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## List of Abbreviations

An-2	Antonov An-2
ASPMS	Agreement on Strategic Partnership and Mutual Support
F-16	General Dynamics F-16 Fighting Falcon fighter
ISR	Intelligence, Surveillance, Reconnaissance
LAW	Lethal Autonomous Weapon
MoD Armenia	Ministry of Defense of the Republic of Armenia
MoD Azerbaijan	Ministry of Defense of the Republic of Azerbaijan
NATO	North Atlantic Treaty Organization
RMA	Revolution in Military Affairs
SAM	Surface-to-air missile
SOF	Special Operations Force
TB2	Bayraktar TB2
U.S.	United States
UAV	Unmanned Aerial Vehicle

# 1. Introduction

The influence of technology has grown exponentially in recent years with dramatic improvements in additive manufacturing, artificial intelligence, nano-energetics, and drone capabilities (Hammes, 2016, p. 1). Drones<sup>1</sup>, in particular, have acquired a special prominence not only in the commercial and private domain but have become emblematic of 21<sup>st</sup>-century military technologies (Fuhrmann and Horowitz, 2017, p. 397). In 2000, the United States of America and Israel were the foremost operators of unmanned aerial vehicles<sup>2</sup> (UAV) worldwide. Today about 100 countries possess this technology, with most states having developed and deployed new systems within the last five years (Franke, 2020). The Nagorno-Karabakh war in 2020 vividly shows that drones are no longer a future technology. Instead, we are witnessing a “fifth generation war, where combat drones, artillery, and missile systems are used very intensively,” the former press secretary of the Ministry of Defense of the Republic of Armenia (MoD Armenia), Artsrun Hovhannisyan, said (Hovhannisyan, cited in Mgdesyanyan, 2020). Academic writings and the media debate use terms such as “disruptive” or “transformative” to describe drones (Hopia, 2015; Grossman, 2013). The changes in war due to technological innovations have been the subject of the theory Revolution in Military Affairs (RMA) since the 1990s. The capabilities of drones have given rise to the narrative that drones present such a revolution (Stulberg, 2007; Martin and Sasser, 2010; Sharkey, 2011). Against the background of the claims of a revolution in warfare, I study the war between Armenia and Azerbaijan over the Nagorno-Karabakh region, whose military operations included the use of drones. The theory of RMA serves as a theoretical framework for my research.

The Nagorno-Karabakh war provides a critical case study of modern warfare’s character (Shaikh and Rumbaugh, 2020). After Armenia’s victory in the first Nagorno-Karabakh war in 1994, renewed clashes between Azerbaijan and Armenia over the disputed Nagorno-Karabakh enclave erupted on September 27, 2020 (Tonoyan, 2020). The fighting concluded after 44 days on November 10, 2022, through a Russian-brokered armistice agreement (Aliyev, 2020). The agreement fixes Azerbaijani forces’ victory after seizing geographically and politically essential parts of the region from the armed forces of Armenia<sup>3</sup> (Erickson, 2021, p. 1). The war thus shifted the status quo in the South Caucasus in Azerbaijan’s favor (Sarjveladze, 2020, p. 321).

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<sup>1</sup> In the following, I refer to drones in the military-technical regime.

<sup>2</sup> For the purposes of this paper, I refer to UAVs and drones interchangeably.

<sup>3</sup> In the following, I use the term Armenian army as a shorthand.

While the conflict was relatively short-lived, it was an intense inter-state conflict involving heavy and sophisticated weaponry (Kofman, 2020). In particular, the advanced drone warfare capabilities on the Azerbaijani side attracted international attention in policy and military circles. Military analysts and observers attribute Azerbaijan's victory to its technological drone superiority, describing them as a "magic bullet" or a "game changer" (Hambling, 2020; Mgdesyanyan, 2020). Former German defense minister Annegret Kramp-Karrenbauer (2020, p. 3) called the conflict the "first real drone war". Indeed, the war in Nagorno-Karabakh has shown the potential of armed drones on the contemporary battlefield (Kofman, 2020).

Hence, the war implicates a possible revolution in military affairs. To evaluate whether drones are a change in the nature of warfare, I developed a conceptual framework to study the use of drones in the war over Nagorno-Karabakh. The starting point of my analysis is based on the premise that an RMA is not simply due to more sophisticated technologies. Rather, the arrangement of operations and institutions in which the technology is embedded is a significant factor. Thus, I divide the concept of RMA into four criteria: (1) technological innovation, (2) operational change, (3) organizational change, and (4) doctrinal change. The categories are selected based on the RMA concept and literature (Krepinevich, 2002, p. 3; Rumsfeld, 2002, p. 21; Joshi and Stein, 2013, p. 54; Domingo, 2014, p. 45). I orient my analyses alongside this construct and measure the war in Nagorno-Karabakh against these criteria. This defines the scientific relevance of the thesis. Public and political debates surrounding drones often neglect such factors. Until now, most analyses define the role of technology in transforming military affairs, often using fragmented and selected data to support preconceived claims.<sup>4</sup> This bears the danger of overemphasizing technological drone innovation. It is important not to view the drone in isolation but to see it as intimately connected to other military practices. The study of a revolution through the RMA framework thus allows an accurate prediction of their impact on warfare rather than a mere focus on technology.

This leads to the following research question:

To what extent do drones in the Nagorno-Karabakh war represent a revolution in warfare?

The following sub-questions derive from this:

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<sup>4</sup> For an exception, see Erickson, E.J. (2021) 'The 44-Day War in Nagorno-Karabakh Turkish Drone Success or Operational Art?', *Military Review*, p. 1-15.

To what extent do drones in the Nagorno-Karabakh war represent a technological innovation?

To what extent has the implementation of drones led to operational changes in warfare?

To what extent has the implementation of drones led to organizational change in warfare?

To what extent has the implementation of drones been incorporated into doctrinal thinking?

The research question refers specifically to a military revolution in the Nagorno-Karabakh war. The four sub-questions are installed to answer the main research question systematically. First, the conceptual framework for the study of the questions is provided in chapter two. This includes the definition and content of the technological, operational, organizational, and doctrinal criteria. Regarding the order of the sub-questions, technological innovation was chosen as the first category because innovation is a necessary precondition for its potential change in the following areas. The first category thus deals with the technological innovations of drones. For the following categories, I explain the changes that would occur with implementing drones in the respective area. This creates the basis on which an evaluation can later take place. The explanation of the theoretical framework is followed by the analysis of the Nagorno-Karabakh war in chapter four. The research is divided into four parts, according to the categories. Based on the conclusions of each sub-question, I draw a conclusion in chapter five.

Qualitative content analysis is performed to analyze and interpret the derived text sections of data. This is achieved with a theory-based coding scheme and the support of the coding software MAXQDA. I explain the methodology of the research in more detail in chapter three.

## 2. Theoretical Approach

### 2.1. Definition of Revolution in Military Affairs

The RMA refers to a specific concept. It is dated back to 1955, when Michael Roberts (1956) described changes in Swedish warfare between the 16<sup>th</sup> and 17<sup>th</sup> centuries. Roberts argued that changes in tactics, doctrine, and drill and the impact of war on society were profound as to be considered a revolution. Two of the most prominent examples of RMA in history are the Napoleonic Revolution, which marked the standardization of artillery calibers, carriages, and equipment, and the Nuclear Revolution (Krepinevich, 1994, pp. 34–36). The RMA became decidedly fashionable in the 1990s, predominantly in the United States' (U.S.) strategic imagination (Franke, 2018, p. 71). The technology of advanced systems, a constituent element in almost every RMA, primarily characterized the approach to RMA (Krepinevich, 1994).

Scholars and analysts soon criticized the profoundly technological view. They argued that the effectiveness of revolutionary change in warfare lies not in the quality of weapons themselves. Instead, armed forces must find out how to best use them and integrate them into existing structures. Echoing this view, Richard Hundley, a senior physical scientist (1999, p. 27), wrote: “Without an operational concept, the best weapon systems in the world will never revolutionize anything.” Donald Rumsfeld, an American politician and governmental official who served as Secretary of Defense under Gerald Ford and George W. Bush, argues in the same direction. He (2002, p. 21) emphasizes that “a revolution in military affairs is about more than building new high-tech weapons [...]. It is also about new ways of thinking and fighting.” Andrew Marshall, a foreign policy strategist and former director of the U.S. Department of Defense’s Office of Net Assessment, provided the most widely used and accepted definition. He explained RMA as

„a major change in the nature of warfare brought about by the innovative application of new technologies, which combined with dramatic changes in military doctrine, operational and organizational concepts, fundamentally alters the character and conduct of military operations.” (Marshall, cited in Business Bliss Consultants FZE, 2018)

Marshall first mentions the innovative application of new technologies. Only then does he refer to changes in military doctrine and operational and organization concepts. Thus, I consider the capability of new technology a necessary pre-criterion for an RMA, but further changes that allow the technology to be implemented need to occur before an RMA can happen. These elements combined produce an improvement in military effectiveness and combat potential. Based on those accounts and a review of the literature, I identify four criteria for an RMA: (1) technological innovation, (2) operational change, (3) organizational change, and (4) doctrinal change.

