

## Uticaj sukoba u Nagorno-Karabahu 2020. na percepciju borbenih dronova

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**Apstrakt:** Upotreba borbenih dronova je aktuelna više od jednog veka. Tek poslednjih godina smo svedoci kako se evolutivni proces sa napretkom tehnologije pretvorio u pravu revoluciju. Sukob u Nagorno-Karabahu 2020, predstavljao je jednu od prekretnica u pogledu primene ove distruptivne tehnologije u borbene svrhe. Kao nikada do sada masovna upotreba borbenih dronova nije presudno uticala na ishod jednog konflikta. Zbog značaja koji pomenuti sukob predstavlja izvršena je SWOT analiza mogućnosti primene borbenih dronova u lokalnim konfliktima. Izvedeni zaključci mogu pomoći kako u razumevanju ishoda sukoba tako i u definisanju pravca kojim će se kretati dalja primena ovih borbenih sistema u budućnosti.

**Keywords:** UCAV, Nagorno-Karabakh, konflikt, SWOT

## The impact of the Nagorno-Karabakh conflict in 2020 on the perception of combat drones

**Abstract:** The use of combat drones has been existing for more than a century. Only in recent years have we witnessed how the evolutionary process with the advancement of technology has turned into a real revolution. The conflict in Nagorno-Karabakh in 2020 was one of the turning points in the application of this ditruptive technology for combat purposes. As never before, the mass use of combat drones has not decisively influenced the outcome of a conflict. Due to the importance of the mentioned conflict, an SWOT analysis of the possibility of using combat drones in local conflicts was performed. The conclusions drawn can help both in understanding the outcome of the conflict and in defining the direction in which the further application of these combat systems will progress in the future.

**Keywords:** UCAV, Nagorno-Karabakh, conflict, SWOT

### 1. Introduction

Armed conflicts around the world in the last few decades imply an increasing use of unmanned aerial vehicles. Massiveness and possibilities of application have led to a real revolution in redesigning something we consider the battlefield of today. Robotic platforms are slowly taking precedence on the battlefield, and their combination with other systems provides the parties to the conflict with new, hitherto unserved ways of military engagement. The use of unmanned combat aerial vehicles (UCAV) or combat drone with the appropriate strategy can largely compensate the lack of combat aviation or make a state that does not represent military force a potentially respectable adversary. With the relatively low cost of the system, UCAV are becoming the subject of interest of a growing number of countries. Of course, systems that are intended to efficiently detect and neutralize combat drones are also beginning to attract a lot of attention.

Drones, in general, are engaged in the implementation of the so-called Dirty, Dull and Dangerous activities (Szabolcsi, 2018; Austin, 2010). What is noticeable is that their role in conflicts is gradually changing, from the role of reconnaissance that is supervision of the territory or the so-called “Dull” missions’ activities to direct combat application within the so-called “Dangerous” missions (Austin, 2010).

UCAVs have been used throughout history in numerous conflicts, but it can rightly be said that the conflict in Nagorno-Karabakh in 2020 represents a turning point when analyzing the application of this combat system. Prior to the mentioned conflict, during the past few years, there was a sporadic application of these systems on numerous battlefields by numerous armies or armed formations. For example, the Yemen rebel group Houthi has repeatedly attacked civilian and military facilities in Saudi Arabia with relatively primitive, but extremely effective systems in terms of reputation and political repercussions (Muhsin, 2019). The use of unmanned aerial vehicles by the conflicting parties in Syria was relatively unnoticed. On the intricate Syrian battlefield, the Israeli and Turkish systems caused great damage to manpower and equipment to both government forces and their collation partners. Russian units stationed in Syria, which provide assistance to government forces, were not spared from drone attacks, and the attackers were Syrian rebels (Urcosta, 2020).

## **2. Review of the problem**

### **A brief history of the Nagorno-Karabakh conflict**

Nagorno-Karabakh or Artsakh is a self-proclaimed state of 4,400 km<sup>2</sup> on the border of Europe and Asia in the unstable geostrategic region of the Caucasus. The conflict for independence of Nagorno-Karabakh began in 1988, when the ethnic majority Armenians, with the help of the Socialist Republic of Armenia, decided to secede the territory that was part of the Socialist Republic of Azerbaijan and create an independent state. The conflict, which caused great destruction and numerous human casualties, ended in 1994 with the formation of an autonomous region that covered 20% of the territory of Azerbaijan (Schiop, 2016).

During 2008 and 2014, more intense conflicts erupted, as the solution offered by the OSCE Minsk Group did not bring lasting peace and a solution to the conflict, but only an immediate cessation of hostilities. The most intense conflict broke out between April 2 and 5, 2016. During the Four-Day War, about 200 people were killed on both sides. The Azerbaijani side achieved certain minimal territorial gains, but a far more important consequence of the Four-Day War is the awareness of Azerbaijan that they can regain the areas occupied by the Armenians by military means (Bayramov, 2016). During the conflict, Azerbaijan successfully used several types of combat unmanned aerial vehicles such as "IAI Harop" (kamikaze UCAV), "ThunderB", "Orbiter 2M", "Aerostar", "Hermes 450" and "Heron-1". On the other hand, the Crane combat drone, used by Armenian forces had more modest capabilities than the aircraft used by the opposing side (Urcosta, 2020). The four-day war and the lessons learned from it by the Azerbaijani side were the foundation of what would happen four years later.

### **Prelude to the conflict**

After the end of the 1994 conflict and the armistice, which did not result in a sustainable peace agreement, it was certain that a ruthless arms race would begin between Armenia and Azerbaijan, because the question was not whether the conflict would occur, but when and under what circumstances. As time went on, that race gained more and more intensity. During 1999, the completion of the Baku-Supsa and Tbilisi-Ceyhan pipelines in 2006, as well as the commissioning of the Baku-Tbilisi-Erzurum gas pipeline in the same year, enabled Azerbaijan to export its natural resources outside Russia, which led to economic empowerment in Azerbaijan (Güneylioğlu, 2017).

