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THE EFFECTS OF THE IRAQ WAR ON THE POPULATION

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Abstract: *The main purpose of this article is to highlight the events that took place during the Iraq War, more precisely the effects it had on the population, showing the events that took place during and after the invasion. In this article will be presented the reasons behind the war, official as well as unofficial ones, and the impact that this conflict has had on the both sides. This invasion marked the beginning of a long period dominated by violence, chaos and death for the troops engaged in the fight, but especially for the civilian population that suffered the most from this conflict. After losing everything, the population was forced to take part in a fight for survival, a fight that took place in an environment driven by violence, where even the slightest mistake could mean death and the vision of a peaceful life was only a distant memory.*

Keywords*: Iraq War, terrorism, casualties, refugees.*

1. INTRODUCTION

The Iraq War, also called the Second Persian Gulf War, was one of the most destructive and cruel wars of the 21st century, a catastrophe which has shocked the entire world and aroused a variety of reactions among the population of several countries, involved or not in the conflict. The conflict consisted in two phases, the first one was a brief representing the period of the invasion and the second one was the post-invasion phase which lasted longer and contained a large number of controverted and regrettable events.

2. THE PHASES OF THE IRAQ WAR. HOW IT ALL DID START?

The war phase lasted 42 days, form 20 March 2003 to 1 May 2003, and it begin with a surprise attack (there was no declaration of war) of the US forces along with troops from the United Kingdom and with smaller contingents from several other countries. The "Coalition of the Willing", formed from approximately forty governments provided an impressive number of soldiers for this invasion along with equipment, services, security, and special forces. Approximating the numbers, there were 248,000 soldiers from the United States, 45,000 British soldiers, 2,000 Australian soldiers,194 Polish soldiers and 70,000 soldiers from Iraqi Kurdish militia troops. Despite the large number of soldiers and the quick and decisive operation, the Iraqi military represented a major resistance behind the expectations of the US troops, being prepared to fight both an irregular and conventional. One of the main strategies, the asymmetric warfare, involved leaving the territory when they were overrun by enemy forces and launching smaller-scale attacks by soldiers dressed in civilian or paramilitary clothing. Asymmetric warfare was well defined by Rod Thornton (2007:1), as follows: "The September 11 attack was perhaps the supreme example of what has come to be known as 'asymmetric warfare'. This phrase is one that is now dominating the lexicons of military and security forces around the developed world. At its simplest, asymmetric warfare is violent action undertaken by the 'have-nots' against the 'haves' whereby the have-nots, be they state or sub-state actors, seek to generate profound effects – at all levels of warfare (however defined), from the tactical to the strategic – by employing their own specific relative advantages against the vulnerabilities of much stronger opponents".

The attack was the result of the refusal of Saddam Hussein, the head of the Iraqi branch of the Baʿath Party, to leave the country. It began when the US aircraft dropped several precision guided bombs at a building that was believed to be

the meeting place for the president with his senior staff and it was followed by a series of air strikes directed to other buildings of high importance, government and military installations. The greatest resistance of the US troops was located in southern Iraq and it was slowly advancing northward, facing resistance mostly from irregular groups of Baʿath Party supporters, known as Saddam's Fedayeen. Despite the fact that one of the most powerful units of Iraq, the Republican Guard, was send to protect the capital of Bagdad, the US troops managed to take control over the Baghdad's international airport on April 4 and on 9 April the resistance in Bagdad collapsed and the rival forces took over the city. Also, in the same day the British forces took over Barsa after several days of conflict. To take control of the northern cities of Kirkuk and Mosul, the US troops had joined forces with Kurdish peshmerga fighters – Iraqi Kurdish fighting forces, which has to begin one decade after the fight against Islamic State (Hawramy, 2019) – and on April 13 Saddam's hometown of Tikrīt fell after one last futile attempt to retaliate. Even though there were still some attempts to repost form isolated groups, the US president, George W. Bush, announced on May 1 the end of the major warfare from Iraq. Iraqi leaders had chosen to hide but after intense search operations of US troops they were found and punished for all of their crimes, most of them that had been find alive were executed, including Saddam Hussein that was captured on December 13, 2003 and sentenced to death on December 30, 2006.

The post-invasion phase marked the beginning of a long period dominated by violence, chaos and death for the troops engaged in the fight, but especially for the civilian population that suffered the most from this conflict. The collapse of the Baʿathist regime started a wave of violence and looting that aimed the public institutions and everything that was related to government and to former ruling clique. One of the most difficult tasks of the occupying forces was to maintain the law and order and to keep the angry population under control. Huge losses and fear caused the population to respond with violence and hostility to the invaders who destroyed their homes and killed members of their families. The conflict got worse on a larger scale and soon developed into a civil war, even though the Bush administration chooses to turn a blind eye and to name this warfare "sectarian violence." The number of victims was low in the first phase of warfare, with about 150 deaths. Until the presidential elections from 2004 the number of deaths of US troops reached 1000 and at the beginning of the year 2007 the number of victims reached the number of 3000. Also, the number of the victims from the troops of coalition countries it is uncertain but still reaches a few hundred. A report from 2006 has showed that the number of Iraqi victims is over 650 000, but other estimations approximated the deaths from the same period of time around 50 000. However, in both cases the number of Iraqis who died during the conflict, even thought is uncertain, is much higher than the number of invaders deaths. There was an enormous weight on the shoulders of the Iraqi citizens caused by not only constant fear, chaos and the pain of finding their homes destroyed and their loved ones dead after desperate searches, but also by the threatening of starvation and diseases.

3. WHY DID THE WAR STARTED IN THE FIRST PLACE? WHAT WERE THE REASONS?

After all the things stated above the first questions that comes into our minds is "why?". Why did US invaded Iraq in the first place and what were the reasons behind all of this? To this day, there is a variety of opinions and a multitude of reasons, more or less sustained by the officials of Bush administration, most likely the reason being a combination of all of the reasons stated. To be taken into consideration the fact that the reasons that follow to be stated do not explain the acts that were committed in Iraq during the warfare, acts of cruelty that were committed by the both sides during the conflict.

The first reason that was enounced was the implication of Iraq into terrorism. The al-Qaeda attacks from 9/11 on New York, Washington, and Pennsylvania have made US involvement in the global War on Terror inevitable. The President George W. Bush defined the term "War on Terror" in the State of the Union from 2002, declaring that US will fight against all the states that support terrorism in any way: "States like these, and their terrorist allies, constitute an axis of evil, aiming to threaten the peace of the world" (Bush, 2002, apud Wittmann, 2017:22). He also mentioned Iraq in his speech as an obvious sponsor of terrorism, an enemy for peace and a target for the attacks against terrorism: "Iraq continues to flaunt its hostility toward America and to support terror" (Bush, 2002). Despite all the accusations concerning the links between Saddam and al-Qaeda, there have been several reports demonstrating the contrary that he also saw the group as an enemy, not an ally.

Even so, Saddam had links to other terrorist groups which he supported and hosted on Iraq, helped groups who were in conflict with Turkey, like the Kurdistan Workers' Party, and also several Palestinian splinter groups that oppose peace with Israel.

The second reason was the suspicion that Iraq was possessing weapons of mass destruction and the ability to manufacture them. The 9/11 attacks demonstrated the vulnerability of the US to large-scale terrorist attacks and the ability of these organizations to launch attacks aimed at killing as many people as possible, civilians or not, without regard to the rules of war accepted by most national states. Even so, after the invasion it was demonstrated the fact that the weapons of mass destruction didn't existed in the first place, but that does not necessarily mean that their latent existence did not justify the invasion. Later on, Bush administration declared that is "better safe than sorry", claiming Saddam guilty of failing to comply with UN inspections as well as the nature of Iraq's WMD programme arguing that this would be a valid reason for US military action.

Another reason would be the fact that Iraq was a visible enemy and this war was a way to show the power and dominance of the US army. After the defeat of the Taliban and al-Qaeda in Afghanistan, Iraq represented a better area to show to the entire world the supremacy of the US army. The fact that Saddam was known internationally as a brutal dictator made him the perfect target because removing him would not meet very much international resistance. There are also other theories that sustain the fact that this war was caused also by some old conflicts between US and Iraq or the theory that sustain the fact that President George W. Bush wanted to finish what his father started in the first Gulf War. Anyway, the reasons why this war happened must be understood in the greater context. The US sustained that their goal was to bring democracy into a subjugated country by toppling Saddam Hussein and removing the threats of terrorism and WMD. This desire to spread democracy was a part of US policy for centuries and so they wanted to transform Iraq into an example to the other states, states that could no longer manipulate and oppress their citizens. Also, the fact that Iraq is the country which has the world's second largest oil reserves cannot be overlooked, even though Bush administration denied this accusation. The opinions regarding the importance of oil into this war are divided, even so, this should be considered at least a factor if we consider all the benefits that the US has had because of it.

To sum up everything that has been stated so far, the US invasion of Iraq in 2003 was the product of many reasons and circumstances, the truth being placed somewhere between the official reasons and the unofficial ones.

4. WHAT WERE THE CONSEQUENCES OF THE WAR AND HOW WAS THE POPULATION AFFECTED?

We already know about the large number of deaths that have had place in Iraq during the invasion and mostly after, but the casualties and the damages that aroused during that period are far more shocking, the circumstances making us wonder only if this tragedy was worth it or if it could have been avoided. Even though the fight was between the leaders of the countries that participated in the war, they being the ones that declared war and decided to take all the risks that were needed to achieve their goals, the ones that suffered the most were the civilians, they were dragged into this conflict against their will, were forced to face unimaginable losses and to adapt to a hostile environment in order to survive.

The exact number of deaths is unknown, several studies approximating between 461 000 and 655 000 with over 90% of them being violent deaths, but it is most likely that the number is even higher considering the fact that many deaths were most likely unreported or unrecorded by officials and media. Besides the violent deaths caused by armed attacks, bombs and the interference of civilians into the fight, there were many other factors that increased the number of victims. One factor is the starvation as a result of the increasingly difficult living conditions that lead to acute malnutrition among the population and especially among children, a recent study showing that more than a quarter don't have enough to eat, the percentage of starvation rising from 4%, recorded immediate after US invasion, to 10%. " Oil-for-Food (OFF)" was a programme established by US in 1995 that allowed Iraq to sell oil on the world market in exchange for food, medicine, and other humanitarian needs for ordinary Iraqi citizens, but after the invasion from 2003 the programme was dissolved and so 60% of the population that depended completely on the food ration for their survival fell into starvation. Another factor were the epidemics that broke out immediately after the invasion as a result of the

damage to the electrical grid which affected the potable water networks and the sanitary field. Iraq is a country where water is very valuable and very hard to find and without any help the potable water is almost impossible to provide.

The health sector was also affected by the lack of refrigeration renders available that lead to the increase of consumption of medical supplies and drugs which were already few. Not only the number of deaths was high, but also the number people injured, and the fact that half of the Iraqi doctors left the country between 2003 and 2006 wasn't good news, especially after the cholera outbreak in the northern Iraq as a result of poor water quality. Following the invasion, civilians not only faced a variety of wounds and epidemics whose treatment the majority of the population could not afford, they continued to be victims of psychological pressures that affected the mental health of the population. Studies have shown that one-third of Iraq's population suffers from psychological disorders caused by stress resulting from survival in an environment driven by fear, torture, violence and death. Most of them were pushed to the limit of despair after years of conflict, being mentally exhausted from the traumatic experiences they had and the lack of mental health staff to help them led to an increased number of suicides.

Human rights have been the subject of concerns and controversies since the 2003 invasion, all the sides of conflict being accused, insurgents, the U.S.-led coalition forces and the Iraqi government. There are investigations conducted by all the sides of conflict referring to several allegations of violations of international and internal standards of conduct by their own forces and contractors. The Government of Iraq was accused for using Iraqi security forces to carry out missions consisting of torturing prisoners and also the Iraqi police from the Interior Ministry for forming Death Squads that were used to commit numerous massacres and tortures of Sunni Arabs.

The coalition forces and private contractors were accused of many crimes like the deaths of civilians as a result of bombing and missile strikes without taking into consideration the casualties. They were also accused of torture, rape, murder who had as victims not only adults but also children, a known case being the one of a 14-year-old girl, Abeer Qassim Hamza al-Janabi, that was raped by a group of US soldiers and murdered along her family after that. Another case is the one from Abu Ghraib prison where United States Army and Central Intelligence Agency personnel committed a series of crimes against the Iraqi prisoners, crimes like physical and sexual abuse, torture, rape, sodomy, and murder. The use of white phosphorus against civilian populations, many civilians, including women and children, dying of burns caused by the attacks with this weapon and also the use of depleted uranium rounds that caused deformities, cancers, and other serious health problems in areas where depleted uranium shells were used. There were also accusations of planting weapons on noncombatant Iraqis after killing them and many others kinds of torture like beatings, electrocution, mock executions, and sexual assault.

The accusations regarding the insurgent groups were just as many and just as horrible, including also mass murder and torture. They killed over 12000 Iraqis from 2005 to 2006 by bombings, ambushes and numerous suicide attacks the data showing that during the Iraq War the percent of civilians deaths resulted from execution after abduction or capture was 33%. Attacks on diplomats and diplomatic facilities like bombing the UN headquarters in Bagdad in 2003 and also beheading several diplomats, bombing of the al-Askari Mosque in 2006 and killing several contractors and other non-military personnel. They were also accused of torture and killing of members of the New Iraqi Army, assassination of civilians associated with the Coalition Provisional Authority, or killing other foreign civilians in the most cruel way, using grenades and small arms fire, their corpses being burned and dragged through the streets.

Considering all the above, there would be normal to be some consequences regarding the population of a country that has been destroyed by war, one of them being the Iraq Refugee Crisis. The Iraqi refugee crisis was the result of years of conflict in which the population suffered countless losses that radically changed their lives, millions of families being forced to displace within the country or to flee to neighboring countries, leaving behind their homes and the lives they lived before. The number of Iraqis displaced within the country is about 3 million and over 260 000 were forced to go in other countries, all of this after 2014, in some regions like Kurdistan refugees representing a quarter of the population. Some studies showed that about 40% of Iraq's middle class fled, most of them with no desire to return to the country where they faced so much persecution. Militias, Iraqi insurgents and criminals were targeting all kind of people, from simple bakers, to teachers and doctors, the number of teachers murdered in 2006

being about 331, and that of the doctors being over 2 000 after the US invasion.

The ones that remained inside the country live in informal settlements or refugee camps, this being the home of over 280 000 other refugees from neighboring countries, most of them coming from Syria in search of a less hostile environment than their home country. Refugee camps aim to protect and assist people who have been forced to flee their homes due to conflicts or other causes that have made it impossible for people to live a decent life in the affected area. Although these facilities are not permanent, they are a blessing for all those who need food, shelter or medical treatment during emergencies. But not all refugees live in such camps, in 2014 it was established that 60% of refugees live in cities, the highest rate of refugees in the urban area being found in Turkey. Even though some of the internally displaced people have returned to their homes in 2018, their safety continues to be threatened, with access to essential needs often being a real challenge. Half of the people displaced in Iraq are children, they are part of a generation that has been forced to grow up in unimaginable conditions, they were exiled, separated from their families, abused, forced to marry at an early age or enroll in armed groups, suffering from several traumas after they have been exploited and exposed to a such a large amount of stress. In 2018 over 2.1 million children weren't able to access essential services and over 2.6 million were not attending school. Winter is another enemy that refugees face, with temperatures in the area often drop below freezing, leaving families that live in makeshift shelters or other shelters that do not benefit from any source of heat prey to diseases that may result from long exposure to cold, diseases that along with lack of medical care lead to death. The basic services we are used to and whose presence in our daily lives is something natural, represent priorities in Iraq where they see the poverty and the hard to survive conditions as something normal. The lack of basic services, destroyed infrastructure and lack of economic opportunities are those who stand in the way of families trying to build a better life, 2.3 million people suffering from lack of food, water, sanitation and shelter even at the moment.

5. CONCLUSION

In conclusion, the Iraq War was one of the most cruel war of the century that affected the lives of millions of people, military or civilians, a war that made us realize that this type of conflict should always be avoided because the lives of innocent people are much more important than any political conflict. The history has taught us that there isn't such a thing as "winners" or "losers" in a war, everybody loses, the only difference is the amount of loss. We should use the sacrifices of our ancestors as an example, how many wars has humanity to face to finally understand that wars are not only tragic, but also pointless. How many innocent lives should be ended till we will realize that this is not the answer and that we should use the resources that we dispose of in a more efficient way, a way that is not ruled by violence and chaos. Maybe some people do not agree with my opinion and I totally respect that, but let's make a little exercise of imagination and by that I mean to imagine yourself in the position of a civilian from a country at war: you lost your home, your family and your purpose in life. What would be your opinion then?

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INTELLIGENCE PREPARATION OF THE BATTLEFIELD INTEGRATION IN THE PLANNING PROCESS OF ANTI-AIRCRAFT ARTILLERY COMBAT ACTIONS

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Abstract: *In this paper I have presented the role of intelligence preparation of the battlefield in the planning process the use of anti-aircraft artillery. The purpose of anti-air artillery is to destroy the enemy target (the projectile to meet the target). To achieve this accurately requires a range of information, such as knowledge of the terrain, weather conditions, the system used and the target data. All of this is done using the IPB system.*
I will say how the IPB works, how important it is in the process of planning anti-air artillery structures and what its results are.

Key: *anti-aircraft, artillery, intelligence, conditions, defense.*

1. INTRODUCTION

Law No 18 of 4 March 1992 for the ratification of the Treaty on conventional armed forces in Europe introduces that: "The term artillery means large-scale systems capable of hitting land-based objectives, primarily by the execution of indirect fire. Such artillery systems provide basic indirect fire support for the combined weapons formations. High-caliber artillery systems are cannons, howitzers, artillery parts combining tunnel and howitzer characteristics, throwers and multiple launch systems reactive projectiles with a caliber of 100 mm and greater".

Artillery is a powerful weapon that can perform various tasks in any weather, night or day to support long-distance military operations. The anti-aircraft firing is aimed at satisfying the projectile and the target (destroying it). This means that air defense complexes are placed in the tactical field, that is shooting channels so that air targets can be engaged at the maximum damage distance. The plan to fight an air enemy is a very important activity because the planner must understand how the enemy's aviation is used and how the anti-aircraft artillery units and sub-units are allocated, arranged, and combated. In order to perform the mission, the air defense artillery unit should conduct airspace research, discovery, identification and destruction of air enemies within the maximum possible technical range of the equipment. The design of air defense should be based on a detailed analysis of the situation, so as to conduct useful training on the battlefield in each course of action.

The overall concept of "Intelligence Preparation of the Battlespace (battlefield)" should be carried out in all relevant military operations. A group of authors from military academia said that IPB represents a detailed assessment of the situation and supports the decision-making process of commanders and their major nations, in which IPB is defined as a dynamic, continuous process of threat and environmental analysis. In full agreement with the current Romanian and NATO publications, the author of an expert book in the field of military information systems believes: using the area's information preparation process combat commanders can effectively utilize and maximize the combat capabilities of key points. This is why IPB plays an extremely important role in planning the use of air defense artillery.

2. IMPORTANCE OF IPB FOR AIR DEFENSE ARTILLERY

The information-rich combat training process allows the battery commander to outline the

possible routes of air and ground enemy operations and their impact on future battery operations.

In the process of providing rich information for combat, the commander of the air defense artillery company must disclose the following points:

a) airspace research opportunities
b) the technical-tactical characteristics of the likely means of attack of the enemy
c) the likely approach of the air enemy to the objective covered anti-air
d) the senior echelon's vision of the performance of the mission.

The combat information training for air defense forces includes information on ground operations, but mainly develops issues related to the actions of air enemies and the possibility of anti-air systems to deal with them in order to support their operations.

The information preparation of the fight includes the following steps:

a) define the field of a fight;

When assessing the impact of terrain on operations, consider : the most suitable area for artillery deployment (the availability of ammunition transport, terrain elimination and masking effect), potential places for threats and friendly targets to purchase assets, the effect of terrain on the effectiveness of ammunition, such as soft sand, dense trees or shallow water bedrock, suitable for transporting special purpose ammunition, such as artillery transport area landmines.

b) description of the factors influencing the combat space - field analysis and weather conditions (when conducting weather analysis, consider the impact on the target acquisition system and target activity and ammunition accuracy);
c) air threat assessment;

The air threat assessment is described by:

- improve the standard threat model to focus on HVT's
- use techniques related to rear combat to assess the threat to artillery in the rear area unit
- assess the threat's ability to fight back:

- identify the target acquisition assets; describe their normal deployment patterns and strategy;
- recognize command, control, communication and intelligence (C3 I) system Move the target acquisition information to the decision maker or weapon system;
- describe the capabilities of each target acquisition system with accuracy and accuracy timeliness;
- describe the ability of the threat to find and destroy the target's acquisition of assets.

d) determination of the likely course of actions of the enemy;

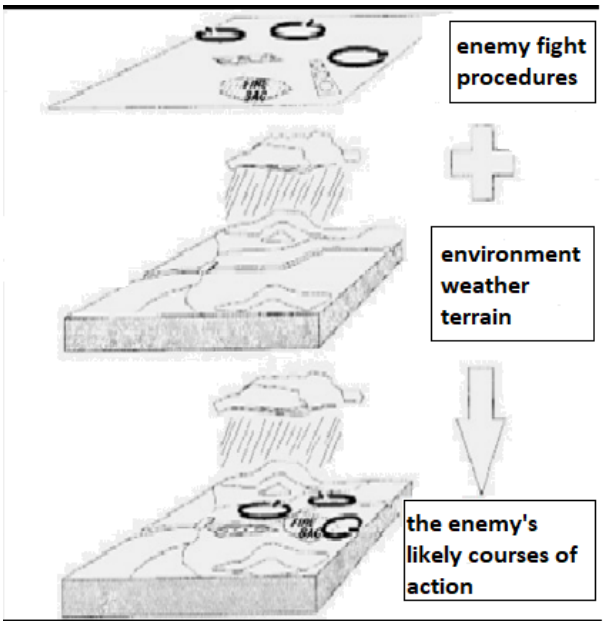

Fig.1 Graphical representation of overlapping plans to find out the enemy's actions [3]

The informative preparation of the anti-air field of fight requires a specific approach to the enemy's actions by air. The particularity of this kind of action in the air is that it is possible for the aircraft to operate at low altitudes and very low altitudes, which means using terrain contours to achieve the approach path to the target, drawing positions from fixed points, or organizing helicopter amphibians. Defining the air environment for the operations of ground forces involves evaluating the types of aircraft: airplane and helicopters, ground air defense systems, unmanned aircraft systems, cruise missiles, and some ballistic or missile systems. When assessing the basis of the possible actions of the enemy, many elements were taken, such as air defense methods, plane survey lines, the existence of linear elements such as roads, railways and rivers. These elements can be high-speed low-altitude navigation, cover-up ground observation, or radar Discover the possibility of direct entry into the target area and obstacles to flying in the wild. It should be pointed out that based on the thematic maps conducted during the preparation period with rich information on the battlefield, the possible route of military confrontation and the probability of success can be predicted.

The final result of the air defense battlefield information training is to obtain the air threat and

aggression mode (NAI-named Area of interest) for the purpose of the air defense device according to the specific conditions of the operation being performed. Based on these plans, the air defense anti-mail model, the tactical moment of air defense concentration (TAI - Target Area of Interest), was developed. When planning and conducting joint operations, information about facilities in the operation area has grown exponentially due to the number of users and participants involved in resolving crises or military conflicts.

3. CONCLUSIONS

The deployment of the planning process for anti-air artillery units is foreseen for the 5-step operations planning process:
- orientation on anti-aircraft defense;
- design of anti-aircraft defense;
- develop the anti-air defense plan in the form of the anti-air defense annex to large interarms units/units or the operations plan at the level anti-air defense units;
- review the plan.

At the basis of the concept of anti-aircraft defense is the Intelligence preparation of the Battlespace (IPB).

This is a systematic, continuous process used to analyze threats and environments in specific geographic areas. A systematic process of analyzing mission variables of enemy, terrain, weather and civilian factors in a target area to determine its impact on combat.

Looking at the information presented above, it is very important that the commander of an artillery battery has the information about the field, the weather and the enemy to be successful in the fight. Intelligence preparation of the Battlespace plays an extremely important role in achieving its actions weapons.

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USE OF DRONES IN CONTEMPORARY AIR OPERATIONS

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Abstract: *Contemporary air operations are based on the use of remotely controlled aircraft, such as UAVs (Unmaned Aerial Vehicle), UCAVs (Unmaned Combat Aerial Vehicle) or drones, as these systems eliminate the risk of personnel los, and their efficiency in carrying out the missions entrusted to them is very high. The use of modern drones began in 1982, when Israel used UAVs to destroy Syria's fleet, wishing that two years later, in 1984, the United States would conclude tens of millions of dollars in contracts for drones. Currently, over 100 countries use UAVs for military purposes, and over 17 use UCAVs for combat operation, the main manufacturers being the USA and Israel.*

Keywords*: air operations, UAVs, drones.*

1. INTRODUCTION

Air operations have evolved a lot over time, air threats and attacks have new features, technology being the main factor that supported this evolution. The advent of UAVs and drones has significantly changed the way operations are carried out, as they are remotely controlled and the resources consumed by them are very limited.

The way an air operation is carried out today is very different from the way such an operation was approached 50 years ago, because new systems of combat, surveillance and aerial research have emerged. These aircraft are intended to detect, identify, locate and assess losses, but can also be used to combat targets.

These UAVs are mainly used for counter-terrorism operations and in war zones where the enemy does not have enough firepower. These combat systems are not yet able to withstand air-to-air combat or anti-aircraft defenses, but it is speculated that in the future they will have a more important place in combat.

The first assassination mission using an American UAV took place in 2001 in Kandahar, and in the last 20 years, the US has stepped up drone attacks on targets in other countries, such as Pakistan, Afghanistan, Yemen and Somalia, causing a very large number of victims.

Fig.1 Chinese UAV model

2. AIR OPERATIONS

A military operation is an action that is planned and coordinated by a state in response to an ongoing situation, an action that is designed by a military plan in order to resolve the situation in its favor.

Air operations represent the entirety of combat actions that take place in a certain period of time in a delimited airspace, according to a well-defined plan that aims to meet objectives, such as strategic, tactical and operational ones.

The air operation is carried out by a group of air forces, independently or in cooperation with the other armed forces of the country. Air operations are conducted and executed in order to conquer, to maintain the desired level of control over airspace at certain times and in certain places, thus allowing

their own forces to exploit the favorable situation created.

The need to control and dominate the environment above the area where military actions take place, requires the Air Force, especially aviation and anti-aircraft missile structures, to be permanently present. These air defenses have demonstrated their ability to carry out missions through their flexibility and the fact that they can adapt very quickly to different situations.