In the following, I examine each category that combines to bring about a revolution in military affairs. It offers insights based on initial research on the importance of drones for the areas mentioned above.

## 2.2. Areas of Change

### 2.2.1. Technological Innovation

The possibility of revolutionary military change has always emerged in a technological context. This technological innovation in current RMA finds its expression in UAVs. UAVs are unmanned aircraft controlled by pilots from the ground or with no remote pilot flying autonomously (Guilmartin, 2022). The definition indicates that there are degrees of autonomy. A drone can perform a task semiautonomous, supervised autonomous, or fully autonomous. Autonomous systems go through a sense, decide, act loop. A person controls the process in semiautonomous systems (human-in-the-loop) and supervised autonomous systems (human-on-the-loop). Fully autonomous systems sense, decide, and act without communicating with the human user. Hence, it conducts the task without human intervention (Scharre, 2018, pp. 71–73). To date, only a few systems perform fully autonomous. Examples of weapon systems include the HARPY drone by Israel Aerospace Industries, the Zala KYB-UAV kamikaze drone by Zala Aer, the Blowfish A3 helicopter drone by Ziyen, and the nEUROn by Dassault Aviation.

Besides armed drones that can be used to launch missiles and bombs, some drones are used for intelligence, surveillance, and reconnaissance (ISR) purposes. The ability to gather, process, and disseminate information during battle has improved over the last few years. The information gained is used to detect and effectively attack the military functions of the adversary, leading to an increase in military effectiveness (Krepinevich, 2002, p. 11). Thus, drones rely increasingly on electronic warfare to gain and maintain information dominance. It is argued that the digitalization of the battlefield creates a new level of battle-space awareness (Domingo, 2014, p. 45). Furthermore, information dominance must be maintained even in the face of enemy attempts to destroy their own information networks. Whether this can be achieved depends on the ability of defenses to protect these networks (Krepinevich, 2002, p. 28). In addition, drones tend to be smaller to avoid detection and destruction and rely more heavily on low-observable and stealth technologies.

The characteristics of drones suggest that the battlefield is becoming increasingly complex. Hence, combat and reconnaissance drones are designed to allow them to be integrated into an ever more sophisticated network of weapon and information systems (Ibid., p. 15). Against the backdrop of drone technological innovations, they are ascribed to infallibility.

I have examined the technological innovation of drones and how drones evolve to exploit technological advances have been examined. Drones in the Nagorno-Karabakh war must have such technical capabilities to be considered an innovation for RMA. In the next chapter, I identify how drones are to be integrated into the operational concept.

### 2.2.2. Operational Change

Operational change means that different operational concepts, including changes in tactics and how military operations are conducted, change (Franke, 2018, p. 86). Krepinevich (2002, p. 19) argues that the “rules of the game” must be fundamentally altered to derive the full military potential from technological advances. If new systems merely overlay an old operational paradigm, it is only possible to become more effective within the old conflict paradigm.

Operational change closely connects to technological innovation. Technological advances pass on potential improvements in combat potential to troops in the field (Ibid., p. 19). With the advent of drones, several observations for operational art arise. First, chapter 2.2.1. indicates that drones will likely be characterized by the technological potential to perform ISR. Establishing an information gap through ISR over one’s adversary at the operational level will be increasingly crucial to the success of military operations. Drones can thus more easily penetrate enemy air defense systems, which allegedly yield an offensive advantage and provide stronger incentives for preemption. For offense-defense theory, RMA advocates argue that warfare will shift the offense-defense balance toward offense (Biddle, 1998, p. 6).

Second, creating a favorable information gap will lead to air control. Hence, in a situation where peer competitors face each other, establishing information dominance and disabling the enemy’s information and air defense networks will be critical to achieving air control (Krepinevich, 2002, p. 24).

Third, strategic strikes are expected to coincide with or follow operations to achieve information dominance and air control. Airborne, space information, and weapon platforms provide real-time targeting information to long-range precision-guided conventional munitions. If a sufficient information gap can be created, it is possible to strike a small set of enemy targets comprising their “center of gravity”<sup>5</sup> in a relatively short time without having to engage in

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<sup>5</sup> Set of targets that, if destroyed, will compromise a state’s ability, or will, to block its adversary from achieving its political objectives (Krepinevich, 2002, p. 11).

intermediate operations (Krepinevich, 2002, p. 27). Carl von Clausewitz (1989, pp. 595–596), a former Prussian general and military theorist, considers the act of destruction of the center of gravity as the most important for the defeat of the enemy. It is argued that the ability of greater precision, which is directly related to strategic strikes, will reduce human casualties (Shahbazov, 2020). Furthermore, some argue that current operational concepts focused on close combat are being replaced by new concepts that are less dependent on approaching the enemy or occupying territory (Biddle, 1998, p. 5). This, in turn, would relieve states from the need to deploy ground troops (Sharkey, 2012).

These operational developments can potentially enhance military operations' effectiveness significantly. To develop the capability to wage war effectively in a new era of conflict, states must think about how they will organize themselves to advance drone innovations. This will be the subject of the following chapter.

### 2.2.3. Organizational change

Organizational innovation is an integral part of a successful transition. A shift in emphasis toward employing drones will require organizing military forces in ways different from their current configurations. Specifically, new institutions with educated officers that deal specifically with drones must be created. This structural change includes new training regimes that focus on training pilots to operate drones. This would ultimately result in a set of service elites, specifically operating drones. An example of such change has been the creation of the air force pilots, which followed the introduction of the aircraft and the creation of air force (Franke, 2018, p. 90). In addition, forces will more likely be organized around significant functional capabilities like air superiority than along traditional service lines (Krepinevich, 2002, p. 21). This would mean a major reduction in ground and surface naval forces and a significant increase in reliance on air and missile forces.

The integration of drones at the operational and organizational levels and its implications should be defined in the doctrine of a state. This will be the subject of the following chapter.

### 2.2.4. Doctrinal Change

The main challenge for politics and the military is to implement the technological elements in a military and political concept. The assertion that doctrine is the “soul of warfare” and the “software of military power” illustrates the importance of a doctrine (Sloan, 2012, p. 243;

Petersson, Slensvik and Ydstebø, 2016, p. 175). A doctrine serves as a basic framework for an armed force to guide its actions and for the government to achieve policy objectives (Baig, 2020, p. 79). Doctrines are unlikely to include specific plans for future investment and procurement of drones. Rather, the general military, operational and organizational capabilities necessary to succeed on the modern battlefield would be described. For example, the importance of information dominance and air superiority would likely be codified in doctrine. This would, in turn, allow predictions about the use of new military systems such as drones. Additionally, there is a general fear that the ability of greater precision and the accompanying reduction of casualties will lower the threshold to war and weaken norms regulating the use of force (Neuneck and Scheffran, 2008, p. 18). The doctrine would reflect such signs.

Now that the changes in each category have been examined, the following chapter will disclose the methodology used to answer the research question and explains why the chosen techniques and concepts are necessary to answer the research question.

### 3. Methods

#### 3.1. Case Selection

For several reasons, the war between Armenia and Azerbaijan is a suitable case for answering the research question. For a country to be considered as a case in this thesis, it must have used UAVs in military operations. Whether drones have revolutionized warfare needs to be based on a study of their actual use (Franke, 2018, p. 7-8). Both Armenia and Azerbaijan have introduced drones into their military arsenal. Additionally, the drones had to be used in a warlike conflict, as the influence of drones on warfare is analyzed. Although drone development is well advanced in many countries, there are few countries, Azerbaijan and Armenia included, that have installed and deployed them in conflicts. Furthermore, the immense media coverage and the public discourse about the future of warfare indicated a far-reaching significance in contemporary military circles. This provides sufficient data sources for the analysis.

The principle of the conflict lies in the national discourse in Armenia and Azerbaijan, according to which both states are not complete as states without Nagorno-Karabakh (De Waal, 2010, p. 140). In the question of the status of Nagorno-Karabakh, two principles of international law collide. On the one hand, Azerbaijan invokes the principle of territorial integrity regarding the territory of the former Soviet Union Republic of Azerbaijan (Sarjveladze, 2020, pp. 322–323).