Thanks to abundant oil reserves, Azerbaijan's military spending increased from \$175 million in 2004 to \$3.1 billion in 2011. If we look at the defense expenditures from the GDP hourly, Azerbaijan set aside 6.2% for those purposes in 2011, while at the same time Armenia's expenditures amounted to around 4.1%. It is important to point out that although the Azerbaijani Armed Forces have doubled their military potential, the Armenian side has enjoyed the benefits of its military cooperation with Russia, from which it has received superior systems in certain segments from its rival. At the same time, Armenia has secured the presence of some 3,000 Russian soldiers at the Gyumri military base on its territory, as well as the missile command center as a result of cooperation between the Armenian Armed Forces and the Russian 102nd military base in that country (German, 2012).

At the same time, it should be noted that Russia has been trying all these years to preserve the frozen conflict without the interference of the West, primarily the United States. It even actively tried to appease Azerbaijan by insisting on diplomatic negotiations that would resolve the status of the disputed Nagorno-Karabakh region, and did not refrain from selling military weapons and military equipment to

Azerbaijan, despite good relations with Armenia, a member of the Collective Security Treaty Organization (CSTO) which is a counterpart to the NATO pact (Güneylioğlu, 2017).

The Velvet revolution that engulfed Armenia in 2018, led to the gradual rapprochement of Armenia with the west, and such development of situation was not well accepted by Russia. The newly elected Armenian Prime Minister Nicole Pashinian tried to apply a balanced approach towards the EU and Russia. Unfortunately, events such as the arrest of the arrest of CSTO Secretary General Yuri Khachaturov on July 26, 2018 for trying to overthrow the constitutional order did not meet with Moscow's understanding. This has led to serious problems in terms of military cooperation between Armenia and Russia (Makarov, 2018).

During 2010, Azerbaijan and Turkey signed two important agreements - the Strategic Partnership and Mutual Assistance Agreements as a kind of response to the agreement allowing the presence of Russian troops on Armenian territory, as well as the agreement on the establishment of the Turkish-Azerbaijani Strategic Cooperation Council. These agreements enabled the strengthening of military-technical cooperation between the two countries, as well as the possibility of providing military assistance if any of the signatory states is attacked by a third party (German, 2012).

The focus of the Armenian side was on strengthening air defense and procuring ballistic missiles as a means of deterring a potential attempt by the opponent to conquer the disputed area militarily. The idea of procuring ballistic missiles was to target power plants and other infrastructure in the event of a renewed conflict, which would thwart the long-term trend of Azerbaijan's economic development. Armenia was counting on Azerbaijan to have a lot to lose if it decided to launch military operations against the breakaway region (Güneylioğlu, 2017).

Table 1. Military spending by Azerbaijan and Armenia in USD millions (2000 – 2016)

Country	2000	2002	2004	2006	2008	2010	2012	2014	2016
Azerbaijan	255	311	470	1130	1653	1382	2728	2770	1932
Armenia	147	142	180	260	354	385	362	413	423

(Source: Babayev, 2019)

Table 2. Military spending by Azerbaijan and Armenia in USD millions prior 2020. Nagorno-Karabakh war

Country	2017	2018	2019	2020
Azerbaijan	1530	1710	1790	2270
Armenia	430	500	640	640

(Source: Sarukhanyan, 2020)

On the other hand, Azerbaijan was buying large quantities of arms not only from Russia, but also from other countries especially Israel and Turkey. Between 2006 and 2019, Azerbaijan obtained 825 million US dollars' worth weapons from Israel. Those export arrangements included very sophisticated systems such as surface-to-air missile system, anti-tank missiles, loitering munitions and what it was most important large quantity of various types of UCAVs (Pérez, 2020). Turkish export of arms to Azerbaijan was approximately 123 million US dollars in the first nine months of 2020 before the fighting began. Most of the procurement was combat drones, rocket launchers, and various types of ammunition (Toksabay, 2020).

Azerbaijan realizes that sophisticated weaponry is the key to potential success in attempt to regain lost territories during 1988-1994 war. In Table 3 and Table 4, both sides modern arsenal of missiles, UCAVs and rockets is presented prior to 2020 war (Shaikh and Rumbaugh, 2020). Only partial look on data presented in Table 3 and Table 4. demonstrate how huge is the disparity when we compare arsenal of modern military combat drones owned by conflicting nations.

Table 3. Armenian armament (missiles, UCAVs and rockets)

Weapon	Notes	Number	Origin	Purchased / Introduced
9K79 Tochka-U (NATO: SS-21Scarab)	Ballistic missile, 120 km range	4 launchers	Soviet Union	/
Iskander-E (NATO: SS-26 Stone)	Ballistic missile, 300 km range	8 launchers / 25 missiles	Russia	2016.
SS-1C Scud B	Ballistic missile, 300 km range	8 launchers / 24 missiles	Soviet Union	/
X-55	Reconnaissance UAV	Unknown	Armenia	2014.
HRESH	Loitering munition	Unknown	Armenia	2018.
Krunk	Reconnaissance UAV	Unknown	Armenia	2011.
Orlan-10	Reconnaissance UAV	Unknown	Russia	2020.
BM-30 Smerch	300 mm MLRS, 90 km range	6 launchers	Russia	2015-2017.
NORINCO WM-80	273 mm MLRS, 120 km range	4-8 launchers	China	1999.
TOS-1A	220 mm MLRS, 6-10 km range	Unknown	Russia	2016.
BM-21 Grad	122 mm MLRS	Unknown	Russia	1995-1996.

