www.ijramr.com

ISSN : 2350-0743

International Journal of Recent Advances in Multidisciplinary Research
Vol. 10, Issue 12, pp.9299-9310, December, 2023

RESEARCH ARTICLE

A CASE STUDY ON THE USE OF DRONE TECHNOLOGY IN THE 2020 NAGORNO-KARABAKH WAR

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ARTICLE INFO

Article History:
Received 17th September, 2023
Received in revised form
29th October, 2023
Accepted 25th November, 2023
Published online 25th December, 2023

Key Words:
Unmanned Aerial System; Nagorno-Karabakh War; Armed Conflict; Advanced Technology; Modern Battlefield.

ABSTRACT

The military conflicts of the new millennium are manifesting themselves as conventional conflicts, supplemented by various modes of military and non-military action. One of the key drivers enabling changes in combat tactics is the development of technologies which underpin the development of advanced capabilities. A case in point was the war in the Nagorno-Karabakh region, where one side, through the innovative use of unmanned aerial systems, achieved an advantage for which the other side was unprepared. A case study of the war between Armenia and Azerbaijan in 2020, focusing on the use of unmanned aerial systems, shows that the innovative use of the new technology helped defeat the enemy. The results of the study confirm that the key advantage of the new technology is to shorten the process of observation, orientation, decision-making and action (OODA), as a basic advantage over an adversary with a conventional approach. This means that conventional defence forces must upgrade their weapon systems and tactics of operation with unmanned aerial systems in order to be able to play their role in an armed conflict effectively.

INTRODUCTION

Armed conflicts around the world in recent decades point to an increasing role for unmanned aerial vehicles (drones). Their multiplicity and possibilities for use have led to a real revolution in redesigning the battlefield of today. Robotic platforms are slowly taking precedence, and their combination with other systems provides the parties to the conflict with new forms of military operation. The use of unmanned combat aerial vehicles (UCAV) or combat drones, with the right strategy, can largely compensate for a lack of combat aviation, and make a country that is not a military power a worthy opponent. At relatively low cost, combat drones are becoming a combat capability of a growing number of countries. Of course, systems intended to effectively detect and neutralize combat drones are also being developed at the same time. Drones, in general, are designed to carry out so-called dirty, dull and dangerous activities.[1] Their role in military conflicts is gradually changing from a role of reconnaissance, enabling supervision of the territory or the 'dull' missions' activities, to their direct use in combat in the context of the 'dangerous' missions.[2]

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Combat drones have been used in many conflicts in recent history, but the war in Nagorno-Karabakh in 2020 can rightly be said to mark a turning point in the use of these combat systems. Prior to this war, these systems had been used sporadically on a number of battlefields over the past several years. For example, the Yemeni Houthi rebel group repeatedly attacked civilian and military facilities in Saudi Arabia with relatively primitive, but extremely effective systems,[3] while the use of unmanned aerial vehicles in Syria went relatively unnoticed. In the complex Syrian battlefield, the Israeli and Turkish systems caused great damage to manpower and equipment to both government forces and their coalition partners.The military conflicts of the new millennium are manifesting themselves as conventional conflicts, supplemented by various modes of military and non-military action. One of the key drivers enabling changes in combat tactics is the development of technologies that underpin the development of advanced capabilities. In the war in the Nagorno-Karabakh region, one side, through the innovative use of unmanned aerial systems, achieved an advantage for which the other side was unprepared. The idea of using unmanned aerial systems is not new, as the benefits have been recognized since the early days of military aviation. These systems were designed to perform long-duration tasks in dangerous environments where human crews would be a limiting element due to their physiological constraints. At the same time, they have the advantage of keeping people in a safe place, away from a dangerous environment. The extraordinary development of technology, the impact on future capabilities,

[1]R. Szabolcsi,' Robust Control System Design for Small UAV Using H2-Optimization',*Revista Academiei Forţelor Terestre*23/2 (2018): 151–9; R. Austin, *Unmanned Aircraft Systems: UAVS Design, Development and Deployment* (Location: John Wiley & Sons Ltd 2010).

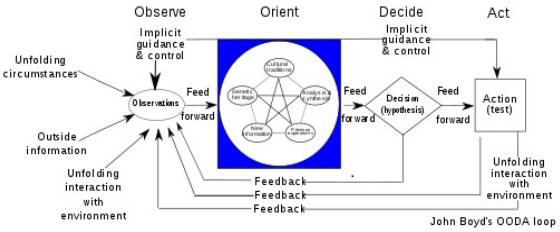
[2]Austin, *Unmanned Aircraft Systems*

[3] D. Muhsin, 'Houthi Use of Drones Delivers Potent Message in Yemen War. IISS' (2019). https://www.iiss.org/blogs/analysis/2019/08/houthi-uav-strategy-inyemen.

and the new forms of warfare pose great challenges to military planners in the long-term future. Unmanned aircraft technology is expected to become dominant, largely replacing conventionally operated aircraft. However, as these are major conceptual and thought shifts, such developments must be carefully planned and developed incrementally on the basis of the experience gained, complemented by new knowledge.

The OODA loop: In assessing the impact of technology on the outcome of war, John Boyd's strategic theory will be used as a benchmark. Its key part is the OODA (observe, orient, decide, act) process, developed by the US strategist Colonel John Boyd for the operational level of warfare. An armed force (unit or individual) which can carry out the full cycle of the process faster, detecting and reacting to random events quicker than the adversary, i.e. outpacing the adversary's decision-making process, can gain a decisive advantage and thus influence the outcome of the conflict. Typically, the innovative use of new technology can be one of the conditions enabling a faster OODA cycle.A concrete example was the use of drone technology in the recent Nagorno-Karabakh war, which shows that innovative use of new technology can be a key advantage in achieving military success. In this article, we limit ourselves to analysing the use of new technology in this conflict and the effects of its use.The OODA (observe-orient-decide-act) loop is a cycle developed by the military strategist US Air Force Colonel John Boyd. Boyd applied the concept to the process of combat operations at the operational level during military actions. The concept is also widely used today to understand commercial operations and learning processes. The approach explains how agility can overcome raw power when facing adversaries.In addition to its use in military strategy, the OODA loop has become an important decision-making concept in litigation, business, law enforcement and elsewhere. According to Boyd, decision-making occurs in an iterative cycle of observation-orientation-decision-action. An entity (either an individual or an organization) that can quickly process this cycle and observe and react to the situation faster than the opponent, thus breaking into the opponent's decision-making cycle, gains an advantage.Boyd developed the concept to explain how to channel energy in order to defeat the opponent and survive. He stressed that the 'loop' is actually a series of interacting loops that must be kept in continuous operation during combat.

Boyd's diagram shows that all decisions are based on observing an evolving dynamic situation. The information obtained is filtered on the basis of our knowledge of the problem being addressed. Observations are the raw information on which decisions and actions are based; the observed information must be processed to focus on decision-making. In the notes to his speech 'Organic Design for Command and Control',[4] Boyd wrote: 'The second "O", orientation, as the repository of our genetic heritage, cultural traditions and previous experiences, is the most important part of the OODA loop, shaping the way we observe, decide and act'.As Boyd indicated, and as is shown in the context of the 'orient' phase, there is a great deal of filtering of information, which is influenced by our culture, genetics, the ability to analyse and synthesize, and previous experience. The OODA loop was designed for a single decision-maker; however, the situation is usually much more complex than shown, as most business and technical decisions are observed and guided by a team of people, each bringing their own cultural traditions, genetics, experience and other information. It is here that we often become stuck in decisions that do not lead to victory, because in order to win, we must operate at a faster pace or rhythm than our opponents, or better still, understand and enter into the opponent's time cycle or OODA loop. This way of operating makes us appear unpredictable in the eyes of our opponents, creating confusion and disorder among them, because they are unable to create mental images or pictures to match the threat, and to keep up with the faster rhythm and patterns they are competing against.



(Source: Defense and the National Interest, 2005)

Figure 1. The OODA loop

As one of Boyd's colleagues, Harry Hillaker,[5] has written, the key is to obfuscate one's intentions and make them unpredictable to the opponent, while at the same time understanding the opponent's intentions. This means that we act at a faster pace to create rapidly changing conditions, which prevent the opponent from adapting or reacting to these changes, and which suppress or destroy their awareness. This results in a mixture of confusion and disorder, leading to the opponent's over- or under-reaction to the conditions or activities, which seem uncertain, ambiguous or incomprehensible. Robert Greene wrote in an article entitled 'OODA and You'[6]: 'The proper mindset is for the decision-maker to let go a little, to allow some of the chaos to become part of his mental system, and to use it to his advantage by simply creating more chaos and confusion for the opponent. In doing so, he funnels the inevitable chaos of the battlefield in the direction of the enemy'. An illustrative example is that of an interceptor pilot who takes off to shoot down enemy aircraft. Before the aircraft is even within visual range, the pilot will consider all available information about the likely identity of the enemy pilot: their nationality, skill level, and cultural traditions which could be relevant. When the adversary's aircraft comes into radar contact, the pilot is provided with more direct information about their speed, size and manoeuvrability; new circumstances which override the previous information. The first decision is based on the information available thus far: the pilot decides to increase altitude and climb above the enemy, revealing themselves to the opponent in the sky, and takes action by using the aircraft's climb controls. They then return to observing: is the attacker reacting to the change in altitude? Next comes orientation: is the enemy reacting in a typical manner, or perhaps acting as a non-combatant? Is their aircraft performing better than expected? Once the confrontation starts, there is little time for orientation, unless some new information comes to light concerning the actual identity or intention of the attacker. This information is accumulated in real time, and the pilot does not

[4]Defense and the National Interest, 2005

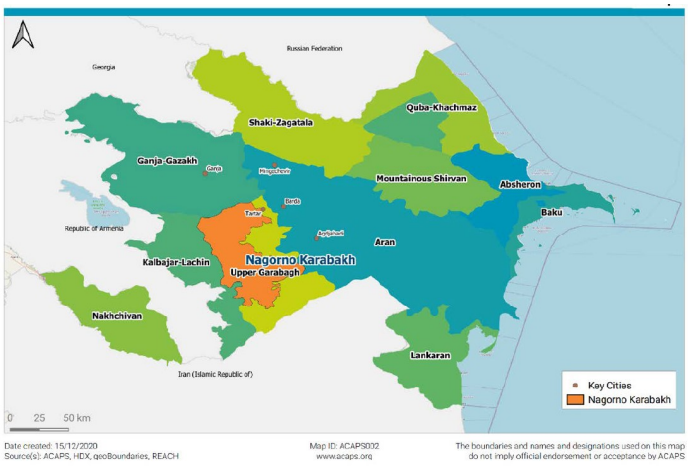
[5] Harry Hillaker, "Code One Magazine"*John Boyd, USAF Retired, Father of the F16*(1997).