In the Russian Empire, Nagorno-Karabakh was subordinated to the governorate of Ganja, the second largest city in present-day Azerbaijan. After the Sovietization of the Armenian and Azerbaijani republics in 1920, Soviet authorities had initially assigned the territory to Azerbaijan as an autonomous region. On the other hand, a majority of ethnic Armenians inhabited the area, resulting from expulsions from the Ottoman Empire and settlements in the 19<sup>th</sup>-century Tsarist Empire (Quiring, 2009, p. 19). Hence, Armenia insists on its right to self-determination. The conflict escalated into an armed conflict between 1991 and 1994. The Armenian-inhabited region of Nagorno-Karabakh declared itself an independent state called Artsakh, which violated the principle of territorial integrity under international law. It therefore received no international recognition. Armenia and Azerbaijan could never overcome the dividing lines due to a lack of willingness to compromise on both sides. On the contrary, the negative dynamic led to warlike incidents in 2016 and July 2020, culminating in a war in September 2020 (Sarjveladze, 2020, p. 325).

### 3.2. Method of Data Collection

This chapter discusses the type of data used in this study and briefly explains why the selected data is appropriate. Different data collection methods can be used in qualitative research. Typical data sources are interviews, group discussions, observations, and documents (Polkinghorne, 2005, p. 137). Press releases and reports of the MoD Armenia and the Ministry of Defense of the Republic of Azerbaijan (MoD Azerbaijan) serve as the primary data sources for technological innovation and operational and organizational change. It provides the most up-to-date information on recent development and includes contributions by actors directly involved. To examine doctrinal change, I study the military doctrines of Azerbaijan and Armenia. I also drew information from official speeches and interviews, which point to emerging doctrines but are not codified in doctrine. Given the subject's topicality, news reporting is an accurate data source. Policy and working papers were collected to increase the data's robustness further.

### 3.3. Method of Data Analyses

Barbara Downe-Wamboldt (1992, p. 314), retired Professor at Dalhousie University, describes qualitative content analysis as a “research method that provides a systematic and objective means to make valid inferences from verbal, visual, or written data in order to describe and quantify specific phenomena.” There are different approaches to qualitative content analysis. Specifically, I use the interaction between the directed and conventional content analysis. I start

with the directed approach to content analysis, as the research questions are conceptualized with the theoretical framework in chapter two. The theoretical framework is operationalized through the following categories: technological innovation and operational, organizational, and doctrinal change. These preconceived categories simultaneously serve as deductive or initial codes, as the theory brings them to the grid of the analysis. This is referred to as the deductive category application (Hsieh and Shannon, 2005, p. 1281). These codes are then underpinned in the coding process with inductive codes, representing sub-aspects of the deductive codes. This conventional content analysis allows the codes to flow from the data. The inductive codes were established by identifying important variables closely related to the deductive codes; thus, the categories of the RMA.<sup>6</sup> It allows for a more detailed analysis of the research question (Ibid., p. 1279). Hence, data material is structured by coding concerning the research question. The code table is used to uncover the relationship between the codes and, thus, to find answers to the sub-questions. Once the data set has been coded, the MAXMaps function of MAXQDA is used to put the codes in relation. This function helps to visualize connections and uncover patterns in the data. Consequently, new connections between the codes are revealed.<sup>7</sup>

In the following chapter, I use this methodological framework to analyze the war between Armenia and Azerbaijan in 2020 based on the theory of RMA.

## 4. Data Analyses

### 4.1. Technological Innovation

Azerbaijani forces made extensive and effective use of UAVs as technological innovations in the form of loitering munitions, including the Harop, Skystriker, Orbiter 1K, and Orbiter-3 (Shahbazov, 2020; Kofman and Nersisyan, 2020). These loitering munitions carry a warhead on the platform and circle in the air over the target area. If a predefined target is detected in the surveillance area and calculated by the onboard algorithm to be permissible, the so-called “kamikaze drones” dive onto their targets, exploding and self-destructing in the process. Thus, it enjoys great autonomy, enabling human out-of-the-loop operations (Kasapoglu, 2020a). Harop’s strike against an Armenian S-300 surface-to-air missile (SAM) site in Shuskakend demonstrated this characteristic (Armenian S-300 Being Destroyed by Azerbaijan Drone IAI Harop Israel, 2020).

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<sup>6</sup> For the Coding Scheme, see Table 1 in the Appendix.

<sup>7</sup> For the Code Networks, see the Appendix.

Furthermore, Azerbaijan used specific models performing ISR tasks, such as the Heron TP, Hermes 450, Hermes 900, Aerostar, and the Bayraktar TB2 (TB2) (Davies, 2020). The latter model notably demonstrated the versatility of UAV platforms. The TB2 drone can carry smart, micro-guided munitions (Shaikh and Rumbaugh, 2020). However, it primarily remains a reconnaissance drone, providing information gathering, surveillance, target acquisition, and reconnaissance (Kasapoglu, 2020b; Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 43). The digitalization of the battlefield through reconnaissance drones ensured better battlespace awareness on the Azerbaijani side. Azerbaijan presumably conducted extensive reconnaissance long before the outbreak of war (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 44).

Reconnaissance drones and loitering munition combined with the help of electronic warfare assets enabled the Azerbaijanis to overwhelm Armenian air defenses. In some cases, loitering munitions were linked through command centers to surveillance drones and controlled remotely by man-in-the-loop operators. The condensed data from the reconnaissance drone was passed to the commando center of combat drones to engage the reconnoitered positions (Bryen, 2020). The MoD Azerbaijan supplied an online video showing this feature. In the video, it can be seen that the reconnaissance drone is viewing the target, but the missile released by the drone arrives from a different altitude and angle (Bryen, 2020; *Düşməyə dəqiq zərbələr endirilib*, 2020). Within the first two weeks of the combat operations, the Azerbaijani armed forces<sup>8</sup> destroyed up to 60 air defense means (Ministry of Defense of the Republic of Azerbaijan, 2020f). On the first day, army artillery and UAVs hit the Armenian 9K33 Osa and 9K35 Strela-10 mobile short-range air defense systems (Erickson, 2021, p. 10). Furthermore, reconnaissance drones located enemy formations by detecting unencrypted electronic signatures of cell phones and quickly countered by armed drones or artillery (Gady, 2021, p. 2). Consequently, entire units fell victim to targeted artillery fire or air strikes. Hence, the war demonstrated the enormous importance of “electromagnetic discipline” in modern combat (Ibid., 2021, p. 5).

The successful use of drones against Armenian air defense installations is mainly due to Armenia’s inadequate air defense installations. Armenia employed legacy short-range air defense systems such as Russian-made S-300, 9K33 Osa, and 9K33 Strela-10 SAM systems designed in the 1980s. These systems could not track Azerbaijan’s modern drones on their radar, although

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<sup>8</sup> In the following, I refer to the Azerbaijani army as shorthand.

the drones in the war were not stealth aircraft (Bateman, 2020; Davies, 2020). Their sensors are designed to identify and track fast-moving fighters, but their moving-target indicators disregard small, slow-moving drones (Gressel, 2020). The small size of loitering munitions and remotely operated systems enabled them to evade detection by radar (Urcosta, 2020). Additionally, even if they could detect these relatively small aircraft, drones like TB2s flew too high for these systems to intercept (Shaikh and Rumbaugh, 2020). In videos taken by surveillance drones or by the attack drone itself, there is no indication that an Armenian air defense system detected the attacking drone or the accompanying observation drone before the air defense system was attacked and destroyed (Bryen, 2020). The MoD Azerbaijan (2020b) has released video footage of the destruction of 9k33 Osa. Drones thus proved to effectively suppress enemy air defense assets against adversaries lacking network-centric air defenses and a complete air picture, validating the importance of full-spectrum air defense (Kasapoglu, 2020a).

At the same time, it must be noted that newer, purpose-built air defenses can detect a drones transmissions and locate it that way (Davies, 2020; Bryen, 2020). In contrast to conventional radars, they have high-resolution scanning and computer algorithms with signature data on different drone threats. Once there is enough radar imagery to run through the computer database, the radar system confirms a drone sighting and can continue tracking the object (Bryen, 2020). In the final phase of the war, the Azerbaijani drones could be successfully engaged in several cases due to adequate air defenses (Ministry of Defence of the Republic of Armenian, 2020a, 2020b, 2020c). Russian Orlan-10 drones were used for target reconnaissance for Armenian artillery systems, and “Krasukha-4” jamming systems counteracted armed drones such as the TB2 and loitering munition (Stöber, 2021, p. 83). Hence, the myth of the infallibility and invincibility of drones must be critically reconsidered (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 47). Against an adversary who possesses a complex air defense capacity that is supported by electronic warfare and counter-drone echelons, drones would not enjoy the same dominance they have in Nagorno-Karabakh (Kasapoglu, 2020a).

