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The Impact of Drones on Manoeuvre Warfare

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Exercise Solo Flight

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The Impact of Drones on Manoeuvre Warfare

Major Justin Salter

THE IMPACT OF DRONES ON MANOEUVRE WARFARE

"You may fly over a land forever; you may bomb it, atomize it, and wipe it clean of life – but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman Legions did – by putting your soldiers in the mud;" this quote from T.R. Ferenbach is the opening line of a 2023 article from Time Magazine, which acts as a clear signal that the impact of unmanned aerial systems ("drones") on the battlefield has reached far beyond the halls of professional military education, and into the mainstream.[1] The Canadian Armed Forces (CAF) has taken note of this impact, and has continued its own movement into this arena of 21st century warfare with the recent purchase of eleven MQ-9 Reapers.[2] This first purchase of armed drones will complement the CAF's ongoing use of both the CU-172 Blackjack, and the CU-179 Raven B, both designated as small platforms that are not currently carrying any weapons systems into the battlespace.[3] As a practitioner of manoeuvre warfare, the CAF continues to integrate this relatively new capability into its strategic and operational doctrine alongside NATO allies and multinational partners that, in many cases, have been adopting and integrating this new warfighting capability for far longer than Canada has. Indeed, the use of drones in warfighting has spread far and wide, and what was once solely the realm of the large and wealthy USA within a unipolar world, has spread to conflicts of every size, shape, and budget amidst an environment of great power competition.[4] Which begs the question, how can manoeuvre warfare exist alongside this new technology that warrants even the layman's awe? In order to explore this, it will be useful to first define what is commonly meant when using the term "drone", and though the focus here will be on aerial drones, which are currently the most common type in use, the considerations will be transferable to discussion of the emerging technologies of ground and maritime drones as well. I will follow this by looking at the phrase "manoeuvre warfare" through both a technical and historical lens. Then, by understanding where drones fit into this manoeuvre warfare framework, I will explore how, or even if, drones will rewrite, or perhaps even unravel, our understanding of manoeuvre warfare as it has been practiced for almost a century. It will be useful to contextualise all of this within recent case studies where drones have played a major role in open conflict, in particular those of Ukraine, Azerbaijan (Nagorno-Karabakh, specifically), and Yemen. Finally, as I draw my conclusion about the impact of drones on

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[1] Eric Schmidt and Will Roper, "Ukraine Shows How Drones Are Changing Warfare," *Time Magazine online*, September 28, 2023, https://time.com/collection/time100-voices/6317661/eric-schmidt-drones-warfare-voices/.
[2] Murray Brewster, "Canadian military buying armed drones for $2.49B," *CBC News online*, December 19, 2023, https://www.cbc.ca/news/politics/armed-drone-canadian-armed-forces-1.7063989.
[3] "List of equipment of the Canadian Army," Wikipedia, last modified April 24, 2024, https://en.wikipedia.org/wiki/List_of_equipment_of_the_Canadian_Army.
[4] Jonathan Marcus, "Combat Drones: We are in a new era of warfare – here's why," *BBC World News online*, February 4, 2022, https://www.bbc.com/news/world-60047328.

manoeuvre warfare, I will allude to some of the ways in which drones are expected to enhance, rather than sideline, the use of manoeuvre warfare in the modern battlespace. Ultimately, I intend to demonstrate to the reader that even though drones represent both an evolution, and a revolution, on the modern battlefield, they will not fundamentally change the relevance or effectiveness of manoeuvre warfare as laid out in CAF doctrine.

