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MIGRATION FROM A BIRD'S EYE VIEW

Research and analysis related to migration, the historical review of its origin, the observation of its cause and its implication have been extremely popular issues since illegal migration has reached unrecognized dimensions in Hungary in 2015. We may hate the wandering „community”, we may be scared of it, it is up to your temper, there is only one thing we cannot do is to ignore it. There are several options for solution and for satisfactory management to take into account, which can spread from the complete separation to integration. The technical barrier protecting our country and the Schengen borders so-called the temporary border fence, had its first section built on the Hungarian-Croatian border line, measuring 4 meters height and 175 kms length. Camera systems, patrol roads, Smart Signal Systems and patrolling police and military forces are integral parts of this defense system. The authors of this publication introduce the migration airborne from the perspective of an UAV (Unmanned Aerial Vehicle).

Keywords: *Unmanned Aerial Vehicle Systems, drone, migration, rural exodus/population shifts, border barrier.*

INTRODUCTION

Migration is one of today`s most significant and unsolved difficulties and is a phenomenon of all periods of history. Throughout the history of humankind, several times we can see traces of wandering nations and ethnic groups which they left their origins. Several factors can be considered and these factors are usually economical, sociological and environmental. At the beginning of societies, humans established their habitats and territories in areas that had a positive influence to their living conditions and provided shelter and good possibilities for trade. We can see wandering and migration of different groups in different periods as they were escaping from extreme climate or war. Today in the period of globalization it has an increasing trend.

"Migration never stops, we shall prepare ourselves for a new age, and Afro-European culture is on the doorstep." [10] Wrote Umberto Eco¹ at the beginning of the 90s.

According to a study published by the United Nations in 2015, nearly 244 million people live outside their own country. Reasons in the background are complex. On the one hand, the Arab Spring had a significant impact, as nearly 65 million people had to leave their homes and escape from their own countries. According to Mr. Balázs Bokor² the half the population of Syria migrated (currently there are 5 million people in refugee camps and 20 percent of this is Syrian). He adds that, during the fights, up to 300,000 people were killed, 15,000 of them children. On the other hand, we shall not forget about the millions who have suffered continuous conflict and war, living in extreme poverty in the Third World. Drastic changes in their climate and economic conditions do not give them any other choice than to migrate.

¹(1932-2016)

²Ambassador. He served as a diplomat for more than 30 years, out of these 24 years in the Middle East.

Irrespective of when it happens, it seems that wandering still appears to be an option for smaller or larger ethnic groups, as the tool of escape. The pace of the exodus at a given time depends mostly on border crossings. Perfect border control is a nearly inextricable task for the involved authorities. Migration is a natural phenomenon, which cannot be stopped by political or military tools, in the same way that we can't stop the water flow in a river, but we can regulate. Rolling waves must be kept in their channel. Groups prepared to erupt must be monitored and if intervention is needed, we have to keep them under control. To achieve this task, many tools and possibilities of border management, immigration policing and intelligence services are available, however execution always depends on the technical standards of the current period.

Beyond the description of some aspects of migration the authors present the ongoing Hungarian defence procedures and, as a feasible solution, they explain the possibilities of airborne tools in this cat and mouse game. Unmanned aerial vehicles have appeared in several aspects of our daily life, and they offer us a great variety of applications. Imagination only imposes limits on tasks that are feasible for them, their technical possibilities does not.

ASPECTS OF MIGRATION

Before we start to examine the appearance of UAV/UAS³ technologies and their tasks with regard to migration it may be useful to review the methods, aspects and risks of this ongoing rural exodus. It is interesting to examine the migration in details.

Today, one of the most frequently used words in internet search engines, is migration. We can find millions of results, and also several libraries can be filled with books of academic studies, and research documents examining the basic theory of migration. „According to some, migration established or formed individual states and whole nations, or it destroyed them. In this context, Hungarian conquest also can be translated as migration, same as the establishment of the majority of the United States. Israel may have been formed due to a particular population shift and the existence of Liberia in Africa is the outcome of a so called repatriation process” [11].

