Article

The 2020 Nagorno Karabakh War: Unmanned Combat Aerial Vehicles in Modern Warfare

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Abstract: The brief conflict between Armenia and Azerbaijan which took place in autumn 2020 caused a stir in strategic and defence circles. An armed stalemate which had persisted between two former Soviet states since 1994 was suddenly upended by innovative use of modern military technology. Azerbaijani Unmanned Combat Aerial Vehicles (UCAVs) wrought havoc on Armenian entrenched forces, rolling back a disputed frontier which had stood for over two decades. Did this conflict represent a revolution in military affairs, acting as a harbinger of things to come? Or was it a restatement of the importance of well-known concepts such as Control of the Air? This article will examine the background and course of the war and analyse, with the benefit of greater perspective, its subsequent impact on modern warfare.

Introduction

On 9th November, 2020, the Prime Minister of Armenia, Nikol Pashinyan, President Ilham Aliyev of Azerbaijan and President Vladimir Putin of Russia signed a ceasefire agreement which drew to a close a remarkable 44-day conflict, a war which upended nearly two decades of military and political stalemate in the contested Nagorno Karabakh region of the Caucasus (See Figure. 2, page 51). Ecstatic scenes of celebration in the Azerbaijani capital Baku, where flag-waving crowds chanted slogans and sang the national anthem,[1] were matched in the Armenian capital, Yerevan, with violent protests. An angry mob dragged the Speaker of the Armenian Parliament, Ararat Mirzoyan, from his car and set upon him, demanding the whereabouts of Pashinyan, who had announced the signing of the ceasefire agreement hours before. In an area as turbulent as the Caucasus, violent protests and energetic celebrations are not unusual, but the cause of these outbursts was. This was further demonstrated at a triumphal victory parade held later, on 10th December, in Baku. Amidst banners proclaiming *Qarabağ Azərbaycandır!* (Karabakh is Azerbaijan!), rows of soldiers marched past President Aliyev in Azadliq Square, alongside captured Armenian equipment on flatbed trailers. Also displayed on low-loader trucks were several examples of the type of equipment which had turned the tide in this long-standing 'frozen-conflict'. UCAVs from Israeli and Turkish companies held pride of place; lone examples of each system in the procession out of all proportion to the influence they had on the battlefield.

Figure 1 – Bayraktar TB2 UCAV during the 2020 Baku Victory Parade.

The armed forces of Azerbaijan decisively defeated the forces of Armenia and the self-declared, unrecognised Republic of Artsakh (formed from the territory of Nagorno Karabakh and surrounding captured territory) in a few short weeks, destroying dozens of armoured vehicles and inflicting several thousand casualties. They captured several large sections of the territory of Nagorno-Karabakh and other Armenian occupied areas and compelled Armenia to hand back several other areas of Azerbaijan which had been in Armenian hands since 1994, including the Kabaljar province. This was not the first armed clash over the disputed territory – the forces of Azerbaijan, Artsakh and Armenia had come to blows many times between 1994 and 2020, but something had changed in this most recent war. Azeri investment in UCAVs had allowed them consistently to keep their Armenian foes off balance and led to a decisive outcome. It also provided an international showcase for several systems, notably Turkish and Israeli, which have since proliferated into other conflicts and raise the question of how significant this conflict is in shaping future conflicts around the world.

This article will argue that Azerbaijan's successful use of UCAVs in the 2020 Nagorno Karabakh War represents not a revolution in military affairs but a restatement of the importance of

control of the air in warfare. It will argue that it was not the UCAVs themselves but the co-ordination with other arms which proved decisive, including artillery fires and electronic warfare. It will also show that whilst UCAVs and other autonomous systems had a notable effect, these were enhanced by the political and military constraints on other aircraft operating in the area as well as the limited geographical area of the fighting. It will examine the war through the three components of fighting power model,[2] exploring what lessons can be learned from the Conceptual, Physical and Moral components of both the Armenian and Azerbaijani combatants. Many examinations of the 2020 conflict have been published in the months and years since the conflict, mostly looking at the tactical lessons that can be learned from the war. This article will look to examine some of the wider consequences of the conflict and how these lessons are already playing out in different parts of the world. The use of UCAVs after the 2020 conflict point to a new established trend amongst UCAV users, especially nations which do not have large resources to invest in military technology.

For the purposes of this article, the forces of Armenia and Artsakh will be referred to as 'Armenian' due to their close nature and the fact that Republic of Artsakh forces operated under Armenian command during the conflict. It also helps to highlight the cultural nature of the conflict and how Azerbaijan cast their foes in singular terms rather than as a separate country fighting for its independence. It will also primarily use the term SEAD to refer to both Suppression of Enemy Air Defences as well as Destruction of Enemy Air Defences (DEAD), even though a large amount of the latter was carried out in this conflict.

Crossroads of Empires

To explain the significance of the 2020 conflict, it is necessary to investigate the background of the conflict and how the various disagreements between the parties to the dispute became violent. Perhaps the most significant factor is that, due to a quirk of history, the area known as Nagorno Karabakh has a majority Armenian population, but rests entirely within the internationally recognised borders of Azerbaijan, with only a short distance between the disputed enclave and Armenia itself. Nagorno Karabakh is situated in the Caucasus, the strip of mountainous territory between the Black Sea and the Caspian Sea, taking in modern-day Georgia, Azerbaijan and Armenia (Nagorno Karabakh translates roughly as 'mountainous Karabakh'). The Nagorno Karabakh Autonomous Oblast, as it was known and recognised during the Soviet era, had in 1989 an area only slightly larger than Kent or Rhode Island. The capital, Stepanakert and the other major town Shusha, sit atop high promontories with commanding views over the rest of the territory. Much of the population, estimated at 140,000, live in smaller isolated villages scattered throughout the mountains connected by single track roads.

Historically, the Caucasus has been politically turbulent. Sitting at the crossroads of the Russian, Ottoman and Persian empires, the region has been subject to the ebbs and flows of the differing and conflicting powers in the region. Both Armenia and Azerbaijan were briefly independent following the collapse of the Russian and Ottoman empires at the end of the

Figure 2 – Location of Nagorno Karabakh in the Caucasus region.