In the broadest sense, a drone (aka a 'Remotely Piloted Aircraft System' or 'RPAS' according to the *International Civil Aviation Organization* of the UN) is any unmanned aircraft which is piloted from a remote pilot station.[5] On the modern battlefield, a drone might be a quad- or octo-copter, typically an off-the-shelf (OTS) model that is cheap, relatively short-range, and used in an intelligence-gathering, surveillance, and reconnaissance (ISR) role to, for example, identify attacks, adjust artillery fire, or simply 'see what's over the next hill'. It might also be what's known as a 'drop drone', which is a weaponised version of this ISR drone.[6] It has the same fundamental characteristics as an ISR drone, but includes the ability to release something kinetic down onto a target, and can range in size from carting around a standard hand grenade, to hauling large artillery projectiles. Another category of drones is 'First Person View' drones, more commonly referred to as 'FPV' drones. Originally adapted from civilian racing drones, these are more optimized for speed and agility than the ISR drones, thus placing a higher premium on pilot skill, and are usually even cheaper to purchase.[7] For these reasons, FPV drones are almost always used in the attack role, with most configurations outfitted for single-use operations (i.e., 'suicide' or 'kamikaze' attack runs, with munitions strapped to the drone for payload delivery). Moving away from copters and onto fixed-wing drones, the modern battlefield also hosts 'loitering munitions', winged warheads designed to fly longer distances at higher altitudes and, once a target is acquired (either through human input or machine-learning assessment), drop itself onto that target with lethal effect.[8] As the distances get even longer, and the payloads and target types get more complex and unique, you enter the category of 'long range strike' drones, also known as 'one-way attack' drones, most easily demonstrated by the Shahed-136 attack drones coming out of Iran.[9] These drones have begun to overlap with the operational and strategic space normally occupied by cruise missiles. Finally, you reach the complex, reusable, and multi-role pinnacles of drone warfare that include such beasts as the aforementioned Reaper, and which are typically only possessed in any useful number by the USA and its NATO allies, or the most advanced of their global competitors (ie. China or Russia). The diverse spectrum of warfighting that is enabled or

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[5] ICAO, "RPAS CONOPS," 2024, https://www.icao.int/safety/UA/Documents/ICAO%20RPAS%20CONOPS.pdf.
[6] PerunAU, "Drone Technology in Ukraine – Automation, Lethality & The (Scary) Development Race," YouTube, April 7, 2024, https://www.youtube.com/watch?v=iJnuTtUFiWM.
[7] PerunAU, "Drone Technology."
[8] PerunAU, "Drone Technology."
[9] PerunAU, "Drone Technology."

conducted by drones today thus means that the impact of drones on manoeuvre warfare cannot be painted with a singular, broad brush.

Conversely, 'manoeuvre warfare' is a more technical, and thus somewhat easier to define, term. According to CAF doctrine, "the manoeuvrist [*sic*] approach strikes a balance between the use of physical destruction and moral coercion, emphasizing the importance of the latter, to attack the enemy's will to fight."[10] Similarly, US joint military doctrine equates manoeuvre warfare with striking at the psychological will of an opponent – of deftly moving into a position of relative advantage with as little combat along the way as possible, placing oneself in a point of time, space, and counter-purpose to force the opponent to give up the fight without needing to destroy them.[11] Ultimately, the practice of manoeuvre warfare combines the use of six cardinal elements: tempo, 'Schwerpunkt' (intuitively striking the enemy at the right time, in the right place, with the maximum amount of force available), surprise, combined arms, flexibility, and decentralised command (more commonly referred to as 'mission command').[12] In anticipation of examining where aerial drones fit into the future of this style of warfare, and how they might fundamentally change it, it is worthwhile to examine where air power has historically existed within a manoeuvre warfare context. The most oft-cited example of manoeuvre warfare in action is the 'blitzkrieg', the German invasion of Belgium, Netherlands, and France in 1940. To most observers, it embodies all of these six cardinal elements.[13] The role of the German Air Force ('Luftwaffe') of 1940 in this operation included attacks on airfields and aircraft, followed by a significant role in attacking opponents' supply lines and reinforcements in depth.[14] Today, drones of all types are often being employed in much the same way. Critically, the Luftwaffe of 1940 was most often operating independently of ground forces, instead of in close coordination with them as is encouraged by the principles of manoeuvre warfare (ie. combined arms), and as such the Luftwaffe was unable to provide a decisive strike to the opponent's centre of gravity all by itself, best demonstrated by its inability to prevent or interdict the evacuation of Allied forces from Dunkirk.[15] Despite the technological advancements of drones relative to the Luftwaffe of 1940, they are similarly unable to ignore or replace the need for combined arms and flexibility as demanded by manoeuvre warfare. This can be contrasted with the German invasion of Soviet Russia beginning in 1941, where the Luftwaffe was much better integrated with ground forces in combined operations and yet,