Armenia had a much smaller and less effective drone fleet, possessing only four types of drones, including the domestically produced Baze, Krunk 25-1 and 25-2 models, and the Russian-made Ptero-5E (Davies, 2020). Azerbaijan successfully destroyed Armenia’s UAVs, which confirms the strength of Azerbaijani air defense (Ministry of Defense of the Republic of Azerbaijan, 2020c). Although both sides employed drones, it becomes apparent that Azerbaijan enjoyed a qualitative and quantitative advantage over Armenia in its drone capabilities. This advantage

was mainly due to support from Turkey and Israel over a sustained period (Shahbazov, 2020; Synovitz, 2020). The Turkish-produced TB2 reconnaissance drone and the Israeli IAI Harop loitering munition were two of the most effective systems (Gady, 2021, p. 2). Many scholars assert that the use of Turkish and Israeli drones was a tactical game changer and the decisive element for the military victory of Azerbaijan (Kasapoglu, 2020b; Shahbazov, 2020).

In summary, drones in the Nagorno-Karabakh war have proved innovative applications of new technologies. Such innovation occurred primarily in the area of ISR and loitering munition. ISR and loitering munition enabled the Azerbaijanis to eliminate Armenian air defenses, which underpins the effectiveness of combined UAVs. Furthermore, Azerbaijan's military advantage was due to Armenia's lack of drone defense capabilities. Technologically advanced air defense systems could have countered Azerbaijani drones. This simultaneously underscores the importance of comprehensive air defense.

The following chapter will examine how effective drones have been integrated into the armed forces' operational campaigns.

#### 4.2. Operational Change

The operational campaigns on the Azerbaijani side were planned and executed around an offensive operation (Erickson, 2021, p. 9). Reconnaissance drones were an essential means of this campaign. The reconnaissance drones provided identification and targeting data, which led to information dominance at the operational level (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, pp. 72–73). This condition allowed Azerbaijan to take out the enemy's air defense systems. As discussed in chapter 4.1., Armenia could not repel these threats at an early stage. The combination of information dominance and the destruction of Armenia's air defense networks led to air superiority<sup>9</sup> (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 72). It could now be assumed that drones are likely to shift the offense-defense balance toward the offense, as predicted in chapter 2.2.2. However, Azerbaijan's army could fulfill its missions mainly because it operated relatively freely in uncontested airspace. Drones are nevertheless vulnerable to electronic warfare and air defense systems. This is well reflected in Azerbaijan's and Armenia's ability to destroy the opponent's UAVs. Lieutenant-General David

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<sup>9</sup> NATO defines air superiority as „that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former [...] without prohibitive interference by the opposing force“ (North Atlantic Treaty Organization, 2021, p. 9).

Deptula, a former senior U.S. air force officer, has noted, “We have become accustomed to operating in battle space that we control. [...] Some of the systems that we have today, you put in a high-threat environment, and they’ll start falling from the sky like rain.” (Deptula, cited in Joshi and Stein, 2013, p. 62) Hence, the assertion that drones are likely to shift the offense-defense balance toward the offense falls short (Calcara *et al.*, 2022, p. 133). At least, this is the case when two peer competitors face each other.<sup>10</sup>

In addition, Azerbaijan deployed the so-called “bait drone”. Bait drones were originally Antonov An-2 (An-2) piston-powered light aircraft designed in the late 1940s. Those Soviet-era biplanes are now used as crop dusters or to fight forest fires (Synovitz, 2020). Azerbaijan converted them into uninhabited aerial vehicles. They could thus be piloted by remote control at low altitudes over the Armenian air defenses. Azerbaijan often outfitted the drones with a munition. This was probably to ensure that the Armenian side fired at the bait so that they would not become the targets of a lethal attack (Fogel and Mathewson, 2021). This strategy worked as the Armenians posted videos of what they thought were drones being shot down by their air defenses (Malyasov, 2020; Ադրբեյջանական անօդային խոցումը, 2020). Whenever the Armenian army hit an An-2 with its air defenses, Armenia revealed their defensive positions to Azerbaijani surveillance drones at higher altitudes. These drones could then identify their positions and efficiently destroy these air defenses (Synovitz, 2020). This type of drone has been an effective tool for exposing Armenia’s locations (Fogel and Mathewson, 2021).

Furthermore, UAVs were used to conduct a deep battle operation<sup>11</sup>, which was characterized by strategic strikes.<sup>12</sup> Advanced ballistic missiles complemented longer-ranging UAVs, thus effectively giving them operational-level reach. Azerbaijani UAVs and satellites served as battlefield sensors enabling the precision targeting of enemy assets and positions at operational depth. These sensors increased the effectiveness of Azerbaijan’s UAVs, ballistic missiles, and older guided missile systems. This gave Azerbaijan close-range tactical strike capabilities matched by long-range operational-level strike capabilities (Erickson, 2021, p. 4). The long-range fires and UAVs were used to strike command posts, assembly areas, logistics, and maneuver elements as they approached the combat area (Kaushal and Watling, 2020). Azerbaijani army used the long-range ballistic missile system to destroy a bridge linking Armenia to

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<sup>10</sup> For an illustration of the technological and operational connection, see Code Network 1 in the Appendix.

<sup>11</sup> Deep battle operations are those beyond the immediate tactical battlefield into the enemy’s rear areas (Erickson, 2021, p. 3).

<sup>12</sup> For an illustration of the deep battle operation, see Code Network 2 in the Appendix.

Nagorno-Karabakh, attempting to cut off Armenian reinforcements and supplies (Gressel, 2020; Shaikh and Rumbaugh, 2020). Azerbaijan also targeted Armenian ground lines of communication to prevent the deployment of reserves and block counteroffensives (Kofman and Nersisyan, 2020). Azerbaijan's intensive and accurate strategic strike capabilities enabled the Azerbaijanis on a tactically level to overcome Armenian defense lines and, on an operational level, isolate the battlespace (Erickson, 2021, p. 4). Against the background that the war lasted only 44 days, the assumption that accurate strikes reduce human casualties cannot be confirmed by casualty figures. The number of victims on Armenia's side is 3825; Azerbaijan lamented the death of 2800 soldiers (Pashinyan, 2022; Ministry of Defense of the Republic of Azerbaijan, 2021). 146 civilian casualties were reported (Amnesty International, 2021).

To conduct operations deep into the enemy's rear areas, Azerbaijan invested in building a Special Operations Force (SOF) capability (Erickson, 2021, p. 4). Once the Armenian side was unable to send reserves into battle, the Azerbaijani army overwhelmed the isolated Armenian positions. They repeated this procedure daily (Gressel, 2020). The operation successfully allowed the Azerbaijani army to destroy Armenia's center of gravity. By October 3, the Armenians had lost over 200 tanks and artillery pieces, multiple launch rocket systems, and an S-300 anti-aircraft missile system (Ministry of Defense of the Republic of Azerbaijan, 2020g). On the same day, the MoD Azerbaijan announced that more villages had been liberated (Ministry of Defense of the Republic of Azerbaijan, 2020a). In the course of the war, Armenian units were forced to retreat from numerous areas, suffering severe losses, including large amounts of weapons, munitions, and food supplies (Ministry of Defense of the Republic of Azerbaijan, 2020j, 2020k). The successful combination of weapons illustrated that individual weapons systems would not revolutionize the nature of warfare (Shaikh and Rumbaugh, 2020). The U.S. army's Air and Missile Defense 2028 strategy (2019, p. 4) notes, "The most stressing threat is a complex, integrated attack incorporating multiple threat capabilities in a well-coordinated and synchronized attack."

Regarding "jointness", the Azerbaijani air force and army have fought well together. This was well seen in the latest campaign designed to achieve the strategic outcome of liberating a substantial part of Armenian-occupied Karabakh. For the advance and seizure of the strategically crucial city Shusha, a special joint task force, the "Joint Corps", was formed under Lieutenant General Hikmet Mirzayev. The conventional army artillery and air force UAVs directly and successfully supported army units in contact by destroying ground-based assets in targeted

strikes (Erickson, 2021, p. 13). Azerbaijani ground forces then scaled the high ground to the west of the town. They took control of the city of Shusha itself on November 8 (Ministry of Defense of the Republic of Azerbaijan, 2020h). Fuad Shahbazov, a senior analyst covering regional security and defense policy issues, highlights, “In Susa, when Azerbaijani forces took control of the city, it was not a full-scale assault by Azerbaijan’s artillery and drones.” (Shahbazov, cited in Synovitz, 2020) Instead, ground forces seized territorial control of well-fortified mountain positions by close combat (Davies, 2020; Synovitz, 2020). The town of Shusha is situated on high ground adjacent to, and dominating, the only major road linking the self-proclaimed Republic of Artsakh to Armenia (Bensaid, 2020; Erickson, 2021, p. 7). Holding Shusha ensured the interdiction of the Lachin corridor through which this road runs. Azerbaijani forces advanced on the Lachin district and conquered the strategically important land corridor (Shahbazov, 2020). The possession of the Lachin corridor effectively blocks the entry of goods into Artsakh (Erickson, 2021, p. 7). Therefore, the capture of Shusha and the Lachin corridor became a crucial geographical feature that ensured Azerbaijan’s operational success. This achievement put Azerbaijani negotiators in a position to dictate the terms of a settlement and made Armenia make extensive concessions (Aliyev, 2020; Erickson, 2021, p. 7). The success of the Joint Corps illustrated the importance of combined forces. While technology has changed the battlefield, capable ground forces will remain critical for holding and occupying territory. Likewise, it becomes evident that operational concepts are still dependent on close combat. The study thereby contradicts the prediction that they would be replaced by new concepts less dependent on approaching the enemy and occupying territory.

