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Unmanned Aerial Vehicles (UAVs) in Countries of Visegrad Group

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Contents

Abstract

This thesis studies the situation of unmanned aerial vehicles (UAVs) in V4 countries – Czech Republic, Hungary, Poland and Slovak Republic. It is trying to analyse current situation of this technology in these Central-European countries and find out, what is the future of drone technology in V4 states, if we can expect proliferation of unmanned aerial systems (UASs) in these countries in near future or what are their reasons to adopt such technology. Three different theories that will help to answer these questions will be presented – adoption-capacity theory, ideas of Mauro and Andrea Gilli and hypothesises of Horowitz and Fuhrmann. Ultimately, it will be concluded that Poland and Czech Republic, thanks to their financial resources, organisational structure and infrastructure, have better chances to experience proliferation of drone technology in next few years than Hungary and Slovakia.

Introduction

Chances of winning the military conflict highly depend on level of the technological development of the state. Amount and type of the weapons that country possess is one of the key determinants of its success or failure in future conflict. Therefore, militaries all around the world are trying to develop new technologies that would help them to protect their territories, citizens and win future wars. This thesis will focus on such technology – unmanned aerial systems (UASs). Although most of the people would think that unmanned aerial vehicles (UAVs), also known as drones, are quite new technology, the fact is that the first military drone was created back in 1917 (Mills 2019). So, UAVs exist for over 100 years, but their worldwide diffusion started only quite recently, in the beginning of the 21st century. However, this thesis will not deal with major powers in this area, like USA, Israel or China. Rather, it will look on four Central-European states that are cooperating together in so called Visegrad group. I will make the comparative analysis, focusing on the adoption and use of UASs by the members of Visegrad group, also known as V4, that consists of Czech Republic, Hungary, Poland and Slovak Republic. In my thesis, I want to find out what is the future of drone technology in V4 states, if we can expect proliferation of UASs in these countries in near future or what are their reasons to adopt such technology. To find out answers for these questions, I will apply three different theories on V4 states. Adoption-capacity theory, ideas of Mauro and Andrea Gilli, and hypothesises of Horowitz and Fuhrmann will help me to better understand current situation of drone technology in armies of V4 states and I will be able to better understand how the future of drone technology in these states will look like.

This thesis will start with literature review, with the explanation of military innovation studies that comprises of four schools of thought. This chapter will focus also on the first adoption of UASs into the armies and gradual spread of this technology across the world. Strengths and weaknesses of UASs will be mentioned and in the end, Central-European organisation known as Visegrad group will be presented. In next two chapters, methods that will be used in this thesis will be introduced and three main theories will be explained. In the beginning of the empirical part, I will start with individual analysis of the situation concerning drone technology in all four V4 countries. All three theories will be applied on each V4 state, which will help me to better understand the situation in each particular V4 state, and these informations will be then used in the final chapter before conclusion. Before

the end, I will compare condition of drone technology in V4 states to find out, which state has the biggest potential to become key actor in drone technology in near future. Ultimately, this thesis will conclude that the proliferation of drone technology in next few years is much higher in Poland and Czech Republic than in Hungary and Slovakia.

Literature Review

Just over the last 100 years, humanity made a giant progress in all fields and we have made big steps also in military industry. In the beginning of the 20th century, people fought with simple rifles, and tanks, war planes or nuclear weapons were still technology of a distant future. Today, we have achieved and have perfected these weapons and we are already looking for a new one. We came to the point when we are asking ourselves whether, and if so, when, we will see a battle that will be fought solely by robots. These types of questions are dealt by the academic field named military innovation studies. Military innovation studies lacks the attention of many scholars, since the research topics that this field is dealing with, like the dynamics of organisational culture, the challenges of institutional learning and the relative influence of internal and external factors upon change, are similar to the research topics that are dealt by more influential social science disciplines, such as management or psychology (Griffin 2017: 196). Nevertheless, military innovation studies has potential to greatly contribute with its researches to the other disciplines.

Military innovation studies

There is a debate whether special field of study that is focusing solely on military organisations is really necessary, since it overlaps in many aspects with other disciplines. One argument states that there should be special field of study dedicated to military organisations, because they are unique organisations compared to others. Their uniqueness stems from their difficulty to change, which is a result of multiple reasons. Many countries that are not currently in the war, lack operational tests of their organisational structures and practices and thus, they do not find it necessary to change. Or military leaders can be reluctant to change because there can be unpleasant consequences in case, that the change would not bring coveted results (Nielsen 2010: 11–12). But Stuart Griffin does not agree with such claims. He believes that military organisations are not the only one which are unwilling to change frequently. He mentions management literature, where organisations are also resistant to change, but in that field, there are many studies that explain this phenomenon and give

advices on how to overcome it. In addition, he claims that even in military field, there are multiple case studies that prove that military organisations are not afraid of change and therefore he concludes, that the claim that the uniqueness of military organisations comes from their difficulty to change, is just a myth. In spite of such claims, Griffin believes that military innovation should be a separate field of study, because many different fields choose military organisations for their case studies to better understand organisational dynamics. Therefore, there clearly is a place for military innovation studies, which would focus only on military organisations (Griffin 2017: 212–213).

Military innovation was defined differently by many scholars, but I will use Stephen Rosen's definition. He describes military innovation as "a change in one of the primary combat arms of a service in the way it fights or alternatively, as the creation of a new combat arms." (Rosen 2010: 13) However, there are 3 main components to the definition of military innovation that most of the scholars agree on. Firstly, the innovation changes the functioning of the military formations in the field. Secondly, the innovation is significant in scope and impact. Thirdly, the innovation leads to the improvement of the military effectiveness (Grissom 2006: 907). Therefore, the military change has to bring all these three results to be really understood as the military innovation.

Four schools of thought

Military innovation studies comprises of four major schools of thought that were defined by Adam Grissom, back in 2006. In his work, he describes that every school has its own answer to the question, where does the military innovation come from. They respectively focus on civil-military relations, interservice politics, intraservice politics, and organisational culture (Grissom 2006: 908). However, most of the military innovation scholars are not a die-hard advocates for one school of thought. They usually explain military innovation by using different aspects of multiple schools.

Civil-military model

Civil-military model was derived from the work of Barry Posen, whose research focused on the behaviour of Britain, France and Germany in the interwar period. Posen concludes that "innovation will only occur if statesmen intervene in military service doctrinal development, preferably with the assistance of maverick officers from within the service. Otherwise, military organisations will gradually stagnate and ultimately fail the societies they

exist to serve." (Posen 2006: 909) There are many scholars, like Kimberly Zisk or Deborah Avant, who afterwards, confirmed this conclusion with their own case studies. (Grissom 2006: 908 - 910)

Interservice model

For the interservice model, the key role in military innovation is played by military services inside a state. These services compete between each other for the authority and budget. Each service wants to prove its importance for a state and thrives to be in front of other services, which results in innovation. The advocate for this school of thought, among others, was also Andrew Bacevich with his research on US Army during Cold War era. He wrote that in 1950s, US Army was struggling to gain the authority over US Air Force, which led to the strategical change. They acquired few nuclear weapons just to impress Dwight Eisenhower, who was in favour of nuclear-centric doctrine. After the Eisenhower's presidency, US Army went back to more conventional doctrine since new president, John F. Kennedy, did not support nuclear weapons as much. (Grissom 2006: 910 - 913)

Intraservice model

The intraservice model of military innovation believes that the innovation depends on the competition between the branches within particular services. The major work for this school is the book *Winning the Next War* by Stephen P. Rosen. For Rosen, innovation will occur when service leaders will come up with "a new theory of victory" with which will be the mid-level officers satisfied, and when there will be such institutional arrangements that will ensure the longevity of a new innovation. So, for making the innovation possible, leaders must find supporters and resources for their innovation within their service. (Grissom 2006: 913 - 916)

Cultural model

There are plenty of defenders of the cultural model. Probably the key author for this school of thought is Theo Farrell, who argued that culture influences the military innovation. For him, culture (which is defined as "inter-subjective beliefs about the social and natural word that define actors, their situations, and the possibilities of action" (Grissom 2006: 916)) shapes the reaction of the organisations to the possible innovation. He claims that there are three actors, who can reshape the culture to make the innovation possible – senior service leaders, external actors or cross-national professional military culture (which could be copied

by others). Farrell believes that militaries favour certain innovation opportunities over others, not necessarily based on their rational choice, but rather, based on whether this new innovation would fit to their cultural frame or not. (Grissom 2006: 916 - 919)

Proliferation of UAVs in USA

In 2019, Caitlin Lee conducted a research focusing on the influence of the culture on adoption of the new military innovation. She was interested in the former reluctance of the US Air Force (USAF) in adopting the Predator programme back in 1990s. At that time, there was already a lot of evidence that military drones have great war-winning potential and that they can be great alternative for classic manned aircrafts. One of Lee's explanation of this hesitancy to change is the leadership of the Air Force. It was mainly comprised of former bomber and fighter pilots, who were not in favour of the unmanned aircrafts. They saw them as a threat to manned aircrafts and for that reason, they used them only during wartime, when they were really necessary, which just proves that they were aware of the importance of such technology. (Lee 2019: 8-9)

Probably the biggest advantage of the drones is that by deploying a drone to the battlefield, you are not risking life of your soldiers. And mainly because of this reason, Air Force found it necessary to use drones more frequently in Vietnam War. During Vietnam War, USAF started rapidly innovating UASs, because they were losing much more soldiers than they were expecting. By deploying drones, they were able to slow down the raise of their casualties, which was crucial in this war because the casualty tolerance in USAF and in general public was not so high. It was other story during WWII, when the casualty tolerance was much higher and also for this reason, USAF did not use drones so often during WWII. (Lee 2019: 11)

Reluctance to adopt Predator programme

From 1993 to 1995, USAF rejected the Predator programme and General Merrill McPeak, the USAF Chief of Staff, provided quite rational arguments for this decision. One of the reasons was that USAF was already doubling its investments into the satellites for strategic reconnaissance, and reconnaissance drone was thus understood as redundant. McPeak was also concerned about the high loss rates of drones during Vietnam War. Also, after Cold War, he wanted to save finances and he believed that manned aircrafts are much cheaper choice. But people outside of USAF did not share his opinion. Supporters of the Predator programme like the Deputy Secretary of Defense, William Perry, Pentagon's chief

weapons buyer, John Deutch or the Deputy Undersecretary of Defense for Advanced Programs, Larry Lynn were convinced by the Defense Science Board Study that expressed the importance of the innovation of drones. This study found that UASs are more suitable for reconnaissance missions, because satellites were unable to ensure the long-dwell coverage requirements. Moreover, based on the informations from the Pentagon's briefing, known as Senior Ulm, manned SR-71 spy plane was significantly more expensive than Global Hawk drone. Therefore, McPeak's arguments were invalid and there were proofs that adoption of Predator programme would have improved the situation of USAF. (Lee 2019: 13-15)

Caitlin Lee claims that these rational arguments were overshadowed by McPeak's cultural norms like focus on manned aircrafts, concern for preserving warrior ethos and ignorance of broad conception of airpower during peacetime. It was because of these cultural norms, why USAF refused to undergo technological innovation. (Lee 2019: 19) All other schools of thought failed to explain USAF's behaviour. Based on the civil-military model, militaries will innovate, when new threats will prompt civilians to cooperate with military to innovate. But although CIA succeeded with its Predator missions in Bosnia, and Pentagon civilians supported the idea of drones, USAF refused to adopt them. The inter-service school of thought believes that organisations will compete between each other to gain new technologies. However, USAF did not fight for it, despite the fact that Army or CIA were clearly interested in drone technology. And the intra-service model states that military leaders have to come up with the theory of victory which will be accepted by mid-level officers. But officers on mid-level in USAF did not fully agree with the stance of their leaders. Therefore, for Lee the only model that explained USAF's reluctance to adopt drones is cultural model. (Lee 2019: 22)

Adoption of Predator programme

When McPeak was replaced, on his chair of the Chief of Staff, by General Ronald Fogleman, in 1994, USAF experienced enormous cultural change. Not even after full one year in office, Fogleman adopted the Predator programme. He especially wanted to shift USAF more towards reconnaissance and he believed that they could use a full potential of the drones as the reconnaissance tool, compared to other organisations and this shift will help Americans to win future wars. (Lee 2019: 24-25) And again, Lee claims that all but cultural school fail to explain adoption of the Predator programme. Based on civil-military model, military outsiders force military to change. However, there is not a proof that Pentagon

civilians forced Fogleman to adopt drone programme. For inter-service model, the important is the competition between organisations to increase their resource share. But when Fogleman adopted the Predator programme, he thought that this programme has an added cost and that his organisation will lose some resources and therefore, there is no reason to fight for it with other organisations like Army or CIA. And intra-service model is also not usable because Fogleman failed to create new theory of victory, which is a key concept for this model. So, the cultural model is again the only model which can explain Fogleman's decision in adoption of Predator programme. However, during the Fogleman's incumbency, cultural resistance against unmanned aircrafts did not disappear from the USAF and thus, Mark Welsh, USAF Chief of Staff between 2012-2016, had to establish the Culture and Process Improvement Program to finally decrease this cultural resistance. (Lee 2019: 27)

Proliferation of UAVs and its consequences

During the last decade, the world experienced big proliferation of drones. Study, made by Dan Gettinger, found out that the number of countries that have in their possession drone of any kind increased by 58%, from 60 countries in 2010 to 95 countries in 2019. (Gettinger 2019: VIII-IX) Although most of these countries have only unarmed drones, this rapid acquisition of drones raises a question about the consequences of this proliferation. When discussing, what can be the possible consequences of this proliferation for regional and international security, scholars are divided into two camps.

Negative consequences of drone's proliferation

One group of scholars believe that this drone proliferation will have dangerous consequences. It is because drones are making decision-making, whether to attack the enemy or not, much more easier and thus, also much more likely. Peter W. Singer is worried that the American decision-making about the conducting of the mission where people can die is not taken very seriously anymore, just because at stake is not a life of “our” citizen. (Singer 2012) Micah Zenko agrees with Singer and adds that this lowering threshold for using force can create the precedent for drone airstrikes that can be adopted by other countries and non-state actors. (Zenko 2013: 4) Even UN special rapporteur, Christof Heyns, stated that “drones make it not only physically easier to dispatch long-distance and targeted armed force, but the proliferation of drones may lower social barriers in society against the deployment of lethal force and result in attempts to weaken the relevant legal standards.” (Heyns 2013: 5) Heyns's statement can be backed up by the research that showed that around 65% of Americans

supported counterterrorism drone airstrikes, which would not result in any U.S. casualties. (Kreps 2014: 3) But drones do not make only decision-making about their deployment easier. With proliferation of the drones, defender can be much more prone to shooting down the aircraft, which might create even stronger tensions between adversaries. (Horowitz et al 2016: 14) This group of scholars therefore conclude that proliferation of drones will have many undesirable consequences for regional and international security.