A military operation has three stages:

- Preparatory stage
- Deployment stage
- Completion stage

The preparatory stage consists in preparing the units and moving them to the area of action.

The development stage represents the operation itself.

The completion stage includes all the measures taken after the previous stage, such as staff evaluation and their status.

All air operations performed in the Romanian airspace are planned and coordinated by the Air Operations Center (AOC), an institution that provides air surveillance, air traffic management and command-control of air operations and missions. This center is under national command, but also under NATO command, along with Romania's accession from 2004 to this organization.

The technique used to perform air operations has a very important role as it can determine the fate of the actions. For a higher success rate of operations, this technique must be updated, prepared for any situation, whether we are talking about fighter jets, radars or anti-aircraft missile systems.

The characteristics of air operations:

- The variety of actions. Actions that take place in the airspace can be very different, which determines a permanent threat for the parties that are in a conflict.
- The mobility. This ability has a strong impact on the execution of air operations.
- Continuity and reactivity. They are characterized by the conduct of combat actions throught the duration of the air operation and the rapid reaction in unpredictable situations.
- Coordination. Planning and coordinating in time and space of the actions of the Air Force.
- Finality. The combat actions aim at fulfilling the strategic, tactical and operative objectives
- Integrated use. Achieving a goal requires the use of different aerial means.
- The intensity of the fight. The number of actions performed by own forces in a certain time interval determines the intensity of the fight.
- The psychological effect. Aerial strikes can have a psychological effect, both on our own forces and on the forces of the enemy.
- Depth. It is determined by the wide range of the Air Force systems

An operation carried out by the Air Forces would be the Air Police mission that aims to preserve the integrity of the national airspace and to protect vital targets against the possibility of an attack. This mission is performed by fighter jets, but also by anti-aircraft missile systems. An example of such a mission would be the interception of Russian planes that enter the Romanian airspace quite often by our fighter planes, either MiG-21 Lancer or F-16.

Fig.2 Romanian F-16

A classification of the operations would be according to their purpose, following

1. Offensive
2. Defensive
3. Late
4. Supportive in combat

In the progress of these types of operations, force groups are increasingly using information obtained from aerial devices such as drones or UAVs, and they are increasingly actively involving these aircraft in combat missions. This is due to the efficiency of these devices and their very simple and safe use, as they can be controlled from a greater distance.

3. UAVs

The airplanes without human pilot (UAVs) are aerial devices used for watching over and obtaining dates about targets for the purpose of identifying, revealing and localizing. On the other side, UCAVs (Unmaned Combat Aerial Vechicle) are mostly used for destroying targets.

Those airplanes don't have human pilot at bord because they are either managed from distance, either by a digital automat pilot, the elipse of neccesar equipment of a pilot having it as a result lighter weight and reduced dimension.

Military drones are used in recognizing missions, spying or executing fighting missions. Depending on the type of mission drones execute, those are equiped with weapons and recognizing systems.

By the functioning mode, UAVs clasify in six categories:

1. Combat – The aerial vehicles which execute attack in high risk missions;
2. Reconnaissence – The aerial vehicles that are providing informations about battlefield;
3. Target and decoy – The aerial vehicles which stimulates an enemy aircraft or missile;
4. Civil UAVs – Used for aerial photography, agriculture, data collecting;
5. Logistic – Equipment or merchandise transport
6. Research and development – they have the objective to improve UAVs technology

Those devices are hard to detect and combat, fact due to the reduced dimensions and small thermal and radiolocation fingerprints, characteristics which ensure a bigger surviving possibility.

A drone attack is an attack executed by one or more aerial fight vehicles whithout pilot (UCAVs). Until now, only a few states have produced functional fight vehicles.

These attacks could be executed by UCAVs that are dropping bombs, launching rockets or hiting aims. The majority of drone attacks have been done by USA army.

Fight drones are very efficient and fast, having a very high success rate.We can provide few UCAV examples by mentioning: CASG CH-5, MQ-1 Predator, TAI Anka-S.

UAVs are aerial platforms by reduced dimensions that serve in research and surveillance. We can provide few UAVs examples by mentioning: Boeing Phantom Ray, Desert Hawk III, IAI Bird-Eye.

Drones have a large history, as they promoted a serious number of victims, especially in the Middle East: Afganistan, Pakistan, Yemen and Somalia, among civils being some Al-Qaeda leaders. This victims are from drone attacks made by the US government after the 9/11 events.

At NATO level, drone missions have the role of monitoring and investigating airspace, but the aim is to develop these aircraft in order to be able to carry out air-to-air combat, as it is hoped that in future, air combat will be drone.

In Romania, the first flight missions of the MQ-9 Reaper drone are being performed, a drone that arrived in our country in January, 2021, and the missions performed in the Romanian airspace by these devices started after February 1st. The aircraft are part of the 25th Attack Group of the US Air Force and are located at Câmpia Turzii Air Base, until the works carried out at Miroslawiec Base in Poland are completed.

This unmanned aerial platform is specially designed for surveillance and reconnaissance missions, but also for missions to identify and destroy targets. The purpose of these missions is to intensify reconnaissance and intelligence gathering operations in the Black Sea and Eastern Europe.

Fig.3 MQ-9 Reaper drone from Câmpia Turzii

An example of an operation carried out by a drone, namely an MQ-9 Reaper drone belonging to the US Air Force, would be the assassination mission of January 3, 2020, of Iranian Major General Qassem Soleimani, he was the leader of the Quds Forces and performs clandestine missions, engaging in foreign conflicts, such as those in Iraq and Syria.

His diplomatic influence is supposed to have been much greater than that of the Iranian foreign minister, and it has been speculated that he would be aiming for a very high political office.

The assassination attempt took place near Baghdad International Airport, the drone launching several Hellfire missiles that killed 10 people, including a US-designated terrorist.

The drone that struck the convoy, according to Iraqi officials, was launched from the Ai al-Assad military base and flew over Baghdad for 20 hours, waiting for the landing of the plane in which Soleimani was, and after the assassination, it returned directly to the base from where it was launched.

Fig. 4 Qassem Soleimani's car after the attack

Another example of a drone operation would be the attack on oil facilities in Saudi Arabia, at Abqaiq and Khurais. The attack took place on September 14, 2019 and caused very large fires that were extinguished many hours later.

The attack was appropriated by the Houthi movement in Yemen as response to Saudi Arabia's involvement in the Yemeni Civil War.

By this incident we mean that drones are not only used for assassination or investigation missions, they can also attack a fixed target, a strategic point. These two facilities were closed for repair, and Saudi Arabia's oil production was halved, accounting for about 5% of global oil production.

Fig. 5 The two oil stations from Saudi Arabia after the attack, satellite image.

4. CONCLUSIONS & ACKNOLEDGMENT

Air operations have a very important role to play in protecting a country's vital targets against a possible attack, which demonstrates the need for constant surveillance of airspace, either by radar or drones.

From my point of view, air operations have a very good evolution, because they have developed with technology, which is noticeable in the use of drones.

In contemporary air operations the use of UAVs and UCAVs has a very important role because they can perform missions and operations even in high risk areas, they can be controlled from anywhere in the world, thus eliminating the risk of endangering the life of a pilot of his own forces.

The greatest effectiveness of drones can be seen in counterterrorism operations, their use in these types of missions being strictly necessary to eliminate the exposure of personnel to danger.

The cost of an operation performed with these aircraft is relatively low compared to a mission performed with research or combat aircraft, which supports their use in as many missions as possible.

Another aspect that demonstrates the importance of using drones in contemporary air operations is that they offer very high control of airspace, can be used for a very large number of hours without a break, and the small size due to lack of pilot equipment makes them difficult to detect, which makes it possible to carry out espionage and air reconnaissance missions in the enemy's airspace.

In my opinion, these unmanned aerial platforms will have a constant evolution, and in the future they will be able to perform air-to-air battles, the take-off of a human-piloted aircraft from the ground being only optional.

Nowadays, information is the most powerful weapon, and these drone operations offer the possibility to have it, which demonstrates the need for their use in contemporary air operations.

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FUEL CELL AS A POWER SOURCE FOR UNMANNED GROUND VEHICLE

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Abstract: *This work is aimed to the well-known technology named fuel cells as an energy source for the unmanned military vehicles. The focus of the work was to demonstrate basic principles of the fuel cell and simulate them in MATLAB – Simulink environment. Today we are facing increased effort into replacing fossil fuel source of energy in society also in military applications. Fuel cells have possible applications, because they have many advantages like high efficiency, relatively quiet operation and they are green source of energy. In this paper mathematical model of Proton exchange membrane PEMFC is described. The aim of this work is to simulate possible solution for propulsion of small unmanned ground vehicle (UGV). UGVs are widely used in military sector, because they reduce risk of injury to human personnel. In the work we use general model of PEMFC with DC voltage output 45. The performance of the cell corresponds with current requirements for the propulsion of a small unmanned vehicle.*

Keywords: *Fuel cell, PEMFC, voltage, unmanned, UGV*

1. INTRODUCTION

We can easily describe fuel cell as a electrochemical device, which change directly chemical energy of fuel into electrical energy and by-products. In other words, energy of hydrogen and oxygen is throughout the process in fuel cell transferred to the electrical energy, heat and water. This process is based on reverse electrolysis of water. [1-2]

Fuel cell are very perspective source of energy for military applications. It can be used as a mobile or stationary source of energy. From the review [3] it is obvious, that NATO nations, has researched the applications of fuel cells. They are putting effort to use fuel cell in military land vehicles, unmanned ground vehicles (UGVs), drones, submarines etc. They are also used as a static power sources in some military bases and as a portable, lightweight and wearable power systems, which provide electricity (for GPS, radios, computer, equipment) to soldiers in the field. Fuel cells are promising technology as a APU (Auxiliary power unit) for military land vehicles, which can be run when main engine is off.

Compared to batteries, fuel cells have many outstanding advantages like high energy density, high energy efficiency and no recharge time. Beside the traditional combustion engine, fuel cells are silent, which is very desirable for some military purposes. [3-4]

This work is divided in two parts. First part is about basic description of fuel cell with mathematical basics. Second part is mathematical model PEMFC simulated in MATLAB – Simulink

2. FUEL CELL

2.1 Basic principles. The core of fuel cell are two electrodes (cathode and anode), electrolyte, fuel and oxidizer. Electrolyte must be ion conductive. PEM FC is working on simple principle. Anode is supplied with pure hydrogen or other hydrocarbons and cathode is supplied with pure oxygen or oxygen from the air. On the interface of anode and electrolyte, the electrons are released and hydrogen cations are allowed to pass through electrolyte as follows:

$$H_2 \rightarrow 2H^+ + 2e^-$$

The electrons are flow through external load between cathode and anode. At the cathode cations are combined with the oxygen and electrons and produce water as follows:

$$2H^+ + 1/2\,O_2 + 2e^- \rightarrow H_2O$$

Catalyst in form of platinum or palladium is used to speed up chemical reactions. The Fig. 1 shows basic operation of PEMFC. [5]

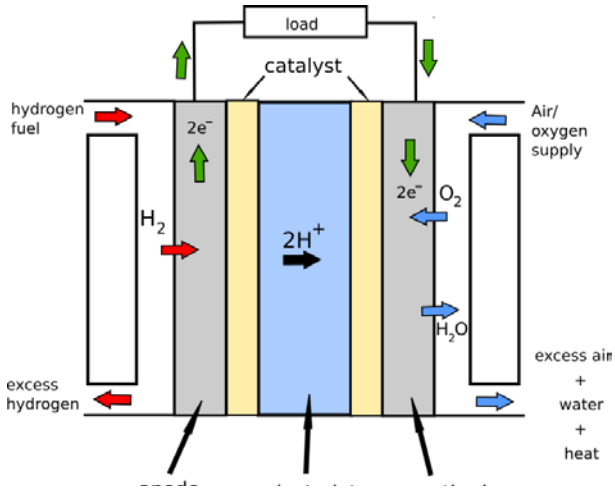

Fig.1 PEM FC scheme

2.2 Fuel cell types. There are different types of fuel cells. These types vary mostly by the electrolyte used, also differ in the electrode and fuel used. Electrolyte affects the operating temperature of the fuel cells. We can divide them in two groups: [6]

a) Low temperature (T < 250°C)

They have fast start up and lower failure rate.

- AFC - Alkaline fuel cells
- PEMFC - Proton exchange membrane fuel cells
- DMFC – Direct methanol fuel cells
- PAFC – Phosphoric acid fuel cells

b) High temperature (T > 600°C)

They have higher efficiency, slower start up and they are more difficult to maintain

- MCFC – Molten carbonate fuel cells
- SOFC – Solid oxide fuel cells

2.3 PEMFC. Today they are most popular and used fuel cell. They have immediate response to change in required power. Mostly pure hydrogen is used as a fuel. Pure hydrogen can be stored in pressure vessels, in liquid phase and as a form of hydride, which is the most promising technology. The main parts of PEMF are solid polymer electrolyte membrane between two porous carbon electrodes with platinum catalyst. All these parts are placed between bipolar or flow field plates. These fuel cells are typical with their proton membrane made form polytetrafluorethylene also known as a Teflon.

The electrolyte is non-corrosive and provide good protection form mixing gases. PEMFC have high energy density and compact dimensions. They have also some disadvantages. They are sensitive to carbon monoxide CO (max 50 ppm), sulphur and ammonia. Electrolyte have to be well-hydrated, what complicate the construction. [6]

3. MATHEMATICAL FORMULATION OF PEMFC

3.1 Basic equations. Mathematical formulation is for the purpose of modelling very important. In this section, we take a look into chemical and energetic principles of PEMFC. Chemical energy in fuel at input are changed into electric energy, heat and water at the output. Reversible cell voltage we can express as:

$$E_{rev} = -\frac{\Delta \bar{g}_f}{2 \cdot F}$$

where E_{rev} [V] is reversible cell voltage (without losses) $\Delta \bar{g}_f$ [kj.mol^{-1}] is change in Gibbs free energy, F [C] is Faraday constant F = 96485 C [5].

Nernst voltage is the maximum voltage of fuel cell, where the changes by impact of concertation and pressure reactants and products is calculated: [6]

$$E_{Nerst} = \frac{-\Delta \bar{g}_f^{\,0}}{2 \cdot F} + \frac{R \cdot T}{2 \cdot F} \cdot \ln\left(P_{H_2} \cdot P_{O_2}^{\frac{1}{2}}\right)$$

where R is molar gas constant R=8,314 J.mol^{-1}.K^{-1}, T [K] is thermodynamic temperature of reaction, P_{H_2} [atm] is the partial pressure of hydrogen, P_{O_2}[atm] is the partial pressure of the oxygen.

The operating voltage of the fuel cell is lower than calculated value. Fuel cell are loaded with the voltage losses. Output operating cell voltage can be defined with maximum voltage of fuel cell and main three voltage losses: [7]

$$U_{fc} = E_{Nerst} - U_{act} - U_{ohm} - U_{con}$$

where U_{fc} [V] is output operating cell voltage, U_{act} [V] are activation losses, U_{ohm} [V] ohmic losses, U_{con} [V] concentration losses.

Activation losses are caused due to slow reaction on the electrode surface. For the purpose of modelling, they can be expressed as:

$$U_{act} = [\xi_1 + \xi_2 . T + \xi_3 . T . (C_{o2}) + \xi_4 \ln(I_{fc})]$$

where $\xi_{1\text{-}4}$ are parametric coefficient, I_{fc} [A] is operating current, C_{o2} [mol/cm] concentration of oxygen on the catalyst interface, which can be expressed:

$$C_{o2}=\frac{P_{o2}}{508\cdot 10^{6}\cdot e^{\left(\frac{-498}{T}\right)}}$$

Ohmic loses are caused due to ionic resistance in electrolyte and resistance of moving electrons. [8]

Ohmic losses can be expressed:

$$U_{ohm}=I_{č}\cdot\left(\frac{\rho_m\cdot l}{A}+R_c\right)$$

where ρ_m [Ω.cm] is specific resistivity of the membrane, l [cm] is thickness of the membrane, R_c [Ω] is resistance of moving electrons, A [cm^2] is active area of the cell. Nafion type membrane is usually used in PEMFC. Specific resistivity ρ_m for this type can be expressed as:

$$\rho_m=\frac{181{,}6\cdot\left[1+0{,}03\cdot\left(\frac{I_{č}}{A}\right)+0{,}062\cdot\left(\frac{T}{303}\right)^{2}\cdot\left(\frac{I_{č}}{A}\right)^{2{,}5}\right]}{\left[\lambda-0{,}634-3\cdot\left(\frac{I_{č}}{A}\right)\right]\cdot e^{\frac{4{,}18\cdot(T-303)}{T}}}$$

where λ expresses volume of water in membrane. Ideal number for λ is 14.

Concentration losses are caused due to fuel utilization. There is concentration drop in reactants on the surface of electrodes caused by mass transport. They can be expresses as: [7-8]

$$U_{kon}=-B\cdot\ln\left(1-\frac{i}{i_{max}}\right)$$

where B [V] is constant dependent on cell, i [$mA.cm^{-2}$] is current density, i_{max} [$mA.cm^{-2}$] is current density at maximum fuel supply.

The fuel cells can be connected in series. Fuel cell stack maximum voltage can be expressed as: [9]

$$U_{stack}=n\cdot U_{fc}$$

where n is the number of cells in the stack.

3.2 Equivalent electrical circuit. Important feature of the fuel cell modelling is charge double layer. This phenomenon arises, where two different materials are attached. The result is accumulation of electrons and cations, which presents electric charge double layer. It behaves like an electric capacitor. [9]. Equivalent electrical circuit of fuel cell is shown in Fig. 2

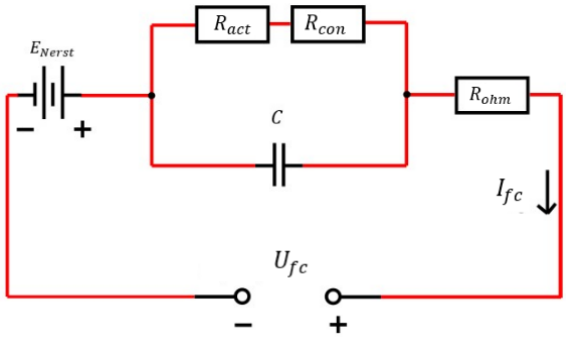

Fig.2 Fuel cell equivalent electrical circuit

R_{act}, R_{con}, R_{ohm} represent activation, concentration and internal resistance; C represent capacitance of the membrane.

3.3 Static model of PEMFC. Mathematical modelling and simulation are used as a tool for optimization of fuel cells. The goal is to improve design, reduce cost and improve overall effectivity. Static or simplified model of PEMFC represent fuel cell working at nominal conditions of temperature and pressure. Input parameters for this model are only maximum operating voltage of the cell and voltage at nominal and maximal operational points. [7,10]. The static model is shown in Fig. 3.

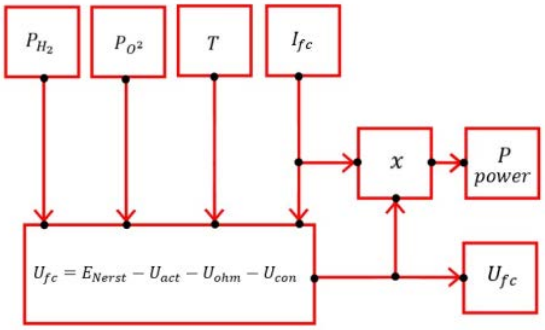

Fig.3 Static model of PEMFC

For simplification, static model has some assumption. The gasses are ideal and equally distributed; liquids are incompressible; the flow is laminar; pure hydrogen and oxygen are supplied; oxygen has 100% relative humidity; temperature of fuel and oxidizer are equal to fuel cell; parts of the cell are homogeneous and isotropic and every fuel cell in the stack has identical properties and power. [8,11]

3.4 Dynamic model. Complete dynamic characteristic of fuel cell is more complicated. Dynamic model represents fuel cells under transient conditions.

This model has integrated all possible dynamic equations like lumped fuel cell body dynamics, anode and cathode channel dynamics and also charge double layer capacitance (discussed in section 3.2). This enables us to capture the transient in cell voltage, gasses input and output flow rates, temperature of the cell in the event of a sudden change in a current load density. There are variables that enters into mathematical description. The most important are the values of fuel U_{fH_2} and oxidant U_{fO_2} utilization. They can be expresses as: [7, 9-10]

$$U_{fH_2} = \frac{n_{H_2}^{r}}{n_{H_2}^{in}} = \frac{6 \cdot 10^4 \cdot R \cdot T \cdot N \cdot I_{fc}}{z \cdot F \cdot P_{fuel} \cdot V_{lpm(fuel)} \cdot x\%}$$

$$U_{fO_2} = \frac{n_{O_2}^{r}}{n_{O_2}^{in}} = \frac{6 \cdot 10^4 \cdot R \cdot T \cdot N \cdot I_{fc}}{2 \cdot z \cdot F \cdot P_{air} \cdot V_{lpm(air)} \cdot y\%}$$

where N is the number of cells, P_{fuel} P_{air} [atm] absolute supply pressure fuel and air, $V_{lpm(fuel)}$ $V_{lpm(air)}$[$dm^3.min^{-1}$] is flow of fuel and air, x is the percentage hydrogen in fuel, y is percentage oxygen in air. Utilization affects the partial pressure of gasses. Partial pressure of hydrogen P_{H_2} and oxygen P_{O_2} are as follows:

$$P_{H_2} = \left(1 - U_{fH_2}\right) \cdot x\% \cdot P_{fuel}$$

$$P_{O_2} = \left(1 - U_{fO_2}\right) \cdot y\% \cdot P_{air}$$

4. SIMULATION UGV WITH PEMFC

The subject of interest is small electric UGV, which source of energy is PEMFC. Presented UGV is has 4 wheels with separate drive. The drive is combination of gearbox and electric motor. It is advantageous to use a planetary gear to mount the motor and the gearbox in one axis. One branch of the drive consists of wheel, shaft, planetary gearbox, DC electric motor and they are firmly mounted. Due to the small dimensions and light weight, steering of this UGV is made by different wheels speeds. In this paper, the simulation of one branch of the wheel drive is described. Basic scheme of concerning UGV is shown in Fig. 4.

4.1 Simulation properties. In this section, the MATLAB model of drive chain is described. The whole simulation consists of two parts: energetical and mechanical part. A generic model of fuel cell is used for purpose of PEMFC simulation. The fuel cell has output of 45 V DC voltage with total power 6 kW. The fuel cell properties are default.

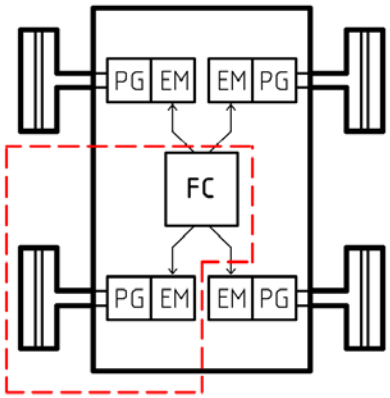

Fig.4 Scheme of UGV
PG represents Planetary Gearbox; EM represents Electric Motor and FC represents Fuel Cell Stack. Red dashed line delimits the simulation area.

Important feature of this model is implementation of DC/DC converter to the model. It is not appropriate to connect fuel cell to the appliance. In our case, the appliance is 24 V DC electric motor. Without DC/DC converter, fuel cell would have some operation problems at high current consumption. Essentially DC/DC converter works like voltage regulator or voltage transformer. In case of high current, the converter will be loaded instead of fuel cell. In other words, fuel cell is not affected by external devices. Using this element, the electric motor speed is regulated by change in voltage output. To connect output, form the converter with physical modelling of electric motor with gearbox, the Simscape Interface element is used.

To reduce speed from electric motor to the wheel planetary gearbox is used. This gearbox consists of two identic planetary gear sets. One planetary gear set consist of Sun, Carrier, Ring and Planet gears. Output from the electric motor is fed to the Sun (Central Gear) of the first gear set. Output from the first gear set is fed to the Sun of the second gear set. Output from the second gear set, from the Carrier is fed to the wheel. In both planetary gear sets, the Ring is braked.

The complete MATLAB model is shown below in Fig. 5.

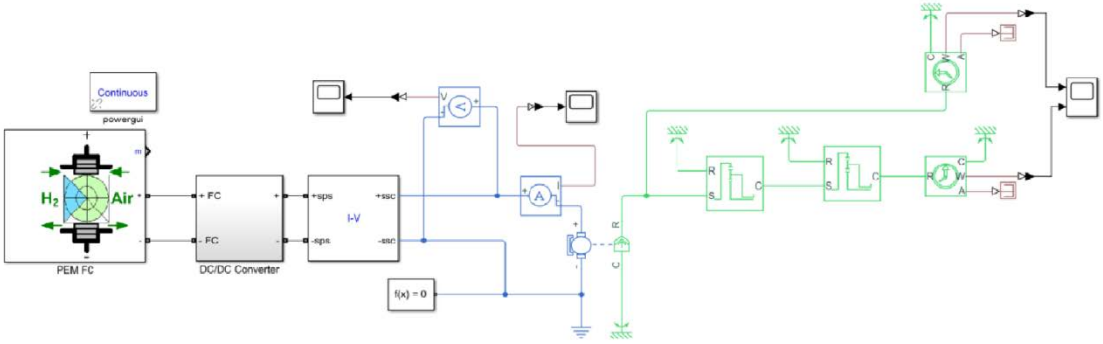

Fig.5 Complete model of drive chain

4.2 Simulation results. The outcome from the simulation are the four charts. The charts show us the dependence some relevant parameters on time. Total simulation time is 10 second. Important point of the simulation is the start of the simulation the time = 0 sec and the time = 5 sec. At the time = 5 sec, there is increase performance requirements from the 12V to 24V. It is clear, that first 5 second of simulation is required minimum power from the fuel cell and then is required maximum power from the fuel cell.

First chart represents the course of the voltage by which the electric motor is supplied. DC/DC converter regulates this value of the voltage. At the beginning of the simulation the voltage varies in wide range but for a little over a second the output voltage is stabilized approximately at 12V. At the time 5 sec, there is a fluctuation of the output voltage due to load changes. The output voltage is stabilized after a less then 0,5 sec to the value of 24V, which corresponds to the load.

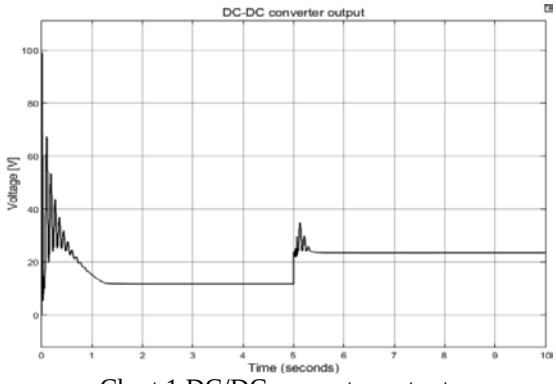

Chart 1 DC/DC converter output

Second chart represents a course of current load. The fluctuation of the current load is very similar to output voltage. There is an obvious relationship between them.