Furthermore, UAVs were a significant factor for operational art regarding the region’s geographical features. Much terrain is mountainous, highly favorable for guerilla warfare, and long-lasting defense (Urcosta, 2020). The landscape of Nagorno-Karabakh and the network of military infrastructure extending to the Georgian border in the north formed a problematic territory for Azerbaijan to capture for a long time. The domination of drones significantly undermined such significant advantages for Armenia, which used the mountains as a natural defense line (Sarjveladze, 2020, p. 325; Urcosta, 2020). Armenia has situated its air defense systems in relatively exposed fixed positions, vulnerable to attack from the air (Kofman and Nersisyan, 2020). Drones were able to fly over massive hills and mountains. Hence, through modern technology, Azerbaijan could compensate for its geographical disadvantage (Sarjveladze, 2020, p. 325).

Reports of successful drone strikes led to commentary speculating on the demise of tanks as valuable military assets (Suciu, 2020). In mountainous regions, this argument holds. The mountainous region is geographically and militarily sophisticated and thus requires completely different military strategies and tactics (Urcosta, 2020). UAVs can better integrate into geographical specificities (Urcosta, 2020). Tanks, however, also served as decisive offensive weapons, having led all large-scale assault operations on flat terrain during this war (Gady, 2021, p. 4). Furthermore, it is argued that the platform is too vulnerable to aircraft, including UAVs (Suciu, 2020). This argument is based on videos of both sides showing armored vehicles being destroyed in battle. However, the large number of hit battle tanks indirectly confirms the enormous combat value attributed to tanks and armored vehicles. To date, no better platform offers a better combination of battlefield firepower, protection, and maneuverability (Gady, 2021, p. 4). Hence, the assumption concerning the end of the battle tank does not conform with the study's findings.

In several respects, the Azerbaijani military planning and operational art in the Nagorno-Karabakh war mirrored Turkey's Operation Spring Shield against the Syrian Arab Army in 2020. Firstly, Azerbaijan's and Turkey's military planning was based on the integration of artillery and multiple-launch rocket systems and UAVs tasked with intelligence, target accusation, and battle damage assessment (Kasapoglu, 2020b). The Azerbaijani artillery salvos demonstrated this feature on the night of October 7 (Ministry of Defense of the Republic of Azerbaijan, 2020n). Secondly, both states focused on systematically destroying the enemy's mobile air defenses. Dr. Can Kasapoglu (2020b), the Security and Defense Studies Program director at the Center for Economics and Foreign Policy Studies, says that Turkey has not only transferred UAVs to its ally Azerbaijan but also a "complete [...] concept of operations."

In summary, drones were integral to Azerbaijan's operational art, as there has been considerably operational change due to drones on the Azerbaijani side. The use of UAVs has improved ISR, which led to information dominance and air superiority. In addition, UAVs were a significant factor for operational art regarding the region's geographical features. Furthermore, drones were well embedded in military tactics and operational campaigns. The deep battle operation and joint planning show such successful integration. At the same time, those campaigns revealed the continuing importance of tactics and weapons of conventional warfare. This observation could also be made concerning tanks. Due to the insufficient number of drones on the Armenian side, almost no drone-specific operations could be identified. Only the use of Russian

Orlan-10 systems for target reconnaissance for Armenian artillery systems is worth mentioning in this context.

The next chapter examines which changes have been made to best incorporate drones into the organizational structure.

### 4.3. Organizational Change

The superiority of Azerbaijan is primarily because Azerbaijan was incredibly well-prepared. Over the past three years, the Azerbaijani armed forces have worked out the most optimal and effective methods of conducting large-scale counteroffensives (Gurbanov, 2019). Under the combat training plan for 2020, UAV crews carried out training flights, during which they increased operational-tactical knowledge and improved practical skills on modern simulators (Ministry of Defense of the Republic of Azerbaijan, 2020l). Additionally, they were trained to detect positions and targets in the depth of the defense of the “imaginary enemy” and transfer the relevant information to the fire control center of artillery units. UAVs designed for optical and radio-electronic reconnaissance of the terrain were used for this purpose (Ministry of Defense of the Republic of Azerbaijan, 2020m). In 2016, UAVs were already used for aerial reconnaissance during a large-scale exercise by the armed forces (Ministry of Defense of the Republic of Azerbaijan, 2016). Practices, however, were not limited to the air force domain. Intensive classes and training were also held for combat training of the tank, missile, and artillery units (Ministry of Defense of the Republic of Azerbaijan, 2020i, 2020d). This suggests that armed forces are not only focused on functional capabilities such as air superiority, as predicted in chapter 2.2.3 (Krepinevich, 2002, p. 21). Instead, the Azerbaijani military is learning to fight in new ways, testing, according to defense minister Zakir Hasanov, “new weapons”, “tactical methods”, and “combat readiness” (Gurbanov, 2019; Hasanov, 2019).

Besides unilateral military exercises, Azerbaijan conducted a series of military exercises with Turkey in the run-up to the war. In late July and early August, Azerbaijan and Turkey maintained Joint Large-Scale Military Exercises with both countries’ land and air forces (Ministry of Defense of the Republic of Azerbaijan, 2020e). The concluded bilateral activities were held under the “Agreement on Strategic Partnership and Mutual Support” (ASPMS), signed in 2010 between Turkey and Azerbaijan. After the exercises, 50 trainers, 90 military advisers, and 20 drone operators from Turkey remained in Azerbaijan (Черненко, 2020). By the ASPMS, Turkey provided more robust professional military education and training opportunities for the

Azerbaijani army. The number of joint Azerbaijani-Turkish exercises has substantially increased compared to previous years. In 2018, the two countries carried out seven joint drills, training Azerbaijani personnel in the operation of Turkish weapons. In 2019, 13 exercises involving the armed forces of both countries were organized (Huseynov, 2020). Turkish defense minister Hulusi Aka reinforced, “This exercise is an example of what the two states can do when they are one nation [and] one army.” (Ministry of Defense of the Republic of Azerbaijan, 2019)

The Azerbaijani-Turkish exercises caused considerable concern in Armenia. While Armenia’s defense minister David Tonoyan emphasized Russia’s constructive and stabilizing role in the region, he claims that the military steps taken by Azerbaijan and Turkey destabilize the security situation in the region. Against the backdrop, the Armenian army continued to monitor and analyze military drills by Turkey and Azerbaijan to be ready for any situation development (Asbarez, 2020b). In July 2020, Armenian forces conducted a joint command-and-staff exercise with the Russian army. The exercise involved the commanders of a Russian-Armenian air-defense system and the Armenian army’s separate anti-aircraft units. The MoD Armenia declared that the particular objective of the activities was to develop new ways of fighting against UAVs (Asbarez, 2020a).

The cooperation between Azerbaijan and Turkey also implemented officer exchanges and the education of Azerbaijani officers in Turkish professional military educational institutions (Erickson, 2021, p. 5). This is evident in the Turkish assistance in developing the Azerbaijani SOF capabilities. The Azerbaijani army held a “Command-Staff War Game” in 2018, replicating SOF operations. Practical actions were worked out using new technologies of the Azerbaijan army for continuous troops management, interoperability, fast data transmission, and quick decision-making (Ministry of Defense of the Republic of Azerbaijan, 2018). Konstantin Makienko (2020), deputy director of the Centre for Analysis of Strategies and Technologies, argues that Turkish staff officers planned the entire operation.

Nevertheless, structural change against the background of the advent of drones cannot be identified. New institutions that deal specifically with the use of drones were not created. Additionally, there is nothing to suggest that new officers working exclusively with drones were recruited, hired, or trained. Instead, the primary goal of this effort was a general modernization, recasting the military from a Soviet-style force to a North Atlantic Treaty Organization

(NATO)-style force. This also included embracing NATO-compatible doctrine and acquiring modern equipment. In fact, over the last thirty years, the Azerbaijani general staff has been transformed from a Soviet-influenced to a more western NATO-style general staff (Ibid., pp. 2–5).

