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C O N T E N T S

1.	***THE CURRENT STRATEGIC AND GEOPOLITICAL CONTEXT. THREATS TO WORLD STATES*** **Andreea DĂNILĂ, Sebastian TRANDAF**	**7**
2.	***FLYING TRAINING SYSTEM FORCADETS IN POLISH AIR FORCE ACADEMY– CHANGES AND EXPECTATIONS*** **Maciej MIESZKOWSKI, Marcin OLECH**	17
3.	***HUMAN FACTORS INFLUENCING AVIATION SAFETY*** **Cătălin MOCANU**	25
4.	***THE GEOGRAPHY OF POWER: RELATIONS BETWEEN RUSSIA AND GERMANY IN TODAY'S BROADER INTERNATIONAL CONTEXT*** **Oana PUIE, Andreea ȘERBAN**	31
5.	***PASSENGER CONTROL AND ONBOARD BOMB ATTACK OPPORTUNITIES FOR IMPROVING AIR SAFETY*** **Vivien SZABÓ**	37
6.	***THE ISLAMIC STATE: GROWTH, RESOURCES AND MANAGEMENT*** **Mihai VIDESCU**	43
7.	***OPTIMISM IN DAILY LIFE*** **Diana GRUIA , Andreea MUNTEANU**	49
8.	***STUDY REGARDING THE PERCEPTION OF THE MILITARY STUDENTS FROM THE A.F.A. AND THE L.F.A. OF THE GENDER RELATED STEREOTYPES*** **Gabriel-Ionel MĂRCULEȘTEANU, Alina-Ioana BÎNDIU**	55
9.	***EUROPEAN POLITICAL ANTIESTABLISHMENT MOVEMENTS – AN ASCENDING TREND*** **Alexandru NICA**	65
10.	***THE EFFECTS OF MUSICAL PHENOMENA ON LIFE DIMENSIONS*** **Paul-Alexandru POPA**	71
11.	***THE PREVALENCE OF CURRENT PATHOLOGIES AMONG MILITARY STUDENTS AND PROPHYLACTIC METHODS***	77

12.	***ALGORITHM FOR CALCULATING THE NUMBER OF BOMBERS NEEDED FOR DESTROYING A RUNWAY*** **Ivan DIMITROV, Ivan STEFANOV**	87
13.	***COANDA EFECT OPTIMISATION OF A (UAV) FLYING SAUCER*** **[illegible]**	95
14.	***OBTAINING THE EQUATION OF THE POSITION FUNCTION OF A DOUBLE-CONTOUR PLANE RETRACTION MECHANISM OF THE LANDING GEAR USING THE ANALYTICAL METHOD***	101
15.	***GENERAL NOTIONS RELATED TO PHENOMENA OCCURRING IN ROCKET NOZZLES*** **Marian POTOLINCA**	107
16.	***COMPARATIVE ANALYSIS OF PORTABLE MISSILE SYSTEMS*** **[illegible]**	115
17.	***COMPARATIVE STUDY BETWEEN THE ANTIAIRCRAFT WEAPON SYSTEMS S-400 TRIUMF AND 9K720 ISKANDER-M (SS-26 STONE)*** **George-Adrian MARIN**	121

THE CURRENT STRATEGIC AND GEOPOLITICAL CONTEXT. THREATS TO WORLD STATES

Andreea DĂNILĂ, Sebastian TRANDAF

„Henri Coandă" Air Force Academy, Braşov, Romania

Abstract: *The concepts of danger, threat, risk and vulnerability were defined by different theories and approaches implicit and explicit doctrine of security , but the consensus seems to be achieved. In this paper we planned the conceptual clarification of the terms that we will operate in the analysis of risks and threats to the security of states, but not limited to simple review of existing definitions.From a military perspective, threat analysis can take into account the ongoing process of compiling and reviewing all available information regarding on, Middle East, the danger posed by ballistic missiles or potential terrorist activities.*

Keywords: *threats, psihotronic war, tactical ballistic missiles, terrorism.*

1.INTRODUCTION

The threats to world's states security is a very topical subject which is in a constant evolution. There are many factors that influence directly this development . The most signifiant are:

- Destabilizing global security correlated with emphasizing the danger of regional crises;
- The importance of air war was increased paradoxically reducing air forces;
- Increasing the importance of tactical ballistic missiles, air-ground missiles, antiradar missiles, cruise missiles and unmanned aircraft;
- These weapons systems are effective, so more states allowing their purchase;

The evolution of the launche ammounition processes by modern means of air attack and the aerial threats on land targets involves analysis the following aspects:

- the assessment of range and type of munitions;
- the tactics that can be used for deployment in space of these weapons and for the profiles of flight paths;
- evaluation of tactical weapons integration;
- evaluating changes in integration weapons tactics during the change of situation;

2.THE CURRENT STRATEGIC AND GEOPOLITICAL CONTEXT

2.1. Iran's geopolitics. Iran is the country that has profited the most in terms of geopolitical fall of communism because, since then, the world's attention was turned to Middle East and this situation won't change very soon. Therefore, the attacks in Paris are more important for Bolivians or Angolan than an attack with 10 times more victims in other less developed countries. The Middle East becomes the new hub of global journalism and many names were enshrined. Moreover, the Al Jazeera apperance opened the space for almost everyone, which for diplomats, military and geopolitical area

professionals have been excellent: attention, money, influence, power - these were the benefits of the past 25 years in the Middle East .

2.2. Iranian resistance. Decreasing power of Iraq during 1991-2003 consolidated Turkey's power in that area allowing it to think even a major expansion of its influence, including by blocking the Kurds, but also Iran, dismay primarily Saudi Arabia.

Middle East is an area where political and administrative institutions of the European type truely succeeded only in Israel, in other countries degrees of success being influenced by religion, tradition and historical education. Thus, only Turkey and Iran have reached better results, other countries being more or less affected by how religion was imposed in society and the degree of corruption of leaders. The final collapse of Iraq in 2003, in conjunction with management mistakes in the coming years have led to the liquidation of the Iraqi state. Political power in Baghdad lost control of the country where Kurds are the majority and in recent years has come close to building a Sunni state in Iraq and Syria. (Fig.1)

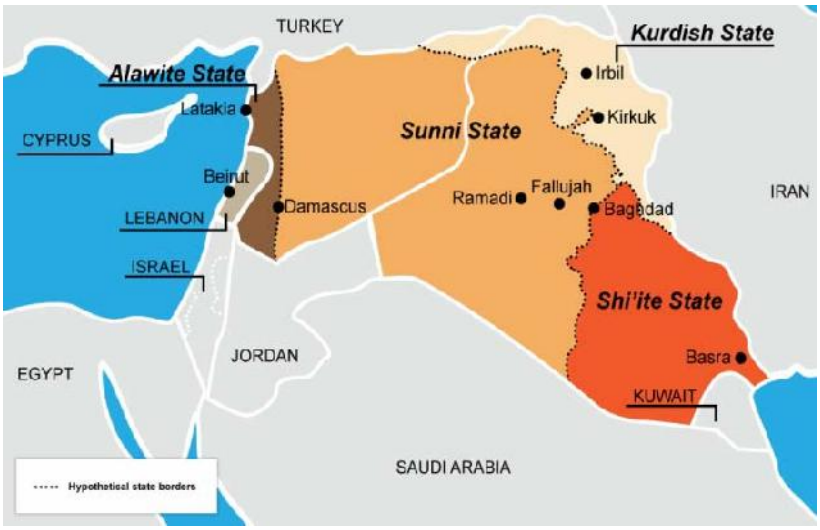

FIG. 1

2.3. Ethnic, religious and theritorial. For a full picture, we must also observe the religious map of the Middle East (Fig. 2) where Kurds live.

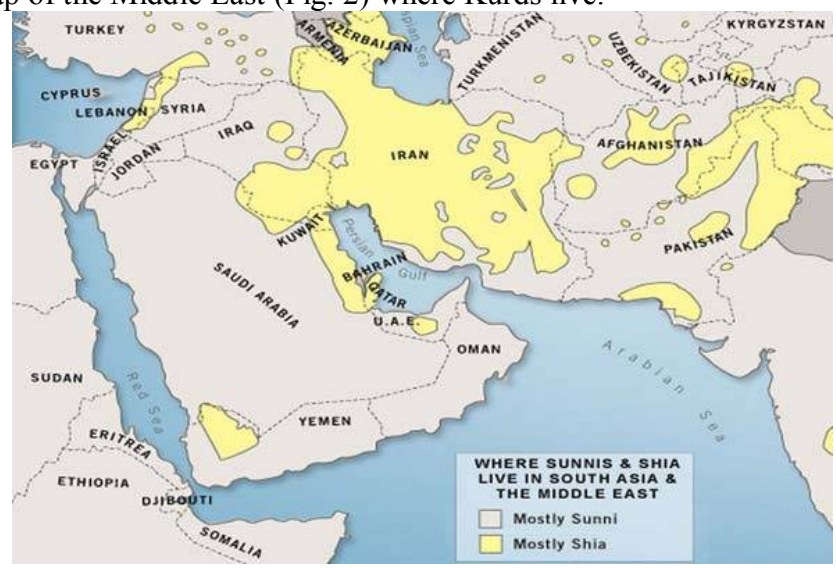

FIG. 2

Riyahd's plan to have a Sunni wall against Shia- perfectly coherent geopolitical point of view- is very doable now because the configuration of the territory is one that would require military Arabia to join the fight against the group quasi-state ISIL, to defeat and then the military can provide Badgad- Basra- Amara– Kut, so to hope to a Iranian-Saudi condo on lower Euphrates and Tigris basins of the great rivers of Mesopotamia. This is an ambitious project itself, and if the entire population of Saudi Arabia would be Sunni.