Drones are just another platform

Second group of scholars is not afraid that world will change massively, because drones do not bring much more new capabilities compared to other, already existing, technologies. Armed drones are usually used to carry out targeted airstrikes, but this can be done also by manned aircrafts. Therefore, objective that the military is trying to achieve, remains same and it is only the platform through which can be this objective achieved that changes. Norton Schwartz, Chief of Staff of the USAF, claimed that if it is a legitimate target, it does not really matter in which manner you will engage the target. (Schwartz 2016: 16) Supporters of this group like Charli Carpenter and Lina Shaikhouni believe that drones are not a real problem. For example, they disagree with the statement that drones kill too many civilians by arguing that there are not available reliable data to make such claim. Or they do not agree that drones make killing much more easier, because many pilots of these unmanned drones suffer from mental stress after conducting a deadly airstrike. (Carpenter & Shaikhouni 2011)

Advantages of UAVs

Drones experienced big proliferation over the last few years, so it is clear that countries believe that drone technology have some major advantages compared to other technologies. Drones are praised especially for their ability to fly without anyone in the cockpit. Obviously, this is an enormous benefit for militaries, which cannot risk lives of their soldiers, although this benefit can backfire when it comes to the decision-making of conducting a mission, which was discussed above. Another advantage of drones is their ability to stay in the air much longer than any manned aircraft. While U.S. drones, like Predator and Reaper, can fly for over 14 hours, F-16 fighter jet can stay aloft only around 4 hours. Moreover, drones can deliver missiles with much higher accuracy. It is because of these reasons, why still more and more countries are starting to invest into the drone technology. (Horowitz et al 2016: 19-22)

Disadvantages of UAVs

Although many scholars are not afraid to title drones as revolutionary technology, drones do have some major disadvantages. First, the speed of drones in the air is nowhere near to the speed of their manned counterparts. This makes drones useless in areas, where the enemy has air defenses. Second, what makes drones even more vulnerable to the opposing air defenses, is drone's lack of air-to-air countermeasures. Third, the technology that connects the aircraft to the remote control is vulnerable and can be hacked by the enemy. This case happened back in 2009, when American Reaper was hacked by Iraqi insurgents using software that costed $26. (MacAskill 2009) Fourth, people forget that although there is no pilot sitting inside the cockpit of a drone, there is a pilot sitting thousands miles from a drone in front of the screen and flying the drone. These pilots have three to four times more flight hours per year than pilots of the manned aircrafts. Drone pilots often develop post-traumatic stress after conducting the deadly airstrikes on the target that they usually monitored for weeks and over time, they have created some form of familiarity with a target. (Horowitz et al 2016: 17-19)

UAVs in the hands of non-state actors

Pros and cons of drones listed above show that drones are much more useful in fighting terrorists than fighting other states. It is because, states usually have some form of air defense, which makes drones much less effective, as they do not have any countermeasures by which they could protect themselves against enemy's attack. Despite this decreased effectiveness of drones against state actors, there is still big fear of non-state actors acquiring drone technology. It is because previous discussion about effectiveness of drones was focused on armed military drones like Predator or Reaper, which are not frequently used by non-state actors. How easily can be civilian drone modified into the drone used for military purposes can be seen in conflict in Ukraine. Russian separatists are supplied with drones by Russia and Ukraine had to improvise to protect itself. Ukrainian soldiers are using modified civilian drones that are often manufactured by volunteers. There are multiple groups which are modifying civilian drones for military purposes, but only group named “Aerorozvidka” works with Ukrainian artillery forces. Ukrainian Commander even stated that in the beginning, they were using civilian drones with GoPro camera attached to it for reconnaissance missions. (Lazaredes 2015) Terrorists could modify civilian drones in similar fashion and by adding small amount of explosives, they can generate great destruction. And because these civilian drones are usually very small, they cannot be detected by air defenses.

These types of drones would be suitable especially for small terrorist groups or “lone wolves”, who only want to achieve destruction. For bigger terrorist organisations, like Hezbollah, even bigger drones can be useful, especially for reconnaissance missions. Already in 2006, Israel shot down Hezbollah's drones that were armed with explosives. (Hoenig 2014) Hezbollah was presumably supplied with these drones by Iran. And keenness to use drones showed also Islamic State, which conducted its first deadly airstrike in 2016, which killed two people. (Ware 2019) It is understandable that many scholars worry about drones in the hands of non-state actors because they can be easily acquired, can generate big destruction and defending against them is quite difficult.

Moral and ethical concerns

Probably the most important question in future development of drones is, how much autonomous will the future drones be. Nowadays, most of the military authorities call drones “Remotely Piloted Aircraft” (RPA) to stress that they are not flying on their own, but there is someone, somewhere who is piloting that aircraft. However, fully autonomous drones (meaning that they can make their own choices) are already mostly developed, but they are not operational yet. (Dyndal et al 2017) But with development of this technology, moral and ethical questions arise. Singer in his article writes that when it comes to the question about the autonomy of drones, most of the military personal do not respond or just simply say “People will always want humans in the loop”. (Singer 2009a) And yet, we are developing this technology. We are not able to put moral and ethical principles into the machines. We can program it in some way, but what will the machine do, when the enemy will take cover behind a child? In such situation, even human soldier would not be sure what to do. Next question is, who will take responsibility if fully autonomous drone malfunctions? In 2002, American pilot flying over Afghanistan saw flashing lights underneath him and because he thought that he is under fire, he dropped a bomb. He ended up killing 4 and wounded 8 Canadian soldiers, who were on a training mission. Later, he was found guilty of dereliction of duty. (Singer 2009b) If such mistake would have been made by fully autonomous drones, who would be responsible? Today, there is no clear answer for this question. Obviously, if one day, fully autonomous drones will start flying in the skies, new laws, which will make someone liable for drone's mistakes, whether it will be commander, software developer or someone else, must be adopted. Because of these reasons, countries which are already developing fully autonomous drones, should really reconsider if they will really want to use them in war.

Visegrad group

The Visegrad group was formed on 15th February 1991 by Václav Havel, the President of Czechoslovakia, Lech Wałęsa, the President of Poland and József Antall, the President of Hungary. After dissolution of Czechoslovakia, in the end of 1992, both newly created states, Czech Republic and Slovak Republic, joined Visegrad group. Therefore, nowadays Visegrad group comprises of four states – Czech Republic, Hungary, Poland and Slovak Republic – and is commonly known as V4. The initial fuel for this cooperation was the belief that together they will faster eliminate the remains of communist bloc and start the process of European integration. (Visegrad Group no date a) Today, cooperation includes working together on projects from many different fields like science, education or culture but also internal security and defence. The only organisational platform of V4 is the International Visegrad Fund and the cooperation works on the basis of periodical meetings of their representatives. (Visegrad Group no date b)

Military cooperation

Military cooperation of V4 countries started to form in 2014, when three areas of cooperation were stipulated – capability development, procurement and defence industry; establishment of multinational units and running cross border activities; education, training and exercises. (Visegrad Group no date c) Probably the most important is the creation of the V4 EU Battlegroup, which consists of soldiers from all four member states. This Battlegroup was created for the use of NATO and EU, and should have been the cornerstone of the permanent military cooperation between V4 states. Battlegroup was firstly deployed in 2016 and it was composed of 3 700 troops (1800 Polish, 700 Czechs, 640 Hungarians and 560 Slovaks). (Macq & Michelot 2018: 7) Although this was a big step in improving the military cooperation between V4 countries, this cooperation is still far from perfect. In the beginning of the 1990s, when representatives of Czechoslovakia, Poland and Hungary were thinking about the mutual cooperation, they assumed that because of the similar history, they will all share similar goals, which they could achieve together. However, what worsens the cooperation of these states in defence area, is the inability to find common goal. This inability stems from the fact that they do not agree on what is the biggest national threat for them. It looks like V4 countries are especially torn on the opinion about Russia. While Poland sees Russia as the biggest threat, Hungary has quite good relationships with Russia and for them, migration is much bigger threat. Czech Republic and Slovak Republic stand somewhere in

the middle and they would like to be a mediator between the West and Russia. (Krupa 2019) There were multiple cases when V4 countries could have worked together but decided to go own way. For example, they created a plan to acquire together new radars, which would protect the air space of whole V4. However, all members started to put national interest in front of the common interest. In the end, they started blaming each other for favouring national over common interest and they did not buy new radars together. (Krupa 2019) When it comes to UAVs, V4 countries do not cooperate much together in this area at this moment and looking on the previous experience, it can be assumed that they will not do so in near future.

Theory

Nowadays, development of new technologies is quite quick process. There are still new and new inventions that improve our lives in all areas. And military sector is not an exception. Especially thanks to the globalisation, new innovations can quickly spread across the globe, to other countries. But the speed by which countries adopt these new technologies is not constant. It depends on the attributes of the particular innovations and capabilities of particular states to adopt them. For instance, proliferation of military drones is relatively quick. While prior to 2000 only Israel and USA possessed Predator-like drones, today tens of countries have this technology. There are multiple theories that are trying to explain when are countries more willing to adopt new innovations. There are two big camps of theories that deal with this question. On the one hand, supply-based theories are focusing on state's capabilities to adopt new technology. Important are especially financial and organisational capabilities. On the other hand, interest-based theories focus on attributes of innovation and what benefits would this new technology bring to the state if the state adopted it. (Weiss 2017: 190) This thesis will focus especially on adoption-capacity theory which is part of the supply-based theories.

Adoption-capacity theory

Adoption-capacity theory suggests that there are two factors which determine the likelihood of the state to adopt certain technology. Those two factors are financial intensity and organisational capital. (Horowitz 2010: 30) Financial intensity refers to the cost of the innovation and how much is the innovation oriented on military. Higher cost per unit and higher level of military exclusivity makes the innovation less probable to be adopted by a

state. Thanks to the lower prices, states can buy few units and test their ability and then decide, whether this new innovation is useful for them and go for full deployment of this technology or they will decide that they will not invest more money into it. The level of exclusivity of the innovation for the military is important because if the technology could be used also in commercial space, private firms would invest in it too, which means, that military organisation would need to invest less and essentially, the probability of adopting such commercially-oriented technology by military organisations would be higher. (Horowitz 2010: 30-31) The organisational capital focuses on bureaucratic changes that the innovation requires. (Gilli & Gilli 2014: 517) Understandably so, lower organisational capital of the innovation makes it more probable that it will be adopted by a state. Thanks to these two measurements, we are able to predict, how fast will the innovation spread to other states in general. However, Horowitz adds that if we want to predict, if and when particular state will adopt new technology, we need to look also on other factors, especially motivations of a state to adopt it. He believes that claim that states with capacity to adopt new technology will always do so, is incorrect. He insists that security threats and internal politics influence decision-making of a states and they can choose to maximise certain utility over short-term military power. (Horowitz 2010: 40) Adoption-capacity theory will be applied to V4 states in empirical part of this thesis, because this theory provides two factors, financial resources and organisational capital, thanks to which it will be clear, which V4 states have means to adopt new technology like UASs. These informations will help me to determine, in which country is the proliferation of drones in near future most probable.

For Horowitz, there are multiple ways of how states can respond to new military technology, and they are divided into two groups – internal and external responses. One of the possible external responses is that state will not adopt new innovation and it will change its foreign policy in a way, in which it will protect itself from states that will decide to adopt new innovation, which could make those states more powerful. Paul Schroeder describes this as: “hiding in international politics or potentially “transcending”: pushing for international institutions or other means to deal with a situation in which a state no longer has the relative power to protect itself.” (Schroeder 2010: 26) This can lead to the shift of the state towards neutrality. Another possible external response is to decrease possible dangerous consequences by becoming an ally with a state or group of states which already adopted this new technology or there is a big chance that it will do so soon. State, which did not adopt new technology should also want to become an ally with a state who came up with this

innovation and is able to use the potential of that technology on maximum. (Horowitz 2010: 25-28)

To the possible internal responses to new innovation belong partial adoption of that innovation. States often do not want to make organisational changes and therefore, they adopt only technological and operational aspects of that innovation. Also, some states may not have enough capacity to fully adopt new innovation and therefore, they adopt just part of it. Alternatively, states might just decide not to adopt new technology, even though they have financial and organisational capabilities to do so, either because they fear that this new technology would trigger domestic revolts or they just think that financial and non-financial costs would be higher than the benefit from new technology. Lastly, states can also make counter innovation, which Horowitz describes as: ”an internal military response that excludes adopting the innovation, yet can range from trying to neutralize its impact with inexpensive tactics drawn from existing forces and operational plans to the search for another new military innovation to counter the first one.” (Horowitz 2010: 28) Horowitz states that the state with medium-seized economy, medium power and advanced industrial base will most likely choose partial adoption or it will try to become an ally with the possible adopter. (Horowitz 2010: 29)

Hypotheses concerning proliferation of UAVs

Michael Horowitz, together with Matthew Fuhrmann in one of their articles, tried to explain the proliferation of drones and they came up with five hypothesises. From the supply-side of UAVs proliferation, they assume that “more advanced economies should be more likely than less developed states to pursue UAVs” (Horowitz & Fuhrmann 2017: 407) They looked at the situation in Pakistan, where the willingness to adopt drones was very high, but it still took a lot of time to adopt it. Because of the high complexity of drones, Pakistan had to improve its technical capacity and these technological challenges slowed down the process of adoption. These difficulties are common especially when the technology is still very new, and states do not have much informations about it. Their another hypothesis states that it is more likely that military allies of major UAV suppliers will adopt drones than those states which are not allies with major suppliers. (Horowitz & Fuhrmann 2017: 407-408) Authors thus assume that political factors also play a significant role in the diffusion of military innovations.

Horowitz and Fuhrmann also present multiple interest-side reasons for the UAVs proliferation. One of the major priorities of every state is to protect itself and its citizens. New technologies are thus developed or adopted in response to international threats. This idea was already articulated by Posen, who stressed that countries are competing for security. In his article, Posen claims that: "Military capabilities are a key means to such security, and thus states will pay close attention to them. States will be concerned about the size and effectiveness of their military organizations relative to their neighbours. As in any competitive system, successful practices will be imitated." (Posen 1993: 82) Because of this, one of the Horowitz's and Fuhrmann's hypothesis states that "countries with international disputes should be more likely than dispute-free states to obtain UAVs." (Horowitz & Fuhrmann 2017: 403-404) So, countries that believe that their military power and their security will improve after the adoption of drones are more likely to adopt them. Another hypothesis is very similar to the previous one and it also deals with the state's security. This paper has already mentioned that UAVs are especially successful in fighting terrorists. With this knowledge, authors assume that "countries facing terrorist threats should be more likely than states that do not experience terrorism to obtain UAVs." (Horowitz & Fuhrmann 2017: 404-405) Last of the interest-side reasons for the adoption of UAVs deals with the regime type of the state. For democracies, drones should be attractive especially because of their ability to fly on their own, without risking life of the pilot. In addition, labour costs for drones can make, especially states with lower defense budgets, more willing to adopt them. On the other hand, for autocracies, UAVs can be attractive because they can be operated from command strongholds, which can be a crucial advantage for the autocrat, for who the possibility of a coup is constant threat. Thus, authors came up with the hypothesis that states that: "Democracies and autocracies should be more likely to pursue UAVs than mixed regimes." (Horowitz & Fuhrmann 2017: 405-406)

Horowitz and Fuhrmann tested their hypotheses and they were distinguishing between states that adopted advanced UAVs and states that adopted armed UAVs. They found out that territorial disputes increase the probability that state will adopt advanced drones. But when it comes to the armed drones, territorial disputes are not a reason for states to acquire them. (Horowitz & Fuhrmann 2017: 410-411) Their hypothesis was therefore just partially correct. They claimed that this shows that for states which experience territorial disputes, advanced drones that can be used for reconnaissance are all what they need, and they do not necessarily need to arm those drones.