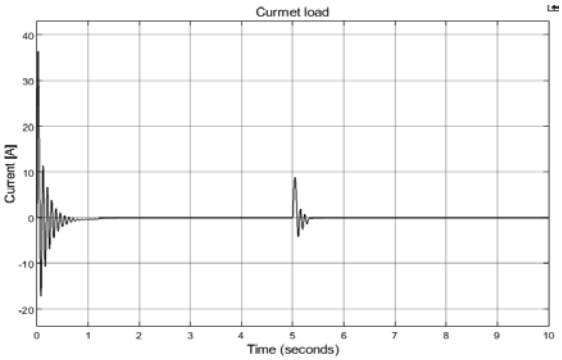

Chart 2 Current load

The chart number 3 represents the course of revolutions per number (RPM) of DC electric motor. At output voltage 12 V the value is 389 RMP and at the 24V is the value 782 RPM. Because this RPM for the purpose of UGVs are too high, there is a planetary gearbox. The chart number 4 represents the course of RPM at the planetary gearbox output. At the output voltage 12 V corresponds the wheel speed approximately 50 RPM and at the 24 V is the value almost 100 RPM. These speeds, with adequate torque are further usable for UGV propulsion.

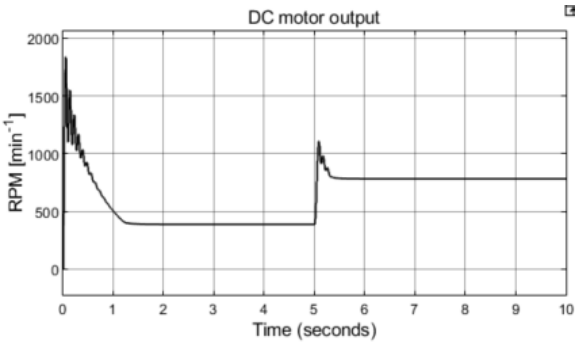

Chart 3 DC motor output

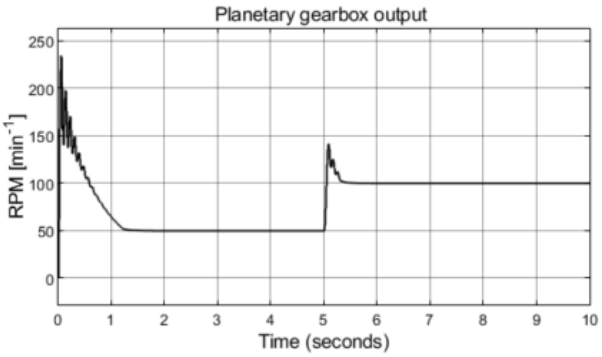

Chart 4 Planetary gearbox output

5. CONCLUSIONS & ACKNOLEDGMENT

The aim of this work was to describe PEMFC as a protentional source of energy for the military purposes. First part was focused to mathematical description of the PEMFC. In the second part, a possible drive solution for small UGVs was simulated. Simulation gives to us a closer idea of operation and performance simple drive solution, which uses a fuel cell as a source of energy. It can be used in further development of unmanned vehicle propulsion.

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OVERCOMING A STAIR-TYPE OBSTACLE WITH TRACKED VEHICLE

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Abstract: *In this paper, the movement of a tracked vehicle while overcoming stairs will be described. First of all, it is important to define the dimension of the stairs. Overcoming the stairs will be demonstrated in consideration of their construction and vehicle use. The subsequent movement of the tracked vehicle on the stairs can be simply described as climbing a slope (on an inclined surface) if it is taken into account that the vehicle will move along the edges of the stairs. All these aspects will be illustrated in the MATLAB simulation.*

Keywords*: tracked vehicle; stairs climbing; unmanned ground vehicle; stairs; locomotions;*

1. INTRODUCTION

Unmanned ground vehicles can be defined not only in the military field as fully valid assistants, which can fully replace a soldier in dangerous situation on the battlefield. It must not be forgotten that it is still just a machine that needs human control. Apart from its transportation to place of deployment, the vehicle can be fully autonomous. That´s why we aren´t talking about control here. The size and weight of the vehicle also depend on this, as easy handling is assumed e.g. transport of a robot in a soldier´s backpack. The main advantages of autonomous use is that robot can´t be affected by weather conditions or stress. The involvement of different UGV´s in combat or various reconnaissance tasks has been and still is a question of last decades. War situation caused military conflict to move from open to built-up areas. The fighting in this area had a fatal consequence for the soldiers because the enemies could use the moment of surprise, knowledge of the area, and the fact that even an inexperienced fighter can cause colossal damage at close range. With this comes new obstacles, especially the stair. That isn´t the only problem. We come to the possibilities of UGV´s locomotion, due to the used mechanism. In general movement mechanisms are classified as :

- Legged vehicles
- Tracked vehicles
- Wheeled vehicles

Each type of locomotion has different advantages and disadvantages. Legged vehicles have been deeply inspired by natural movements of animals and humans. They are characterized by a complex construction. Wheeled and tracked vehicles are the most common, due to their simplicity of construction and low production costs. [1][2]

2. CLIMBING STAIRS

Stairs are one of the most difficult obstacles for UGVs because in order to overcome them, the robot must meet four basic requirements:

- Overcoming the first step
- Stability during movement and climbing (There is a risk of flipping over)
- Moving up the stairs
- Moving down the stairs

Before each climbing, a robot must be in level with the direction of the stairs, as this could prevent instability and subsequent overflip during moving.

2.1 Stairs. It is practically impossible to define the exact size of the stairs because each country has its own technical standards in place. We therefore focused on the Slovak technical standards. Due to STN 73 4130 we know common stairs defined:

- Stair angle 25-35 [α°]
- Height of one step 150-180 [mm]

However, we can calculate these parameters, where:

- h_s – height of one step [mm]
- ch – construction height of the room [mm]
- w_s – width of one step [mm]
- n_s – total number of steps

$$h_s = \frac{ch}{n_s}$$

$$w_s = 630 - 2 * h_s$$

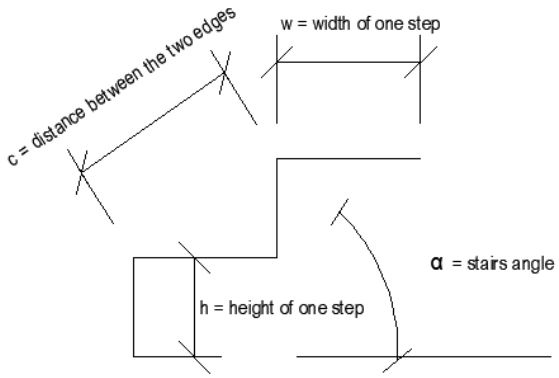

Fig.1 Steps dimension

We used 630 mm as the average human stride length. However, not all stairs are the same. Due to the shape of the staircase we know the three most basic types :

- Steps with aligned edges. These stairs were the easiest to climb because nothing prevents the track from moving across the step. Factors that affect climbing are the dimension of the step and the angle of the staircase. Figure No. 2.A
- Steps with a hanging upper part. They are hard to overcome by vehicles with fixed geometry when the step is above the point of contact with the vertical edge. Figure No. 2.B
- Wall-mounted stairs. It´s the most difficult type of staircase because the height of the track needs to be higher than the gap between the step and the floor. Figure No. 2.C. [5][6]

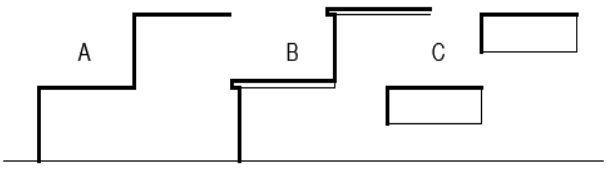

Fig.2 The shape of the staircase

2.2 Tracked vehicle. The movement mechanism consists of tracks which have greater friction force compared to others and because they have a larger area in contact with road. Regarding the way the geometry of the track is used, they can be divided into two groups:

- vehicles with fixed geometry - a smaller version of classic tracked vehicle. Figure No. 3.A.
- vehicles with variable geometry – they have additional tracks that can change positions. Figure No. 3. B.

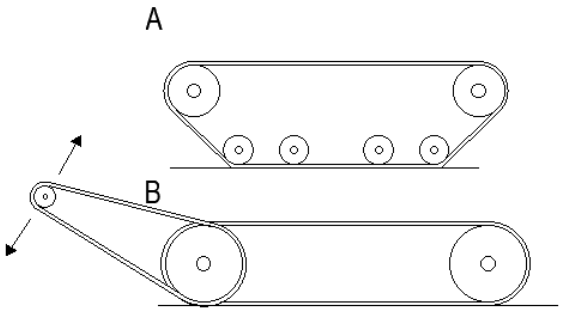

Fig.3 Kind of the track geometry

Advantages. Better mobility and dynamics. Simplicity of the locomotion mechanism, low price and higher durability. Turning is performed by regulating the speed of the individual track. The turning radius (R_t) depends on the tracks gauge (G_t).

$$R_t = \frac{G_t}{2}$$

Disadvantages. Lower speed compared to the wheeled vehicles and increased energy consumption for movement. During rotation and turning, power is lost by countercurrent torque.

2.3 Overcoming the first step. In the first phase, it is important to lift the front of the track to the upper edge of the step. This process depends on where the step is, it may be below the point of contact with the vertical edge or above it. The best way to arrange optimal climbing is to move the center of gravity of the vehicle as close to the rear of the vehicle as possible. For vehicles with a fixed geometry, it´s very important to have track at an angle, which makes it easier to climb the first step. The vehicle comes to the vertical edge of the step, at constant speed and lines up with stairs. When the robot is moving, it is necessary to ensure that same amount of force is being transferred from the motor to both of the tracks. The opposite can cause twisting and deviating from the straight direction. Figure No. 4. shows situation when the robot touches the first step. Based on classical mechanical analysis we can describe this movement and set up the robot´s dynamic model in process.

The force F_M is generated by engine and F_N is a component of the tractive force perpendicular to the surface. F_T represents friction force between the lower edge of the tracks and the step edge.

$$F_M - F_{Ne} * \sin(\beta+\gamma) + F_T * \cos(\beta+\gamma) = m\ddot{x}_G$$

$$-mg - F_N + F_{Ne} * \cos(\beta+\gamma) + F_T * \sin(\beta+\gamma) = m\ddot{y}_G$$

$$-mg*\rho\cos(\varphi+\gamma) + F_{Ne} * \left[L\cos\beta + \frac{(h-L\sin\gamma)}{\sin(\beta+\gamma)}\right] + F_T * L\sin\beta - m\ddot{x}_G * (y_G + R) - m\ddot{y}_G * x_G = J_S$$

- F_{Ne} - component of the tractive force on the edge of the step, perpendicular to the surface [N]
- β – approach angle [°]
- γ – angle between bottom of the track and ground [°]
- ρ,φ – angle made with the X-axis [°]
- J_S – moment of inertia
- v – vehicle speed [$m*s^{-1}$]
- L – vehicle length [mm]
- R – drive wheel radius [mm]

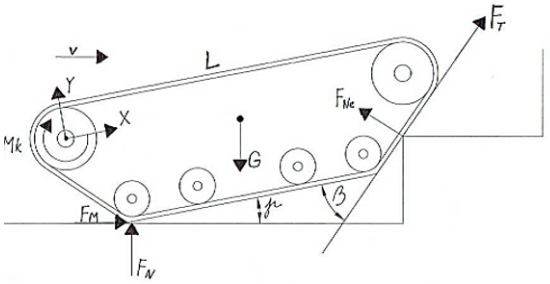

Fig.4 Overcoming the first step

Friction force F_T is calculated according to the formula:

$$F_T = \mu * F_{Ne}$$

Overcoming this obstacle is strongly influenced by the adhesive conditions, as the vehicle track mustn´t slip. Due to the lifting of the front part of the vehicle, the contact area of the track is also reduced. As it is mentioned above, the center of gravity of the vehicle should be located mostly at the rear but not too much because it would flip the vehicle backward.

2.4 Movement along the edges of the stairs. It can be defined as a locomotion on an incline surface. After overcoming the first step the robot lands on the edges of the steps. Even in this case, robot parameters must meet certain requirements. The length of the track which is in contact with the road must be longer or equal to the distance between the three edges of the steps.

$L \geq 2*c$

- c – distance between two edges. Figure No. 1. [mm]

These conditions must be met so that the robot doesn't fall from the edge of the step. Concerning the elasticity of the track, stability during climbing is very important. The left and right track´s contact with the edge of the step might differ. This might lead to the vehicle being turned to the side When the robot is moving up the stairs the smooth track is being considered.

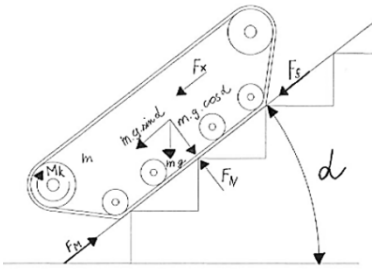

Fig.5 Stairs climbing

The values of the resulting forces and moments are calculated according to the formulas. However, some of them aren´t mentioned below because they were demonstrated in the previous step.

- m – mass of vehicle [kg]
- g – gravitational acceleration [m/s^2]

$$F_N = m\,g\cos\alpha$$
$$F_X = -m\,\ddot{x}$$

- $\ddot{x}$ – vehicle acceleration [m/s^2]

In the case of using a robot with grousered tracks, the larger resulting angle can be achieved. This is the static analysis and is mainly used as a way design the dimensions of the vehicle. The dimensions also depend on the track that is used.

3. MATLAB SIMULATION

Dynamic analysis of vehicle movement was described and simulated in the MATLAB program. The main result of this simulation is how powerful the electric motor should be. The basic conditions that the electric power unit must realized is a speed

of movement of stairs 0,3 m/s. This speed indicates a constant speed of movement of vehicle up the stairs. The design of the power unit, the speed of electric motor, its dimensions and price directly depend on the force takt was determined by the simulation.

3.1 Mathematical model. This model is based on the movement of the vehicle on an incline surface that was demonstrated in the previous step. Which is based on the second Newton´s law. The second Newton´s law states that the rate of change of momentum of body over time is directly proportional to the force applied, and occurs in the same direction as the applied force. For tracked vehicle which is with constant mass, the second law can be re-stated in terms of vehicle acceleration. [13]

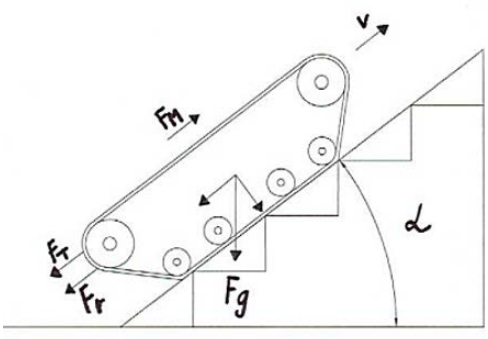

Fig.6 The scheme on which the mathematical model is based

By applying the second Newton´s law we get the formulas:

$$ma = \sum F$$

- m – mass of vehicle which is 1 [kg]
- a – vehicle acceleration [m/s^2]
- F – all forces influence and acting on the vehicle. [N]

If all forces are expressed in the equation, its general form is:

$$ma = F_M - (F_T + F_r + F_{Gx})$$

Each terms of this equation expresses the force acting in the direction or opposite direction of the vehicle´s movement on the stairs. In the next step, the individual forces and values that were needed to calculate them were defined.

F_M - represents the value of the required engine power.

F_T – friction force

$F_T = \mu mgv$

- μ – friction coefficient. In our case it represents a value 0,002 [s/m], which expresses the time loss per meter of length traveled
- v – it refers to the required speed of climb, 0,3 [m/s]

F_r – It is an aerodynamic drag of the vehicle while is climbing the stairs.

$$F_r = \frac{1}{2} c_r A v^2$$

- c_r - aerodynamic drag coefficient. The value for our vehicle is 0,01
- A – 0,014 [m^2], expresses the value of the front area of the vehicle.

F_{Gx} – x-axis component of the vehicle weight acting against the direction of movement of the stair.

$F_{Gx} = mg\sin\alpha$

- α – stairs angle. This case value was used – 27 [°] which was selected from the values mentioned in section 2.1 (Stairs)

After substituting into the equation arises:

$$ma = F_M - \mu mgv - \frac{1}{2} c_r A v^2 - mg\sin\alpha$$

The whole equation was divided by the value “m”, due to the independence of the acceleration (a) with which we worked in the next step.

$$a = \frac{F_M}{m} - \mu gv - \frac{c_r A}{2m} - g\sin\alpha$$

In general acceleration is defined as the first derivate of velocity. The equation will remain valid even if it is written:

$$\dot{v} = \frac{F_M}{m} - \mu gv - \frac{c_r A}{2m} - g\sin\alpha$$

3.2 Simulink model. Simulink model works on the principle of integration, which is actually the opposite of derivation. In simplicity, the acceleration that we calculate by second Newton´s law, integrates and gets the velocity. We need to find out:

- F_M……? The force that the power unit must have.
- The time taken for the vehicle to reach the required speed. Speed change over time.

All constant and values are show in the Simulink model Figure No. 7. The output of the simulation is a graph Figure No. 8, in which the time [s] is displayed on the x-axis and the speed [m/s] in the y-axis.

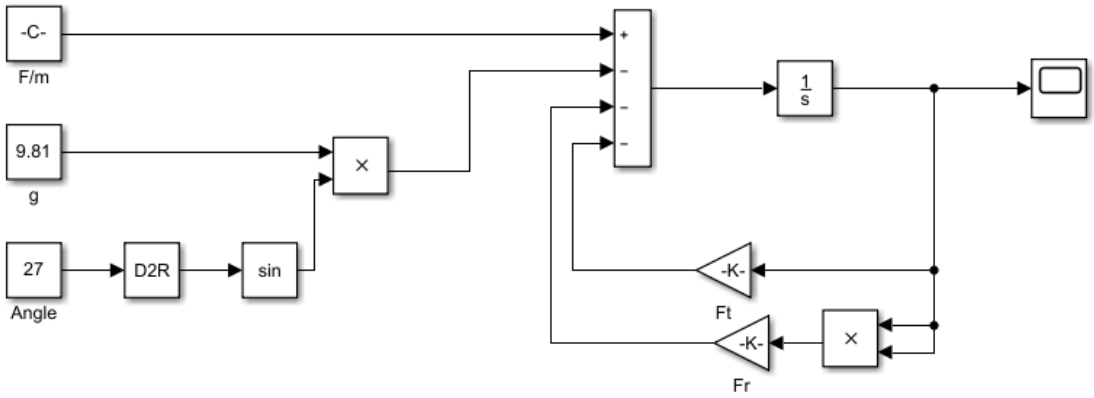

Fig.8 Simulink model

4. CONCLUSIONS

Simulation in MATLAB found that the minimum tensile force of the engines need to overcame the stairs at constant speed 0,3 [m/s] is 4,4596 [N]. Based on the tensile force we can choose an electric motor that will meet the following requirements. Because at present great attention is paid especially to economic aspects. The power unit must not be unnecessarily large and have a high excess of power, as this will be reflected in the final price of the engines and the vehicle as a whole.

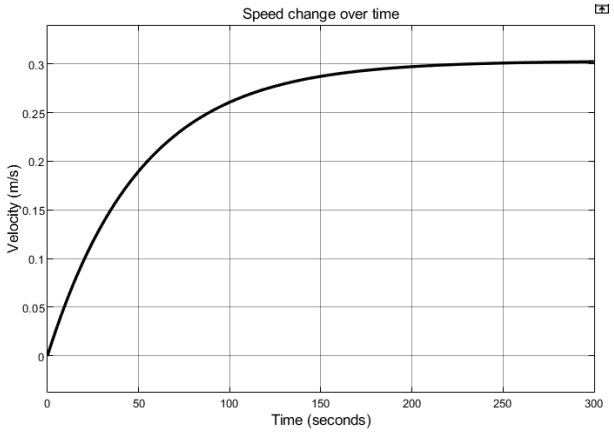

Fig. 7 Graph - Speed change over time

Fig.8 shows time t = 250 [s], when the vehicle reaches the required speed v = 0,3 [m/s], and constantly maintains it. Our simulation doesn´t consider discharging the battery. Which would cause the vehicle to be unable to move a long time with constant speed.

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OVERVIEW OF THE "*PATRIOT*" COMPLEX

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Abstract: *Initially designed as an anti-aircraft system, PATRIOT gained attention in the 1991 Gulf War when it was used as an extempore defense against Iraqi Scud missiles. Since then, PATRIOT and its related interceptors have been optimized for defense against tactical ballistic missiles, but remains capable against aerial threats such as aircraft and cruise missiles.*

Keywords*: anti-aircraft missile; system; PAC 3.*

1. INTRODUCTION

Due to the continuous evolution of the characteristics of the air enemies, the air threat and the air strikes will have new dimensions, causing a growth of the importance of missile and anti-aircraft artillery systems in missions, these being among the few ones that are permanently prepared for fighting in any conditions of time and weather.

The idea for a mobile air defense system utilizing missile interceptors was first conceptualized in 1961 in the U.S. and by 1965 a program had been development and established. The system was initially designed as an anti-aircraft, surface-to-air defense battery, but further upgrades allow for defense against a wide array of air targets.

The *PATRIOT* complex is intended for the interception of aircraft, ballistic missiles and tactical cruise ships, at low, medium and high altitudes, in the conditions of a strong counteraction of the enemy.

2. THE COMPOSION

2.1 Generalities

The basic fire subunit is the battery which is able to execute simultaneously fire on ten air targets.

In the composition of the battery enters:

- the engagement control station (ECS), the "man in the loop" for firing an interceptor;
- the phased-array radar, designed to track enemy missiles or aircraft;
- the launcher configured with four interceptors per launcher for the PAC-1/2 and 16 interceptors per launcher for the PAC-3;
- the 150kW diesel powered generator units.

2.1.1. The engagement control station (ECS)

The engagement control station is intended for collection, storage and processing all necessary information for operation the complex, for management the work of the radar station as well as for missile guidance.

It is arranged in a van and is composed of:

- two specialized electronic computers which double each other and control the radar station and the missile in flight;
- control blocks of transmission frequencies and of moving the antenna beam;
- two indicators with control panels of the entire radar station;
- equipment of connection with other elements of the complex (radar relay station).

The existence of two display devices allows the display on one of these of the radar station situation on which it can be seen the missile flight to the target.

The engagement control station is served by two operators.

2.1.2. The radar station

The multifunctional radar station is intended for search, discovery, identification and accompanying air targets and missiles, as well as for the transmission of their directing commands. The station is oriented in the probable direction of appearance of the target and during the shooting remains in this position.

The antenna system of the station comprises seven networks of phased antennas and an antenna for the recognition station.

Phase antenna networks are intended for:

- transmission and reception of signals in airspace observation;
- target discovery and their subsequent accompaniment;
- emitting the target illumination signal for semi-active self-steering missile head;
- sending orders to missile board.

The second antenna, in size, receives the information on the missile board.

The other five antennas constitute the compensation antennas for the secondary lobes effects, to reduce jamming efficiency of the enemy on the radar station.

2.1.3. The launching station

The launching station is arranged in a large capacity trailer and it is served by a team of three soldiers. It can be moved, with the missiles in containers, on roads and in rough terrain, but it can also be transported by plane.

On a launcher are placed four missiles in launch-transport containers and each installation is able to provide a single launch.

The connection to the engagement control station is achieved through the data transmission line or phone.

3. THE LOCATION ON THE BATTLEFIELD

On the ground, the anti-aircraft missile battalion *PATRIOT* is arranged on batteries. The batteries are arranged at 30-40km from each other to create a reciprocal and complete cover with fire at all heights.

In the firing position, the launcher is arranged at a distance of up to 1 km from engagement control station and the radar station, which is installed so that plan of the antenna is located in the center of the responsibility of the missile complex.

It is mandatory the procedure of correction by which are specified the coordinates of the radar station and of the launching installation in relation to the radar station.

The duration of the transition from the initial position to the combat position is about 30 min.

4. ADVANTAGES AND DISADVANTAGES

In the opinion of the military specialists the strengths of the complex are:

- action on several channels on the target and missile;
- high protection against interference;
- viability;
- automation;
- mobility;
- the possibility of cooperation with other anti-aircraft missile complexes.

But this complex of anti-aircraft missiles has disadvantages too, of which we must mention the possibility of removing from function in case of radar station destruction or possibility of target failure due to the jamming of the self-steering head of the anti-aircraft missile.

5. THE MIM-104 ANTI-AIRCRAFT MISSILE

The anti-aircraft missile is made according to the normal aerodynamics scheme.

The ammunition load is break-explosive type and weighs 90.7 kg.

The engine, with an average traction force of 11,000 kg, works with solid fuel for 11 sec.

The speed of the missile is about 1,750 m/sec.

The total weight of the *PATRIOT* missile is 906 kg and it is calculated for an overload up to 30 G.

6. THE OPERATING PRINCIPLE OF THE *PATRIOT* COMPLEX AND THE MISSILE DIRECTING SYSTEM

Multifunctional radar station performs search, discovery, identification and determining the coordinates of the target.

As the approach of dangerous targets to the alignment of interception, are calculated future points of meeting and the decision to launch missiles is made. All operations are performed at the engagement control station, in automated mode, with the help of the electronic computer. During the approach of the target to the set alignment, the launching station is rotated in azimuth towards the calculated meeting point and the missile is launched.

If the target is isolated and found far from the defended goal, then one single missile is launched.

If there are more targets, but flying far away into the tight combat device, then the missiles are launched successively so that they approach to the target group at an interval of 5-10 sec.

Immediately after launch by the scheduled method, on within a few seconds the missile enters the area of action of the radar station, after which it

engages the data transmission line. By successive swinging of the radar station beam on launch direction, the catching and the accompanying of the missile is realized.

In the first stage of directing the accompaniment is performed on the "missile passes" option.

When the radar station beam is oriented on missile direction, directing orders are sent to it. Can be driven ten anti-aircraft missiles at a time, three of them on the final portion of the trajectory. The directing signal is transmitted to each missile on its own carrier frequency to achieve electromagnetic compatibility of directing board installations.

On the final part of the missile flight trajectory, it goes from the method of directing through commands to the self-guiding regime with the retranslation of data missile-ground.

Missile and target illumination, in this regime, is provided by Doppler pulse signals. The signal reflected is received at the missile and, through the transmission line, it is transmitted to the terrestrial radar station, for processing and formation of directing commands.