Referring to figures highlighted in figure 1, it can be stated that in 2015 every ninth person in 1000 worldwide was a migrant.

Nation-states, depending on their political and economic structure, handle the challenge of migration in a different manner. In addition, the US have strengthened migration policy recently and supported Mexico with significant millions of dollars for preventing migrants of reaching the US border. On the one hand, US established 1,100 Km of border fence between 2006 and 2010 in critical areas of its borders with Mexico concerned by heavy migration. The European Union also faced larger or smaller waves of migration over the past 25 years. „The increased number of migrants can be explained by the changes of power relations. On the one hand, after the collapse of the bipolar world order and the termination of its discipline effect, numbers of smaller local conflicts and crises appeared to regulate forced migration. Relevant examples are the Syrian and Libyan civil wars. Referring to statistical information, these two conflicts have

³ Unmanned Aerial Vehicle/Unmanned Aerial System

a significant role in the development of the migrant crisis in Europe in 2015 and could have a significant role in its handling too” [1].



Figure 1. The global number of refugees per 1,000 people in the world [12]

Since wandering has got several aspects, guiding principle can be a motive, a state border, a motivation, legality or the period of residence. Authors summarize these principles in the table (figure 2) below.

Type of migration	Essential factors
external or internal (in-country or international)	Concluded with or without crossing state border
Inbound or outbound (emigration or immigration)	Determination by the direction of wandering
Individual or mass (collective)	Numbers or dimension of participants
Freedom based or violence based (voluntary or obligatory)	The possibility of freedom of movement
Periodic or enduring (temporary or permanent goal, primary or secondary)	Temporarily or permanent
Economic, political, ecologic or cultural	Better quality of life, security reasons
Controlled or uncontrolled (legal or illegal, regular or irregular, registered or not)	Taking into account the rules and regulations of the host country and the acceptance of these rules, residence without legal status

Figure 2. Types of migration and its essential factors [13].

In short, we can say that migration is an individual activity, which can turn into a social phenomenon. It occurs if at least one of the reasons detailed in figure 2 above exists, and implemented by huge numbers of people.

It have shown up primarily in connection with The Paris, Berlin, Madrid, Barcelona and Nice terror attacks that terror acts and their increased risk are fundamentally related to the intensified migration. National security experts, journalists, media actors and politicians are still having continuous arguments if there is any significant relation between illegal migration and the incursion of terrorism?

There is no exact answer to this question. We can have our judgement, but first we have to analyse several data appropriately. What is needed is to know the number of migrants and the number of terror attacks committed. The comparison of these numbers referring to a period of time can give us a determinant figure.

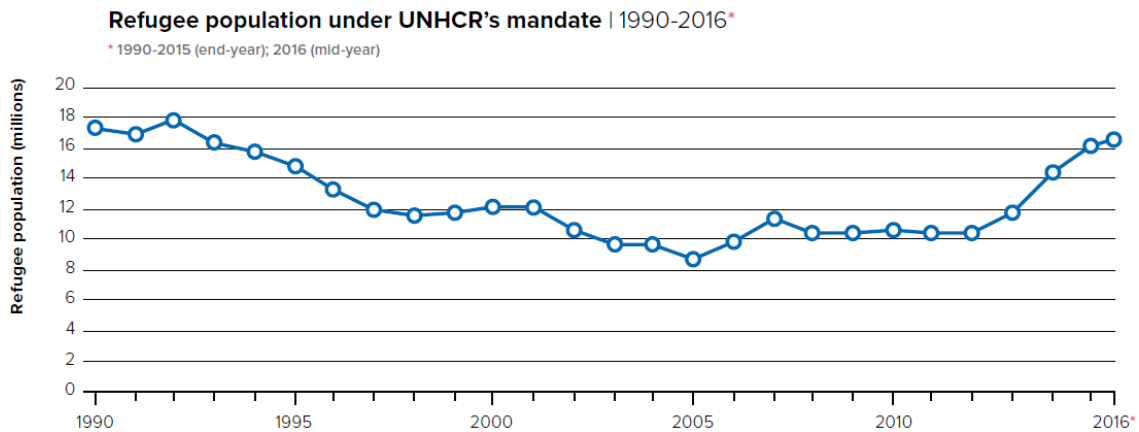


Figure 3. Evolution of migrants [14]