First World War but were quickly subsumed by the Russian Bolshevik Red Army as the Russian Civil War raged. The new communist government was faced with a difficult political situation. Many of its newly acquired territories contained divergent ethnic groups with their own conflicting political aims, not only Armenia and Azerbaijan but also places such as Ukraine and Byelorussia. This problem was addressed with the organisation of the new Union of Soviet Socialist Republics into its hierarchy of constituent administrative units – the Union Republics (Soviet Socialist Republics, SSRs), Autonomous Soviet Socialist Republics (ASSR) and further down to Autonomous Oblasts, Okrugs and Krais. The treaties signed in the early 1920s, with a complicated web of agreements on defence, foreign affairs and finance, consecrated the supremacy of Moscow.[3] By arranging the new Union in this vertical manner, Moscow ensured each region would be economically viable, allowing ethnic groups to remain in specific geographical areas, with local responsibilities but no local power. Armenia and Azerbaijan became SSRs within this new Union, and Nagorno Karabakh became an Autonomous Oblast within the larger Azerbaijani SSR. The Soviet constitution had provisions for both secession from the Union and for the Republics to vote for and against Soviet policy, but in practice, the Central government's attitude to dissent, as seen in the brutal repressions of Hungary in 1956, Czechoslovakia in 1968 and Poland in 1981, meant that the Union Republics, ASSRs and other divisions typically rubber-stamped any decisions made in Moscow and secession was never seriously discussed.

Seeds of Conflict – 1988-1994

This began to change, however, after Mikhail Gorbachev took office in 1985. The early indications of change occurred in Nagorno Karabakh itself, when Karabakh Armenians staged

a series of protests in the capital Stepanakert, in February 1988. They openly demonstrated their desire to leave the Azerbaijani SSR and transfer to the Armenian SSR. This desire was supported a week later by a resolution in the regional Soviet (the local legislative assembly) to formally request authorisation for this move from the Moscow Central Committee. Considering the history of harsh crackdowns on dissent seen in Hungary, Czechoslovakia and more recently Poland, the Central Committee's response to this challenge was half-hearted at best. A small detachment of Interior Ministry troops was sent to the areas, as well as some Moscow-directed changes in local Party personnel. In the absence of the anticipated strong response from Moscow, Armenia and Azerbaijan began to take matters into their own hands. A pattern of interethnic violence, which had simmered between the two communities on and off for years, began to spiral upwards. Clashes between both sides, often supported by local governments, led to increased bloodshed and deportations of ethnic Armenians and Azerbaijanis. Disputes which had been settled previously with farm tools and hunting rifles began to be fought with Kalashnikovs. Moscow continued to mishandle the situation after the 1988 Armenian earthquake and the 1990 Baku riots, further undermining its authority. This bred confidence in the burgeoning Armenian and Azerbaijani independence movements, as well as others in the various constituent SSRs which began to spread across the wider Union.

As the Union of Soviet Socialist Republics (USSR) disintegrated, Armenia and Azerbaijan both declared independence in 1991. It left them as two countries at war without armies, instead possessing rather shaky control of the fragments of the former Red Army. The military development of these two new nations followed the pattern of the former Soviet Union elsewhere, as a previously large and well-organised force with considerable amounts of weaponry splintered into smaller groups. In the chaos following the collapse, many non-local forces, unpaid and without orders, simply went home, often taking their equipment with them. This set a pattern of both sides in the Nagorno Karabakh conflict acquiring heavier weapons by any means, both legal and illegal. In Soviet times, less than 40 percent of combat aircraft were stationed in Russia itself, the majority being stationed forward in the Union Republics facing NATO to be ready for any conflict with the West. To right this balance, after the collapse, many Russian pilots stationed in the former Union Republics simply took off for Russia and did not return.[4] It took Azerbaijani troops forcing their way on to the airfield at Dallyar and blocking the runway for them to acquire 16 MiG-25 fighters and Su-24 fighter-bombers.[5] In Armenia and Nagorno Karabakh, unpaid and desperate former Soviet troops were happy to exchange their tanks and armoured vehicles for money or valuables. Karabakh itself acquired ten tanks from the remnants of the 366th Motorised Regiment, stationed in the province, in this manner, as the majority of its ex-Soviet conscripts left the area, while a few stayed out of ethnic loyalty or to make black market deals.[6] Fighting in the region now became battles between villages, as small groups of Armenian and Azerbaijani troops, sometimes with tanks and heavy weapons, sometimes without, fought short engagements, which often ended with one side capturing the village and forcing the occupants to flee from the area. Levels of training and serviceability seriously affected the use of any sophisticated weaponry, especially aircraft, meaning it quickly became a primarily land-based conflict.

By mid-1992, as the situation in Russia began to settle down, both Armenia and Azerbaijan received large amounts of armoured vehicles, artillery and aircraft as part of the Tashkent agreement apportioning assets of the former Soviet Army, which only fanned the flames of violence.

Figure 3 – Situation following 1994 ceasefire agreement. Lighter shade indicates territory controlled by Republic of Artsakh at the end of First Nagorno Karabakh War.

The Armenian forces took the town of Shusha from Azerbaijani forces in 1992 and continued their advance, moving beyond the southern boundary of Nagorno Karabakh and into Azerbaijan itself towards the town of Horadiz on the Iranian border. Movement was faster in this flatter, open ground and Armenia was quick to reinforce its gains. By now both sides were sufficiently organised to conscript troops for the fighting (although Azerbaijan resorted to press gangs roaming the streets of Baku for new recruits). Armenia, after many smaller battles, began to gain the upper hand. As the former Oblast was surrounded by Azerbaijani territory, the decision was made to seize territories adjacent to Nagorno Karabakh to achieve more defensible borders. In the summer and into the autumn of 1993, as the conflict escalated to pitched battles with tanks and artillery, Armenian forces captured the Kabaljar province to the west and the Jabrayil and Zanglian provinces to the south. This effectively left Nagorno Karabakh (and Armenia) in control of the south-western corner of Azerbaijan, along a portion of the border with Iran and a large portion of the border with the rest of Armenia. Yet, with thousands of lives lost on each side by this point there was political pressure to end the fighting at any cost – for Armenia and Artsakh to consolidate their gains and for Azerbaijan

to prevent further losses. After a protracted peace negotiation, a ceasefire to which all sides agreed was signed at Bishkek in 1994, ending what became known as the First Nagorno Karabakh War. This fragile settlement left the internationally unrecognised state of Nagorno Karabakh/Artsakh within Azerbaijan, consisting of around sixteen per cent of its lawful territory.