However, the religious map of the Arabian Peninsula (Fig. 3) shows that Shiite populations are more in the area, inclusive in the State which dominates the peninsula . This would be why the Saudi government can not engage in operations in Iraq and may have problems with the Shiites in his own country, thus adding to the second outbreak problem , namely that of Yemen.

Therefore, there is no one to secure Iraq's territory, leading to a clear future modification of borders in the Middle East.

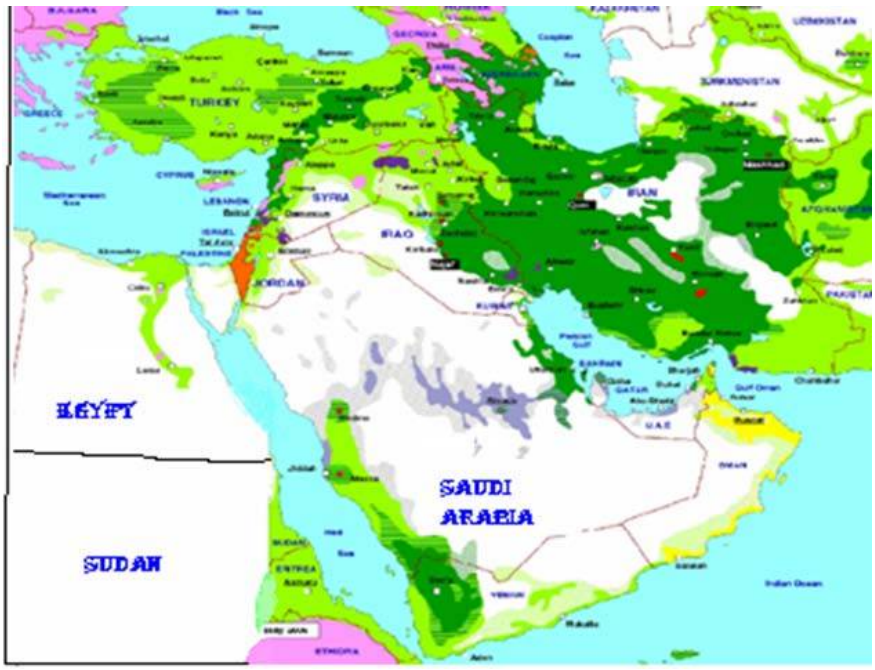

FIG.3

Mixed population of Sunnis and Shiites

Mixed population of Shia and Wahhabi

Judaism

Christians

Sunni rite population Shafi, Maliki and Hannifin

Shiite rite population Imami , Ismaili and Zaidi as Alawis, Ahl - i Haqq and Nusairis

Turkey has two historic rivalry: Iran and Russia, which won't end in the coming decades.In addition, Persian- Soviet Treaty of 1921 has not been denounced by both sides- as required by its terms- which makes the alliance between the two countries almost eternal , the unilateral denunciation not beeing sufficient.

It is possible to create a buffer state between the three, Kurds being slaughtered again. Combat troops will determine borders and not diplomats, because Middle East is, in terms of geopolitical maturity, where Europe was in the years 1939-1941.

2.4. Forecasts. However, it appears that neither Ankara nor Riyahdul don't feel comfortable in the current situation, each of which beeing more or less locked in certain directions and borders that do not allow them to have a strategic initiative in the area. Iran does not have this problem, and the agreement achieved this year with the US has allowed an increase in the financial resources of the state, which in the medium and long term will matter greatly, becoming even more a stable power and in economic advance in the East. It is true that reconnection at modern space creates fears among power in Tehran, but at least now nobody has strategic initiative in the Middle East except Iran.

The demography of the area, failures in providing powerful learning systems, huge gaps regarding the legality and the rule of law suggests that the Middle East will remain stuck in old rivalries that will reduce power to adapt to the new society of XXI century.

Regarding to the US pivot, the main geopolitical event of 2016 will be electing a new president . The winner can not make predictions, but let's not forget that the new leader in the White House will take office on 20 January 2017. Until then, we have the same president, and if Barack Hussein Obamawas not a too inspiring leader, US reaching a gigantic public debt, over 18.6 trillion dollars, the same can be said about teams that led the US administration sectors.

2015 has led to several important changes to US interests: were made agreements with Iran and Cuba, with profound consequences for regional geopolitics or geopolitics of energy resources; the ban on oil exports was dropped, which has profound consequences on oil prices in the medium and even long term; The 0% interest rate policy, which Federal Reserve had had for years, was dropped.

A strong dollar encourages EU companies to export more to the US , helping to decrease roughness of the negotiations. How EU countries need exports to recover economy, the opening of the US market to a higher will be apreciated and I believe that in the medium term even this year the trade agreement between the two economic zones euro/dollar will end.

Just this agreement based on strengthening the relationship with the US will be a very strong argument to keep Britain in the EU, and not apart. Whatever different leaders want from Berlin, Paris or Brussels, the EU can not exist without London and all know this very well. Economic interests will tame on each other claims and finally, after Cameron will get some advantages for British, Brexit's story will end.

2.5. China's political game. China, the country that in the last 25 years has become the " workshop of the world " exports to US more materials than services, because the industry has developed on an unprecedented scale in history, surpassing the capacity for harmonious development of their economy. Therefore , it could be said that a strong dollar will help China's exports to the US market.

Even if state debt is not so high, local authorities have accumulated large debts and this affects their stability. Corroborateing with power struggles within the Chinese Communist Party, a negative situation in the economy of large cities can lead to internal coalitions that can oppose not only President Xi Jinping, but also center, regarded as the

place where decisions affecting the country, but which are taken without consulting the population. Chinese domestic policy paradigm is the same for over 2 000 years, which obliges reflection and awareness of the dangers.

The last major domestic economic problem that China has is decreasing scholarships which causes nervousness in many countries, especially in Beijing, which sees in the position to recognize that not all its development plans materialize . When a rising state sees an important aspect of his plans regresses , it will understand that there is a gap that less friendly states will exploit , with serious consequences.

China has leads a firm policy of promoting its own interests in the adjacent space for several years, becoming an important factor in the Pacific area and seas which separates shores of Korea, Japan, the Philippines and Vietnam, but also in Central Asia. Basically, this concerted action in the marine area - which led to the recent adoption of a decision to build a new aircraft carrier- manages to unite increasingly more countries in the Far East against China; alliances are clearly directed against Beijing, which will have strong support from the US .

2016 wiil make permanent the position game in that part of the world and Japan will increasingly be forced to assume a more active military role in the region and the medium and long term tension will rise further .

2.6. Russia's political game. Russia is seen in 2016 the subject to many challenges, some direct and others that manifests itself stronger every year. If the Chinese action is calm, firm and always on the offensive, Moscow's relations to its western and southern borders have another consistency and especially more harshly.

Problems that the ruble has had for two years have greatly weakened the strength of the Russian economy, and they are the result of issues from the west and not the east. The current oil price comes partly from the west and it creates state budget problems of the Russian Federation. Therefore, the September elections for the Duma will have a special significance, both in terms of the recruitment of an elite III decade of this century and for development projects that are proposed.

How the relationship Russia - Ukraine is strongly affected, analysts considering that the complete rupture between the two countries will occur this year and we continue to expect "something important " in the whole context mentioned above .

Neither Russia nor Ukraine have not won too much economically in the last two years, the number of people living in poverty is increasing and the pressure of these many poor people will force the two governments to stronger action in defense of national interests. If Ukraine will understand correctly the relationship with the other neighbors, it could get some support in proportion with his actions against minorities acquired in 1945; otherwise, it will have to cope alone the Russian pressure, which is not too easy. A resumption of fighting in Donbas is more than predictable, because the parties have almost a year a kind of truce, but that was not done in order to reach an effective peace .

As Moscow and Kiev have reached trade and air transport embargo, the year 2016 will not bring peace, but - we hope - not too dramatic accents for several months. All this will be seen and will pass in a negative sense in Chisinau, because both can be there- an inefficient political class has managed to almost completely destroy a territory, leaving him one of survival : the European road [1].

The concern in Washington would be: Moscow exploiting disunity in Europe to undermine NATO, missile defense programs and try to get rid of international sanctions imposed after the illegal annexation of Crimea peninsula .

Sources quoted by The Telegraph adds that the UK referendum- by the way the EU membership Kingdom– is one of the main opportunities to weaken the Union by the Kremlin.

If the relationship with Christianity is clear - the state nearly destroying its foundation and forcing him to give in many areas that violate biblical precepts- population situation of Islam in Western Europe is much different. Muslims in Western Europe are mainly from Africa and Middle East areas with weak education systems, gangrenous hundreds of years of tyranny, religious and political nomenclature and lack of legality.

Generations who have emigrated to Europe at a time when society was more cohesive morally and religiously were able to integrate to some extent, because they knew the position in society. Relativism and political correctness that has taken the lead in the West for nearly 50 years has resulted in the first collapse of schools and hence, as an inevitable consequence, the alienation of education of younger generations, especially those who come from companies well based on education. As Muslim immigrants were vulnerable in this aspect, the failure of too many young people in Muslim communities became inevitable. The void in their mind needed to be filled with something, and for many the victory was won by the ultra-radical new interpretation of the Koran . As recent years brought the appearance of the group in Iraq and Syria and a greater radicalization of young people from predominantly Muslim countries, it has become as relentless expansion problems that Muslims will make European continent [1] .