(Source: Shaikh and Rumbaugh, 2020)

Table 4. Azerbaijan armament (missiles, UCAVs and rockets)

Weapon	Notes	Number	Origin	Purchased / Introduced
LORA	Ballistic missile, 280 km range	4 launchers / 50 missiles	Israel	2017-2018.
9K79 Tochka-U (NATO: SS-21Scarab)	Ballistic missile, 120 km range	3-4 launchers	Soviet Union	/
EXTRA	Guided missile, 150 km range	6 launchers / 50 missiles	Israel	2005-2009.
Bayraktar TB2	Tactical UAV	Unknown	Turkey	2020.
Harop	Loitering munition	50	Israel	2014-2016.
Orbiter 1K	Loitering munition	80	Israel	2016-2019.
Orbiter 3	Loitering munition	10	Israel	2016-2017.
SkyStriker	Loitering 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	Surveillance UAV	14	Israel	2007-2012.
Searcher	Reconnaissance UAV	5	Israel	2011-2013.
Antonov AN-2	Converted to UAV	Unknown	Soviet Union	/
BM-30 Smerch	300 mm MLRS, 90 km range	30-40 launchers	Russia	2003-2005.
T-300 Kasirga	300 mm MLRS, 120 km range	20 launchers	Turkey	2015-2016.
Belarusian Polonez	300 mm MLRS, 200 km range	10 launchers	Belarus	2017-2019.
TOS-1A	220 mm MLRS, 6-10 km range	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 range	30 launchers	Turkey	2010-2013.
RM-70	122 mm MLRS	30 launchers	Czech Republic	2016-2018.

Source: (Shaikh and Rumbaugh, 2020)

## Conflict

The conflict over Nagorno Karabakh 2020 began on September 27, 2020 with the attack of Azerbaijani units on Armenian positions under the pretext that it was a response to the bombing of villages from the territory of Karabakh by the Armenian side (Ergun and Aliyev, 2020). The conflict that lasted for 44 days ended on November 10, 2020, with the acceptance of the peace agreement. About 4,000 people were killed during the conflict on both sides, mostly on the Armenian side, due to the massive use ofUCAVs in war operations (Westad, 2021). Under the peace agreement signed by Russia, Azerbaijan and Armenia, Azerbaijan will retain control of the areas it regained control of during the conflict, as well as seven neighboring territories occupied by Armenia during the conflict that ended in 1994. Armenian military units have pledged to leave Nagorno-Karabakh and neighboring territories. This agreement should enable the return of displaced people during past conflicts in this area (ACAPS, 2020).

Five reasons significantly influenced Azerbaijan to start its military actions. These reasons include a lack of progress on peace talks, the consolidation of the Azerbaijani military, the ineffectiveness of the OSCE's Minsk Group, Turkey's desire to become a regional power and Russia's suspicion of the new Armenian authorities who have occasionally expressed pro-Western rhetoric. The conflict was certainly preceded by a kind of tacit agreement between Russia and Turkey by which each side would satisfy some of its aspirations (Ergun and Aliyev, 2020).

TheUCAVs at the disposal of the Azerbaijani side played a key role in this conflict. Their widespread use provided an opportunity for Azerbaijani forces to carry out surgically precise attacks far from the front lines and to detect, monitor, and destroy all those targets that pose a danger to the development of the situation on the battlefield. Unmanned combat aerial vehicles were integrated with the air force, artillery units, but they are also very often used independently to attack certain targets. According to available data, the combat drones contributed to the destruction of numerous combat systems at the disposal of the Armenian forces. Their penetration into the background of Nagorno-Karabakh weakened Armenian supply lines and logistics. The TurkishBairaktar TB2UCAV showed exceptional versatility during the conflict. In addition to target identification, tracking, and guidance, TB2s were armed combat systems capable of independently destroying targets (Shaikh and Rumbaugh, 2020).

The key advantages of combat unmanned aerial vehicles over manned aircrafts are reflected in lower costs (financially and humanly), and this is undoubtedly one of the reasons for the mass use of unmanned aerial vehicles in the war around Nagorno-Karabakh in 2020. The price for TurkishBairaktar TB2UCAV is about five million US dollars. On the other hand, a modern fighter jet costs several tens of millions of dollars. The possibility of carrying a large amount of ammunition by fighter planes cannot be compared to TB2. But on the other hand, lower procurement and maintenance costs, as well as the lack of a man in the cockpit, have led to the loss of UAVs being more easily compensated (Ho, 2020). In the first days of the war, Azerbaijan used obsolete An-2 planes that were turned into drones as bait for Armenian air defense systems. Since the air defense unit would reveal its position by acting on the bait plane, Azerbaijan would send drones to detect the targets and then the observed targets would be acted upon by armedUCAVs or kamikazeUCAVs (Dixon, 2020). Armored vehicles, together with other ground combat systems represent easy target for unmanned aerial systems (UAS) in the absence of mobile and self-propelled air defense systems, electronic warfare systems and anti-UAS systems. Combat drones have to execute intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) missions in order to obtain the necessary information for the precise operation of various artillery weapons (Kasapoglu, 2020).

The most modern air defense systems available to the Armenian side were the S-300PT and PS series and the 9K37M Buk-M1 and they were not capable to detect, identify and track slow-moving targets such as combat drones. It should be noted that Armenia has export versions of these air defense systems with somewhat limited possibilities, especially in terms of plot fusion (Gressel, 2020). Azerbaijani military has effectively used UAS, to deal with the Armenian air defenses. Laser-guided smart munition system played a main role in the suppression of enemy air defenses (SEAD) campaign. In the first two weeks of the ongoing clashes, the Azerbaijani Armed Forces destroyed some 60 pieces of Armenian air defenses (Kasapoglu, 2020).

The Armenian side in the conflict did not have electronic jammers that could interfere with the signals connecting theUCAVs with their guidance stations. Just before the end of the conflict, Russia used the

Krasukha electronic warfare system from its military base on the territory of Armenia, Giumri, in order to prevent Azerbaijani reconnaissance in the depths of Armenian territory. It is important to note that in such circumstances, Azerbaijani forces relied on Israeli kamikaze Harop drones, with relatively reduced efficiency since they do not require a guidance link (Gressel, 2020).