As we look back in time to the nadir of the migration diagram, we can see that the number of terror acts worldwide was 1,159 in 2004, in 2011 we can see 5,000 perpetrations, 11,952 in 2013 and 16,818 terror acts were registered in 2014. If we compare the trend of global migration with the evolution of terror acts in the last 25 years (figure 3) we can see that there may be some particular connection between these numbers. Concerning the evolution of migrants the increase was not more than 40%, but on the other hand the number of terror acts increased in the same period with 1,350% [9].

The next aspect of migration is the determination of wandering routes. The possible existing alternatives of reaching Europe are clearly highlighted in figure 4. Because of its relevant efficiency, the route highlighted with blue is used the most frequently. The main barriers of the shortest route to approach are the existence of natural barriers, malignant and armed guerrilla groups and man-made barriers such as technical barriers (border fence). To accomplish long term preventive function to technical barriers we have to guard them. Guarding of technical barriers will be introduced by the authors in the next chapter.



Figure 4. The Balkan route [15]

THE INSTRUMENTS OF DEFENCE

The expression **European migration crisis** was used first in April 2015 when 5 boats sank while they were transporting migrants to Europe across the Mediterranean Sea. During the disaster nearly 1,200 people died. Probably, these unfortunate migrants were escaping from the war dispersing and broadening in the Middle East, especially from Syria. As the result of the horrible accident the European Union launched first Operation Triton and then the EU Navfor Med operation. In the framework of these operations EU tripled the budget to control the shores of the Mediterranean. Thanks to these naval operations thousands of lives have been saved. During this period FRONTEX⁴, whose main task is to protect and control the Schengen borders, was rescuing migrants arriving by sea with a considerable number of ships and boats, because every night, just in August 2015 alone and just in the Aegean, hundreds of boats tried to cross the sea. Since 2015, migrants have arrived on the territory of the EU through three main routes. They used the Central Mediterranean route via Malta and Italy, the Eastern Mediterranean route by via Greece and the Aegean Sea and the Western Balkan route by via Hungary. According to the increased migratory pressure thousands of people crossed state borders without any check and control. Their aim was to enter the European Union, mainly Germany. The first EU border section immediately after the border of Greece was the Hungarian border, which is also the external border of the Schengen area. Whilst in 2014 altogether 42,700 people applied for asylum, in 2015 this number exceeded 57,000. In the EU whole, this number exceeded 753,000 as it is highlighted in figure 5.

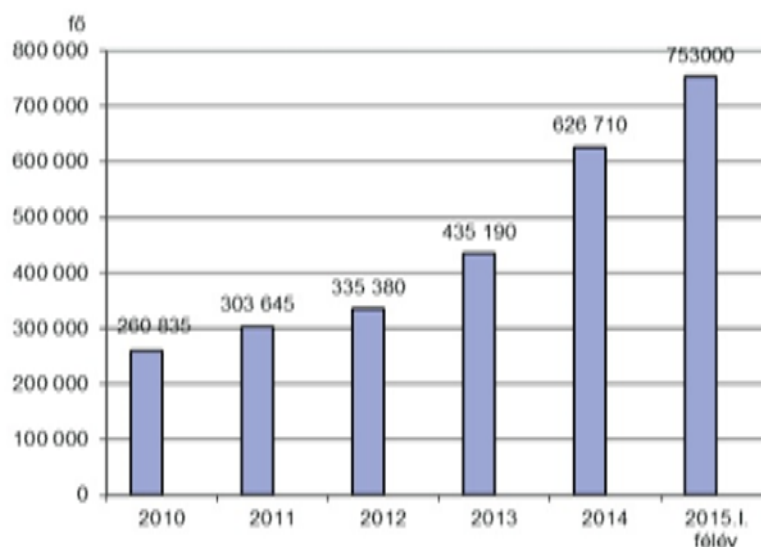


Figure 5. Numbers of asylum applicants within the European Union in 2010–2015 [16]