3. THE PSYHOTRONIC WAR AND MUSLIM INVASION

In this context, the actual massive wave of immigrants from North Africa and Middle East is not a consequence of a humanitarian crisis, but rather an exodus very well organised through a Muslim invasion of the EU, which will bring changes at the ethnical, religious and politics' structure of the old continent, even before 2050 when it was prophesied by the French writer Houellebecq Ionuţ Ţene, the Europe will be transformed in Islamic Caliphate [5].

One of the most surprising things today is the almost lack of reaction of the Germans and Austrians who are watching in a passive way at this Muslim invasion organized in their countries, hidden after the refugees crisis.

Those peoples, known in the history for their nationalism, for the desire to preserve its own genes, it seem to be hit by lethargy, they seem transfigured, some inert witnesses at the gradual modification of the ethnical report of their country and also at the cultural dissolution which is prepared for them. Moreover they applaud this situation…

In this context is not an exaggeration to look at these things also from the modelling crowd reactions perspective with the help of the psychotronic weapons.''Psychotronic weapons!?!'' they cry in chorus stuck in groups' naive mechanistic universe of Descartes…. Yes, psychotronic weapons! [2] .

The psychotronic weapons, as so many men confirmed who had positions in the army, including the general Mircea Chelaru, former Chief of General Staff of the Romanian Army, those not only exist but also they are used from a lot of time on the population in order to make it obedient or to hysterical it when it is needed to [2].

These sources which can issue through remote control are hard to identify and is activated through satellite command. According to the declaration these devices can be placed in the principle centres of major risk of the assembly sets. They are named psychotronic devices against uprisings. They were tested in the 1995-2005 in different theatres of the operations and the results were exceptional.

And then, this generalized lethargy of many nations with well-defined European traditions that simply do not seem able to defend the identity profile should not be interpreted in terms of the type of aggressions mentioned above?

4. THE TERRORISM. ISIS LEADS AN ASYMMETRIC WAR AGAINST EUROPE

One of the newspaper's journalists Napoca News reports in an article the opinion of a former member of the Soviet special troops, about the refugees who invaded Europe and their true intentions.

He says that it all started after the attack in France, from Charlie Hebdo, and the jihadists want to implement the terrorist threats that they launched a few months ago to Europe.

The Jihadist commando showed by summary execution and punctual that ISIS Islamists from actually controlling in terms of public safety the continent.

In February, the Islamic State threatened publicly that they will invade Europe until the fall with 100,000 fighters.

According to Romanian diplomats, "Islamic State exceeds the size of a typical terrorist organization. It is organized like an irregular type of army, which has 100,000 armed agents, of which 40,000 Westerners and hundreds of thousands of sympathizers. Resources amount to 2,000,000,000 dollars plus access to non-financial resources, especially oil resources in the area. "

In May 2015 the Turkish secret services interrogated several jihadists fighters captured in Syria, stating that in four months will begin the Islamist offensive in Europe. In late August it was set in motion the torrent, about one million refugees from Middle East and North Africa. UN analyzes the situation and 70 % of the refugees are young men, the rest being women and children [3].

Head Frontlex revealed in a press conference that they caught or intercepted ISIS fighters among them, some of them were arrested on the Bulgarian or Hungarian border. But the bulk of Islamists went smoothly in the EU. Security experts and agencies interested in the future of Europe noted that Muslim refugees are highly organized and insolent, they do not seem like people fleeing war and hunger, because they throw the food received. They are divided into groups coordinated by a leader. Fifty people have a commander who transmits to the group the instructions in Arabic. It has been found in Budapest, as Muslims "refugees" come in buses ordered and coordinated and they obey the commands of their heads, in Arabic [3].

5.THEIMPORTANCEOFTACTICALBALLISTIC MISSILE (TBM), ANTI-RADAR MISSILE (ARM), CRUISE MISSILE (CM) AND UNMANNEDAIRCRAFTS (UAVS)

The analysts in aviation at Teal Group (Washington, DC) estimated that, by 2018, the UAV market will total about 55 billion USD in procurement charges and R&D (research and development) compared to the amount of approximately $ 4 billion spent until the present. The largest market share belongs to the military and defense agencies of the US (64%). The Asia-Pacific area totaling 20%. The European and NATO requirements sum up the remaining 16 % market share. In this context UAVs market is currently "a moving target" in the literal and figurative sense. Now, over 50 states have such aircraft, which, since 2007, have been over 500,000 flight hours. This figure is expected to grow further at a pace logarithmically [4].

FIG. 4 Types of UAV

There are a multitude of missions which the airplanes can execute, both in peacetime and in times of crisis and war. The areas for their use are different, there are ongoing concerns for the development of UAVs and their integration into the airspace.The presence and effectiveness of unmanned board bring these to the fore and remember such factors as, until 2004, they were used in, support of Operations Enduring Freedom and Iraqi Freedom, more than 20 types of UAV, totaling 100,000 flight hours which demonstrates their importance in the preparation and execution of operations. Moreover, one can say that they have changed the leadership of the war against terrorism in the world just by the multitude of tasks they can perform [1].

In this area have been important advances that have allowed minimizes the sensors. Modern UAV systems have the requirement to ensure the highest possible flight autonomy and knowledge at any time of the parameters of movement of vehicles. In relation to the whole, drones represent around 10% of purchases and deliveries of UAVs. The segment radar decoy without power is narrower. In relation to complete forecast, radar baits will represent less than 1% of all production of UAVs. Combined, UAVs in target segments represented by drones and radar decoys will total approximately 400 deliveries each year until 2018.

In the near future, the main development of the means of air defense will not be spectacular. The evolution of threats coming from the air, with the development of missiles that can be launched from greater distances from the target, requires increasing the capacity to fight missile by making efficient integrated systems.Intercontinental ballistic missile (ICBM) is part of aerospace vehicles for ground-ground type with long range (over 5,500 km). After the ascent stage when the engine is used for propulsion, rocket get out of the atmosphere and uses the energy stored during the ascent to descent to target moving along a ballistic trajectory. Sequences development of a ballistic missile Minuteman -III MIRV type since the launch sequence evidenced in their performance chart in Fig.5.

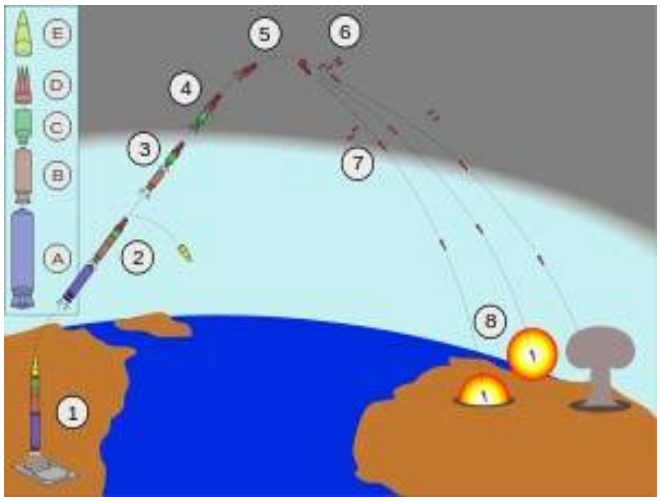

FIG. 5 Steps trajectory of an intercontinental ballistic missile

The significance of each sequence is as follows:

1. Rocket launch silo with igniting the first stage rocket motor (A) ;
2. After about 60 seconds after launch the first stage emerges and the engine of the second stage starts (B); The coating of the rocket is thrown (E);
3. At about 120 seconds after launch, the engine of the third stage starts (C) and it is separated from the second stage;
4. At about 180 seconds after launch, the traction of the third stage ends and the post-stage traction (D) lights;
5. Post- traction stage handles itself and prepares for missile reentry;
6. The aerospace vehicle as false targets is launched with the return to the atmosphere;
7. The aerospace vehicle re-enters in the atmosphere at high speed and arming in flight;
8. The initiation of nuclear warhead to blast air or on the ground.

CONCLUSIONS

A regional conflict amid the straining relations between Turkey and Syria and between Iran and Israel and the rivalry between Moscow and Ankara would contaminate the Black Sea:"The conflict is not likely, but possible and if it held, it will impact Romania – from refugees to war export". "We must be prepared for different eventualities" the director of the Center for East European Studies points out, ''because the today's world is not a world where you can sleep peacefully". In this context we talk about the crisis in the east, this vast territory, this changing map of the East, which includes Russia's neighboring countries plus countries that were part of the Soviet bloc called Lab Europe.

Crimean crisis in 2014 was triggered as a result of anti-government protests in 2013-2014.The trigger was the repeal of the law on regional languages status whereby multiple languages used in Ukraine, including Romanian, were removed from official use. Those who created tension are on the one hand the Russian-speaking groups who oppose the new political changes in Kiev and want annexation of Crimea and Russia, on the other hand, groups of Ukrainians and Crimean Tatars.

The density and timing of air attacks will require to maximum integrated air defense systems. Air opponent will use massive means specific electronic warfare to neutralize in the first stage the radar and communication systems.

In this context, factors, requirements and operational concepts of an integrated air defense are complicated to the maximum. The most important objective will be to reach the level "Near Zero Leak" (any area uncovered) protection objective. This level of protection is best guaranteed by a mixed system composed of missiles and antiaircraft artillery.