[6] Greene Robertand Power.' Seduction and War, OODA and You'. (2017). http://powerseductionandwar.com/ooda-and-you/.

have the time to process it consciously; they react as trained, and their conscious mind is directed towards controlling the flow of action and reaction, continuously repeating the OODA cycle. At the same time, the opponent goes through the same cycle. One of John Boyd's main views on interception was that it was crucial to change speed and direction faster than the opponent. This can disrupt the opponent's OODA cycle. This does not necessarily depend on the aircraft's manoeuvring ability, but on the pilot thinking and acting faster than the opponent. Getting 'in the loop', short-circuiting the opponent's thought processes, creates opportunities for the opponent to react inappropriately. The same cycle works over time in a competitive business environment, where the same logic applies. Decision-makers gather information (observe), form hypotheses about customer activity and the intentions of competitors (orient), make decisions, and act on them. The cycle is repeated continuously. The aggressive and conscious application of the process gives a business advantage over a competitor who is merely reacting to conditions as they occur or who has poor awareness of the situation. Especially in business, in which teams of people are working the OODA loop, it often gets stuck at 'D',[7] and no action is taken, allowing the competition to gain the upper hand or resources to be wasted. The approach favours agility over raw power when facing opponents in any venture. Boyd brought the ethos to life through his work in the United States Air Force. He was an advocate of agile fighter aircraft, as opposed to the heavy, powerful jet fighters (such as the McDonnell Douglas F-4 Phantom II) which dominated the 1960s. He inspired the Lightweight Fighter programme which produced the successful General Dynamics F-16 Fighting Falcon and the McDonnell Douglas F/A-18 Hornet, both of which are still in use by the US and many other armed forces in the 21st century.

The six-week war in Nagorno-Karabakh

Strategic situation: Nagorno-Karabakh is a self-proclaimed state of 4,400 km^2 on the border between Europe and Asia, in the unstable geostrategic region of the Caucasus. The Nagorno-Karabakh War of Independence began in 1988 when the ethnic majority Armenians, with the help of the Socialist Republic of Armenia, decided to secede from the Socialist Republic of Azerbaijan and establish an independent state. The war, which caused widespread destruction and many human casualties, ended in 1994 with the creation of an autonomous region comprising 20%of Azerbaijan's territory.[8]Intense clashes broke out between 2008 and 2014, as the solution offered by the OSCE Minsk Group did not bring lasting peace and a resolution of the conflict, but only an immediate cessation of hostilities. The most intense battle took place between 2 and 5 April 2016, in which around 200 people were killed on both sides. The Azerbaijani side made some minimal territorial gains, but a much more important consequence of this four-day war was Azerbaijan's realization that it could use military means to regain the territories occupied by the Armenians.[9] During the fighting, Azerbaijan successfully used several types of combat drones, such as the Harop, Thunder B, Orbiter 2M, Aerostar, Hermes 450, and Heron. On the other side, the Crane combat drone used by the Armenian forces had more modest capabilities than those used by Azerbaijan.[10] The Four-Day War and the lessons learned from it on the Azerbaijani side were the basis for the events four years later.After the end of the fighting in 1994 and the ceasefire which failed to produce a lasting peace agreement, it was clear that Armenia and Azerbaijan were about to embark on a ruthless arms race – the question was not whether there would be a confrontation, but when, under what conditions, and under what circumstances it would take place. Over time, this competition became more intense. By 2006, the completion of the Baku-Supsa, Tbilisi-Ceyhan,and Baku-Tbilisi-Erzurum pipelines allowed Azerbaijan to export its natural gas, leading to an economic boost.[11] Due to its abundant oil reserves, Azerbaijan's military spending increased from $175 million in 2004 to $3.1 billion in 2011. Looking at defence expenditure as a share of GDP, Azerbaijan spent 6.2% of its GDP on defence in 2011, while Armenia's expenditure was around 4.1% at that time. It is important to note that while the Azerbaijani armed forces doubled their military potential, the Armenian side received better weapon systems in some segments as part of its military cooperation with the Russian Federation. At the same time, Armenia secured the presence of approximately 3,000 Russian troops at the Gyumri military base, and a missile command centre at a military base in its territory.[12]



(Source: www.acaps.org)

Figure 2. Armenia-Azerbaijan conflict zone

The Russian Federation worked in those years to keep the conflict free from interference from Western countries, especially the United States. It actively sought to reassure Azerbaijan by insisting on diplomatic negotiations to resolve the status of the disputed Nagorno-Karabakh region, and to restrict the sale of arms and military equipment to Azerbaijan. The Velvet Revolution, which engulfed Armenia in 2018, led to Armenia's gradual rapprochement with the West, a development which did not go down well with the Russian Federation. The newly elected Prime Minister of Armenia, Nikol Pashinyan, tried to adopt a balanced approach to the EU

[7] David G. Ullman, "'OO-OO-OO!' The Sound of a Broken OODA Loop." *CrossTalk* (2007) https://docs.wixstatic.com/ugd/20f020_65b20dec99cb45d0bd1456ed526c09b8.pdf.

[8] E. N. Schiop, "Nagorno-Karabakh Conflict and Its Implications for Citizens."*Annals of University ofOradea, Series*(2016).

[9] A. Bayramov, 'Silencing the Nagorno-Karabakh Conflict and Challenges of the Four-Day War', *Security & Human Rights*27/1–2 (2016): 116–27.

[10] R. B. Urcosta, "Drones in the Nagorno-Karabakh". Small War (2020) https://smallwarsjournal.com/jrnl/art/drones-nagorno-karabakh.

[11] M. Güneylioğlu, 'War, Status Quo, and Peace in the South Caucasus: A Power Transition Perspective', *Public Integrity* 19/4 (2017): 316–41.

[12] T. German, 'The Nagorno-Karabakh Conflict Between Azerbaijan and Armenia: Security Issues in the Caucasus', *Journal of Muslim Minority Affairs* 32/2 (2012): 216–29.

Table 1. Armenia's key weapon systems (Shaikh and Rumbaugh, 2020)

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

Table 2. Azerbaijan's key weapon systems (Shaikh and Rumbaugh, 2020)

Weapon system	Characteristics	Number	Country of origin	Year of purchase
LORA	Ballistic missile, 280km range	4 launchers/ 50 missiles	Israel	2017-2018
9K79 Tochka-U (NATO: SS-21 Scarab)	Ballistic missile, 120km range	3-4 launchers	Soviet Union	
EXTRA	Guided missile, 150km range	6 launchers/ 50 missiles	Israel	2005-2009
Bayraktar TB2	Tactical UAV		Turkey	2020
Harop	Smart munition	50	Israel	2014-2016
Orbiter 1K	Smart munition	80	Israel	2016-2019
Orbiter 3	Tactical UAV	10	Israel	2016-2017
SkyStriker	Smart munition	100	Israel	2016-2019
Hermes-900	Tactical UAV	2	Israel	2017-2018
Hermes-450	Tactical UAV	10	Israel	2008-2013
Heron	Tactical UAV	5	Israel	2011-2013
Aerostar	Reconnaissance UAV	14	Israel	2007-2012
Searcher	Reconnaissance UAV	5	Israel	2011-2013
Antonov AN-2	Converted into an UAV		Soviet Union	
BM-30 Smerch 300mm	MLRS, 90km range	30-40 launchers	Russia	2003-2005
T-300 Kasirga 300mm	MLRS, 120km range	20 launchers	Turkey	2015-2016
Belarus Polonez 300mm	MLRS, 200km range	10 launchers	Belarus	2017-2019
TOS-1A 220mm	MLRS, 6-10km range	36 launchers	Russia	2011-2017
T-300 300mm	MLRS	20 launchers	Turkey	2015-2016
T-122 122mm	MLRS	40 launchers	Turkey	2010-2014
T-107 107mm	MLRS, 11km range	30 launchers	Turkey	2010-2013
RM-70 122mm	MLRS	30 launchers	Czech Republic	2016-2018