Their hypothesis concerning the terrorist attacks was confirmed. Countries which often experience terrorist attacks, are more prone to adopt advanced and also armed drones than those countries, where terrorist attacks are rare. (Horowitz & Fuhrmann 2017: 411)

They also partially confirmed their hypothesis about regime type. Democracies and autocracies are indeed much more prone to adopt drones than mixed regimes. But this is correct only when it comes to the adoption of armed drones. In case of adoption of advanced UAVs, type regime did not play significant role. They even found out that autocracies are little bit more willing to adopt armed drones than democracies. (Horowitz & Fuhrmann 2017: 411-413)

Their hypothesis about the technological capacity turned out to be also correct. However, countries like Nigeria, Pakistan or Iraq already acquired drones and therefore authors do not want to conclude that you necessarily need big technological and economic capacity to adopt drones. (Horowitz & Fuhrmann 2017: 413)

Their last hypothesis about the alliance with a supplier is not right though. Countries that are allies with major UAV suppliers are not more prone to adopt UAVs. For example, China and Israel are selling drones to basically anyone. (Horowitz & Fuhrmann 2017: 413)

Horowitz and Fuhrmann predict that drones can become regular part of most militaries, just like tanks or fighter aircrafts. They believe that when drones become cheaper and more usable in commercial space, it will be much more easier for states to acquire them. Although, more advanced drones will still be out of the reach for some states.

On the cases of V4 states, I will try to test Horowitz's and Fuhrmann's hypothesises concerning the security threats. I picked these hypothesises because V4 states are very similar in many ways, but one of the few areas where their opinions can differ is the area of security threats for their country. Thanks to these possible differences, it will be much clearer to determine, whether the factor of security threats is the reason, why countries are adopting drones.

Ideas of Mauro and Andrea Gilli

Another authors who dealt with the question of proliferation of drones are Mauro Gilli and Andrea Gilli. Most of the scholars believe that thanks to their low price and quite easy production, drones are diffusing in rapid speed. (Lorenz et al 2011) Gillis do not share this opinion and they believe that adoption of UAVs is not easy process as most of the scholars

suggest. They came up with two arguments. First, production of combat-effective drones is difficult even for rich states with advanced technological capabilities like Germany or USA. Second, development of control, command, communication and computers infrastructure and organisational capabilities is difficult for developed states like UK, USA or Germany. Therefore, their ultimate claim is that drones will continue to spread, but only the most powerful and wealthiest countries will be able to achieve combat-effective drones. (Gilli & Gilli 2016: 52-53)

Since Gillis believe that there are two major problems in international relations literature – there is no empirical and theoretical proof that military technology diffuses quickly and easily; carelessness for material support that new technology need – they came up with their own argument. For them "successful adoption and employment of military innovations depends on meeting the ecosystem challenge." (Gilli & Gilli 2016: 56) The ecosystem challenge consists of platform challenge (ability of state to develop, design and manufacture armed drones) and adoption challenge (ability of state to access organisational and infrastructural support).

How difficult it is for a state to overcome platform challenge depends on weapon capabilities (technology) and manufacturer's experience (technological capacity). Technologically, it is much more difficult to design and develop a weapon which can conduct multiple tasks, can function in different environmental conditions or is advanced in other way. Technological capacity of each state is different. This capacity describes the amount of workforce, laboratories and experience of developers. Bigger this technological capacity is in a state, more advanced weapons can be produced by it. (Gilli & Gilli 2016: 56-58)

Adoption challenge consists of organisational and infrastructural challenges. Organisational challenges require set of appropriate practices, codes or doctrines and workforce with specific skills, which are organised in appropriate structures. If a country does not already have workforce and has to develop new practices, the adoption of new technology will be much more costlier. The level of difficulty to adopt new technology also depends on the infrastructural challenges. To the concerned infrastructure belong logistics, communication systems and possession of other weapons systems. Lesser the development of the state in these three areas is, lesser its likelihood that it will adopt this new technology. (Gilli & Gilli 2016: 58-60)

Gillis believe that when both platform and adoption challenges are low, new technology will spread really fast. Any light weapon, like AK-47, belong into this category. On the other hand, when platform and adoption challenges are high, new innovation will spread slowly. Example for this is U.S. multi-layered intercontinental missile defense shield. If new weapon presents high platform challenges but low adoption challenges, this weapon will spread quickly to those states, which can secure foreign supply of the platform. Possible examples are surface-to air batteries. And finally, weapons that present high adoption challenges, but low platform challenges will not spread very fast, and only to few countries. Conventionally propelled aircraft carriers belong to this category. (Gilli & Gilli 2016: 60-61)

In their research, Gillis are trying to test different explanations of supposedly fast proliferation of the drones and thus, they focused on three different drones. Loitering attack munitions (LAMs) are technologically very similar to cruise or guided rockets. Most of the scholars would therefore predict that adoption of LAMs would not be difficult, especially for countries which can already make cruise or guided rockets. Intelligence, surveillance, and reconnaissance (ISR) drones rely on commercial and dual-use technologies. Therefore, globalisation and development in commercial sphere should make the adoption of this type of drones quicker. And unmanned combat autonomous vehicles (UCAVs) are the evolution of jet fighters. Therefore, states just have to imitate this technology. If imitating is that easy as many scholars claim, especially states that have experience with manufacturing jet fighters should not have a problem to adopt UCAVs. In addition, Gillis remind also infrastructural and organisational challenges of drones. They believe that drones are not stand-alone platforms. State must develop infrastructure for drone otherwise it is like buying train while not having any railways. (Gilli & Gilli 2016: 64-65)

Ultimately, Gillis's research showed that even rich and more developed states had problem to design and manufacture those three types of UAVs, and some of them even failed to do so. It also showed that many countries had struggled with organisational and doctrinal challenges. These two outcomes lead Gillis to the conclusion that poorer countries would be even more unlikely to adopt these armed drones, as they would probably experience even bigger problems than more developed and financially stronger countries. They showed that developing and manufacturing a drone requires highly specific scientific and industrial capabilities. And they also conclude that infrastructure and organisational factors influence speed of the proliferation. (Gilli & Gilli 2016: 82)

The ideas of Gillis will be applied on V4 countries because they provide different factors, than adoption-capacity theory, which should influence the speed of proliferation of drones. In addition, Gillis tested their hypothesises on cases of the most technologically developed and wealthiest states. V4 countries do not belong to this group of states and therefore, it will be interesting to see, whether their hypothesises are correct when they are applied to the states that are not the most powerful states in the world.

Methods

In this master thesis, I will do comparative analysis of Visegrad four countries – Czech Republic, Hungary, Poland, and Slovak Republic. I picked this group of Central-European states because they are all members of the EU and NATO and all of them, but Czech Republic, are protecting certain part of the Eastern border of both of these organisations. Therefore, military power and technological capacity of these states is important for EU and NATO. In addition, the bond between these four states is quite strong because of their membership in V4, where they cooperate together in many different areas, including defence.

Interviews

Initially, I wanted to conduct an interview with representative of each state, who would give me informations about the situations and ideas about drones in their military. Therefore, I wrote an email to the battalion of each state that deals with UAVs. (In Czech Republic – 533. Prápor bezpilotních system, in Hungary - MH 24. Bornemissza Gergely Felderítő Ezred, in Poland - 12. Baza Bezzałogowych Statków Powietrznych, and in Slovak Republic – 5th Special Operations Regiment in Žilina) I conducted an interview only with Slovak soldier, who teaches Slovak soldiers to fly with drones. Czech soldier, who is part of the Permanent Delegation of the Czech Republic to HQ NATO and National Armament Director Representative, answered my questions in written form. I did not get any response from Hungarian and Polish representatives. For my research, I will gather informations mainly from military documents and in Slovak and Czech cases I will add informations from interviews. Therefore, at least in cases of Slovakia and Czech Republic, I will be able to use triangulation. Triangulation is an approach, usually to qualitative research, which is characterised by the use of multiple sources of data, which will make results of my research more reliable. (Bryman 2012: 392)

Application of theories

The goal of this thesis is to find out, why there have not been major proliferation of drones in V4 countries yet, what are the barriers that they will have to overcome to adopt drones and if we can expect proliferation of drones in V4 countries in near future. To find out answer for these questions, I will apply adoption-capacity theory, ideas of Mauro and Andrea Gilli and hypothesises of Horowitz and Fuhrmann concerning the security threats. Adoption-capacity states that financial resources and organisational capital of a country influence the probability of the adoption of new technology by a country. To find out, what is the financial situation of a country, I will look on how much money Ministry of Defence received from national budget for this year and how much money it received two years ago, to better understand, whether defence is becoming more important for state or not. To see the organisational capital of a country, I will look on whether they already established special military unit for UASs and if not, where are their UASs stored. To test Horowitz's and Fuhrmann's hypothesises about security threats, I will focus on different documents of different Ministries, but mainly Ministry of Defence, alternatively on speeches of Ministers, to find out what they consider as a biggest security threats for their country. Gillis's ideas say that the probability of adoption of drones depends on technological capacity and built infrastructure. To find out whether country has technological capacity to adopt drones, I will look on whether they have already made their own UASs and to test their infrastructure, I will look on the condition of their army.

Czech Republic

The first country which I will focus on and try to analyse its situation with UASs is Czech Republic. At this moment, Czech Republic belongs to the group of states that possesses some military drones, but it definitely does not play a key role in Europe, when it comes to UASs. However, Czechs surely have the potential to change this and they can become a key player in this area. And based on their recent claims and actions, it is obvious that they are determined to make unmanned vehicles important part of their army. Czech Republic is the only V4 member, which is fully surrounded by other EU members states, and the only country that borders with Czech Republic and is not part of the NATO is Austria, which clearly does not pose any possible threat for Czechs. Since some scholars believe that the possibility of the security threat is one of the key accelerators of the technological development, which can lead to the adoption of drones, this geographical position of Czech

Republic might make Czechs feel more secure than their partners in V4, and thus, it can influence their decision-making about the adoption of drones.

Understandably, significant technological development would not be possible without financial resources, as Horowitz and Fuhrmann claim in their adoption-capacity theory. Looking on the GDP per capita of EU members, Czech Republic does not reach the average amount and is in second half of the table in this statistics. (Eurostat 2020) Although this statistics suggests that the financial situation of Czech Republic is not ideal, when we compare its GDP per capita to the GDP per capita of other V4 countries, Czechs have the highest GDP per capita among V4 countries. However, when it comes to the GDP, naturally, the biggest state, Poland, is on top. (World Bank 2018) But Czech Republic is behind Poland, in second place. Nevertheless, this is the indicator that Czechs should be prone to the adoption of drones than other members of V4. Next part will focus on the recent actions of Czechs on drone adoption, which will clearly show, what are their opinions on UASs and what are their intentions with them.

533. Battalion for unmanned vehicles

Definitely the most important action that Czechs recently did to improve their drone coordination was the creation of the battalion for unmanned vehicles (In Czech: "533. Prapor bezpilotních systémů"). This battalion was created in January 2020, it will achieve some operational capabilities in October 2020 and it is assumed that this battalion will be fully operational in January 2025 and around 270 soldiers should be part of it. (Štrbík 2019: 12) Main reason why they decided to establish this battalion is the current environment of the war conflicts. Czechs believe that today, one of the most important capabilities of militaries is the achievement of the informations about the military units of your adversary. The strength of the UASs lays in gathering in such informations and for that reason, they will be a crucial part of an army in near future. This battalion for unmanned vehicles was thus created, because Czechs are aware of the power of UASs and they want to keep developing capabilities of their drones. (Želinský & Herber 2020) So, Czechs are starting to do organisational changes, which Horowitz and Fuhrmann, write about.

However, establishment of this battalion is just first step, crucial decisions for Czech military concerning drones will come in few upcoming years. In the document titled "*Dlohodobý výhled pro obranu 2035*" (In English: Long-term view for Defense 2035), it is mentioned that until 2024, they will decide whether Czech military will buy new attack

helicopters or it will replace them with new UAVs, that will have same capabilities as those new helicopters. (Ministerstvo obrany České republiky 2019a: 21) But it looks like the question is not if Czechs will invest more in drones, but rather, how much they will invest. Replacement of attack helicopters is still in question but at the opening ceremonial of the 533. Battalion for unmanned vehicles Aleš Opata, Chief of General Staff, said that Czech military is planning to buy new armed drones. (Opata 2020) This intention is mentioned also in the document "*Koncepce výstavby Armády České Republiky 2030*" (in English: Concept for the construction of the Army of Czech Republic 2030) which clearly states that Czechs want to invest more in drones. (Ministerstvo obrany České republiky 2019b: 26)

Drones in Czech possession

Today, Czech military possesses few different types of drones of categories Nano, Micro, Mini and Small and none of them has ability to be armed. The first drone that Czech military possessed was developed by Czech Military Technical Institute in 1994 and its name was Sojka III. They stopped using this drone in 2010 and since then, they operate drones that were not developed by them but rather, they bought them from USA and Israel. First drone that was bought in 2009 by Czech military was American RQ-11 B Raven and later, in 2017, they replaced it by 15 units of modernised version, RQ-11 B DDL. They also have drones such as RQ-20 A Puma III LE, RQ-12 A Wasp or Black Hornet. Czechs bought from Israel Skylark I-LE but the current most powerful drone in Czech armoury is American ScanEagle, bought in 2015. Czech military is using ScanEagle especially in Afghanistan, where it was used for more than 3 500 hours. Last year, Czech military ordered modernised version of ScanEagle, which will be used from October 2020. (Štrbík 2019: 10-11) Since all these drones are not armed, they are used for surveillance and reconnaissance missions.

Plans for future

As it was mentioned, Czechs are planning to buy their first armed drone. Czech soldier that I spoked to told me that Czech army was gathering informations about British Watch Keeper, and Patroller which is now operated by French army. It is therefore probable that Czechs will buy one of these armed drones. Jan Štrbík, man who was commissioned to establish Czech battalion for unmanned vehicles, writes in his article that MALE/HALE type drones like HERON or MQ-9 Reaper are basically unattainable for Czech army, because of their high price and technological difficulty. (Štrbík 2019: 13) But although Czech Republic will probably not possess most powerful drones, they definitely want to improve in this area,

which is stated also in the Conception for the construction of Czech Army in 2030. In this document, it is stated that Czechs plan to buy new drones for reconnaissance missions. But this document does not forget about the security against drones. They plan to invest in weapons, like mobile jammer of the radio signals, that would protect them against UAVs. (Ministerstvo obrany České republiky 2019b, 30) So, Czechs are aware of the dangerous potential of drones in the hands of adversary and they want to be ready to protect their citizens and their soldiers in case of an attack by UAVs.

Adoption-capacity theory

Organisational capital

It is clear that Czechs are aware of the big potential of UASs and they are trying to adapt to the changing military environment. Establishment of the battalion for unmanned vehicles in the beginning of 2020, underlines the Czech awareness about the importance of drones in Czech Army. Multiple documents concerning future development of Czech Army write about investments in drones and stress the importance of unmanned systems. By creation of battalion for unmanned vehicles, Czechs have started necessary organisational change, which is required to be able to use full potential of their UAVs. This change will take some time, just the battalion itself will be fully ready in 2025, and as adoption-capacity theory suggests, if new technology requires big organisational changes, militaries are less likely to adopt it. But the necessity for big organisational change did not stop Czech Republic in adoption of drones, since Czechs believe, that UASs will be essential part of every powerful army.

