RESEARCH ARTICLE

DEVELOPMENT OF UNMANNED AERIAL SYSTEMS AS A CASE STUDY IN NAGORNO-KARABAKH AND UKRAINE

[1,*]Darko Ščavničar and [2]Andrej Jesenovec

[1]National Military College, Military Schools Centre, Slovenian Armed Forces, Slovenia
[2]General Staff of the Slovenian Army, Slovenian Armed Forces, Slovenia

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ARTICLE INFO

ABSTRACT

More than a century after the first aircraft were used in combat, drones are fundamentally changing the modern battlefield, offering a huge comparative advantage to the armed forces that own them. Over the last decade, they have played an increasing role in armed conflict and modern warfare. The mass and low cost of use have led to a veritable revolution in the design of the modern battlefield. Drones lower the cost of war and can provide even a small country air superiority during war. The Nagorno-Karabakh battlefield is a landmark battlefield where a side in a conflict has achieved a battlefield advantage by using new technologies, and the Ukrainian battlefield is no exception to the use of advanced technologies.

INTRODUCTION

In 1903, the Wright brothers tested their first successful aircraft. By 1914, just over a decade after its successful flight, the aircraft was already being used in World War I in combat roles including reconnaissance, bombing and aerial combat. Most historians categories this as a revolution in military operations. The battlefield, which previously included land and sea, now included the sky, permanently changing the way wars were fought. With the new technology came new strategies, policies, tactics, procedures, and formations. Innovative use of drones also represents a milestone, as the case of Nagorno-Karabakh testifies. Twenty years ago, unmanned aircraft systems (UAS) were far less widespread and capable. Today, their threat potential and risk profile have increased dramatically. UAS are becoming increasingly affordable and powerful, with improved optics, higher speed, longer range and increased lethality. More than a century after the first aircraft were used in combat, drones are fundamentally changing the modern battlefield, offering a huge comparative advantage to the armed forces that own them. Over the last decade, they have played an increasing role in armed conflict and modern warfare. The mass and low cost of use have led to a veritable revolution in the design of the modern battlefield. Drones lower the cost of war and can give even a small country air superiority during war. Another advantage of tactical drones is that their small size makes them extremely difficult to detect by air defense systems. Drones are slowly assuming key roles, and their combination with other systems in a conflict provides actors with new options and ways of warfare. The use of combat drones, with appropriate strategy and tactics, can largely compensate for the lack of combat aviation and can counter a worthy adversary.

Corresponding author: Darko Ščavničar,
National Military College, Military Schools Centre, Slovenian Armed Forces, Slovenia.

Drones are generally designed to conduct prolonged and dangerous activities in which manned aircraft pose a high risk of crew loss. Their primary role in military activities is gradually changing from a reconnaissance role to direct use in actual combat. A logical consequence of the mass deployment of these unmanned aerial systems is that systems designed to effectively detect and neutralise them are being developed in parallel. The rapid development of new technology therefore poses challenges for the design of new military capabilities. Modern militaries are investing significant effort in the development of new capabilities because they are aware of the advantages of using advanced technology and are closely monitoring developments and evolving tactics in new theatres. The military conflicts of the new millennium manifest themselves as conventional conflict, equipped with different modes of military and non-military action. Looking only at the military side, the war in Ukraine shows the outlines of a modern army, which must be equipped with modern artillery, unmanned aerial systems, air defenses and sufficient quantities of anti-tank weapons. Incredible, but true. It is necessary to know how to dig trenches and build fortifications, all reminiscent of the First World War, and to combine this with the latest technology in the field of communications and command. The Nagorno-Karabakh battlefield represents a turning point in the conflict, where the side using the new technologies has gained the upper hand on the battlefield. The Ukrainian battlefield is no exception to the use of advanced technologies, but there are changes in the tactics of the use of unmanned aerial systems themselves, which will also be the subject of the final thesis. The Ukrainian battlefield is a testing ground for new weapons and tactics. Nagorno-Karabakh in 2020 represents a turning point in the deployment of this combat system, where the value of tactical and deliberate deployment of this system has been demonstrated. The combat drones available to the Azerbaijani side played a decisive role in this war. Their capabilities enabled the Azerbaijani forces to perform surgically precise attacks far from the

front line, detecting, monitoring, and destroying any target that poses a threat on the battlefield. The current Ukrainian battlefield is no exception to this, but the recent development of anti-drone systems has seen a change in the very tactics used. The increasing time windows of electronic warfare have recently led to a decrease in their use and lifetime. Due to electronic warfare and GPS jamming, drones use a fully automated flight plan, assisted by inertial navigation systems (INS), allowing them to operate independently and be more resilient to electronic warfare. The limited use of drones makes the data obtained from them less useful, in particular for tracking mobile targets, due to the time-consuming processing of the data. The emergence of new weapons and military strategies is an interesting topic in global security discourse and military intelligence fora. Nagorno-Karabakh and the Ukrainian war is an example where drone warfare in a direct kinetic engagement can change the tide on the frontline and the associated theatre. There are several names for the new technology and, it appears in different sources under different names, such as Unmanned Aircraft System, Unmanned Aerial Systems, drones, drones, quadcopters, remotely piloted flights, etc.

WAR IN NAGORNO-KARABAKH

KEY WEAPON SYSTEMS OF ARMENIA: The Armenian side has focused on strengthening air defenses and procuring ballistic missiles as a means of deterring any attempt by an adversary to militarily conquer the disputed area. The idea of purchasing ballistic missiles was to target the threat to power plants and other infrastructure in the event of a renewed conflict, which would derail Azerbaijan's long-term trend of economic development. Armenia reckoned that Azerbaijan had much to lose if it decided to launch military operations against the separatist region (Güneylioğlu, 2017). Armenia's missile arsenal consists entirely of Russian missiles. Armenia inherited its Tochka and Scud missiles from the Soviet Union after its collapse and purchased Iskander missiles from Russia in 2016. Armenia's missile artillery is also mostly Russian, with the exception of the Chinese-made WM-80 multirole rocket system (MLRS). Armenia's drone fleet consists of smaller indigenous systems focused on reconnaissance missions. They are generally considered to be less capable than Azerbaijan's fleet of foreign UAVs (CSIS, 2020).