and the Russian Federation. Unfortunately, events such as the arrest of the Secretary General of the Organization for Security and Cooperation in Europe, Yuri Khachaturov, on 26 July 2018, for attempting to overthrow the constitutional order, were not met with Moscow's understanding. This caused serious problems in terms of military cooperation between Armenia and Russia.[13] In 2010, Azerbaijan and Turkey signed two important agreements: the Strategic Partnership and Mutual Assistance Agreement, in response to the agreement allowing the presence of Russian troops in Armenian territory; and an agreement on the establishment of Turkish-Azerbaijani strategic cooperation. These agreements allowed for the strengthening of military-technical cooperation between the two countries, and the possibility of providing military assistance in the event of an attack by a third party against one of the signatory countries.[14]The Armenian side focused on strengthening its air defence and on procuring ballistic missilesas a means of deterring any attempt by the adversary to conquer the disputed area by military means. The idea of purchasing ballistic missiles was intended as a threat to power plants and other infrastructure in the event of a renewed conflict, which would derail the long-term trend of Azerbaijan's economic development. Armenia reckoned that Azerbaijan had much to lose if it decided to launch a military operation against the separatist region.[15]Azerbaijan purchased

area.[20]Azerbaijan commenced military activities due to the lack of progress in the peace negotiations, the strengthening of the Azerbaijani forces, the ineffectiveness of the OSCE Minsk Group, Turkey's desire to become a regional power, and the attitude of the Russian Federation towards the new Armenian authorities, which occasionally expressed pro-Western rhetoric. Before the conflict, a sort of tacit agreement was reached between Russia and Turkey, under which each side would satisfy some of its own aspirations.[21] The combat drones available to the Azerbaijani side played a decisive role in this war. Their capabilities enabled the Azerbaijani forces to carry out surgically precise attacks far from the front line, and to detect, monitor and destroy all those targets which posed a threat to the favourable development of the situation on the battlefield. According to the information available, combat drones contributed to the destruction of several combat

[13] A. Makarov andV.Davtyan, 'Post-velvet Revolution Armenia's Foreign Policy Challenges', *Demokratizatsiya*(2018).
[14]German, 'The Nagorno-Karabakh Conflict'.
[15]Güneylioğlu, 'War, Status Quo'.
[16] E. Toksabay, 'Turkish ArmsSales to AzerbaijanSurgedBefore Nagorno-Karabakh Fighting'(2020) https://www.reuters.com/article/armeniaazerbaijan-turkey-arms-int-idUSKBN26Z230.
[17] S. Shaikh and W.Rumbaugh. 'The Air and Missile War in Nagorno-Karabakh: Lessons for the Future of Strike and Defense' CSIS (2020)https://www.csis.org/analysis/air-and-missile-war-nagorno-karabakh-lessons-future-strike-anddefense.
[18] A. Ergun and A. Aliyev, 'An Account on Karabakh War: Why Now and Then What?.' *Panorama* (2020) https://www.uikpanorama.com/blog/2020/11/09/an-account-on-karabakh-war-why-now-and-thenwhat/.
[19] J. P. Westad, 'Another War Over', *New Internationalist* (2021).
[20] ACAPS, 'Azerbaijan and Armenia Conflict in Nagorno-Karabakh' (2020) https://reliefweb.int/sites/reliefweb.int/files/resources/20201120_acaps_short_note_update_nagorno-karabakh_0.pdf.
[21]Ergun and Aliyev, 'An Account on Karabakh War'.

systems belonging to the Armenian forces. Their penetration of the Nagorno-Karabakh hinterland weakened the Armenian supply lines and logistics. The Turkish Bayraktar TB2 combat drone showed remarkable versatility during combat. In addition to identifying, tracking and targeting objectives, TB2s were armed combat systems capable of autonomous target destruction.[22]The key advantages of combat drones over manned aircraft are reflected in their reduced resource requirements, both financial and human, which is undoubtedly one of the reasons for their massive use in the Nagorno-Karabakh war in 2020. The value of a Turkish Bayraktar TB2 combat drone is around $5 million; on the other hand, a modern combat aircraft costs tens of millions of dollars. The combat payload capacity of a combat aircraft cannot be compared to the TB2; however, lower acquisition and maintenance costs, as well as the absence of people in the cockpit, have made drone losses easier to accept.[23] In the early days of the war, Azerbaijan used obsolete An-2 aircraft converted into drones as decoy targets for Armenian air defence systems. When air defence units revealed their positions by operating on the false targets, Azerbaijan sent drones to identify these positions, followed by an attack by combat drones or disposable (kamikaze) drones.[24] Combat vehicles and other ground combat systems were easy targets for unmanned aerial systems in the absence of mobile air defence systems, electronic warfare systems, and counter-drone systems. Combat drones also carried out intelligence, surveillance, and target acquisition for the effective use of various artillery weapons.[25]The most advanced air defence systems available to the Armenian side were the S-300PT and PS series systems and the 9K37M Buk-M1, which, however, were not capable of detecting, identifying and tracking slow-moving targets such as combat drones. It should be noted that Armenia had export versions of these air defence systems with somewhat limited capabilities.[26]The Azerbaijani forces effectively used UAVs to counter Armenian air defence systems. A laser-guided smart munitions system played a major role in reducing the enemy's air defence capabilities.In the first two weeks of the conflict, the Azerbaijani forces destroyed some 60 Armenian air defence positions.[27]The Armenian side did not use electronic warfare, which could have interfered with the signals linking the combat drones to their targeting ground stations. Just before the end of the conflict, Russian troops used the Krasuka electronic warfare system from their military base in Armenian territory to prevent Azerbaijani reconnaissance in the Armenian hinterland. In these circumstances, the Azerbaijani forces relied on the Israeli Harop kamikaze drones, which are less efficient but do not require a constant link for guidance.[28]By 2010 Azerbaijan had already acquired a lightweight reconnaissance UAV, the Orbiter, from Israel, followed by orders for the larger Elbit Hermes 450 and IAI Searcher, which were used for reconnaissance purposes. Experience led to the purchase of more capable unmanned combat aerial vehicles (UCAVs) with greater flight autonomy: the IAI Heron and the Elbit Hermes 900.

In the conflicts of 2016-2020, these UCAVs were actively used for reconnaissance and fire control.[29] Israel's Harop smart munition (or the kamikaze drone) has proven to be a very effective system. Its main features are high autonomy, with or without human interaction, and its counter-radar capabilities, which proved very useful during the attacks on the Armenian air defence units.[30]Azerbaijan also acquired a number of newer models of disposable aircraft, such as the Aeronautics Orbiter 1K, the Elbit SkyStriker, and the Turkish kamikaze quadcopter STM Kargu.[31] In June 2020, just before the outbreak of the conflict, information began to circulate about Azerbaijan's purchase of a Turkish Bayraktar TB2 combat drone. In September, the first footage of these combat systems in action emerged, raising doubts about the ability of the Azerbaijani troops to fully master their use in a short period of time. Based on the testimony of the Russian troops carrying out electronic jamming near their base in Armenia, there were indications that these combat drones were being used by Turkish troops.[32]The Turkish engineers seem to have built a good drone from the subsystems available on the market, but far from the level of the products of the most developed countries in this field. The drone is distinguished by its flight duration and its ability to be armed with MAM-L and MAM-C guided mini-bombs, an anti-tank missile and a 70mm rocket, but with the drawbacks of a short range and the absence of a satellite communication channel.[33]According to known data, the losses on the Armenian side caused by Azerbaijan's unmanned combat systems are estimated at around $1 billion in lost technical assets. The destroyed equipment includes 84 tanks, 27 infantry fighting vehicles, 5 radarsystems, 25 missile systems, 32 howitzers, 155 different types of vehicles and 18 air defence systems, etc.[34]The Nagorno-Karabakh conflict in 2020 had a major impact on the understanding of warfare and on military equipment markets. During the conflict, the Armenian side relied on its links with Russia, on outdated weapons, and on the strategy of deterring a possible attack, while the Azerbaijani side had been investing in modern weapons, notably drones, for years. It should be noted that investing in drones without proper tactics does not mean much, but the Azerbaijani side had both the appropriate weapon systems and the tactics. It was a high-profile demonstration in military circles of what a small country, not recognized as a world power, can show on the battlefield with the massive use of drones.There are fears that some of the currently frozen conflicts could be reignited if one of the warring parties were to get its hands on the technology used during the Nagorno-

[22] Shaikh and Rumbaugh, 'The Air and Missile War'.
[23] B. Ho, 'Nagorno-Karabakh Conflict: The Role of Airpower. RSIS', (2020) https://www.rsis.edu.sg/wp-content/uploads/2020/10/CO20188.pdf.
[24] R. Dixon, 'Azerbaijan's DronesOwned the Battlefield in Nagorno-Karabakh – AndShowed the Future of Warfare', *The Washington Post* (2020) https://www.washingtonpost.com/world/europe/nagorno-karabkah-drones-azerbaijanaremenia/2020/11/11/441bcbd2-193d-11eb-8bda-814ca56e138b_story.html.
[25] S. Kasapoglu, 'Analysis-Five key military takeaways from the Azerbaijani-Armenian war' (2020) https://www.aa.com.tr/en/analysis/analysis-five-keymilitary-takeaways-from-azerbaijani-armenian-war/2024430.
[26] G. Gressel, 'Military Lessons from Nagorno-Karabakh: Reason for Europe to Worry', (2020) https://ecfr.eu/article/military-lessons-from-nagornokarabakh-reason-for-europe-to-worry/.
[27] Kasapoglu, 'Analysis-Five key military takeaways'.
[28] Gressel, 'Military Lessons from Nagorno-Karabakh'.
[29] A. Yermakov, 'Unmanned Aerial Vehicles over Nagorno-Karabakh: Revolution or Another Day of Battle' (2020) https://valdaiclub.com/a/highlights/unmanned-aerial-vehicles-over-nagorno-karabakh/.
[30]Kasapoglu, 'Analysis-Five key military takeaways'.
[31] Yermakov, 'Unmanned Aerial Vehicles'.
[32] J. Frew, On the Edge. Security, Protracted Conflicts and the Role of Drones in Eurasia. Drone (2021).
[33]Yermakov, 'Unmanned Aerial Vehicles'.
[34] A. Rakesh, 'Azerbaijan Destroyed Six', *Systems of Armenia: President Ilham Aliyev*.
Defenseworld.net
(2020)https://www.defenseworld.net/news/28193/Azerbaijan_Destroyed_Six_S_300_Systems_of_Armenia__President_Ilham_Aliyev#.YCO7cnko_IU.