Back in 2010, Azerbaijan acquired the ultralight reconnaissance drone Orbiter from Israel, followed by orders for the larger Elbit Hermes 450 and IAI Searcher aircraft, which were used for reconnaissance purposes. When the potentials of the UCAVs were considered and their application was mastered in the middle of the decade, heavier UCAVs with greater flight autonomy were purchased - IAI Heron and Elbit Hermes 900. In the conflicts of 2016 and 2020, these combat drones were actively used for reconnaissance and fire control (Yermakov, 2020). The Israeli Harop loitering munitions (or kamikaze UCAV) prove to be very efficient system. Harop main features are great autonomy, with, or without human interaction, and anti-radiation capabilities which proved to be very useful during the attacks on Armenia Air Defense units (Kasapoglu, 2020). Azerbaijan has also come into possession of a number newer kamikaza drones models such as the Aeronautics Orbiter 1K, the Elbit SkyStriker and the Turkish kamikaze quadcopter STM Kargu (Yermakov, 2020).

During June 2020, shortly before the outbreak of the conflict, information began to circulate about the purchase of the Turkish UCAV Bayraktar TB-2 by Azerbaijan. During September, the first recordings made during the operation of these combat systems were published, which seriously calls into question the ability of the Azerbaijani units to fully master the use of this system for a short time. Based on the testimony of Russian units that carried out electronic jamming of these UCAVs near their base in Armenia, there are indications that the combat drones were operated by Turkish units during the conflict (Frew, 2021). It seems that Turkish engineers have made a good unmanned aerial vehicle from what is available on the market, but far from the levels of the most developed countries in that field. The aircraft is distinguished by good flight duration, the ability to carry munitions in the form of MAM-L and MAM-C guided mini-bombs, an anti-tank missile and a 70-mm rocket, but it is also characterized by a small range and the absence of satellite communications channel (Yermakov, 2020). According to the data of the defense world net, the losses of the Armenian side caused by the UCAVs of Azerbaijan are estimated at about 1 billion dollars in technology. The destroyed equipment includes 84 tanks, 27 infantry fighting vehicles, 5 radars, 25 multiple launch rocket systems, 32 howitzers, 155 different types of vehicles, 18 air defense systems, etc. (Rakesh, 2020).

Figure 1. Territorial control by country under the settlement (Cameron, 2020).



### Shift in combat drone perception as a result of the Nagorno-Karabakh conflict in 2020

The Nagorno-Karabakh conflict in 2020 largely affected the situation on the arms and military equipment market. During the conflict, the Armenian side placed its hopes in ties with Russia, an obsolete weapon and a strategy to deter a potential attack, while on the other hand, the Azerbaijani side has been investing in modern weapons, primarily drones, for years. It should be noted that investing in drones without proper tactics of use does not mean much, and the Azerbaijani side possessed both the

technique and the appropriate strategy. What resonated in military circles was a demonstration of how a small country that is not known as a world power can do on the battlefield with the mass use of drones. There are fears that some currently frozen conflicts could come to life if one of the conflicting parties comes into possession of the technology used during the Nagorno-Karabakh conflict (Roblin, 2020).

Countries such as Ukraine, Estonia, Belarus, Armenia, Azerbaijan, and Kazakhstan have shown interest in using UCAVs developed with their own production capacities. It is worth noting that many NATO members possess insufficient tactical attack drones in their arsenal (Hambling, 2020). Faced with war on its own territory, during 2019, Ukraine signed a \$69 million deal with Turkey to buy six Baykar TB2s and showed interest in starting its own production of the combat drones (Bershidsky, 2020).

Analyzing the outcome of the conflict in the instigational Karabakh, British military officials came to the conclusion that they needed cheap UCAVs like the ones used by the Azerbaijani side in the conflict. They also expressed the belief that the mentioned use of combat drones was crucial for the outcome of this conflict (Sabbagh, 2020).

The focus on brutal military power has been shaken in the eyes of India after the conflict between Azerbaijan and Armenia in Nagorno-Karabakh in 2020. Faced with growing tensions with Pakistan and China, India is becoming aware of the situation that it has a small arsenal of UCAVs intended for reconnaissance as well as loitering ammunition. India intends to focus on technologically complex combat systems that it is able to develop on its own, which would reduce dependence on foreign factors (Snehesh, 2020).

### **3. SWOT analysis of the applicability of combat drones in local conflicts**

The presented SWOT analysis is the result of an analysis of the mass use of UCAVs in conflicts around the world with a focus on the conflicts over the past decade (war in Syria, war in Yemen, and finally conflict over Nagorno Karabach in 2020). The mentioned conflicts, and especially the conflict between Armenia and Azerbaijan, demonstrated the extent to which combat drones can be crucial for the outcome of the armed conflict.

#### **Strengths**

Combat drones have low purchase and operation cost compared to other systems. The MQ-9 Reaper American combat UCAV has a purchase price of \$ 6.48 million and an operating cost of close to \$ 3 million. The hourly rate is \$ 3,250 per hour. Compared to the MQ-9 Reaper, 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 (McLean, 2014).

Using unmanned combat drones, it is possible to attack targets anywhere on the planet without putting the pilot in danger (Dowd, 2013). A standard manned fighter aircraft in the event of a crash not only endangers the pilot's life, but can cost the country diplomatic humiliation. Hiring UCAVs reduces potential political risk (Qaisrani et al., 2016).

UAS are capable of performing different types of missions. These include Intelligence, Surveillance, Reconnaissance and Strike mission. In the near future, the mentioned missions will probably be expanded to Resupply, Combat Search and Rescue, refueling and Air Combat missions (Rudaski, 2014). Improving UCAV performance can certainly affect the withdrawal from use of some older manned combat aircraft. Table 5. shows the characteristics of some of MALE and HALE class drones in terms of ceiling, flight endurance and speed (Adamski, 2020). It is noticeable that UCAVs are characterized by extremely high flight endurance.