No War, No Peace – 1994-2020

Both Armenia and Azerbaijan, in the years after the ceasefire, shared similar problems typical of other parts of the post-Soviet space and it was in both their interests to focus on other aspects of their countries rather than attempt to change the military and political situation in Nagorno Karabakh. Both countries suffered economic hardships as their societies adjusted to life outside the former Soviet Union and could ill afford the expense of escalating the conflict beyond the status quo. This led to the curious situation of two armies, previously belligerent, facing each other across contested ground with no peacekeeping force from an outside country separating them. This front line (what the Bishkek Protocol defined as the Line of Contact (LoC)) became entrenched over the years, with both sides digging trenches and vehicle revetments. It also became one of the most heavily mined areas in the world.[7] Away from the LoC, the opposing governments made political capital from the ongoing situation. The Yerevan leadership, with many veterans of the fighting such as Levon Ter-Petrosian and Vazgen Sargisian, benefitted from the victory as a political boost to their patriotic credentials. The Azerbaijani President Heydar Aliyev used the defeat to purge his rivals from the government and military and secure his position, a tactic later used by his successor, his son Ilham. On the military front, a pattern emerged of low-level skirmishing with occasional flare-ups, primarily between ground forces. Several dozen soldiers from each side died each year, from mines and accidents as well as enemy fire.[8] Aircraft, when they were used at all, were utilized in small numbers and did not lead to any decisive breakthroughs. This was a small arms and artillery conflict, a duel which favoured an increasingly dug-in Armenia, who were able to reinforce their positions both from inside Nagorno Karabakh and from Armenia proper. Attempts at a formal political settlement, brokered by external agencies such as the Minsk Group, ultimately came to nothing as neither side was willing to concede what had been achieved before the end of the war in 1994.

This was not to say that both sides remained static; developments were made in each country with a view to improving their positions. Azerbaijan, with its oil and gas wealth, from the mid-2000s invested billions in heavy weapons, aircraft and Unmanned Aerial Vehicles (UAVs).[9] Armenia, since 1992 a member of the Collective Security Treaty Organisation (CSTO), an alliance of post-Soviet states including Russia, Kazakhstan and Uzbekistan, was able to strengthen its existing, inherited armed forces with newer equipment at reduced rates.[10] The pattern of small arms and artillery clashes continued as the ceasefire agreement passed its 20-year anniversary, although noticeable changes were afoot. The International Crisis Group, a non-governmental organisation dedicated to conflict prevention, studied the recorded clashes between the two parties. From January 2015 to September 2020, it showed the instances where 'heavy weapons' (artillery, fixed wing and rotary wing attack aircraft, Surface

to Air Missile (SAM) systems), 'special groups' (diversionary raids across the LoC) and 'drones' (kamikaze and surveillance UCAVs) were used in the conflict zone.[11] The records show a peak of activity, primarily with heavy weapons, around spring 2016. This coincided with a short conflict (later dubbed the Four-Day War) in which Azerbaijan gained a few hectares of territory at the cost of several hundred lives. After a brief spike in February 2017, the reported activity declined to minimal levels for nearly two years until July 2020 when there was a huge jump in activity, primarily involving drones. This shift in emphasis would be hugely consequential and set the stage for the larger-scale conflict about to erupt.

The Second Nagorno Karabakh War – 27th September to 9th November 2020

Large scale conflict finally broke out again on 27th September 2020, although Azeri reserves had received call-ups a week before. The initial attack came in the north of Nagorno Karabakh, near Aghdam, although within days it was clear that this was merely a diversion from the main effort which came in the South, across the LoC in the Zanglian province. It was immediately apparent that this would not just be a repeat of previous armoured and artillery duels (although that would take place throughout the war at certain points). Azerbaijani UCAVs, a mixture of mostly Israeli and Turkish reconnaissance and attack vehicles, began deliberately targeting the Armenian air defences. The Azeris used a novel approach to Suppression of Enemy Air Defences (SEAD) – Soviet-era Antonov AN-2 agricultural biplanes were repurposed as unmanned systems, flying as large, slow-moving decoys to tempt the Armenian air defences (AD) into activating and revealing their positions in an ad hoc 'Wild Weasel' mission. As the Armenian systems were discovered, they were picked off by UCAV strikes and air strikes or coordinated artillery. In this way, Azerbaijan, over the course of the war, took control of the air over the battlefield and once most of the air defence systems were supressed, began to move on to other armoured vehicles as well. Azerbaijan also mounted a vigorous information campaign. Slickly produced videos began to appear on social media, showing Armenian

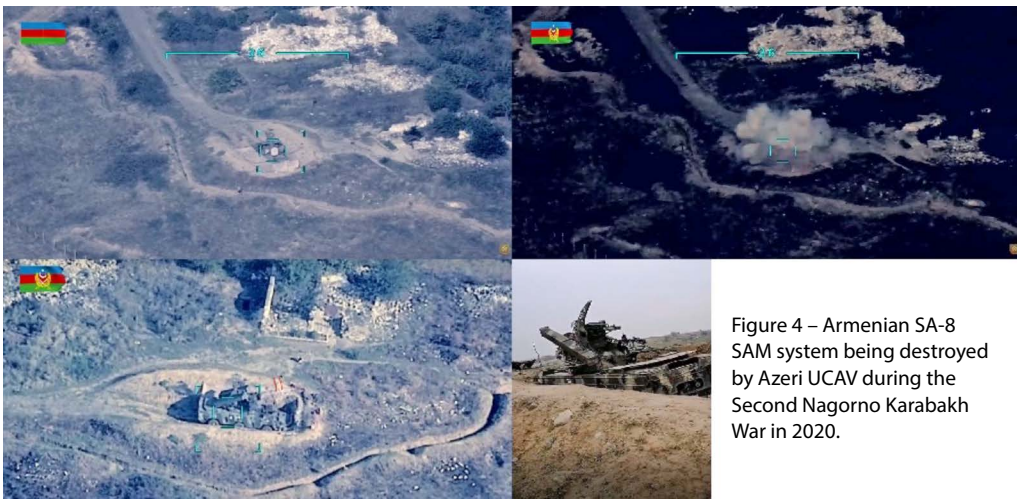

Figure 4 – Armenian SA-8 SAM system being destroyed by Azeri UCAV during the Second Nagorno Karabakh War in 2020.

systems being destroyed from the air. Air defence systems such as Armenia's SA-8s (often with their radars still turning), tanks and other armoured vehicles in entrenched revetments were easy targets and dozens were shown being destroyed by the end of the conflict. The mountainous terrain, which had provided a huge advantage to the Armenian defenders of Nagorno Karabakh in previous conflicts, began to tell against them. The few winding roads through the mountains provided Armenia with limited options for manoeuvre or re-enforcement, so when Azeri forces attacked, any supporting Armenian forces moving up to the front lines were easy targets from the air or by indirect fires. On several occasions, Armenian attempts to mass forces for counterattacks were disrupted from the air or by air-directed artillery. Many troops were caught standing in groups out in the open, apparently unaware of the peril they faced until it was too late.