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FLYING TRAINING SYSTEM FORCADETS IN POLISH AIR FORCE ACADEMY– CHANGES AND EXPECTATIONS

Maciej MIESZKOWSKI, Marcin OLECH

Polish Air Force Academy

Abstract: *Systems and ways of training of cadets in Polish Air Forces have evaluated with a run of time. Different times called for different solutions. Beginning with a 'before war mobilization through requiring and expensive times of 'cold war' as well as realities of People's Republic of Poland, up to the modern times of glass cockpits and ubiquitous simulators. Polish Cadets received knowledge and abilities in accordance to the challenges that our country were facing those days. Year 2010 showed many shortcomings in Polish Air Forces and forced it to implement upgradesand improvements, which effect we are able to experience today. Nowadays, Polish Air Forces are undertaking general changes in structures , equipment and training systems what is mostly visible in Polish Air Force Academy. What and why has been done? These are the main topics that we are going to discuss in our paper.*

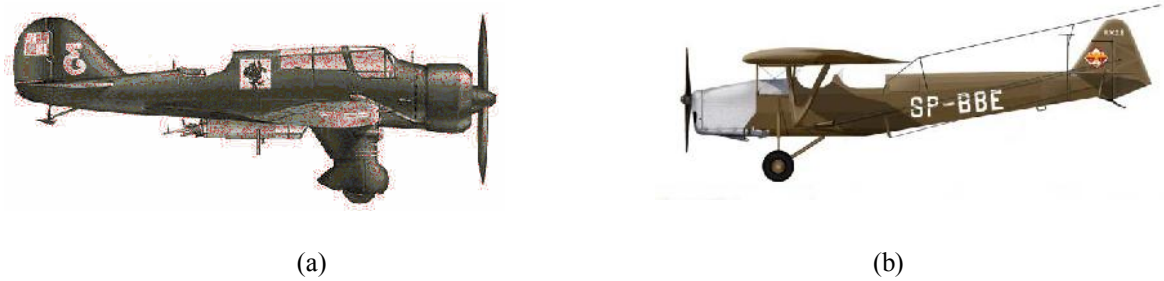
Keywords: *Poland, cadets, training, changes.*

1. INTERWAR PERIOD

From the first days of the existence of Polish Air Forces, there was a need which must have been satisfied. That need was a necessity to have well trained pilots, observers and navigators - crew of soldiers ready to defend Polish 'air borders' in case of war. In the run of time system of training evaluated, regarding to the aims that Polish Air Forces were facing those days. Let me start from the very beginning.

The 'Eagle's School' continues an over ninety years tradition of training the cadets of Polish aviation. Polish Air Force Academy has been created in Grudziądz in 1925 and was moved to Dęblin in 1927 under the name of 'Aviation School of Pilots'. Teaching personnel received a goal - to train candidates for first pilot-officers. Unfortunately, as a result of the May Coup and the decision of Marshal Piłsudskiwho changed the priorities of using Air Forces, cadets were educated in the way to become observers, upon new program of training. In 1929 in purpose to fill the lack of pilots in Polish Air Forces, the course for 'Lower Aviation Officers' has been created. Between 1929 and 1934 over 200 pilots were trained – more than 75% of them up to the class of higher pilotage. Till the beginning of Second World War, 47 of them died in a plane crashes. In account of rising size of German Air Forces, the decision to start the recruitment of cadets for aviation has been made. After 10 years-long break, young men were able to join academy again. At the beginning of 1935, Polish government extended the period of training up to 3 years, and abandoned the one year long, basic military training. During the first year cadets were divided into two groups: pilots and navigators - in accordance to their flying predispositions. The second year was designated for theoretical training - during 3rd semester and practical training - during 4th semester. In purpose to make the training as effective as it is possible 2 training squadrons have been created. First squadron for preliminary training and second one designated for training on combat

aircrafts. Squadrons commanders and instructors were well qualified – they had full permissions and were able to fly on every single plane in Polish Air Forces. The main types of planes exploited in Polish Air Forces were : Bartel M-4, RWD-8, PZL-23 'KARAŚ', P-7 and P-11.



(a) (b)

FIG. 1.(a) PZL.23 Karaś - Polish light bomber and reconnaissance aircraft, (b) RWD 8 - Polish parasol monoplane trainer aircraft.

Introducing new planes into the training system, brought a possibility to reduce costs and rise the level of knowledge of future pilots as well as speed up a time of whole training.

New learning program provided cadets of the Aviation Academy with more practical training in use of weapon, bombarding, tactics of air fight, navigation and radio communication.

Practical training started with 22hrs of basic pilotage focused on training of departing, building an airdrome circuit and three points landing. Passing an exam was a gate to solo flights in dimension of 10hrs. Training ended with parachute jumps. In year 1938 basic training was improved by 'blind pilotage' on a plane PWS-26, and the number of solo flights raised up to 41hrs. Training at a combat planes and receiving 3rd class of a military pilot allowed a cadet to be promoted and serve in an Air Regiments.

Threats of those times forces Polish Air Forces to introduce additional shooting practices – especially during courses of higher pilotage. Course ended with nine air fights between student pilot and an instructor which lasted around 2hrs 25min at all. Last cadets promotion in August 1939, just a month before a war, delivered around 180 combat planes pilots, 46 well trained observers and 130 pilots trained on a plane PWS-26.

In September 1939 absolvents of 'Eagle's School' proved their value in clash with German Luftwaffe. During fights Polish pilots destroyed over 100 German planes and damaged at least 200. More than 780 Polish pilots were fighting in the French and British territory, what is more, they become famous of their indisputable achievements during big air battles – like a battle of England.

2. PEOPLE'S REPUBLIC OF POLAND

As a result of geographic changes and new zones of influences especially in the middle-east Europe, Poland were in a quite complicated situation. Huge collateral damages, repression policy for intelligence group and lack of qualified officers-instructors because of mass murders by Nazis and Red Army soldiers, had a huge impact on directions that Polish Air Forces were heading.

First after-war school for pilots was 'Military Aviation School of Polish Army' established in 1945 in Zamość. No more than 3 month later it was moved to Dęblin under the name of 'Military School of Pilots'. One month later name was changed to 'Aviation

School for Officers of Polish Army'. During first few years after war, when the needs for pilots of Polish Air Forces were the biggest, period of training have been shortened, and lasted from 6 up to 10 months. Process of education has been improved equally in every possible area only in the 1947-1949. Theoretical training of pilots was foreseen for one and navigators for two years.

Unfortunately decisions made those days had a huge impact on level of recruited candidates for future pilots. Pursuant to the order of Minister of National Defense, 60% of candidates were supposed to be chosen from the working class, 30% from rural class and just 10% from the working intelligence class of polish society. The only condition was to graduate 7years of primary school. That reflected negatively on the knowledge and training level of cadets.

In line to escalation of cold war, special moves were undertaken. Between 1950-1951 number of cadets was doubled and the period of theoretical training was shortened to the very minimum. According to the guidelines, cadets were learning '*only those things that are necessary to know during war and only in this way that is required on a war'*.

Another turning point in history of training systems for cadets of aviation was an introduction of jet fighters to Air Forces of People's Republic of Poland as well as new electronic and steering systems. Most popular planes in use by polish pilots those day were: MiG-15, MiG-17, Su-7, Jak-23, Ił-10 and later PZL TS-11. First helicopter used by Air Forces was Mi-1.

(a) (b)

FIG. 2.(a) MiG-15 Fagot - jet fighter aircraft, (b) II-28 Beagle –jet bomber.

Changes mentioned before, required specific steps in training systems. The aviation training camps for cadets have been created. The main purpose was to prepare pre-cadets for flying training at the military machines. Camps were divided in two groups. First for gliders and second one for a planes. (LPW 1 and LPW 2) One of the substantive reforms was a providing necessity to graduate a high-school before application for academy. What is more, the period of studying has been increased, at the beginning to 2,5 years, later up to 3years. Only 20-30% of candidates for cadets were able to start studies in 'Eagles School' as a result of intensification of health and conditional requirements.

The educational reform from 1967, initiated new period in our school, which in 1968 became the only one higher educational school of aviation in Poland and changed name from 'Flying Training Center' to 'Higher School for Officers of Aviation of Jan Krasicki'. The main change was a huge improvement in theoretical training for cadets and extending the learning period up to 4 years. Furthermore, absolvents received a rank of second lieutenant-pilot or 3rd class navigator degree as well as engineer-commander diploma. Those times theoretical and practical training of cadets was undertaken in a staggered manner. First three semesters were similar for every specialization and designated for technical and political education. Next, 4th, 6th and 8th semester was earmarked for practical training in the air (cadets-pilots) or practical training for other specializations. Semester 5th and 7th was spent for courses aimed for gaining additional: technical and special knowledge. Training courses in WOSL (Higher School for Officers

of Aviation) were fulfilled in several fields: pilot (jet pilot, transport plane pilot, chopper pilot), on-board navigator, ground navigator, political officer and commanding officer.

3. MODERN PERIOD

The fall of Warsaw Pact and changes involved with it, forced new Polish government to provide educational system with new quality. October the 1st will be always remembered as a turning point in a modern history of aviation education in Poland. The name was changed for the last time. 'Higher School for Officers of Polish Air Forces' (Polish Air Force Academy) remains present till today, and is one of the biggest Air Force Academy in Europe.