Karabakh conflict.[35]Countries such as Ukraine, Estonia, Belarus, Armenia, Azerbaijan, and Kazakhstan have shown interest in using combat drones developed with their own production capabilities. It is worth noting that many NATO member states do not have enough tactical combat drones in their arsenals.[36] Faced with war on its own territory, in 2019 Ukraine signed a $69 million deal with Turkey to buy six Baykar TB2 drones, and has shown interest in starting its own production of combat drones.[37]Analysing the outcome of the Nagorno-Karabakh conflict, British military analysts have concluded that there is a legitimate need in modern warfare for simple combat drones such as those used by the Azerbaijani side in the conflict. They have also expressed their belief that the use of combat drones was crucial to the outcome of this war.[38] In India, the focus on brute military power has wavered since the Nagorno-Karabakh conflict between Azerbaijan and Armenia in 2020. In the face of rising tensions with Pakistan and China, India is increasingly aware that it only has a small arsenal of reconnaissance drones and smart munitions which stay in the air until they find a suitable target. It intends to focus on technologically sophisticated combat systems which it can develop itself, thereby reducing its dependence on foreign factors.[39]

Unmanned aerial systems

Armenia

Table 3. Armenia's unmanned weapon systems (Shaikh and Rumbaugh, 2020)

Name	Category/equipment	Number	Country of origin	Remarks
X-55	Reconnaissance UAV		Armenia	2014
HRESH	Smart munition		Armenia	2018
Krunk	Reconnaissance UAV		Armenia	2011
Orlan-10	Reconnaissance UAV		Russia	2020

Azerbaijan

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

Name	Category/equipment	Number	Country of origin	Remarks
Bayraktar TB2	Tactical UAV		Turkey	2020
Harop	Smart munition	50	Israel	2014-2016
Orbiter 1K	Smart munition	80	Israel	2016-2019
Orbiter 3	Smart munition	10	Israel	2016-2017
SkyStriker	Smart munition	100	Israel	2016-2019
Hermes-900	Tactical UAV	2	Israel	2017-2018
Hermes-450	Tactical UAV	10	Israel	2008-2013
Heron	Tactical UAV	5	Israel	2011-2013
Aerostar	Reconnaissance UAV	14	Israel	2007-2012
Searcher	Reconnaissance UAV	5	Israel	2011-2013
Antonov AN-2	Converted into an UAV		Soviet Union	

[35] S. Roblin, 'Cheap Drones from China, Turkey and Israel Are Fueling Conflicts Like Armenia and Azerbaijan's' *NBC News* (2020) https://www.nbcnews.com/think/opinion/cheap-drones-china-turkey-israel-are-fueling-conflictsarmenia-azerbaijan-ncna1243246.

[36] D. Hambling, *Swarm of Troopers, Archangel Ink* (2015).

[37] L. Bershidsky, 'Drones Have Raised the Odds and Risks of Small Wars' Bloomberg (2020) https://www.bloomberg.com/opinion/articles/2020-11-30/drones-have-raised-the-odds-and-risks-of-small-wars.

[38] D. Sabbagh, UK Wants New Drones in Wake of Azerbaijan Military Success." *The Guardian* (2020) https://www.theguardian.com/world/2020/dec/29/uk-defencesecretary-hails-azerbaijans-use-of-drones-in-conflict.

[39] A. P. Snehesh, 'Drones Won the War for Azerbaijan. India Must Spend Military Modernisation Money Wisely' *Print*. (2020) https://theprint.in/opinion/brahmastra/drones-won-war-for-azerbaijan-india-must-spend-militarymodernisation-money-wisely/548029/.

War doctrines of the warring parties

Armenia: The President of the Republic of Armenia, Robert Kocharian, signed Armenia's official military doctrine, which describes Azerbaijan's commitment to regaining Nagorno-Karabakh as a key threat to Armenia's national security, and asserts the right of Yerevan, as Armenia's capital, to launch pre-emptive military strikes against potential aggressors. The doctrine, approved by Kocharian's National Security Council on 27 December 2007, states that 'in the event of an imminent threat of armed aggression, the Republic of Armenia reserves the right to take military action to neutralize it'. The 18-page document was prepared by a special commission of the Armenian Ministry of Defence, in cooperation with national and international experts. Its main points are in line with the separate 'National Security Strategy' signed by the President in February 2007. Both documents were developed as a result of Armenia's decision to deepen its defence and security links with NATO and other Western security structures. Since then, the Armenian government has built on its participation in NATO's Partnership for Peace programme by negotiating an 'Individual Partnership Action Plan' with the US-led alliance. Accordingly, the military doctrine states that Armenia will increasingly cooperate with the armed forces of NATO member states, and in particular the US, in reforming its military and contributing to international security.

Yerevan is specifically committed to expanding its participation in Western-led peacekeeping operations abroad. The Armenian armed forces already have small contingents in Kosovo and Iraq, and at the same time were considering joining the NATO-led multinational force in Afghanistan. However, the doctrine also makes it clear that the 'strategic partnership' with the Russian Federation will remain the cornerstone of Armenia's defence policy. The two countries will continue to maintain close military ties both bilaterally and within the framework of the Collective Security Treaty Organization led by the Russian Federation. The Nagorno-Karabakh conflict and Azerbaijan's persistent threats to resolve it by force are high on the list of 'external threats' to Armenia's security contained in the document. 'The Republic of Armenia is the guarantor and defender of the security of the people of the Republic of Nagorno-Karabakh, and their chosen path of development'. Other alleged security threats include Turkey's 'strategic alliance' with Azerbaijan, and Armenia's continued economic blockade.[40]

Azerbaijan: On 8 June 2007, the Azerbaijani parliament approved, by 110 votes to two with one abstention, a draft military doctrine to complement the national security doctrine ratified by the Azerbaijani President, Ilham Aliyev, in May 2007. The draft was first submitted to the parliament three years before, but its ratification was postponed several times and was apparently amended after the Russo-Georgian war in August 2008.The doctrine outlines the main threats facing the Republic of Azerbaijan; the military and strategic foundations of its national security; the main objectives of its armed forces in war and peace; and the prospects for the further strengthening of the country's military potential. The first of these threats is the continued occupation of Azerbaijani territory by Armenian forces. In this context, the doctrine confirms that 'any political, military, economic or other

[40]"Armenian Doctrine–GlobalSecurity.org" (2017) https://www.globalsecurity.org/military/world/armenia/doctrine.htm.

support to the Republic of Armenia, and to the separatist regime created with the support of Armenia on Azerbaijani territory, in order to secure official recognition of the results of the occupation, will be interpreted as an act directed against the Republic of Azerbaijan'. Other threats include possible foreign military interference in Azerbaijan's internal affairs; claims by neighbouring countries to Azerbaijani territory; actions aimed at destabilizing the domestic political and economic situation, including support for separatist and extremist religious movements; and the infiltration of illegal armed groups and terrorists into Azerbaijan. It also mentions the 'violation of the regional military balance', i.e. the deployment of troops close to Azerbaijan's national borders or territorial waters; the involvement of neighbouring countries in inter-state conflicts (i.e. a repeat of the Russo-Georgian war of August 2008); and the 'existence of domestic conflicts or armed disturbances', which means that the country reserves the right to use military force against its own citizens. Azerbaijani officials never miss an opportunity to condemn Armenia for doing just that after the disputed presidential elections in February 2008. Further threats included in the initial draft doctrine include attacks on sites of military or economic importance (probably primarily oil and gas pipelines and pumping stations); organized crime, terrorism and smuggling; and information warfare. The doctrine confirms that Azerbaijan has no intention of launching military operations against any other country unless it becomes a 'victim of aggression'. It also rules out war as a means of exerting pressure on the independence of other countries, or as a means of resolving international conflicts. The doctrine does not foresee the deployment of foreign military bases on Azerbaijani soil, except in the circumstances provided for in the international treaties ratified by Azerbaijan. Nor does the doctrine cite integration with the Euro-Atlantic structures as a strategic objective. This omission is not surprising in the light of Azerbaijan's apparent lack of interest, despite its declarations to the contrary, in joining NATO. In contrast, the initial draft of the doctrine highlighted the importance of military cooperation with Turkey, NATO, and the members of GUAM (Georgia, Ukraine and Moldova).The final doctrine still confirms Azerbaijan's continued readiness to cooperate with NATO. In February 2009, Lieutenant General Vahid Aliyev, the President's military adviser, told the Azerbaijan news agency that the doctrine 'might' be submitted to parliament for debate during the spring session. This statement suggested that the original draft may have been withdrawn and revised after the Russo-Georgian war in August 2008.[41]