As the conflict continued Armenia began to make increased use of some of its more capable systems, although deciding to limit the scope of the engagement to Nagorno Karabakh and its surroundings. Armenia fired Iskander ballistic missiles at a bridge in the Azerbaijani town of Ganja, with limited success – missiles which could have reached Baku but were aimed at targets nearer the conflict zone. Azerbaijan reportedly also fired long-range missiles and launched UCAVs towards Yerevan, again with limited success. Armenia also redeployed their longer-range SA-10 AD systems towards their eastern border and into Nagorno Karabakh

Figure 5 - Final positions at the time of the November 9th 2020 ceasefire. Territory captured by Azerbaijan in red, hatched territory previously held by Armenia and now handed back to Azerbaijan as part of the ceasefire agreement.

itself. Clearly recognising their value, they were escorted with Electronic Warfare (EW) anti-UAV systems, only for several of the Transporter Erector Launchers (TELs) and radars to be destroyed by Azerbaijani Harop loitering munitions. Armenia had also recently purchased at least four Sukhoi Su-30 fighters from Russia but did not deploy them throughout the war, for reasons discussed later. Azerbaijani forces were eventually able to position themselves to threaten the Lachin corridor, the only major road link into Nagorno Karabakh from Armenia. Despite Armenian resistance, Azerbaijani forces were able to capture the town of Shusha on 9th November, and with it the commanding high ground above the capital Stepanakert. Later that evening, Armenia sued for peace, with nearly half of the territory claimed by the Republic of Artsakh occupied by Azerbaijani forces.

Conceptual – Winning the 'Air Littoral'

The 2020 conflict indicated that both sides had differing concepts of how to fight the war and the outcome suggests Azerbaijan's approach was better suited to the conflict than Armenia's. In this context it is perhaps best to describe it in terms of what Bremer and Greico called the 'Air Littoral'.[12] Like its naval counterpart, it is defined as the boundary layer between two domains, in this case the earth's surface and the low air, usually below 10,000' in which increasing numbers of actors have the military capabilities to dispute its control.[13] It is something which has its conceptual roots in the earliest days of air power theory. Giulio Douhet described the surface of the earth as the 'coastline of the air',[14] and it must be controlled to support land and/or maritime operations.[15] Control of the air, in general or in the Air Littoral, centres on preventing prohibitive or effective interference of friendly air, land or maritime operations from the air or surface.[16] However, any systems operating in this environment are faced with the challenge of surviving long enough to have any effect. The slow and poorly manoeuvrable aircraft of Douhet's day have given way to faster and more sophisticated systems to meet this challenge. Modern AD systems have also developed to keep pace, with modern SAMs able to intercept targets at huge distances and high altitudes. Bremer and Greico have defined these as 'blue sky' systems.[17] All this technological advancement has not changed the fundamental fact that slower, lower-technology aircraft can still dominate the Air Littoral, given the right circumstances. In fact, they may be better placed to do so when AD systems set against them are designed to counter the faster and more advanced aircraft. High-performance aircraft have traditionally lacked persistence. 'Blue-sky' aircraft consume huge amounts of fuel and require either greater numbers of similar fast systems or expensive and vulnerable refuelling platforms to allow them to be present for more than a few hours within the battlespace. The Medium Altitude Long Endurance (MALE) UCAV addresses this limitation, able to loiter for many hours at altitudes which cannot be reached by short-range systems like shoulder-launched Man-Portable Air Defence Systems (MANPADS). In addition, these UCAVs are often armed or can coordinate with other armed systems such as artillery, drastically reducing the time taken to identify targets, decide on a course of action and then prosecute them (the 'kill-chain'). Whilst it may not be as sophisticated as its 'blue-sky' counterparts, the persistent MALE UCAVs may be the timely difference which tips the balance in a local engagement, as was the case with Nagorno Karabakh.

In countries with limited resources such as Armenia and Azerbaijan, funds are scarce and large numbers of 'blue-sky' aircraft are an unrealistic goal. This left both sides trying to use their limited funds as best they could. Most of the aircraft Azerbaijan was able to capture at Dallyar, for instance, were soon grounded due to lack of funds and spares and they could not mount large-scale air operations. Armenia, in the strategic defensive posture as the controlling force in the disputed territory, invested the funds it did have in defending against 'blue sky' systems with SAMs. This made any Azerbaijani air attack likely to be prohibitively costly. At the start of the 2020 War, Armenia had a reasonable air defence system on paper – multiple SA-8, SA-13 and SA-15 SAM systems, designed to counter fast air systems at short range and low altitude, plus several SA-10 SAMs for longer range and higher altitude threats.[18] As recently as January 2020,[19] Armenia purchased additional SA-8s from Jordan, showing that they were looking to bolster their existing defences against traditional ground attack aircraft such as fighter-bombers and helicopters, as well as purchasing four Sukhoi SU-30 multirole fighters from Russia. Armenian use of decoy AD system mock-ups also suggests they were geared towards the faster systems. Whilst it is probable that resources were too limited to create significant numbers of decoys, their positioning is telling. Armenia placed them in small numbers alongside the real systems, rather than in larger numbers in strategic locations away from their genuine counterparts.[20] This would indicate they were oriented against an attacker whose time in the target area would be fleeting, such as a fast jet. Azerbaijan's third and fourth generation, ex-Soviet fast jets would be forced, in their limited, hazardous time over the target, to pick a target from many in front of them which may not be the real system. A long endurance UAV or loitering munition, with plenty of time to reconnoitre a target before attacking, could simply pick off targets as it wished once it became obvious which were fake and which were the real thing.