KEY WEAPON SYSTEMS OF AZERBAIJAN: In contrast, Azerbaijan had a more diverse and modern arsenal of missiles, rockets and drones. The country's oil and gas sales over the past two decades have allowed it to modernise its armed forces, including substantial funding for missiles, drones and rocket artillery. In addition to the Tochka missiles inherited from the Soviet Union, Azerbaijan has purchased the Israeli LORA ballistic missile and the EXTRA guided missile (extended-range artillery), both of which are more accurate than older Soviet missiles (CSIS, 2020). Azerbaijan has also developed an impressive arsenal of drones, including Turkish and Israeli UAVs. Earlier this year, it bought a Turkish TB2, but reports suggest that the sale will not take place until June 2020. Before that, Azerbaijan bought a number of Israeli hovering munitions, also known as "suicide" or "kamikaze" drones, including Harop, Orbiter and Sky Striker UAVs. In the recent conflict, Azerbaijan modified its Soviet-era An-2 Colt biplanes with remote-control systems and took them to the front lines as a target to engage Armenian air defences (CSIS, 2020).

DRONES IN NAGORNO-KARABAKH: Azerbaijan has used armed drones, both dump and suicide variants, highlighting the capabilities and limitations they expose. In addition to the technical aspects of the drones themselves, there are tactical and professional aspects on the Azerbaijani side that may have prevented them from fully exploiting the capabilities of drones. On the Armenian side, technical, tactical and professional aspects may have helped the Azeris to achieve more than they could have against a better-prepared enemy. It should be noted that the photographic pattern of targets hit by the Azerbaijanis shows only successes and never misses (Hecht Eado, 2022). The full photographic sample provided by Azerbaijan covers almost 60% of all targets, and 75% of the targets are believed to have been destroyed by drones, almost 45% of the total claimed by

Azerbaijan. Even assuming that this is the total proportion of targets destroyed by drones, it is certainly a large proportion. The actual proportion may be even higher, as we do not know how many targets have been destroyed by drones without the publication of photographic evidence. As for the destroyed trucks and most other light vehicles, given the short distance from the front line, most are estimated to have been destroyed by drones and are unlikely to have been targeted by artillery in these locations. On the face of it, claims of Azerbaijani ground forces having achieved success on the back of a drone storm are well founded (Hecht Eado, 2022). In the first days of the war, Azerbaijan failed to break through the Armenian defences, despite repeated ground attacks. Even after they finally succeeded, exploiting this success was met with fierce resistance and they suffered many tactical defeats before the final victory. The war was won by the perseverance of the Azerbaijanis, despite heavy casualties and many minor defeats, while the Armenian forces were gradually exhausted. The Azeris gradually took over the positions. The Armenian political and military leadership realised that the position was irretrievably lost, and further resistance would cost more casualties and territory (Hecht Eado, 2022). Review of statements by the Azerbaijani Ministry of Defence shows that the focus of the drone force during the first days was on destroying Armenian air defences. Based on their official statements, the attacks on air defences continued at a slower pace, indicating that the Azeris were satisfied with the initial results. The videos of the attacks they released showed far fewer air defence targets attacked than had been announced, so either the statements were exaggerated or the videos were just a selected sample. A review of the photographic evidence of drone strikes suggests that the Azeris have an advantage in target engagement, with almost twice as many artillery targets hit as tanks and other combat vehicles (Hecht Eado, 2022). In conclusion, it is very clear that without drones, the Azerbaijanis would not have achieved the success they have. However, it is also clear that drones have not won the war per se, but they have greatly facilitated the ground battles. Given the available data, it is impossible to calculate with precision the exact proportion of victory between drones and ground forces (Hecht Eado, 2022).

Armenian air defence failure: At the end of the war, the Armenians claimed to have shot down a total of 264 drones, 25 fighter jets and 16 helicopters, but provided no evidence. If these figures are true, then the Armenian air defense is certainly worth the adjective 'terrifying', as stated above. The Azeris deny anything close to these figures, but provide no real figures or evidence of their own. Although the Armenians shot down 264 drones, the Azeris clearly had many more at their disposal to achieve the results described above. No other figures can be provided, but the achievements of Armenian drones and aviation in general suggest that the Armenian claims are a gross exaggeration. A careful study of Armenian air defenses shows that they have not been "terrible," certainly, not as far as drones are concerned (Hecht Eado, 2022). The exact quantities of the various missile systems are not available, but included a combination of Strela-10 (SA-13), Osa (SA-8), Kub (SA-6), Krug (SA-4), S-300 and Tor. With the exception of the Tor, all were older, less powerful versions. Only the Tor was a threat to the Bayraktar TB-2 and Israeli-made suicide drones. Effective range of the Strella-10s and Osa against targets the size of the TB-2 drones was shorter than the range of these missiles, while the longer-range Kubi, Krugs and S-300s were optimised for larger and faster targets, making the drones invisible to them. One Tor was destroyed towards the end of the war. The Azeris watched it from a safe distance with a drone until it folded its antenna and went into a garage for maintenance or rest. As soon as he failed to defend himself, he was bombed by several suicide drones. Not only did the Armenians lack adequate systems, but even those who had them did not use them properly (Hecht Eado, 2022). The important question is why the Armenians have unbought better systems. This is not the first time in this war that they have faced drone attacks by the Azerbaijanis. They have used Israeli made suicide drones in many previous conflicts since 2016. Apparently, the Armenians have too much confidence in their own protection. After the four-day conflict in July 2020, an Armenian major-general stated that during that conflict, the Armenian army destroyed more than a dozen Israeli-made strike drones that were in the Azerbaijani arsenal

in a few days. These drones were made using the best technology and were considered indestructible. The only change that the Azeris have made since the July conflict until the war added to their arsenal a new Bayraktar TB2 drone, that fires missiles, allowing them to attack targets up to 8 kilometers away. Most videos of attacks released by the Azerbaijani defense ministry were taken by TB2s, but these include videos of suicide drone attacks, so it is not clear how many of these videos show actual TB2 attacks and it is not known whether TB2 is just an observer of a suicide drone attack (Hecht Eado, 2022).