Table 5. MALE and HALE classes of military drones characteristics

UCAV	Ceiling [ft]	Flight Endurance [h]	Maximum Airspeed [kt]
Global Yabhon	50 000	40	740
Mantis	50 000	36	555
MQ-1B Predator	25 000	40	222
MQ-9 Reaper ER	50 000	42	444
Wing Loong	23 000	20	281
Jabhon-United 40	26 000	100	200

(Source: Adamski, 2020)

Combat drones have the ability to fly at extremely low altitudes, which makes them a very difficult target for the enemy (Szabolcsi, 2020). In the analysis of the conflict in Nagorno Karabakh in 2020, it is noticeable how much this characteristic of military drones in combination with low flight speed was an obstacle for the Armenian Air Defense.

### Weaknesses

Combat drones have a lower ability to carry combat payload compared to 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 radar with a longer range. UCAVs are very slow and their engines are very noisy, which greatly facilitates their detection. Their low speed causes greater exposure to enemy fire, but it can also be considered an advantage when considering the possibility of detecting the aircraft with less modern radar systems.

The drones are also limited by the weather conditions during the operation, whether they are extreme temperatures, fog, rain, wind, etc. (Yaacoub et al., 2020). Dynamic weather conditions have a great influence on the behavior of the aircraft itself (Shahzaad, 2021). During military operations in Nagorno-Karabakh, the presence of UCAVs was noticeably lower 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: Advanced Test High Energy Asset (ATHENA), Rafael Drone Dome, Boeing Compact Laser Weapons System (CLWS) and others (Yaacoub et al., 2020). Table 6. presents various countermeasures against drones, and their limitations (Guitton, 2021).

Table 6. Countermeasures/limitation against drones

Countermeasure	Effect on target	Limitations/vulnerability
Direct fire	Destruction	Size of drone; Number of targets; Visibility.
Hunting drones	Destruction	Number of targets; Visibility; Inherent drone weaknesses; Deployment time
Missiles	Destruction	Costs
Laser weapons	Destruction	Atmospheric conditions; Smokescreens; Target's coating
Microwave weapons	Disabling	Sealing of electronics
Electronic jamming	Disabling /Control taking	Sealing of electronics
Defending drone swarm	Destructions/Disruption	Lack of accurate response; Deployment time

(Source: Guitton, 2021)

During the conflict in Nagorno Karabakh, the Russian S-300, Tor, and Osa missile systems proved ineffective in the fight against Azerbaijani UCAVs, primarily due to the inability of their radars to detect drones produced by Israel and Turkey (Shahbazov, 2020).

## **Opportunities**

There are expectations that world spending related to research, development and procurement of UCAVs will increase from 11.1 billion dollars in 2020 to 14.3 billion by 2029, which represents adoption by almost 30 percent (Harper, 2020). Israel, the United States, and China are the leading manufacturers of combat drones (Chamola et al., 2021). The United States has supplied UCAVs exclusively to NATO members for many years. From 2018, India becomes the first non-NATO country to procure sophisticated American equipment. Israel is the largest exporter of military drones in the world. Israel's contractual obligations are accounted for 41 percent of all drones reported between 2001 and 2011. China is increasingly present as an exporter of combat drones thanks to its liberal export policy. Their biggest customers are countries like Pakistan, Iraq, Nigeria, and others (New America, 2020).

During 2018 in Syria, the Russian base Hmeimim came under attack by low-tech home-made combat drones made by Syrian rebels (Sly and Zakaria, 2018). Although no major damage was caused, the mentioned attack is proof that even with the help of simple drones made without the use of high technology, the desired goal can be achieved. There is a large offer of equipment on the market today that can be used to make modern drones. For example, Turkish UCAVs are made from commercially available components from various manufacturers - electronic circuits are made in Great Britain, aircraft engines in Austria, and optoelectronic equipment is of Canadian origin (Yermakov, 2020).

The purchase of combat drones from foreign sources has the consequence that the countries that have been using the mentioned solutions for many years are starting to develop their own models and thus improve their defense industry. As a result of military cooperation with Israel, for example, Azerbaijan managed to independently develop the Zerbe (Strike) drone, which is irresistibly reminiscent of the Israeli Orbiter 1K (Shiriyev, 2016). UCAVs can serve as a quick and effective response to a potential threat. Whether it is reconnaissance of the movements of enemy units, or surgically precise strikes on targets both on the front line and far behind the lines of enemy forces.

The latest conflict in Nagorno-Karabakh has shown that combat drones can also be a powerful weapon of propaganda. Numerous UCAV strikes have been publicly broadcast online or via billboards in the Azerbaijani capital Baku (Shaikh and Rumbaugh, 2020). Every moment of destruction of either military equipment or attacks on soldiers in the trenches was accurately recorded, and brutal footage of individual strikes was even created from several different angles in high resolution. Footage of combat drone strikes on Armenian infantry units trying to help wounded comrades who were already victims of the previous attack was often broadcasted. It should have created the impression that there is no hope that you can hide from the blow that can happen at any moment and from which there is no effective protection.

## **Threats**

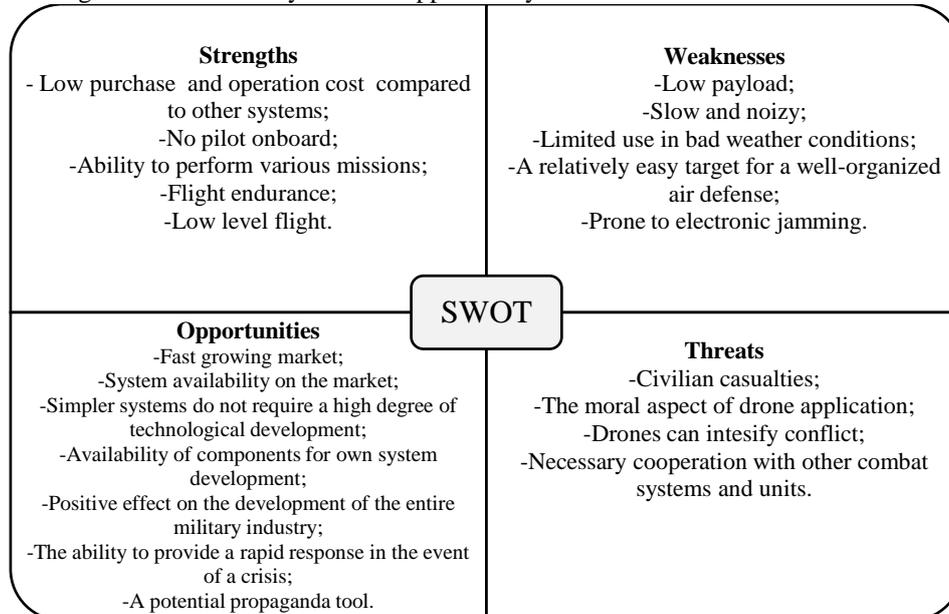
The use of UCAVs in conflicts around the world often results in numerous civilian casualties, despite high-quality sensors that can accurately monitor the situation on the ground. So when it comes to even individual military operations, civilian casualties are numerous. Thus, according to research by human rights organizations, 1,141 people were killed in US drone attacks targeting 41 people (Vacca and Onishi, 2017).