The government of Hungary, to mitigate the increasing migratory pressure and to keep illegal border crossing under control, decided on 17 June 2015 to close the 175 km long Hungarian-Serbian green border section. The first step taken was to build a 1.5–2 meter high border fence called technical border barrier as an instrument to avoid illegal border crossings. The engineering units of the Hungarian Defence Forces used metal poles fitted with 3 lines of

⁴ European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (Frontex)

(NATO standards) barbed wire to achieve the desired result. In addition, under the command of police forces, units of the Hungarian Defence Forces started also to patrol together with the police. The implementation of border defence tasks consisted of 3 main duties. These were technical (vehicle) and infantry patrols, high-stand observation and air patrolling. In parallel with the establishment of this technical border barrier the construction of an additional three meters high wired fence also started to strengthen the defence capabilities of the already deployed first defence line. This defence line was called Temporary Border Fence (TBF). There was also a need to modify the legislative environment in force, because, according to Hungarian law, crossing or destroying the technical border barrier was only an administrative offence. On 4 September 2015, the National Assembly of Hungary adopted law CXL 2015, whereby the destruction or illegal crossing of the technical border barrier constitute a criminal offence which may be sanctioned with immediate expulsion.



Figure 6. construction of Temporary Border Fence started on the Hungarian border [17]

After the closing of the Hungarian-Serbian green border line a decision was made to also close the Hungarian-Croatian green border line. Following this decision of the government on 16 October 2015 the establishment of a new 41 km technical border barrier was started. Moreover, the relevant legislation was also modified, new border management rules came into force, which involved the physical defence system of the 3 liner NATO rapid deployable barbed wire.

After having the technical border barrier established the number of illegal border crossings decreased, from four to eight thousand daily to a few dozens. There was scope for further progress by the already established technical border barrier, because human traffickers found out the weak points of the barrier and helped migrants pass through to Hungary by cutting the defence wire. Due to the lack of EU management of the migration crisis it was also expected that further hundreds of thousands will leave their countries to reach the EU. In August 2016, a further fence line was started on the Hungarian-Serbian border line, which integrated a surveillance and security system. By the beginning of 2017 the smart fence plant highlighted on figure 7 had also been deployed. This Intelligent Signalling System (ISS) is also equipped with thermal cameras, night vision equipment and video cameras. ISS is a technical system

which operates with and detects restricted voltage impulses. Sabotage of the system triggers an alarm which is detected in the Command Control (CC) centres established for this reason in police headquarters. After the evaluation of these alarm signals actual patrol forces of the Ministry of Interior and the Ministry of Defence⁵ were tasked. The second line of fence is equipped with such enhanced technical substance that makes it significantly difficult to cut through it. Manoeuvre and service paths have also been constructed, which improved the rapid and professional intervention in the prevention of illegal border crossings.



Figure 7. Intelligent Signalling System (ISS) [18]

Transit zones established by the border line have a significant role in the defence system. Migrants arriving with an application for asylum can present their documents here, and upon arrival they are briefed in their native language on their rights and obligations. The policy of transit zones is regulated in Regulation (Ministry of Interior) 3/2017(III.23.). Transit zones are operating 24/7 and staff members of the Immigration and Asylum Office (IAO) are responsible for processing the asylum applications. „National security checks of asylum applicants are an integral part of asylum procedures in Hungary. Unfortunately, neither in Hungary nor in other countries it can't be completely guaranteed that people dangerous to national security can be identified in the early phase of the procedure. Links between national security and asylum can hardly be examined, which depends mostly on the equipment used, technical resources and financial conditions of various administrative departments.” [5] During the asylum procedure applicants are interrogated, fingerprints and photograph are taken too. Thanks to this procedure it can be partly identified which asylum applicant is recorded by the authorities in connection with terrorism or other crimes. It is important to maintain an atmosphere of trust with the asylum applicants to obtain information on possible dangerous and suspicious people.