7. CONSTRUCTIVE VARIANTS

In operation since 1984 in the variant *PAC-1*, subsequently benefiting from upgrades materialized in *PAC-2*, *PAC-3* variants (developed in 1995-2000) and *PAC-4* (in development since 2013), this complex of anti-aircraft missiles is considered by specialists to be the most performant and will continue to modernize continuously by implementing new technologies and ensuring air protection at least until 2040.

Thus, Romania joins the countries accepted by the US senate to have anti-aircraft defense capabilities such as Germany, Japan, the Netherlands, Israel, Saudi Arabia, Kuwait, Greece, Spain, United Arab Emirates, Qatar.

Important to emphasize is that the acquisition and implementation of this anti-aircraft missile complex contributes to the realization of multi-level integrated space defense system of Romania, next to the newly acquired *F-16* Squadron, together with the others anti-aircraft artillery/missile systems/complexes already existing.

PAC 1 Raytheon

PAC 2 Raytheon

PAC 3 Lockheed Martin

8. TECHNICAL AND TACTICAL CHARACTERISTICS

Characteristics	PAC 1 Raytheon	PAC 2 Raytheon	PAC 3 Lockheed Martin
Maximum combat distance of aerodynamics target [km]	70	94-160	150
Minimum shooting distance [km]	6	3-5	1
Maximum speed of targets to be fought [m/s]	800	1,000	1,000
Altitude of fire [km]	24.2	25	36
Maximum missile speed [m/s]	1,000	1,700	2,000
The weight of the missile at launch [kg]	914	900	312
The weight of the combat component [kg]	90	91	73
Missile length [m]	5.80	5.31	5.20
Type of combat component	explosive striated body	explosive with fragmentation	hit-to-kill and explosive
Combined conducting system	semi-active self-direction		active self-direction
Conducting method	proportional approximation method		
Minimum interval between launches at a station [s]	3	3	0.5
Launching station reload time [minutes]	15	12	12

9. CONCLUSIONS & ACKNOLEDGMENT

Airplanes and helicopters are still the main airspace threats. However, the current trend is to develop, in particular, air attack systems without pilot, ballistic missiles, cruise missiles, unmanned aerial vehicles and reactive projectile launchers. Due to lower costs, it may be within reach of potentials enemies, which do not necessarily have a developed technological level.

In the process of transforming the capabilities of the Romanian Army, development and modernization are dynamic elements that trains substantial human, technical-material and financial resources.

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ACHIEVING AN EFFICIENT COMMUNICATION WITHIN THE MILITARY EDUCATIONAL INSTITUTIONS

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Abstract: *The purpose of this paper is to draw attention to the importance of understanding the communication process for its effective implementation. A few brief notions of neuroscience and psychology are enough to explain the existence of emotional diversions and how they prevent the effective transmission of concepts and ideas. With their help it can also be explained that it is important to pay attention to the existing feedback for the efficient functioning of any type of organization.*

Keywords*: communication, emotional diversions, different perceptions, feedback.*

1. INTRODUCTION

The huge cultural progress has been possible throughout history due to the unique human ability to create symbols. The reference moments of the appearance of speech and figurative signs cannot be strictly delimited on the scale of human evolution.

The appearance of speech is supposed to be positioned before the appearance of writing, chronologically, one of the main arguments being the existence of certain eminently oral languages. However, their parallel development is not excluded. What we can say with certainty is that there is an evolution from simple to complex, in terms of the two dimensions of the act of reproducing exteriority.

The difference between humans and animals was not big before the appearance of the spoken word, but the ability to use symbols to communicate developed their ability to coexist in a society. Communication was also to some extent responsible for the creation of tribes, and later provided a favorable framework for the division of labor and thus contributed to the creation of human cultures.

One of the main purposes of communication is to transmit information. The message sent to the receiver by the sender can be also studied according to the intentions of the sender. In transmitting the message, both the informative side and the one regarding the ability to influence can take precedence. Thus, another purpose of communication, which prevails in most communication acts, is to influence.

2. THE NEUROSCIENCE OF COMUNICATION

In order to understand the process of communication and then the process of influence, it is necessary to know some notions of neuroscience. The theory of the Triune Brain is attributed to the American physician Paul MacLean. It was first introduced in the 1970s. According to this theory, the human brain has 3 large cortical structures, and these correspond to different evolutionary periods (MacLean, 1973).

The first structure, *the reptilian brain*, is the oldest structure that the human being possesses and is between 500 and 250 million years old. Summarily, it deals with maintaining body functions such as breathing, digestion, temperature regulation.

On the other hand, the *paleomamalian brain* is much more developed in the case of reptiles, that of mammals being extremely rudimentary. It developed about 150 million years ago and gives human beings a broad emotional spectrum. Among many other functions, it is also responsible for creating attachments.

What differentiates human beings from other mammals is the *neo-mammalian brain* or *neocortex* which is about 150,000-200,000 years old. The neocortex is the one that allows all the higher functions such as abstract thinking, imagination, the ability to plan things and last but not least, speech. No other species is able to communicate at the level of complexity at which human beings succeed. What Freud (1904/ 2010) called the "unconscious mind" is mainly represented by the limbic system aided by his set of memories. Based on these ideas, psychologists recommend that all difficult conversations should be planned for the moments when the individual thinks he will have enough energy to use the neocortex. This is based on the fact that the neocortex did not have time to evolve to withstand continuous fire unlike the limbic system and the reptilian brain. In other words, a person is always ready to jump up two meters when watching a snake in the woods, but is not always ready to solve a complete equation or have a difficult feedback conversation.

2.1 The involvement of emotions in the decision-making process. The theory that says that people nowadays take the model of *homo economicus,* making completely rational decisions after weighing information is incomplete. Psychologist Daniel Kahneman confirmed this and won the Nobel Prize in Economics in the 2000s following a demonstration that included this idea (Kahneman & Tversy, 1979). He came to the conclusion that human beings have two mental systems: *system one* the oldest and most concerned with survival, and *system two* more evolved and with complex cognition. The reptilian brain and the paleomamalian brain represent the first system and the neo-mammalian brain represents the second system. The first system is described by fast thinking or emotion, and the second one is called rationallity and also slow thinking. Daniel Kahneman demonstrates that all decisions of a person, even if made with the ocasional participation of the second system, are actually made by the first system. In other words, they are taken based on the raw data given by the first system. This discovery was considered a revolutionary one because it demonstrates that the human being cannot be compared to a computer that makes decisions based on the information it has, but a great emotional load is involved in everything he does. Thus Daniel Kahneman managed to change the rules of the game, especially in the field of psychology and economics (Kahneman, 2011).

In the communication process we try to call the second system and in order to be possible this is important to keep the first system in control. In the event of threats to the first system, the emotional diversion takes place, the first system takes control and fulfils its biological mission, that of helping the individual to survive by triggering the fight-flight-freeze reaction. This reaction prepares the individual to either fight the threat, to flee, or to freeze in the hope that he will pass without harming him. Problems arise when some of the sender's information scares the caller's first system, which will confuse the social threat with a life and death threat and set in motion the same mechanisms as in that case. Thus, the interlocutor will choose to become defensive and not listen to the transmitter's speech, using this time to prepare his combat arguments. He could also react by disengaging from the conversation, withdrawing into himself and avoiding further interaction. Last but not least, he could get stuck and find it difficult to gather his thoughts. So the first mission of the sender is to keep the Elephant of the interlocutor quiet because the appearance of this emotional diversion will thwart any attempt to influence or persuade. This is because the rest of the conversation will be carried through the filter of a cortical structure that has trained for hundreds of millions of years for survival, not to discuss or collaborate.

2.2 Te five 'buttons' that can trigger emotional reactions. In 2009, the president of the NeuroLeadership Institute, David Rock, described in his book „Your Brain at Work" the fact that there are 5 sensitive buttons to which the human being reacts emotionally when they are pressed positively or negatively. These can be abbreviated under the acronym SCARF, starting from: status, certainty, autonomy, relatedness (familiarity) and fairness (Rock, 2009:195-196).

They are sensitive to the first system, regardless of culture, nationality, hierarchical level, age. Pressing them positively in any form of communication will generate a feeling of comfort, security, causing the receiver to be open to what the sender has to say.

Thus, the status button can be pressed positively if the interlocutor will feel respected, appreciated and validated. The button of certainty requires clarity from the interlocutor, keeping promises and informing in advance about any change. In a conversation, to offer autonomy means to give the interlocutor options and freedom in that conversation. For example, phrases like "You do this because I say so!" press this button

negatively. The familiarity button is pressed positively when the transmitter manages to highlight the common points and build the familiarity. And last but not least, the correctness in the case of a dialogue implies the understanding, clarification and fulfilment of the interlocutor's expectations. Therefore, offering a positively pressed SCARF significantly increases the chances of the success of the influence process.

2.3 The forming of perceptions about reality and the importance of feedback. Each individual's perceptions of reality do not always coincide. According to a neurolinguistic programming model, when a certain event takes place in an individual's life, the information about that event enters his life with the help of the senses. Sensory information goes through a lot of filters including past experiences that are or are not conscious, personal values, beliefs and beliefs, conscious and unconscious decisions. This filtering process has the ability to modify, remove or add fragments of the sensory information received. An internal perception or representation is then formed. In essence, perception is what the individual understands in reality.

Depending on each person's filters, perceptions of exactly the same reality can be very different. The perception once formed influences the emotional state, just as the latter can polarize the former in relation to a certain subject. After all this answer, in the real world there is a reaction, and the sender's reaction will become the reality of the interlocutor. This process will then resume.

Therefore, the existence of *feedback* is very important for effective communication. From the perspective of neuroscience, feedback is a real gift. Even before birth, the mother's relationship with the child is based on a feedback loop. The mother's reactions to the child's condition provide a foundation for stability and security that the child develops in the womb.

In the organizational area, feedback is extremely important, as demonstrated by a Gallup study described by Marcus Buckingham and Curt Coffman in the book "First, break all the rules" (2014). It has been conducted over 25 years by 80,000 managers at all levels in 400 companies. The study contains, among other things, a list of the 12 most important things for an organization. In the first place is the question "Do I know what is expected for me at work?". The answer to this question can be obtained only after a clear, honest and timely feedback from those with whom the author of such a question works.

2.4 The pyramid of needs. These possibilities of emotional diversion can be explained by the existence of essential needs of the human being.

Renowned psychologist Abraham Maslow (1943/2016) describes people's needs by drawing them in the shape of a pyramid, thus facilitating their understanding. At the lower level of this pyramid are the urgent needs, and the upper level describes the least intense needs. The levels placed at the top are not considered to be superior to the others, but only different.

However, those specific to the higher level are less likely to appear and are valued differently by each individual, unlike those at the lower level on which everyone agrees, considered to be weaker needs. Maslow believes that if a stronger need is met, a weaker one emerges.

The primary needs, located at the lowest level of the pyramid, fall into the category of physiological needs. They motivate the behavior. Thus, a person deprived of food will be motivated to do any unusual act in order to provide food. Also, security needs are always present because they are redefined once they have been met. After fulfilling the above-mentioned needs, the human being becomes aware of the need for belonging and love. Individuals manage to satisfy this need outside the family circle by looking for available groups. The need for membership also differs depending on age.

On the other hand, as a member of certain groups, the individual feels the need for appreciation within them or the need for appreciation. Working in a community is due to this need and is also one of the motivations for communication.

Last but not least, the highest level of the pyramid is represented by the need for self-realization. How it is met is influenced by cultural trends. With the industrialization, the man left behind the safe life of the farm and was taken over by the instability of urbanism. These needs are powerful tools to motivate recipients, regardless of the form of communication.

3. FORMS OF COMMUNICATION WITHIN MILITARY EDUCATIONAL INSTITUTIONS

In the specific case of military academies, the communication process is quite complex. First of all, there is a formal communication, in which the

broadcasters are represented both by professors, in the university, and by military personnel, in the military. The influence, in this case, is intended to be positive, it aims to grind the young military student towards the training of all himself and the qualities necessary for a young officer.

There are different forms of organization, specific to the military environment, in which the transmission of information is done according to the rules of public communication. In the meetings of the company or of the battalion, the commander, the role of the sender, transmits information that he considers necessary for a better development of the activities. This form of communication is manifested in a descending way, because there is a hierarchy of degrees and functions.

On the other hand, through informal communication, students of military academies share opinions and ideas, which often coincide given their close age and common interests. In this way, friendships and camaraderie are acquired and an attempt is made to obtain the cohesion of the group, the purpose of influencing being thus a positive one. The cohesion of the group is extremely important for the fulfilment of the subsequent tasks and missions, the ability to work in a team being even one of the necessary requirements for admission in any military education institution. This cohesion is achieved through group communication, within the troop, but also through interpersonal communication. The military university environment is conducive to interpersonal communication. Students spend a lot of time together, and interaction is inevitable. They share both common and distinct ideas, given the different backgrounds and areas of origin. The process of influence intervenes in obvious cases such as discussions about the appropriate way to execute a common order or any general idea that is viewed differently by the two actors in the communication in question. Also, the influence exists in the case of trying to validate a certain status, which may or may not exist in reality. In the context of influence achieved through communication, intrapersonal communication has not less important role in shaping the concepts of military students. Information from different sources is filtered by each student through their own conceptions of the outside world. Therefore, any external information is primarily translated through interpersonal communication.

4. CONCLUSIONS & ACKNOLEDGMENT

An efficient communication within the military educational institutions is essential for achieving their objectives.

In order to realize an efficient communication, it is important to avoid emotional diversions and to pay attention to the existing feedback. Thus, understanding the process of transmitting information, but especially that of receiving and filtering it, is fundamental.

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COGNITIVE DISSONANCE: WHY DO WE FEEL UNEASY?

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Abstract: *Do you smoke? If so, do you ever think that smoking is harmful, and you probably shouldn't do it? If you do, what you are experiencing is called "Cognitive Dissonance". Do you work out, or live a healthy lifestyle? If so, do you think 'I really shouldn't do this right now' while eating a doughnut? If you do, you are experiencing "Cognitive Dissonance". I could go on and on, and come up with quite a lot of examples, but you may know by know that this phenomenon is a great part of our lives. More or less, you could say that it means "internal conflict", but what is really happening behind the scenes? Can we fix this? Is there a way to control it? From having cheat days of eating high-calorie foods while on a plan, to having second thoughts about romance, we do know that it can impact our life severely, so it's relatively essential to be informed about this matter.*

Keywords: *non-fitting, contrary, persuasion, decisions, attitude*

1. INTRODUCTION

What is dissonance? Dissonance is a discrepancy, a conflict, between two or more things. Literally, dissonance is the word we would use when we hear a pair or more musical notes that sound wrong, such as a middle C and the C sharp above. A cognition can be chalked up to an idea, an item of knowledge, a life principle. And when we put these two things together, we get cognitive dissonance, the theory that implies internal conflicts.

It was first brought to light by Leon Festinger in 1957, in a book called "A Theory of Cognitive Dissonance", and ever since, it became an influential hot topic on psychology and knowing of one's self. To put it in his own words, he claimed that cognitive dissonance is "the existence of non-fitting relations among cognitions" (Festinger, 1957: 3). While other psychologists, such as Sadaomi Oshikawa, have questioned the efficiency of the studies: 'Asking consumers how dissonant they were may measure their levels of anxiety and may produce invalid indices of cognitive dissonance' (Oshikawa, 1972: 1) , they have agreed to the existence of the phenomenon, and I believe that getting to know about it, maybe understand it, might make our quality of life just a bit better, as those conflicting ideas, cognitions, values, result in a psychological stress, and, the bigger the discrepancy, the bigger the stress.

So why does it matter so much? Well, consistency is an undervalued matter by so many, we almost forget it is an important thing. And so, when these contradictions do happen, the lack of consistency, of 'consonance', as Festinger put it, it makes us uncomfortable, it puts us off, it makes us feel uneasy and just wrong, sometimes. And that lack of consonance pushes us to 'fix' the dissonance. It is especially hazardous when both the conflicting cognitions, or actions, are of a greater magnitude, because both of them have a part of 'truth' in the person's mind, and it is tedious, and difficult to decide which one of them is better. Not only the magnitude of a dissonance is important, but also the number of total dissonances in one's mind (Harmon-Jones, Mills, 2019, 4). If there are too many, even if they are petty, it may not be decent to live comfortably with a great number of them, so the person has to 'fix' some dissonances in order to bring the ratio down. The lack of consistency has been associated with emotions such as fear and anger, and inability to improve the ratio is known to lead to stress.

Though it may sound as a disorder, or a fault in our mind, cognitive dissonance may actually be helpful for our lives. Being, by definition, a difference between our expectations and the reality, people generally reduce cognitive

dissonances to alter those expectations, to make them more fit for reality. And since we constantly gather more knowledge and information as we go on about our lives, we will always experience this dissonance in some way or another, and thus, we can argue that cognitive dissonance is the primary reason people make changes on themselves. When doing something that triggers a dissonance, we can change the behavior of one cognition, we can justify it, or we can ignore one of the cognition. By doing any of those, we change ourselves, but it is important to know in which way to do so.

2. PARADIGMS

There are four major paradigms, patterns, in cognitive dissonance: Belief Disconfirmation, Induced Compliance, Free Choice, Effort Justification.

2.1 Belief Disconfirmation

This is amongst the most frequent pattern we see, should you not even know of cognitive dissonance. This paradigm implies that when someone experiences something contrary to their beliefs, it is mentally easier to dismiss the contradiction, to disconfirm it, than to change their personal beliefs (Vaidis, Gosling, 2011). For example, in Festinger, Henry Riecken and Stanley Schachter's book, "When Prophecy Fails: A Social and Psychological Study of a Modern Group That Predicted the Destruction of the World", members of an apocalyptic cult, when realizing that apocalypse still hasn't come, instead of changing their belief on the cult, and asking themselves if they had donated for nothing, and believed in nothing, they justified themselves by disconfirming the contradiction, basically by remarking that they had been given a second chance that time, and fueling their belief further on.

How many times do we see this pattern happen every day? We all know at least an example of refusing to change, because it is easier not to change what we think, feel, and act, than to do so. It is easier to say 'This pizza is not so harmful anyway, it does not matter if I eat one every now and then' than to actually control and regulate ourselves.

2.2 Induced or Forced Compliance

The Forced Compliance theory is, more or less, a subset of the cognitive dissonance theory. (Festinger, Carlsmith, 1959)

It is a paradigm that has its bases on persuasion, and authority, pressure.

If a person is forced to write about and speak about, say, eating fast foods, and why is it healthy, but the person does not agree to this opinion, a dissonance appears. One cognition, their personal opinion on fast foods, and them being unhealthy, will clash with the other cognition, the fact that they have to write about fast foods being healthy. The compliance part works as follows; the person, while writing and speaking about that subject, will start to alter the easiest to change cognition, that being their personal opinion, in such a way as to align with the cognition that is forced upon them. Basically, by writing and speaking about fast foods being healthy, the person will start thinking towards this way. We could argue that this is the primary reason behind sayings like "Fake it till you make it" and ideas like lying or telling something you don't think is true so much or in so an intense way that you would start to actually believe it.

In an article about this specific phenomenon, COGNITIVE CONSEQUENCES OF FORCED COMPLIANCE, by Leon Festinger and James M. Carlsmith, an experiment was done in order to study this paradigm more accurately and precisely. The subjects were Stanford students, in the Introductive Psychology course. They were made to do tedious tasks, meant to be boring and incite a negative reaction or feeling about them, such as placing spools in a tray for half an hour, and turning pegs quarter by quarter, for half an hour. After this phase, they were allocated in 3 groups. One group meant that the subject received no money, and the other two groups meant that the subject received either 1 dollar or 20 dollars for convincing the next subject, which was an "actor", that the experiment would be fun and enjoyable. After this, they would be interviewed and asked about the experiment, to see how they feel. The one dollar group felt the best about the experiment, in contrast to the other two. (Festinger, Carlsmith, 1959) Due to the fact that the dissonance was rather high; since being paid one dollar made them feel more coerced than being paid twenty dollars, where the higher value would alleviate some feelings, the pressure to reduce the dissonance was equally high, so they brought themselves closer to the opinion that the experiment was not dull and boring and bland, to ease the conflict between the cognitions.

2.3 The Forbidden Behaviour paradigm

We may think that we could make someone, be it a child, or a subordinate, or, really, anyone, obey something we want them to by threatening, intimidating with severe punishment. But, by doing so, it will only work for a few times, shall we not

proceed with the punishment, which is a hard thing to do, and, frankly, most of us don't even want to proceed with the severe punishment. But there is another, better way, to do this, and it showcases a subset of the Induced Compliance Theory.

Such is the case with an experiment made by Elliot Aronson and J. Merril Carlsmith, in which 22 children enrolled at Harvard Preschool took part. The children were divided in two pairs, the Mild Punishment group and the Severe Punishment group. When asked what the favorite toys were, an analysis was made to rank the toys in order of preference for the whole 22 children, and the second most preferred toy was chosen as the forbidden toy. When the examinator left the room and left the children alone, not one child did play with it, but when the examinator came back after 10 minutes and told the children they could play with the forbidden toy, the children that were in the Severe Punishment group immediately started playing with that toy, while the children in the Mild Punishment group did not play with it. (Aronson, Carlsmith, 1963: 584-588)

So why is that? How come the children that were less threatened did not want to play with the toy? The answer is relatively simple: the children in the Severe Punishment group did not play with the toy because of the degree of punishment, and they did indeed experience dissonant cognitions, in the sense that the cognition of wanting to play was colliding with the cognition of being punished to do so. Therefore, when the punishment was removed, there was no further dissonance, there was no reason for them not to, because the only reason they wouldn't play is the severe punishment. But, the children in the Mild Punishment group experienced dissonant cognitions when they were told they could play with the toy again, in the way that the mild punishment devalued the toy, the degree of punishment was not strong enough and they had to justify themselves, for example, by thinking that the toy was not worth it anyway.

Worth mentioning is the fact that another study, made in 2012 by Nobuo Masataka and Leonid Perlovsky, was overseeing a similar message: does music affect these decisions? And they found out that the group of children that received Mild Punishment threats, but were also listening to a Mozart concert in the background, were more likely to play with the toy, indicating that listening to music actually helps reduce the cognitions that will stimulate dissonance. (Masataka, Perlovsky, 2012: 1-4) Another study, done by Spike W. S. Lee and Norbert Schwarz, made in 2010, confirms this fact, (Lee, Schwarz, 2010: 709) noting that the need to justify past reasons is alleviated by music.

2.4. The Free Choice paradigm

Have you been in a situation where it was quite difficult to choose? Of course you have, everyone has been through difficult decisions, it is a part of our lives. But have you noticed that, in most cases, you start to devalue the choice you didn't make and start to appreciate the choice you did, for reasons you can't really say? Well, we are talking about the Free Choice pattern.

To be more specific about it and let you know what it's about, Jack W. Brehm made a study, called 'Postdecision Changes In The Desirability Of Alternatives', where 225 sophomores from University of Minnesota were to rate various objects by preference, given the choice of picking one of two of the objects, and rate by preference again, in order to observe this matter, manipulating the dissonance. After picking one of the two preferred objects, the subject almost always rated the picked objects better and the left object worse. (Brehm, 1956: 384-389)

This is not to be confused with conflict of decisions. The conflict arouses when dealing with a difficult decision, manifesting itself by a long time to make the decision and hesitation, and it's more prevalent when the objects are not similar, but will not decrease if they were more similar, as long as not identical. (Jarcho, Berkman, Lieberman, 2010: 460-467) The dissonance in this part is what happens after making such choice. It is represented by the fact that one cognition is liking so-and-so parts about the object you didn't pick, and the other cognition being the fact that you didn't pick said object. So, in order to resolve this dissonance, we usually change the cognition is easier to change, and in this case, the only one possible to change: the fact that you like so-and-so about the object you didn't pick, and it manifests in the fact that you start to dislike said object. Another study made in 2010 by Louisa C. Egan, Paul Bloom, Laurie R. Santos, confirmed this pattern happening in young children and capuchin monkeys, (Egan, Bloom, Santos, 2010: 204-207) which can, hypothetically, translate into the idea that animals also have, at least, some measure of dissonance.

2.5. Effort justification

We have been put in very difficult or embarrassing situations, at least once. But what we may have not noticed is our change in attitude

regarding the people behind the embarrassing situation, after such event.

This pattern is about this. Let me put it this way, the bigger the difference between conditions and reward, the better our views will be towards the reward.

A study done by Elliot Aronson and Judson Mills, was made to observe this pattern. Subjects comprised of 63 female college students were split in three groups, Mild Condition, Severe Condition and Control group, each of which was to enter a sexual psychology group discussion. The difference between the groups was that the first group subjects had to read aloud obscene sexual words and explicit sexual passages from books, and the second group, Mild Condition, had to read aloud mild sexual words, to enter the group discussion, and the Control group did not have to do anything to enter the discussion. Afterwards, they would enter the discussion, and, at the end, rate the group, its people and its subjects of discussion, which was purposefully banal and bland. The study shown that the subjects in the Severe Condition group had the best attitude and opinion about everything. (Aronson, Mills, 1959: 177-181)

How so? Well, the dissonance happening in this case is shown by one cognition being the fact that they had undergone the initiation phase, which was painful and embarrassing, and the other cognition was the negative opinion about a group discussion so bland and boring. So, since we know by now that having dissonant cognitions produces pressure to reduce them, the subjects changed the cognition they could: their opinion about the group discussion, and, hence the overestimated attraction towards the members and talk subjects.

3. CAREER-RELATED ISSUES

Cognitive dissonance can imply various instabilities in our lives. They may cause anxiety, feelings of unease, discomfort, but in more cases it may cause feelings of anger, sadness and uncertainty. Other times it may cause what we perceive as great changes in our lives.

At least one certain paradigm can be found in military lives, and that is the Effort Justification paradigm, which we can find in hazing and initiation programs. People made to do embarrassing things are prone to thinking higher of the responsible group.

But what I want to get to, is to what extent does cognitive dissonance affect military pilots' lives?

In order to become a military pilot, you'd have to get thoroughly checked for any health issues, but including mental health. Supposedly, you have to be at least content with your life, so as not to risk doing too stupid. Also, on the other hand, you should be capable of focusing on your role, leaving behind any other personal problems while you enter the cockpit. We can see that cognitive dissonance may, at least, confuse us, and it wouldn't be really be beneficial to be potentially confused or unsure of something in the heat of the moment. But again, on the other hand, this phenomenon can lead to great choices in life, as the pressure to reduce dissonance is equal to the importance of the dissonance itself.

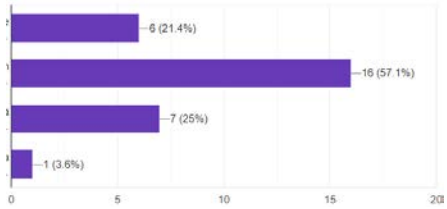
I would argue that it is not a huge matter, but still, it is good to keep an eye on, just to know what we are doing, and make sure we do not stray from our career path's lifestyle.