Comparison of the military doctrines of the two parties involved: The Armenian and Azerbaijani military doctrines described in the preceding sections are derived from publicly available sources, and are not available as a complete document. At the same time, they come from a period which, alongside the rapid technological development in the field, also represents a considerable time lag. Nevertheless, on the basis of the methodology used by Posen (1984), and by comparing the available sources for the above sections and the sources defining the strategic background of the Nagorno-Karabakh conflict, we can conclude that:

- The military doctrines of both countries are mainly defensive. The organization of the armed forces and weapon systems are adapted accordingly. Both countries envisage offensive activities for the purpose of preserving or acquiring territory they perceive as their own, which in our case is Nagorno-Karabakh.
- The military doctrines follow the national strategy, probably with some delay. Political developments in Nagorno-Karabakh are generally followed by military activities which support the previous activities. The two countries are forming international alliances, even with the same allies, although these are chosen more discreetly when it comes to unresolved mutual issues.
- The most significant discrepancies in the case of the Nagorno-Karabakh war and the military doctrine applied can be found in the area of obsolescence or innovation. Armenia's military doctrine is based on the concept of defence and deterrence with equipment which is outdated, or noticeably older than that of the opposing side. So are the tactics used. On the opposing side, Azerbaijan has invested heavily in weapons systems and their use in recent years. The most visible and decisive factor in the last war was the acquisition of a wide range of drone systems and, above all,investment in the development of innovative tactics, which gave the country an advantage in specific conflicts in the last war.

The course of the war and the explanatory power of john Boyd's strategic theory: The military dimension of the Second Nagorno-Karabakh War will be discussed by highlighting the following qualities of the campaign: command and control; the importance of manoeuvre warfare; flexibility of tactics; and the joint capabilities of the armed forces. The condition of command and control is an issue which can disrupt or enhance the operational tempo in contemporary warfare. The western mindset of warfare implemented this idea in the decades following World War II. The practical implications and theoretical works of US Air Force Colonel John Boyd set a solid background for this understanding.[42] Additionally, the rapid growth of technological solutions since the 1980s has had an enormous impact on new command and control (C2) capabilities. These capabilities are advocated by the US Department of Defense, followed by multiple coalition partners working on updated radio networks and satellite communications, and developing advanced beyond-line-of-sight data sharing solutions.The Second Nagorno-Karabakh War highlighted the two most important competing factors of C2 capabilities: the reliability of secure communications and integrated sensors for data sharing. Both aspects of reliable C2 require the available technological solutions, and personnel capable of operating this technology. In both cases, the leading role was taken by the Azerbaijani side. Communication technology was not excluded from the constant modernization of its armed forces. During the war, the Azerbaijani armed forces demonstrated their ability to synchronize and carry out flanking manoeuvres from the south and north towards Nagorno-Karabakh. Given the high altitude and reduced line of sight of the area, this tactical initiative provided a key advantage.[43] In addition, the integration of surveillance and reconnaissance sensor data into the tactical decision-making process was also a key strength of the advancing Azerbaijani

[41] Azerbaijan Military Doctrine–GlobalSecurity.org (2015) https://www.globalsecurity.org/military/world/azerbaijan/doctrine.htm.

[42] F. Osinga, 'The enemy as a complex adaptive system: JohnBoyd and airpower in the postmodern era', in Olsen, A. (Ed.), Airpower Reborn: The Strategic Concepts of John Warden and JohnBoyd. (Annapolis, MD: Naval, 2015).

[43] Lithuanian Land Force Command, Nagorno-Karabakh War Analysis. Vilnius, Lithuania: G2 Intelligence Analysis Branch (2020): 6.

forces. In this area, some research suggested that technology supplied by Turkey and Israel played a key role during the tactical campaign.[44] The integration of sensors enhanced the situational awareness of the Azerbaijani forces and facilitated tactical decisions at various tactical levels.[45]The Armenian forces fought a fierce defensive battle to hold the planned elevated areas.[46] This operational decision led to the preparation of deliberate defensive positions with a more static landline and short-range communication capability. Disrupted lines of defence and the transition to mobile defence in the last phase of the war indicated possible inadequate C2 support, as the Armenian units were forced to adapt to manoeuvre warfare.It is worth mentioning that manoeuvre warfare was another feature which implied tactical differences during the Nagorno-Karabakh war. In this case, the Armenian side used a static defence, while the Azerbaijani forces relied on offensive manoeuvres. Manoeuvre in this mountainous terrain required rapid positioning and continuous support from integrated direct and indirect fire systems. This was tactically much more challenging given the limited avenues of approach in Nagorno-Karabakh. The limited manoeuvre space for the weapons systems, and the increased need to overwhelm the adversary with fire support from a distance, were an essential part of the breakthrough advantage. In this war, tanks and armoured infantry fighting vehicles became valuable targets. The neutralization of these targets significantly reduced manoeuvre capabilities.[47] Thus, the Second Nagorno-Karabakh War demonstrated that tanks can turn from agile hunters into easily identifiable targets.[48]The military practice of this war suggested that success in manoeuvre warfare depends heavily on the capabilities of integrated combat support. This is a classic concept of manoeuvre warfare which has been repeatedly proven in contemporary military campaigns.[49] The case of Nagorno-Karabakh demonstrated that the advantage of manoeuvre was not only based on skilful tactics and the exploitation of the surrounding terrain, although this could have been the operation planning estimate of the Armenian side; this war demonstrated the success of manoeuvre based on technological improvements.[50] This finding is supported by the remarkable examples of the dominance of unmanned aerial vehicles as an integrated weapons system. Previous observations of the Nagorno-Karabakh fighting highlighted the improved use of unmanned aerial platforms, and their effectiveness against armoured targets,[51] but this is only one side of the coin. The other side of manoeuvre warfare must also be analysed;elements of the Azerbaijani offensive suggested that their manoeuvre was intentionally covered by outreaching UAV capability and target data transmission. These technologically enabled elements of offensive manoeuvre required extended situational awareness and rapid target elimination with all available weapons systems. This is a quality of the offensive manoeuvre that needs to be assessed and adopted further beyond the case of the Second Nagorno-Karabakh War. Rapid manoeuvre, enabled by enhanced situational awareness, and supported by integrated fire support, has broader implications for the changing understanding of warfare. The high ground of Nagorno-Karabakh was a battlefield where deliberate defence on dominant difficult terrain, supported by massive artillery, was met with rapid manoeuvre supported by increased situational awareness and precise strike capabilities. The initial outcomes of the war suggested more devastating fire and manoeuvre applied by the Azerbaijani forces. Initial battle damage assessments suggested that Armenia lost about six times more tanks, and about 16 times more artillery pieces, not to mention the destruction of air defence positions,by the integrated surveillance and strike capabilities of the Azerbaijani forces.[52]The identified advantages in the military dimension of the war suggest that advanced manoeuvre supported by technological capabilities spared some additional troops for the Azerbaijani forces to implement an additional offensive in the north, and to conduct an astounding light force manoeuvre to retake the highland of Shusha town.[53]

In practical terms, all this suggests that technologically advanced military forces have more flexibility of where and for what purpose to task their infantry. As the war over Nagorno-Karabakh has shown, the pure role of infantry is still essential for the consolidation of gains.This overview of the military dimension implied by the strategic setting of this conflict suggests some key lessons to be learned from Nagorno-Karabakh. First, there is an increased need to have a reliable and adaptive decision cycle in a contemporary war campaign. This decision cycle must be agile and resilient despite the environment, operational changes, and counter effects. Another lesson suggests that armoured formations must be protected and exploited more thoroughly. Danger to armoured manoeuvre is concentrated not only in terrain obstacles, but in minefields and the concentrated fire power of an adversary. Another significant source of danger is the increased lethality of unmanned aerial systems. As General James C. McConville, Chief of Staff of the US Army, has recently suggested, unmanned aerial vehicles should be considered as a new improvised explosive device type threat. The third lesson indicates the importance of a joint approach to the use of military forces. During the Second Nagorno-Karabakh War, two different war fighting capabilities collided. The outcome of this war shows that there is no second place in contemporary war. Furthermore, this war indicates that joint force employment based on speed, range and convergence provides an increased possibility of victorious achievements. Contemporary warfare becomes a competition based on the joint capabilities of irregular warfare elements, regular forces, and combat support empowered by educated, well-trained specialists.[54] SWOT analysis of the applicability of combat drones in local conflicts. The presented SWOT (strengths, weaknesses, opportunities and threats) analysis is the result of an analysis of the massive use of combat drones in conflicts