One disadvantage of a remotely piloted drone is the threat of an enemy overriding the controls and forcing it to crash by jamming or falsifying the signals sent by the pilot. One report claimed that 9 Azerbaijani drones were shot down in this manner when flying too close to a Russian army base in Armenia. After the war, an Armenian general stated that the Armenians had successfully used the Russian electronic warfare system on several occasions. The lesson is clear that armies need to develop and procure several counter-drone systems. Systems optimized to deal with manned aircraft are usually not sufficient to deal with smaller drones, although they can be effective against larger drones (Hecht Eado, 2022). Some analysts believe that the problem was mainly the lack of camouflage of the Armenian off-road fighting vehicles, which were often parked in the open and squeezed too tightly into a convenient target. The terrain over most of the battlefield does not have tall vegetation or other camouflage options. In addition, some of the drone strike footage clearly shows unsuccessful attempts to hide equipment in the undergrowth or under camouflage nets. The capability of drones is that they can conduct long area scans with multi-spectral cameras, allowing them to locate such targets as well (Hecht Eado, 2022).

The only solution is to ensure active interception of drones and kamikaze drones. The solution is a mobile electronic warfare 'interception dome' that can cover an area large enough for a ground force company or battalion to manoeuvre in, and can move with that unit and maintain that dome wherever it goes. Electronic warfare is useful but can also accidentally destroy its own drones, while interception weapons can be equipped to distinguish friendly from hostile drones. Another issue is that whether physical interceptors or electronic warfare are used, a defending unit can continuously signal its location and the location of the unit it is defending to enemy intelligence (Hecht Eado, 2022).

WHAT CAN WE LEARN FROM THIS WAR AND THE USE OF MACHINE GUNS?

Azerbaijan's drones were essential to winning the conflict, but they did not win the war alone

Heavy ground combat was also needed. Some lessons are not new, and when one side has an advantage in the air, it also gains a significant advantage on the ground. The Azeris did not command the air, but the capability of their drones gave them the advantage of exploiting the gap in the Armenian air defenses, giving them the freedom to use the air. Gradually, as more and more of the Armenians' air defense weapon systems were destroyed due to gaps and mistakes, this allowed them to use manned combat aircraft. If not for the defects in Armenian air defense, the gap could only have been reduced, not completely filled. It must be realised that the smaller the drones needed to exploit the remnants of this gap, the smaller the size of the munitions they can carry, and therefore the smaller their tactical impact. In fact, most drones today can carry munitions e q u i v a l e n t only to attack helicopters. Whenever a larger bomb is needed, manned aircraft are still needed. This is likely to change in the future, but not for a few years at least.

Although the success of drones may be exaggerated, the obvious lesson from all these events is that ground forces should invest significantly in the development and procurement of effective equipment to counter small drones. Once the technological issue is resolved, tactical issue must also be addressed, and units must be trained to deploy and maneuver with the new equipment, and not to be mistakenly moved outside the protective dome they provide. It will

be necessary to learn how to operate their own equipment and use their own drones through this protective dome. Drones provide new tactical capabilities, such as longer flight times compared to manned aircraft, the ability of the operator (pilot) to sit in the office and calmly scan the ground and focus on target detection and targeting. There is also the advantage of being able to replace the seat with someone fresh during long operations. A tactical revolution is not on the cards, but a strategic one is. It stems not from the tactical capabilities of drones, but from their low cost, simplicity and accessibility compared to manned aircraft. Countries and organisations that cannot afford an air force with the full capability of manned aircraft can now acquire a capability that may not be as comprehensive or as powerful as manned aircraft. This is a very big leap from a small to a large capability that we can only dream of. The lesson of Nagorno-Karabakh is that many advanced air forces are not being used enough learn from this war. Countries that have advanced air defence forces, ground forces, advanced air forces, must prepare to face a new threat that allows inferior and even primitive military forces to create an air threat that did not exist before.

WAR IN UKRAINE 2022

The first casualty of war is the truth, which is why the war in Ukraine cannot be presented objectively. The Internet and the media are awash with half-truths and misinformation. Whoever does not read the newspaper is uninformed and whoever reads the newspaper is misinformed - Mark Twain. To better understand what is happening in Ukraine, it is necessary to study its history and the chronology of events over the last century.