In addition, the extent to which Turkish support went is disputed. It is questionable, for example, who operated the drones. On the one hand, Turkey reportedly sent in UAV trainers ahead of the war (Kington, 2021). On the other hand, drone operators remained in Azerbaijan after the bilateral exercises (Черненко, 2020). Nevertheless, such drones require highly trained personnel and support from complex military assets (Calcara *et al.*, 2022, p. 133). To handle the weapon system in a target-oriented manner, the Azerbaijani military would have had to train pilots, sensor operators, tacticians, and support personnel in a short period. In addition, integration of the weapon system into the existing military structure in the context of network-centric warfare also does not seem possible without considerable outside involvement (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 40). Against this backdrop, some believe Turkish crews may have operated drones (Urcosta, 2020; Erickson, 2021, pp. 9–10). However, this is not confirmed.

While Azerbaijan is increasingly moving away from Soviet influences toward a modern way of operating and training, the Armenian army remains strongly influenced by its Soviet heritage. Soldiers were trained by older Soviet officers, following outdated Soviet-era tactics (Stronell, 2021). As a consequence, a Soviet-era defense met a 21<sup>st</sup>-century offensive. A higher level of competence and preparation on Armenia's part could have overcome Azerbaijan's technological advantage. This becomes evident in the electromagnetic field. Armenian soldiers should have been trained to limit their electronic and thermal signatures for longer times and distances (Shaikh and Rumbaugh, 2020). In this way, the reconnaissance drones could not have located them easily. Especially in the age of proliferating sensors and shooters, forces must adequately consider new ways to prepare against these threats. Against this background, experts argue that Armenia's losses are due to improper training, not “magic technology” (Bateman, 2020).

Overall, little organizational change has been made regarding the integration of UAVs. The organizational changes on the Azerbaijani side were made within the framework of a general modernization effort. Drones have certainly played an important role in this modernization process. In addition, the organizational assistance of Turkey should not be underemphasized. In

this respect, it is unclear who operated the drones. A modernization could not be identified on Armenia's side. Instead, training and preparation were influenced by its Soviet heritage. Generally, there were no structural changes that included the creation of drone-centric institutions or hiring officers tasked with particularly drone-related duties on both sides.

The following chapter examines whether and how drones, their integration in operational campaigns, and organizational modernization have been incorporated into doctrine.

#### 4.4. Doctrinal Change

The military doctrine of the Republic of Armenia and Azerbaijan defines possible internal and external threats and determines means for counteracting them and ensuring the military security of both states. Azerbaijan's doctrine dates back to 2010, and the one of Armenia dates back to 2007. There have not been updated doctrinal documents in the timeframe relevant to the thesis. Neither record has thus addressed measures that indicate the use of drones. Nevertheless, applicable policies can be derived from both papers.

The doctrine of Azerbaijan gave a new impulse for enhancing military capabilities and pursuing the military agenda during the past twelve years. The "occupation of Azerbaijani territories and ethnic cleansing of Azerbaijani people by the Republic of Armenia" was defined as the main external threat (Kharatyan, 2018, p. 28). The doctrine has thus become the basis for Azerbaijan's aspiration to restore territorial integrity by any means, including military operations (Kharatyan, 2018, p. 39). Speeches by Ilham Aliyev, the President of Azerbaijan, made since 2010, reflect this logic. Aliyev frequently emphasizes the importance of restoring territorial integrity "at any cost" and the necessity of enhancing "military power" (Aliyev, 2010). Azerbaijan increasingly presented the military option as the only remaining way to restore its territorial integrity since mediation has failed to produce a breakthrough to a political solution to the conflict (Rajabova, 2013). At a parade celebrating the centennial of Azerbaijan's army in 2018, Ilham Aliyev (2018) claims, "We want a peaceful settlement of the conflict," but "international law does not work." Against this backdrop, Azerbaijan made deliberate preparations for offensive warfare (Erickson, 2021, p. 9). The marked increase in Azerbaijan's defense budget indicates that an operation was planned well in advance. According to the Stockholm International Peace Research Institute (Stockholm International Peace Research Institute, no date b), between 2000 and 2020, Azerbaijan's military spending increased from \$119.6 million to \$2.2 billion. Revenues from oil and natural gas made Azerbaijan economically more

powerful and allowed the government to pursue an increasingly independent and self-confident foreign policy and armament (Kharatyan, 2018, p. 29; Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 8). Regarding new military systems, Azerbaijan has been the fourth biggest UAV importing country since 2010 (Kharatyan, 2018, p. 30). In addition, the fact that General Dynamics F-16 Fighting Falcon fighter (F-16) jets of the Turkish air force remained in Azerbaijan after a joint military exercise of Turkey and Azerbaijan at the end of July 2020 also speaks for a long-planned approach (Middle East Monitor, 2020). Ilham Aliyev told the TASS news agency that the Turkish F-16s initially remained as “moral support for us” (TASS, 2020). The use of Azerbaijani bait drones is also noteworthy. Planning and implementing the conversion and test flights must have taken several weeks or months. Therefore, this step must have been taken well in advance and intentionally (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, p. 40).

Following its military build-up, Azerbaijan enlarged the realm of military collaboration (Kharatyan, 2018, p. 34). Turkey played a decisive role as a strategic partner by proactively positioning itself on the Azerbaijanis’ side.<sup>13</sup> Article 2 of the ASPMS obligates both parties, in line with article 51 of the United Nations Charter, to provide mutual assistance when either country is subjected to an armed attack or military aggression (Aliyev and Gül, 2010). Against Turkey’s moral and military support, Azerbaijan proved to be more confident in provoking violence. However, the provocation to use violence should not be equated with lowering the threshold to war. The apprehension mentioned in chapter 2.2.4. has been made in connection with the use of drones. This provocation, however, stems from the general aspiration to restore territorial integrity and is reinforced by Turkey’s support. The fact that no norms weaken the regulation of the use of force underscores the argument.

The main external threat reflected in the military doctrine of Armenia is the Nagorno Karabakh conflict. In chapter I, the doctrine (2007) defines “the aspirations by the Azerbaijani Republic to resolve the Nagorno Karabakh conflict by military means” as a security threat of physical destruction. Another external threat is „the strategic alliance between the Republic of Turkey and the Republic of Azerbaijan and their activities aimed at maintaining the blockade of the Republic of Armenia.” (Ibid., 2007) This indicates that Armenia was well aware of the danger posed by Azerbaijan. The threat became real in 2016 when Azerbaijan launched a limited offensive (The Ministry of Defence of the Republic of Armenia, 2016). Azerbaijan used UAVs

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<sup>13</sup> For an illustration of Turkish Military Support, see Code Network 3 in the Appendix.

in the four-day war (Huseynov, 2020). The conflict between Armenia and Azerbaijan had expected to flare up again as tensions along the Line of Contact remained high, and clashes between Armenia and Azerbaijan broke out frequently (Erickson, 2021, p. 7). Consequently, Armenia has also undergone considerable militarization and rearmament over the past years. Between 2000 and 2020, Armenia's military spending increased from \$68.1 million to \$634 million (Stockholm International Peace Research Institute, no date a). The militarization is reflected in the doctrine. Chapter VIII deals with the task of military-economic and military-technical support. This includes providing the military security system with modern military equipment, weapons, materials, financial and other means (Kocharian, 2007).

Against this background, it is surprising that Armenia failed in the war. There are several approaches to explain this. First, as mentioned in chapter 4.1., Armenia's militarization has focused less on drone procurement. Armenia did not expand its drone fleet with outside purchases like Azerbaijan. Instead, Armenia obtained its military equipment almost exclusively from Russia. Therefore, Armenia could not keep up with Azerbaijan despite their nearly equal military standings. It is possible that the Armenian government relied on Russia's military and morals against the background of its close relations with Russia (Davies, 2020). This argument is supported in chapter V of the doctrine. The strategic partnership with the Russian Federation is a priority direction for military and military-technical cooperation (Kocharian, 2007). In contrast to Armenia's expectations, Russia positioned itself as a mediator in the conflict (Davies, 2020). Second, it is argued that Armenian political and military leadership underestimated Azerbaijan and failed to recognize the progress toward modernization and professionalization that the Azerbaijani forces had made. This argument becomes apparent in assertions that Daniel Balayan, head of Armenia's Military Aviation University, made in July 2020. He stated, "Armenia and Artsakh do not lack UAVs and have equipment in all directions," and further claims, "We have everything necessary now. If they try to even strike unexpectedly, they will not succeed." (Balayan, cited in Aysor.am, 2020) Such statements indicate that Armenia felt sufficiently prepared to defeat Azerbaijani UAVs. Armenia's rhetoric did not match the reality of a militarily inferior country (Kofman, 2020). These misperceptions likely contributed to the insufficient investments in the right capabilities and to Armenia's failure to train its forces in the run-up to the war adequately.