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[10] Canada, Department of National Defence, *Canadian Forces Joint Publication 01, Canadian Military Doctrine* (Ottawa: Joint Doctrine Branch, 2011), 6-13 – 6-14.
[11] Joint Chiefs of Staff, *Joint Publication 3-0, Joint Operations* (Washington, DC: Government Printing Office, 2017), III-38.
[12] Martin Van Crefeld, *Air Power and Maneuver Warfare* (San Francisco: Tannenberg Publishing, 2015), 16-20.
[13] Van Crefeld, *Air Power*, 46.
[14] Van Crefeld, *Air Power*, 46-51.
[15] Van Crefeld, *Air Power*, 53.

despite a rapid and enduring state of German air superiority, was ultimately a failed operation because air power, of which drones are currently a significant part, was not a replacement for proper manoeuvre warfare.[16] This further stands in stark contrast to Soviet Russian operations during 1941-43, where the integration of technologically-inferior air forces into an overall framework of manoeuvre warfare enabled success in a way that even drones, *by themselves*, could not hope to do so today.[17]

The drones of today are a far cry from the air forces of World War II, and their proponents may easily protest the idea that drones, despite being overwhelmingly aerial, belong exclusively in the 'air power' bucket. The roles of drones are far more diverse on the modern battlefield than the air forces of the 20th century were, and are expanding into both the ground and maritime domains. They have greatly enhanced military ISR capabilities, which has bolstered situational awareness and the ability to precisely strike at targets at almost any depth of the enemy front. They have become a force multiplier, and a weapon on the psychological plane as much as the physical one: "the constant threat of drones profoundly destabilizes the troops' morale by creating a climate of terror."[18] And yet, drones are still bound up in the six cardinal elements of manoeuvre warfare, by their very nature enhancing tempo, surprise, and flexibility while also greatly enabling 'Schwerpunkt' through the improvements to awareness and targeting that they have allowed. They also possess significant vulnerabilities, which are less well-advertised in the modern discourse surrounding drones but simultaneously make drones just as reliant on a combined arms structure as any other 'game-changing' system that has rolled out onto the battlefield in the past 100 years (such as the machine gun, the tank, the aircraft, the rocket, or the satellite). Current analysis suggests that "…drones are unlikely to eliminate close combat and erase the importance of skills and proficiency in modern warfare because of opportunities to conceal ground capabilities."[19] Drones are still very limited by the conditions in which they operate, with inclement weather still being a greater threat to drones than to manned systems, and night-time and low-light conditions still posing barriers to ISR and FPV drones, even those equipped with rudimentary thermal or night vision optics.[20] In fact, accounting for grain, interference, and limitations to resolution, the visual feedback from the smaller, cheaper drones (which are preferred because they are smaller and cheaper) is often inferior to regular human vision.[21] The

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[16] Van Crefeld, *Air Power*, 64.
[17] Van Crefeld, *Air Power*, 158.
[18] Tancrede Jankowski, "The Proliferation of Militarized Civilian Drones in Ukraine: a Lesson from the War for Western Military Staffs," *Network for Strategic Analysis*, May 1, 2023, https://ras-nsa.ca/the-proliferation-of-militarized-civilian-drones-in-ukraine-a-lesson-from-the-war-for-western-military-staffs/.
[19] Antonio Calcara, Andrea Gilli, Mauro Gilli, Raffaele Marchetti, and Ivan Zaccagnini, "Why Drones Have Not Revolutionized War: The Enduring Hider-Finder Competition in Air Warfare," *International Security* 46 (4) (Spring 2022): 130–171.
[20] PerunAU, "Drone Technology."
[21] PerunAU, "Drone Technology."