By contrast, Azerbaijan had decided to break the pattern in favour of a new approach. By investing in unmanned, slower systems, they decided to commit to dominating the lower altitudes, the 'Air Littoral', over the battlespace, instead of the previously unsuccessful, drawn-out artillery duels with a well dug-in enemy, with some limited use of air power. With the small size and limited mobility options of Nagorno Karabakh, this made tactical sense and had potential to fundamentally change the situation. Azerbaijan also recognised the drawbacks of these newer systems; namely that they were slow, vulnerable, and required a constant electronic command and control link, and so mitigated them. The Azerbaijani answer was to use their UCAVs alongside EW systems to degrade enemy AD systems and allow them greater freedom of movement. These systems will be discussed later. With a fleet of AN-2 biplanes they could convert into decoy drones, Azerbaijan had no need to risk its expensive, conventional 'blue sky' fleet of Su-25s and MiG-29s when they could achieve their tactical goals with cheaper and longer endurance MALE UCAVs.

This did not answer the other major threat to UCAVs – fighter aircraft – such as Armenia's new Su-30s, which could have, in theory, made short work of any airborne UCAVs. This was countered in other ways, producing an interesting reversal of Western attitudes to SEAD.

The usual, Western-oriented approach is for SEAD missions to be carried out to provide 'blue-sky' systems the freedom of manoeuvre to rapidly complete their mission. Azerbaijan used 'blue-sky' systems to allow freedom of manoeuvre for its UCAVs. Turkish F16s, in addition to Azerbaijani fast jets, were present in Azerbaijan throughout the conflict, easily observable on open dispersals at two airfields. In response, Russia made it clear it would not bolster its or Armenia's existing air forces, giving tacit acceptance of the Turkish and Azeri escalation and in effect, as Gustav Gressel put it, served air superiority on a diplomatic platter to Turkey and Azerbaijan.[21] From the outset then, Azerbaijan had committed to dominating the Air Littoral by ensuring threatening AD systems were neutralised, using allied and own-force 'blue-sky' systems to ensure UCAV freedom and then exploiting this dominance to defeat a well-entrenched enemy.

Physical – The Second Drone Age

Hand in hand with a strong conceptual grasp of the conflict were the right systems to exploit it. Perhaps the most attention-grabbing aspect of the conflict was the heavy use of UCAVs by Azerbaijan. They would not, however, have been nearly so effective had it not been for coordinated use of EW systems with the UCAVs. The UCAVs will be discussed first. Systems such as the Turkish Bayraktar Tactical Block 2 (TB2) MALE UCAV and the Israeli Harop 'kamikaze' loitering munition, amongst others, were responsible for huge Armenian losses and were pivotal in the Azerbaijani victory. However, the conflict does not represent the maturing of UCAV use on the battlefield so much as providing a shop window for already proven systems in a long-standing theatre of conflict, benefitting from the unique characteristics of the particular scenario to have decisive effect. The concept of arming UAVs is not new – the American MQ-4 Predator was developed into an armed system in the early 2000s and was used heavily in the permissive air environments of Afghanistan and Iraq. However, a mixture of policy decisions and cost meant that use of these and other American systems has, until recently, been a mostly Western tactic. This has not prevented other countries seeking the same capabilities and effects. Several countries have been developing their own systems since then, in what journalist Chris Woods has called 'the second drone age, that is, the age of proliferation'.[22] At the forefront of this development has been Israel, with its many unique security challenges; China, with its expanding military and, more recently, Turkey. In the case of the Nagorno Karabakh conflict, this development came together with the use of the Bayraktar TB2 and the Harop 'kamikaze' UCAV, alongside others. Whilst the TB2 can be seen in similar terms to US and Western European UCAVs, with long endurance and underwing pylons to carry munitions, the Harop is a slightly different proposition. The Harop is a development of the earlier Harpy system, which homed in autonomously on radiating AD systems and dived to destroy them (hence the 'kamikaze' or 'suicide' moniker). The Harop is more capable. It has integrated electro-optical sensors, like the TB2, which allows operators to spot targets visually throughout its estimated six-hour loiter time. Like the Harpy, it also carries a small warhead which is activated when the Harop dives onto its target from above. After the Azerbaijanis used AN-2s as decoys to tempt the Armenians into activating their AD radars, they used a mixture of TB2s dropping precision munitions, Harops diving on to their targets or both platforms

(along with other unarmed UAVs) acting as real-time reconnaissance for artillery fires to destroy Armenian defences.

But why did Azerbaijan settle on these systems when US and Western European systems had a proven combat pedigree and developed training systems? One of the main benefits of these weapons which made them suitable and attractive for this task was their price tag. To give an indication of similar costs, an April 2021 sale of 12 General Atomics MQ-9B Protector UCAVs and their attendant operating systems from the USA to Australia was agreed at $1.6bn.[23] By contrast, a deal between Turkey and Poland signed in the following month indicated that a 'set' of Bayraktar TB2s (six aircraft with ground control systems, weapons, equipment and training) cost $67m.[24] The Harop reportedly has a unit cost of around $10m,[25] which may sound expensive for a system which destroys itself. However, the Harop can be recovered if it finds no targets and in this case, they were indeed used against vastly more expensive SA-10 TELs and radars. Neither of these Turkish and Israeli systems are a match in terms of capabilities to the American UCAV. In terms of range, satellite uplinks or weapons capacity, they are much more limited. However, under the circumstances, they still provided a huge benefit in terms of near real-time Intelligence, Surveillance and Reconnaissance (ISR) and precision strike for a fraction of the price. This has been borne out by the wide range of countries who have either shown interest in or purchased the systems. Before the 2020 conflict, Qatar and Government of National Accord in Libya, as well as Turkey, had already successfully operated the TB2. Since the conflict, Poland, Morocco, Ethiopia, Niger, Kyrgyzstan and Turkmenistan had either purchased or agreed a purchase of the system,[26] Ukraine went further, both purchasing them and agreeing a license deal to manufacture them domestically.[27] Whilst air power traditionally has come with a hefty bill for the greatest capabilities, the systems Azerbaijan chose offer real benefits to countries which have not necessarily had them before at a much more affordable price.