HISTORICAL FACTS AND SITUATION IN UKRAINE

Ukraine is an old and proud country, full of beauty, rich history, heroism, and sacrifice. Ukraine has always been a frontier country, connecting East and West. Ukraine's flag, blue and yellow, symbolises the blue sky and the fields of wheat. Ukraine has been the prize that many in history have coveted, and much blood has been shed to rule it. Ukraine has always been the way for the Western powers to conquer the East. The Poles were the first to try, in 1609, the Austro-Hungarian Empire in 1809, Napoleon's armies in 1812, the First World War in 1914-1918 and Hitler in the Second World War in 1939-1945. In each case, the Ukrainian nation ended up paying the greatest price (Oliver Stone, 2016). In 1932 and 1933, when Ukraine was part of the then Soviet Union under the dictator Josef Stalin, millions of people died from food shortages. Due to its strategic location on the border between West and East, Ukraine has changed sides several times in its history. In the mid- 17th century, Ukrainian leader Bogdan Khmelnitsky broke the armistice with Poland and joined the more powerful Russia. 50 years later, Ukrainian leader Ivan Manzepa switched sides in the middle of the Russian-Swedish War and joined the Swedes. Ukrainian history has often been dictated by third powers. In 1918, Russia signed the humiliating Peace of Brest-Litovsk and Ukraine came under German protection. In 1939, the Molotov-Ribbentrop Agreement was signed, changing Ukraine's destiny. The aim was to protect the country from the growing influence of a powerful Germany. Josef Stalin signed a non-aggression agreement with Adolf Hitler and this agreement redrew the map of Eastern Europe. In 1939, Eastern Poland also found itself in the western part of the Ukraine as part of the Soviet Union. Shortly afterwards, Germany broke its agreement with the Soviet Union and in 1941 invaded the Soviet Union in the biggest operation of all time, Barbarossa, with the aim of taking St Petersburg, Kiev, Moscow and Stalingrad. Ukraine, with its wealth of resources, was of great industrial and economic importance to the Soviet Union. Note that a large part of western Ukraine welcomed the Germans as liberators and during the Second World War Ukraine openly collaborated with Hitler. Today we know that the Ukrainians formed entire divisions and battalions, such as the SS Galicia, Nahtigal and Roland. At the beginning of the war, 80,000 volunteers joined the SS Division Galicia in Galicia alone.

Table 1. Armenia's Key Weapon Systems, (Shakikh and Rumbaugh, 2020)

Weapon system	Features	Number	Source:	Year of purchase
9K79 Tochka-U(NATO: SS- 21Scarab)	Ballistic missile, 120km reach	4 launchers	Soviet Union	
Iskander-E (NATO: SS-26 Stone)	Ballistic missile, 300km reach	8 lanser / 25 rackets	Russia	2016
SS-1C Scud B	Ballistic missile, 300km reach	8 lansers / 24 rackets	Soviet Alliance	
X-55	Reconnaissance BPL		Armenia	2014
HRESH	Smart ammunition		Armenia	2018
Krunk	Reconnaissance BPL		Armenia	2011
Orlan-10	Reconnaissance BPL		Russia	2020
BM-30 Smerch	300 mm MLRS, 90 km reach	6 lancers	Russia	2015-17
NORINCO WM-80,273 mm	MLRS, 120 km reach	4-8 launchers	Russia	1999
TOS-1A	220 mm MLRS, 6-10 km reach		Russia	2016
BM-21 Grad	122 mm MLRS		Russia	1995-96

Table 2. Armenia's unmanned weapons systems, (Shaikh and Rumbaugh, 2020)

Title	Category/Operation	Number	Source:	Notes
X-55	Reconnaissance BPL		Armenia	2014
HRESH	Smart ammunition		Armenia	2018
Krunk	Reconnaissance BPL		Armenia	2011
Orlan-10	Reconnaissance BPL		Russia	2020

Table 3. Key weapon systems of Azerbaijan, (Shaikh and Rumbaugh, 2020)

Weapon system	Features	Number	Source:	Year of purchase
LORA	Ballistic missile, , 280km Range	4 launchers / 50rockets	Israel	2017-2018
9K79 Tochka-U(NATO: SS-21Scarab)	Ballistic missile, 120 km Range	3-4 launchers	Soviet Union	
EXTRA	Guided rocket,150 km Reach	6 launchers / 50missiles	Israel	2005-2009
Bayraktar TB2	Tactical BPL		Turkey	2020
Harop	Smart ammunition	50	Israel	2014-2016
Orbiter 1K	Smart ammunition	80	Israel	2016-2019
Orbiter 3	Tactical BPL	10	Israel	2016-2017
SkyStriker	Smart ammunition	100	Israel	2016-2019
Hermes-900	Tactical BPL	2	Israel	2017-2018
Hermes-450	Tactical BPL	10	Israel	2008-2013
Heron	Tactical BPL	5	Israel	2011-2013
Aerostar	ReconnaissanceBPL	14	Israel	2007-2012
Searcher	ReconnaissanceBPL	5	Israel	2011-2013
Antonov AN-2	Processed in BPL		Soviet Union	
BM-30 Directi on 300 mm	MLRS, 90 km Reach	30-40 launchers	Russia	2003-2005
T-300 Kasirga 300mm	MLRS, 120 km Reach	20 launchers	Turkey	2015-2016
Belarusian Polonaise 300 mm	MLRS, 200 km reach	10 lansers	Belarus	2017-2019
TOS-1A 220 mm	MLRS, 6-10 km Reach	36 launchers	Russia	2011-2017
T-300 300 mm	MLRS	20 launchers	Turkey	2015-2016
T-122 122 mm	MLRS	40 launchers	Turkey	2010-2014
T-107 107 mm	MLRS, 11 km Reach	30 launchers	Turkey	2010-2013
RM-70 122 mm	MLRS	30 l lansers	Czech Republic	2016-2018

Table 4.Azerbaijan's unmanned weapons systems, (Shaikh and Rumbaugh, 2020)

Title	Category/Operation	Number	Source:	Notes
Bayraktar TB2	Tactical BPL		Turkey	2020
Harop	Smart ammunition	50	Israel	2014-2016
Orbiter 1K	Smart ammunition	80	Israel	2016-2019
Orbiter 3	Smart ammunition	10	Israel	2016-2017
SkyStriker	Smart ammunition	100	Israel	2016-2019
Hermes-900	Tactical BPL	2	Israel	2017-2018
Hermes-450	Tactical BPL	10	Israel	2008-2013
Heron	Tactical BPL	5	Israel	2011-2013
Aerostar	Reconnaissance BPL	14	Israel	2007-2012
Searcher	Reconnaissance BPL	5	Israel	2011-2013
Antonov AN-2	Processed in BPL		Soviet Union	-

For a month and a half they were known for their brutality against the Poles, Jews and Russians living in the territory. The members were mostly from the OUN, the Organisation of Ukrainian Nationalists, founded in 1929, which had the aim of ethically cleansing Ukraine. The flag of the organisation was red-black, representing earth and blood, and it remained long in Ukrainian history after the abolition of the OUN.