[44] Shaikh and Rumbaugh, 'The Air and Missile War in Nagorno-Karabakh'.
[45] H. Mirza, Presentation of Azerbaijani Tactical Solutions and Aspects of War, Conference of the Nagorno-Karabakh war Analysis (Vilnius, Lithuania, 2021).
[46] Lithuanian Land Force Command, Nagorno-Karabakh War Analysis.
[47]Lithuanian Land Force Command, Nagorno-Karabakh War Analysis.
[48] N. Reynolds and J. Watling, 'Your Tanks Cannot Hide. RUSI Defense Systems' (2020) https://rusi.org/explore-our-research/publications/rusi-defence-systems/your-tanks-cannot-hide.
[49] J. Rayburn and F. Sobchak, eds 'The U.S.' *Army in the Iraq War: Surge and Withdrawal 2007–2011* (Carlisle, PA: US Army War College, 2019).
[50] P. Remler, 'OSCE Minsk Group: Lessons from the past and Tasks for the Future'. *OSCE in-Sights, Issue* 6 (2020).
[51] J. Watling, *The key to Armenia's tank losses: the sensors, not the shooters', RUSI Defence Systems*. (2020) https://rusi.org/explore-our-research/publications/rusi-defence-systems/the-key-to-armenia%E2%80%99s-tank-losses-the-sensors-not-the-shooters.
[52]Lithuanian Land Force Command, Nagorno-Karabakh War Analysis.
[53]*The New York Times*, 'AzerbaijanClaimsCapture of KeyTown in Nagorno-Karabakh', (2020) https://www.nytimes.com/2020/11/08/world/europe/nagorno-karabakh-azerbaijan-shusha. html.
[54] J. C. McConville, "'Not fighting the last war better', in Western Way of War" [Podcast series] *Episode*, (1958) https://rusi.org/podcasts/western-way-of-war/episode-58-general-james-mcconville-not-fighting-last-war-better.

around the world, with a focus on the conflicts of the past decade (war in Syria, war in Yemen, and finally the conflict over Nagorno-Karabakh in 2020). These conflicts, especially that between Armenia and Azerbaijan, have demonstrated that combat drones can be crucial to the outcome of an armed conflict.

Strengths: Combat drones have low purchase and operating costs compared to other combat systems. The MQ-9 Reaper combat UAV has a purchase price of $6.48 million and operating costs of close to $3 million. The hourly rate is $3,250 per hour. Compared to this, the fifth-generation F-35 Joint Strike Fighter is priced at $91 million per aircraft, its operating costs are $5 million, and the cost per flight hour is $16,500.[55]Using combat drones it is possible to attack targets anywhere on the planet without putting the pilot at risk.[56] A standard manned fighter aircraft not only endangers the pilot's life in the event of an accident, but can also cause major diplomatic damage to a country. The use of combat drones reduces the potential political risks.[57]Unmanned aerial vehicles are capable of performing different types of missions. These include intelligence, surveillance, reconnaissance, and strike missions. In the near future, thesepossibilities will probably be expanded to resupply, combat search and rescue, refuelling, and air combat missions.[58] Improving combat drone performance could certainly affect the withdrawal from use of some older manned combat aircraft.Combat drones have the ability to fly at extremely low altitudes, which makes them a very difficult target for the enemy.[59] An analysis of the Nagorno-Karabakh conflict in 2020 showed how much this characteristic of military drones, in combination with low flight speed, was an obstacle to the Armenian Air Defence.

Weaknesses: Combat drones have a lower ability to carry combat payload than manned combat aircraft. They are also limited in terms of the weight and size of the sensor, which primarily refers to the possibility of carrying long-range radar. Combat drones are relatively slow, and their engines can be noisy, making them much easier to detect. Their low speed causes greater exposure to enemy fire. Drones are also limited by the weather conditions during the operation, be it extreme temperatures, fog, rain, wind, and so on.[60] Dynamic weather conditions have a great influence on the behaviour of the aircraft itself.[61] During the military operations in Nagorno-Karabakh, the presence of drones was noticeably reduced during bad weather. Enemy combat drone detection techniques include audio detection, video detection, motion detection, thermal detection, radar detection, and RF detection. Anti-drone countermeasures include modern laser systems such as the Advanced Test High Energy Asset (ATHENA), Rafael's Drone Dome and Boeing's Compact Laser Weapon System (CLWS), among others.[62]During the Nagorno-Karabakh conflict, the Russian S-300, Tor, and Osa missile systems proved ineffective against the Azerbaijani combat drones, primarily due to the inability of their radar to detect drones.[63]

Opportunities: Global spending related to the research, development and procurement of combat drones is expected to increase from $11.1 billion in 2020 to $14.3 billion by 2029, an increase of nearly 30%.[64] Israel, the United States, and China are the leading manufacturers of combat drones.[65] For many years, the United States supplied combat drones exclusively to NATO members, but in 2018 India became the first non-NATO country to procure sophisticated US equipment. Israel is the largest exporter of military drones in the world. Its contractual obligations accounted for 41% of all drones reported between 2001 and 2011. China is increasingly present as an exporter of combat drones due to its liberal export policy. Its biggest customers are countries like Pakistan, Iraq, Nigeria, and others.[66]In 2018, the Russian base Hmeimim in Syria was attacked by low-tech homemade combat drones built by Syrian rebels. Although no major damage was caused, this attack shows that even simple drones, built without the use of high technology, can achieve the desired goal. There is a large range of equipment on the market today which can be used to build modern drones. For example, Turkish combat drones are made from commercially available components from various manufacturers: the electronic circuits are made in the UK, the aircraft engines in Austria, and the optoelectronic equipment is of Canadian origin.[67]The purchase of combat drones from foreign sources has resulted in countries which have been using these solutions for many years beginning to develop their own models, and thus improving their defence industry. As a result of military cooperation with Israel, Azerbaijan has managed to independently develop the Zerbe (Strike) drone, which closely resembles the Israeli Orbiter 1K.[68] Combat drones can serve as a rapid and effective response to a potential threat. Whether it is reconnaissance of enemy troop movements or surgically precise attacks on targets, both on the front line and far behind enemy lines, the recent conflict in Nagorno-Karabakh has shown that combat drones can also be a powerful propaganda weapon. Numerous drone strikes were publicly broadcast online and in other media in the Azerbaijani capital Baku.[69] Every moment of destruction, whether of military equipment or of attacks on soldiers in the trenches, was accurately recorded, with brutal footage of individual attacks even filmed from several different angles in high definition.

[55] W. McLean, 'Drones Are Cheap, Soldiers Are Not: A Cost–Benefit Analysis of War' (2014) https://theconversation.com/drones-are-cheap-soldiers-are-not-a-costbenefit-analysis-of-war-27924.
[56] A. W. Dowd, 'Drone Wars: Risks and Warnings', *US Army War College Quarterly: Parameters* 43/1 (2013).
[57] Qaisrani, I. H., L. A. Ali, M. N. Mirza, and A. A. Naqvi. Unmanned Aerial Vehicles: A Revolution in the Making. *South Asian Studies* (2016).
[58] E. Rudaski, *Drone Strikes: Effectiveness, Consequences and Unmanned Aerial Systems Background* (Nova Science Publishers, Inc, 2014).
[59] Szabolcsi, 'Flight Path Planning for Small UAV Low Altitude Flights', *Land Forces Academy Review* 25/2 (2020): 159–67.
[60] J. P. Yaacoub, H. Noura, O. Salman, and A. Chehab, 'Security Analysis of Drones Systems: Attacks, Limitations, and Recommendations', *Internet of Things* 11 (2020).
[61] B. Shahzaad, A. Bouguettaya, S. Mistry, and A. G. Neiat, 'Resilient Composition of Drone Services for Delivery', *Future Generation Computer Systems* 115 (2021): 335–50.
[62] Yaacoub et al. 'Security Analysis of Drones Systems'.
[63] F. Shahbazov, 'Tactical Reasons Behind Military Breakthrough in Karabakh Conflict' (2020) https://jamestown.org/program/tactical-reasons-behind-military-breakthrough-in-karabakh-conflict/. Jamestown Foundation.
[64] J. Harper, '$98 Billion Expected for Military Drone Market' *National Defense* (2020) https://www.nationaldefensemagazine.org/articles/2020/1/6/98-billionexpected-for-military-drone-market.
[65] V. Chamola, Pavan Kotesh, Aayush Agarwal, Gupta Naren, Navneet Gupta, and Mohsen Guizani, 'A Comprehensive Review of Unmanned Aerial Vehicle Attacks and Neutralization Technique', *Ad Hoc Networks* 111 (2021): 102324.
[66] New America, 'Introduction: How We Became a World of Drones. New America' (2020) https://www.newamerica.org/internationalsecurity/reports/world-drones/introduction-how-we-became-a-world-of-drones.
[67] Yermakov, 'Unmanned Aerial Vehicles'.
[68] Z. Shiriyev, 'Azerbaijan Looks to Greater Reliance on Domestically Produced Weapons' *Urasianet* (2016) https://eurasianet.org/azerbaijan-looksgreater-reliance-domestically-produced-weapons.
[69] Shaikh and Rumbaugh, 'The Air and Missile War'.

Footage of combat drone strikes on Armenian infantry units trying to help wounded comrades who had already been victims of earlier attacks was widely broadcast. This was meant to give the impression that there is no hope of hiding from an attack, which can happen at any moment and against which there is no effective protection.

Threats: The use of combat drones in conflicts around the world often results in numerous civilian casualties, despite high-quality sensors which can accurately monitor the situation on the ground. Even when it comes to military operations, civilian casualties are high. According to research by human rights organizations, 1,141 people have been killed in US drone attacks targeting 41 people.[70]The conflict in Nagorno-Karabakh in 2020 was characterized by the intensive use of smart munitions (so-called 'loitering munition' systems). Smart munitions are a kind of hybrid between drones and guided missiles. These systems are able to stay in the air for a longer period of time before hitting the target, giving the operator time to select a target and to choose the exact time of the attack. Some smart munition systems are capable of autonomously engaging targets without human control, which raises moral dilemmas about the use of such combat systems. It should be noted that low-cost smart munitions or 'kamikaze drones' can also be used in swarm form; there is currently no effective protection against such aerial threats.[71]Today, countries which own combat drones are able to use this low-cost technology much more aggressively against countries which do not. Nine countries have used drones for military purposes to this date, while at least twenty countries are working intensively on their development.[72] However, it is important to point out the fact that no matter how drones are armed, they cannot achieve their objectives on their own, without cooperating with other combat systems and units. This is especially evident when the enemy uses a variety of means to intensely and effectively counter drones.