'manoeuvrist' doctrine of the CAF already dictates that the most vulnerable warfighting activities should take place at night or in low-light conditions, so once more drones prove not as revolutionary as they might seem at first glance. Signal transmission also imposes constraints upon drones similar to those imposed upon typical manoeuvre forces by the communication systems that have been critical to the execution of manoeuvre warfare since its inception. "Specifically, drones are unlikely to shift the offense-defense balance toward the offense because they are vulnerable to electronic warfare and air defense systems."[22] Drones remain susceptible not just to attacks from Electronic Warfare (EW), but also to interference in the line-of-sight (LoS) between the drone and its remote operator caused by terrain elevation, wreckage on the battlefield, and even just the curve of the earth itself.[23] In combination, these two limitations (low-light functionality and LoS) cause drones to miss their targets quite often, and have led to an expansion in the use of machine-assisted (ie. autonomous) target identification and attack guidance.[24] These autonomous systems also remain flawed and continue to evolve in much the same way that so many other warfighting tools have similarly done in the past without rewriting the book on manoeuvre warfare. There even remains countermeasures built right into the hardware and software of drones by the manufacturers, a consequence of the fact that so many of the battlefield drones below the size and scale of the Reaper are modified OTS models. Many governmental oversight bodies in western nations, such as the Federal Aviation Administration (FAA) of the USA, have increasingly legislated requirements for built-in signal-tracking systems that are meant to discourage and/or punish misuse of a drone, and for hard-coded software restrictions on the coordinates that a drone can be ordered to fly through (eg. in the airspace above a military installation).[25] These platform limitations present further evidence of the continued need for the practice of manoeuvre warfare, even in the age of drones.

Just like other aforementioned 'game-changers' on the battlefields of the 20th century, it is clear that drones do represent a massive change in the landscape of the modern battlefield, but ultimately, they will not force a significant departure from the established fundamentals of manoeuvre warfare. An adage may be applied here: 'the proof of the pudding is in the eating'. The effect of drones on manoeuvre warfare has been highlighted in three war zones, two of which remain active at the time of writing: Ukraine, Nagorno-Karabakh, and Yemen. In Ukraine, drones have played a multifaceted role, are reshaping the dynamics of the conflict by influencing military strategies and are raising international concerns about the future security environment. From surveillance and reconnaissance to targeted strikes and tactical support, drones in Ukraine are proving terrifyingly effective and continue to have serious strategic significance. Since Russia's

[22] Calcara et al, "Why Drones Have Not Revolutionized War."
[23] PerunAU, "Drone Technology."
[24] PerunAU, "Drone Technology."
[25] PerunAU, "Drone Technology."

invasion in 2022, they have accounted for a significant proportion of visually confirmed artillery losses, and have inflicted a lot of visually-confirmed damage against a lot of different target types.[26] What they have not done, however, is made irrelevant the need for both sides to employ manoeuvre warfare in both their offensive and defensive operations. For example, Ukraine has been successfully using drones to strike at critical Russian supply lines, such as the road-and-rail bridge linking Russia and the Crimean Peninsula, as well as achieving significant success on the psychological plane by using drones to strike at Russian ministries and businesses within Moscow, which speaks to the CAF's doctrinal definition of a 'manoeuvrist' approach that attacks the enemy's will to fight.[27] And yet, for all these achievements that drones have enabled, the Ukrainian counter-offensive of 2023 still found itself stalled by Russian defenses that posed no threat to drones or drone operators, but rather to mechanized ground forces.[28] Ukraine's decisions, whether by choice or by necessity, to ignore several of the cardinal rules of manoeuvre warfare contributed to its inability to break out of the stalemate that had developed all across its front with Russia. In the matter of both tempo and surprise, the Ukrainian decision to delay the start of their 2023 counteroffensive "played a crucial role by allowing Russia time to fortify the front line," and "…the open, flat terrain in the region [of Zaporizhzhia] made it more difficult for Ukraine to move with any element of surprise."[29] The Ukrainian counteroffensive also ignored the critical factor of 'Schwerpunkt' when it decided to split its forces along three axes of advance, as opposed to concentrating its forces into just one axis.[30] On the other side of this conflict, Russian drones have found similar success on the psychological plane, as well as playing a critical role in halting the aforementioned counteroffensive by providing ISR capabilities to Russian defenders.[31] And yet, by their own admission, the Russians do not believe that employing drones, or even gaining superiority over Ukrainian drones, will provide any sort of deciding factor in their invasion. Instead, embracing the concepts of tempo and combined arms, Russia expects that ammunition manufacturing will play a more important role in its conquest over Ukraine, with the Russian Ministry of Defence calling out artillery ammunition specifically; a staggering 4 million rounds of 152mm and 1.6