At the beginning of 1940, Ukraine got a new leader, Stepan Bandera, as a great anti-Semite and anticommunist, and in 1941 proclaimed an independent Ukraine. Independent historians claim that between 150 and 200 thousand Jews were killed by OUN troops by the end of 1941. The largest genocide ocurred between 29 and 30 September 1941 in Babi Yar, near Kiev, when 33,771 Jews were killed.

The second major crime was committed by Bandera's SS unit against Poles in Volhynia (eastern Galicia) in Poland between 1943 and 1944, led by Mikola Lebed. It is estimated that between 35,000 and 60,000 people were killed in Volhynia. As the Germans began to lose the war, the OUN detachments fought against both the German and Russian forces at the end of the war. Western Ukraine was still in German hands after 1943. It was liberated by Russian forces in November 1944, but Bandera's forces nevertheless continued bloody attacks on liberated Ukrainian villages and the Soviet regime until 1955 (Oliver Stone, 2016).

After the fall of the Berlin Wall, the nationalist political organisation in Ukraine had growing aspirations for independence, and on 24 August 1991 Ukraine became an independent state. In 1991, Oleg Tiagnibog founded the radical nationalist Svoboda party, which advocated Bandera's ideology against Russians and Jews. In 1994, Dimitrij Yarosh founded the nationalist group Trizob (Trident). In 2013, he became an assistant to the opposition party Udar and in the same year became the leader of the most radical Nazi group, Right Sector. The marches through Ukrainian cities with torches and Nazi symbols (2015) are very well known. After independence, there was a large-scale privatisation of social wealth and the emergence of oligarchs, while the majority of the population lives in extreme poverty. The discontent of the nation led to the first colour revolution in 2004 and Ukraine became the subject of a struggle between the West and the East. Two candidates emerge in the presidential elections, the pro-Western Viktor Yushchenko, and the pro-Russian Viktor Yanukovych, but they received almost the same number of votes. Yanukovych won, but the pro-Western Ukraine did not agree. The then NATO Secretary General Javier Solana also got involved in the problem and visited Ukraine several times. New elections were held and the pro-Western candidate Viktor Yushchenko won. This mandate is notorious for corruption and infighting, and at the end of the mandate he proclaims Stepan Bandera a national hero. This status did not last long, and in 2010 the pro-Russian Viktor Yanukovych came to power and in 2011 removed Bandera's hero status. During his term of office, Ukraine was deeply embroiled between the interests of the West and those of the International Monetary Fund, which made impossible demands of the country and refused to cooperate with Ukraine. Russia, on the other hand, offered cooperation and economic support to Ukraine (OliverStone, 2016).

At the end of his mandate in 2014, Ukraine is rocked by another revolution, but it does not end peacefully. It is important to realize that the revolution was triggered by the West, through the funding of NGOs and journalists, who, through the new television channels, encouraged people to participate in demonstrations and to support the agreement with the EU. Throughout the chronology of events, we can see the strong involvement of the US military, which provided the conditions for developing the revolution, with the participation of Ukrainian neo-Nazi organizations. Many influential Ukrainians from high positions in the government and leaders of radical parties have made no secret of their collaboration with Western intelligence services. The patterns and techniques that have emerged in this revolution are similar to those we have seen in Yemen, Libya, Moldova, Georgia, Syria... indicating a strong Western involvement. Because such a revolution does not happen without money, George Soros often appears in the financial donations. US representatives and congressmen have frequently visited Ukraine, among them Victoria Nuland, US Assistant Secretary of State, who personally supported the protesters on the Maidan with Congressman John McCain, stands out. When the political storm swept the country in 2014, the US stoked anti-government sentiment through mechanisms such as USAID and the National Endowment for Democracy (NED). In December 2013, Victoria Nuland, Assistant Secretary of State for European Affairs, said that the US government had spent $5 billion on "democracy promotion" in Ukraine since 1991. The money has gone to support "senior officials in the Ukrainian government... members of the business community as well as opposition civil society" who share US goals. This sent a strong message that the US is with Ukraine and has big appetite there. In this coup d'état, the violence 100 protesters and 24 police officers were killed by neo-Nazi groups and unidentified snipers. This was the trigger for replacing the pro-Russian Yanukovych, who was blamed for the violence against protesters. Yanukovych flees to Russia and is replaced by Oleksander Turchynov, illegally recalled as President, who is immediately recognised by the US as the legitimate government. Soon after, there is a revolt in pro-Russian eastern Ukraine. On March 16, 2014, Crimea's people, the majority of whom are Russian speakers, held a referendum on secession and annexation to the Russian Federation, fearing another Maidan and a neo-Nazi takeover. In the referendum, 96.77% voted in favour of joining the Russian Federation, but the Western world refused to recognize the result consider Crimea's secession a false election and a Russian invasion. In the summer of 2015, there was also a boiling point in the eastern region, especially in the Donetsk and Logansk districts, which are culturally closer to Russia. They opposed the new Kiev authorities and feared that nationalism would enter their soil. Language is a major problem in Ukraine and in 2012 Yanukovych recognised Russian as a second language in eastern Ukraine, which is strongly opposed by the western-oriented part of Ukraine.