From 1994 till 2012 cadets of Polish Air Force Academy were being trained in 7 fields of education: air traffic controller, intercepting navigator, on-board navigator, parachute jumper and pilot (jet pilot, transport plane pilot, helicopter pilot). Training system was quite similar to this one from the late 80'- which means that was undertaken in a staggered manner. First three semesters – for basic knowledge of math, science, electronics and other technical courses. 4th, 6th and 8th semester for practices and semester 5th and 7th focused on final paper to receive engineer degree and special courses. Students were able to continue studies until receiving master degree. On-board navigators were being trained for a 3rd class of navigator, air traffic controllers received MATCL (Military Air Traffic Controller License) just before graduation. Parachute jumpers (just few of them) were trained in a special, individual way, to become a military instructor of parachute jumpers. Pilots were trained at a different types of aircrafts and simulators to receive 3rd class of military pilot. It was necessary for them to gather around 300 hours in the air - for jet pilots, 150 hours for transport plane pilots and around 120 hours for a helicopter pilot. Main training aircrafts were: TS-11 'ISKRA', PZL – 130 'ORLIK', An-2, M-28 'BRYZA', and helicopters Mi-2 and SW-4. (There was a try, to introduce polish advanced training jet I-22 'IRYDA' to the Polish Air Forces, but unfortunately after several crashes program was abandoned.)Cadets were supposed to receive second level of English degree according to STANAG 6001. What is more, Polish Air Force Academy implemented system of evaluating which bases on the ECTS points. That is the first step for international exchanges and cooperation.

(a) (b)

(c) (d)

FIG. 3.(a) PZL TS-11Iskra - Polish jet trainer aircraft, (b) PZL I-22 Iryda - twin-engine, two-seat Polish military jet trainer aircraft, (c) PZL SW-4 Puszczyk – Polish light single-engine multipurpose helicopter, (d) PZL M28 Bryza – Polish light cargo and passenger plane.

4. 'CIVILIAN CHANGES'

At the fall of 2009/2010 Polish Air Force Academy opened its gates for a civilian students, in aim to fill the lack of workers in rapidity growing aviation job market. Firstly civilian students were trained as airport crew, navigators and received basic knowledge as an air traffic controllers. Later, level of training was increased to received civilian licenses of air traffic controllers and navigators. Few years ago, civilian students received a possibility to study as a pilots to receive Commercial Pilot License at Airplanes (up to the frozen ATPL) as well as CPL at Helicopters. Everything mentioned before was available because of creation an Academic Training Center under command of Air Force Academy.

April the 10th 2010 is probably the most sad and terrifying day in Polish modern history.Tu-154, plane of 36th Special Transport Squadron crashed during final approach at the Smoleńsk – Siewiernyj airport. All 96 passengers died including President of Poland – Lech Kaczyński. Official report of investigation team showed a lot of shortcomings during training of pilots and several mistakes that lead the plane to the catastrophe. Polish government was obligated to make necessary steps, to not let the same thing happened again in the future.

The biggest, and probably the most visible thing that was changed is new system of training in Air Force Academy. Staggered manner system was changed with even system. First 7 semesters of education in Polish Air Force Academy includes technical education for students like math, science, electronics, basic knowledge about an aircraft, etc. What is more cadets have to receive level 3,2,3,2 of English according to STANAG 6001 before graduation.

However first seven semesters are made for theoretical training, there is a time for practices as well. Military students are obligated to pass civilian licenses before starting practical training at military aircrafts, during 8th, 9th, 10th and 11th semester. Starting with helicopter pilots, they have to receive PPL (H) license which means, they are supposed to have around 50 hours at civilian chopper (GuimbalCabri G2) – around 20 hours of solo flight. Then they are prepared to attend training on military choppers like Mi-2 and SW-

4.Jet pilots are training on civilian plane (Diamond DA-20) to receive PPL(A) license and gather additional 50 hours of solo flights. Training includes airdrome circuits, flights to another airports and flights during nights. After passing IR and acrobatics on a plane Zlin-242, cadets are ready to start training on a military machines such as PZL-130 'ORLIK', TS-11 ' ISKRA' and in the close future M-346. Cargo and transport plane pilots are training on a Diamond DA-20 to receive CPL(A) license. What is more, it is necessary for them to finish training during a night and receive rating for multi-engine plane – in this case on a Diamond DA-42. After civilian part of training, transport-plane pilots, start training at a military aircraft M-28 'BRYZA'. Cadets experience as a pilots after almost 5 and a half is created as follows: helicopter pilots around 180 hours in the air on both, civilian and military helicopter and additional 60 hours on a simulator of SW-4; transport pilots havearound 300hrs in the air and on the simulators at almost 4 types of an airplane; jet pilots graduates academy with around 230 hours in the air on private account.

(a) (b)

FIG. 4.(a) M-346 Master - military twin-engine transonic trainer aircraft, (b) PZL-130 Orlik - Polish turboprop, single engine, two seat trainer.

5. SUMMARY

Level of training of cadets in Polish Air Forces were always connected with amount of money that Polish government was able to spend for it. But here comes the moments, when money does not have a meaning anymore. Like war, treat of war or a really serious catastrophe. Does the all mentioned before changes matters anything ? I am just a simple cadet and it is hard for me to find a direct answer, but personally I think that Polish Air Forces are heading in a right direction. Lot of training on a modern simulators and top-notch equipment is something that we can be proud of. One of the side-reason of Smoleńsk catastrophe was a pushing and a making a pressure on pilots to make a decision to land. Most of you, readers of this papers, are soldiers and knows best how hard is to refuse orders of our commanders, but I think that treat of losing a license helps a lot, to make an only one - correct decision.

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HUMAN FACTORS INFLUENCING AVIATION SAFETY

Cătălin MOCANU

"Henri Coandă" Air Force Academy, Braşov, Romania (catalin_cata516@yahoo.com)

Abstract: *The aim of this paper is to present the main errors which occur in flight operations and ways of reducing vulnerability to them and the impact of biological factors in aviation safety.*

The term "human factors" has become increasingly popular as aviation industry has realized that most aviation accidents and incidents are caused by human error, rather than mechanical issues. In aviation, the 'human factors' concept is dedicated to understanding how humans can be integrated with the technology in the safest and most efficient ways. Despite major progress in technology, ensuring the success and safety of the aviation industry ultimately depends on human responsibility. The consequences of errors in aviation are certain to grow as the system complexity increases and the traffic volume rises. It is counterproductive to interpret errors as evidence of human inadequacy. For every accident linked to human error, a great number of accidents are prevented by the skilled intervention of human operators.

Keywords: *human factors, aviation, safety, error, performance, accident*

1. THE HUMAN COMPONENT AND AIRCRAFT SYSTEMS

Automation began to invade the aircraft industry many years ago, with the first autopilots and human factor professionals as well as systems engineers recognized that it poses difficulties. Computer control changes the nature of the human task, and there may be many control options.

The human functions are divided into: sensation (all the neuro-physiological functions of sensing visual, auditory and haptic information from both the machine and the environment lumped together), cognition (including allocation of attention, perception, memory and decision), and action (muscle responses to operate discrete controls such as buttons, switches, pedals to adjust continuous controls and to speak).

A finer analytical breakdown can be made, but within the human body the hard task is to identify and bound the component elements in order to know what the interconnecting variables between sensation and cognition are, and between cognition and action. What a person sees on a display can be elicited by experiment and what a person decides can be similarly determined.

Figure 1 shows a single operator (pilot) observing information from a machine display and also from the machine's environment, responding with control actions. Also, it can be seen how the variables mentioned above are interconnected.

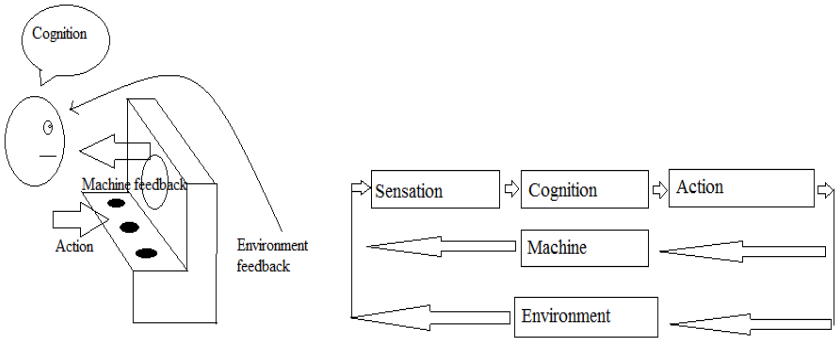

FIG. 1

It is very important to distinguish direct control from supervisory control. By direct control, a command is sent directly to the machine with no intervention by a computer (for example, to take an aircraft to a new altitude the pilot continuously adjusts pitch and increases throttle to raise the nose and thrust), whereas in supervisory control, the human command is sent to a computer and it processes the human command using its own programmed intelligence (for example, the pilot can punch into the autopilot a new altitude).

Figure 2 shows a human operator (pilot or air traffic controller) having to allocate both his senses (usually vision) between direct and supervisory control, whereas in supervisory control case for both displays and controls there is automation that mediates what the human does or sees.