In addition to capable non-Western UCAVs in action, the 2020 War also stood out due to the apparent impunity with which many of the UCAVs were able to operate over the battlefield. In theory and in practice, the slow-moving UCAVs used in Nagorno Karabakh are vulnerable. However, this war and their uses before and since have shown that they can overcome these shortcomings when their operators integrate with EW systems. Whilst the Harop is very small and would be difficult for AD systems to detect at the best of times, the TB2 should be a different matter. As Uzi Rubin pointed out, the TB2 has a wingspan larger than an F-16. Although made primarily of harder-to-detect composite materials, it has enough metal parts in its engine and electronic systems to provide a large enough target for detection.[28] Indeed, in conflicts leading up to 2020 in which the TB2 was used, such as Libya, many were shot down by AD systems like those possessed by Armenia. Yet, in Nagorno Karabakh, multiple Armenian AD systems were shown, with radars still operating, being destroyed by UCAVs without firing in retaliation. It was the Azerbaijani use, amongst other things, of EW systems which made the decisive difference here. The Turkish KORAL system was reported to have been used to interfere with the AD systems and help in their

destruction, allowing systems which may have been vulnerable to Armenian systems act with relative impunity.[29]

This coordination between UCAV and EW systems has been seen beyond the Nagorno Karabakh conflict, showing that this war represents the circumstances aligning to produce a decisive result. Turkey used a combination of UCAVs and EW systems against Syrian forces during Operation Spring Shield over Idlib province in Syria in early 2020. These attacks caused a stir in defence circles as the AD systems Turkey defeated included the much more advanced Russian-built SA-22 or S-1 Pantsir (Carapace), designed specifically to target this kind of short-range threat with both missiles and 30 mm autocannons. Whilst it could have been operated manually, the SA-22 was designed more towards countering short range and swarming threats with an autonomous Human Out Of The Loop (HOOTL) mode. As around seven of the AD systems were reported destroyed, the SA 22s here at the very least underperformed in this mode,[30] indeed an upgrade of the system was announced later that year.[31] The TB2s should have been easy targets for this advanced system but used in conjunction with EW systems such as KORAL they were lethal. Against older systems in Nagorno Karabakh their effect was even more pronounced. With the Azerbaijani strategic objective being linked to a small area of territory which could be captured following the destruction of AD systems, they were devastatingly effective.

To further highlight the importance of EW in the air domain we can look at the disjointed use of EW systems by Armenia. At the outset of the conflict Armenia was aware that EW systems would have a part to play as well, as they had a Russian-made REPELLENT-1 anti-UAV system, and later used a POLYE-21 system which had an effect against the UAVs. However, in the event, their expectations did not match the reality as the POLYE was only used for a short time,[32] later in the war after much of their AD system had already been neutralised. The REPELLENT-1 system, according to President Pashinyan, simply did not work. It certainly did not protect the valuable SA-10 system deployed to the eastern border of Armenia from being destroyed by an Azeri Harop diving onto it. The failure of the REPELLENT-1 system appears to have come as a shock, but the limited use of EW systems in its defence shows the Armenians did not exploit one of the critical vulnerabilities of their opponents and paid the price as a result. It is also worth noting that there was reportedly a much more powerful EW system in Armenia at the time which shows the importance of control of the EW spectrum but more importantly who is in control of it. A Russian designed and operated Krasukha-4 (Belladonna) EW system was stationed at the air base at Gyumri. In mid-October, reports emerged that multiple TB2s had crashed near the base, showing no signs of having been shot down, rather simply falling from the sky.[33] The implication was that the EW system had interfered with the UCAVs to such an extent that they were rendered uncontrollable, something which the Russian media also reported happening in Syria. A Krasukha was deployed to Hmeimim Air Base outside Latakia, the home of Russian Air Forces in Syria, in response to recent small drone attacks launched at the base. Reportedly the EW system had a similar effect on these air systems as the TB2s, causing them to fall from the sky

before causing any damage. Had this powerful system been made available to the Armenian forces in the Nagorno Karabakh conflict, things clearly may have turned out differently. As a CTSO member, it would not be unreasonable for Armenia to expect their Russian ally to come to their aid, especially after the fighting spilled into undisputed Armenian territory, but this was not the case and Armenia paid the price.

It is worth noting that Azerbaijan was also able to exploit a lack of capability within Armenian systems, particularly their lack of plot fusion.[34] This ability to share information between systems on positions and targets essentially rendered them as a collection of individual systems, even more vulnerable to being picked off one by one. The addition of electro-optical targeting systems on most ex-Soviet systems such as the SA-8 and SA-13 apparently did not improve matters. This lack of plot fusion is common to many systems sold by Russia to other countries[35] and put Armenia at a disadvantage, compounded by the use of EW to neutralise individual systems to render them defenceless.

Moral – Preparing for War or Preparing for Parades

The moral component of the fighting power of both sides will be examined at two levels, strategic and tactical, as they are the most pertinent to this argument and show the effects of leadership on this conflict. At the strategic level, it helps to understand the belligerents' assumptions and thought processes going into the conflict, and at the tactical level it helps to show how each side's forces reacted once the fighting started. At the outset it is worth stating that both Azerbaijan and Armenia clearly had a will to win. The military and political capital invested in the decades since 1994 in what amounts to an armed stalemate, when there were many other pressing demands on national resources, demonstrate this. However, the influences of more powerful allies and the eventual battlefield outcomes highlight differences in the leadership of both sides which had differing outcomes.

At the strategic level, both Armenia and Azerbaijan were unable to escape the fact that they are smaller countries heavily influenced by larger, more powerful regional allies. For Azerbaijan, this is Turkey; the two countries share a strong Turkic cultural heritage which dates to the smaller nation's birth and beyond. Turkey was the first country to recognise Azerbaijan's independence before it was subsumed into the Soviet Union after the First World War and the cultural ties have been summed up as 'One Nation, Two States'.[36] Armenia's geographical position places it between these two hostile countries; relations with Turkey have been poor since the terrible events of 1915 and for most of its history as an independent country its border with Turkey has been closed. Armenia therefore looks to Russia as a regional ally; as a member of the CSTO, Armenia has been able to offset its numerical and economic disadvantages vis-à-vis Azerbaijan with Russian military equipment. Even before this, Armenia was able to negotiate an amount of military equipment above its previous share of former Soviet Army forces agreed at Tashkent in 1992[37] and allowed Russia to station its forces in Armenia, particularly the airbase at Gymuri.