Immediately after taking power on February 23, 2014, they abolished Russian as a second language, which alarms eastern Ukraine. On April 6, protests began in the Donetsk region and the following day they declare the Donetsk National Republic. There were bloody clashes from both sides, but Kiev did not declare martial law because the IMF had made it a condition that no money would be pumped into a country under martial law. The greatest blame for this lies with Alexander Turchinov, who banned the Russian language and started a war against his own people. The world was too busy hailing the new democracy in Kiev and ignoring what was happening in eastern Ukraine. In early January 2014, Odessa also witnessed an anti-Maidan protest, which from a strategic point of view represents a major problem for the new Kiev authorities. On May 2, 2014, a large group of neo-Nazi supporters arrived in Odessa for a football match and clash with the anti-Maidan protesters. They retreat to the Trade Union Centre, which is set on fire and burned down by the protesters. No one was ever convicted for the crime, in which around 50 people died. On February 12, 2015, the Minsk 2 peace agreement was signed by Ukraine's leaders, Russia, Germany, and France. It contained 13 points, the most important of which was a ceasefire in the Donetsk and Lugansk regions (Oliver Stone, 2016).

In 2014, during the Ukrainian crisis, when the separatist movement in Kharkiv was active, "Sect 82" took over the regional administrative building and served as a local "defence force". It formed a special police unit called the "Eastern Corps". From this, the backbone of Azov was formed and filled with white nationalists. In 2015 and 2016, Azov used its forces on the civilian population, seizing their property and forcing them from their homes. Azov fighters have also raped and tortured prisoners in the Donbas region. All the while, their militant groups, with the support of the police, have attacked the population of the Lugansk and Donetsk People's Republics. The number of victims has risen to 14,000 and despite warnings, the entire Western world has turned a blind eye (Oliver Stone, 2016). On February 24, the Russian Federation launched a "surprise" attack on Ukraine. Today, the media portray Ukraine as a little "David" who fearlessly stood up to "Goliath" in an unequal battle where "heroes" are born. I conclude the history of Ukraine here, and you can draw your own picture from the historical facts.

THE USE OF DRONES IN THE UKRAINIAN CONFLICT: As the war in Ukraine is still ongoing, the flood of disinformation makes it impossible to give an analysis of the military operation as in the case of Nagorno-Karabakh. At the moment, there are fewer analyses than in the case of Nagorno-Karabakh. It must be realised that the element of surprise with unmanned systems is much smaller than in the case of Nagorno-Karabakh, but still. Drones large and small continue to play a dominant role in this terrible conflict. Unmanned combat aerial vehicles (UCAVs) with missiles or hovering munitions have shown great value in this war. Russia is economizing on the use of long-range conventional missiles, which can only be produced in

single digits per month. For this reason, it is buying hundreds of 'kamikaze drones' from Iran and sending them into action. Between September 2022 and the end of the year, at least 200 of them carried out attacks on Kiev, Odessa and other cities. What has also been disturbing is the adaptation of cheap commercial drones on both sides to carry out surprisingly effective tactical attacks, and even more lethally, to acquire targets for artillery fire with remarkable precision and speed. The result is a battlefield focused on indirect fire, in which even main battle tanks are more likely to be destroyed by howitzers with the help of drones than by anti-tank missiles, air strikes or enemy tanks. (Inside Unmanned Systems, 2022). While air defences against drones were weaker in the first weeks of the war, by late spring drones from both sides began to suffer heavy losses. A study showed that on average a Ukrainian drone survived only 7 days of combat activity. Many Ukrainian units using drones were no longer able to provide a real-time picture of the battlefield because of the anti-drone protection. To this end, they started sending drones according to pre-set flight plans and later analysed the footage. Due to Russian jamming of the GPS signal, the drones use a fully automated flight plan, assisted by Inertial Navigation Systems (INS), allowing them to operate independently and to be immune to electronic jamming. In general, the resulting data is less useful, especially for mobile targets, and the processing of the captured imagery is time consuming (Inside Unmanned Systems, 2022). Electronic warfare (EW) and the resulting jamming of unmanned systems by Russia have made Ukrainian command centre operations heavily dependent on windows of opportunity at a time when Russian EW is weak.

From the beginning of September until the end of 2022, the destruction of at least 14 Bayraktar TB2 combat drones is confirmed, and the loss or capture of eight Ukrainian-built A1-SM Fury and three Leleka drones 100 ISR. The Russian Zhitel R-330Zh tracked R-330Zh and Pole-21 systems mounted on the telescope provide near constant area interference affecting the UAS and GPS. More targeted electronic jamming (EW) attacks on Ukrainian drones are carried out by various tactical jammers, ranging from the Repelant-1 truck (reportedly effective only within 2.6 miles) to anti-drone guns. The most important tactical system for countering BLS in Russia is the truck-mounted Shipovnik-Aero tactical jamming system, which can simultaneously jam two drones and also disable local communication networks. When Aero detects a BLS, it takes about 25 seconds to deploy a queue and then uses an appropriate transmitter to disrupt its command frequency. Sometimes it can even strike the drone's control station and allow the drone itself to be captured. Russia first deployed Shipovnik-Aero in Ukraine in 2016. By the summer of 2022, their presence had become widespread, severely limiting the airspace into which Ukrainian SAMs can penetrate. The Russians also have great difficulty in deploying BLS because the Ukrainian army also uses advanced drone protection systems. The actual total losses for both sides are certainly in the hundreds, especially when considering smaller, multi-rotor drone systems. It should be borne in mind that modern drone protection also provides information on the location of the operator of the UAV. This puts the position of the UAV operator at risk and forces him to retreat to avoid attack. Due to the new battlefield situation, both sides are now reworking their drone software to make smaller multi-rotor systems more resistant to EW, but many EW systems cannot be defeated. Of course, drones are also responsible for a significant proportion of EW and air defence systems destroyed, either through direct attacks or by calling in and adjusting indirect fire (Inside Unmanned Systems, 2022).