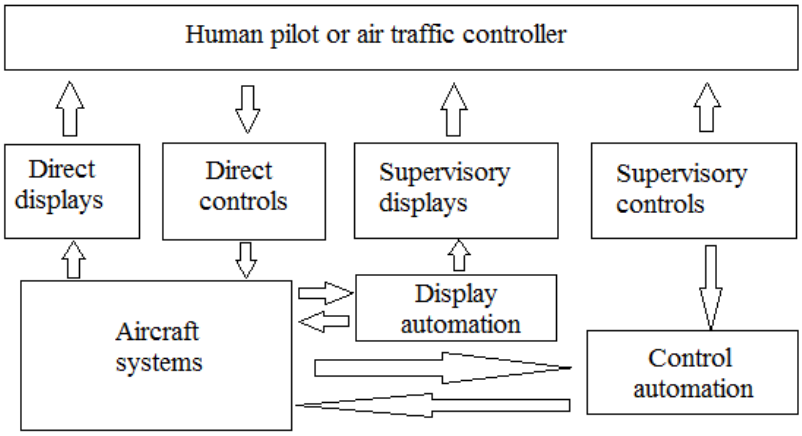

FIG. 2

The design and development of an aviation system, whether it be the aircraft itself, some component piece of avionics, an airport or a major air traffic control system, is best implemented by human system integration, which is the process of incorporating the efforts of human factor professionals and the methods of experimentation, hardware/software design and testing/evaluation into much larger engineering enterprise.

2. HUMAN ERROR IN REAL-WORLD OPERATIONS

How organizations interpret and respond to human-operator errors is driven largely by their perspective on why humans make errors. The dominant perspective was that professionals who make errors performing tasks appropriate to their skill-level show

some personal shortcoming: they must lack skill or diligence. Therefore, the organizational response was to admonish, punish, re-train or fire the individuals whose errors adversely affected the organization. However, in recent years a strong consensus has emerged among scientists in several disciplines that this approach is misinformed and impairs efforts to improve safety.

From a scientific view, the errors made by skilled experts such as controllers, professional pilots, mechanics and dispatchers are not root causes of accidents but symptoms of the flaws and limitations of the overall socio-technical system in which they work. Also, the causes of errors are closely related to the cognitive mechanisms that make skilled performance possible. Even the most conscientious and skilled person occasionally makes errors, not because humans are intrinsically inadequate but because some of the tasks they perform do not allow 100% reliability.

2.1 Classification of error types

After analyzing about 80 incidents from several European and overseas sources, the results indicated that, most of the time, more than one error was made by one or more individuals and that several contextual conditions contributed to the errors. Figure 3 shows the most significant results.

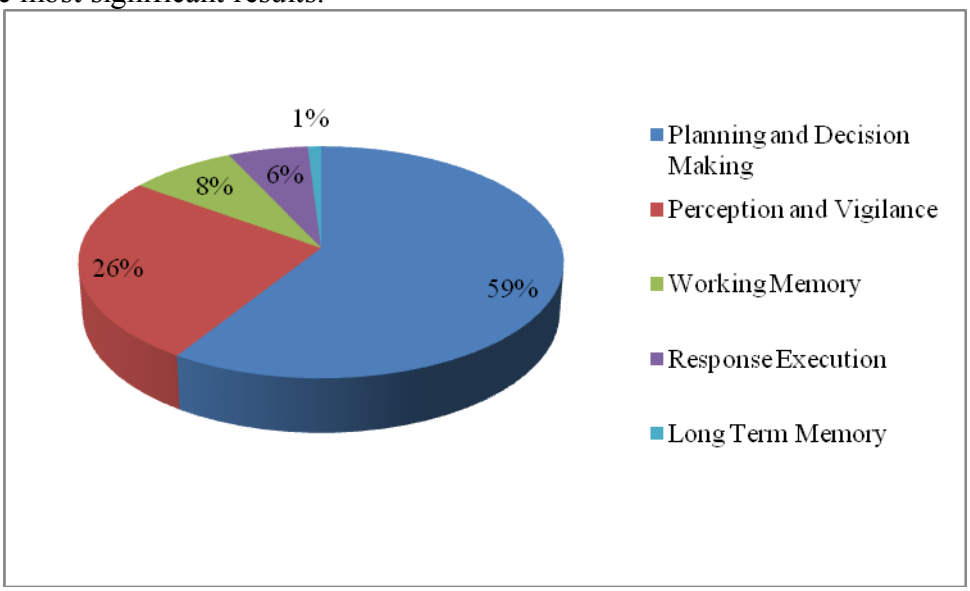

FIG. 3

The results show that the highest number of errors was found in Planning and Decision Making; more precisely the problems were in the area of incorrect decision or plan. The second area of concern was seen in Perception and Vigilance and more precisely in the problems of hear-back and mishearing.

Within the same 80 incidents, the Contextual Conditions were also identified. The most prominent contextual conditions were linked with teamwork related issues (lack of communication, lack of coordination between the controllers and/or other personnel). The second most prominent contextual condition was related to the traffic (complexity, mix of traffic, sector capacity) and the airspace/aerodrome structures. Another problematic issue was associated with workplace design and Human-Machine Interface.

2.2 Reducing vulnerability to errors and accidents

The ”blame and punish” mentality towards error, especially those made by skilled professionals highly motivated to avoid accidents, is inimical to safety, deflecting attention from identifying and reducing system vulnerability. An appropriate system safety perspective holds that the design of equipment, operating procedures, organizational policies and training should start with the understanding that errors will occur but can be minimized with proper design. Systems must provide ways to detect and correct errors before they endanger system operation.

Well-designed training is crucial for preventing and managing error, although it cannot compensate for poorly designed equipment and procedures. Training could be enhanced by explaining to pilots how concurrent tasks and prospective memory increase vulnerability to error.

When humans are under time pressure, they tend to rush. However, in the operational world, rushing only saves seconds at best and greatly increases probability of error. Training, policies and procedures should be explicitly designed to counter the lure of rushing. Organizations should also periodically review all operating procedures to determine if they create situations in which interruptions, concurrent tasks and deferred tasks are more likely to arise.

The cause of errors and their role in accidents cannot be fully understood by looking only at flights in which accidents occur. The aviation industry needs data on what happens in apparently normal flights in a wide range of operational situations in order to identify the problem areas.

3. BIOLOGICAL FACTORS IMPACTS IN AVIATION SAFETY

In this chapter we will discuss about aircrew fatigue, sleep need and circadian rhythm, as these are the most important factors that greatly affect performance and overall safety.

Fatigue is classically defined as a decrease in performance or performance capability as a function of time on task. However, many scientific studies in the past half century have established that human fatigue is dynamically influenced by neurobiological regulation of sleep need and endogenous circadian rhythms, which interact to produce changes in human alertness and cognitive performance over time.

Humans are not designed to operate effectively under the pressure of 24/7 schedules. However, fatigue cannot be eliminated from aviation operations because of the inherent schedule requirements for trans-meridian travel, unpredictable schedules, long duty days, night flights and reduced sleep opportunities. Therefore, there is a need to develop scientifically valid fatigue-management approaches to diminish sleep loss, enhance alertness and cope with circadian factors.

A fundamental neurobiological process involved in the timing of alertness and quality of optimal cognitive performance is the homeostatic sleep drive, which interacts with the endogenous circadian pacemaker. The increase in homeostatic sleep drive with time awake and the circadian cycle interact to produce dynamic nonlinear changes in human fatigue and functional capability. Therefore, inadequate sleep duration and reduced quality of sleep lead to fatigue that drastically diminishes performance.

The aviation industry seeks to manage fatigue relative to the demands of 24-hour operations. Individuals required to maintain high level of alertness over extended periods of time or at night are open to neurobehavioral and cognitive consequences of sleep loss and circadian disruption which lead to slowed reaction times, difficulties in problem solving and perseveration. The risk of errors and accidents increases.

Fatigue can also occur due to excess cognitive or physical workload. The risks of accidents and injuries increases as workload increases, especially after 12 hours of work a day or more than 70 hours of work a week. Also, higher cognitive workload increases the adverse effects of sleep loss on cognitive performance.

Overnight operations pose a challenge because circadian biology promotes sleepiness and sleep at night. Neurobehavioral and cognitive deficits linked with night work are likely to be most acute with extended wakefulness. The consequences of fatigue for performance can be as serious as other risks.

Pilots are additionally affected by trans-meridian flights because they are not in a time zone long enough to adapt biologically. Also, this can cause problems with the ability to initiate and consolidate sleep at the new destination, and lack of sleep leads to fatigue. Fortunately, napping in the cockpit for 26 minutes was associated with significant improvements in pilot physiological alertness and psychomotor performance.

Operational demands such as extended work days, increased workload levels, reduced sleep opportunities and circadian disruption pose significant challenges during aviation operations. There is a need to develop approaches that reduce fatigue related issues, by implementation of scientifically valid and operationally feasible technologies that provide intervention to help manage the fatigue in aviation personnel.

4. CONCLUSIONS

The human error can result in fatalities, injuries, equipment damage, operating costs and loss of productivity. As traffic volume rises, economic conditions drive cost-cutting measures and system complexity increases, the consequences of error in aviation are certain to rise. Although most aviation accidents are linked to operator error, it is facile and counterproductive to interpret this simply as evidence of human shortcoming. It is far more productive to understand operator errors as symptoms of system weaknesses, and to acknowledge that human operators are performing tasks under conditions in which computers would be terribly inadequate. For every accident attributed to human error, vast numbers of accidents are prevented by the skilled intervention of human operators.

Human error and the ways in which they contribute to accidents and to inefficient operations are as complex as the human brain itself. Although most accidents are attributed to operator error, the amount of research conducted on it is insignificant in comparison to the investment spent on developing new technologies. Safe and efficient operation of these technologies requires that all stages of development be firmly anchored in deep and correct understanding of human performance.