Amongst the establishment of the technical and physical defence to manage the migration crisis and to avoid illegal border crossing, it was also essential to develop a legal background for the required defence policy. On 31 July 2015 the government Regulation 213/2015 (VII.31.) was

⁵Ministry of Interior and the Ministry of Defence

published in the Hungarian Official Journal to promote conditions for uninterrupted work during the construction of the fence. Under legislation, unauthorized access to the construction site, hinder of works or to control an unmanned aerial vehicle in its air space is punishable and incur a financial penalty.



Figure 8. The border from a bird's eye view [19]

Controlling a UAV is a proven practice used by human traffickers to assist illegal migrants before and also after the adoption of the legislation to locate and deceive weak areas of the border defence system. To avoid damages to the border fence and to be able to sanction illegal border crossings the rules of crime have been adopted in law CXL2015. According to paragraph 352/A and 352/B of the Criminal Code of Hungary, damages caused to the border fence and illegal border crossing have become a criminal offence. Following the law amendments adopted by the Parliament in the first quarter of 2017 the restricted legal border barrier came into force. The legislation made it clear that asylum applicants have to issue their applications in the transit zones established by the border line in Hungary, and they have to wait for the result. It also regulated that illegal migrants caught by authorities inside the country have to be moved back to the border fence and have to be escorted out of the country.

Information and data on the wandering and location of migrants gathered during aerial reconnaissance have an essential role in the framework of border defence, because airborne, as it is highlighted in figure 8, a much greater area can be examined in much less time. Aerial reconnaissance tasks at the Hungarian-Serbian border line are carried out by the helicopters of the HDF 86th Szolnok Helicopter Base and the police. The purpose of these control flights is to check the integrity of the border fence and to reconnoitre and report abandoned camps of migrants and their movement. The quality of execution of this duty depends largely on the terrain conditions and on the weather. Depending on these two factors the altitude of the helicopter can be between 15 and 300 meters and its speed between 0 and 200 Km/h. Due to this excellent flight characteristic, like just hanging static on a low altitude, perfect observation can be obtained. Personnel involved in the aerial reconnaissance task is on continuous standby, so they can be alerted 24/7. In case of need, they are not just capable to execute reconnaissance tasks, but also capable to execute transport tasks. Because of this, there is a chance to supply

logistic or human reinforcement within a short time to areas that are difficult to reach by vehicle. The only disadvantage of aerial reconnaissance flights is their efficiency, because helicopters can perform their duties only with a very high operating cost.

We think that aerial reconnaissance duties can be much more cost-effective by using unmanned aerial vehicles in parallel with the partial or total replacement of helicopters.

THE POTENTIAL OF UNMANNED AERIAL SYSTEMS IN MIGRATION

The application of UAV/UAS to execute reconnaissance duties on the border of a specific country is not new. The US applied drones with testing intents to check its borders at the beginning of the 2000s. However, at that time operational costs of this technology did not make it possible to deploy this system for border defence tasks.

Due to the technical evolution of the last decades this issue is topical again, because unmanned aerial systems went through a great evolution and continuous improvement, even turbulent. Several types exist, such as fixed wing, rotor driven and even flapping-wing (ornithopters). One type can fly faster than the speed of sound, one weighs only a few grams and one is capable to depart with several tonnes of take-off mass, one can only fly a few hundred meters from its base of operation and other types are capable to fly across the continents. They can fly autonomously or can be remotely controlled by a human, or it can be a combination of both. Common feature of these constructions is the necessary presence of technical personnel [7].



Figure 9. Deployable command centre [20]

Considering the above, it is not surprising that not just regular forces dealing with border defence such as the HDF and the police prefer this tool, but also human traffickers looking for advancements in illegal migration prefer this technical equipment. An advantage of applying UAV/UAS during the execution of border reconnaissance duties is the relatively low operational cost, and in addition it gathers a significant quantity of information. After the

construction of the border fence the National Directorate General for Disaster Management and the Hungarian Defence Forces carried out frequent aerial reconnaissance with UAVs in critical areas. They provided particular assistance if the terrain was complicated, where monitoring of migrants who arrived on the border to cross it illegally, was difficult, because of specific landmarks such as buildings or wooded strips. According to international regulations and law in force, it is not possible under any circumstances to fly across the border line.