Financial resources

Second part of the adoption-capacity theory writes about the importance of the price of new technology. Understandably, lower the price of the technology, more likely is state to adopt it. It is generally believed that UAVs are relatively low-cost technology. Of course, there are many different types of drones, so their prices vary a lot. Some of the most expenisive drones cost over 90 million € per unit. (Ritsick 2020) So these drones are accessible only for most powerful and wealthiest states. But smaller drones, like Black Hornet, which is one of the drones that is possessed also by Czech Republic, only costs around 14 000€ – 18 000€ (Trevithick 2019), which makes these drones accessible for almost any state. When we look on the division of money from Czech national budget over the last few years, it is clear that they are investing more in army every year. While in 2018 Ministry

of Defence of Czech Republic got almost 60 billion CZK (almost 2.22 billion €) (Ministerstvo obrany České republiky 2019c: 9), in 2020 it got 75.5 billion CZK (almost 2.8 billion €) (Ministerstvo finance České republiky 2020: 32). So, in the period of two years, budget of Ministry of Defence of Czech Republic raised by more than 500 million €. And when we look on the rank on how much money each Ministry received, Ministry of Defence is on fourth place. This shows that military sector is becoming more important for Czechs and they are willing to invest more in modernisation of their army. These numbers show that Czechs have financial resources to fulfil their intensions in UAVs area. Although, as Štrbík noted, financial resources are one of the barriers in achieving the most powerful drones, it is clear that Czechs have resources to heavily invest in drone technology in future years.

Summary

Adoption-capacity theory states that in order to find out the probability of the adoption of new technology, one has to look on financial resources this new technology requires and organisational change this new technology requires. Czechs do have financial resources to adopt bigger amount of small types of drones and few armed drones, and because they are currently in a process of organisational change, we can conclude, based on the factors presented by adoption-capacity theory, that we can expect proliferation of drones in Czech Republic in near future.

Security threats for Czech Republic

Many scholars believe that states that are under higher security threat, are more likely to adopt new technology. Horowitz and Fuhrmann agree with this statement and their two hypothesises states that country that experiences more terrorist attacks or territorial disputes is more likely to adopt UAVs, than those countries that do not experience them very often. Therefore, I will look into the documents of different Czech Ministries to find out, what they consider as the biggest security threat for their country.

In the document Concept for the construction of the Army of Czech Republic 2030, written by Ministry of Defence, Russia is described as a threat, since it is trying to weaken cohesion of NATO and EU, using mainly hybrid activity like spread of disinformation. Also, Russia is not afraid to use military power to achieve its goals in regional conflicts and thus, Russia is a threat for Czech Republic. China is also mentioned in this document because of its disinformation activities and cyber attacks. This document especially stresses the importance of the protection in cyberspace. Maybe surprisingly, fight against terrorism in a territory of

Czech Republic is not mentioned here. This document writes only about fight against terrorism on international level. (Ministerstvo obrany České republiky 2019b: 8-9) Similar document, but for the year 2035, does not mention China and thus Russia is the only state that is mentioned as a security threat. What concerns Czechs is the migration, which could increase criminality and terrorism in Europe. Although this document lists these and other security threats, it also states that the possibility of a direct threat on Czech Republic by armed attack is low. (Ministerstvo obrany České republiky 2019a: 8-10)

Ministry of Interior of Czech Republic lists terrorism as one of the key threats for Czech Republic. It states that although the current situation with terrorism on Czech territory is calm, Czechs are still preparing themselves for possible terrorist attack. It does not write about any armed threat from other countries, but it reminds the necessity to improve security of Czech Republic in cyberspace. (Ministerstvo vnitra České republiky 2019)

Document written by Ministry of Foreign Affairs of Czech Republic and accepted by Czech Government expresses concerns for similar threats like two previous Ministries. It is necessary to realise that cyber attacks can have big negative consequences for Czech Republic. Illegal migration is a phenomenon that creates many different threats. And when it comes to terrorism, Ministry of Foreign Affairs of Czech Republic states that the possibility of terrorist attack is always high, and it underlines the threat from "Lone Wolves" rather than from big terrorist organisations. (Ministerstvo zahraničních věcí České republiky 2015: 11-12) From these documents it is clear that Czech Republic does not feel very threatened by security issues at this moment and therefore, Czech future acquisition of new drones does not come from their fear from security threats as some Horowitz's and Fuhrmann's hypothesises would suggest.

Countermeasures against UAVs

Although none of these documents mention UAVs as a threat to the security of Czech Republic, Czechs made in 2017 national project "*Protiopatření proti působení bezpilotních vzdušných prostředků*" (in English: Counter-measures against the Unmanned Autonomous Systems) to improve their weapons that would protect them against drone strikes. In three years, they invested in this project over 10 million CZK (370 000 €). Document states the following goal: "The goal of this research project for Czech Army is to design, simulate and functionally verify the possibilities for development economically acceptable system of early warning and protection against UAV resources, allowing automated "multi-spectral" (optical,

radio-electronic, radar, acoustic, or other) reconnaissance of area of interest, including the ability to focus and precision targeting and (kinetic and non-kinetic) "countermeasures" to detected or externally marked (stated) UAV (targets) in a tactical distance (20 km).” (Starfos 2017) This national project already achieved some goals because, as the Czech soldier I spoked with told me, in 2018, Czech companies developed first drone detection system which they provided to Czech Army. However, they still do have a lot of to improve, since he told me, that currently Czech Republic is able to protect themselves against drones, but not effectively.

Application of Gillis's ideas

Infrastructure

Gillis believe that the probability of the adoption of UAVs depends on platform challenges and adoption challenges. Adoption challenges then divide into organisational and infrastructural challenges. Czech Republic is currently in a process of lowering these two barriers by creating new battalion for unmanned vehicles. This battalion should be ready in 2025 and it will consist of headquarters, centre for tactical unmanned vehicles, two companies for tactical unmanned vehicles and company for logistics. (Štrbík 2019: 12) So, they are improving their infrastructure for adoption of new UAVs that will allow them to use UAVs more effectively. Czechs are working also on improving their organisational challenges, which involve training of the workforce. While today this battalion consists of 136 soldiers, it is expected that when this battalion will be fully operational, 270 soldiers will be part of it. (Štrbík 2019: 12) But making soldiers ready to serve in this battalion is not easy. Colonel Šnajdárek, who helped to establish this new battalion, said that training of the soldier for this newly created battalion will take from two to five years, depending on the type of the UAS which the soldier will operate. (Šnajdárek 2020)

Technological capacity

Although Czech Republic does not have technological capacity to build its own drones, it is part of the Eurodrone project. Germany, France, Italy and Spain are also part of this project and their goal is to develop an advanced armable drone, which should serve mainly for surveillance and reconnaissance missions. (Kunertova 2019: 27-28) However, development of this drone is not going according to plan and it was already announced that the finishing year will be prolonged for two years to 2027. (Monroy 2019) Nevertheless, involvement of Czech Republic in such project is just another proof that Czechs realise the

importance of possession of UAVs in their army. And although they do not have technological capacity to develop their own drone, they are willing to help to develop European drone. Czech soldier that I spoked to also let me know that in 2018, Czech Republic decided to join MALE RPAS Community. Key goal of this cooperation is to provide for member states simulators for the training of operators of Remotely Piloted Aircraft System (RPAS). All members states would thus acquire same simulators, which would lead to the harmonisation of training procedures and experts from countries that operate most powerful drones could teach operators from countries like Czech Republic, who do not have much experience with these types of drones.

Summary

Gillis believe that since most powerful, wealthiest and technologically developed states struggle to develop UASs, less developed and poorer states will struggle even more. This claim can be confirmed with case of Czech Republic. Although Czech Republic does not belong to the group of states that we would consider poor or underdeveloped, and Czechs understand the importance of UAVs, they decided, probably because of their technological deficit not to develop their own drones, but rather, to help develop European drones. Gillis also stress the involvement of organisational and infrastructural challenges in adoption of drones. Czechs are aware of this and that is why they are currently creating their battalion which will be followed by bigger investments in drone technology.

Conclusion – Czech Republic

Although today Czech Republic is not considered as big player in drone area, this can change in near future. Main achievement of Czech Republic in drone sector is definitely the establishment of the battalion for unmanned vehicles, which will be fully operational in 2025. This organisational change will improve the infrastructure, which will be more suitable for the use of UAVs. Their involvement in European UAV projects shows their awareness of the importance of drones in future conflicts. But most importantly, they claimed that they want to invest in drones and also acquire their first armed drone. If they will fulfil their claims and continue their cooperation with most powerful and wealthiest European countries through European projects, Czech Republic has potential to become key European player in drone sector and therefore, we can expect proliferation of drones in Czech Republic in near future.

Poland

Now I will focus on the situation of UASs in Poland. Poland is the biggest, most powerful and wealthiest member of V4. Therefore, it has all preconditions to be the most developed member when it comes to drones. And it is true. While none of the Czech Republic, Hungary and Slovak Republic can be considered as key player in drone industry, Poland already achieved some major achievements in this area, it possesses multiple types of drones and it has even developed its own drones. Poland has to protect Eastern borders of EU and NATO as it borders with Ukraine, Belarus and Russian exclave called Kaliningrad Oblast. So, because of their geographical position, Polish people can feel more vulnerable and thus might invest more in military to protect themselves, which will be discussed later. Probably the most important thing state needs, if it wants to improve its technology are financial resources. Poland is dominating over other V4 countries when it comes to finances, since it is much bigger country than other three members. GDP of Poland is $585 billion (World Bank 2018), which is more than GDP of all three remaining V4 countries combined. However, this is a result of the much bigger territorial size and higher population of Poland, compared to others V4 states. Chart of the GDP per capita shows that there are only four members of the EU that are worse in this statistics than Poland. (Eurostat 2020) And when we look only on the V4 countries, Poland is the absolute worst. But in spite of being the worst members in GDP per capita, thanks to its much higher GDP, it can invest much more money in the military and technological innovation. And as will be shown in next part, Poland has already invested in drone technology and is ready to invest even more money to improve capabilities and quantity of their UASs.

Poland is obviously trying to use its financial and technological potential on maximum. While most of the states are buying their UAVs, most of the drones that Polish army possesses, was made by Polish companies. There are two major Polish companies which are developing and offering drones to Polish Army – WB Electronics and Polska Grupa Zbrojeniowa. WB Electronics was established in 1997 by Piotr Wojciechowski, Adam Bartosiewicz and Krzysztof Wysocki. Already in 1998, they distributed first product, which was the automated fire control system for ground artillery ZZKO TOPAZ, to the Polish Army. (WB Group no date a) Nowadays, WB Electronics is the main shareholder in WB Group, which has offices all over the globe, in Asia, America or Middle East. And it is biggest private distributor of various defense technologies for Polish Army. They focus on

development of observation systems, strike systems, fire control systems or cybersecurity systems. WB Electronics has created UAVs such as FT-5 LOS, Warmate R or mini UAS FLYEYE. (WB Group no date b) Polska Grupa Zbrojeniowa (Polish Armaments Group) was established by Polish Government. It comprises of more than 60 companies and its annual revenue is around 5 billion PLN (1 billion €). It is the primary business partner of Polish Army and Ministry of Defence of Poland, which focuses on development, not only unmanned vehicles, but also anti-aircraft defence, artillery weapons or command support and battlefield visualisation. (Polska Grupa Zbrojeniowa no date) Existence of these companies like WB Electronics or Polska Grupa Zbrojeniowa surely helps Poland to accelerate modernisation of their military.

Polish drone projects

Poland sees the potential of drones and many new capabilities UASs can bring to the Polish Army. That is why in last few years, Poland invested in multiple drone projects. One of such projects has codename "Orlik". This project was initially cancelled in July 2016, but after two years, in November 2018 Ministry of Defence of Poland signed contract with consortium composed of three companies: Polska Grupa Zbrojeniowa, PIT-Radwar, Wojskowe Zaklady Lotnicze. (Kwasek 2019: 36) These companies will develop and distribute eights sets of drones PGZ-19R in years 2021-2023, and in contract is an option for four additional sets of same drones that should be delivered in years 2023-2026. Ministry of Defence of Poland invested in this project almost 790 million PLN (171 million €). (Inspektorat Uzbrojenia 2018) PGZ-19R is a short-range UAS which should be used for reconnaissance missions as a support for ground units. (Czulda 2019) Another Polish project which goal is to acquire new drones is titled "Ważka". Through this project, Polish Army would like to get drones of type micro. The necessary ability of this drone has to be the ability to fly during night and day, in different environments and should be equipped by infra-red imaging systems. In addition, it should be able to take-off and land in vertical position and it should not be heavier than 1600 grams and longer than 70 cm. (Defence24 2018) In February 2020, company named Asseco Poland offered drones with these abilities to the Ministry of Defence of Poland. The offer is for six drones, which would cost 4.6 million PLN (997 220€) and could be delivered in November 2020. (Wilewski 2020) Polish Ministry is yet to accept this offer but if it will do so, these drones will become one of the smallest drones that Polish Army possess.

Third project through which Polish would like to acquire another drones is codenamed "Wizjer". Just like project Orlik, Wizjer was also initially stopped in July 2016 (Orlik and Wizjer were cancelled in 2016 due to "changes in commentary to the essential national security interest clause" (Duda 2017)) but was restarted in April 2018, when new negotiations started. Ministry of Defence of Poland started negotiations with Polska Grupa Zbrojeniowa and Instytut Techniczny Wojsk Lotnicznych to distribute 25 sets of Neox 2 drone which should be delivered in years 2020-2022. (Kwasek 2019: 36) Neox 2 is another drone from class "mini" and it is used for reconnaissance missions.

However, Polish do not only want UAVs for reconnaissance missions. They are investing also in bigger drones, for example like in project "Gryf". Companies Thales and WB Electronics signed the contract with Ministry of Defence of Poland to develop battle drone that will be similar to British drone Watchkeeper 450. (UAS Vision 2015) This new drone will be only inspired by Watchkeeper 450, critical technology will be developed by Polish company, which will make newly made drone fully sovereign. Polish Army would like to get 12 such systems from which 6 should be delivered between 2020 and 2022 and another 6 after 2022. (Sabak 2018) But Polish would also like to acquire armed drone. Codename of this project is "Zefir" and it focuses on getting MALE type drone. In this case, Polish companies lack the ability to create such drone and therefore the only choice for Poland is to purchase it. They are currently thinking about two variants. Either they will buy American MQ-9 Reaper or Israeli Hermes 900. They are planning to acquire two systems until 2022 and additional two later, optionally. (Sabak 2018) These are Polish five main project through which they want to acquire new drones. They already possess different types of drones. Part of the Polish Army are 15 Orbiter drones from Israeli production, 16 Polish FlyEye drones, one set of American ScanEagle, undisclosed amount of Warmate drone, one set of RQ-21A BlackJack or and PD-100 Black Hornet 3. (Wilewski 2018) But once they will finish their projects, their military will be much more powerful with these new types of UAVs.

