attack. If properly implemented and administered, AI-centric military organizations and doctrine have the potential to cripple a strategic competitor's ability to use military force to accomplish their policy goals, while offering new methods of protection to one's own military forces and civilian population.

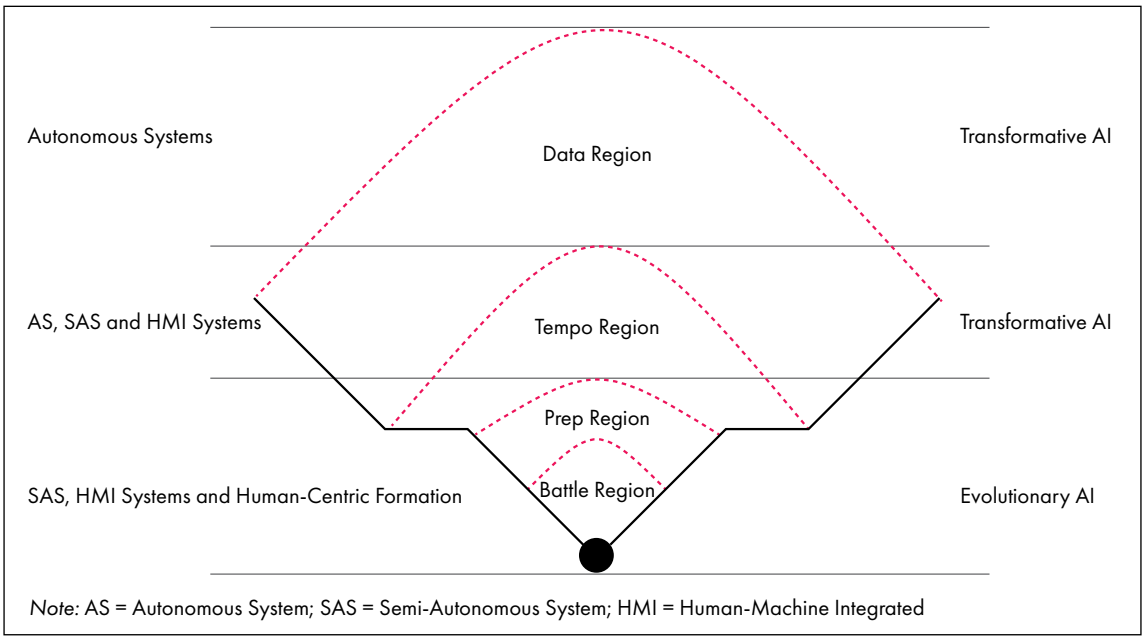
To that end, states must develop organizations that harness AI's power to collect information pertaining to the enemy and the operating environment; transmit data or pictures of reality to the adversary for the purpose of deception; influence the enemy toward a welcoming disposition; and manipulate the tempo of an opponent's operations. As noted in this paper's section on doctrine, this philosophy of warfare must not be applied to the existing deep, close and rear area framework. Robotic formations need geographical space to operate in a manner unencumbered by friendly human-based military formations. In this situation, autonomous and semi-autonomous systems and formations can operate independently to gather information about a threat, purposefully present crafted information to that threat and use a mix of lethal fires and non-lethal attacks to influence the tempo of operations and weaken the constitution of the enemy force.

In addition, AI can contribute to the conditions that preempt close combat. In an AI-rich battlespace, a military's focus should be on avoiding close combat; in fact, military forces should attempt to defeat an opponent well ahead of close contact with land forces. Why the shift away from the traditional close area? Eliminating an adversary before they have the opportunity to fully deploy their forces and warfighting capabilities has several benefits. First, it preserves one's forces, helping support their ability to arrive at an objective relatively fresh and not on the cusp of culmination. Second, by obstructing an adversary's ability to occupy the physical battlespace, a force provides itself with greater freedom of action and reaction time, which subsequently gives it a wider range of options to address political-military matters. Finally, eliminating an adversary well ahead of the battle region using AI-driven robotic formations minimizes the inevitable death, destruction, collateral damage and civilian casualties caused by close combat.

This might be achievable by applying a reconfigured battlespace and new, AI-infused military organizations operating forward of traditional close and deep areas. Rethinking the battlefield as separate regions might help in this process. Figure 3 shows four regions: the battle region, preparation region, tempo region and data region. Traditional military formations, semi-autonomous systems and human-machine integrated formations all operate in the battle region, which can be thought of as the traditional close area. AI in this space will likely be evolutionary as it will add incremental improvements to how land forces and joint forces participate in tactical military operations.