Heading into this fight, with these regional allies, the influences on the combatants become apparent. Azerbaijan and Turkey had been conducting joint military exercises and training for years, but had more recently conducted an exercise just prior to hostilities breaking out in September 2020. Conspicuously, several Turkish F-16s deployed to Azerbaijan for the exercise did not return home at the end, remaining at Ganja and then Gabala airfield. This led to speculation that they may have been a deterrent to Armenian aircraft becoming involved,[38] particularly its new Su-30s, or even taken part on the Azerbaijani side. Armenia reported that one of its SU-25s was shot down by a Turkish F-16, a claim Turkey and Azerbaijan denied.[39] It has also transpired that despite long standing ties, the TB2 UCAVs, so vital to the Azeri victory, were only delivered in June or July of 2020 by Turkey.[40] With such a short time between delivery and operational use, the suggestion has arisen that Turkish personnel operated the TB2s throughout the war on behalf of Azerbaijan, bringing their experience and expertise to the conflict.[41] Turkey also both increased its own deniability and bolstered Azerbaijani fighting power by sending Syrian mercenaries, with recent combat experience in their own country, to fight for Azerbaijan.[42] At the outset of this conflict then, Azerbaijan had new and battle-tested technology, with trained operators, with an understanding of how to integrate air and EW assets to great effect, as well as a strategic deterrent and political support from a more powerful ally.

The contrast with Armenia at the strategic level is striking. As the controlling power of Nagorno Karabakh, and having remained so for decades despite Azerbaijani attacks, Armenia considered itself in a strong position on the ground. On paper at least, it was also in a strong position against the air threat. With numerous, if dated, short range AD systems, it could deal with conventional fixed wing and rotary wing threats as it had done before. For longer range threats against Armenia proper, it had long-range SA-10 systems on Armenian soil defended from UAVs and loitering munitions by anti-UAV EW systems. As a last resort, as a member of the CTSO, it could rely on Russian intervention if its territory was attacked. In the event, this approach was flawed, and the Armenian leadership must take responsibility for it. The short-range systems were picked off with UCAVs and artillery, the EW systems did not prevent loitering Harops from attacking long range AD systems and as a result, Armenia lost a large amount of territory to Azerbaijan. It must be stated that Armenia suffered some bad luck in this conflict. Russia has a reputation for producing world-class EW systems, and for one to underperform to such a degree that the Armenian Prime Minister announced in a radio address that the unnamed system did not work,[43] is at minimum a misfortune. Also, even though an Armenian SA-10 TEL and Radar was destroyed by a Harop on Armenian soil itself, at Kaghnut, several miles inside from the eastern border with Azerbaijan, Russia chose not to honour its obligations under the CTSO treaty and intervene militarily, until after the ceasefire deal had been signed. Commentators have speculated as to why Russia chose to act as it did. Nico Popescu suggested that Russia had grown impatient with Armenian intransigence over peace talks and was prepared to use the war to put itself in a more influential position in the Caucasus.[44] Whatever the reason, Russia did less than it could have on Armenia's behalf, and Armenia suffered for it.

Misfortunes aside, the senior leadership in Armenia also failed to adapt their strategy for Nagorno Karabakh to changing circumstances, even when they had a taste of what was to come several years before. The Four Day War in 2016, whilst in many ways a continuation of the previous artillery and small arms duels, was also an opportunity to see new tactics in action. Azerbaijan made use of Harop UCAVs in this conflict, reportedly destroying a bus transporting Armenian soldiers, killing seven of them.[45] The significant use of heavy weaponry during the short conflict and the minimal gains Azerbaijan made from it may have convinced the Armenian leadership that 2020 would simply have been business as usual. However, it proved to be a precursor to the war that was to come. Use of Turkey's UCAVs and EW systems also increased in the years between the 2016 and 2020 conflicts, by Turkey and other countries, but Armenia's response was to invest in more of the same systems they had, such as the SA-8s from Jordan. They also had some of their own UAVs going into this conflict, but they were purely for reconnaissance. This would suggest a leadership expecting to enhance the way it had fought previously, not to counter a new threat.

At the tactical level is a nuanced picture which shows both continuity and change in a world in which integrated use of UCAVs and loitering munitions feature on the battlefield. The striking feature of much of the Azerbaijani information material, including online videos, was the defenders' behaviour. What appeared to be groups of Armenian soldiers were standing in the open, in broad daylight, apparently unaware that they were being targeted, often up to the point an air-delivered weapon detonated on them. Any attempts at camouflage and concealment were limited, and prepared trenches and revetments which provided cover from small arms and indirect fires did not protect troops and vehicles from precision air strikes. There were also only minimal second-line fortifications behind the LoC defences, meaning once broken, front line forces did not have defensive positions upon which to fall back. Such behaviour suggests that there was certainly no pre-war Armenian preparation for the possibility of strikes by persistent air systems and how to preserve forces behind the lines from attack. This is reflected in the reported casualties. Since the 1994 ceasefire, only upsurges such as the 2016 conflict produced large casualty figures beyond the annual few dozen, in this case measured in the hundreds. The 2020 conflict cost Armenia 2425 lives and this was clearly enough to tip the balance against them. Armenia's performance on the battlefield led a Russian commentator to remark that, 'If one side [Azerbaijan] was preparing for this [conflict]… the other… had been preparing, in fact, for parades'.[46]

However, this would not be entirely fair. Analysts have regularly rated Armenian tactical leadership as superior to their opponents and there is evidence of this happening here. Whilst Armenian losses were high, the reported number of captured Armenian forces was only 40,[47] in a war in which a significant amount of territory, defended in fixed positions, was lost. This at least raises the possibility that Armenian leadership was sufficient to order its forces to retreat in good order, or that its forces were trained well enough to retreat before being captured. But what if it was a total collapse on the part of the Armenians? In a bombastic

speech at the Baku victory parade in December 2020, President Aliyev claimed that there were more than 10,000 Armenian deserters during the war,[48] which would represent a significant proportion of the force fielded by Armenia in Nagorno Karabakh. In the unlikely event that this was true, why did it take so long for Azerbaijan to take advantage of an army in flight? The war lasted six weeks, at the end of which a large portion of the original Oblast territory was still in Armenian hands, territory still within the international boundaries of Azerbaijan. In strategic terms, the advances were significant, in that Azerbaijan had been unable to achieve that in two decades. Physically however, it was only a very small area, which could, in peacetime, be transited in a few days. Moreover, the Azeris lost a similar number of personnel in the war to the Armenians, in an interesting continuation of previous experience. Reportedly, Azerbaijan suffered 2,783 deaths, only slightly more than their foes.[49] These figures must be qualified; firstly, this is a huge jump from previous conflicts where casualties were measured in the hundreds. Secondly, it represents a bigger proportional loss for Armenia as the smaller combatant. Indeed, it has been represented as the equivalent of America losing 350,000 troops or the EU losing 440,000 troops in six weeks.[50] But the losses suggest that it was not such a one-sided affair, as Aliyev claims. Such Azeri losses raise the possibility that their opponents were sufficiently organised and led to exact a heavy price for their defeat. With such an advantage in the air, the slow progress and the high casualties raise questions about the Azeri leadership and why it was not able to capitalise on their obviously unbalanced and retreating foe. Azeri equipment and Turkish assistance may have given them an edge, but their leadership was not a match for their advantages in the air.