Adoption-capacity theory

Financial resources

Horowitz's and Fuhrmann's adoption-capacity theory claim that the probability that a state will adopt new technology depends on financial resources and organisational capital. When it comes to finances, Poland has the biggest amount of money for technological investments from V4 countries. In 2020, Ministry of Defence of Poland can spend more than

49 billion PLN (10.6 billion €). (Blaszczak 2020: 1) Poland has the biggest Army from V4 members and it is clear that it must invest each year a lot of money, just to secure proper functionality of its Army. Nevertheless, they do have financial resources that they can invest in new technologies. Just the Air Force itself has 1.8 billion PLN (3.9 billion €) to spend this year. (Ministerstwo Finansów 2020: 51) And when we look just two years back, we can see that Ministry of Defence of Poland experienced big increase of financial resources that they got from national budget. In 2018, Ministry of Defence of Poland got 40.3 billion PLN (8.7 billion €) (Ministerstwo Obrony Narodowej 2018: 5) from national budget. So, this year it has almost 2 billion € more to spend than two years ago. Therefore, Ministry of Defence of Poland has enough financial resources that it can invest in new technologies, such as UAVs, thanks to the willingness of Polish Government to invest more money in this sector than in previous years.

Organisational capital

Polish Army has been possessing UAVs for 15 years. Their first drone was Israeli drone Orbiter, and 15 sets of them were bought by Polish Army in 2005. (Belvpo 2014) However, their battalion for unmanned vehicles "*12. Baza Bezzałogowych Statków Powietrznych"* was formed only in 2015 and became fully operational on 1 January 2016. (Jednostki-Wojskowe no date) Polish battalion for unmanned vehicles has been operating for a couple of years and it already has multiple drones in its armoury, as it was shown before. Therefore, acquisition of new UAVs will not result in organisational changes, since Polish organisational capital is already good enough. Novelty in future years should be only acquisition of their first MALE type drone, through project Zefir.

Summary

Poland has enough financial resources which they could invest in drone technology, as it is clear from their drone projects which they would like to finish in next few years. It also has enough organisational capital and thus, acquisition of new drones will not require big changes in organisational structure of Polish Army. Factors that, based on the adoption-capacity theory, influence the possibility of the adoption of new technologies are not big barriers for Poland and therefore, we can expect proliferation of UASs in Polish Army in near future.

Security threats for Poland

Horowitz and Fuhrmann believe that security threats can influence decision-making of a country to adopt new technology. I will now look in various Polish documents to find out, if they feel threatened and what they consider as a security threats for their country. For Ministry of Defence of Poland one of the main threats is Russia. Examples like war in Georgia or annexation of Crimea show that Russia is not afraid to use power and break international law. Fact that Russians claim that NATO is a threat for them is making countries that are protecting NATO's eastern border vulnerable. But Russia does not constitute a threat only when it comes to military attack. Their cyber-attacks and disinformation campaign can be also very dangerous. Russia is also source of instability in many states that are close to Poland like Ukraine or Belarus. As another threat, Ministry of Defence of Poland mentions terrorism. It believes that religiously oriented terrorist attacks are a big threat for Poland and countries have to cooperate on international level to fight terrorism. They did not forget to mention necessity to protect themselves also in cyberspace and that development of new technologies will be crucial for future defence of Poland. (Ministry of National Defence 2017: 22-37)

Polish National Security Bureau also mentions Russia as one of the main threats for Poland. It says that Russian confrontational policy will challenge security of countries, which are on the eastern part of the EU. It is therefore necessary for states in this region, to strengthen security and mutual trust. This document also expresses concerns about migration, which can result in higher criminality in European countries, including Poland. Of course, Polish National Security Bureau stresses the threat that comes from terrorists. But it also mentions cyberterrorism, and cyber-attacks in general, that might come from other states. And although most of the European states are cooperating with each other through organisations like NATO or EU, there still are European states which experience ethnic and religious tensions, which can result in military conflicts and thus influence Polish security either directly or indirectly. It is therefore necessary for Poland to keep improving its defence capabilities and closely cooperate with its partners in NATO, and in EU, especially through Common Security Defence Policy. (National Security Bureau 2014, 17-26)

Both of these documents write about similar threats. Although their lists of threats were not ranked, it looked like Poland is even more concerned about the threats that might come from Russia than from terrorists. Since Russia is a key player when it comes to drones

and Poland is aware of the security threat which Russia poses for them, this awareness might be one of the reasons why Poland wants to invest big amount of money on development and purchase of new UASs.

Application of Gillis's ideas

Technological capacity

Based on the Gillis's ideas, the probability of the adoption of new technology should be higher, when this new technology does not require big infrastructural changes (adoption challenge) and technological improvement (platform challenge). From the technological point of view, Poland is technologically highly developed state. Nowadays, adoption of UAVs does not pose to Poland any challenge from a technological side. As a proof can serve the existence of Polish companies like WB Electronics or Polska Grupa Zbrojeniowa, which are developing and distributing drones to the Polish Army. Only development of armed drones proved to be a challenge for these Polish companies. That is why, Poland is forced to buy armed drones from foreign countries. But although Poland does not have capabilities to develop its own armed drones, it wants to help international community to develop them. In 2013, Poland together with France, Germany, Greece, Italy, Spain and the Netherlands, formed a "club" which will focus on development of MALE type drone. (Rettman 2013) Membership in this club will improve cooperation of states that are operating drones and it will allow them to share informations between each other. Although Poland does not have the ability to create armed drones, it still has high technological capacity and thanks to that, level of technological development is not a challenge for Poland in adoption of drones.

Infrastructure

Polish army has been operating drones for quite a long time. They adopted their first UAVs back in 2005 and over time, they acquired many new types of drones. Since they have been operating drones for some time, they had a chance to build relevant infrastructure to effectively operate their drones. Polish Air Base in Miroslawiec, which is a place where Polish battalion for unmanned vehicles is situated, is even used by U.S. Air Force, which is using it as their base for their MQ-9 Reapers. From there, Americans are using their Reapers to do reconnaissance missions. (Rempfer 2019) From this information, it is clear that Polish has the infrastructure that is good enough even for effective operation of Reaper. Therefore, Polish does not need to worry that their current infrastructure will be a barrier to adopt their new drones.

Summary

Platform challenges and adoption challenges should not negatively influence Polish decision-making about acquiring new UAVs, since Poland has already built its infrastructure to effectively operate drones and it is highly technologically developed state.

Conclusion - Poland

Poland today possesses multiple drones of different types. Since they started using UAVs back in 2005, they had a lot of time to build their infrastructure and undergo the organisational change that allowed them to operate drones effectively. Big advantage for Poland is also the existence of Polish companies, which are developing UAVs for Polish Army. But since they are not able to produce armed drones, Poland is member of the European community, which is trying to create such drones. It looks like that there are no big barriers that could stop the proliferation of drones in Poland, since it is technologically highly developed state, with enough resources and developed infrastructure. And because they already announced multiple projects that aim on development and purchase of new drones, we can expect proliferation of drones in Poland in next few years.

Slovak Republic

After analysing the situation in two members of V4 that would seem to have more potential to become strong player in UAS sector, I will now focus on two remaining members, which should struggle more in this sector, starting with Slovak Republic. Slovakia is the smallest member of V4, and it is protecting short part of the NATO's and EU's Eastern border, since it borders with Ukraine. When it comes to the finances, Slovakia has the lowest GDP among V4 members, 105 billion USD (97 billion €). (World Bank 2018) However, it is on much better position when we look on the statistics that shows GDP per capita. (Eurostat 2020) After Czech Republic, Slovakia has the second highest GDP per capita among V4 countries. Nevertheless, the low level of GDP could suggest that the lack of financial resources can be a reason of Slovak slow modernisation.

There is very limited amount of informations about UAVs in Slovak army on the internet. Thankfully, I was able to make an interview with a Slovak soldier, and most of the informations I will use in this chapter about drones in Slovak Army, I got from him.[1] He is

[1] The interview was conducted in Slovak language. Therefore, informations from the interview that are used in this thesis were translated by the author.

part of the 5th Special Operations Regiment in Žilina. And he is one of the teachers that teaches soldiers to fly with UAVs. However, he wanted to remain in anonymity and therefore, I will not use his name and I will refer to him simply, as the Slovak soldier.

Probably no one considers Slovakia as a strong military actor in Europe. And therefore, it is easy to assume that Slovak situation with UAVs, will not be any better. However, they do have some drones in their armoury, although all of them are only for reconnaissance missions and are not armed. Slovak army possesses 6 sets of Israeli MicroFalcon systems from which each set consists of 2 aircrafts and one set cost 525 360€. Slovaks also have Skylark 1-LE (987 520€) and Skyranger Quadcopter (300 000€). (Kooperativa 2018) Currently, these drones are used only on the Slovak territory. They are used especially during natural catastrophes like floods or snow calamities to monitor situation and get informations that could be useful for other emergency units.

Although today is Slovakia using its drones only for emergency missions, this could change in near future, as they are planning to invest also in armed drones. This claim is supported by document "*Biela kniha o obrane Slovenskej republiky*" (in English: White book about the defence of Slovak Republic) which lists acquisition of new drones as one of the priorities in modernisation of Slovak army in next years. (Ministerstvo obrany Slovenskej republiky 2016: 90) The modernisation process is divided into two stages and in each stage, it is stated, that Ministry of Defence of Slovak Republic would like to buy new UAS. Slovakia have already achieved its goal of the first stage of modernisation, which started in 2016 and will finish at the end of 2020, because in 2018 they bought two new sets of MicroFalcon from Israel. In second stage, which will take place from 2021 until 2030, Ministry of Defence of Slovak Republic is again planning to buy new drones, however, in a document it is not specified which drones would it like to purchase. It is only stated there that it would like to buy "*taktické bezpilotné vzdušné prostriedky*"[2]. (Ministerstvo obrany Slovenskej republiky 2016: 93) The Slovak soldier told me that there are multiple possible projects to purchase new UAVs and some of them include also adoption of armed drones. He claimed that Ministry of Defence of Slovak Republic is currently deciding between two models of drones and both of them belong to the category of so called "kamikaze drones". They are type of the loitering munition. One project include purchase of Israeli IAI Harop drone, and second

[2] Own translation: "Tactical unmanned aerial vehicles"

project include drone called Predator AX-1, which is being developed by two Slovak companies named Compel Industries and Incoff Aerospace.

When I asked the Slovak soldier why Ministry of Defence of Slovak Republic wants to buy these drones, he gave me two answers. The main reason is the ability of drones to fly without anyone in a cockpit. Noone wants to risk a human life when they can use a robot instead. This is the main reason, he believes, why most of the countries, including Slovakia, are starting to adopt military drones. And second reason for Slovakia to adopt drones is simply, prestige. This is important factor, especially for smaller countries like Slovakia, to show that their military is modern and capable to protect themselves and that they can help their international partners in case of the international security threat.

Adoption-capacity theory

Financial resources

Adoption-capacity theory states that countries with big amount of financial resources and organisational capital are more likely to adopt new technology. When we look on finances of Ministry of Defence of Slovak Republic, we can see that the amount of money the Ministry can spend, raised significantly in last two years. For year 2020, 1.608 billion € were allocated to Ministry of Defence of Slovak Republic from the national budget. In 2019, the amount was even bit higher – 1.662 billion €. However, the important change happened between years 2018-2019, because in 2018, Ministry of Defence of Slovak Republic got only 1.082 billion € from the national budget. (Ministerstvo financií Slovenskej republiky 2020) So, after 2018, Ministry could have spend around 550 million € more than in previous years and currently, Ministry of Defence is the third highest paid Ministry from the national budget. This significant raise of money for Ministry of Defence shows that defence has become much more important for Slovakia in recent years and can suggest that the Slovak Army will undergo big modernisation in near future. However, modernisation of regular equipment and vehicles in Slovak Army is necessary and therefore, most of the money will go into this modernisation process. Only after that, can Slovaks invest in advanced technology like drones.

Organisational capital

After the acquisition of UASs, there were no organisational changes in Slovak military. Currently, drones are situated in two different military units – 5th Special Operations

Regiment in Žilina and Battalion ISTAR in Prešov. So, Slovak army have not yet made separate military unit that would group together all drones, like Czechs recently did. However, Slovak soldier told me that in a meantime, he does not find it necessary to follow Czech steps and create battalion for unmanned vehicles yet. He explained to me that the fact that drones are part of the military unit that possesses different types of vehicles and equipment is an advantage. Drones can be thus deployed immediately with other technologies and because they are part of the same military unit, operators of these different types of technologies know each other and therefore, cooperation is much easier. If special battalion for unmanned vehicles existed, all military units would have to ask for the support by drones, which would take much more time, since when you want to ask for such support, it is not as easy as it looks in the movies, but you have to follow certain protocols. And since UAVs are in Slovakia used especially in emergency missions this delay can be crucial. Therefore, he believes that Slovakia is today better off without the special battalion for unmanned vehicles and he would be in favour of organisational change only after acquisition of multiple new drones.

Summary

After looking on the factors that, based on the adoption-capacity theory, are the major determinants of the adoption of new technology, we can conclude that Slovakia will not experience big proliferation of drones in next years. Although the financial resources of the Ministry of Defence of Slovak Republic raised significantly in last two years, it is still not enough to buy bigger amount of UASs. Slovak army has not yet undergone any major organisational changes because of drones and the Slovak soldier believes that the Slovak army will not experience any organisational changes until it will purchase multiple more UASs. Because with this small amount of UASs that Slovak army possesses, it is not necessary to do such changes.

Security threats for Slovak Republic

Based on hypothesises of Horowitz and Fuhrmann, security threats can influence the probability of the adoption of new technology. Therefore, I will now focus on Slovak documents that are writing about possible security threats for Slovakia to find out whether this factor is influencing Slovak decision-making about the adoption of drones. First document was written by Ministry of Defence of Slovak Republic and is called White book of the defence of Slovak Republic. It is not surprising that one of the major security concerns

in this document is the situation in Ukraine, since Slovakia has a border with this state. Although Slovaks are not expecting that this conflict between Ukraine and Russia will intensify, they still have to be ready for the escalation of the conflict, which could lead to the massive migration of Ukrainians to neighbouring states. And not only migration of Ukrainians, but migration in general is mentioned in this document as a possible security threat. As for probably every country, terrorism is a security threat also for Slovakia. In this area, Slovaks are especially concerned about "lone wolves" rather than big terrorist organisations. This document also stresses the importance of the protection against propaganda. And it finds it also necessary to be able to protect their territory against new technologies, including UAVs and also ability to protect their data in cyberspace. (Ministerstvo obrany Slovenskej republiky 2016: 32-36)

Document titled "*Obranná stratégia Slovenskej Republiky*" (In English: Defence strategy of Slovak Republic), written by Slovak Government, also lists situation in Ukraine as the major threat for Slovakia, although it does not state name of the countries. The sentence goes: "*Bezpečnostné prostredie v Európe je zhoršené najmä v dôsledku násilného narušenia zvrchovanosti, územnej celistvosti a nedotknuteľnosti hraníc susedného štátu Slovenskej republiky a pričlenenia časti jeho územia k inému štátu, ozbrojených konfliktov vo východnej časti Európy*…"[3] (Vláda Slovenskej republiky 2017: 5) Although Slovaks believe that the possibility of an armed attack against them is low, because of this worsening situation in Eastern Europe, countries that are protecting eastern borders of NATO and EU have to be ready to challenge possible attacks. Another threat is propaganda that spreads disinformation and polarise society and decrease trust of Slovaks in organisations like NATO and EU. Shortly mentioned are also threats like terrorism, migration and cyber-attacks. (Vláda Slovenskej republiky 2017: 5-6)

Last document is titled "*Bezpečnostná stratégia Slovenskej Republiky*" (In English: Security strategy of Slovak Republic) which was written by Slovak National Security Bureau. Also this document starts with the Russian annexation of Crimea which was a strong violation of international law and which resulted in worsening of relations of NATO and EU member states with Russia. As a big problem this document states decrease of trust of Slovak citizens to NATO and EU, which is a result of propaganda and spread of disinformation.