The conflict in Nagorno Karabakh in 2020 was characterized by the intensive application of the so-called "loitering munition" systems. Loitering munition represents some form of hybrid between drone and guided missiles. These systems have the ability to stay in the air for a longer period of time before hitting the target, giving the operator time to choose the target and the time when the target will be attacked (Slijper, 2017). Some loitering ammunition systems can autonomously attack targets without human control, which imposes moral dilemmas regarding the use of such combat systems. It should be noted that low cost loitering munition or "kamikaze drones" can be used in the form of swarm, and in that situation there are currently no effective protection against this type of threat from the air (Gettinger, 2017).

Today, countries that own UCAVs have the opportunity to apply this low cost technology far more aggressively towards countries that do not have the mentioned technology. Nine countries have used drones for military purposes to this date, while at least twenty countries are working intensively on

their development (Parker, 2018). However, it is important to point out the fact that no matter how much armed drones may be an advantage over the enemy, they alone cannot achieve the set goal without cooperation with other combat systems and units. This is especially evident when the enemy uses various means to fight drones intensively and effectively.

Figure 2: SWOT analysis of the applicability of combat drones in local conflicts



#### 4. Conclusion

Every day we are witnessing more and more mass use of drones for military purposes. Many countries are transforming from importers of foreign technology into renowned manufacturers of their own systems. Taking into account the relatively low cost of the systems, as well as their high efficiency, this use is gradually moving away from sporadic to mass application.

The conflict in Nagorno-Karabakh in 2020 showed us 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 of the conflict. During the conflict, Azerbaijani combat drones destroyed a large number of Armenian armoured vehicles. The purchase price of one combat drone and one tank used during the conflict is more or less similar. However, no immediate conclusions should be drawn that armored mechanized units no longer have their place on the modern battlefield. On the contrary. Nevertheless, if you don't have quality air defense systems, if you don't have electronic warfare (EW) capabilities, things just can't work the way you want. To paraphrase an orchestra without a couple of musicians is still an orchestra, but the music it performs loses its quality. The whole world watched as a relatively modest military force, through the mass use of drones for various purposes, inflicted extremely great losses to the other conflicting side in manpower and technology.

The role of drones in the war ranged from directing artillery fire at enemy positions, reconnaissance missions, and attacks by armed drones on enemy targets, all the way to constant use of loitering ammunition systems. The war in Syria was a testing ground for some new technologies. The war in Nagorno Karabakh 2020 was a mere materialization of everything that was learned regarding the application of combat drones on the modern battlefield. Carefully analyzing the conflict as well as its consequences, it is concluded that the conflict in Nagorno-Karabakh in 2020 represents a turning point when it comes to the use of UCAV and that the consequences of that conflict will largely affect the perception of combat drones as a combat system in years to come.

The paper focused exclusively on the contribution of combat drones to the achievement of war objectives without a deeper analysis of cooperation with other systems and units.

Future research will focus on selecting the specific type of aircraft that can provide the country's military with the most opportunities for investment in a given geopolitical situation.