UCAVs in Action Since Nagorno Karabakh – The Best Shepherd

Whilst many observers identified lessons from the war in its immediate aftermath, the elapsed time since then has highlighted their importance by showing these lessons implemented in many parts of the world, not just in the immediate surrounds of Nagorno-Karabakh. The increased sales and interest in Turkish UCAV systems show no sign of abating, with sales of the TB2 continuing to soar and newer models such as the heavier and more capable Akinci already in Turkish service. The spread of EW systems also continues. Along with its purchase of UCAVs, Morocco has also purchased the KORAL system.[51] Whilst it is not yet apparent how they will be used, Morocco's long-standing dispute with the Polisario Front in Western Sahara, as well as tensions with their eastern neighbour Algeria, provide a possible future avenue for these systems' utilisation. Morocco followed the Azeri model even more closely, with an arms deal signed with Israel in 2021. Whilst officially unconfirmed, it has led commentators to conclude that Morocco is also seeking a loitering munition capability in the form of Harop,[52] a capability for which India has also shown an interest. Elsewhere in Africa, the government of Ethiopia, in a region sadly familiar with prolonged conflict, has put recently purchased TB2s into action against the rebel Tigray region in the country's north. Like Azerbaijan, a very short time elapsed between the agreement to purchase, their delivery and entry into operation in support of Ethiopian government aims,[53] with a high likelihood of Turkish operators operating on behalf of Addis Ababa. In Europe, Poland, also having purchased the TB2, is in a unique position being what Polish commentators recently

recognised as a NATO 'flank' country,[54] seeing both sides of the 'Air Littoral' argument. As well as capable long endurance UCAVs, they recognised very quickly the need for cost-effective defence against such drones and loitering munitions, not simply the use of the most powerful anti-air and anti-missile defence systems.[55]

By far the most visible use of UCAVs since 2020 has been in the Russo-Ukrainian War. Use of UCAVs in this conflict is worthy of more discussion than can be encompassed here, but there are several striking similarities with the Nagorno-Karabakh conflict. Ukrainian TB2s went into action against Russian ground forces, along with a vast array of other systems, both military and rapidly converted commercial models, from the first day. Despite an anticipated Russian dominance of air and EW domains, Ukrainian UCAVs captured footage of Russian tanks and AD being picked off from the air, especially in the early weeks of the war when Russian disorganisation led to poor deployment of their ground systems. Like Azerbaijan, Ukraine used its TB2s as part of an information campaign as well. The footage showing TB2s striking Russian AD systems was distributed on social media, with marked similarities to the footage captured in Nagorno Karabakh. Internet users even shared the hashtag #BayraktarTB2 alongside these striking and often-graphic clips. Sometimes accompanying the videos was a new patriotic song written specifically for the conflict, praising the UCAV and the effect it is having, comparing the Russian invaders as 'sheep from the east' with the Bayraktar as the 'best shepherd.'[56] Ukrainian use of these UCAVs has been able to exploit failings in the much more powerful Russian forces and cause considerable damage not just to hardware and infrastructure but also to Russian credibility.[57] Even after Russian forces reorganised themselves and the confirmed number of Ukrainian UCAV losses rose greatly,[58] the lingering impression of Russian incompetence has been hard to dismiss since.

Conclusion

The cheering throng of Azerbaijanis celebrating in late 2020 were marking a victory over Armenia which was not a revolutionary turn in military history. Instead, a combination of factors, mostly long recognised, coalesced to bring Azerbaijan victory. Primarily, the Second Nagorno Karabakh War serves as a reminder of the importance of control of the air in modern conflict. Azerbaijan went into the war prepared to fight in a new way, matched with equipment suited to the environment and tasks in the conflict as well as moral leadership from regional allies who also supplied the equipment and training. Armenia prepared to fight as it had done previously and equipped itself as such. Furthermore, under the pressure of conflict, Armenia did not adapt fast enough to meet the challenge. Responses which affected Azerbaijan's air strategy, such as employment of EW systems, were a case of too little, too late. Armenia's strategic goals did not match those of their main regional ally, Russia. Once the shooting started, they did not have the same regional support as Azerbaijan and suffered for it. That said, Armenia was able to make Azerbaijan pay for their gains in lives, even if it cost Armenia dearly politically. The use of UCAVs in this conflict does not represent a revolution in military affairs as much as providing an ideal scenario for them to be used. The combined use of EW systems, air launched weapons, loitering munitions and indirect fires

gave Azerbaijan the edge, and with little threat from other 'blue sky' systems, they were able to dominate the Air Littoral and turn the tide of battle.

The 2020 conflict was not the final settlement on the dispute. After a familiar pattern of small incidents from early 2021 onward, with a few casualties, the two sides launched large scale operations against one another again in September 2022. As Azeri forces pushed into Armenia proper from the north, several hundred casualties, both military and civilian, were suffered on both sides. With Turkey only offering diplomatic support this time and with Russian peacekeeping forces stationed nearby after the 2020 conflict, there was no fundamental change to the status quo and the long-standing pattern of mutual accusation and recrimination resumed. Armenia has shown repeatedly that it is willing to fight for what it considers to be her ethnic territory. Azerbaijan, whilst triumphant in 2020, was not flawless in its performance and Armenia will likely study this conflict for lessons identified. For all the gains Azerbaijan made in 2020, a considerable enclave of Armenian governed territory still sits within Azerbaijan's borders, with no signs of being transferred to Azeri control, despite continued conflict. However, the Azeri use of UCAVs in achieving its military and political goals has provided a view of how future conflict may unfold. As a template, it is already having effects around the world as other nations seek to emulate Azerbaijan's success, with UCAVs and EW systems likely to become a permanent fixture of the battlefield of the future.

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