4. SELF-MADE STUDY

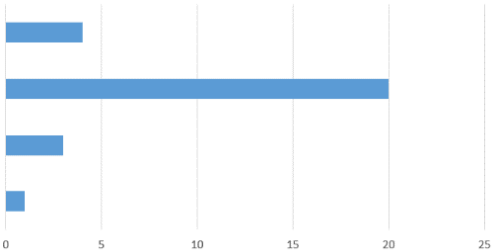
After a period of time of thinking about this subject, I decided to take matters in my own hands, by asking 59 pilot students to fill out a form regarding their opinion on this subject, and some questions that could confirm, deny, or stand neutral by the dissonance theory.

Out of 59 pilot students, 28 answered the questions, out of which half were smokers, which concerned two questions about smoking.

They were asked what should they ideally think if they were eating fast-food, and what would they actually think.



This is the 'What should you ideally think' chart, and the order is as follows: first column – 'I will give up eating fast-food', second column – 'I am allowed to eat now and then', third column – 'I will work this meal off', fourth column – 'This meal isn't unhealthy anyway'.



This is the 'What would you actually think' chart, and the index is as follows: first – 'I will give up eating fast-food', second – 'I am allowed to eat now and then', third – 'I will work this meal off', fourth – 'This meal isn't unhealthy anyway'.\

What I can interpret from these answers is a confirmation of a kind of awareness of having inconsistent cognitions. Some subjects know that eating fast-food is unhealthy, but while eating, they do think they are allowed now and then. But what follows afterwards, is a dissonance between the cognition that it is unhealthy and the cognition that they have ate fast-food.

When asked about why not give up smoking, 10 subjects also chose the 'Other answer' checkbox, raising suspicion that they also actively seek to avoid dissonance, because most of them agreed to smoking being unhealthy or having thoughts of giving it up while smoking.

But still, out of the 28 subjects, 24 agreed to the fact that knowing about cognitive dissonance is good, and that it may affect our lives, as military personnel, and not only.

What I can draw from these results is that people are aware of some sort of discrepancy between thoughts and actions, but also are hesitant to admit, probably because the mere fact that admitting it would lead to such phenomenon; but are also willing to learn more, to get to know about this theory.

5. CONCLUSIONS: IS IT BAD? IS IT GOOD?

My personal opinion.. it is neither. It is a way to know ourselves better, a way to decide which way to go is best, maybe a way to manipulate some opinions, as we have seen in the Free Choice paradigm. It can be bad, as it gives us negative feelings, the inconsistency within us causing a state of unrest, but the importance of the dissonance determines the pressure of resolving it, by changing one cognition. From that point onwards, it is up to us if it is good or bad.

This theory has long been appreciated and considered of great value. It sparked a lot of studies and inspired a number of researchers and psychologists alike to deepen the search of our mind. It has made its way into media as well, with artists' putting out songs and albums featuring this subject. It is, undoubtedly, interesting, at the very least, if not intriguing, to find out what actually happens behind the scenes, and how we subconciously deal with it, what happens when we choose something, and all this.

Thank you for your attention, and do not let your exploration of our mind cease, as you will find explanations you couldn't have imagined exist!

The human mind is so complex, that we will never understand it fully. More so, what we can understand, we should appreciate and learn not to fall in mistakes and run around in circles and clichées.

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ELEMENTS THAT MAY HAVE LED TO THE FAILURE OF THE UNITED NATIONS ASSISTANCE MISSION FOR RWANDA- UNAMIR, 1994

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Abstract: *The Rwandan genocide has been one of United Nations biggest failures since its insception, causing hundreds of thousands of deaths. Rwanda is the country that explored genocide, political corruption and the repercussions of violence, actions that should have been stopped by the UNAMIR, a mission that failed. UNAMIR was established by the Security Council as a peacekeeping force in Rwanda, with the main purpose of establishing a secure environment for a transitional government and planned elections and to coordinate humanitarian activities. This mission was plagued by problems from the beginning, due in large part to the lack of cooperation from the two parties involved, the minority Tutsis and majority Hutus, both of them demonstrating a willingness to use the instruments of the nation-state to oppress one another when they enjoyed power. After providing an overview of the civil war and genocide of 1994, presenting a brief history of the conflict and the reflection of it in the movie "Hotel Rwanda", this paper outlines the elements that may have led to the failure of the United Nations Assistance Mission for Rwanda – UNAMIR.*

Keywords*: UNAMIR; peacekeeping; genocide; ignorance; United Nations*

1. INTRODUCTION

Hotel des Mille Collins is a four-star hotel located in the capital of Rwanda, Kigali. It represented the accommodation for many Americans and Europeans who were living a luxurious life there, completely different to the lifestyle the people of Rwanda were accustomed to. Even when genocidal violence swept Rwanda, the manager of the hotel, Paul Rusesabagina, tried to maintain its high position and not transform it in a refugee camp. The hotel is a symbol of salvation because of the many refugees that the manager decided to protect inside it from the Hutu army and the people that wanted to kill them. In the middle of a cruel, dangerous and hazardous world, the hotel is a blessing, because of the kindness shown by the manager who is using all his resources to save the lives of his compatriots. Despite his appartenance to the Hutu tribe, he opens his door to the refugees. Thus, the hotel becomes the proof that reconciliation is possible. This place becomes symbolic for Rwanda, the country that explored genocide, political corruption and the repercussions of violence, actions that should have been stopped by the UNAMIR, a mission that failed. The name of the movie "Hotel Rwanda", mixing facts and fiction, highlights the importance of the hotel as it saved many lives and although it was small, it was an important blessing for the country. About the humanitarian attitude of the hotel manager, about the movie and about the particular success despite the collective failure, of the Rwandan government, one of the survivors of the real hotel, Edouard Kyihura, wrote a book in collaboration with Kerry Zukus (Kayihura & Zukus, 2014). If the efforts of a man like Paul Rusesabagina (the name of the character of the movie rather the name of the real character) managed to save the life of 1200 Hutu and Tutsi refugees, would it really have been impossible for the entire world to avoid the terrible tragedy that happened in Rwanda?

2. THE HISTORY OF THE CONFLICT

First and foremost, it is very important to observe the fact that the massacre would not have

taken place, unless there was a dispute between the two tribes, Tutsi and Hutu, which began many years before and is one of the acts that led to the failure of the UNAMIR. The Germans were the first European invaders of Rwanda and Burundi and they were the first to make a major differentiation between the two tribes. They have occupied the country in 1894 and are responsible, together with the Belgians, for the hatred between the two groups. The German Colonial Administration have studied the racial characteristics of the people from Rwanda and decided that the Tutsis have European characteristics, with a tall appearance and a light skin color. These were sufficient arguments for the Germans to think that Tutsis were more evolved and more intelligent. After the end of the World War I, the country was occupied by the Belgians and they continued to make this unjust distinction between the two groups. Thus, they gave them good jobs, well-paid and high-state positions. The greatest error made by the Belgians was the introduction of the ethnic identity cards. It is important to consider the fact that there is an unresolved debate as to whether the Hutu and Tutsi are ethnically distinct. They were following the same religion, they were speaking the same language and they were sharing the same history as far back as the 16th century. The Tutsi were a minority of the population of Rwanda and the Belgians gave them the power to control the state. After they have left, the power was taken by the Hutus which then started to revolt against Tutsis, as revenge. The conflict between Tutsi and Hutu tribes leads primarily to impossibility of defining Rwandan identity, as Newbury (1995:12) pointed out: „… the ambiguity of defining Rwanda was not only a product of differing views between the power holders and the powerless, it was also an ambiguity apparent with ruling class, as the state sought both to expand territorially and to consolidate its power internationally. At times the court defined being Rwandan in terms of upper-class court values… At others the court defined Rwandan culture by language alone…" (*apud* Jefremovas, 1997:93).

3. THE CONFLICT REFLECTED IN THE MOVIE

In the cinematographic creation "Hotel Rwanda" there are presented some relevant scenes from which we can observe the hatred between the two tribes. The movie begins with a statement from which we can see the intensity of the conflict and the hatred between people "When people ask me why do I hate all the Tutsi I tell them to watch their history". The fact that there is no relevant difference between the tribes is implied by the scene when two friends were hanging out and a journalist from the US observed that although they were not part of the same group they looked similar. The height, which was one of the criteria when distinguishing the two ethic groups, is highlighted by the phrase used by the Hutus to start the revolt "Cut the tall trees". The failure of the UNAMIR was determined to a great extent by the intense hatred between the tribes that was cultivated a long time before and could not be stopped or ameliorated with a mission like this. This hatred is highlighted by some cultural elements such as, the different types of clothes that they were wearing (Hutus were dressed with colorful clothes, while Tutsis were dressed with simple and some of them poor clothes). Something that was built and amplified throughout many years could not disappear in a short period of time and stop immediately.

Secondly, the bribery that existed even before the genocide represents another element that may have led to the failure of the UNAMIR. People were accustomed to making illegal items in order to make money, using their power to achieve different commodities and maintain a good relationship with influential people. A corrupt society should not expect its people to be honest and to respect the rules imposed by the UNAMIR. There are many elements that highlight the general corruption in Rwanda, from the civil life, up to the government and the army. Consequently, corruption is the proof of people's immorality, a characteristic that had led to the genocide and the failure of the UNAMIR. In support of this argument, the movie shows some cases when people's lives revolved around corruption: a business man says that "The politics mean power. The power means Hutu. And money". He deals with guns smuggling, he is an important person who leads the manifestations of the Hutus, but seems to be a good person who occupies his time with the food distribution business. Paul Rusesabagina, the manager of the Hotel des Mille Collines from Kigali, used to give cigars, scotch, beer and money to the powerful people from the society in order to gain their support. Paul gets his family and friends into the hotel by bribing a local general. He paid the army to save his family's life, neighborhoods and many innocent people. According to the film, Rusesabagina bribed the Hutu army with money and alcohol to protect

them and to obtain food and water. Furthermore, the people that were staying at this hotel tried to save their life by calling important people, with high-state positions from Europe, who could do something to stop the massacre. In fact, the right to live was determined by the relationships they had, which is utterly unfair and it was breaking the civil rights. In addition to this, people's immorality is demonstrated by the fact that they did not respect the agreement from de UNAMIR by killing the president.

4. SOURCES OF UNAMIR FAILURE

There are a lot of papers and books which analyze the causes of UNAMIR failure, such as Jentelson (2000) or Grünfeld & Huijboom (2007). One of the elements that may have led to the failure of UNAMIR is represented by the lack of implication of the two countries that had direct interests in this conflict, Belgium and France, but also the alliance between France and the Hutus. In addition to the fact that Belgium is guilty to an extent for the disputes between the two groups, disagreement that obviously led the failure of this mission, this country is guilty for indifference and for helping the genocide by non-involvement. Belgium had troops in Rwanda, but the UN's mission was not given a mandate to stop the killing, forcing them to stay there and watch the massacre happen right under their eyes. Belgium was a country that supported the initial operations of UNAMIR, but because their troops were in danger, the government and the public went back on their world and were no longer committed to the mission, retreating the troops. Despite the elements presented earlier, we must consider the fact that Hotel des Milles Collins was a safe place because the Hutus were afraid of the Belgian troops that were supposed to be there and protect it. When looking at France, matters are a little different as it was a member of the Security Council with national interests in Rwanda which is why they did support UNAMIR. The French were allies of the Hutu government and they supported and financed the Hutu army. If this army was not funded by France, it would not be able to start the killing because of the lack of resources. Moreover, an article published in august 2008 by BCC News declared that a Commission from Rwanda announced France's genocide preparation stating that France prepared the military of the Hutus who were responsible for that massacre. What should also be taken into account is that despite all these hypotheses, France was the only country who finally sent armed troops in order to stop the massacre.

When looking at the failure of UNAMIR we should also consider the lack of prevention demonstrated by the UN. There is a strong argument to be made for the UN's failure in collecting relevant and important information about what was really happening in Rwanda and about the tense situation between the tribes. The UN was poorly organized when collecting and flagging information about human rights violations and certainly genocide. It is clear that lacking a proper system for identifying and anticipating a possible UN involvement, the Security Council was hindered in its ability to respond. It is believed that only the non-governmental organizations were the ones who gave information to the UN, therefore making it filtered and unofficial. However, it is said that some information about a planned and organized coup d'état was sent to the UN, but they refused to take any measure in order to prevent it. A report concluded that "Information on the genocide under way was already available when the final decision was made to reduce the force dramatically". Even though the UN would not have enough information to anticipate the killings, there were sufficient proofs available as the crisis unfolded to act decisively. As the Secretary general declared: "It is difficult to accept that member states with more intelligence-gathering capabilities than the UN did not know what was happening."

Another key element is the way in which the UN did not accomplished their purpose and mission in Rwanda. Being the most powerful and authentic organization in the world, with the main role of maintaining the peace and helping countries to resolve their issues, they were expected to intervene and stop this catastrophe. Despite the fact that theoretically the presence of the UN should have been beneficial, it did not represent a support for the ones who tried to prevent and then stop the genocide. There are some mistakes that have been made by the UN and the greatest one is abandoning in the middle of the crisis. When the situation escalated they decided to retreat their troops and not to send more. Moreover, their presence there was useless considering that they did not have a mandate to intervene and take measures in the middle of the massacre. The rules of the engagement were to be defensive rather than based on "enforcement action", so the UNAMIR troops could act in a limited way to save lives. In

addition to this error, we should consider the incapacity to take any effective action in a timely manner. UNAMIR could have saved so many lives if there was a mobilization to send troops, taking into account that the big attack started a month after the beginning of the killings. A military action could have been effective during the first weeks. To give an illustration on these topics we should remark the scene from the movie when UN's soldiers were watching the massacre, not being able to do anything without a mandate "We are here as peace keepers not as peace makers. My orders are not to intervene" (burbles Oliver – based on real-life Canadian UN General Romeo Dalaire – as children are hacked to death with machetes all around him).

Not only the elements described earlier, but also the ignorance of the international community have led to the failure of UNAMIR. There was little interest in Rwanda both before and during the genocide crisis and only France and Belgium had direct interest in the area. The reaction of the most powerful countries in the world at the time, including the US, is extremely disappointing. It was expected from them and from all the people around the world who knew about the killings from the news to try to stop them and to intervene effectively in Rwanda. The international response to the call for UNAMIR II troops was underwhelming, as no major power came forward to support the operation and there was no government that had troop standby arrangements with the UN that agreed to participate. There can be little doubt that the international community was well aware of the seriousness and nature of the crisis early on in Rwanda. There are some scenes in the movie that submits the cruel and indifferent world in which we live, such as the scene where the UN organization sent some troops to save and take the Europeans and Americans from the hotel, while the people of Rwanda was left to die. A sign of discrimination between the black and white people is represented in the scene where the general of the UN troops told the manager of the hotel that they do not matter for the world because they are black, so they were not important for anybody. An emotional statement is revealed by Paul as he says what would be the reaction of the people who would watch the massacre in the news "'Oh my God, it's horrible', and then they will continue to eat their dinner". However, we should not omit the presence of the non-governmental organizations such as The Red Cross, UNICEF, Medicines Sans Frontiers, who helped many people with food, medicine, shelters and relieved the gravity of the situation in this way. Maybe the presence of more organizations like these would have led to the success of the UNAMIR.

5. CONCLUSIONS

Taking into consideration all the actions that took place, the lack of some moral values to whom the actions are subordinated have led to the infiltration of the hunger and insanity for power, selfishness, desire for war and revenge, indifference and lack of compassion. These aspects are the roots of all the arguments presented in this essay, elements that I believe that have led to the failure of UNAMIR in the context of the tragic genocide from Rwanda in 1994. The genocide is surely the responsibility of the Hutu's extremists, but it cannot be denied that the lack of intervention of the UN and the international community are not responsible for it too.

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WOMEN IN THE MILITARY

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Abstract: *In a specific male area, such as the military one, women who have chosen this career and excelled in a wide range of fields, inevitably taking up leadership positions, have had a strong social impact over time. They have crossed the barriers of a mindset and continue to do so today. About these women, living models of devotion for the country, first of all, there is still too little talk. They have marked history and are still among us today. The Romanian army, like other armies of the world, has general women, but also young fighters who wonder about the professionalism with which they carry out their missions. It is enough reason for women to be encouraged to enter a career full of deprivation, such as military. Especially that there are areas in the army that need femininity.*

Keywords: *military organization; military man; men vs. women; psychological aspects; difference;*

1. INTRODUCTION

Initially, a military organization represents the entire structure of the armed forces of a given State. Its aim is to ensure all the military capabilities required for national defense policy. Regardless of the political or economic system of the States, military organizations around the world are similar. Such an organization is based on a collectivist principle: Any type of military activity is organized, carried out and completed in a group context. Also, a key feature of the activities of the military organization is the need for certainty. The latter is important in terms of the deployment of military actions and activities, with the aim of reducing the rate of loss of staff or territories of that State. (Moskos, 2005)

Military personnel work in difficult conditions that have the ability to endanger life -- the predominant side of military activities is the armed struggle. Long periods of armed fighting, stress, loss of herds, loss of sleep are all factors that have a strong impact on human psychic. This requires that military personnel receive specific training, both physically and mentally. However, this training cannot entirely eliminate the characteristics of the personality traits of the human individual: there are certain temperature limits, for example, which need to be balanced and which require the learning of techniques to compensate them in a way beneficial to themselves, but also for the situation of military personnel (Zeigler, 2005).

Emotional stability is a key factor: under certain circumstances, orders to be carried out by a military may have an extremely strong emotional impact, which is why it must remain emotionally stable in order to ensure that the military mission's objective is met, but also to be able to resist in the context of armed fighting. At the same time, emotional stability is needed to protect other military colleagues. Awareness facilitates the exact execution of orders and the achievement of objectives, together with fairness in relation to the military debt that the individual has taken upon from the time of acceptance of membership of the military organization. As for conformism, it is necessary for strict compliance with military rules and, by implication, for the execution of orders received from superiors.(Breland, 2017)

Loyalty and devotion are a number of facilitators in the performance of the military's own duties and in respect of orders from the superiors. Courage is clearly an important quality in the context of armed missions or which may endanger life. Discipline is essential, given that military activities are carried out in a collectivist manner and that the success of the mission, together with the survival of those involved, depends on the synchronization and respect of their roles, as well as on the respect of the combat techniques learned during training and simulation. Just like in the case

of conformism, subordination facilitates compliance with military norms and position in the military hierarchy, while humor aims to ease tensions.(Dimian, 2019)

2. WOMEN IN THE MILITARY

Whatever the case, female identity seems to be established as a new identity in the workplace, in relation to successive career stages, individual social characteristics and origins. The setting up of this new female military figure is part of the men's domination, the changing conditions for admission to the military group (skills, contracts), in terms of balance with family life and hopes of professional ascension, with everyday compromises in terms of adaptation and differentiation. A woman to succeed in a military career must necessarily be fully integrated into the military institution. The process of introducing women into the military field is progressive. In this chapter, I address issues related to obstacles encountered by women in their military careers. I believe that these are very important for forming a broader perspective on this continuous and irreversible process of feminization of the army.

2.1 Are there differences between men and women in the capabilities required to carry out military activities? There is a clear difference between male and female gender in physical structure, with significant influence on the physical capabilities required for a military. A fundamental aspect of gender differences is the menstrual cycle of women, which has strong involvement in the ability to carry out the activities required by the military environment. Although the symptoms of the menstrual cycle may differ depending on the metabolism of each woman, there are some common characteristics for each of them, such as weakening resistance to physical effort and increasing difficulties in carrying out military tasks, especially physical ones.(Radu, 2019)

Biological limitations are another important element in the gender gap in the military environment. Women are at a disadvantage compared to men in terms of their ability to maintain resistance to effort and physical power, but also because of the ways in which the body is affected by wounds and mission trips. In a study by Cerveld (2001), military women recorded 55% of the muscular power of male colleagues and 67% of their physical resistance. The researcher also recorded that military women between the ages of 20 and 30 showed the same aerobic abilities as men at the age of 50. (Carreiras, 2008)

There are also differences in cognitive functions between women and men. It seems that women are much more likely to react in an unexpected way to stress factors, which directly and negatively affect their diet. A much more precise example is the following: A long armed struggle situation prevents the possibility of normal diets, which, in addition to the stress caused by the threat of fighting, can lead to a disorderly and poor diet for military women. In addition, according to Carrieras (2006), the ability to concentrate and maintain attention in the case of the military woman is affected by her family structure -in other words, her responsibilities within her own family. The greater the responsibilities and concerns at home (especially those relating to children), the weaker the participation in military activities.

2.2 Do women have access to all military specialties? In 1939, at the beginning of the second World War, women from countries involved in the war joined various civil defense unit groups, resistance groups or military organizations. Although the United States only entered the war in 1941, women have been involved in aviation, civil defense and medical care since 1939. At the end of this war, there were 277,000 women in the US military. Even so, only a part of the women were kept in US military organizations, especially nurses. In 1948, the US military organization prohibited the participation of women from the naval, marine and air forces in armed fighting and the possibility that those from the naval or marine army might be on a warship of the military, the only exceptions are health care and transport boats. During the years 1970, women were allowed to become officer and to order and supervise men's military. Separate promotion lists were excluded, and women and men could compete for the promotion simultaneously. At the same time, the changes in that period allowed women to take up positions of specialists in aviation, in the sea and in combat rockets. (Duțu,2007)

In Europe, between 1957 and 1987, out of the 20.000 UN peacekeeping troops, only 20 were women, and they dealt with healthcare. In 1993, about 1,7% of peacekeepers were women. As far as our country is concerned, in 2015 there were about 1800 women enrolled in the army, and some of them benefited from the degree of colonel. In 2003, women from the Romanian army were allowed access to positions they could not access so far.

2.3 Involvement of military women in combat missions. In the case of a military woman, we can talk about a double exposure to danger in combat missions: The danger of being injured or

killed by the enemies, as well as the danger of being raped, both by the enemies and by their own comrades. In combat missions, sexual assault is one of the most significant factors in terms of affectation of military women. One argument against the existence of a military woman in these missions is the "need for male aggressiveness", which is cited by the mission's critical situation or armed fighting. Sexual harassment is considered to be a factor with strong implications for the inability of women to advance or cope with armed missions, a factor which has more implications than physical (in)capacity. One way of solving the problem of sexual harassment is to improve the determination of permitted conduct within the military organization, but lack of privacy, confined spaces and intense working environments, together with deportations abroad, are factors that hinder or hinder the application of this solution (Zeigler & Gunderson, 2005).

In the combat missions of the wars in Iraq and Afghanistan, the main stress factors of military women have been assault and sexual harassment, gender harassment or a lack of positive people-to-people relationships, along with experiences in emergency rooms, the perception of danger during patrol in unsecure areas, and fear of explosives on the routes they led . An important aspect of the positive impact that the Vietnam war has had on military women, in particular military assistants, is to benefit from the experience resulting from the responsibilities imposed by the specialization they held. In the Iraqi war, many women were trained to search and search Iraqi women at various checkpoints. That responsibility shall be considered to place the military woman at a level of risk as high as that of the military man and that the women who participated in the Iraqi war have lived, worked and fought with men for a long period of time, with the utmost discipline and no negative effect on group cohesion of the units within which they belonged. (Jeffreys, 2007)

2.4 Increase the share of military women. The increase in the proportion of military women or the "feminization of the army", as some foreign authors call it, is a complex process that characterizes the evolution of national armies in the world's democratic States after 1990. This process has been triggered by the democratic society in which the military institution is established that has implemented the principle of gender equality. On the other hand, the increase in the share of military women constitutes a major dimension of the reform of the military institution.

A woman, in order to succeed in her military career, must necessarily be fully integrated into the military institution. A mere adaptation to the military environment is insufficient to gain access to high positions and grades in the army (Duțu, 2007).

Also, while there are countries that accept women in combat positions, other countries do not. Similarly, some countries send women on missions outside national territory, sometimes not far from "fire", other countries do not. Finally, the rate of feminization of the armed forces varies quite from country to country.(Mattocks, 2011)

The increase in the number of women who have chosen the military profession is seen as a kind of link between the army and the society to which the latter belongs. The privileged proximity of women to the army is therefore "societal", in other words, society has led the army to receive women as soldiers. Today, women officers, underofficers and military can meet under contract in all categories of armed forces. In the French Army, for example, in 2004, female officers accounted for 8,4% of all officers, 11% of all sub-officers and 15% of contract soldiers.

Four factors are said to explain, in the Western world, the increase in the number of women-militaries in the army. On the one hand, society is pushing for recognition of the important role of women in professional circles. On the other hand, the women-soldiers demand an improvement in their career prospects. Then, valuing physical force, once essential in the army, is giving way to mastery of technology, which favors women. Finally, the new generations of political leaders of European countries are favorable to the inclusion of women in the army.(Helmer, 2015)

It should be noted that the integration of women into the military environment has been progressive. Today, women are increasingly in operational positions. They are present in all hierarchical categories and almost in all groups. However, they are unequally represented in some hierarchical functions. These disparities are due to historical, time-related reasons (usually shorter career paths than men), sociological reasons and the effects of the socio-demographic composition of the female population.

This evaluation study was carried out at the Air force Academy in Brasov, more specifically at the level of the students at the institution. The purpose of the questionnaire was to gather the participants' opinion on the women's profile within the military. But at the same time to highlight the emancipation

of women in contemporary society and to highlight the differences in mentality between generations, by comparing this questionnaire with the research carried out over the years.

The questionnaire was applied online through video conferences from 10 to 24 January 2021.

- Male participants: 47.
- Female participants: 24.

At the end of the research, observations and feedback from the application of the questionnaire were collected, analyzed and centralized.

After the application of the questionnaires and the collection of the replies, the data have been processed and interpreted statistically for each size and we are specific. Below is the analysis and interpretation of the data obtained, supported and illustrated by relevant graphs.

After collecting and analyzing responses on the exclusively male component of the military field, the majority of participants (66) considered that women should be integrated into military activity and the minority (3) considered that it should be exclusively composed of men. [Fig.1]

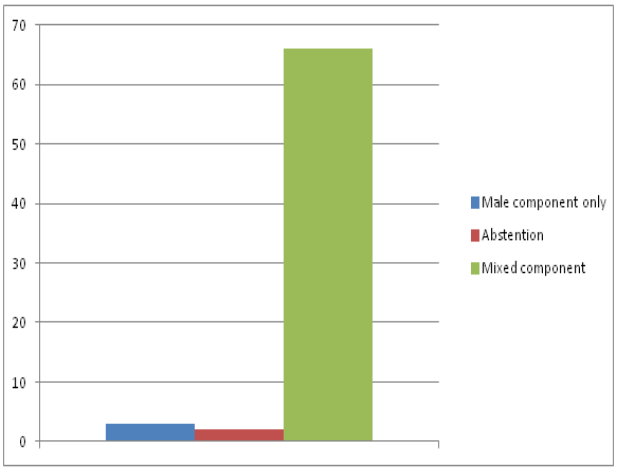

Fig.1. Centralizing responses

The questionnaire launched the subject of the resistance of military women in military combat activities. The survey revealed that 35 participants consider that female soldiers have equal resistance with men, 27 of them lowered the idea of equality between men and women in the context of resistance, 9 did not respond.