To sum up, content that indicates the use of drones could not be found in either doctrine. Only general tendencies could be identified. There has been considerable militarization on both sides

since the early 2000s. Azerbaijan has made no secret about its intention to rearm and retake Nagorno-Karabakh by force. This is particularly evident in Ilham Aliyev's rhetoric, the increase in Azerbaijan's defense budget, and the fact that weapons remained in Azerbaijan after joint exercises with Turkey. Armenia's misperceptions about the role of Russia and the militarization of Azerbaijan have led to misguided defense policies on Armenia's side. The military reality, characterized by Armenia's inferiority, did not correspond to Armenia's political strategy, which was driven by a perceived superiority.

## 5. Conclusion and Outlook

The research interest for the thesis has been to answer whether drones are revolutionizing warfare in the Nagorno-Karabakh war. The RMA was used as a framework to answer the research question. I argued that drones, when well-integrated into operational art, organizational techniques, and doctrinal thinking, bring about a revolution in military affairs.

In this chapter, the answers to the sub-questions are combined into a final argument to sufficiently answer the main research question. First, UAVs in the Nagorno-Karabakh war presented innovative use of new technologies. Drones have become an increasingly powerful and sophisticated tool for ISR. In combination with loitering munitions, they eliminated Armenian air defenses. The successful drone campaign owed much to the inability of Armenia to counter Azerbaijan's drone attacks, thereby confirming the devastating effect airpower can have on an adversary with relatively poor air defenses. Second, the study showed that the most critical and possibly revolutionary changes the introduction of drones has caused are operational. Drones successfully supported Azerbaijani operations, leading to information dominance and, ultimately, air superiority. Additionally, the analysis demonstrated the effectiveness of strategic strikes at operational depth. It is observed that drones, in conjunction with other weapons such as ballistic missiles and artillery, targeted and destroyed Armenia's center of gravity. This underlines the importance of the combination of firearms. The last campaign, aimed at seizing Shusha, illustrates the effectiveness of joint operations between UAVs and ground forces. Close combat through ground forces was essential in capturing the strategic position, thereby rejecting claims about the end of close combat and ground forces. Furthermore, UAVs were a significant factor for operational art regarding the region's geographical features. Although drones could better integrate into geographical features than tanks, tanks were still able to demonstrate their capabilities in large-scale assault operations on flat terrain. Hence, while drones were an

integral part of operational art, tactics and weapons of conventional warfare remain crucial for conducting operational campaigns. Third, there has been little organizational change regarding the integration of drones. In this regard, there are no signs of structural changes, including the creation of drone-centric institutions and officers, supervised with drone-specific tasks. The drone-centric exercises on the Azerbaijani side were carried out as part of a general modernization effort. Meanwhile, the Armenian army remains strongly influenced by its Soviet heritage, being trained outdated tactics by Soviet officers. Fourth, the study showed that changes were more prevalent in action than in writing because drones have not found their place in doctrinal writing yet. Only general tendencies could be identified. There have been considerable militarization efforts on both sides. The militarization was mainly driven by the conflict over Nagorno-Karabakh, which is classified as the greatest external threat in both doctrines. The research revealed that Azerbaijan had been threatening war and arming for over a decade. Drones, which were part of the military build-up, have certainly given Azerbaijan increased self-confidence in this regard. Armenia's policies and rhetoric did not match military reality. Armenia's misperceptions about the role of Russia and the militarization of Azerbaijan made them think they were superior when they were actually not. Consequently, this led to misguided defense policies on Armenia's side.

The decisive factor was the support from Turkey in all areas. Turkey has not only provided technological innovation but assisted Azerbaijan on the organizational and operational levels. Azerbaijani modernization was achieved through an extended period of joint exercises and education. Turkey also provided military advisors and officers and enabled Azerbaijan to gain a military advantage by operating drones technically. Furthermore, the analysis shows that Azerbaijani operations are similar to Turkish operations in terms of air defense destruction and integration of artillery and multiple rocket systems and UAVs.

Ultimately, the research question can be answered as follows: The technological innovation of drones and the integration of drones in operational art practices made the victory of the Azerbaijanis possible. Therefore, it is appropriate to highlight the special significance of drones in this war. Integration of drones into organizational and doctrinal thinking on the Azerbaijani side was limited and can be traced back to a general modernization. Regarding Armenia, it must be noted that drones were qualitatively inferior and thus appeared to have had no role in the war.<sup>14</sup>

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<sup>14</sup> For an illustration of technological, operational, organizational, and doctrinal connections, see Code Network 4 in the Appendix.

The analysis shows almost no integration of drones into operational, organizational or doctrinal domains. Hence, drones in the Nagorno-Karabakh war represent an evolution rather than a revolution in warfare.

The subsequent section concludes with implications for future warfare. The war in Nagorno-Karabakh has demonstrated to the world the use of some modern weapons and has vividly shown the direction in which warfare might evolve. There will be an increasing struggle for the information environment. The factor for the Azerbaijani victory was absolute air superiority, which was achieved through excellent and unrivaled information gathering, surveillance, and target acquisition (Wissenschaftliche Dienste des Deutschen Bundestages, 2021, pp. 72–73). In this respect, procuring reconnaissance capabilities in the form of ISR drones is indispensable from a military perspective. Furthermore, the Harop loitering munition as an autonomous weapon has proven its effectiveness. These systems have advanced in their level of automation, suggesting that warfare becomes more autonomous (Trager and Luca, 2022). Lethal autonomous weapons (LAW) are the newest and most far-reaching military technology development that will play a significant role in future warfare. The role of LAWs in combat should be the subject of further research. The war has witnessed the catastrophic effects drones have on inadequate air defense. It can be assumed that greater importance will be placed on air-defense systems capable of striking drones. With more effective air defense systems and the resources to develop new counter-drone strategies, it is far from clear that contemporary UAVs would enjoy the same dominance they have in the Nagorno-Karabakh war (Davies, 2020). Furthermore, a higher complexity will undoubtedly characterize future wars. This complexity is characterized by the integration of UAVs into the comprehensive network of weapons and forces. The prerequisites are military officers and advisers who know about respective advantages and disadvantages, conditions for effective employment, and training procedures. Institutions that specifically deal with the education and training to conduct combined operations will be essential in modern warfare. Finally, Armenia's policy illustrates the gap between military reality and political leaders' perceptions (Kofman, 2020). This led to the fact that Armenia was not sufficiently prepared for the war. It is expected that more emphasis will be put on the need to link military strategy to state policy.

More work on other countries' experiences with drones would help to confirm the thesis findings and further contribute to the literature. Given the rapid developments in drone technology, generalization must be taken with caution. What is certain is that drones will have an important place in future warfare.

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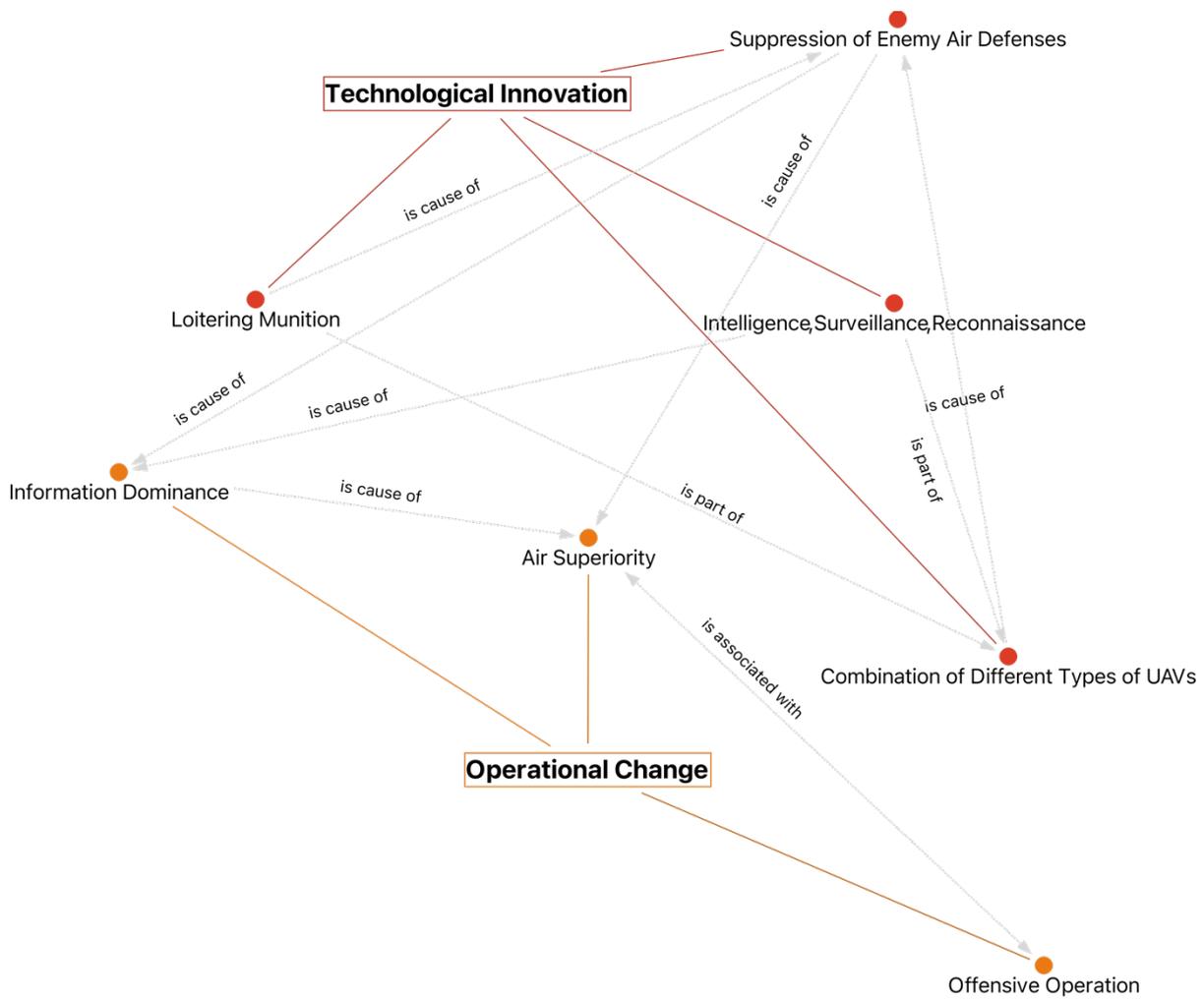
# Appendix