[3] Own translation: "Security environment in Europe is worsened especially as a consequences of violent disturbance of sovereignty of the neighbouring state of Slovak Republic and annexation of the part of its territory to other state, armed conflicts in Eastern Europe…"

Even in this document, terrorism is only shortly mentioned. And also this document does not forget about the threat that can come from illegal migration from Africa and Asia to Europe. (Bezpečnostná rada Slovenskej republiky 2017: 6-8)

All of these documents agree that the situation between Ukraine and Russia is worsening the situation in Eastern Europe and constitute a security threat for Slovakia. Besides this Russian offensive strategy, Slovakia is also concerned about propaganda, supposedly Russian propaganda, as they are afraid about the decrease of trust of Slovaks in NATO and EU. Surprisingly, in all documents, terrorism was mentioned very shortly. Based on these informations we can conclude that security threats are not a reason for Slovakia to adopt drones because, as one of the documents states, Russian offensive strategy is concerning for Slovakia, but Slovaks do not expect that Slovakia will be a victim of armed attack of Russia or other country.

Application of Gillis's ideas

Technological capacity

Gillis claim that most of the states will struggle to adopt UAVs because these states do not have enough technological capacity and built infrastructure to adopt them. In document "*Vojenská stratégia Slovenskej republiky*" (In English: Military strategy of Slovak Republic) it is stated that the quality of equipment and vehicles in Slovak Army is not good, compared to our allies. (Ministerstvo obrany Slovenskej republiky 2017, 6) This suggests that the technological capacity in Slovak Army is not on high level and Slovakia will have to invest in modernisation of its regular vehicles and equipment, and only after that, they could start investing in UAVs more. Nevertheless, there are Slovak companies that are currently building UAVs for Slovak Army, which can help Slovak army to accelerate the acquisition of drones in future.

Infrastructure

Since Slovak Army does not possess many UASs, Slovaks have not built yet valid infrastructure for effective operation of multiple drones. Right now, they do not even have battalion dedicated to unmanned vehicles. And as the Slovak solider told me, they do not even find it necessary to build one now, since because of the low number of UASs, it is better to have drones incorporated in different military units with other technologies.

Summary

Gillis are right that countries which are not the wealthiest and on high technological level will struggle to adopt drones. Although Slovakia does not belong to the poorest or least developed states in the world, it is obvious that it lacks technological capacity to purchase multiple drones and it has to firstly focus on the development of their regular army vehicles and equipment. In addition, before the big investment in drone technology, they will have to build an infrastructure thanks to which they will be able to effectively operate big amount of drones. Creation of the infrastructure and necessity of further technological development are barriers which will slow down the process of adoption of drones and therefore, we will not see proliferation of drones in Slovakia in next few years.

Conclusion – Slovak Republic

Slovakia currently possesses some drones and although they are planning to invest in purchase of new UASs, we cannot expect big proliferation of drones in Slovakia. It is true that financial resources of Ministry of Defence of Slovak Republic significantly raised in last two years, but because Slovak regular vehicles and equipment are out of date, Ministry of Defence will surely invest these money firstly into modernisation of their current technology. Therefore, Slovakia does not have enough financial resources to adopt drones, and also second factor of adoption-capacity theory suggests that Slovakia will not adopt drones in near future as it does not have enough organisational capital. Using ideas of Gillis, we came to the same conclusion since Slovakia will firstly have to focus on modernisation of its current equipment and improving the infrastructure and only after that it will be able to invest in drones more significantly. And because Slovakia does not experience any major security threat and, as the Slovak soldier told me, Slovakia adopts drones mostly for prestige, Slovakia does not have a reason to purchase big amount of drones. Therefore, there will not be major proliferation of drones in Slovakia in near future.

Hungary

Last member state of V4 that I am yet to analyse is Hungary. Hungary has to protect NATO's and EU's borders on two places since on the south it borders with Serbia and on north-east it borders with Ukraine. Level of Hungarian military power is therefore important for both of these organisations and as it will be shown later, Hungarians are aware of the security threats that may come from their north-eastern and southern borders. That is why

they are currently in a process of modernisation of their army. Financial situation of the country is probably the main factor that determines how big the level of modernisation can be. Looking on GDP of Hungary, from V4 countries, only Slovakia has worse GDP than Hungary. (World Bank 2018) Since in cases of smaller states, level of GDP can be deceiving, to get a better picture about financial situation of a country, better idea is to use GDP per capita statistics. But even in this statistics, financial situation of Hungary does not look any better. Compared to V4 states, only Poland has worse GDP per capita and Hungary has sixth worst GDP per capita from all EU member states. (Eurostat 2020) So, financial situation of Hungary is not great, but its vulnerable geographical position and outdated military equipment force them to invest more in military and modernise their technologies. However, as it will be shown, UASs are not essential in this process of modernisation of Hungarian Army.

I was not able to find any document which would lists drones that the Hungarian Army currently possesses. I will therefore use the latest article I found, which is from 2013 and since then, of course, their situation with drones might have changed. The only UASs that Hungarians bought from abroad is Israeli Skylark II. All other drones were made on Hungarian territory. Drones named Bora and Ikran were made by state company named HM El Zrt. Hungarian Army also has drone BXAP – 13, which was made by Hungarian company named BHE Bonn Hungary. (Kovács 2013) Another Hungarian drone that could be used in future by Hungarian Army is MP – H. It was developed by start-up company named Ku-Me Invest Kft and first tests of this drone took place last summer. (Dunai 2019) None of these drones is armed and all are designed for surveillance and reconnaissance missions. It is clear that Hungarians prefer to develop their own drones, rather than purchase them from abroad. The reason for that, as Hungarian Minister of Defence said, is that the development of own drones is cheaper by half than buying already made drone from foreign country. (Suas News 2012) He added that drones made by state company are designed to be used also in civil sector. In Hungary, drones can be used especially during natural catastrophes or for patrolling borders. In Afghanistan Hungary is using its Skylark I-LE drone for surveillance and reconnaissance missions. And in dangerous Afghan areas, the ability to get important informations about the terrain and position of enemies without risking life of soldiers is very appreciated. (Trautmann 2014)

Hungarian Army is currently in a process of modernisation and rearmament. This process started back in 2017 and it should be finished in 2026 as the program called “Zrínyi

2026" states. In Air Force, Hungary is planning to invest in H145 light helicopters or H225M multirole transport aircraft. (András 2020) Document Zrínyi is also writing about the modernisation of their jets Grippen. (Honvédelmi Minisztérium no date: 33) Hungary has already acquired armoured vehicles from Germany and it is planning to buy more from Turkey. However, Zrínyi 2026 is not only about purchasing new equipment and vehicles. The main intent is, of course, to improve military power of its army, but Hungarians would also like to become major supplier of weapons and military equipment. Hungary has already signed an agreement with Czech weapons manufacturer, Česká Zbrojovka, which goal is to build new arms factory in Hungary and there, they would produce 200 000 guns for Czech and Hungarian militaries. (MTI 2018) These were just few goals that Hungarians are trying to achieve through program Zrínyi 2026. However, this program does not mention purchase, development or modernisation of UASs and thus, it is obvious that drones are not currently a priority for Hungarians.

Adoption-capacity theory

Financial resources

Horowitz and Fuhrmann in their adoption-capacity explain that the amount of financial resources and level of organisational capital are main factors that influence the probability of adoption of new technology by a state. For this year, Ministry of Finance of Hungary allocated 616 billion HUF (1.75 billion €) from national budget for Ministry of Defence of Hungary. (Honvédelmi Minisztérium 2019: 6) Over the last two years, the amount of money that Ministry of Defence of Hungary could have spent during a year raised significantly because in 2018, it got only 427 billion HUF (1.20 billion €). (Honvédelmi Minisztérium 2017: 6) So, its budget raised by 0.5 billion € in just two years. It is clear that defence was not priority for Hungary in last years because even after this significant increase of money in budget, there are still four Ministries that have bigger budget than Ministry of Defence. (Magyarország Kormánya 2018) And although budget of Ministry of Defence has improved, most of the money will probably go into Zrínyi 2026 program, which does not involve modernisation of drones and therefore, Ministry of Defence will not have money to heavily invest in UASs.

Organisational capital

The second factor that influences the probability of the adoption of new technologies based on adoption-capacity theory is organisational capital. Because Hungarian Army does

not possess many drones, it does not have special battalion for UASs. Therefore, all drones are part of the *MH 24. Bornemissza Gergely Felderítő Ezred* – regiment for reconnaissance missions. In this regiment, drones are part of the special unmanned reconnaissance squadron – Pilótanélkűli Felderitő Repűlő Század. (Felderitő Ezred no date) So, when will Hungarian Army decide to invest more in UASs, it will need to establish special military unit for drones, which can slow down the process of adoption of new drones.

Summary

Adoption-capacity theory claim that financial resources and organisational capital influence the probability of the adoption of new technology. In case of Hungary, both of these factors suggest that Hungary will not be able to adopt big number of drones in next few years. Although Ministry of Defence of Hungary got historically the most money from national budget for this year, Ministry's main focus is to accomplish program Zrínyi 2026, which includes modernisation of regular vehicles and equipment in Hungarian Army. This program does not include purchase of new drones and therefore, it is clear, that UASs are not priority for Ministry of Defence of Hungary for now. In addition, necessity to establish new military unit in case of increase of drones in Hungarian Army, makes purchase of drones in near future even less probable.

Security threats for Hungary

Horowitz and Fuhrmann came up with hypothesis which state that countries that feel more insecure are more prone to adopt new technologies. To test this hypothesis, I will use mainly document about Hungarian security strategy that came into power on 21st April 2020, to find out what Hungarians consider as the biggest security threats for their country.

Even back in 2015, when migration crisis started, Hungary was one of a few states that was strictly against letting refugees come to Europe. And migration is for Hungarians still one of the biggest security threats. They believe that migrants would raise criminality in Europe and therefore they find it necessary to protect their borders with Serbia and do not let migrants into Hungary and further into Europe. Although Hungarians believe that the armed attack against Hungary or its allies is not probable, they realise that the security level in neighbouring regions is lowering and therefore, Hungarian Army needs to be ready to protect its territory or help its NATO allies. Since not only Hungary, but all of the NATO and EU states realise that security environment is getting worse, many states are modernising their armies. However, Hungarians are afraid that this will disrupt the balance of military power

between regions and will lead to bigger instability, which could worsen security environment even more. This document mentions also threat of terrorist attacks. Terrorism poses big threat for whole continent and it is very difficult for states to protect their citizens against such unpredictable attacks. Hungarians link terrorism with migration and believe that chances of terrorist attacks will be higher, if we will let migrants come to Europe. Russia is mentioned in this document only in one point and it is not pictured as a threat. Hungary realises that the tension between NATO and Russia has escalated over the last years and Hungary still stands on NATO's side. However, Hungarians do not see Russians as a threat and would like to create political dialogue with them and start building mutual trust between Hungary and Russia. These were the major security threats that the Hungarian security strategy lists, although there were mentioned many other threats like propaganda, spread of disinformation or cyber-attacks. (Magyarország Kormánya 2020: 2105-2113)

But the biggest security threat for Hungarians looks to be migration and situation in Western Balkan. Hungarian Minister of Defence, Tibor Benkő, believes that the relative peace in Western Balkan is there only thanks to the peacekeeping missions. It is therefore difficult to predict how will situation in this region change over the next few years and Hungarian Army must be ready if the situation will worsen in Western Balkan. (MTI & Honvedelem 2019) And as Szilárd Németh, State Secretary of Ministry of Defence said, protection of Hungarian southern border with Serbia is important, especially to stop illegal migrants that are still trying to get to Hungary and further to other European states. (Honvedelem 2019) Since Hungarians are aware of the possible threats that they might face in future, they are modernising their army. However, this modernisation program does not involve purchase or modernisation of drones and thus, although Hungarians feel threatened, they decided not to invest in UASs and thus, Horowitz's and Fuhrmann's hypothesis is not confirmed in case of Hungary.

Application of Gillis's ideas

Technological capacity

To test ideas of Gillis, I will focus on technological capacity and infrastructure of Hungary, since Gillis believe, that these are the barriers states have to overcome to acquire drones. From a technological side, Hungary is currently undergoing modernisation process of its army. They started this process back in 2017 since they realised, that the security environment in Europe is getting worse and that its army would not be able to protect its

citizens in case of an attack. This modernisation process includes purchase of new vehicles and equipment, but drones are not included in this process. (Honvédelmi Minisztérium no date) Although today Hungarian Army is not on high technological level, it might change in future, after finishing their modernisation program Zrínyi 2026. This program is main priority for Hungarian Army and only after finishing this program, which will improve its technological capabilities, it might start focusing on acquiring more advanced technologies like UASs. However, Hungarian state company, HM El Zrt, has already developed UASs for Hungarian Army. And there are also Hungarian private companies like BHE Bonn Hungary or Ku-Me Invest Kft that developed or are currently developing drones for Hungarian Army. This shows that Hungarians have technological capacity to create their own drones and once will Hungarian Army decide to heavily invest in drones, Hungary has technological capacity to develop them quite quickly.

Infrastructure

Since Hungarians does not possess many drones, they have not built yet infrastructure, that would let them use drones in more effective way. UASs are currently part of the regiment that deals with reconnaissance missions. However, their infrastructure will have to be improved when they will acquire new drones. This barrier can slow down the adoption of drones in future.

Summary

Gillis suggest that even the wealthiest and technologically most advanced states will struggle to acquire drones because of the necessity to build infrastructure for drones, and technological capacity of state has to be on high level, if the state wants to acquire drones. Hungary is definitely not the wealthiest nor technologically highly developed state, but it is still able to develop its own drones, thanks to its state and private companies. Their lack of infrastructure stems from the fact that drones are not priority for Hungarians, and they are focusing on modernisation of its regular vehicles and equipment. Nevertheless, Hungary proves that even smaller states can develop its own drones. However, the proliferation of drones in Hungary cannot be expected, as their main focus is to finish project Zrínyi 2026.

Conclusion - Hungary

Ministry of Defence of Hungary is currently focusing on finishing its modernisation program Zrínyi 2026. This program is its main priority and because it does not involve

modernisation of drones, we cannot expect proliferation of drones in Hungary in near future. However, Hungarians have technological capabilities to build their own UASs. And although they are using most of the finances to fulfil Zrínyi 2026 program, after finishing it, they might start investing in new technologies, including drones. The barriers that they will have to overcome when they will decide to purchase more drones are that they will have to make organisational changes in their Army and built the infrastructure suitable for drones. But after modernisation of their regular vehicles and equipment, Hungarians might want to invest in drones and make their army even more modern. But since the program Zrínyi is expected to be finished in 2026, we can expect major investment in drones at the earliest in the end of this decade.