The qualities of a military in armed missions are physical ability, resilience to effort and adaptability. Participants have been assigned to rank according to importance, their responses are represented in the chart below. [Fig.2]

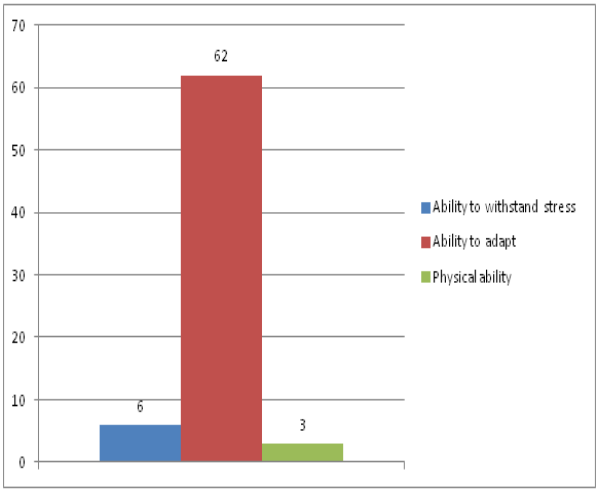

Fig.2. Military skills

Based on women's awareness of the risks assumed in combat missions, we have listed three of their most common from both the enemies and military colleagues. The participants placed the same risk on the same place as men's body wounds and aggressiveness, placing sexual abuse on their last position. The graph below shows the survey responses. [Fig. 3]

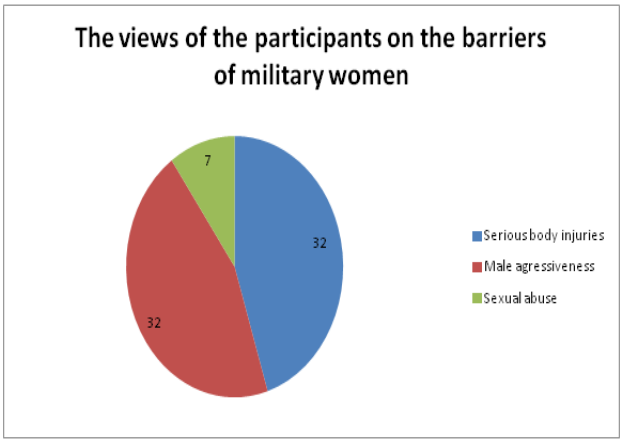

Fig. 3 Survey on women's military barriers to taking part in missions

Following the application of the questionnaire at the level of military students from the Air force Academy, we reached the conclusion that the process of integrating the female gender in the military context is progressive, with a reaction to support the increase in the number of women in the army.

3. CONCLUSIONS AND LESSONS LEARNED

The fact that the UN and the Member States only seek to count the number of women in the uniform employed in peacekeeping operations makes the goal of mainstreaming the gender perspective into the field missions even more obscure. Both objectives are hampered by three main issues: (1) the lack of understanding of Resolution 1325 and the UN policy and guidelines on gender equality in peace operations; (2) the prevalence of social standards and prejudices that perpetuate gender inequality in the security sector and (3) insufficient mechanisms for the recruitment and promotion of women in the armed forces, plus the gap in data and analyzes of gender equality. Women in senior military posts. What are the possibilities of women who achieve the highest rank in the national armed forces and when could women be at the helm of armed forces? Although there is no data on this subject, it is well known that lack of experience in fighting or lack of experience in leading a conflict battalion may restrict women from taking up leading positions in the country, as well as in UN peacekeeping missions.

Traditionally, family responsibilities are seen as a basic barrier for the enrolling and preservation of women both in national armies and in UN peacekeeping missions. However, there is no exact information why and how family concerns would be a barrier for women. Women are bearing higher opportunity costs to participate in UN peacekeeping operations, in part, due to the professional advancement they would benefit from if they stay in their home country and use military service as a springboard for opportunities outside the army. Leave also threatens the social benefits enjoyed by many women in Western countries, such as childcare, health care benefits, as well as maternity and pay leave. If they go on a one-year mission, they can lose many, if not all, benefits.

On the other hand, many of those interviewed also mentioned that for women in non-Western countries peacekeeping missions can be attractive, given the value of UN allocations (around USD 1000 per month), at the same time, They "may not be supported by someone else to take care of their families while they are at work" or "do not have a safe job" and therefore "will not be in the same job when they return [home]". Lack of experience in the handling of firearms and hand-operated vehicles can be another barrier for women's entry in UN peacekeeping operations.

Following the application of the questionnaire at the level of military students from the Air force Academy, we reached the conclusion that the process of integrating the female gender in the military context is progressive, with a reaction to support the increase in the number of women in the army.

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DRESS CODES, UNIFORMS, AND THEIR INFLUENCE ON BEHAVIOR

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Abstract: *A major role in social interactions is played by dress codes, dress code policies, and uniforms. These have inherent psychological effects on people, whether they are the wearers or not. The author reviewed articles and books, along with internet resources on the subject to try to shine light on just how deep the implications of uniform effects really go. Also, a short survey was made to gauge a military academy's students' response to uniform and dress code-related questions, in order to confirm behavioral change related to these. Results were positive, as a majority. One end of the spectrum had the predicted (positive) response, while on the other end, a minority reported neutral or negative responses.*

Keywords: *dress code; uniform; behavior; influence; military*

1. INTRODUCTION

People wear different clothes for different occasions. This behavior is known as a dress code, and it plays an important part in our daily lives. Only some outfits are acceptable in certain situations. This naturally implies that there are unacceptable ways of dressing for occasions and in social groups, something that creates discomfort on both sides of the interaction. The improperly dressed individual feels uncomfortable, and other people will notice, too. This, in turn, might make the individual feel socially segregated. Moreover, improper attire might disadvantage one in a professional setting.

Uniforms are an integral part of dress codes, and they play an important role in the image of a certain institution (Šterman, 2011). This applies to school uniforms, law enforcement uniforms, military uniforms, work uniforms, and many others. They provide a sense of unity (among several other effects) to the people that wear them, they feel included, as is the tendency of humans.

A dress code is a means of communication, just like a language, albeit not as complex. A police uniform, for example, should elicit a feeling of pride to the wearer, and respect or even fear (Šterman, 2011) from those who see it. Moreover, the existence of dress codes and uniforms can make the wearer socially invisible, people only noticing the uniform: a saying goes that a high-visibility jacket and a clipboard can get you virtually anywhere.

People's behavior changes when near an official looking person, in uniform. They are more inclined to listen to the wearer and consider them knowledgeable. Moreover, a uniform can empower, identify, or cloak the wearer: it creates a sense of unity, but also deindividualizes. It has sociological effects, establishing a hierarchy. The old adage "clothes make the man" does generally apply.

2. UNIFORM. BEHAVIOR.

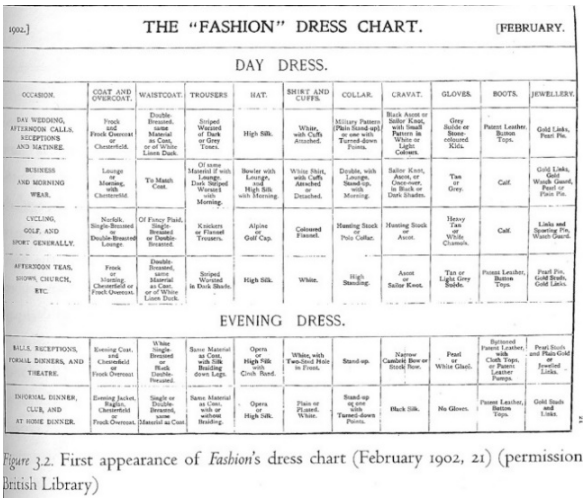
According to the UK Cambridge English Dictionary, a dress code is an accepted way of dressing for a particular occasion or in a particular social group. Or, the US version: a set of rules for what you can wear (Šterman, 2011). A **uniform** is a collection of interconnected pieces of clothing that are to be worn together to denote a certain look and to distinguish the wearer from others. By extension, military uniforms, the centerpieces of military dress code, are standardized and distinguishable forms of dress that differentiate soldiers, airmen, and sailors form civilians (Krueger, 2012). The Merriam-Webster dictionary (2021) defines **behavior** as the way in which an individual conducts or manages the actions of oneself in a particular way. A person's behavior can be changed by a uniform, applying to both the wearer, and the people who interact with or see the

wearer. If the environment in which a person conducts their activity employs the use of uniforms, a positive impact on performance and behavior will be observed in that individual (Karch, 2017).

3. DRESS CODE

In the following subchapters I will be introducing the dress code categories and their military counterparts, plus dress code policies. I will also tackle the subject of formal versus informal and cite several sources on the subject.

3.1. Dress code categories. In this paper, for the sake of simplicity, only the subject of Western dress codes will be tackled, as fashion and dress culture are highly varied. Generally, the same principles apply there, too. When discussing formal *(full dress)* and semi-formal *(half-dress)*, their meanings have largely remained the same. In 1902, *Fashion* comprised a chart of dress codes (Fig. 3.1.), although definitions of individual codes were looser.



1902.] THE "FASHION" DRESS CHART. [FEBRUARY.

DAY DRESS.

OCCASION.	COAT AND OVERCOAT.	WAISTCOAT.	TROUSERS	HAT.	SHIRT AND CUFFS.	COLLAR.	CRAVAT.	GLOVES.	BOOTS.	JEWELLERY.
DAY WEDDING, AFTERNOON CALLS, RECEPTIONS AND MATINÉE.	Frock and Frock Overcoat or Chesterfield.	Double-Breasted, same Material as Coat, or of White Linen Duck.	Striped Worsted of Dark or Grey Tones.	High Silk.	White, with Cuffs Attached.	Military Pattern (Plain Stand-up) or one with Turned-down Points.	Black Ascot or Sailor Knot, with Small Pattern in White or Light Colours.	Grey Suède or Stone-coloured Kids.	Patent Leather, Button Tops.	Gold Links, Pearl Pin.
BUSINESS AND MORNING WEAR.	Lounge or Morning, with Chesterfield.	To Match Coat.	Of same Material if with Lounge, Dark Striped Worsted with Morning.	Bowler with Lounge, and High Silk with Morning.	White Shirt, with Cuffs Attached or Detached.	Double, with Lounge, Stand-up, with Morning.	Sailor Knot, Ascot, or Once-over, in Black or Dark Shades.	Tan or Grey.	Calf.	Gold Links, Gold Watch Guard, Pearl or Plain Pin.
CYCLING, GOLF, AND SPORT GENERALLY.	Norfolk, Single-Breasted or Double-Breasted Lounge.	Of Fancy Plaid, Single Breasted or Double-Breasted.	Knickers or Flannel Trousers.	Alpine or Golf Cap.	Coloured Flannel.	Hunting Stock or Polo Collar.	Hunting Stock or Ascot.	Heavy Tan or White Chamois.	Calf.	Links and Sporting Pin, Watch Guard.
AFTERNOON TEAS, DRIVES, CHURCH, ETC.	Frock or Hunting, Chesterfield or Frock Overcoat.	Double-Breasted, same Material as Coat, or of White Linen Duck.	Striped Worsted or Duck Shades.	High Silk.	White.	High Standing.	Ascot or Sailor Knot.	Tan or Light Grey Suède.	Patent Leather, Button Tops.	Pearl Pin, Gold Studs, Gold Links.

EVENING DRESS.

BALLS, RECEPTIONS, FORMAL DINNERS, AND THEATRE.	Evening Coat, Chesterfield or Frock Overcoat.	White Single-Breasted or Black Double-Breasted.	Same Material as Coat, with Silk Braiding down Legs.	Opera or High Silk, with Crush Band.	White, with Two-fold Note in Front.	Stand-up.	Narrow Cambric Bow or Stock Bow.	Pearl or White Glacé.	Buttoned Patent Leather, with Cloth Tops, or Patent Leather Pumps.	Pearl Studs and Plain Gold or Jewelled Links.
INFORMAL DINNER, CLUB, AND AT HOME DINNER.	Evening Jacket, Raglan, Chesterfield or Frock Overcoat.	Single or Double Breasted, same Material as Coat.	Same Material as Coat, with or without Braiding.	Opera or High Silk.	Plain or Pleated White.	Stand-up one with Turned-down Points.	Black Silk.	No Gloves.	Patent Leather, Button Tops.	Gold Studs and Links.

Figure 3.2. First appearance of *Fashion*'s dress chart (February 1902, 21) (permission British Library)

3.1. 1904 "Fashion" dress chart
(https://en.wikipedia.org/wiki/Western_dress_codes)

Varying on the level of formality, dress codes range from casual to formal, or full dress. The military equivalent for formal, is the full-dress uniform, which are worn at parades, ceremonies, and receptions. Civilian full evening dress is also called white tie and is considered most formal. Usually, floor length gowns and black dress coats (with matching trousers) over white shirts, with white waistcoats and a white bowtie.

A modern equivalent for the aforementioned chart would be this (Fig. 3.2.):

Formality	Day	Evening	Military	Ladies	Supplementary
Formal wear i.e. *"Full dress"*	Morning dress	White tie	Full dress uniform	Ball gown	Ceremonial dress, religious clothing, folk costumes, orders and medals, etc.
Semi-formal wear i.e. *"Half dress"*	Black lounge suit	Black tie	Mess dress uniform	Evening gown	
Informal wear i.e. *"Undress"*	Suit		Service dress uniform	Cocktail dress	
Casual wear	Anything considered inappropriate for more formal occasions				

3.2. Modern "Fashion" Chart Equivalent
(https://en.wikipedia.org/wiki/Western_dress_codes)

Semi-formal dress is known as mess dress in the military, and it is the slightly less formal option for ceremonies and celebrations. Civilian half-dress, also known as black tie, consists of a fashionable and acceptable evening gown or dress. For men, a black dinner jacket or tuxedo (and matching trousers) over a white shirt, and a black bow tie is required. It is noteworthy that creative black tie is largely the same thing as black tie, but the event leaves room for creativity (e.g., the ability to use colors, textures, and accessories). Informal dress refers to the military undress or the service dress uniform. It is worn every day at office jobs or other informal occasions. It is equivalent to the civilian suit. In the civilian world, informal means wearing a cocktail dress or "little black dress" for women, and a suit with matching tie for men. The combat uniform (or battle dress uniform – BDU) sits in the casual category, as it is supposed to be worn during training and operations, events which do not require any sense of formality. Moreover, comfortable clothes are required for these activities. Civilian casual style is intended for comfort and does not require any special attire (emilypost.com/advice/attire-guide-dress-codes-from-casual-to-white-tie).

3.2. Impact of formal and informal attire. The main style difference between formal and informal affects people's view upon the individual, mainly trustworthiness, likeability, credibility, and expertise (Sebastian, 2008). In their study, the researchers wanted to see whether style of dress, along with form of address would impact students' perception of their professors. Some say that this is natural, and it does generally occur (Morem, 2005, Seitz, 2000, Sabath 2000, in Sebastian, 2008), underlining performance, attendance, and

motivation, along with behavior influences, making the students more interested and more respectful towards the professor. To summarize the results of the study, the researchers discovered that: formal dress in formal situations and informal dress in informal situations increased the trustworthiness of the professor, as well as their credibility. Gender-wise, women appeared more credible in casual attire rather than formal, and for men it was the other way around. Results pertaining to likeability were that casual dress made professors more likeable than formal dress, indifferent of gender. It is noteworthy that for some reason, both in formal dress, women seemed less likeable than men. The study ends with a conclusion that in universities informality is rising and becoming more popular.

On the same paradigm of students, they overwhelmingly stated that they preferred to work in places where the dress code is business casual, rather than formal (Cardon, 2009), despite the fact that most young students or graduates looking for a job are told to dress up: most people make initial decisions about you in the first five minutes they meet you (…) Does your clothing say 'I'm an up-and-comer' or 'I'm inept'? (Lorentz, 2008 in Cardon, 2009). Because of this, and because a lot of interviewers put great accent on dress, potential interviewees dress up to look the part, and come to embrace the casual/business casual style after being hired. I believe that it makes sense to lose the formalities and to focus on the thing you are hired to do, rather than exuding formality. It is recommended that young professionals become aware that dressing up more formally is commonly associated with desirable professional characteristics, and that employers take into account that the young workforce prefer business casual attire, and a generally more lenient workplace dress code (Cardon, 2009).

3.3. Dress code policies. This simply dress codes are separate from the dress code categories (white/black tie) discussed above, as policies refer to uniform wear in certain settings and environments, such as at school or at the workplace. During school, these policies are enforced to teach young students about appropriate and inappropriate dress (Freeburg, 2016), and to also reduce discrimination based on clothing, and peer pressure to acquire higher-end garments (LaPoint, 2003 in Freeburg, 2016). Supposedly, uniform wear enhances the physical and psychological safety, as students are significantly less inclined to bring expensive items to school, such as designer wear and accessories, thus decreasing the chance of aggression from others (Workman, 2006 in Freeburg, 2016).

Also, dress code policies in schools have a pacifying effect on students, as hate symbols some may wear on t-shirts and such are replaced by uniforms (Freeburg, 2016). As such, among children or young adults, who are more vulnerable to and predisposed to use obscenities and vulgarity, the ruling out of possible sources of conflict has a beneficial effect. It is said that there isn't enough empirical data on dress code influence (Gurung, 2017), but it is acknowledged that there is some sort of link between school dress codes and decreases in disruption, peer pressure, indecency and violence (Anderson, 2002 DeMitchell, Fossey & Cobb, 2000, Holloman, 1995, Siner, 2017 in Gurung, 2017). Also, dress codes contribute form a company's image, and influences people's rating of the services provided (Easterling, Leslie & Jones, 1992, Hay & Middlemiss, 2002 in Gurung, 2017).

4. UNIFORMS. MILITARY UNIFORMS.

Their use is ubiquitous, whether found on schoolchildren, boy scouts, bus drivers, employees of a company, priests, security personnel or members of the military (Pfanner, 2004). Members of the police are required to wear them in order to differentiate themselves from everyone else, and to ensure that the organization's goals will be attained, while ordering priorities for the individual (Joseph, 2009). This change of priorities appears because the individual is no longer separate from the group when wearing the uniform. Their priorities change from their own to the organization's. Individuals may perceive a loss of own personality whilst on duty (Karch, 2017).

Uniforms are also significant from a communication standpoint. They provide identification with a group, that means people wearing the classic uniform colors, khaki, blue, or white, indicate more than a weirdly uniform sense of fashion, they indicate membership in a certain group, such as the police, health services, or the military (Joseph, 1972). As such, the affiliations to a certain group that a uniform provides is a necessary social marker while interacting to a person. A uniform defines an individual's role, both differentiating organizations, such as police officers and soldiers, but also on an internal level, as most uniformed groups have different types of personnel within them. For example, the military

has different uniforms for different branches, although they are similar in style (Pfanner, 2004). For different occasions, there are more or less formal uniforms to choose from, and a certain behavior is to be expected from the wearer. For instance, at a parade, wearers of uniform are expected to behave in a certain way, to act as a unit, and straying from this rule is seen as disobedience and indiscipline, two behaviors which are frowned upon. The uniform communicates with the crowd of people watching, influencing them to respect the wearers, maybe even influencing some people to enroll.

One also needs to know what a certain person does in order to properly communicate with them and to behave accordingly. This makes social interaction easier. "The clothes worn at a hospital by doctors, porters, visitors, and patients proclaim the role of the people who wear them. It is necessary to know a person's role in order to behave properly towards them" (Barnard, 2002).

Another influence on behavior can be seen when it comes to power and status. Clothing and inherently uniforms are symbols and demonstrate that the wearer is aware of the status they hold (Rubinstein, 2001). When it comes to military uniforms, power and status resonates with this institution's dress code. General officers must be distinguished from commissioned officers, from NCOs, and from enlisted (wo)men. An officer would not like to have them mistaken for a common soldier, especially on a battlefield, where a different rank has different responsibilities. For this reason, special insignia were developed, for each different rank, and implicitly for every level of power and status within the organization. "Through insignia, the line of command in the heat of the situation is always in evidence, ensuring that there will be uncritical obedience" (Elias in Rubinstein, 2001). Therefore, a certain behavior is to be expected from every link in the chain of command. The uniform reveals and conceals the status of an individual (Joseph, 1972). It is, again, a device which serves a social purpose, on the subject of military hierarchy. On the one side, it eliminates of the possibility of confusion of members with non-members revealing their status as a man/woman in service, but it also conceals one person's identity (Joseph, 1972). Most likely a soldier does not personally know the commander of a unit but does know their name and rank. When they see a man wearing a commander's specific uniform, with its specific rank and name insignia, the soldier will recognize them and behave accordingly. Here, the uniform exudes authority and demands respect and obedience.

5. THE PRACTICAL AND PSYCHOLOGICAL EFFECTS OF THE MILITARY UNIFORM

The uniform has both obvious and somewhat hidden and obscure effects, affecting the body and the mind. It is obvious that a good uniform will be comfortable and reliable, but slightly less obvious that it also affects your behavior and moves your boundaries.

5.1. Helping the body and the mind. Modern military uniforms employ the use of a spectrum of materials, styles, and colors, for every use case and circumstances. As such, there are formal, semi-formal, informal, and casual attires. Krueger says that some militaries tried to simplify the uniform structure, reducing their number. As such, the ones remaining were a mix of combat dress, service or work dress, and optionally a ceremonial attire. Non-casual dress is notably elegant, and induces a certain feeling of pride (Šterman, 2011) to the wearer influencing their behavior to represent the unit and their country, especially in public.

Combat dress or fatigues must be extremely versatile, functionality-wise, very comfortable in most work environments, resistant to repeated laundering, and easily repairable, as tailors are never really deployed along with soldiers. Depending on the uniform, they might include extra or specially destinated pockets, protective surfaces, and chemical or burn resistant fabrics. These specialized uniforms serve to ease the job of certain military units (Krueger, 2012).

An important psychological attribute of the uniform is the way it makes its wearer feel, and here I refer to the combat dress, not the fancier, more formal dress. When donning fatigues, especially along with all the accessories, such as the ballistic helmet, body armor, bandoliers, and all other extra tactical and/or protective gear, it makes the wearer feel empowered, it gives them confidence that the uniform will protect them and their equipment will work well (Krueger, 2012). An accessible example would be the combat boots. They are designed to support the ankle, to be light, to ensure ventilation of the foot, among other specific features. In this way, along with the tactical design, they make the wearer feel like they can move through rougher terrain, being assured by the idea of combat boots that they will be just fine.

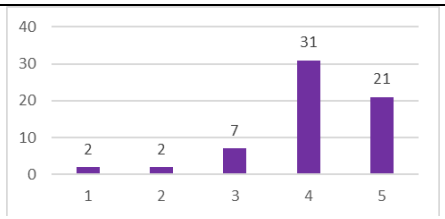
A psychological phenomenon pertaining to uniform wear in the military, and a basic one at that, is the suppression of individuality (Joseph, 1972). Many military doctrines include uniforms as a way to build cohesion within a group of soldiers. According to (Kirke, 2010), cohesion is the main factor when comparing the human element in a military conflict. Cohesion between squad members is the only force capable of pushing soldiers to move on in times of confusion, danger, and hardship. The very etymology of the word uniform suggests cohesion: una (one) and forma (form). Kirke (2010) interprets the ideas of sticking together and cohesion as a bond between the members of a unit in such a way as to sustain both their own will as well as their commitment to each other, and the mission. The use of similar uniforms makes soldiers lose the sense of individuality and encourages them to embrace camaraderie and solidarity.

Now, referring to the formal dresses, one soldier may display his or her awards, ribbons, and medals on and around the uniform, as accessories. A soldier fights in their battle dress uniform, but parades in the full dress uniform, mainly. Some countries get away with smartening up the fatigues with a few simple accessories, and soldiers parade in that uniform. Despite this, at ceremonies and receptions members of the military wear their formal attire. This uniform falls in place along with the civilian dress codes. In the past, field uniforms were akin to the current service uniforms, with button designs and coat-like side pockets. I believe that modern suits, for men at least, are inspired from older military uniforms, with some modifications, of course, and vice versa because of their striking similarities. Formal uniforms enhance the manly pride of the wearer (Laver, 1951), along with the display of accolades. The psychological effect in part here is one aimed at the wearer, already present in fatigues, but greatly amplified: pride. All of the individual's accomplishments are displayed in full sight of everyone else. Maybe a soldier does not feel that level of pride when in civilian clothes, but at a formal dress parade, they definitely feel it. They start to behave in different ways, they change their mannerisms as to not disgrace the uniform (Joseph, 1972).

5.2. Experiment of influencing others. Apart from the myriad of effects on the wearer, uniforms also influence others. Supposedly, in Prussia, civilians gave way to officers (Stahl, 1968 in Chelcea, 2005). In an experiment conducted by Bickman (1974), subjects (unaware of the experiment, chosen based upon whether they saw a previous subject interaction) were presented with a simple task, such as picking up a bag on the ground. The experimenters were dressed in 3 outfits, either a civilian, a milkman, or a guard. The experiment basically aimed to see whether influencing power is affected by attire, by embodying some sort of authority, which people are naturally more inclined to obey. To summarize the results, when asked to pick up a bag, 82% of people obeyed the guard, versus 36% and 64% for civilian and milkman attire. Then, when asked to pay a dime in another person's running out parking meter, 89% of people obeyed the guard, versus 33% and 57% for the civilian and milkman. Finally, when asked to step behind a certain point at a bus stop, 56% obeyed the guard, unlike the 20% and 21% who obeyed the civilian and milkman. This suggests that wearing a uniform, representing an authority has an overwhelming advantage on convincing power compared to normal attire. A similar experiment conducted by Bickman (1974) rated the legitimacy of requests made by people, and again, requests made by a guard in uniform were rated significantly more legitimate than others, once again demonstrating how effective a uniform really is. This study remains valid to this day, being quoted in contemporary research, and signaling the accurate results found in the study (Knapp, 2012).

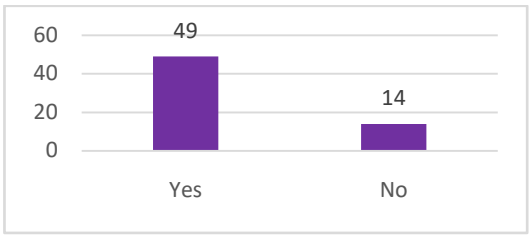
6. INDIVIDUAL SURVEY

Starting from Bickman's ideas in relation to uniform authority and adding some of mine, I made my own survey on some of my colleagues, looking to discover their opinions on the idea at hand. In order to gauge the responses of people in relation to their perception upon uniforms, I comprised a short survey. It had 10 questions with yes or no answers, a 1 to 5 option, or a short answer. I wanted to see whether uniforms really do affect people's behavior when wearing them, or when interacting with someone in a uniform. Respondents were 63 students of the Air Force Academy, second and first year of study. According to the survey, 52 people were attracted to the idea of a uniform on a level of 4 or 5 (Fig. 6.1.).