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[26] PerunAU, "Drone Technology."
[27] Reuters, "Crimea bridge: why is it important and what happened to it," *Reuters online*, July 16, 2023, https://www.reuters.com/world/europe/crimea-bridge-why-is-it-important-what-happened-it-2023-07-17/; Reuters, "Drone hits tower housing Russian ministries for second time in three days," *Reuters online*, August 1, 2023, https://www.reuters.com/world/europe/drones-target-moscow-high-rise-building-hit-2023-08-01/
[28] Jamie Dettmer, "Ukraine counteroffensive ramps up, but meets stiff Russian resistance," *Politico*, June 9, 2023, https://www.politico.eu/article/ukraine-russia-war-counteroffensive-ramps-up-but-meets-stiff-russian-resistance/.
[29] Mariano Zafra and Jon McClure, "Four factors that stalled Ukraine's counteroffensive," *Reuters online*, December 21, 2023, https://www.reuters.com/graphics/UKRAINE-CRISIS/MAPS/klvygwawavg/.
[30] Zafra and McClure, "Four factors."
[31] Al Jazeera, "More than 70 Russian drones hit Kyiv, wounding five: Ukrainian officials," *Aljazeera Online*, November 25, 2023, https://www.aljazeera.com/news/2023/11/25/more-than-70-russian-drones-hit-kyiv-wounding-five-ukrainian-officials; Zafra and McClure "Four factors".

million rounds of 122mm are Russia's own estimated requirements just for the year of 2024 should they wish to make any significant gains in Ukraine over the course of this year.[32] In summary, "Drones have not, and are not likely to, shape the outcome of the war in Ukraine. They have not allowed Ukraine to break its stalemate with Russia, nor have they encouraged Russia to end its occupation of Ukraine."[33]

In Nagorno-Karabakh, a region recognised as belonging to Azerbaijan but having been held under Armenian control during the period of 1994 – 2020, the extensive and successful use of drones by Azerbaijan's forces during their 44-day war in 2020 led many to (prematurely) proclaim that warfare had reached a turning point, that the age of tanks was ended, etc.[34] Deeper analysis did not support this claim. "In contrast, this case further strengthens the validity of the modern system of force employment…" in other words, the prevailing 'manoeuvrist' approach.[35] Armenia's air defence lacked the layered integration, skilled personnel, and advanced signal processing functions needed to address the threat posed by Azeri drones, despite the fact that these exact same drone models had utterly failed to enable operational success in Libya during 2019 – 2020, or in Syria during 2011 – 2020.[36] Armenia also lacked the EW capabilities to counter enemy drone signals.[37] Most importantly, "Azeri forces employed tactics and technologies to deceive, blind, locate, and destroy Armenian air defenses," reinforcing the importance of manoeuvre warfare in the era of drones.[38] "Additionally, Turkey shared its expertise in and experience with employing modern tactics and operational concepts with Azerbaijan…" which proved far more critical to Azeri success than simply the breadth and depth of its drone forces.[39] Meanwhile, "…[Armenia] did not turn to drones to redress its numerical and qualitative military inferiority on the battlefield."[40] On both sides, it seems, drones did not prove critical, or even decisive, across this modern battlefield. In Nagorno-Karabakh, drones did not render obsolete the need for ground forces to employ manoeuvre warfare in pursuit of victory, with infantry units inside defensive trench systems proving far more critical to both sides (in a fashion very similar to what has developed between Ukraine and Russia four years later).[41] The Battle for Shusha City, where 400 Azeri special operation forces surprised 2,000 mechanised

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[32] Jack Watling and Nick Reynolds, "Russian Military Objectives and Capacity in Ukraine Through 2024," *RUSI*, February 13, 2024, https://www.rusi.org/explore-our-research/publications/commentary/russian-military-objectives-and-capacity-ukraine-through-2024.
[33] Paul Lushenko, "Cult of the Drone: At the two-year mark, UAVs have changed the face of war in Ukraine – but not outcomes," *The Conversation*, February 16, 2024, https://theconversation.com/cult-of-the-drone-at-the-two-year-mark-uavs-have-changed-the-face-of-war-in-ukraine-but-not-outcomes-221397.
[34] Calcara et al, "Why Drones Have Not Revolutionized War."
[35] Calcara et al, "Why Drones Have Not Revolutionized War."
[36] Calcara et al, "Why Drones Have Not Revolutionized War."
[37] Calcara et al, "Why Drones Have Not Revolutionized War."
[38] Calcara et al, "Why Drones Have Not Revolutionized War."
[39] Calcara et al, "Why Drones Have Not Revolutionized War."
[40] Calcara et al, "Why Drones Have Not Revolutionized War."
[41] Calcara et al, "Why Drones Have Not Revolutionized War."