Comparison of V4 states

I will now compare all V4 countries to find out which country has the biggest potential to experience proliferation of drones and become key player in Europe in this area. I will start by adoption-capacity theory that states that financial resources and organisational capital are the main factors that influence the probability of the adoption of new technology by a state.

Adoption-capacity theory

Financial Resources

Financial resources are clearly the major factor that countries have to take into consideration, when they are deciding whether they will invest in new technology or not. There are three relatively similar V4 countries when it comes to their territorial size and number of citizens, and one country that is much bigger and much more populated than the rest. It is therefore not surprising that the Ministry of Defence of Poland has the most money to spend on its army. For this year, Ministry of Defence of Poland got 49 billion PLN (10.6 billion €) from their national budget. So, the budget of Polish Ministry is 4-5 times higher than particular budgets of Ministry of Defence of other V4 members, and even if we combined budgets of Czech Republic, Hungary and Slovakia, Poland would still have more money than its three partners together. Furthermore, Polish are still willing to invest more in defence. Just in two years, their budget raised by 9 billion PLN (almost 2 billion €), which is more than the whole budget of Hungarian or Slovak Ministry of Defence. There is no doubt that Polish soldiers have much more financial resources than their other partners from V4.

However, not all of this money can Polish invest in purchase and development of new technologies. Polish Army is much bigger than the armies of their V4 partners and therefore, Polish have to invest much more money in its army, to ensure the highest possible effectivity of their units. They have to ensure that all of their equipment and vehicles are in good condition, they spend more money on the wages of their soldiers and so on. In addition, Poland is the only V4 country that have access to sea and have to heavily invest also in Navy. All of this must be taken into the consideration, but it still does not change the fact that Ministry of Defence of Poland has the most money that it can invest in new technologies such as drones, although the difference is not as significant as it looks on first look.

Czech Republic, Hungary and Slovakia have much less money than Poland but especially Czech Republic's financial situation gives Czechs the opportunity to invest in new technologies such as UASs. Of course, the term "drones" is very broad since there are different types of drones, some costing over 90 million € per unit and some cost around 15 000 € per unit. While those more expensive UASs are out of reach for Czech Army, they definitely have enough financial resources to invest in cheaper ones. Current budget of Ministry of Defence of Czech Republic is 75.5 billion CZK (almost 2.8 billion €) and since their army is in good condition, Czechs might want to invest in modern technologies. In addition, budget of Ministry of Defence raised in last two years by 0.6 billion € and Czechs already made their projects that involve investments in drones. This clearly shows that Czech have enough financial resources to make these investments.

Financial situation of Slovak and Hungarian Ministry of Defence is very similar. Both Ministries have similar amount of money – Ministry of Defence of Hungary has 616 billion HUF (1.75 billion €) and Ministry of Defence of Slovakia has 1.608 billion €. Also, the amount of money by which their budgets raised over the last two years is almost identical – around 0.5 billion €. In addition, armies of both states require massive modernisation process of their basic equipment and regular vehicles. While Hungary has already started this modernisation process, Slovakia might start do so very soon as the new Government was elected in the beginning of March 2020. Understandably, these modernisation processes will require big investments and therefore, investment in advanced technologies like drones are not probable, especially with their low budgets.

Factor of financial resources negatively influences the probability of the adoption of drones in Hungary and Slovakia. None of these states have budgets big enough to heavily

invest in UASs and most of the money will go into modernisation of their equipment and vehicles that are out of date. On the other hand. Czech Republic and Poland realise the importance of possession of drones by their armies and they both made multiple projects that involve purchase of new drones, even armed drones. Ministries of Defence of both of these states received enough money from national budget to ensure that financial resources will not be a barrier for Czech Republic and especially for Poland in adoption of UASs in near future.

Organisational Capital

Organisational capital of a country is the second factor that influences the probability of the adoption of new technology according to adoption-capacity theory. There are two V4 countries that already made organisational changes in their armies to ensure the most effective use of drones. Czech Republic has done this just recently and their special battalion for unmanned vehicles will be fully operational in 2025. Creation of such military unit is clear sign of Czech awareness of the importance of UASs in future conflicts. It is also proof that Czechs are determined to heavily invest in drone technology in near future because currently, they do not possess many drones and so, until now they have not needed special battalion for UASs. Czechs have similar amount of drones as Slovaks and Slovak soldier with who I made an interview told me that in case of Slovakia, special military unit for drones is not needed, simply because Slovaks do not have many drones. He even claimed that at this moment, it is better to have UASs incorporated in military unit that specialises in reconnaissance and surveillance missions and has in its armoury different types of vehicles for reconnaissance missions and not just drones. Only after purchase of multiple drones, he would like to have special military unit for unmanned systems in Slovakia. I believe that same logic is applicable also in case of Czech Republic and therefore, this organisational change in the form of creation of the special battalion for unmanned systems in Czech army shows their ambitions to heavily invest in drone technology in next years.

Poland is the second V4 country that has made organisational changes in its army to be able to use UASs in more effective way. It is not surprising, since they are operating most UASs from V4 states. Because they already created their battalion for unmanned systems and they have experience in operation of drones, factor of the organisational capital will not slow down the process of adoption of new drones in Poland.

Slovak and Hungarian army are yet to establish special military unit for unmanned systems. Both states do not possess many drones and they are not planning to heavily invest

in drones in near future. It is because their armies are not in good condition and they will have to firstly focus on modernisation of their basic equipment and vehicles. Only after finishing this process of modernisation, they could start thinking about adoption of the advanced technologies. However, when they will decide to invest in drones and make them substantial part of their army, they will have to make some organisational changes, which can slow down the process of adoption.

Organisational capital is a factor that will slow down a process of the adoption of drones in Hungary and Slovakia. Both of these countries will have to overcome this barrier when they will decide to invest in drone technology. Poland has already overcome this barrier, and therefore, this factor will not influence Polish decision-making about the adoption of new drones. In case of Czech Republic, they are currently overcoming this barrier by making step and establishing special battalion for unmanned systems. After finishing this organisational change in 2025, when their battalion will be fully operational, there will be much higher probability that they will start heavily investing in drone technology.

Conclusion – Adoption-capacity theory

According to adoption-capacity theory, two factors are influencing the probability of the adoption of new technology by a state – financial resources and organisational capital. When I looked on the budgets of Ministries of Defence of V4 countries, I found out that financial situation will be a barrier for two members of V4, and it is one of the reasons, why these states will struggle to adopt more drones. Not only Ministries of Defence of Hungary and Slovakia have the lowest budgets, but their armies are not in good condition and they will have to firstly invest in the modernisation of their most basic equipment and vehicles. Therefore, they will not have enough financial resources to focus on more advanced technologies and thus, they will not be able to heavily invest in drone technology before finishing their process of modernisation of their regular armies. For other two V4 members, Czech Republic and Poland, factor of financial resources should not be an obstacle in adopting new drones since they both have enough resources to buy even more advanced drone and even armed ones. Factor of organisational capital divided V4 countries into same two groups. Poland has already made organisational changes in its army to improve its ability to use drones in more effective way and Czech Republic is currently doing so, by establishing special battalion for unmanned systems. Therefore, organisational capital of these two

countries will not slow down their processes of adoption of new drones. On the other hand, factor of organisational capital will slow down the process of adoption of drones of Hungary and Slovakia, since these two states will have to make organisational changes in their armies before they will heavily invest in drone technology, if they want to use drones in effective way. Ultimately, we can conclude that while factors of financial resources and organisational capital will pose a barrier in adoption of UASs for Hungary and Slovakia, they will not be a barrier for Poland and Czech Republic. Therefore, based on the adoption-capacity theory, we can expect proliferation of drones in Poland and Czech Republic in near future, but this proliferation will not happen in Hungary and Slovakia anytime soon.

Security threats

Besides adoption-capacity theory, Horowitz and Fuhrmann came up with multiple hypothesises by which they are trying to find out, what are the reasons for states to adopt drones. Two of these hypothesises state that countries that feel more threatened will adopt drones faster than countries that feel safer. Those two hypothesises are concerned about terrorism and territorial disputes but I will focus on all possible security threats for V4 countries.

Russia

It is not surprising that the country that is most often mentioned in documents of V4 states concerning their security environment is Russia. They all believe that conflict between Russia and Ukraine is negatively influencing the security environment in Eastern Europe. Hungary is the only V4 member that did not clearly put Russia at fault. All other three V4 members believe that by annexation of Crimea, Russia violated international law and that they need to protect themselves against this Russian aggressive strategy. Russian threat is probably the biggest security threat for Poland, since all of Polish documents, start with Russian unlawful actions against countries like Ukraine or Georgia and they always underline Russian aggressive behaviour. Although Hungarians see conflict between Russia and Ukraine as a problem for their security, they are more concerned about their southern borders and situation in Balkan. Czech Republic and Slovakia are also pointing finger on Russia for the conflict in Ukraine, but they are not afraid of direct Russian attack on their countries. However, they understand that this conflict has worsened the situation in Eastern Europe and especially Slovaks are concerned that the possible escalation of conflict could lead to a massive migration of Ukrainians into Slovakia.

Propaganda

Another security concern for all V4 states is propaganda and spread of disinformation. This threat is also closely connected to Russia, since all countries, but Hungary, clearly stated that this spread of disinformation comes from Russia and it is aimed at decreasing the trust of citizens to organisations like NATO and EU. Although Hungary stated that propaganda is a problem for them, they did not specify from which country this negative propaganda comes from.

Terrorism and migration

Terrorism is always a threat for all states and V4 countries are not an exception. They are aware that the chance that they would be a target of a big terrorist organisation is low, but they need to be ready to protect their citizens, especially against "lone wolf" terrorist. This is closely connected to the last security threat that V4 countries share and that is migration. All V4 countries believe that migration raises criminality in their countries, raises the probability of terrorist attack and therefore, it is necessary to stop illegal migration from Africa and Asia into Europe. Migration is big concern especially for Hungary, which borders with Serbia and migrants often want to get to the EU by crossing border between these two states.

Conclusion – Security threats

Although security documents of all V4 countries list the possible security threats for their countries, they are aware that the chance of direct threat is very low. Probably the biggest security issue from V4, is currently experiencing Hungary because of the migration, although the situation is not as bad as it was few years ago. Poland's biggest threat is Russia, but the direct Russian armed attack is almost impossible to happen. And in case of Czech Republic and Slovakia, their biggest security concern are probably terrorist attacks, which chances are low. Since there are no immediate security threats for V4 countries, it is clear that Poland and Czech Republic, countries that are planning to invest in drones in near future, are not investing in them because of the security threats. Therefore, Horowitz's and Fuhrmann's are incorrect in cases of Poland and Czech Republic. But their hypothesises can be correct in case of Slovakia and Hungary, countries that will not invest in drones in near future, since it can be claimed that they are not investing in drones just because they are not experiencing any direct security threats.

Application of Gillis's ideas

Mauro and Andrea Gilli believe that adoption of UASs is difficult even for the wealthiest and the most technologically advanced countries. They claim that in order to adopt drones, states have to overcome two barriers – platform challenges and adoption challenges. V4 countries are not the poorest countries in the world nor technologically underdeveloped, but certainly they do not belong into the group of states that could be considered as the wealthiest and most technologically advanced states on the planet. Therefore, I will look on whether V4 states are struggling to overcome these challenges or not, to find out if these challenges are blocking way of V4 countries to achieve proliferation of drone technology.

Technological capacity

Platform challenges depend on the technological level of a country and its ability to develop their own drones. Only one V4 state has not got companies that could produce UASs. There are no Czech companies that are currently developing drones for Czech Army and therefore, Czech Army possesses only drones that were made abroad and all their projects for future investments in drones, involve purchase of drones from foreign countries. However, they are member of the club of European countries that are together trying to develop Eurodrone. Also Slovakia does not currently have Slovak-made drones in its armoury. However, two Slovak companies, named Compel Industries and Incoff Aerospace, are currently in a process of development of drone for Slovak Army. Order to develop "kamikaze" drone, Predator AX-1, was made by Ministry of Defence of Slovakia and it is the only drone that can destruct things and is being developed in V4 region.

Other two V4 countries not only have private companies that are developing drones, they also established their own state companies that are focusing on development of drones for their armies. Polish state company, Polska Grupa Zbrojeniowa, is part of the consortium of three companies that should develop and distribute new drone, PGZ-19R, for Polish Army in years 2021-2023. This is just one of multiple projects of Polska Grupa Zbrojeniowa. There are also many private companies in Poland that are developing UASs. The major Polish private company in this field is WB Electronics and they have already manufactured drones like FT-5 LOS, Warmate R or mini UAS FLYEYE. Polish Army mainly relies on their domestic suppliers, but they are planning to purchase some UASs from abroad, since all Polish companies are developing only unarmed drones that can be used only for reconnaissance missions.

Hungarian Army also operates multiple drones that were made by Hungarian companies. Their state company, HM El Zrt, has made drones Bora and Ikran, and private company BHE Bonn Hungary has developed drone BXAP – 13. There are also other Hungarian companies that are trying to develop UASs, like company Ku-Me Invest Kft. This company tested last year their drone MP – H and this drone can soon become part of the armoury of Hungarian Army. Same as in case of Poland, Hungarian companies have abilities to develop only unarmed drones.

It is clear that most of the V4 states have technological capacity to develop their own drones. Only in Czech Republic there are no companies that would develop drones for Czech Army. However, since they are part of the Eurodrone project, Czechs certainly have technological ability to at least help in development of European drone. Poland, Slovakia and Hungary have their national companies that are developing UASs for their armies, although only Slovak company is developing drone that is capable to destroy things. Understandably, drones made in V4 countries will not be the best drones on the market, but they are certainly good enough for their armies. Therefore, platform challenges can slow down the process of adoption of drones only in Czech Republic since all other V4 states are able to manufacture their own drones.

Infrastructure

Currently are V4 states on different levels in drone technology. While Poland is the most dominant, Czech Republic is starting to chase them, and Hungary and Slovakia are less developed in this field. Poland is the most dominant state as they possess most drones and are able to develop their own drones. Because they have many drones, and also multiple projects to purchase new ones, Polish have already created infrastructure, thanks to which they are using their drones in most effective way. Their military base in Miroslawiec is even home for drones that are operated by American Army. Although Czech Republic currently does not have many drones, they are starting to build their infrastructure, like the establishment of special battalion for unmanned vehicles shows. Czech soldiers have been operating their drones in Afghanistan for a few years and so, their soldiers have experience to operate UASs in action.

Although Hungarians and Slovaks have only few drones, they have national private companies that are able to develop drones for their armies. Hungarians even have state company for this purpose. Both armies are yet to make organisational changes and since most

of their equipment and vehicles are out of date, both armies need to go through modernisation process. In addition, their soldiers only have experience in using them during natural disasters. However, Slovak soldier told me that although cooperation of V4 countries in UASs area is not very high, soldiers from all four states meet and train the operation of drones together. Building the infrastructure for use of drones is a barrier that Hungary and Slovakia will have to overcome when they will decide to invest in drones, and it will slow down a process of this adoption. It will not be a barrier for Poland since they already overcame it and Czech Republic will make a big step in overcoming it in 2025, when their special battalion for unmanned vehicles will become fully operational.