## I. Coding Scheme

Deductive Codes (Category)	Inductive Codes
Technological Innovation	Intelligence, Surveillance, Reconnaissance
	Loitering Munition
	Suppression of Enemy Air Defenses
	Electromagnetic Field
	Jamming systems
	Combination of different types of UAVs
	Turkish and Israeli military assistance
Operational Change	Information Dominance
	Air Superiority
	Offensive Operation
	Deep Operation
	Strategic Strikes
	Combination of Weapons
	Combined Forces (Jointness)
	Special Operation Force
	Capture of Strategic Positions
	Turkey's Operation Spring Shield
	Bait Drones
Organizational Change	Azerbaijan Military Exercises
	Turkish Organizational Assistance
	Azerbaijan Turkey Joint Exercises
	Operating Drones
	Armenia Russia Joint Exercises
Doctrinal Change	Azerbaijan Doctrine
	Armenia Doctrine
	Military Spending
	Russia Influence
	Agreement on Strategic Partnership and Mutual Support
	Rhetoric Azerbaijan

Table 1, Coding Scheme

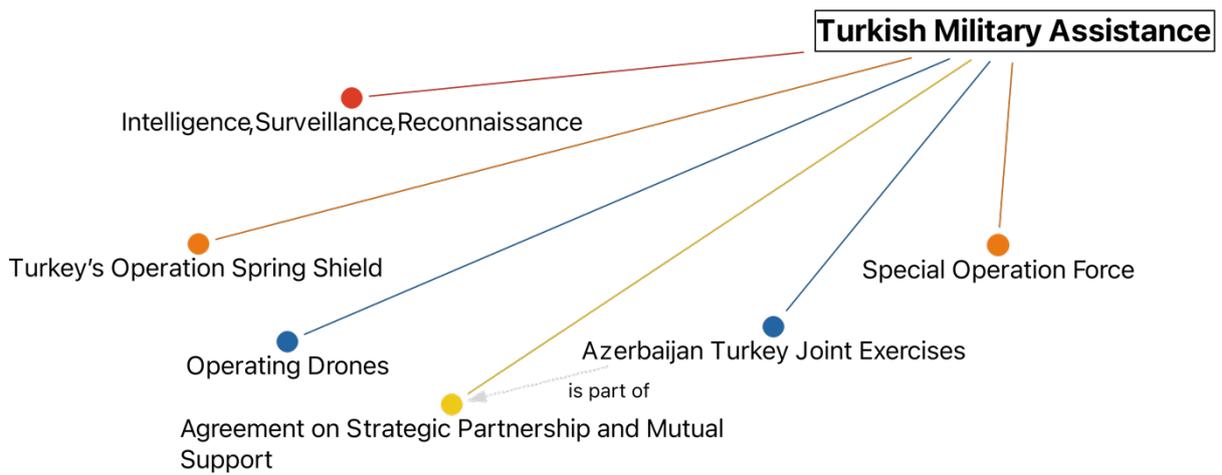
## II. Code Networks



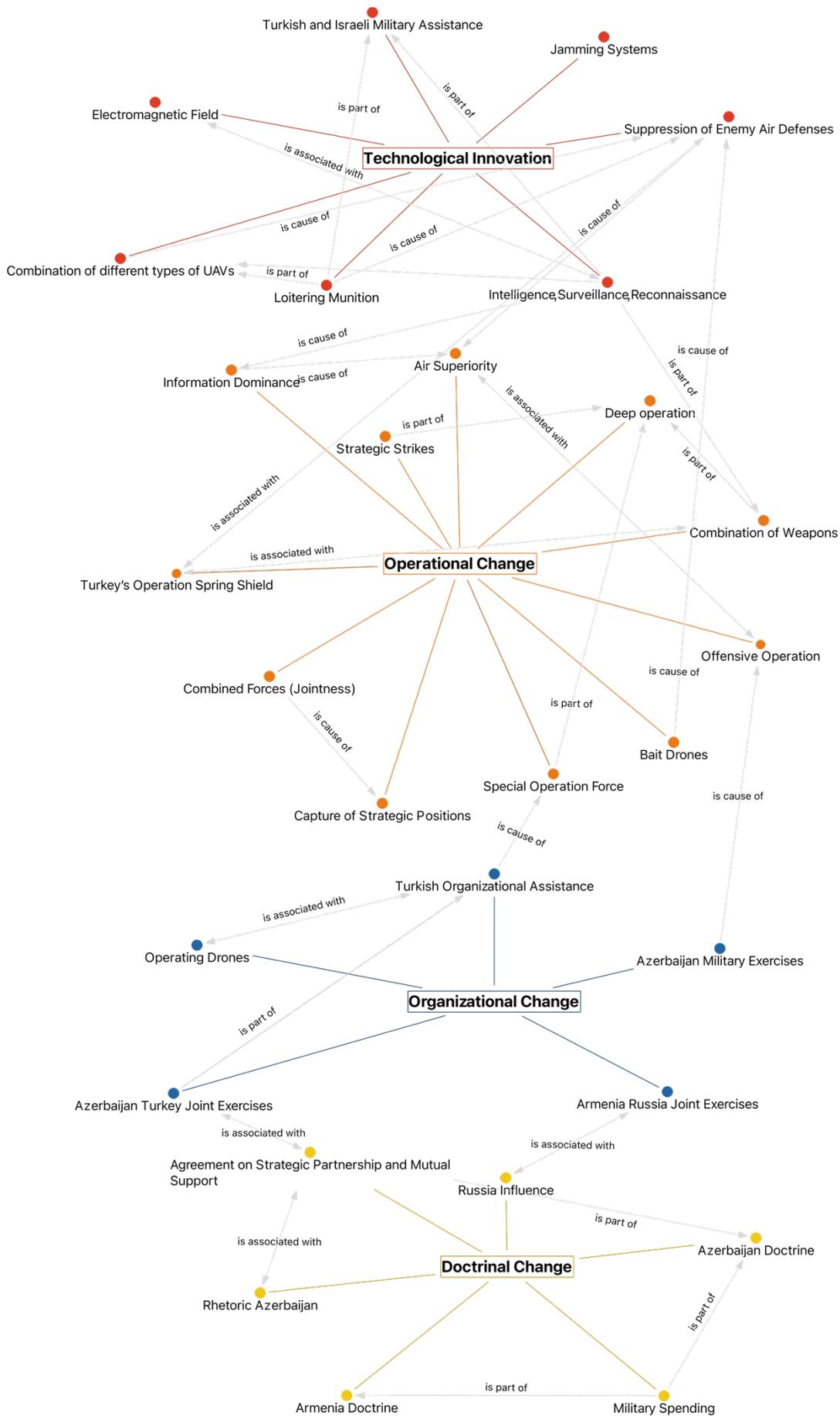
Code Network 1, Technological and Operational Connection



Code Network 2, Deep Battle Operation



Code Network 3, Turkish Military Assistance



Code Network 4, Connection between Technological Innovation and Operational, Organizational, and Doctrinal Change