6.1. 1 to 5 scale on how attractive the idea of a uniform

A majority of 40 people were influenced by uniform wear when choosing a career path. Moreover, an overwhelming 55 respondents felt pride when wearing a uniform. It is worth noting that most other feeling evoked by uniform wear were positive, such as comfort, honor, and importance, but some felt that they have a responsibility, effectively demonstrating that uniform wear changes the priorities of the individual. Also, some people reported not feeling like themselves, suggesting loss of individuality. Another 43 people reported an increase in group cohesion and 49 were more careful in public when in uniform (Fig. 6.2.).

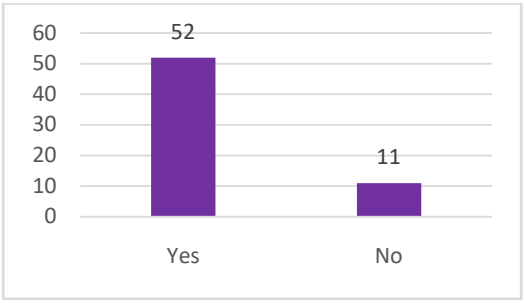


6.2. Yes or no responses to whether wearing a uniform in public changes the wearer's behavior

A total of 34 subjects reported negative feelings when in casual attire while in formal settings, such as discomfort, shame, inadequacy, intrusiveness, uneasiness, and unimportance. Exactly 10 people reported good feelings, such as comfort and easiness. The other 19 reported normalcy.

Most people pointed out details about attitude, behavior, stance, posture, or the fact that they imposed respect. Some people did notice things such as physical traits, hairstyle or facial expressions, and a smaller amount of people did not remember anything. I believe this demonstrates, at least partially, that people mainly see the uniform and its effects, and not the person wearing it, causing them to lose focus.

Also, a great majority of 52 people reported that people acted differently towards them when wearing a uniform (Fig. 6.3.), and 46 respondents say that it's more likely to obey a person in uniform.



6.3. Yes or no responses to whether people act differently towards the uniform wearer

To summarize my simple study, the respondents turned out to be fans of the uniform, observing its effects (good and bad, mostly good) on themselves, and on other people around them. Inappropriate dress code seemed to bother the majority of respondents, yet a sizeable part of them reported no negative feelings. One could say, after taking all these into account, that uniforms and dress codes do influence behavior. The three charts portrayed here once again demonstrate the inherent attractiveness of a uniform and its effects on wearers and people who interact with said people.

7. CONCLUSIONS AND DISCUSSION

Arguably, there isn't much recent research (or at least it was inaccessible to me) on military uniforms and their effect upon the wearer. Things have changed a significant amount since the 20th century: uniforms are different, there are a lot of new accessories and technologies, and soldier mentality is different.

My survey was performed on students of a military academy, many of them with a background in a military high school, and I realize that might have influenced the results, but in order to answer questions from the wearer's perspective, the target group was suitable. I used its results to (re)confirm other researchers' findings referring to psychological effects, and I am happy that the results were satisfactory. The study method could have used a larger sample size, but this only warrants the possibility of a larger, more elaborate study.

In conclusion, uniforms have a substantial impact towards behavior, both on the wearer an on people interacting with them. It imposes behavior limitations, rendering some actions off-limit.

Furthermore, it increases other people's obedience, pursue career paths specific to uniforms and increases group cohesion.

Dress codes have their own place in the world, with appropriate and inappropriate dress for different occasions. They establish social classes, and separate people based upon them. Policies have different roles, but mainly to build and maintain an organization's image, and order within said organization.

Naturally, some people are against uniform wear and choose to express themselves however they want, but the power of a uniform is nothing to scoff at. After all, there is a reason why you can find them all over the world.

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USING OF ARDUINO UNO DEVELOPING KIT IN THE PROCESS OF SIMPLIFYING THE SORTING OF MAIL DEVICES USING RFID TAGS

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Abstract: *This essay shows how can we use RFID tags, in order to simplify the sorting process of mail, using this measure which can be easily implemented in existing sorting systems. Based on the "Arduino UNO Kit" RC522 RFID reader and a few RFID tags, we will create a reliable solution which can easily be implemented in mail sorting centers, in order to eliminate the human mistakes and enhance the sorting process by eliminating the classic time-killing register, in which people must write the code of the envelopes; also, by using this method, the loss rate of correspondence can be dropped very close to 0.*

Keywords*: reader, envelopes, sorting, RFID, tag, Arduino.*

1. INTRODUCTION

The radio frequency identification (RFID) has been developed over 60 years ago, and since then, it started to have multiple applications, such as being used for access control, and keeping track of timesheets; for example, in order to facilitate the access of employees in the offices and even to do the clocking for the working days, and all this without using any physical keys and time sheets. But, since then, the applications started to vary a lot, due to the simplicity of the system and the ease of the implementation for this particular solution.

One of the greatest advantages of RFID technology is that the most expensive things are the system itself, the maintenance and the installation; but once installed, the tags are the smallest problem, because they are the cheapest part, and can be easily configured and programmed to fulfill all that the customer needs.

It may have all started with access control and keeping the timesheets in a flawless way, but with a bit of imagination and maybe also a little overengineering of these systems, the applications can be easily multiplied.

According to an article, more than 600 million RFID tags have been sold in 2005, and it's been approximated that in 2016 there were sold almost 450 times more tags than in 2005 – also, the whole value of the RFID market in the EU has exploded from 2.2 million € to 20.8 billion € in just 10 years.

This essay presents how can we create even at home, a very easy way to implement a cheap solution in order to sort the correspondence.

2. USING OF ARDUINO UNO KIT FOR DEVELOPING

2.1 COMPONENTS

The Arduino UNO microcontroller board, which is based on the ATmega328P has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; you can connect it to a computer with a USB cable or power it with an AC-DC adapter and it's good to go.

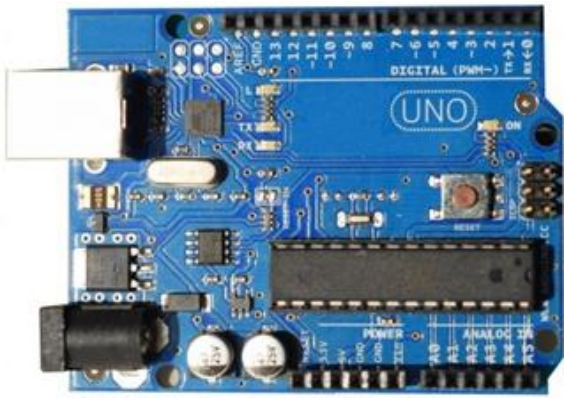

Fig.1 The Arduino UNO microcontroller board.

Next, we have the 1602 LCD display. There is not actually very much to say about this module, it's a pretty basic and very commonly used in various devices and circuits. These 1602 LCD displays are the top choice for experimental devices and circuits over the seven segment displays, the main reasons for this being that they are easily programmable, they have no limitation of displaying special and even custom character, animations and so on.

The 1602 is a synonym to 16x2, which means that it can display 16 characters per line and there are 2 lines. This LCD has two registers called Command and Data.

The command register stores the command instructions sent to the LCD, and the data register stores the data to be displayed on the LCD.

Fig.2 The 1602 (16x2) LCD display

The next component is the RC522 RFID reader.

The RC522 is a RF Module that consists of a RFID reader, RFID card and a key chain. The module operates 13.56MHz which is industrial (ISM) band and hence can be used without any license problem. The module operates at 3.3V typically and hence commonly used in 3.3V designs. It is normally used in application where certain person/object must be identified with a unique ID.

The keychain has 1kB memory in it which can be used to stored unique data. The RC522 reader module can both read and write data into these memory elements. The reader can read data only form passive tags that operate on 13.56MHz.

Fig.3 The RC522 RFID reader

Last, but not least, we have the RFID tags.

These are standard 13.56MHz RFID tags, not reprogrammable, which can be put either on a keychain, or inside an envelope.

Fig.4 The RFID tags

2.2 CONTENTS AND SCHEMES

For this project I have used 2 Arduino UNO developing modules, 2 MB-10 solderless breadboards, 1 5V LCD1602 Yellow/Green Backlight, 1 5V LCD1602 White/Blue Backlight, 2 Mini 10kΩ potentiometers, 2 RC522 13.56MHz RFID readers, 6 generic non-rewritable 13.56MHz RFID tags and connecting wires.

We will do 2 identical builds, but with different coding, so that the first one will simulate a central sorting center in which the bags must be separated, and the second one will serve as the destination center, in which the bags will be unloaded, and then scanned in order to be loaded with the correspondence for the reverse route.

In postal services, usually there is no midpoint, especially in national mail, so there are no intermediaries; that being said, if we have a bag from Bucharest to Brasov, when it arrives in Brasov, the mail will be unloaded, and next, the mail from Brasov to Bucharest is going to be loaded and sent. Of course, there can be transports from Constanta to Brasov, or from Tulcea to Arad and reverse, because there are regional sorting centers, and envelopes can be sent directly from one corner of the country to another one without any problem.

As mentioned earlier, we have 2 different builds: one will be acting as a central sorting center, and the other one will play the role of multiple sorting centers in the country.

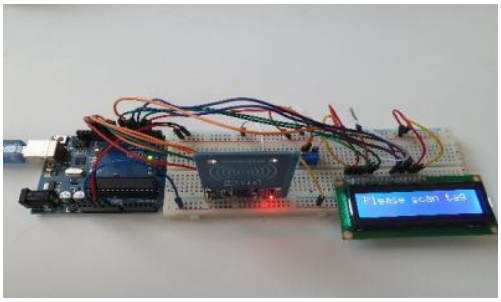

Fig.5 Arduino kit for central sorting center

You can observe on the above photo that we have the Arduino UNO board on the left which is connected to the breadboard on the right on which are placed the LCD display, the 10k potentiometer to set the contrast of the display, and the RFID reader. This is the setup for the main sorting center, which will be placed in Bucharest (B).

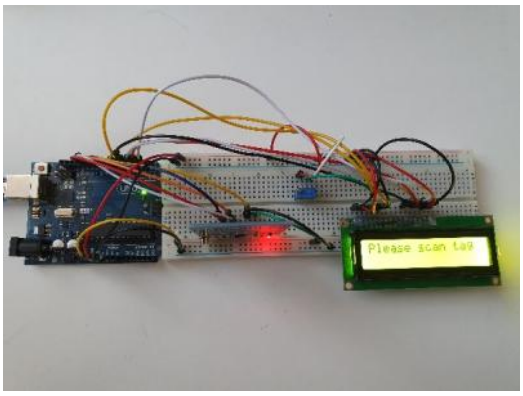

Fig.6 Arduino kit for local sorting centers

Next, we have above the second build, with the exact same configuration, made of the Arduino UNO board on the left, connected to the breadboard on the right on which we have the 16x2 LCD display, a 10k potentiometer for setting the contrast of the display, and the RFID reader.

The main advantage of this type of reader is that we can use up to five readers connected in parallel with many coded tags for the appliance, and based on the different strings the sorting can be taken to a whole new level

This reader is very versatile, because you can code tags or delete them from its memory using a master card (declared by the programmer), making any modifications of the registered addresses very easy.

The data is processed by the boards by the following code sequences, which are made of a sum of if clauses, so that the board will be able to associate each RFID address to a certain route; we will have first the initialization lines and the libraries used, with the role of teaching the board what is connected and what should happen on each pin, so that everything can run properly:

Fig.7 Initialization sequence

Now, for the first board (main sorting center), a slice of the sorting sequence will be presented below:

```
if (content.substring(1) == "09 E3 41 C1")
{
 lcd.setCursor(0,1);
  lcd.print("B->AB");

  delay(3000);
 lcd.clear();
  setup();
}

if (content.substring(1) == "89 E0 41 C1")
{
 lcd.setCursor(0,1);
  lcd.print("B->NT");

  delay(3000);
 lcd.clear();
  setup();
}

if (content.substring(1) == "77 43 84 5F")
{
 lcd.setCursor(0,1);
  lcd.print("B->AR");

  delay(3000);
 lcd.clear();
  setup();
}

else {
 lcd.setCursor(0, 1);
  lcd.print("Mail not found");
  delay(3000);
  lcd.clear();
   setup();
   }
}
```

Fig. 8 Slice of the sorting sequence in main sorting center

Basically, it's not a very complicated code. It's just a sequence of "IF" clauses, followed by an ELSE.

The role of the "ELSE" clause is just to print a message in case that an unregistered tag is presented.

Now, we will see below a slice of the code sequence from the board that simulates multiple centers. The algorithm is the same, the only difference being the message which is printed on the screen:

```
if (content.substring(1) == "09 E3 41 C1")
{
 lcd.setCursor(0,1);
  lcd.print("AB->B");

  delay(3000);
 lcd.clear();
  setup();
 }

 if (content.substring(1) == "89 E0 41 C1")
 {
 lcd.setCursor(0,1);
  lcd.print("NT->B");

  delay(3000);
 lcd.clear();
  setup();
 }

 if (content.substring(1) == "77 43 84 5F")
 {
 lcd.setCursor(0,1);
  lcd.print("AB->B");

  delay(3000);
 lcd.clear();
  setup();
 }

else  {
 lcd.setCursor(0, 1);
  lcd.print("Mail not found");
  delay(3000);
  lcd.clear();
   setup();
   }
}
```

Fig.9 Slice of the sorting sequence in other sorting center

Here you can observe the code from the second board, which has small differences as mentioned above.

I chose to use one board as "main" sorting center, and the other one as small sorting centers because it would have been very counterintuitive and even pointless to have multiple boards with the exact same code which has minor changes, just for the sake of having a more individual sorting centers with different destinations implemented.

2.3 FUNCTIONALITIES AND OTHER IMPLEMENTATIONS

Like any other appliances, unfortunately they all have their pros and cons.

The first thing is that being an open-source platform, you can implement almost anything you want, the only limits being your imagination and the compatibility of certain components.

For example, starting from this build that we have right here, we can build a sorting platform; the principle is basically easy: you get up to 5 RFID modules, connect them in parallel and then you build a transport band which has a ejecting mechanism based on the information read from the tag. Basically, it's a string of "IF" clauses based on up to 5 substring comparison codes, each being set for ONE RFID reader.

So, if you build this, when the "envelope" crosses the band, the sensor which sorts the packages for that certain destinations (RFID tag unique ID-s - UID), the ejecting system will put it in the corresponding tray if it matches the coded UID's; otherwise, it'll go on the band until the "destination" is found, or in the worst case, if it's a ghost tag (not recognized by any reader because it hasn't been coded), it's going to be simply evacuated from the band.

Now, returning to our project, let's see what our "sorting centers" will display on the route identification device.

Also, we have a dummy among our trackers, which will not return any destination info, because it hasn't been coded. You'll see that this system can't be fooled in any way, only if you reprogram it, but this is a thing you can't do wirelessly, so you must have physical access to the board in order to alter the coding which has been made..

Now, let's see what the "main center' shows when scanning a random tag from our batch:

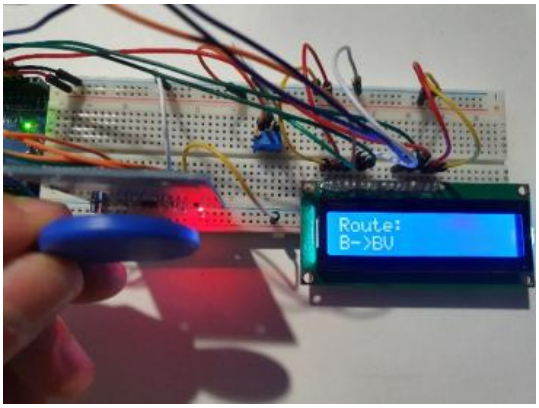

Fig.10 The result of the RFID scanning in main sorting center

It seems that the tag we have scanned is for a package that goes from Bucharest to Brasov; next, let's see what this tag will generate on the screen of the sorting center in Brasov:

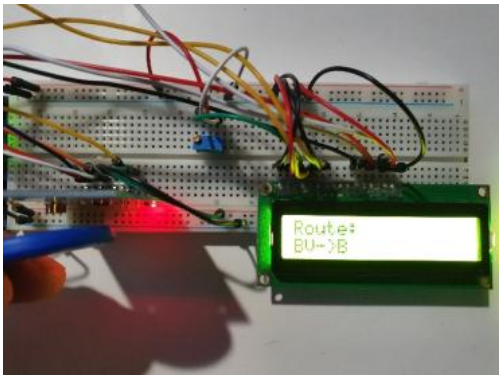

Fig.11 The result of the RFID scanning in other sorting center

As you can see, it's just the reverse route, which is printed on the display; therefore, the human error and losing the envelopes is technically impossible, assuming that you know that you're going to receive 6 packages, from which 3 must be sent back the same day loaded with mail that must obviously reach the starting point, then 3 being stationary and being loaded in the following days/weeks etc.

Now, for the situation where we have our dummy, an unidentified package, the device will simply let us know by showing the following message on-screen; before I put the photo here, I have to say that no matter what center scans the tag, the message will be the same. So, in order to prove that, I will show you this on both our builds; please keep in mind that any tag we use except the coded ones, the message will be the same on each "sorting center":

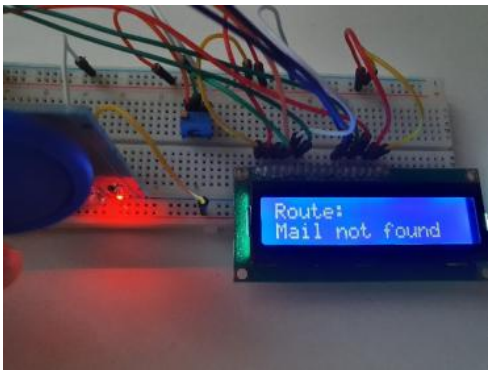

Fig.12 The result of scanning the unidentified RFID tag in main sorting center

Here we can see the message on the first "sorting center" when scanning our dummy

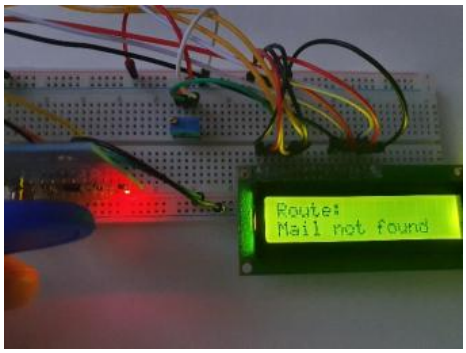

Fig.13 The result of scanning the unidentified RFID in other sorting centers

This is the message on the other "sorting centers" when scanning the exact same dummy tag.

So, this being shown, we can conclude once again the safety and precision of this sorting method, given the fact that it's a rudimentary build.

That being proved, with a more expensive and complex build, more things can be implemented at a larger scale.

One of the greatest advantages of RFID technology is that the most expensive things are the system itself, the maintenance and the installation; but once installed, the tags are the smallest problem, because they are the cheapest part, and can be easily configured and programmed to fulfill all that the customer needs.

It may have all started with access control and keeping the timesheets in a flawless way, but with a bit of imagination and maybe also a little overengineering of this system, the applications can be easily multiplied.

3. CONCLUSIONS

The first conclusion is that this could be a very effective future solution for sorting mail, no matter the type (envelope, package, etc), and it can be a very easy to adapt solution which can have transport bands and so on.

Another good thing about this system is that loss of correspondence can be minimized to almost zero, the same thing being said about the human error.

In the same time, it can have a small disadvantage: depending on the customer's needs, the size of this system can be ridiculously big, so depending on the application, we may need a huge room for this to work just as the beneficiary wishes.

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DATABASE

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Abstract: *A database is an organized collection of information or structured data, stored electronically in a computer. A database is managed by a database management system (DBSM). Cumulatively, the data, DBMS, and associated applications represent a database system, called the abbreviated database. Data from the most common types of databases are usually distributed in rows and columns, in different tables, to streamline data processing and query. Data can be easily accessed, managed, modified, updated, controlled and organized. Most databases use a structured query language (SQL) for writing and querying data.*

Keywords: *information; digital; accessibility; communication*

1. INTRODUCTION

A database is a collection of information relating to a particular subject or purpose, such as data management about students in the academy in digital system. This is a much more efficient way to use and search for data about them in situations that require it, than to find ourselves in a situation where we do not have the data stored in a computer and have to track the information from a lot of other sources that we will have to coordinate and organize personally, activities that require a lot of time. For example, suppose that students' telephone numbers are stored in different places: in a file with admission forms when students enroll in the academy; in files with information about their agreements; in a file cabinet; or in a data sheet required for Security. If a student's phone number changes, you will need to update that information in all of the places we mentioned. By comparison, in a database, that information will only need to be updated in one place — the student's phone number is automatically updated wherever it will be used in the database, leading to an improvement in information management and efficiency of time.

Using this digitized management system, all the information in a single database file can be managed, which leads to more efficient actions. Within the file, the following can be used:

1. Tables for storing data.
2. Queries to find and retrieve only the desired data.
3. Forms for viewing, adding and updating data in tables.
4. Reports for analyzing or listing data in a particular aspect.
5. Data access pages for viewing, updating, or analyzing database data from the Internet or an intranet.

2. FUNDAMENTAL OBJECTIVES OF A DATABASE

A database (BD) must provide:

• centralization of data, to allow unjustified surplus of information, to ensure the uniqueness of registration and control centralized on data;

• data independence, the organization of data to be transparent for users and constantly updated without affecting the software applications;

• intercorrelation of data, making connections between data entities data, indispensable for the efficient operation of the computer system;

• data integrity, the correctness of the uploaded data and manipulated so as to ensure the reliability and consistency of the database;

• data security, limiting access to the database, in order to prevent logical or physical damage;

• data sharing, the possibility of simultaneous data access by users, by blocking waiting requests and subsequent servicing of them.

2.1 Database systems (SBD)

Database systems (databases) are a system of

organization and processing, respectively remote processing a information. A database system (SBD) consists of:

• interdependent data collection;

• elements to describe the data and the relationships between them;

• system of programs that ensure the operation of the database (update, interrogation).

A database is a less structured database and that serves documentation systems.

The date model is the set of necessary concepts and tools to build a database schema. Data modeling can be targeted all or part of the data in the database.

Several types of databases are known by the way they are organized, the magnetic arrangement of information and elements component:

• primitive databases, in which data are logically organized in files;

• hierarchical databases, in which the links between the data are uniquely ordered

• networked databases, in which data is represented as in a set of hierarchies (a member can have as many superiors, and a subordinate can

reaches in several ways);

• relational databases, in which the basic structure of the data is the same relationship-table;

• distributed databases, which are integrated results of technology databases with that of computer networks;

• object-oriented (semantic) databases that are oriented representation of the significance of the data.

Data in a database can be structured on three levels, depending on category of staff involved:

• the conceptual level, which expresses the administrator's vision database on data;

• the logical level, which expresses the vision of the application programmer on the data;

2.2 Database management systems (dbms)

The architecture of the database system consists of the components• the database, ie the actual data collections;

• the database management system, ie the set of programs through which ensures the complex management and processing of data;

•other components, manual or automatic procedures, regulations administrative for the proper functioning of the system, the BD dictionary containing information about the data, their structure, elements of semantics description, statistics, documentation, hardware used, staff involved.

The interface between users and BD is provided by the management system of databases (DBMS) that generally allow the creation, updating and consulting databases. In other words, the DBMS is a tool assembly, coding, arrangement, protection and retrieval of data in the database.

The main functions that a DBMS performs are the following:

• storing data on external media through the management system a

files;

• management of data and links between them for retrieval

fast through the access system;

• input and retrieve data from / to the outside in the form required by user via DBMS.

2.3 Word database

Microsoft Word is currently one of the most popular high-performance text editors. The application uses high efficiency facilities for encapsulation and chaining of objects.

Microsoft Word is a professional word processor that provides the following facilities: creation and correction of documents; working with several documents; printing documents; block and text operations; operations of search and replacement; document formatting at character level, paragraph, page and the administration of automated document templates he document formatting process; inserting tables in the document and their administration; creating marked or numbered lists; arranging the text in columns; creating index, table of contents, object and authority tables; inserting objects in the document (images, sounds, equations, diagrams); correspondence administration; creating and using macros.

3. ACADEMY APPLICATION

3.1 Purpose of this work

Because we keep evolving over time, I thought we could change our way of working in the academy by replacing the letters of appreciation of students with electronic envelopes that can be sent to the family or even sending recommendations of students to a military unit.

3.2 Creating envelopes

Following steps will be followed to perform a label classification:

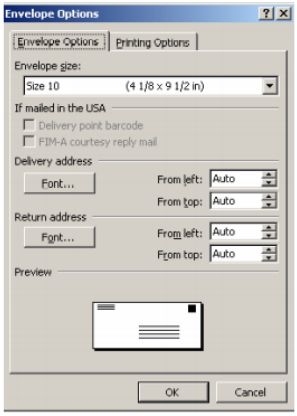
•From the To ols menu chose the command Letters and mailings → Mail

•Merge Wizard; the Mail Merge dialog box appears on the right;

•the Envelopes button is pressed;

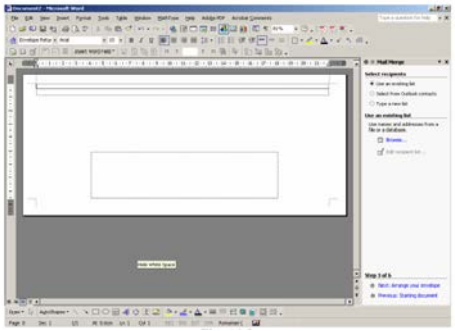
•another dialog box is displayed in which the document is selected work;

•the Envelope options button is pressed to set the options on envelopes and the printer.

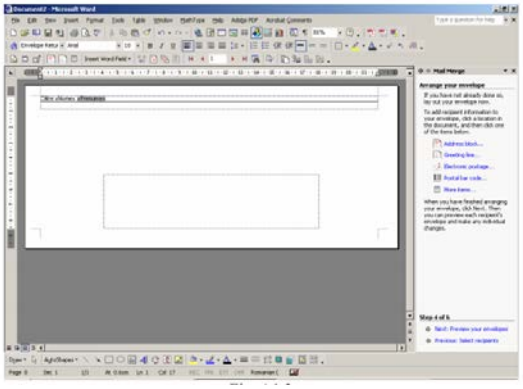


•

- The next button is pressed;



- If we have a database, click the browse button, if not, create one;
- the Next: Arrange your envelope button is pressed, to write the letter; field codes are entered from the More Items option



- After all the criteria are set, press the Merge button.