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THE GEOGRAPHY OF POWER: RELATIONS BETWEEN RUSSIA AND GERMANY IN TODAY'S BROADER INTERNATIONAL CONTEXT

Oana PUIE, Andreea ȘERBAN

"Mihai Viteazul" National Intelligence Academy, Bucharest, Romania
(puieoana21@gmail.com, andreea.serban10@gmail.com)

Abstract: *The paper aims to analyse the dynamics of the relations between Russia and Germany, in the context of the current impact of the policies of these two countries in the European security environment. Starting from the international relations theory, in particular realism and the power balance, the paper highlights some key issues focussing primarily on the competition between the US and Russia for hegemony in Eastern Europe and, secondly, on Germany's role in the balancing process.*

Keywords: *foreign policy, Russia, Germany, crisis from Ukraine*

1. INTRODUCTION. THEORETICAL FRAMEWORK

Realism, along with constructivism and liberalism, is one of the general theories that define international relations. Some of the main scholars of realism are Kenneth Waltz, Hans Morgenthau and John Mearsheimer. Due to the diversity of their approaches, my attempt to provide a comprehensive definition was replaced by the extraction of some of the elements that all theories have in common, which has helped in drawing a more dynamic outline of realism.

A first characteristic quoted in the works of Waltz is that the interest of the state triggers its need to act and to develop policies in the face of international competitiveness. The success of a policy is measured by the state's preservation and consolidation on an international scale. Morgenthau formulates six principles of political realism starting from the assumption that: "*Politics is governed by objective laws, rooted in human nature. The main marker that helps political realism find its path in the field of international politics is the concept of interest, defined in terms of power.*" Mearsheimer completes the conceptual formulations, considering that the international system is an anarchic system, where survival is the guiding principle of each state. By definition states are rational, therefore the inherent availability of offensive military capacities leads in a permanent state of scepticism and suspicion towards the intentions of other state players (Morgenthau, 2007:45).

The power balance is the main instrument that realists relate to. A power balance is a state of fact whose aim is the equal distribution of power in the international system (namely a relative equality). Waltz explained the existence and motivation of such an instrument of international relations(Waltz, 2006:143). This is based on three assumptions. First of all, it asserts that the field of international relations is a field of anarchic (non-hierarchical) structures and that the order derives from the interactions of state players. Secondly, political structures are distinguished by their capabilities, and not by their functions (which is inherent of hierarchical structures): the capabilities are those

that enable them to reach their targets. Thirdly, political structures display a differentiated distribution of capabilities, and, therefore, also different opportunities for exploitation and domination. Therefore, bipolar systems (in which two super-powers are dominant) and multipolar systems (dominated by three or several powers) emerge as well as the concept of "*power balance*". In the anarchical environment in which they live, states relate to the relative power they have and regard the power of other states as a threat. The purpose of each state is to acquire international power. One of the best known instruments used is balance: attracting a state to one of the parts of the power balance to obtain benefits and to achieve the targets set. The power balance used to define international order during the Cold War. The two power poles (US and USSR) embodied two essentially different systems, approaches and visions.

On the one hand, the US was the leading promoter of democracy as a political system and of capitalism as an economic approach. The separation of powers, free and universal vote, the involvement of civil society in the governing process by lobby activities and NGOs, the observance of human rights and freedoms, private property, the law of demand and supply – are the principles adopted by American leaders that applied and pursued their adoption in all countries with which they collaborated. Among these were the Western European countries, democratic, which enjoyed the financial support (the Marshall Plan) and the military support (NATO) of the US since the end of the Second World War (1945).

On the other hand, the USSR was the main promoter of a totalitarian system, Communism. Characterized by a nationalized, centralized economy, collectivization, nationalization of the means of production and the main production factors, forced industrialization, one party and one leader, propaganda, censorship, the cult of the leader's personality, interdiction of any form of professional partnership, Communism was, ideologically speaking, the biggest threat to the US. Communism was spread in the Soviet republics forming the USSR, dominated by the centre in Moscow, and in satellite states, such as East European countries.

The confrontation between these two poles was military (NATO – Warsaw Pact), economic (the wars for the resources in the Middle East, the opposition between market economy and centralized economy), political (democracy versus totalitarianism and their enforcement in as many areas as possible), cultural (the right to free speech and its counterpart, censorship and repression), psychological and social (the confrontation between the attempts of encouragement and repression of the development of civil society). The consequence was maintaining the power balance for 40 years, while neither of the two powers succeeded in asserting its domination towards the other, but tried to monopolise as many small states as possible to create a counterbalancing effect.

2. POWER PROJECTION. EASTERN EUROPE

Although currently we cannot speak of two dominant poles, the model of the power balance is still topical and we can say that it applies to the US-Russian relations. Currently, the US and Russia have a common stake: Eastern Europe. The intended purpose is to attract the former countries of the Separatist block towards a collaboration either with NATO (an objective pursued by the US), or with the Russian Federation. This would re-establish the balance lost, in Russia's opinion, after 1991 with the implosion of the USSR.

Caught between two powers is the European Union, a contemporary political and economic force, but disadvantaged by the lack of military size. The common historic,

ideological and economic fund with the US could be a decisive factor in EU's direction, but the current context has intensified the role of the energetic dimension, so that the EU is in a position in which it is also dependent on the Russian Federation.

A relevant and illustrative example is Germany, EU's tacit leader that succeeded to impose itself at European level by economic and political superiority. Germany's decisive attraction by NATO, respectively the US, could translate into the implementation of firm policies and sanctions against Russia, as a result of the breach of some international regulations and principles, in counterbalance, its attraction towards an intensive collaboration with Russia would mean EU's failure and a series of negative consequences for NATO. For a better understanding of Germany's position, as starting point in the analysis, here is the brief presentation of Germany's evolution.

3. GERMANY'S RISE

Germany's history was marked by personalities like Bismarck, Wilhelm II, Hitler and Konrad Adenauer. With their visions, the country's approach to international relations was always realistic. Bismarck succeeded in unifying German states around Prussia and applying the *Realpolitik* in its relations with the other European states, Wilhelm promotes colonialism, Hitler marked Europe by the consequences of the war he started – against the Jews and against the Allies, Adenauer advocated for European unification, being considered one of the founding fathers of the European Union.

Today, Germany has the largest economy in Europe, with a GDP of 3,635 trillion dollars in 2013, being considered one of the strongest leaders of the EU. Since the unification of the two Germanies, GDR and FRG (1990), the consequences of Europe's division during the Cold War, the country was in the first line of political, economic and security organizations such as the EU, OSCE and NATO. Currently, the head of the state is the president Joachim Gauck (since 2012), but the biggest power is in the hands of the head of the Chancellery, Angela Merkel (appointed in 2005), preceded by Gerhard Schroder (1998- 2005).

Upon takeover of the executive power, Angela Merkel socially and politically benefits from the effects of structural reforms initiated by Schroder, which focussed on the problem of the low birth rate and the demographic challenges due to globalization, the most prevalent of which is migration. Merkel took actions mainly in the economic sphere, by implementing measures that led to the significant increase of the budget deficit (4.1% in 2010). However, the lower consumption rate and the taxation rate have reduced this deficit to 0.8% in 2011 and 0.1% in 2012.

Germany's biggest challenge at the moment is its energetic security. Although politically and economically speaking, the state is a model of good practice, in the field of energy Germany does not have a good position. Germany relies 87% on natural gas imports: 38% from Russia, 24% from Norway, 23% from the Netherlands and 11% from local sources. Where oil is concerned, 39% is imported from Russia. Germany's dependence on resources was also amplified by Merkel's decision after the nuclear disaster of Fukushima in March 2011. The chancellor decided to shut down 8 of the country's 17 nuclear reactors, the others being scheduled to be shut down by 2022 (before the 8 reactors were shut down, Germany had 23% of the total energy from exploitation of nuclear energy).

4. THE GERMAN-RUSSIAN COOPERATION

The relationship between Russia and Germany was always seen as an opportunity to create a bond between Europe and the Euro-Asian space, represented by Russia. The relationship between the two countries could ensure the pre-requisites of the security of the European system and of economic development. Nevertheless, the current evolutions marked by the events in the Ukraine, prove that the relationship is both positive and negative.

The recent Russian-German cooperation is closely exploited and managed. In 1998 the relations between these two states cooled down: the massive devaluing of the Rouble did not allow Russia to pay the 30 billion dollar debt to Germany. The inauguration of Gerhard Schroder's office helped overcome this bottleneck, resulting in a more clear definition of the German policy towards Russia which was materialized in the first stage by the signature of a bilateral strategic partnership (2000).

The convergent interests of the two countries have led to the strengthening of the collaboration relations in the economic and energetic field. On the one hand, Russia is an important market for German products, and on the other hand Germany is a destination for exports of Russian resources. Their economic relation is quantified by huge sums from their economic exchanges and by the number of German companies resorting to the outsourcing strategy on the Russian market.

Another form of cooperation is the common energetic project Nord Stream. It is the main direct natural gas pipeline to Germany through the North Sea, avoiding the transit through countries like Poland, Belarus and the Baltic countries. Nord Stream is a joint venture between the Russian giant Gazprom (51%) and four other energy companies - BASF SE/Wintershell Holding GmbH (15,5%), E.ON Ruhrgas (15,5%), Gasunie and GDF SUEZ (9% each). Currently, the former chancellor Gerhard Schroder is the head of the Nord Stream shareholding committee.