The preparation region is somewhat like the traditional deep area, but as with the battle region, military forces there will also consist of semi-autonomous systems, human-machine integrated formations and human-centric units. It will be used to functionally, positionally and temporally dislocate an adversary, and lure an adversary into unfavourable positions of relative weakness on the physical terrain utilizing ploys, tactics and strikes. This would be done if a military is not successful in defeating an adversary in the tempo region. In the tempo region, militaries attempt to win an emerging conflict or battle before it can expand into something far more significant or deadly. Military commanders might rely predominantly on autonomous and semi-autonomous systems and human-machine integrated robotic formations to fulfill their commander's intent in the tempo region.

Figure 3: Theory of Transformative AI



Source: Author.

The goal of AI-infused military operations should be to defeat an adversary state's military without having to use one's own close combat forces, killing an enemy attack in the proverbial crib with the appropriate doctrine, organizations and sustainment backbone. Doing so will lessen the potential number of challenges of land war in which one might have to encounter a hostile force. This is accomplished by negating that hostile force's ability to attack by defeating or destroying four key features: their ability to understand; their means to advance; their ability to operate efficiently; and their ability to win. Protecting those same features for one's own forces is the other side of the coin and of equal importance. The goal is to avoid doing this in the status quo manner by engaging in this fight within the battle region with close combat forces, resulting in the attritional toll of positional warfare. Aggressive, AI-governed autonomous and attritable machines, as well as autonomous and semi-autonomous formations operating far ahead of close combat forces, can blunt the offensive and shift the balance away from the necessity of fighting large-scale positional battles of attrition.

If leveraged correctly, AI-enabled military formations should be used to defeat adversaries in the tempo region to sidestep the opponent's ability to mass (whether practically or theoretically) for perilous combat in the preparation or battle region. AI-enabled robotic formations should be programmed with the intent of destroying an opposing enemy's land or joint force where the data and tempo regions intersect. These robotic formations, free from the fear of human casualties, will allow militaries to aggressively identify and eliminate a strategic competitor's warfighting capabilities, while simultaneously protecting one's own forces.

Forward-thinking states and their militaries should invest in mobile robotic strike groups, mobile robotic tempo groups and mobile robotic data groups to accomplish this new doctrine. To blunt hostile forces, these formations can be filled with autonomous and semi-autonomous systems, sensors, air defence systems, data transmission, formation facsimiles, generative sustainment, self-sufficient power generation and strike capabilities that operate untethered by human-based forces and at a faster pace, giving policy makers and senior military leaders struggling with how to win a specific conflict the benefit of additional time and information.

Policy makers, senior military leaders and science and technology experts should also be well-grounded in stand-off warfare, particularly in terms of how it contributes to positional warfare and accelerates wars to an attritional status as a result. These individuals do not need to be experts in the military arts and sciences, but they should possess at least a working familiarity of the causality between these various forms of warfare. In this way, they will be able to maximize the potential of AI in military operations to prevent strategic competition from drifting into wars of attrition.

Policy and Interoperability

As it currently stands, most Western states, led by the United States, lack a coherent and complete policy for how to use AI on the battlefield. Many are already working on this, as exemplified by the US government's Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence (2023), and the US DoD's *Data, Analytics, and Artificial Intelligence Adoption Strategy: Accelerating Decision Advantage* (2023). The US DoD is particularly focused on the ethical use of AI; in 2020, it articulated five principles for its ethical military use. Those principles are: responsible use; equitable use (i.e., the mitigation of unintended bias); traceability; reliability; and governability (The Joint Artificial Intelligence Center 2020).

Nonetheless, additional work is required. States and their defence departments or ministries need to codify authority for use and responsible actors. Authority for use should clearly articulate where the decision authority resides for using the various types of AI-driven autonomous systems and where humans must be directly involved in their operation as opposed to simply overseeing it. Similarly, defence departments and ministries must also identify the responsible authority in the event that AI-driven autonomous systems conduct military activities that are immoral, unethical or illegal, or that violate the norms of international humanitarian law and the law of armed conflict. If Western states and NATO attempt to wait until those systems are fully fielded before putting these measures in place, they will have waited too long.