4. CONCLUSIONS

To sum up, a database is a way of storing information on a external support, with the possibility of finding them. I consider that this method is a contemporary one and brings us to another level of work because we manage to complete our uses in a much simpler and more efficient way than we did before. Such a student information management system is very useful in working with data and not only, due to the fact that this field is very vast, it helps us to make our work easier in as many fields as possible. In a word, the digital management system somewhat revolutionizes this field of work with data and facilitates meticulous work in which if there are errors, they were difficult to detect and fix.

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ATTENUATION OF ELECTROMAGNETIC RADIATION BY ATMOSPHERIC CONDITIONS

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Abstract: *As electromagnetic waves propagate through the atmosphere, they lose power due to attenuation of atmospheric aerosols like fog, clouds, rain, etc. The attenuation of electromagnetic radiation might be so severe sometimes that radars become useless. So, in order to accurately predict the performance of radar systems we must consider the effects of atmospheric conditions when talking about the electromagnetic wave propagation. This study assembles the values of free space path loss, the attenuation due to rain, fog, clouds, and the atmospheric gas attenuation. The figures are simulations from MATLAB based on recommendations from ITU-R. The functions used in MATLAB applies the ITU attenuation models.*

Keywords: *electromagnetic propagation; attenuation; atmospheric aerosols; ITU models*

1. INTRODUCTION

To accurately evaluate the performance of radar systems we have to understand the propagation environment. The performance of radars suffers from attenuation of electromagnetic waves by fog, rain, clouds and absorption by atmospheric gases like oxygen, ozone, etc.

Such studies as modeling the propagation loss during certain conditions are critical to determining the radar effectiveness over different distances and frequencies.

I chose to use MATLAB for modeling the propagation of electromagnetic waves through various atmospheric conditions. The code that I used is presented for every atmospheric condition and is based on ITU models.

2. ATTENUATION OF THE ELECTROMAGNETIC RADIATION

2.1 Free space path loss. The free space path loss is the attenuation of electromagnetic radiation on its propagation path, from antenna to a target and back. This type of loss is also called the spreading loss and like all the other losses is expressed in dB. The following code was used for modeling the free space path loss for different ranges over frequencies between 10 to 1000 GHz:

```
c = physconst('lightspeed');
R0 = [10e3 100e3 250e3];
freq = (10:1000).'*1e9;
apathloss = fspl(R0,c./freq);
loglog(freq/1e9,apathloss);
grid on; ylim([120 250])
legend('Range: 10 km', 'Range: 100 km', 'Range: 250 km')
xlabel('Frequency (GHz)');
ylabel('Path Loss (dB)')
title('Free Space Path Loss')
```

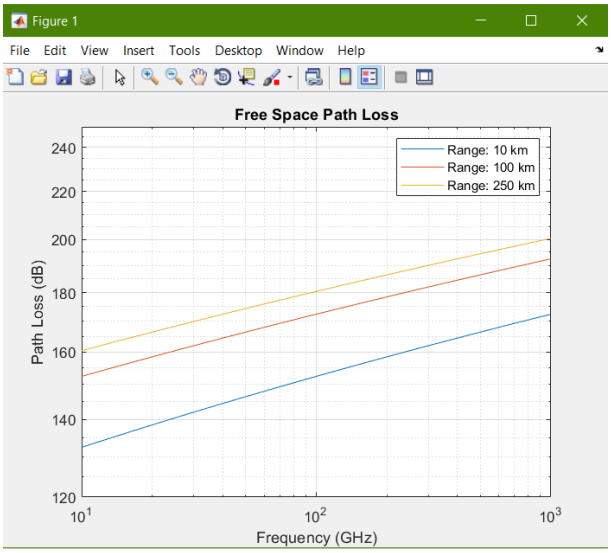

Fig.1 Free space path loss

2.2 Attenuation due to rain. The free space path loss is only a part of the signal attenuation. Signals interact as they propagate through atmosphere with particles and lose energy.

Rain attenuates electromagnetic radiation through absorption and scattering. The rain attenuation amount depends on the rain rate intensity. Attenuation by rain have the biggest impact on EM propagation from all of the atmospheric attenuation forms and can be a major limiting factor for radar systems that operates at high frequencies above 5 GHz.

The rain rate can range from less than 2.5 mm/h for light rain to over 50 mm/h for heavy rain. The propagation loss due to rain depends also of signal polarization, because of the rain drop's shape and its relative size compared to the EM signal wavelength.

The code used in MATLAB for modelling the rain attenuation from Figure 2 is:

```
R0 = 1e3;
rainrate = [1 4 16 50];
el = 0;
tau = 0;
for m = 1:numel(rainrate)
   rainloss(:,m) =
rainpl(R0,freq,rainrate(m),el,tau)';
end
loglog(freq/1e9,rainloss); grid on;
legend('Light rain','Moderate rain','Heavy
rain','Extreme rain', ...
   'Location','SouthEast');
xlabel('Frequency (GHz)');
ylabel('Rain Attenuation (dB/km)')
title('Rain Attenuation');
```

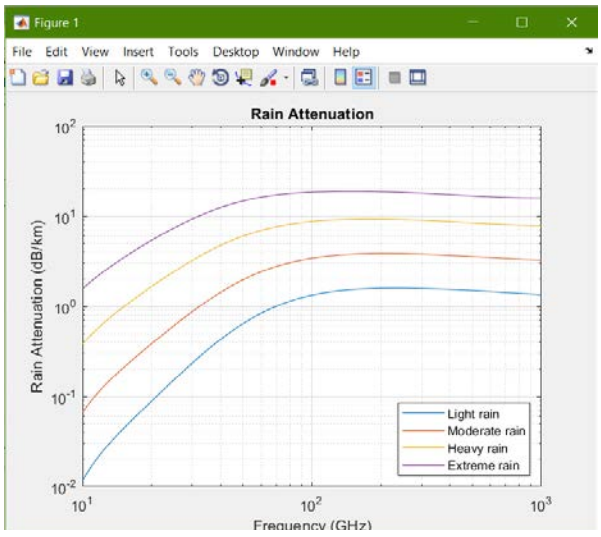

Fig.2 Rain attenuation

Fig.2 presents how losses due rain varies depending on frequency and the rain rate. Polarization is horizontal and the elevation angle is 0. This type of polarization represents the worst case of attenuation due to rain.

2.3 Attenuation due to fog and clouds. Fog and clouds also attenuate the propagation of the EM radiation. The difference between fog and clouds is the height of them, fog contacts the ground and clouds do not. As composition, they are formed with ice crystals and also with water droplets, but much smaller than the rain drops.

Fog is characterized by the liquid water density. From the recommendations of the ITU model the code for modelling this type of attenuation is the following:

```
T = 20;
waterdensity = [0.05 0.5];
for m = 1: numel(waterdensity)
   fogloss(:,m) =
fogpl(R0,freq,T,waterdensity(m))';
end
loglog(freq/1e9,fogloss); grid on;
legend('Medium fog','Heavy fog');
xlabel('Frequency (GHz)');
ylabel('Fog Attenuation (dB/km)')
title('Fog Attenuation');
```

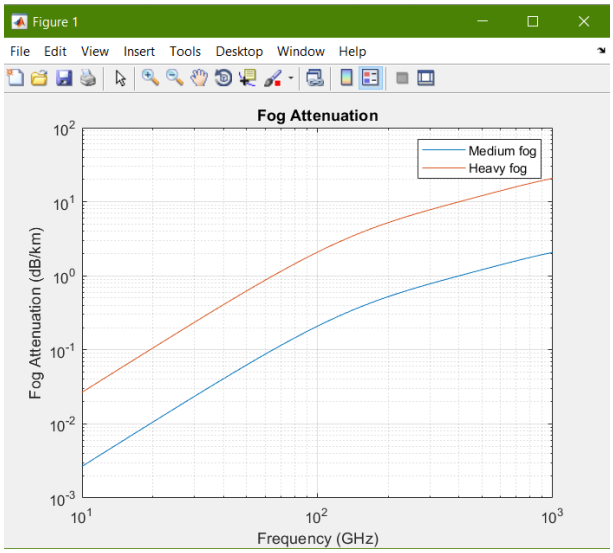

Fig.3 Fog attenuation

Fig.3 presents how fog attenuation varies depending on the frequency during medium fog and heavy fog.

2.4 Attenuation due to atmospheric gases. Even if the sky is clear, in the atmosphere there are also gases that affects the propagation of the electromagnetic radiation.

The atmospheric gas attenuation depends by air pressure measured in hPa and water vapor density measured in g/m^3 .

The code for modelling the propagation attenuation due to atmospheric gases is based also on the ITU model.

```
P = 101300;
ROU = 7.5;
gasloss = gaspl(R0,freq,T,P,ROU);
loglog(freq/1e9,gasloss); grid on;
xlabel('Frequency (GHz)');
ylabel('Atmospheric Gas Attenuation (dB/km)')
title('Atmospheric Gas Attenuation');
```

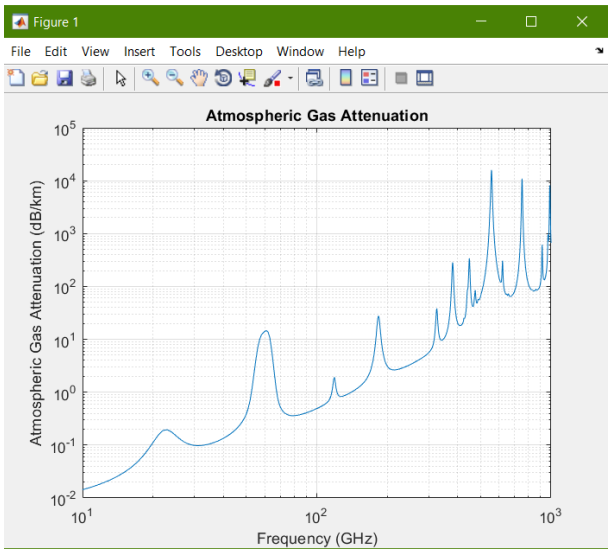

Fig.4 Atmospheric gas attenuation

Fig.4 presents how atmospheric gas attenuation measure in (dB/Km) varies with the frequency. It is shown that atmospheric gas absorption is increased at higher frequencies.

3. CONCLUSIONS

As the modelling of the electromagnetic waves propagation in different atmospheric conditions shows, the attenuation is important for knowing the effectiveness of radar systems.

The rain is the major cause in limiting the radar range from all the atmospheric attenuation situations.

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ANALYSIS OF EXTREME PRECIPITATION RECORDED AT THE METEOROLOGICAL STATION IN CLUJ-NAPOCA, BETWEEN 1965 AND 2015

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Abstract: *This paper aims to illustrate how the amount of precipitation, as well as their type, may affect a place. By means of climate data extracted from the station in Cluj-Napoca, we analyzed how precipitation has evolved over an interval of 50 years, from 1965 to 2015. The most representative indices, which had a significant contribution are represented by values either monthly or annual, of wet days, or of days when the precipitations have reached a certain number, or have exceeded it. This study helps to observe, through an overall perspective, the accentuated changes that have taken place over the years, starting with the study of a single station in Romania, the one in Cluj-Napoca, and later extending to a larger, wider scale, at the level of the whole country, Europe or worldwide. Precipitations are extremely important, because together with other natural factors, they define the predominant climate of that space, and are determined by the existing forms of relief, as each type of relief corresponds to a certain characteristic, entailing a specific type of precipitation.*

Keywords*: extreme indices, precipitation, Cluj-Napoca, climate change*

1. INTRODUCTION

Romania is a country that has almost all types of relief, with a temperate continental climate of transition, specific for the space in which it is located, this being part of Central Europe. This makes possible the existence of four distinct seasons, spring, summer, autumn and winter. The territory of Romania receives numerous meteorological influences such as the oceanic ones from the west, the Mediterranean ones from the southwest and the continental ones from the east, which produce, through the action of each one, various local climatic differences. Due to the distribution of the relief forms on the territory of the country, the temperatures tend to decrease slightly, from the south, where the average value of 10 ° -11 ° C is registered, to the north, where the average value of 8.5 ° -9 ° C is registered. The lowest temperature value recorded in Romania was -38.5 ° C, in Bod village, Brasov County, on January 25, 1942, and the highest temperature value was + 44.5 ° C at Ion Sion village, in Braila County, on August 10, 1951. Regarding the precipitations, an annual average of the precipitations fallen of 637 mm was calculated, with slightly higher values in the mountainous area, but slightly lower ones to the east. Due to global warming, which has increased in recent years, summers have become very hot and unbearable, holding effects on every field of activity, including agriculture but not only it, because studies show negative effects on the human mental level, with people becoming more and more irascible and intolerable, this type of behavior increasing at the same rate with the positive value of the temperature, in summer. Due to global warming, there are many consequences that directly affect the region of Romania, alongside with similar global effects such the decrease of glacier volumes, extreme climate phenomena, such as heat waves, or intense and frequent heavy rainfall.

Atmospheric precipitation represents any form of water that falls from the atmosphere on earth, and their role is represented by the fact that it is a basic component of the water circuit in nature. Precipitations are distinguished by the state of aggregation in which they are found, solid or liquid, and by the size of the particles. The main

forms of precipitation are: rain, sleet, snow, hail and frost. Each type of precipitation behaves differently and has different effects on the environment. Rain is caused by the condensation of water in the atmosphere, and falls to the ground in the form of water droplets. This phenomenon is often accompanied by adjacent factors such as wind, lightning, thunder and lightning. In this way, the snow is represented by a rain in which the water drops turn into snowflakes, due to the low temperatures. Among the factors that influence the formation of flakes are: temperature, air humidity and air currents. Only flakes that have not met atmospheric conditions in which the temperature is higher than 0 ° C reach the earth's surface. The hail is the result of Cumulonimbus clouds, and represents water particles that fall to the ground as ice. Dew can be observed on clear summer nights, when water vapor condenses, and when touched by cold bodies on the ground, small drops of water are formed, which evaporate with increasing temperature. Sleet is that form of precipitation that combines snow with rain, because it tends to be observed as snow that has partially melted during its fall to the ground. When sleet is formed, the soil temperature is higher than the freezing temperature, which is why the fallen snow does not keep its shape intact on the ground, but melts to some extent.

There is another form of precipitation often found in the mountains, where the rain evaporates before it reaches the ground, and water drops fall in the form of strips. Cluj-Napoca is located in the Hilly Depression of Transylvania in the central-northwestern part of Romania, and is bordered by Feleacului Hill in the south, Lomb and Hoia hills in the north, and by the Somesului Mic valley to the east and west. In the vicinity are the Apuseni Mountains, which are responsible for the development of meteorological events throughout the year. Climate of Cluj is temperate-continental, but there are also slight oceanic influences. The average annual temperature is 8.2 ° C, while the average rainfall is 557 mm.

2. DATA AND METHODS

The data used in this article are in the form of daily data, recorded from 1965 to 2015.

2.1 Study area and data

The meteorological station from Cluj-Napoca is the place of analysis from where we evaluated the necessary data.

Fig.1 Study area

The city of Cluj-Napoca is located, as can be seen in the Fig.1, in the Transylvanian depression, in its northern part, between the Apuseni Mountains and the Transylvanian Plain, on the valley of the river Somesul Mic. At the level of the country, this city is located in the central part of Romania, located at northern latitude 46 ° 46 '39' 'and at eastern longitude 23 ° 34' 17 ", at an altitude of 410 meters. The measurements performed at the Cluj-Napoca meteorological station captured the evolution of the precipitation quantities, which took place systematically, over a carefully selected period of time. Thus, the number of wet days recorded monthly or annually, when precipitation exceeds 10 mm, or the number of days when precipitation exceeds even the value of 20 mm, have contributed to the creation of an overview, which aims to outline an objective perspective, on the many questions about what has been, what is, or is to come, regarding the changes in precipitation and its effects, which are either seen at the macro scale or felt at a smaller level, are of considerable importance, because changes can be noticed even locally.

The meteorological data necessary for the analysis of precipitation are taken with the help of a specialized instrument, called a rain gauge. This is the meteorological instrument, which detects the amount of liquid precipitation, fallen on the ground, but there are also more advanced models, which are equipped with certain technologies, which allow them to detect solid precipitation, such as snow or hail. The measurement is performed using the self-discharge scaling principle, where a Reed relay releases a pulse every 0.1 mm of precipitation, and this pulse is passed on an external meter, or is sent to a central system for data recording.

2.2 Methods.

The data collected through weather-specific tools were processed in the ClimPACT2 analysis program, whose founders are Lisa Alexander and Nicholas Herold (2016). The indices derived from the daily data represent an attempt to extract objective information from the weather observations, in order to answer questions related to climate aspects. Such indices extracted by ClimPACT2 may reflect the duration or amplitude of heat waves, the intensity of extreme rainfall and the frequency or measures of extremely wet or dry periods, hot or cold, which have a socio-economic impact. ClimPACT2 is an R software package, which calculates ET-SCI indices as well as other extreme weather data, from the data store, in text or in netCDF files. It directly incorporates the climdex.pcic and climdex.pcic.ncdf R packages developed by the Pacific Climate Impacts Consortium (PCIC). Three methods of using this software allow the user to calculate indices at a station through a text file at the Graphical User Interface, to combine the multiple process of text files and to calculate indices on the netCDF given in parallel. The team that makes this program work is composed of the World Meteorological Organization (WMO), the Expert Team on Sector-specific Climate Indices (ET-SCI), for design and documentation Lisa Alexander and Nicholas Herold.

3. RESULTS & DISCUSSIONS

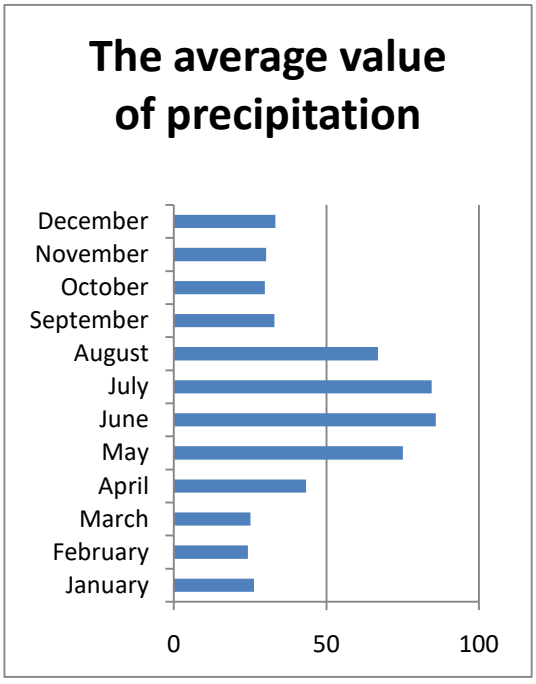

Fig.2 The average value chart

February is the driest month of the year, with only 23.3 mm. In general, the snow layer does not reach too high altitudes, but a situation was the exception in 1984, when a record snow layer of 56 centimeters was set. Precipitation becomes more abundant in the second half of spring, when the first showers with electric discharges are observed, so the average precipitation for March is 25.1 mm, in April 43.3 mm, and in May it reaches even at the value of 75.1 mm. During the summer season, in June, it accumulates on average 83.9 mm, in July 84.5 mm and in August the values decrease sharply, reaching 66.5 mm. In the Cluj area, as well as in the eastern part of the Apuseni Mountains, the highest frequency of thunderstorms found in Romania was found. Precipitation has a deficient regime in autumn, in September it was 33 mm, in October 29.8 mm, and in November 30.3 mm. These values of the precipitation quantities registered in autumn were analyzed in the period between 1961 and 1990, but in the last 10 years the average values have increased by 5-10 mm for each autumn month.

The indices chosen to outline the analysis of the frequency of precipitation recorded at Cluj-Napoca station between 1965 and 2015 refer to the number of consecutive wet days, the monthly maximum of consecutive wet days and the monthly or annual evolution of days when rainfall exceeds 10 mm, or 20 mm. The first index analyzed refers to the standard precipitation index, which is observed in Figure 3. This first chosen index describes the totality of the dry days, from the point of view of the precipitations, registered at the station Cluj-Napoca. The graph contains on the axis of the ordinates some positive and negative values of the observed precipitations, and on the axis of the abscissas are found the years between which these elements were counted. The color blue is present above point 0, while the color red is below, this color delimitation indicates how rainfall has increased or decreased, every 5 years, from 1965 to 2015. The slope of the linear trend is oriented in the direction of growth, which shows that it is easy to see an increase in "dry" days, in which precipitation has made its presence slightly felt. One of the economic sectors that is impacted by climate change is agriculture, because agricultural production depends largely on weather and climate conditions, which makes it the most vulnerable branch of economic sectors. These fluctuations influence crop yields and animal productivity.

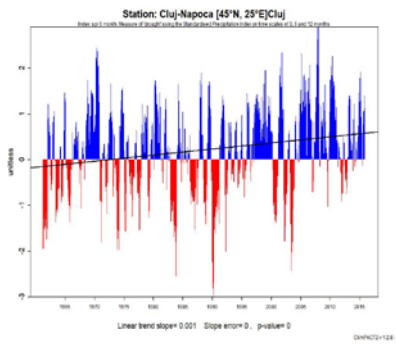

Fig.3 The standardized precipitation index

The second index refers to the maximum number of consecutive wet days, when precipitation exceeds 1.0 mm, which is observed in Figure 4. This index describes the maximum number wet days, over a period of time, recorded at the station Cluj-Napoca. These wet days are characterized by the condition that requires a quantity of precipitation greater than 1 millimeter. On the y-coordinate (vertical) there are recorded the days, and on the x-coordinate (horizontal) there are the years, the study of data from 1965 to 2015. The way in which that line oscillates shows the increase or decrease of the number of wet days, noting that the average number of days is 6. However, the slope of the linear trend is oriented towards the direction of decrease, this corresponding to the fact that the value of the slope is negative, of -0.005.Compared to other natural hazards, the drought causes a process that takes place once in a while, slowly, but affects in the long run, because although they do not actually kill people, it causes serious consequences on crops, and causes famine. A particular case was analyzed in the region of Moldova, in Romania, when the years 1896, 1899, 1928, 1946, 2003, 2007 and 2012, experienced a very dry period, but a substantial famine was felt between 1946 and 1947, both due to losses in agriculture, as well as due to other collateral factors.

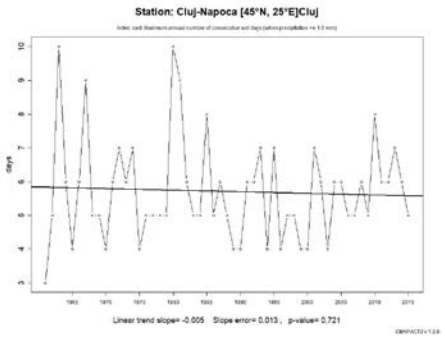

Fig.4 The maximum annual number of consecutive wet days index

The third index of the analysis is that of the total precipitation from the first days of the month, which can be observed in Figure 5. This index describes the maximum values of precipitation, recorded monthly, per day, from Cluj-Napoca station. On y-coordinate (vertical) there are the values expressed in millimeters, and on the x-coordinate (horizontal) there are found the years, from 1965 to 2015. The way in which the line of values oscillates shows a certain periodicity of the data, because they seem to remain relatively constant. The trend of the linear slope has a very small positive value, of 0.003, a sign that the data preserve their evolution, which is obvious from the graph.

Each beginning of the month represents a starting point for a possible forecast, because the normal average values for the calendar date on which the study is made are known, thus, if the recorded precipitations have a different value from the normal average value calculated for that moment from season, based on the difference, if it is a higher or lower value, you can see the trend felt at that time, when if it is a dry year there are lower values than the normal value, or at the opposite pole, if it is a year richer in rainfall, it can have the effect of flooding in different places on the earth's crust.

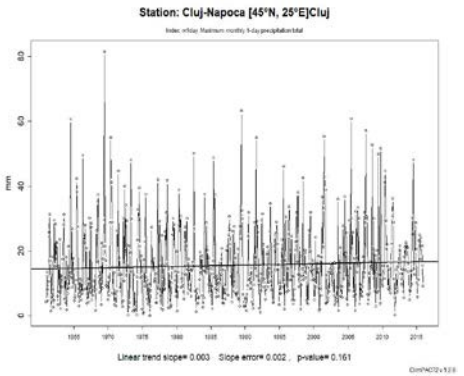

Fig.5 The maximum monthly 1-day total precipitation index

Another important index for the study of climatic data shows the total number of days in a month, when the precipitations exceed the value of 20 mm, which can be observed in Figure 6 . The graph below shows the number of days on the vertical axis, and on the horizontal axis, the period of time, starting with 1965, until 2015. The values of the days raise to 2, most often, but some years are an exception. , because they reach values such as 3 or even 4.

The value of the p-value parameter is 0.318, which is higher than 0.05, which describes the fact that this increase is statistically insignificant.

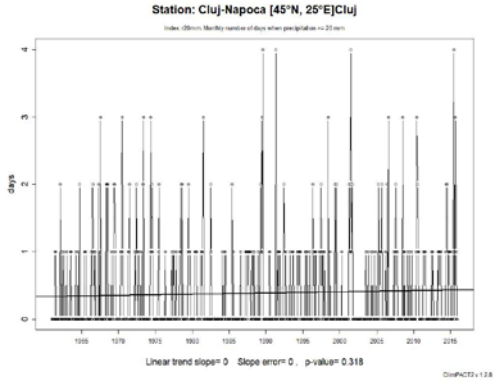

Fig.6 The monthly number of days when precipitation >= 20 mm index

4. CONCLUSIONS

Changes that occur locally, are directly linked by the events that take place on a larger scale. The ice caps are melting, which leads to rising water levels in the seas and oceans. Along with this increase, there is also a contrast between extreme weather events and rainfall that increase in frequency in some areas, while in others there are heat waves and extreme droughts.

It is a well-known fact that in nature, all processes are interdependent, as even a change of one component leads to the modification of the others. Adaptation to the increasing intensification of extreme weather events, such as heat waves, hurricanes, torrential rains, floods and droughts, is done by accommodating natural or artificial systems to the effects already existing or expected to occur, thus reducing the level of damage. The anthropic role of people intervenes by building dams to protect against floods or by introducing new varieties of crops that could withstand drought or other calamities. Some other areas affected by the change of the precipitation regime, include the forests, because their life and their geographical distribution depend on the climate conditions and on the quantity of precipitations. Wherever the environment is warm and rainfall is low, herbaceous plants are favored, and this is how the steppes appear.

In conclusion, precipitations have a very important role in carrying out of many human activities, because their action can favor or on the contrary, can disfavor the natural environment, which is directly reflected on all existing elements in correlation. with the environment and beings on earth. In the absence of water, life cannot exist on Earth, which is why rainfall influences this essential aspect of life.

5. REFERENCES

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