Conclusion – Gillis's ideas

Mauro and Andrea Gilli believe that adoption of drones is very difficult process, especially for poorer and less technologically advanced states, because these countries would not be able to overcome platform and adoption challenges. However, Poland and Hungary have already developed drones for their armies and are fully operational. These countries even established their own state company that is developing drones. Slovak private companies also have the ability to develop drones and are currently in a process of developing drone for Slovak Army. Czech Republic is the only V4 state that is currently not developing their own drone, but it is helping to make Eurodrone. Technological advancement is therefore not slowing down a process of adoption of drones in V4 countries. On the other hand, necessity to create infrastructure for effective operation of drones will slow down the process of adoption of drones in Hungary and Slovakia. Since Poland has already built such infrastructure and Czech Republic is currently in process of building it, these states will not struggle to adopt new drones because of this factor. Application of Gillis ideas on V4 countries showed that even poorer and less technologically developed states have capabilities to manufacture their own drones and thus, their hypothesis is incorrect. However, the factor of infrastructure is a barrier for Hungary and Slovakia and before these countries will decide to heavily invest into drone technology, they will have to build infrastructure for them. In conclusion, factors that Gillis mention will not negatively influence possible proliferation of UASs in Poland and Czech Republic, and in Hungary and Slovakia proliferation of drones cannot be expected in near future since these two states will have to firstly overcome infrastructural challenges.

Conclusion – Application of all theories

After applying two different theories that introduce factors that influence the probability of a state to adopt new technology, we can conclude that Poland has the biggest potential to experience proliferation of drones in near future. Poland has enough resources, has already made organisational changes in its army and has overcome barriers that could slow down the process of adoption of new drones. They also have multiple projects that involve purchase of new drones and development of new drones in Polish companies. Proliferation of drones in next few years can be expected also in Czech Republic. Although they lack national companies that could develop UASs for their Army, Czechs have enough resources to invest in drone technology and purchase them from foreign countries. They are currently doing organisational changes in their army, which shows that they would really like to fulfil goals of their drone projects.

On the other hand, application of factors from adoption-capacity theory and Gillis's hypothesises on Hungary and Slovakia showed, that these two countries will not experience proliferation of drones in near future. The major problem is that their armies are not in good condition and therefore, their priority is to modernise their basic equipment and vehicles. Only after that, they can start focusing on adoption of more advanced technologies. Most of their money will have to go that modernisation process and the adoption of bigger amount of drones will require organisational changes and improvement of the infrastructure of their armies.

I also applied on V4 countries Horowitz's and Fuhrmann's hypothesises that state that countries that are under security threats are more prone to adoption of drones. These hypothesises are incorrect in cases of Poland and Czech Republic since these countries are planning to invest in drones and although they are concerned about some security issues, they are not under any major security threat. Similar security environment is also in Slovakia and Hungary but since these states are not planning to invest in drones, Horowitz's and Fuhrmann's hypothesises cannot be refuted on the cases of Hungary and Slovakia. However, I might have got the answer for the question, why are V4 states adopting drones, from the Slovak soldier I interviewed. He said that for Slovak army, possession of UASs is a form of prestige. I believe that this can be applied to all V4 states. Even though all V4 countries certainly realise the advantages of drones for their armies, one of the major reasons to adopt drones for all V4 states might be prestige.

Conclusion

Although most of the people consider UASs as a fairly new technology, first news about this technology date back to 1917. During the 20th century, drone technology was improving and was becoming much more useful during military conflicts. Prior to year 2000, only few states were operating UASs. The turning point came in the beginning of 21st century, when states from all around the globe started to adopt this technology. Proliferation of drones is a continuous trend and still more and more countries are willing to invest in this technology. In my thesis, I focused on four Central-European states – Czech Republic, Hungary, Poland and Slovakia. I picked these states because all these states, but Czech Republic, play a crucial role in protection of Eastern borders of EU and NATO and all these four states are closely connected to each other, since they are cooperating with each other through Visegrad group. All V4 states currently have in their possession some UASs, but they are not important part of their armies yet. Therefore, in my thesis, I wanted to find out what is the future of drone technology in V4 states, if we can expect proliferation of UASs in these countries in near future or what are their reasons to adopt such technology. To find out answers for these questions, I applied three different theories on V4 states.

According to adoption-capacity theory, financial resources and organisational capital influence the probability of the adoption of new technology. These two factors are lowering the probability of the Hungarian and Slovak armies to adopt new drones in near future, since both armies struggle financially, and their regular vehicles and equipment require modernisation. On the other hand, Poland and Czech Republic have enough financial resources, they have already done organisational changes and thus, probability of the big investment in drones is much higher in these two V4 member states.

Mauro and Andrea Gilli claimed that countries will struggle to adopt UASs, because in order to get them, states need to overcome platform challenges and adoption challenges. Poland has already overcome these barriers and therefore, these challenges will not slow down their process of adoption of new drones. Disadvantage for Czech Republic is that they do not have companies which could develop UASs for Czech army, although Czechs have technological capabilities to help in development of Eurodrone. Slovaks and Hungarians are in similar situation because they both have companies that are currently developing drones for their armies, but before they will decide to heavily invest in drones technology, they will have to create an infrastructure, thanks to which they will be able to operate drones in most

effective way. Creation of such infrastructure is a barrier for these two countries that will prevent the proliferation of UASs in their countries in next few years.

I also tested hypothesises of Horowitz and Fuhrmann that state that countries that are under direct security threat are more prone to adopt drones. All V4 states share similar security threats like terrorism, Russia or migration, but none of them feel very vulnerable. Therefore, these countries are not adopting drones because of the security threats and as the Slovak soldier told me, for V4 countries, possession of drones is form of prestige and this may be the main reason for adopting them.

In a conclusion, Poland has the biggest probability from V4 countries to experience proliferation of drones in near future, since they already overcome all barriers, made organisational changes in their Army and have enough resources to invest heavily in drone technology. Proliferation of drone technology can be expected also in Czech Republic after they finish their organisational changes in 2025. Slovakia and Hungary will not invest in drones in near future mainly because their armies are not in good condition and their priority in next years will be to modernise their regular vehicles and equipment.

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Appendix

Aké drony v súčasnosti vlastní Slovenská republika?

Momentálne máme k dispozícii 6 setov systému MicroFalcon z Izraela a každý z tých setov je zložený z 2 lietadiel. Ďalej vlastním Skylark 1-LE a taktiež Skyranger Quadcopter. Využívame ich skôr na rýchly prieskum, kde sa dá spraviť veľmi rýchlo, zistiť situácia aká je okolo vás. Napríklad v Afganistane za plotom alebo sa chcete pozrieť do domu cez okno. Naše drony robia dlhý, dlhý prieskum, keď niečo potrebujeme potvrdiť, on dokáže vydržať až 3 hodiny vo vzduchu. Na dlhé vzdialenosti sa robí tento prieskum, že aká je situácia, a potom sa to vlastne, keď sa toto video vyhodnotí, tak potom sa to potvrdzuje týmito snímkami. Či to tak je naozaj. Alebo potom ten Fix wing lieta stále na podporu jednotiek a dáva informácie o tom, že či sa nejako zmenila situácia.

Využívame naše drony aj v akcii alebo slúžia len na tréning?

Na Slovensku to funguje keď sú povodne, monitoruje sa situácia, že kde sa tá rieka rozlieva a tým pádom, my tam nemusíme poslať človeka. Hasičom dáme info o tom, že aká je situácia a oni vedia potom čo majú robiť. Potom napríklad keď boli snehové kalamity. Na Orave odrezalo ľudí v podstate od sveta a nevedeli sa dostať preč. Tak my sme vlastne nalietavali s tým a zisťovali sme, že čo tí ľudia, v akej sú situácii. Lebo hasiči tam chodili na štvorkolkách. A niekde aj autom ale to auto už ďalej neprerazilo lebo už tam bol sneh. A my sme im dávali informácie, môžeš prísť potiaľ a potiaľ. Potom tam máš mostík ktorý dokážeš prejsť štvorkolkou alebo pešo. A tým ľuďom napríklad trebalo doniesť lieky. Tak našim dronom im tam dokážeme zaviesť balíček prvej pomoci alebo im lieky doviesť alebo vodu. Síce odnesie iba pol kila ale dokážem sa s nim točiť. A tak dokážeme ľuďom zhadzovať nejaké zásoby, aby aspoň prežili. Takto to využívame. Alebo ďalšia situácia. Dohľadávame osoby. Nejaký turista sa zraní v horách a ten záchranár aby k nemu išiel čo najkratšou cestou, aby ho nemusel hľadať tak my ho vyhľadávame tým dronom a my ho vieme navigovať. Choď tade a tade, tu máš prekážku, choď doprava a takto ich navigujeme aby čo najkratšou cestou prišli ku nim. A keď vidíme, že tá vzdialenosť je veľká, lebo v tých horách kým sa záchranár dostane k nemu, tak to trvá nejaký čas. Tak vtedy dokážeme, keď je pri vedomí a vie si spraviť sám prvú pomoc, vieme mu zhodiť balíček alebo len vodu mu zhodíme.

Čiže my drony využívame len na Slovensku? Lebo napríklad takí, Česi ich využívaju aj v Afganistane.

V Afganistane Česi používajú pevné krídlo ale moc tam s tým nelietajú, pretože tam je hrozne plný vzdušný priestor a oni im dovolia vzlietnuť iba na to, aby tam niečo monitorovali. Nikto z tej V4 nerobil extra lety na podporu a už duplom že by mali nejaké hlavice alebo niečo. Predátory a podobné drony majú Američania.

Áno, presne to som pozeral, že vlastne všetky V4 krajiny majú drony len na pozorovanie.

Áno, plán do budúcna je taký, že by boli už aj na ničenie.

Čiže aj Slovensko má taký plán?

Z časti áno, chceme ísť týmto smerom. Volá sa to kamikaze ale to by som moc neuvádzal ako kamikaze dron. Ale funguje to na tom systéme, že dron vyletí, monitoruje všetko a potom ničí tým, že sám, v podstate celý dron je nálož, ktorá ničí niečo. Buď osoby alebo budovy alebo nejakú obrnenú techniku. Takže sú také UAV, ktoré dokážu toto.

Presne takéto drony by mala vyrábať aj slovenská firma...

Áno, rieši sa niečo aj na Slovensku, ten sa volá Predator AX-1. Ale v tomto sú dobrí Izraelci, to je to IAI Harop. A na ich stránke sa môžeš dočítať o tom drone a ten dokáže ničiť tak, že nevystrelí raketu ale on sám je raketa.

A prečo vlastne Slováci investujú do dronov? Ja by som povedal, že naša technika nie je veľmi dokonalá, tak prečo chceme investovať do dronov? Aký to má zmysel pre Slovensko?

V prvom rade je to šetrenie živej sily. Čiže je to to, že tam nemusíš poslať človeka ale radšej tam pošlem stroj a ten stroj mi spraví robotu. A miesto toho aby tam išiel ten človek a riskoval by som život toho chlapa. A keď už som si istý, že je to tam bezpečné a viem aká je tam situácia, tak až potom pošlem chlapov. A tí chlapi vedia do čoho idú. Lebo keď niekde skočíš do jamy, tak nevieš, že čo ťa čaká. Alebo do vody. Keď skočíš do vody o ktorej nevieš aká je hlboká tak čo spravíš? Možno sa utopíš a možno to prežiješ. A takto nechceme riskovať, takže toto je prvotný zmysel UAV. Aby si nemusel riskovať životy ľudí ale posielať tam mašiny najskôr a tie ti ukážu situáciu. Čiže toto je prvotný zámer, prečo to armáda nakupuje. Druhá vec je prestíž. Proste každé armády to používajú. Bez UAV už armáda skoro ani nie je. A dokáže ti to pomôcť. Je to ako ďalší človek v skupine. Sú to tvoje oči. Ja to beriem tak, keby sme na niekoho útočili, napríklad v Afganistane. A na Slovensku ti to

hrozne pomáha lebo dokážeš riešiť také situácie ktoré som ti opisoval, že naozaj dokážeme pomáhať ľuďom, keď sú v kríze.

V rámci V4 existuje nejaká spolupráca čo sa týka dronov?

Niečo také malé je, že sú nejaké cvičenia spoločné. Že prídu Česi alebo my ideme do Čiech. Máme nejaké kontakty s Maďarmi, Poliakmi a robíme spolu nejaké tréningy ale moc sa nespolupracuje. Každý si skôr chráni to svoje. A robia si svoje úlohy o ktorých sa moc nerozpráva.

Česi v januári zriadili špeciálny útvar pre drony. Nebolo by dobré, keby aj Slováci zriadili takýto prápor?

Ťažko povedať či by to bolo až tak dobré lebo ten prápor by bol stále len na to aby podporoval nejaké jednotky. Čiže vždy si musíš vyžiadať túto jednotku aby ti išla pomôcť. A my keď ich máme začlenených na piatom pluku a robíme spolu už veľa rokov tak ja už tých ľudí poznám, ktorí to žiadajú a aj oni vedia ako o to majú žiadať a čo od toho môžu očakávať. Tým pádom je to jednoduchšie aby som podporil vlastné jednotky. Lebo normálna mentalita ľudí, ktorí to nepoznajú je, že pozerajú americké filmy. A tam sa povie, že chcem UAV. Máme UAV tak to UAV mi spraví prenos z Košíc do Bratislavy a bude likvidovať vo Zvolene niečo. Toto je voláme generálsky syndróm. Ale takto to nefunguje. Ani v Amerike to tak nefunguje. Takže skôr ľudia ešte o tom nemajú také podvedomie, že ako s tým robiť a ako o to žiadať a z tohto dôvodu by u nás na Slovensku takýto prápor ešte nemal opodstatnenie. Lebo ľudia ešte nemajú o tom také povedomie, že čo by od toho mohli čakať. Proste majú prehnané nároky na to.

A tí vojaci, ktorí riadia ten dron, potrebujú na to nejaký výcvik.

No niektoré drony sú jednoduchšie a na ne človek nepotrebuje dlhý výcvik. Samozrejme, že nejakým výcvikom ale ten človek musí prejsť. Pri tých komplexnejších dronoch už je potrebný výcvik a každý výrobca na to dáva výcvik. Tam je to zložitejšie. Ale tie jednoduchšie sa človek rýchlo naučí. Problém je ale v tom, že ty musíš absolvovať ešte ďalšie výcviky aby si vedel ako sa delí vzdušný priestor, ako sa objednáva vzdušný priestor , kde môžem lietať, ako môžem lietať, kedy môžem lietať, neohrozujem niekoho a tieto veci. To sú právne veci, to je legislatíva a povolenia, vyjednávanie vzdušného priestoru a tieto veci. Takže nie je to len že si operátor a môžeš lietať ale musíš vedieť okolo toho milión vecí. Takže to nie je iba o kurze, že som operátor. Ale musíme ísť na kurz čo je v Liptovskom

Mikuláši, to je akadémia, alebo do Brna na ich akadémiu vojenskú. Tam máš kurz na licenciu operátora. A tam dostaneš licenciu, že si operátor UAV. Čiže to nie je len, že si vodič auta, ale si znalí aj všetkých vecí okolo toho. Ako vzdušný priestor, vyžiadávanie si vzdušného priestoru a tieto veci.