Armenian forces and engaged them in short-range street fighting that was defined by its use of armour, anti-armour, and artillery, was fought under a blanket of fog; what is considered the most important battle of this war did not involve a single drone.[42] Drones proved to be a force-multiplier for Azerbaijan, whose drones complemented their use of manoeuvre warfare, specifically combined arms and tempo, rather than trying to replace it.[43] Conversely, Armenia's use of drones did not make up for the fact that they failed to adequately employ the principles of manoeuvre warfare, such as with "…mass movements of troops, in the open, during daylight, and without air defense…."[44] While under the threat of attack by Azeri drones, Armenian forces continued to "…implement insufficient countermeasures and countertactics such as dispersion or camouflage to avoid exposure to enemy fire."[45] The real 'silver bullet' in Nagorno-Karabakh was superior use of manoeuvre warfare, in which drones played a significant, but not defining, role.

Since 2016, in Yemen and the neighbouring Red Sea, the Houthi rebel movement ("Ansar Allah") has made extensive use of drones against Yemen, Saudi Arabia, UAE, and even maritime shipping and NATO naval forces.[46] This could be considered an excellent example of the 'democratization' of air power, once solely the realm of large, wealthy nations that can afford complex fighters and bombers but now is available to almost any non-state actor. Yet, in the case of Ansar Allah, drones have provided far more of a symbolic value than a tactical one, with reputational damage to the Saudi-led coalition in Yemen far outweighing any actual casualties inflicted upon personnel or equipment.[47] In fact, "…research indicates that while non-state actors like the Houthis may aim to cause mass casualties against soft targets such as civilians, they are unsuccessful at doing so with weaponized UAVs…."[48] Similarly, from the other side's perspective of this conflict, "…[drone] use by Ansar Allah has not shifted the strategic calculus of the Saudi-led coalition."[49] This use of drones by Ansar Allah speaks to a 'manoeuvrist' approach that targets the moral centre of their opponent, rather than attempting to attrite their opponent's forces, but the fact that drones are the preferred tool is irrelevant to the strategic methodology at play. These drone attacks are ultimately just one part of the Houthi strategy, which has the strategic objective of de-legitimizing the

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[42] Calcara et al, "Why Drones Have Not Revolutionized War."
[43] Calcara et al, "Why Drones Have Not Revolutionized War."
[44] Calcara et al, "Why Drones Have Not Revolutionized War."
[45] Calcara et al, "Why Drones Have Not Revolutionized War."
[46] Conflict Armament Research, "Evolution of UAVs employed by Houthi forces in Yemen," *CAR Ltd., London*, February, 2020, https://storymaps.arcgis.com/stories/46283842630243379f0504ece90a821f.
[47] Dhia Muhsin, "Houthi use of drones delivers potent message in Yemen War," *International Institute for Strategic Studies*, August 27, 2019, https://www.iiss.org/en/online-analysis/online-analysis/2019/08/houthi-uav-strategy-in-yemen/.
[48] Jarrett Benkendorfer, "Examining the Houthi Use of Unmanned Aerial Systems to Meet Strategic Objectives," (PhD diss., John Hopkins University, 2021), 24.
[49] Muhsin, "Houthi use of drones."