CONCLUSION

Every day we see the greater use of drones for military purposes. Many countries are turning from importers of foreign technology into renowned manufacturers of their own systems. Given the relatively low cost and high efficiency of these systems, their use is gradually moving from sporadic to widespread.The Nagorno-Karabakh war in 2020 showed how the dominance of combat drones on the one hand, and the lack of certain combat systems on the other, can be reflected in the final outcome. During this war, Azerbaijani combat drones destroyed a large number of Armenian armoured vehicles. The purchase price of a combat drone and a tank used during the conflict is more or less similar when comparing a modern combat drone and an older tank. However, one should not immediately conclude that armoured technology no longer has a place on the modern battlefield; quite the opposite. But in the absence of quality air defence systems and electronic warfare capabilities, things simply cannot go as planned. The whole world watched as a relatively modest military force inflicted extremely heavy losses on the other conflicting side in terms of manpower and technology, through the mass use of drones for various purposes. The role of drones in the war ranged from directing artillery fire on enemy positions, reconnaissance missions, and attacks by armed drones on enemy targets, to the constant use of drones as smart munitions. The war in Syria was a testing ground for some new technologies; however, the Nagorno-Karabakh war in 2020 was a materialization of everything that has been learned about the use of combat drones on the modern battlefield. A careful analysis of the war and its consequences is the basis for the conclusion that the conflict in Nagorno-Karabakh in 2020 represents a turning point in the use of drones, and that the consequences of this conflict will greatly influence the perception of combat drones as a combat system in the years to come. Over the past decade, drones have been used in a number of military operations, proving to be an efficient and cost-effective tool for a variety of tasks. It has also become clear that the system is equally well suited to civilian needs. Drones can perform tasks which are currently carried out by manned aircraft at lower cost, or which cannot be carried out efficiently or safely by conventional aircraft. Capabilities and technological developments have already far surpassed the basic role in which drones provided real-time situational awareness on the battlefield. They are now capable of carrying out direct combat support from the air and all other support tasks which require the presence of certain weapons or technical systems over the area of operations with full credibility. The analysis of the Nagorno-Karabakh conflict shows that upgrading conventional combat systems with advanced drone technology solutions and their innovative use is an advantage compared to the use of conventional technology and its application on the battlefield. This is also confirmed by the application of Boyd's theory. In the OODA cycle (observation-orientation-decision-action), unmanned technology represents a significant time saving in both the observation and action phases, as the new technology allows a virtually continuous presence in the area of operations with combat systems that have both a reconnaissance and a kinetic function. This means a direct advantage over the adversary, and the additional and invaluable benefit of keeping people out of risk zones for all activities.The Nagorno-Karabakh war was the first war in which unmanned aerial systems played a key role. With a similar military doctrine, combat systems used (leaving aside Azerbaijan's advanced drone technology), and an almost identical view of the disputed area, an innovative approach in the use of the new technology gave the winning side a key advantage. The use of deception, new reconnaissance capabilities, the integration of reconnaissance and fire support on the same platform, and the use of intelligent weapon systems enabled the Azerbaijani armed forces to accelerate the OODA cycle. This enabled extremely rapidfire manoeuvre, which caused the enemy several times more damage and casualties than expected using conventional warfare. All the advantages offered by the mountainous terrain were lost. The OODA cycle supported by modern technology was faster. The impasse in the decision-making process on the opposing side was caused not only by the new technology itself, but also by the remarkable innovation in the use of modern technology. As the adversary was not aware of the new tactics, these were not built into their OODA cycle, so theywere unable to respond in an appropriate way.The innovative use of modern technology enabled a faster OODA cycle on the Azerbaijani side, without interruptions, while at the same time slowing down and stopping the same

[70] A. Vacca, and H. Onishi. 'Drones: Military Weapons, Surveillance or Mapping Tools for Environmental Monitoring? The Need for Legal Framework Is Required', *Transportation Research Procedia* 25 (2017): 51–62.
[71] M. Holland and D. Gettinger, 'Loitering Munitions in Focus. The Center for the Study of the Drone at Bard College' (2017) https://dronecenter.bard.edu/files/2017/02/CSD-Loitering-Munitions.pdf.
[72] C. B. Parker, 'Armed Drones Changing Conflict Faster than Anticipated, Stanford Scholar Finds' (2018) https://news.stanford.edu/2018/03/05/armed-drones-changing-conflict-faster-anticipated/.

cycle on the opponent's side. The result was a military victory; as Colonel John Boyd also argued, in war, whoever has the faster ODDA cycle wins. In this way, Boyd's theory, used in this article, explains the victor in the Second Nagorno-Karabakh War well.

REFERENCES

1. "Armenian Doctrine – GlobalSecurity.org, 2017". https://www.globalsecurity.org/military/world/armenia/doctrine.htm.
2. "Azerbaijan Military Doctrine – GlobalSecurity.org, 2015." 2017. https://www.globalsecurity.org/military/world/azerbaijan/doctrine.htm.
3. "Defense and the National Interest, Organic Design for Command and Control." *John R. Boyd, 2005*. https://pdfs.semanticscholar.org/6ca9/63358751c859d7b68736aca1aa9d1a8d4e53.pdf.
4. ACAPS. 2020. "Azerbaijan and Armenia Conflict in Nagorno-Karabakh". https://reliefweb.int/sites/reliefweb.int/files/resources/20201120_acaps_short_note_update_nagorno-karabakh_0.pdf.
5. Andrius, Bivainis. 2022. "Multidimensional Assessment of the Second Nagorno-Karabakh-War, Defense and Security Innovations".https://securityanddefence.pl/Multi-dimensional-assessment-of-the-Second-Nagorno-Karabakh-War.
6. Austin, R. 2010. *Unmanned Aircraft Systems: UAVS Design, Development and Deployment*. John Wiley & Sons Ltd.
7. Bayramov, A.,'Silencing the Nagorno-Karabakh Conflict and Challenges of the Four-Day War',*Security & Human Rights* 27/1–2 (2016): 116–27. https://doi.org/10.1163/18750230-02701009.
8. Bershidsky, L. 2020. "Drones Have Raised the Odds and Risks of Small Wars". Bloomberg. https://www.bloomberg.com/opinion/articles/2020-11-30/drones-have-raised-the-odds-and-risks-of-small-wars.
9. Boyd, John R. Sept. 3 1976. *Destruction and Creation (PDF)*. U.S. Army Command and General Staff College.
10. Chamola, Vinay, Pavan Kotesh, Aayush Agarwal, Gupta Naren, Navneet Gupta, and Mohsen Guizani. 'A Comprehensive Review of Unmanned Aerial Vehicle Attacks and Neutralization Techniques.'*Ad Hoc Networks* 111 (2021): 102324. https://doi.org/10.1016/j.adhoc.2020.102324.
11. Dixon, R. 2020. "Azerbaijan's Drones Owned the Battlefield in Nagorno-Karabakh – And Showed the Future of Warfare." *The Washington Post*. https://www.washingtonpost.com/world/europe/nagorno-karabkah-drones-azerbaijanaremenia/2020/11/11/441bcbd2-193d-11eb-8bda-814ca56e138b_story.html.
12. Dowd, A. W. "Drone Wars: Risks and Warnings." *US Army War College Quarterly: Parameters* 43/1 (2013). https://doi.org/10.55540/0031-1723.3016.
13. Ergun, A., and A. Aliyev. 2020. "An Account on Karabakh War: Why Now and Then What?." *Panorama*. https://www.uikpanorama.com/blog/2020/11/09/an-account-on-karabakh-war-why-now-and-thenwhat/.
14. Frew, J. 2021. *On the Edge. Security, Protracted Conflicts and the Role of Drones in Eurasia. Drone*.
15. German, T., "The Nagorno-Karabakh Conflict Between Azerbaijan and Armenia: Security Issues in the Caucasus." *Journal of Muslim Minority Affairs* 32/2 (2012): 216–29. https://doi.org/10.1080/13602004.2012.694666.
16. Gregl Dominik, Letalski razlagalni slovar. *Samozaložba*. 2009.
17. Gressel, G. 2020. "Military Lessons from Nagorno-Karabakh: Reason for Europe to Worry".https://ecfr.eu/article/military-lessons-from-nagornokarabakh-reason-for-europe-to-worry/.
18. Güneylioğlu, M., War. "War, Status Quo, and Peace in the South Caucasus: A Power Transition Perspective." *Public Integrity* 19/4 (2017): 316–41. https://doi.org/10.1080/10999922.2017.1302868.
19. Hambling, David. 2015. *Swarm of Troopers, Archangel Ink*.
20. Harper, J. 2020. $98 Billion Expected for Military Drone Market. *National Defense*. https://www.nationaldefensemagazine.org/articles/2020/1/6/98-billionexpected-for-military-drone-market.
21. Hillaker, Harry."Code One Magazine." *John Boyd, USAF Retired, Father of the F16*. Jul. 1997.
22. Ho, B. 2020. "Nagorno-Karabakh Conflict: The Role of Airpower. RSIS". https://www.rsis.edu.sg/wp-content/uploads/2020/10/CO20188.pdf.
23. Holland, M., and D. Gettinger. 2017. "Loitering Munitions in Focus. The Center for the Study of the Drone at Bard College". https://dronecenter.bard.edu/files/2017/02/CSD-Loitering-Munitions.pdf.
24. Jordan, David. 2008. *Understanding Modern Warfare*. Cambridge University Press.
25. Kasapoglu, S. 2020. https://www.aa.com.tr/en/analysis/analysis-five-keymilitary-takeaways-from-azerbaijani-armenian-war/2024430. ANALYSIS-Five key military takeaways from the Azerbaijani-Armenian war.
26. Lithuanian Land Force Command. 2020 Nagorno-Karabakh War Analysis. Vilnius, Lithuania: G2 Intelligence Analysis Branch. "Staff" 2020: 6.
27. Makarov, A., and V. Davtyan. 2018. "Post-velvet Revolution Armenia's Foreign Policy Challenges." *Demokratizatsiya*.
28. Mc Conville, J. C. 2021. "'Not fighting the last war better', in Western Way of War" [Podcast series]. *Episode*, Accessed August 5, 1958. https://rusi.org/podcasts/western-way-of-war/episode-58-general-james-mcconville-not-fighting-last-war-better.
29. McLean, W. 2014. "Drones Are Cheap, Soldiers Are Not: A Cost–Benefit Analysis of War". https://theconversation.com/drones-are-cheap-soldiers-are-not-a-costbenefit-analysis-of-war-27924.
30. Mirza, H. 2021. *Presentation of Azerbaijani Tactical Solutions and Aspects of War, Conference of the Nagorno-Karabakh war Analysis*. Vilnius, Lithuania.
31. Muhsin, D. 2019. "Houthi Use of Drones Delivers Potent Message in Yemen War. IISS". https://www.iiss.org/blogs/analysis/2019/08/houthi-uav-strategy-inyemen.
32. New, America. 2020. "Introduction: How We Became a World of Drones. New America". https://www.newamerica.org/internationalsecurity/reports/world-drones/introduction-how-we-became-a-world-of-drones.
33. Parker, C. B. 2018. "Armed Drones Changing Conflict Faster than Anticipated, Stanford Scholar Finds". https://news.stanford.edu/2018/03/05/armed-drones-changing-conflict-faster-anticipated/. Stanford.
34. Posen, Barry R. 1984. *The Source of Military Doctrine*. Cornell University Press.
35. Qaisrani, I. H., L. A. Ali, M. N. Mirza, and A. A. Naqvi. 2016. "Unmanned Aerial Vehicles: A Revolution in the Making." *South Asian Studies*.
36. Rakesh, A. 2020. "Azerbaijan Destroyed Six." *Systems of Armenia: President Ilham Aliyev*. Defenseworld.net. https://www.defenseworld.net/news/28193/Azerbaijan_Dest