Furthermore, interoperability cannot be overlooked. National caveats must be considered now,

before autonomous systems are fully fielded. AI-related policy must focus on the nexus of allies and partner states in relation to laws governing the use of AI, information systems and networks. The drafting of potential caveats must be done with allies and partner states now to prevent some states from bowing out of supporting military operations at a future date.

Interoperability also implies that all allies and partners possess the command and control of network systems to operate and manage autonomous systems in order for military operations to be truly multinational. Therefore, as states look to industry to develop AI-enabled autonomous systems, those systems must come with the requisite tools to allow all alliance members and partners to employ, monitor and control those systems. Otherwise, wartime command structures will not truly reflect the power of a multinational alliance, but rather only that of those states most invested in autonomous systems.

Conclusion: Policy Recommendations

In closing, the Russo-Ukrainian War provides a set of useful considerations for Western states and NATO. These considerations are not specific to Russia or Europe, but apply to any conflict in which a fight for territory is the goal. If China were to invade Taiwan, for instance, and NATO were required to assist Taiwan in extricating Chinese forces from the island, the challenges of land warfare outlined above would remain germane, regardless of the naval, air or contested logistics challenges also associated with that situation.

Nonetheless, NATO and its members must not become blinkered by the sensationalism of stand-off warfare. Drones, long-range strikes and precision warfare all represent the continued challenges of "attacks from above," which soldiers have addressed since the First World War. When strikes from above dominate the battlefield, soldiers go below ground; when soldiers go below ground, static battlefields develop. Positional warfare and attrition are where the costs mount in war, whether that be in the form of dead and wounded soldiers, lost resources, civilian casualties, collateral damage or even national prestige. When static battlefields develop, positional warfare replaces manoeuvres and conflicts drift into wars of attrition.

NATO should consider this hypothesis: While stand-off warfare paradoxically accelerates wars of attrition, a more weighted land campaign lightly supported by joint elements better enables mobile warfare, thus unlocking a quicker and less destructive war. It therefore follows that if NATO members want to avoid wars of attrition, they should further examine this line of logic through experimentation. Wargames and tabletop exercises might suggest that stand-off warfare and "attacks from above" are the solutions to the challenges of future warfare, but they are actually causing more problems than they are solving.

NATO should also take pause and examine the relationship between battlefield transparency, targeting, force design, dispersed operations and future military operations. One of the major talking points to emerge from the Russo-Ukrainian War, which is a continuation of the discourse from the 2020 Nagorno-Karabakh War, is that sensors and drone technology are obviating large land forces, making these new implements just as slow and unwieldy as tanks (McFate 2019, 231) and towed artillery (Roque 2024), both relics of a bygone era of armed conflict. Other experts who are anticipating a potential future conflict with China have made similar arguments (Underwood 2022). To address this challenge, change advocates assert that NATO forces must become smaller and lighter and operate with dispersed operations to defeat battlefield transparency, enemy drones, and threat missile and artillery targeting, among other high-technology threats in the future (Judson 2023).

As analyst Frank Hoffman (2024) contends, military operators only think through the problem of being seen by their enemy, and fail to consider the challenges that armies have to address once they have reached their objective. Thus, it would be prudent for NATO policy makers, military leaders and pundits to think through military operations from beginning to end, rather than excluding the latter at the expense of the former, which contributed to the US military's failures in both Afghanistan and Iraq. NATO policy makers must appreciate that this approach requires resilient and robust — not light, small and disperse — land forces. NATO requires land forces that can make their way through the rigours of a transparent battlefield and array ready forces with sufficient

combat power to meet the challenges of land warfare. Light, small and dispersed land forces fighting in stand-off warfare will not be able to defeat an ensconced challenger intent on retaining confiscated or annexed land. Strikes from the sky, regardless of how precise or deftly adjudicated, will not effectively eliminate those land forces. Ruggedized, resilient land forces — human, human-machine integrated, robotic or otherwise — are needed to accomplish that task. Thus, NATO policy makers, military leaders and other supporters should advocate for the development of larger, more armoured land forces, while at the same time making it clear to policy makers why larger, not smaller, land forces are needed.

In overcoming the challenges of land warfare — including any future war with Russia, China or even Iran or North Korea — stand-off warfare, precision strikes and long-range fires would only play small supporting roles. The majority of combat would occur on the ground between land forces, which means that the victor would have to be capable of surmounting the seven challenges of land warfare outlined within this paper. In achieving a clear victory using the methods outlined above, the winning forces would simplify diplomacy for NATO policy makers.

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