The current system of border defence could be expanded with a 24/7 UAV air traffic control service. The mission of this service is to provide aerial reconnaissance information to the personnel involved in border defence tasks. Controllers and a control centre may be deployed in existing Border Defence Bases and in the deployable command centre highlighted in figure 9. Type and flight parameters of unmanned aerial vehicles on duty may depend on the actual patrolling exercise.

„Requirements imposed to unmanned aerial vehicles used in the field of safety technology are usually common (there may be specializations in specific sectors of industry): in case of human controlling the connection between the control panel and the drone has to be established securely to avoid external disturbance, interception (cyber tapping) or override. In case of an autonomously operated UAV it has to sense the discharge of the battery and has to fly back to the recharge station. In case of unexpected discharge of the battery a safe route must be used to avoid a crash on humans or critical systems or system components. Recorded pictures, if any have to be handled in accordance with the privacy act and in accordance with the regulations of the respective industrial sector.”[4]

However, with regard to privacy, we have to emphasise data protection, that the problem is not related to the use of these unmanned aerial vehicles, but to adjustable accessories with atypical data management capabilities equipped on them. The biggest difference in data management and processing is that this tool is capable to collect data and information about everything within its sight, and even in case of its intended use it may represent a breach into people's private sector. This horizon compared with the previously used tool's horizon, is remarkably wide and can be adjusted rapidly. If there is no related regulation (contrary to a camera applied on a helicopter or a permanently deployed private security system) it can track moving people or objects without unnoticed. Anyway, this ability is the focal point during the execution of border defence activities. By using this new technology, the controller can easily execute an undercover observation, because the size of the aerial vehicle enabling the observation is very small [6].

UAV controlling stations may be able to manage patrol duties and aerial control within their area of operation. Control of aerial vehicles can be executed by direct human control or by pre-programmed and pre-edited routes. The feature of autonomous aerial systems, „contrary to human controlled ones, is that during their whole flight they execute their tasks according to the memory pre-loaded into the programme package of the onboard computer. All basic data required for the flight to manoeuvre the UAV on the appropriate route with the appropriate profile and with the simultaneous operation of onboard systems are stored in the onboard computer” [2].

A UAV participating in the task is adaptable with video recording and simultaneously transmitting video systems. Autonomous, pre-programmed, patrolling UAVs can be equipped with camera systems that can recognize thermal signs by video analytics, they can acknowledge

human body's thermal imaging highlighted on figure 10 and they can send an alarm to the control centre automatically. Identification is possible from 16 pixels / meter. From this distance it can be determined if the person is armed or not. After the alarm the controlling personnel of the UAV can inform the relevant police patrols and can continue the manually controlled reconnaissance and analysis of the affected area. In addition, the UAV can supervise, and record police measures taken against illegal migrants. Use of these aerial vehicles may be great assistance against illegal migrants, who enter Hungary by damaging the temporary border fence and those who are already inside the country.



Figure 10. 23 meters: 84 pixels resolution [21]

Such equipment can be very useful in the search and exploration of these migrants, because it is capable to develop airborne reconnaissance in a relatively large area in a very short period of time. Information acquired by using this method may increase the efficiency of search and exploration and improve chances to have wanted people arrested. If correctly programmed UAS is capable to sense and to react to the low level of its battery. In case of reaching the pre-programmed minimum level of the battery, the UAS may return to its base, where its recharge might be technically possible with wireless connection and without any human intervention. Autonomous UAV returning to base can be replaced automatically without any human intervention with a UAV prepared for a mission. Continuity of aerial reconnaissance activities can be ensured by applying this method and human resources planned for the actual guarding activities can be reduced. The operational cost of UAVs is only a fraction of the cost of aerial reconnaissance operations executed by helicopters.