## 5. Literature

1. ACAPS (2020). Azerbaijan and Armenia conflict in Nagorno-Karabakh. Retrieved on November 30, 2020 from: [https://reliefweb.int/sites/reliefweb.int/files/resources/20201120\\_acaps\\_short\\_note\\_update\\_nagorno-karabakh\\_0.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/20201120_acaps_short_note_update_nagorno-karabakh_0.pdf)
2. Adamski, M. (2020). Effectiveness analysis of UCAV used in modern military conflicts. *Aviation*, 24(2). <https://doi.org/10.3846/aviation.2020.12144>
3. Austin, R. (2010). Unmanned aircraft systems : UAVS design, development and deployment. John Wiley & Sons Ltd.
4. Babayev, A. (2019). Nagorno Karabah: The Genesis and Dynamics of the Conflict. Ed. Azer Babayev, Bruno Schoch, Hans-Joachim Spanger. The Nagorno-Karabakh deadlock: Insights from successful conflict settlements. Springer. 2019. p.27.
5. Bayramov, A. (2016). Silencing the Nagorno-Karabakh Conflict and Challenges of the Four-Day War. *Security & Human Rights*, 27(1/2), 116–127. <https://doi.org/10.1163/18750230-02701009>
6. Bershidsky, L. (2020). Drones Have Raised the Odds and Risks of Small Wars. Bloomberg. Retrieved on November 30, 2020 from: <https://www.bloomberg.com/opinion/articles/2020-11-30/drones-have-raised-the-odds-and-risks-of-small-wars>
7. Cameron, P. (2020). Text of the November 9th, 2020 Conflict Settlement Between Armenia, Azerbaijan, and Russia. Retrieved on November 30, 2020 from <https://deadpolitician.medium.com/text-of-the-november-9th-2020-conflict-settlement-between-armenia-azerbaijan-and-russia-f5e9bf4a6747>
8. Chamola, V., Kotes, P., Agarwal, A., Naren, Gupta, N., & Guizani, M. (2021). A Comprehensive Review of Unmanned Aerial Vehicle Attacks and Neutralization Techniques. *Ad Hoc Networks*, 111. <https://doi.org/10.1016/j.adhoc.2020.102324>
9. Dixon, R. (2020). Azerbaijan's drones owned the battlefield in Nagorno-Karabakh — and showed future of warfare. *The Washington Post*. Retrieved on November 30, 2020 from: [https://www.washingtonpost.com/world/europe/nagorno-karabakh-drones-azerbaijan-armenia/2020/11/11/441bcbd2-193d-11eb-8bda-814ca56e138b\\_story.html](https://www.washingtonpost.com/world/europe/nagorno-karabakh-drones-azerbaijan-armenia/2020/11/11/441bcbd2-193d-11eb-8bda-814ca56e138b_story.html)
10. Dowd, A.W. (2013). Drone Wars: Risks and Warnings. *Parameters*, 42, 7-16.
11. Ergun, A. Aliyev, A. (2020). An Account on Karabakh War: Why Now and Then What?, Panorama, Retrieved on November 30, 2020 from: <https://www.uikpanorama.com/blog/2020/11/09/an-account-on-karabakh-war-why-now-and-then-what/>
12. Frew, J. (2021). On the Edge. Security, protracted conflicts and the role of drones in Eurasia. *Drone Wars*. Retrieved on January 1, 2020 from: <https://dronewars.net/wp-content/uploads/2021/01/DW-Eurasia-WEB.pdf>
13. German, T. (2012). The Nagorno-Karabakh Conflict between Azerbaijan and Armenia: Security Issues in the Caucasus. *Journal of Muslim Minority Affairs*, 32(2), 216–229. <https://doi.org/10.1080/13602004.2012.694666>
14. Gressel, G. (2020). Military lessons from Nagorno-Karabakh: Reason for Europe to worry. Retrieved on November 30, 2020 from: <https://ecfr.eu/article/military-lessons-from-nagorno-karabakh-reason-for-europe-to-worry/>
15. Guitton, M. J. (2021). Fighting the Locusts: Implementing Military Countermeasures Against Drones and Drone Swarms. *Scandinavian Journal of Military Studies*, 4(1), 26. <https://doi.org/10.31374/sjms.53>
16. Güneylüoğlu, M. (2017). War, Status Quo, and Peace in the South Caucasus: A Power Transition Perspective. *Public Integrity*, 19(4), 316–341. <https://doi.org/10.1080/10999922.2017.1302868>
17. Harper, J. (2020). \$98 Billion Expected for Military Drone Market. *National Defense*. Retrieved on November 30, 2020 from: <https://www.nationaldefensemagazine.org/articles/2020/1/6/98-billion-expected-for-military-drone-market>
18. Hambling, D. (2020). The Weird And Worrying Drone War In The Caucasus (Updated). *Forbes*. Retrieved on November 30, 2020 from: <https://www.forbes.com/sites/davidhambling/2020/06/22/the-weird-and-worrying-drone-war-in-the-caucasus/?sh=582aacc45daf>
19. Ho, B. (2020). Nagorno-Karabakh Conflict: The Role of Airpower. RSIS. Retrieved from: <https://www.rsis.edu.sg/wp-content/uploads/2020/10/CO20188.pdf>