Kinetic air defence, including expensive ground-based air defence missiles, also accounts for many drone losses. Although many drones cost less than a missile fired at them, the potential destruction that could be caused by a precision artillery strike makes it worthwhile to use all the handy means at hand with a drone. Nevertheless, the importance of using more versatile and cost-effective weapons to combat BLS is clear. Drones have been destroyed with small arms, bouncing tubes, cannons and fighter aircraft, among other weapons. Ukraine's supporters are sending laser-guided missiles and vehicle-mounted jammers.

Soldiers on both sides use anti-BLS rifles, often acquired outside regular military procurement channels. As small drones are difficult to detect compared to manned aircraft, the combat experience of this war proves beyond doubt that even smaller tactical formations such as infantry companies should incorporate light radars and sensors to more reliably detect nearby BLS without depending on air defence (Inside Unmanned Systems, 2022).

LOGISTICS AND TRAINING OF BLS OPERATORS: Due to high attrition, the demand for drones from frontline units is extremely high. Russian forces are also heavily dependent on civilian donations because of the procurement gap for smaller, shorter-range drones. A list of suggested equipment for new recruits circulating on Russian social networks recommends bringing a drone and an extra pair of socks. The government of Buryatia (a minority region in Russia that is disproportionately represented among frontline troops) has spent $3.4 million of its own funds to provide drones and other equipment to its soldiers, reflecting a widespread awareness that the Russian military is failing to equip them adequately (Inside Unmanned Systems, 2022).

The Russian military is taking steps to procure more drones, but is also facing a shortage of d r o n e operators. From September 1 to 5, veteran drone operators gathered at Lake Ilmen in Russia for the Dronnitsa conference to share best practices with the ultimate goal of creating a professional corps of instructors and developing a standardised training curriculum. Moscow has announced measures to increase drone production, as well as to include drone training in school curricula. Ukraine organised a meeting in Kiev that brought together 150 operators, engineers and programmers to exchange ideas on how to harness Ukraine's large technology sector to improve the effectiveness of BLS operations. These moves show that both sides recognise that even small civilian drones have become a key component of military power and that governments should standardise training and procurement capabilities that have so far developed organically from improvisations on the ground (Inside Unmanned Systems, 2022).

KAMIKAZE DRONES: Kamikaze drones are playing an increasingly important role. Both Ukraine and Russia are resorting to them to perform penetrating attacks, when manned aircraft in such cases are suicide missions because of their strong air defenses. Media coverage of the effective use of the small kamikaze drone at the start of the war is increasingly rare. There are a few videos of the Switchblade-300 drone showing attacks on individual soldiers. The Russian version of the ZALA KUB delta-winged drone showed poor accuracy and did not have enough punch to reliably disable a towed howitzer. In the summer of 2022, Russia launched a newer ZALA Lancet-3 missile with a larger warhead for a greater obvious impact. The Lancet-3 missiles can hit towed howitzers, moving self-propelled artillery, air defence systems and even the Bayraktar radio repeater, and have become a nightmare for the Ukrainian Armed Forces. In September 2022, Russia began deploying the Iranian-made Shahed-136 (renamed Geran-2) munition and has achieved some success, according to the commander of Ukraine's elite 92nd Brigade, who told the Wall Street Journal that in just a few days Shahed-136 destroyed four self-propelled howitzers and two armoured personnel carriers. The older Shahed-131 (smaller, but similar to Shahed-136) floating munition was also apparently used. Ukrainian forces have demonstrated successes with the Warmate field-launched munition. They received some Switchblade-600s, which took time to enter production. Kiev has also acquired hundreds of Phoenix Ghost, a backpack-carryable, classified, floating munition. In July, Ukrainian Presidential Adviser Oleksii Arestovysh attributed a 60% kill rate to the backpack-able ammunition. In October 2022, Ukraine debuted the RAM-II recoverable munition derived from Leleka- 100, which recorded the destruction of an Osa air defence vehicle. The Ukrainians have also used racing drones with specialised goggles as kamikazes to attack targets inside buildings (Insideunmannedsystems 2022). It is clear that militaries should use a multi-faceted mix of kamikaze drones, ranging in cost, range and strike power, with at least one "medium" option that can be cost-effectively used for tactical attacks against artillery and armoured vehicles.

Such a weapon is particularly interesting if it can be produced at a similar or lower cost than, for example, the Javelin missile ($80,000+ without launcher) or the Excalibur artillery grenade ($112,000) (Inside Unmanned Systems, 2022).

RUSSIAN IRANIAN DRONE STRIKES

Iran used its first bomb-carrying drones in combat in the 1980s. Today, it various BLS, UCAV and micro-aircraft from competing manufacturers. Tehran has used them to expand its power over the Persian Gulf and Syria and to arm overseas allies such as Hamas, Hezbollah and the Houthi rebels in Yemen. According to military aviation historian Tom Cooper, Iran's drones, sensor domes and munitions have evolved significantly since 2016, thanks to technology transfers from China (Insideunmannedsystems 2022). As Russia's UCAV capability through the Orion platform only became operational in 2021, Moscow wanted to quickly procure more combat drones and ISR drones from Iran in July 2022, possibly in exchange for Su-35 jet fighters. The first Iranian drones were delivered in mid-August and Russian personnel have been trained in Iran to operate the UAVs. Subsequently, on 8 October, 24 Shahed-129 UCAVs and Shahed-136 Kamikaze drones based in Crimea and Belarus were evaluated for deployment on targets across Ukraine, and the drones are expected to assist in missile targeting. The Ukrainian military claims that the air defence has shot down 12 drones, including nine of the 12 Shahed-136s. The three Iranian UCAVs using the runway, which were found to have been delivered to Russia, have already been used in combat operations and are equipped with the necessary electro-optical sensors and small guided missiles in laser, IR and TV-guided versions (Insideunmannedsystems2022).