recognised government of Yemen, and is assessed to have an operational objective of seizing Marib, an area of Yemen containing a large number of strategic oil resources.[50] Drone attacks have failed to land the decisive blow, or even be the deciding factor, in Marib, where Ansar Allah has proven behind-the-curve in their use of tempo, combined arms, and 'Schwerpunkt', and as a result "…the battle for Marib seems to suggest that while the Houthis have an offensive capability in the use of ballistic missiles and weaponized [drones], the Saudi-led coalition may be able to thin out Houthi forces…."[51] Attacks on maritime shipping in the Red Sea, directly adjacent to Houthi-controlled areas of Yemen, have painted a similar picture. Though drone attacks have enabled Ansar Allah, a relatively poor non-state actor, to strike at the global economy at a pace and scale that was unheard of prior to the proliferation of drones, these drone attacks have not led to the operational or strategic advancement of Ansar Allah's goals. In fact, the opposite seems to have occurred, with the United States, United Kingdom, France, Belgium, Canada, Denmark, and the Netherlands all publicly supporting retaliatory strikes against Ansar Allah-controlled territory in Yemen when they hadn't before been strongly involved in the outcome of the conflict.[52] Even tactical success using nothing but drones seems elusive, with Ansar Allah reportedly launching 43 drone and/or missile strikes against maritime targets from their territory during the period of November 19th, 2023, until March 8th, 2024, but only 21, or less than half, even hit their targets.[53] It is evident that even non-state actors, empowered by drones in a way never before seen in history, are unable to provide convincing evidence that drones will supplant the need for the fundamentals of manoeuvre warfare in the future.

Since both drones and manoeuvre warfare are clearly here to stay for the foreseeable future, we should then consider how they will interact with one another. After all, if drones do not mean the end of manoeuvre warfare, they must clearly be considered a significant change within it. "Conventional maneuver warfare is being studied and implemented by every major power in the world, as is the use of drone swarms…."[54] Drone swarms, harkening back to the loose formations of horse archers of the Asian steppe, could potentially be ground-, air-, or maritime-based, they are likely to be individually inexpensive and mass-produced (along the lines of the ISR and OTS drones mentioned earlier in this paper), and they would offer a numerical advantage that seeks to

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[50] Berkendorfer, "Examining the Houthi Use."
[51] Berkendorfer, "Examining the Houthi Use."
[52] Al Jazeera, "World reacts to US, UK attacks on Houthi targets in Yemen," *AlJazeera Online*, January 12, 2024, https://www.aljazeera.com/news/2024/1/12/world-reacts-to-us-uk-attacks-on-houthi-targets-in-yemen.
[53] Simon Scarr, Adolfo Arranz, Jonathan Saul, Han Huang, Jitesh Chowdhury, and Vijdan Mohammad Kawoosa, "Red Sea attacks," *Reuters online*, published February 2, 2024, last updated March 8, 2024, https://www.reuters.com/graphics/ISRAEL-PALESTINIANS/SHIPPING-ARMS/lgvdnngeyvo/.
[54] Davide Montingelli, "A New Way of War," *Marine Corps University Press*, September 9, 2022, https://www.usmcu.edu/Outreach/Marine-Corps-University-Press/Expeditions-with-MCUP-digital-journal/A-New-Way-of-War/.

overwhelm modern finder-shooter systems, specifically air defense.[55] Already, "…military scientists have contemplated the advent of swarming tactics as an evolution within maneuver warfare…."[56] Highlighting the enduring nature of manoeuvre warfare, these swarm drones could "…resemble a microcosm of the combined arms forces that have made up militaries since the mid-20th century."[57] These swarm drones would enable a tempo and flexibility that simply wouldn't be physically possible with just human combatants, having in them an apathy to drone casualties that would prevent the swarm's manoeuvre from being restricted by enemy fires or obstacles.[58] The potential to enable 'Schwerpunkt', to allow a commander to make the decisive strike at the right time and place, would be immensely enhanced by these swarm drones. With each drone in the swarm being a smarter, faster, more advanced sensor than any human soldier, the swarm could rapidly relay continuous situation reports based on enemy fire and movement, determining the mass and disposition of enemy forces along a wide front with more speed and accuracy than traditional patrolling or reconnaissance has ever been able to achieve.[59] With this information in hand, commanders would gain a previously unthinkable visualization of their enemy on the battlefield. "Imagine the power of thousands of drones gathering combat data in real time and the rapidity with which weak points in the enemy line could be calculated and exploited with a robotic coup d'oeil."[60] Now knowing where and when to strike, the swarm drones could concentrate together to exploit such an opportunity with greater speed and accuracy than ever before to deliver that decisive blow that epitomises the 'manoeuvrist' approach. "The potential for a trained swarm to observe, orient, decide, and act faster than human combatants in this scenario is frightening."[61] Finally, the potential for surprise would be greatly expanded by the use of these swarm drones in a 'manoeuvrist' context. Launched via missile or other long-range, indirect payload, these swarm drones could infiltrate beyond enemy front lines in a faster and far less obvious way than traditional infiltration methods such as airborne or airmobile operations.[62] Canada's biggest ally and fellow 'manoeuvrist', the USA, is already considering the future role of drone swarms with respect to their own doctrine of offensive manoeuvre, specifically infiltration, penetration, frontal attacks, envelopments, and turning movements.[63] In every case, drone swarms could provide unprecedented