20. Holland, M. Gettinger, D. (2017). Loitering Munitions In Focus. The Center for the Study of the Drone at Bard College. Retrieved on November 30, 2020 from: <https://dronecenter.bard.edu/files/2017/02/CSD-Loitering-Munitions.pdf>
21. Kasapoglu, S. (2020). ANALYSIS - Five key military takeaways from Azerbaijani-Armenian war. Retrieved on November 30, 2020 from: <https://www.aa.com.tr/en/analysis/analysis-five-key-military-takeaways-from-azerbaijani-armenian-war/2024430>
22. Markarov, A. Davtyan, V. (2018). Post-Velvet Revolution Armenia's Foreign Policy Challenges. *Demokratizatsiya*, 26(4), 531–546.
23. McLean, W. (2014). Drones are cheap, soldiers are not: a cost-benefit analysis of war. Retrieved on November 30, 2020 from: <https://theconversation.com/drones-are-cheap-soldiers-are-not-a-cost-benefit-analysis-of-war-27924>
24. Muhsin, D. (2019). Houthi use of drones delivers potent message in Yemen War. *IISS*. Retrieved on November 30, 2020 from: <https://www.iiss.org/blogs/analysis/2019/08/houthi-uav-strategy-in-yemen>
25. New America (2020). Introduction: How We Became a World of Drones. New America. Retrieved on November 30, 2020 from: <https://www.newamerica.org/international-security/reports/world-drones/introduction-how-we-became-a-world-of-drones>
26. Parker, C. B. (2018). Armed drones changing conflict faster than anticipated, Stanford scholar finds. Stanford. Retrieved on November 30, 2020 from: <https://news.stanford.edu/2018/03/05/armed-drones-changing-conflict-faster-anticipated/>
27. Pérez, C. (2020). Israel's game in Azerbaijan: arms sales and reports on Iran. *Atalayar*. Retrieved on November 30, 2020 from: <https://atalayar.com/en/content/israels-game-azerbaijan-arms-sales-and-reports-iran>
28. Qaisrani, I. H., Ali, L. A., Mirza, M. N., & Naqvi, A. A. (2016). Unmanned Aerial Vehicles: A Revolution in the Making. *South Asian Studies (1026-678X)*, 31(2), 243–256.
29. Rakesh, A. (2020). Azerbaijan Destroyed Six S-300 Systems of Armenia: President Ilham Aliyev. *Defenseworld.net*. Retrieved on November 30, 2020 from: [https://www.defenseworld.net/news/28193/Azerbaijan\\_Destroyed\\_Six\\_S\\_300\\_Systems\\_of\\_Armenia\\_President\\_Ilham\\_Aliyev#.YCO7cnko\\_IU](https://www.defenseworld.net/news/28193/Azerbaijan_Destroyed_Six_S_300_Systems_of_Armenia_President_Ilham_Aliyev#.YCO7cnko_IU)
30. Roblin, S. (2020). Cheap drones from China, Turkey and Israel are fueling conflicts like Armenia and Azerbaijan's. *NBC news*. Retrieved on November 30, 2020 from: <https://www.nbcnews.com/think/opinion/cheap-drones-china-turkey-israel-are-fueling-conflicts-armenia-azerbaijan-ncna1243246>
31. Rudaski, E. (2014). Drone Strikes : Effectiveness, Consequences and Unmanned Aerial Systems Background. Nova Science Publishers, Inc.
32. Sabbagh, D. (2020). UK wants new drones in wake of Azerbaijan military success. *The Guardian*. Retrieved on January 1, 2021 from: <https://www.theguardian.com/world/2020/dec/29/uk-defence-secretary-hails-azerbaijans-use-of-drones-in-conflict>
33. Sarukhanyan, V. (2020). Armenia vs. Azerbaijan: Military Expenditures. *Hetq*. Retrieved on November 30, 2020 from: <https://hetq.am/en/article/123482>
34. Schiop, E. N. (2016). Nagorno - Karabakh Conflict and its Implications for Citizens. *Annals of University of Oradea, Series: International Relations & European Studies*, 8, 35–42.
35. Slijper, F. (2017). Where to draw the line. *PAX*. Retrieved on November 30, 2020 from: <https://www.paxforpeace.nl/media/files/pax-report-where-to-draw-the-line.pdf>
36. Sly, L. Zakaria, Z. (2018). Russia says DIY drones that attacked its base in Syria came from a rebel village. *Washington Post*. Retrieved from: [https://www.washingtonpost.com/world/russia-says-diy-drones-that-attacked-its-base-in-syria-came-from-a-rebel-village/2018/01/10/9e9bddd4-f615-11e7-9af7-a50bc3300042\\_story.html](https://www.washingtonpost.com/world/russia-says-diy-drones-that-attacked-its-base-in-syria-came-from-a-rebel-village/2018/01/10/9e9bddd4-f615-11e7-9af7-a50bc3300042_story.html)
37. Shaikh, S. and Rumbaugh, W. (2020). The Air and Missile War in Nagorno-Karabakh: Lessons for the Future of Strike and Defense. *CSIS*. Retrieved on November 30, 2020 from: <https://www.csis.org/analysis/air-and-missile-war-nagorno-karabakh-lessons-future-strike-and-defense>
38. Shahbazov, F. (2020). Tactical Reasons Behind Military Breakthrough in Karabakh Conflict. *The Jamestown foundation*. Retrieved on November 30, 2020 from: <https://jamestown.org/program/tactical-reasons-behind-military-breakthrough-in-karabakh-conflict/>
39. Shahzaad, B., Bouguettaya, A., Mistry, S., & Neiat, A. G. (2021). Resilient composition of drone services for delivery. *Future Generation Computer Systems*, 115, 335–350. <https://doi.org/10.1016/j.future.2020.09.023>

40. Shiriyev, Z. (2016). Azerbaijan Looks to Greater Reliance on Domestically Produced Weapons. EURASIANET. Retrieved on November 30, 2020 from: <https://eurasianet.org/azerbaijan-looks-greater-reliance-domestically-produced-weapons>
41. Snehesh, A. P. (2020). Drones won the war for Azerbaijan. India must spend military modernisation money wisely. The Print. Retrieved on November 30, 2020 from: <https://theprint.in/opinion/brahmastra/drones-won-war-for-azerbaijan-india-must-spend-military-modernisation-money-wisely/548029/>
42. Szabolcsi, R. (2018). Robust Control System Design for Small UAV Using H2-Optimization. *Revista Academiei Forțelor Terestre*, 23(2), 151–159. <https://doi.org/10.2478/raft-2018-0018>
43. Szabolcsi R. (2020). Flight Path Planning for Small UAV Low Altitude Flights. *Revista Academiei Forțelor Terestre*, 25(2), 159–167. <https://doi.org/10.2478/raft-2020-0019>
44. Toksabai, E. (2020). Turkish arms sales to Azerbaijan surged before Nagorno-Karabakh fighting. Reuters. Retrieved on November 30, 2020 from: <https://www.reuters.com/article/armenia-azerbaijan-turkey-arms-int-idUSKBN26Z230>.
45. Urcosta, R. B. (2020). The Revolution in Drone Warfare: The Lessons from the Idlib De-Escalation Zone. *Journal of European, Middle Eastern, & African Affairs*. Retrieved on November 30, 2020 from: <https://media.defense.gov/2020/Aug/31/2002487583/-1/-1/1/URCOSTA.PDF>
46. Urcosta, R. B. (2020). Drones in the Nagorno-Karabakh. *Small war Journal*. Retrieved on November 30, 2020 from: <https://smallwarsjournal.com/jrnl/art/drones-nagorno-karabakh>
47. Vacca, A. Onishi, H. (2017). Drones: military weapons, surveillance or mapping tools for environmental monitoring? The need for legal framework is required. *Transportation Research Procedia*, 25, 51–62. <https://doi.org/10.1016/j.trpro.2017.05.209>
48. Westad, J. P. (2021). Another War over. *New Internationalist*, 529, 13.
49. Yermakov, A. (2020). Unmanned Aerial Vehicles over Nagorno-Karabakh: Revolution or Another Day of Battle. Retrieved on November 30, 2020 from: <https://valdaiclub.com/a/highlights/unmanned-aerial-vehicles-over-nagorno-karabakh/>
50. Yaacoub, J. P., Noura, H., Salman, O., Chehab, A. (2020). Security analysis of drones systems: Attacks, limitations, and recommendations. *Internet of Things*, 11. <https://doi.org/10.1016/j.iot.2020.100218>