CONCLUSION

As an overall conclusion we can say that migration is almost as old as humanity. However, we should not be surprised of the reactions of people, because dramatic growth or decrease of societies can cause significant disturbances. Today, several armed conflicts and climate change force people to leave their countries. In addition, a significant number of economic migrants depart to find better living conditions, primarily aiming advanced civilizations such as the United States of America or the European Union. In 2015, partly because of the Arab Spring and the

Syrian war, hundreds of thousands of refugees of war reached the border of the European Union on the three main routes described earlier in this article. On a daily basis, tens of thousands of migrants arrived in Hungary from Greece by using the Eastern Mediterranean route and crossing the border illegally. To manage the situation the Hungarian government took the decision to establish a physical barrier first on the Hungarian-Serbian and then on the Hungarian-Croatian border section. Besides the construction of a physical defence, all required legislations have also been established. These regulations can enforce successful execution of border defence duties and tasks and prevent illegal border crossing. Beside the police forces, the personnel of the Hungarian Defence Forces was also assigned to border defence duties, to serve in joint patrols. The lack of a common European approach has made it clear that other hundreds of thousands of migrants and refugees will aim countries of the European Union, so the Border Fence has been consolidated. Due to the related political decision an Intelligent Signalling System (ISS) with integrated guarding and defence component has also been established. Other state actors also have a significant role in border defence duties. Their helicopters execute aerial reconnaissance and monitoring tasks. Thanks to their activities, reconnaissance of large areas can be executed in a short period, which supports infantry and technical patrols during the execution of their defence duties. UAVs also present a great support. Their application gathers a significant amount of information with regard to the position, numbers and movement of illegal migrants. They can be used above difficult and intensely covered terrain.

The already established border defence system can be integrated with a **24/7 Air Traffic Control Service** that consists of aerial vehicles and their controllers. The service could execute 24/7 airborne reconnaissance, control and patrolling of the border line. It also can support tasks of search and exploration related to illegal border crossings. Unmanned aerial vehicles and systems may carry out their duties without any human intervention. They may execute their patrols on pre-programmed routes and with appropriate technical equipment applied, like infra camera, facial recognition tool, they can send alarm signals on potential threat sources such as thermal signals of humans. Air Traffic Control Service integrated with UAV/UAS may increase the efficiency of the border defence. It can greatly contribute the exploration success of illegal migrants and can partly expand actual helicopter reconnaissance. Due to these positive effects significant cost-efficiency can be obtained.

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A MIGRÁCIÓ MADÁRTÁVLATBÓL

A migrációval kapcsolatos kutatások, elemzések, a kialakulásának történeti áttekintése, a vándorlás okainak és következményeinek vizsgálata 2015 óta az illegális bevándorlás Magyarországon eddig nem tapasztalt méretei miatt, rendkívül népszerű téma. Lehet gyűlölni a vándorló „közösséget”, lehet félni tőlük, mindenki vérmérséklete szerint dönthet, egyet nem tehetiünk, mégpedig azt, hogy figyelmen kívül hagyjuk a témát. A megoldásra törekedve számos lehetőség nyílik a helyzet megnyugtató kezelésére, amely repertoár a teljes szeparációtól a befogadásig terjedhet. Az országot és egyben a schengeni határt védő műszaki határzár, azaz a határőrizeti célú ideiglenes kerítés első eleme a magyar-horvát határszakaszon épült meg, mintegy 175 km hosszan és 4 m magasan. A védelmi rendszer szerves részét képezik a kamerarendszerek, manőver utak, Okos Jelző Rendszerek, valamint a járőr szolgálatot teljesítő rendőrök és katonák. A szerzők ebben a publikációban a népvándorlást a levegőbe emelkedve, a pilóta nélküli légi járművek szemszögéből kívánják bemutatni.

Kulcsszavak: pilóta nélküli légi jármű rendszerek, drón, migráció, népvándorlás, műszaki határzár

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