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[55] Jules Hurst, "Robotic Swarms in Offensive Maneuver," *Joint Force Quarterly* 87, 4th quarter (2017): 105–111.
[56] Hurst, "Robotic Swarms."
[57] Hurst, "Robotic Swarms."
[58] Hurst, "Robotic Swarms."
[59] Hurst, "Robotic Swarms."
[60] Hurst, "Robotic Swarms."
[61] Hurst, "Robotic Swarms."
[62] Hurst, "Robotic Swarms."
[63] Department of the Army, *Field Manual 3-90, Tactics* (Washington, DC: Headquarters Department of the Army, 2001), 2-2.

utility when employed in conjunction with more conventional, human-operated, mechanised forces.[64]

In summary, drones are a military innovation that, like many new warfighting tools before it, are consequential and noteworthy, but will not irrevocably alter the principles of warfighting on their own. The most apt modern comparison for drones might well be that of Improvised Explosive Devices (IED), which afforded an offensive advantage and a "leveling effect" for adversaries in Afghanistan and Iraq, but also prompted an opposite-but-equal investment by NATO nations into new tactics and technologies designed to minimise the risks of IEDs.[65] The proliferation of cheap drones has similarly shifted the advantage on the battlefield, providing otherwise over-matched forces with an asymmetric advantage that they would not normally enjoy against the overwhelming firepower of USA or NATO, and are prompting a similar reaction in anti-drone capabilities.[66] As demonstrated in Ukraine, Nagorno-Karabakh, and Yemen, drones alone are not a 'magic bullet' that allow a military force to ignore or gloss over the critical fundamentals of manoeuvre warfare. Rather, they represent another shift in how we execute our plans based on these same timeless factors of tempo, surprise, combined arms, flexibility, mission command, and the elusive 'Schwerpunkt'. It must be considered immensely telling that the CAF, since it started regularly using drones back in 2004, has not rewritten its 'manoeuvrist' doctrine, nor has it even revisited the idea of manoeuvre warfare as a central tenet.[67] Instead, each branch of the CAF more or less considered drones to be a tool for increasing their ability to carry out their existing core tasks within the CAF's 'manoeuvrist' approach.[68] The same can largely be said for the rest of Canada's NATO allies. Already, major powers are looking at how they will tailor their use of drones to fit into 'manoeuvrist' doctrine (such as with drone swarms), and not the other way around. "States that are considering radical changes in their force structure by shifting toward cheap and small platforms or revisiting their defense postures solely on the basis of technological considerations should be cautious about such actions."[69] Even amidst the ubiquity of drones, battlefield success will more than ever require initiative, adaptability, problem-solving, and creativity from leaders at all levels of the CAF – in other words, those virtues, skills, and attitudes long associated with the practice of manoeuvre warfare.

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[64] Hurst, "Robotic Swarms."
[65] Sarah Kreps and Paul Lushenko, "Drones in Modern War: Evolutionary, Revolutionary, or Both?" *Defense & Security Analysis* 39, no. 2 (2023): 271–74.
[66] Kreps and Lushenko, "Drones."
[67] Gary Schaub, "JUSTAS for All? Innovation and UAVs in the Canadian Forces," *Defence Studies* 15, no. 2 (2015): 124–42.
[68] Schaub, "JUSTAS."
[69] Calcara et al, "Why Drones Have Not Revolutionized War."

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