COMBAT DRONES (UCAV) OVER UKRAINE:

Both Russia and Ukraine continue to use UCAVs in combat, but the density of the air defence and electronic warfare environment has prevented the unrestricted use of UCAVs. Neither the Ukrainian Bayraktars nor the Russian Orion and Forepost-R drones have caused of mass destruction achieved against Armenian and Syrian ground forces in 2 0 2 0 , but the use of combat drones may accept greater risks than with combat aircraft. Russia could arguably benefit even more from UCAVs due to their long-endurance intelligence-scouting capability (ISR) and utility compared to manned aircraft. It could make an ideal platform for hunting and destroying precision Western artillery and GPS-guided missile systems (HIMARS, MARS) that are ruthlessly destroying Russian ammunition depots. In practice, however, Russia has not provided convincing evidence that its UCAVs have located and destroyed any HIMARS systems. In the summer of 2022, Russia developed a method to arm Orlan-10 ISR drones with grenades and launched a new small attack drone, the Lastochka-M, which dropped unguided munitions. By 2023, Russia hopes to increase production of Orion UCAVs and install satellite links and develop autonomous air-to-air refuelling technology to extend the range of its drones (Inside Unmanned Systems, 2022).

CAMERA DRONE WAR

Despite the production of various indigenous fixed-wing drone platforms, Ukraine and increasingly Russia are heavily dependent on the purchase or donation of large and small UAVs from abroad. The most numerous are the cost-effective DJI camera drones manufactured in China. Demand during the war reportedly caused the price of drones in Russia to at least double, especially after DJI stopped sales to Russia and Ukraine in April. Moscow has its own ways of circumventing bans and sanctions. The Russians specifically instruct volunteers to purchase DJIs on various online and physical markets in Eastern Europe and Asia. Commercial remotely operated multi-rotor systems have also proven to be easily convertible, precision strike weapons. Videos released by Ukrainian and Russian soldiers continue to show outrageous feats of gravity bombardment, dropping tiny anti-tank grenades through the open hatches of main battle tanks and other vehicles with absurdly devastating results. The mass deployment of DJI products could theoretically be jeopardised if the company or state regulators attempt to impose geographic

barriers. However, Ukraine is believed to have developed a hack into DJI's drone refresh system and removed security software that Russia has used in the past to locate and disable d r o n e s or attack their operators. Ukraine and Russia could produce similar camera drones domestically, but the quality, scale and cost-effectiveness of production would probably not be the same. However, Russian arms manufacturer Almaz-Antey has announced that it is testing a quadcopter it has developed itself with 90% indigenous parts made of lightweight polymers and carbon fiber, which could eventually serve as a "Russian DJI" (Inside Unmanned Systems, 2022).

WHAT CAN WE LEARN FROM THIS WAR AND THE USE OF DRONES?:

Today, there is no doubt that drones played an important role in the Russo-Ukrainian war. Looking only at the military side, the war in Ukraine is drawing the outlines of a modern army, which must be equipped with modern artillery, unmanned aerial systems, air defenses and enough anti-tank weapons. The number of drones used by both sides is extremely high, and while air defenses against drones were inferior in the first weeks of the war, by late spring the drones of both sides had begun to suffer heavy losses. Currently, the Ukrainians are using more than 20 different drones from different manufacturers from all over the world against Russia. The drones are mainly used for aerial reconnaissance and fire adjustments and play an important role in ensuring the combat performance of individual units. Both Russia and Ukraine continue to use UCAVs in combat, but the density of the air defense and electronic warfare environment has prevented the unrestricted use of UCAVs. The use of the Turkish TB-2 drone played a significant role on the Ukrainian side in the early days, but its role has been greatly diminished by the Russian electronic warfare environment. A study showed that the TB-2 drone survived on average only 7 days of combat activity. Kamikaze drones, known as "flying munitions", are coming to the fore and are taking on an increasing role. Both Ukraine and Russia are resorting to them to perform penetrating attacks when manned aircraft in such cases are a suicide mission due to their strong air defenses. The Shahed-136 long-range explosive drones supplied by Iran have disabled Ukrainian power stations but have not proved particularly clever. Drones such as the Switchblade 600 from the US and Poland's Warmate currently require a human to select targets via a live video feed and then AI completes the job. The drones, technically known as "hovering munitions" or kamikaze drones, can hover over a target for several minutes, waiting for a clean shot. Drones can identify targets such as armored vehicles using catalogued images. However, there is disagreement over whether the technology is reliable enough to ensure that machines do not malfunction and take the lives of non-combatants.

CONCLUSION

The Nagorno-Karabakh War was the first war in which unmanned aerial systems played a key role in the conflict. Azerbaijani drones contributed significantly to the victory itself and played a key role in the conflict. The war was not won alone; heavy ground fighting was also needed. Some lessons are not new, and when one side has an advantage in the air, it can also gain a huge advantage on the ground. The Azeris did not command the air, but they took advantage of their drones and exploited a gap in the Armenian air defenses. Gradually, through the innovative use of drones, they destroyed more and more of the Armenian air defense weapon systems, allowing them to use manned combat aircraft. Most drones today carry munitions that are accurate but have less tactical effect. Whenever more firepower is needed, manned combat aircraft are still required. Today, there is no doubt that drones also played an important role in the Ukrainian war. Looking only at the military side, the war in Ukraine is drawing the outlines of a modern army, which must be equipped with modern artillery, unmanned aerial systems, air defenses and sufficient quantities of anti-amour weapons. It is incredible, but it is real, and it is necessary to know how to dig trenches and build fortifications, all reminiscent of the First World War, and to combine this with the latest technology in the field of communications and command. Although the success of drones may be exaggerated, the obvious

lesson to be drawn from all these events is that the ground forces should invest significantly in the development of these systems and in the acquisition of effective counter-drone equipment. Once the technological issue has been resolved, the tactical issue must be addressed, and units must be trained to deploy and maneuver with the new equipment so that they do not mistakenly move outside the protection provided by it. It will be necessary to learn how to operate this new equipment and how to operate our own drones through this protective dome.

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