royed_Six_S_300_Systems_of_Armenia__President_Ilham_Aliyev#.YCO7cnko_IU vol. S-300.
37. Rayburn, J., and F. Sobchak, eds. 2019. "The U.S." *Army in the Iraq War: Surge and Withdrawal 2007–2011* Vol. 2. Carlisle, PA: US Army War College.
38. Remler, P. 2020. "OSCE Minsk Group: Lessons from the past and Tasks for the Future." *OSCE in-Sights, Issue* 6.
39. Reynolds, N., and J. Watling. 2020. "Your Tanks Cannot Hide. RUSI Defense Systems". https://rusi.org/explore-our-research/publications/rusi-defence-systems/your-tanks-cannot-hide.
40. Robert, Greene, and Power. Febr. 24, 2007. "Seduction and War, OODA and You".http://powerseductionandwar.com/ooda-and-you/.
41. Roblin, S. 2020. "Cheap Drones from China, Turkey and Israel Are Fueling Conflicts Like Armenia and Azerbaijan's." *NBC News*. https://www.nbcnews.com/think/opinion/cheap-drones-china-turkey-israel-are-fueling-conflictsarmenia-azerbaijan-ncna1243246.
42. Rudaski, E. 2014. *Drone Strikes: Effectiveness, Consequences and Unmanned Aerial Systems Background*. Nova Science Publishers, Inc.
43. Sabbagh, D. 2020. "UK Wants New Drones in Wake of Azerbaijan Military Success." *The Guardian*. https://www.theguardian.com/world/2020/dec/29/uk-defencesecretary-hails-azerbaijans-use-of-drones-in-conflict.
44. Schiop, E. N. 2016. "Nagorno-Karabakh Conflict and Its Implications for Citizens." *Annals of University of Oradea, Series*.
45. Shahbazov, F. 2020. "Tactical Reasons Behind Military Breakthrough in Karabakh Conflict". https://jamestown.org/program/tactical-reasons-behind-military-breakthrough-in-karabakh-conflict/. Jamestown Foundation.
46. Shahzaad, B., A. Bouguettaya, S. Mistry, and A. G. Neiat,'Resilient Composition of Drone Services for Delivery',*Future Generation Computer Systems* 115 (2021): 335–50. https://doi.org/10.1016/j.future.2020.09.023.
47. Shaikh, S., and W. Rumbaugh. 2020. "The Air and Missile War in Nagorno-Karabakh: Lessons for the Future of Strike and Defense". https://www.csis.org/analysis/air-and-missile-war-nagorno-karabakh-lessons-future-strike-anddefense. CSIS.
48. Shiriyev, Z. 2016. "Azerbaijan Looks to Greater Reliance on Domestically Produced Weapons." *Urasianet*. https://eurasianet.org/azerbaijan-looksgreater-reliance-domestically-produced-weapons.
49. Sly, L., and Z. Zakaria. 2018. "Russia Says DIY Drones That Attacked Its Base in Syria Came from a Rebel Village." *Washington Post*. https://www.washingtonpost.com/world/russia-says-diydrones-that-attacked-its-base-in-syria-came-from-a-rebel-village/2018/01/10/9e9bddd4-f615-11e7-9af7-a50bc3300042_story.html.
50. Snehesh, A. P. 2020. "Drones Won the War for Azerbaijan. India Must Spend Military Modernisation Money Wisely." *Print*. https://theprint.in/opinion/brahmastra/drones-won-war-for-azerbaijan-india-must-spend-militarymodernisation-money-wisely/548029/.
51. Szabolcsi, R., 'Robust Control System Design for Small UAV Using H2-Optimization', *Land Forces Academy Review* 23/2 (2018): 151–9. https://doi.org/10.2478/raft-2018-0018.
52. Szabolcsi, R., 'Flight Path Planning for Small UAV Low Altitude Flights',*Land Forces Academy Review* 25/2 (2020): 159–67. https://doi.org/10.2478/raft-2020-0019.
53. *The New York Times*. 2020. "Azerbaijan Claims Capture of Key Town in Nagorno-Karabakh", Accessed November 9. https://www.nytimes.com/2020/11/08/world/europe/nagorno-karabakh-azerbaijan-shusha. html? search Result Position=3.
54. Toksabay, E. 2020. "The Revolution in Drone Warfare: The Lessons from the Idlib De-Escalation Zone." *Journal of European, Middle Eastern, and African Affairs*.https://media.defense.gov/2020/Aug/31/2002487583/-1/-1/1/URCOSTA.PDF.
55. Toksabay, E. 2020. "Turkish Arms Sales to Azerbaijan Surged Before Nagorno-Karabakh Fighting". https://www.reuters.com/article/armeniaazerbaijan-turkey-arms-int-idUSKBN26Z230. Reuters.
56. Ullman, David G. Apr. 2007. https://docs.wixstatic.com/ugd/20f020_65b20dec99cb45d0bd1456ed526c09b8.pdf. "'OO-OO-OO!' The Sound of a Broken OODA Loop." *Cross Talk*.
57. Urcosta, R. B. 2020. "Drones in the Nagorno-Karabakh". Small War [Journal]. https://smallwarsjournal.com/jrnl/art/drones-nagorno-karabakh.
58. Vacca, A., and H. Onishi, 'Drones: Military Weapons, Surveillance or Mapping Tools for Environmental Monitoring? The Need for Legal Framework Is Required,' *Transportation Research Procedia* 25 (2017): 51–62. https://doi.org/10.1016/j.trpro.2017.05.209.
59. Wars. https://dronewars.net/wp-content/uploads/2021/01/DWEurasia-WEB.pdf.
60. Watling, J. 2020. *'The key to Armenia's tank losses: the sensors, not the shooters', RUSI Defence Systems*. https://rusi.org/explore-our-research/publications/rusi-defence-systems/the-key-to-armenia%E2%80%99s-tank-losses-the-sensors-not-the-shooters vol. 22. London: Royal United Service Institute.
61. Westad, J. P. 2021. "Another War Over." *New Internationalist*.
62. Yaacoub, J. P., H. Noura, O. Salman, and A. Chehab, 'Security Analysis of Drones Systems: Attacks, Limitations, and Recommendations', *Internet of Things* 11 (2020). https://doi.org/10.1016/j.iot.2020.100218.
63. Yermakov, A. 2020. "Unmanned Aerial Vehicles over Nagorno-Karabakh: Revolution or Another Day of Battle".https://valdaiclub.com/a/highlights/unmanned-aerial-vehicles-over-nagorno-karabakh/.

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