An important issue is the market price of natural gas. The price paid by Germany to Russia is two times lower than the price of natural gas purchased from Norway and the Netherlands and lower than the price that the other European countries pay to the Russians. Two conclusions emerge from this state of affairs. First of all, Russia applies preferential prices, depending on the interests it has in a certain country and based on the relationship with certain political leaders. Secondly, Germany enjoys a privileged position in Europe in terms of natural gas imports, a position Germany wants to maintain in the context of the constant growth of industrial production.

An obstacle in the development of cooperation has been the positions of these two countries towards EU and the US. Germany, as a tacit leader of EU, is the artisan of the extension of the Union and of its good vicinity policy, and as a NATO Member, Germany supports the security interests promoted by the alliance, including those aiming at its extension towards Eastern Europe. Russia, in counterbalance, sees NATO's expansion and the entry of the former soviet republics in EU's sphere of influence as a threat and reclaims its right to keep them under its political and economic umbrella.

5. THE UKRAINEAN CRISIS

The recent events in Ukraine have proved this thesis. Against a background of internal dysfunctions related to the corrupt management of the president Viktor Ianukovici and the abrogation of laws on the status of minorities, the Ukrainian population began to protest against the government in the fall of 2013. The Maidan protests degenerated so that Russia decided in favour of military intervention (March 2014) to give humanitarian aid

to the Russian population. After a referendum held in Crimea, where the majority of the population is Russian, it was voted for the annexation of the peninsula to the Russian Federation, a decision implemented shortly after (April 2014).

The West and the US considered Russia's intervention to be illegitimate and condemned her by applying economic sanctions. The election of a new Ukrainian president - Viktor Poroşenko – and the signature of the EU Association Agreement (September 2014) did not have the desired effect, so that the tense situation in the Ukraine is still a reality.

In this context, the relations between Russia and Germany acquire a greater importance. First of all, Germany, as a European leader, has led a moderate policy in the management of the Ukrainian crisis. The proof is the recently proclaimed separatist republic of Donbass, an event that shows that the measures taken by the Europeans to stabilize the situation in the Ukraine were rather superficial. One of Germany's motivations behind the policy adopted might be the situation of energetic dependence and the economic interest in the Russian space.

Secondly, Russia has set its own "red line" in terms of its close vicinity, and the Ukraine is certainly within these parameters. Taking advantage of the Europe's permissive attitude, the Russian government continues to finance the separatist movements in Eastern Ukraine, in order to maintain the instability climate. The advantage that Vladimir Putin is aware of is that Europe, and especially Germany, depends too much on its resources and that the time that the Europeans have to develop alternative supply sources works to their disadvantage.

CONCLUSIONS

Regarded as the toughest of the international relations challenges, the realism starts from the assumption that the state, as a sovereign, egotistic and rational player, is at the centre of the international system. In the interaction among them, states aim to defend their national interest and to acquire power. The fight among them has generated power balances in time, the most popular emerging during the Cold War, the US-USSR binomial. One of the most well-known instruments of the power balance is balancing by attracting other states.

The current world dynamics allows us to talk about several geopolitical pictures that contain a series of tiers of international relations. One of the most important is the us-Germany- US and Russia – interact in the East European space and both have a common short term objective: to fully attract Germany's support.

However, the current status quo is complex. Ideologically, politically and militarily speaking, Germany adheres to the values and principles of democracy promoted by the Americans. Economically and energetically speaking, Russia is Germany's choice. Divided between the two poles, the tacit leader of the European Union exerts a negative influence on the European security and economic policies: the dragging out of the Ukrainian crisis and the permissive attitude towards Russia only makes the situation on the continent worse, undermines the security environment and encourages the rise of a more authoritarian Russia.

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PASSENGER CONTROL AND ONBOARD BOMB ATTACK OPPORTUNITIES FOR IMPROVING AIR SAFETY

Vivien SZABÓ

Department of Aircraft Onboard Systems, Institute of Military Aviation, Faculty of Military Science and Officer Training, Szolnok, Hungary (vivienszabo92@gmail.com)

Abstract: *In our globalizing world the terrorism has appeared like a security risk which means a growing threat in every country. The terror organizations prefer all those popular places, building or all public transport vehicles where they can have a large number of victims. Train stations, bus stations, airports and aircrafts are usually the main targets of bombing. Till nowadays the fastest and safest form of traveling is still the flying and because of it, compared to our missions we soldiers also use the civilian air transport facilities as personnel or military equipment transportation. In my thesis I would like to introduce more than 80 years' aircraft bombing, those analysis, assessments, what kind of explosive materials were used, also those efficiency, and what kind of devices are used for detecting them.*

Keywords: *passenger security, terrorism, bombing, air safety, explosives*

1. INTRODUCTION

According to the public, available data between 10th of October in 1933 and 5th of February in 2016 there were totally 92 aircraft bomb plot. To make more understandable the numbers of bombing attacks I divided all the plots into decades.

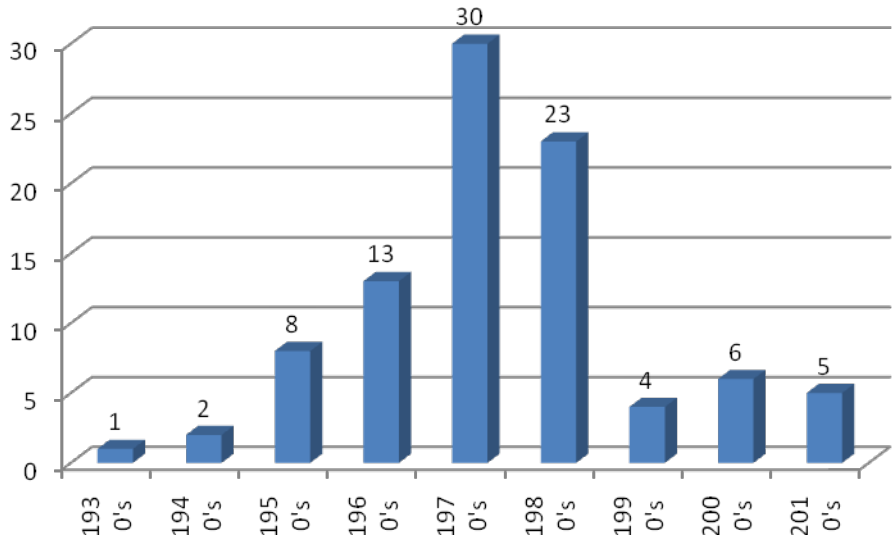

FIG.1. The number of the bombing incidents by decades

The analyses show many illegal actions took place in 1970's and 1980's. We can see in the 1st Figure that in these two decades 53 aircraft attack happened which is almost 58% of the all bombing in more than 80 years in the past. It was possible for all passengers in the early 70's years to board only with a ticket without any security screening. Nowadays it is almost impossible to get through without a multiple layers of security control. The airport security screening has evolved as the dangers have grown in our society. Because of 60', 70's, 80's frequency of terror attacks we pay more attention on flight safety. The last terror attack against aviation occurred on 22th of March in 2016 where the bombers put explosives in the Brussels- Zaventem International Airport landside part. Unfortunately we still have to keep in mind the air safety because it is getting more important nowadays, the aviation sector is improving and more and more people use the air traffic as travelling opportunities. In my thesis in this point of view very actual but my field is all those terror attacks what happened after the passenger security screening, in the restricted area, in the airport's airside.

2. AIRPORT SECURITY AREA

The prevention or control can be divided into physical and human security subsystems. The security screening uses a variety of techniques and methods to search the dangerous materials in order to protect the human life, and aircrafts against of malicious damage, crimes and other threats. The IED can be basically transmitted through the security screening into the aircrafts: in the drop-off check-in baggage (Fig.2) or the terrorist/bomber can bring it in his hand luggage to the cabin. The carry-on luggage is taken away from the passenger at the check-in desk and the security stuff examines it in the Hold-Baggage System (Fig.3).

FIG.2. Check - in- desk

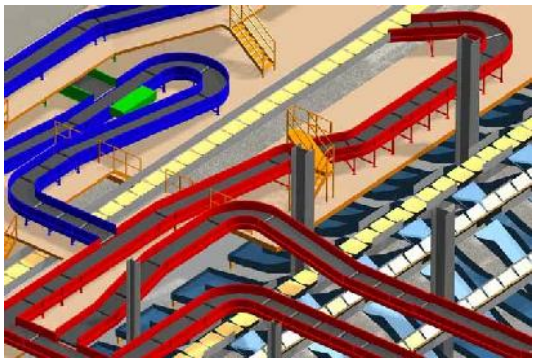

FIG.3. Hold- Baggage System

The hand bags are checked by simple security controller's hands, X-Ray equipment, explosive detection devices, hand held detector, metal detectors, liquid testing machines (Fig.4).

FIG.4. Airport Passenger Security Screening

3. SENSOR SYSTEMS

In order to collect information in measuring technology we use sensors. The task of sensors is to convert measurable electrical signals from the input physical property. The objectives in this case can be drugs, liquid, baggage and explosive devices (improvised explosive devices, IEDs).

X-Ray equipment (carry-on baggage and registered baggage): The dual-energy source x-ray machines are used frequently in the airport security systems. One sensor perceive all the signals which travels through the objects. The stuff inside the bags give back different signals to the machine. We can see on the X-Ray equipment monitor clearly what kind of materials are in the baggage. On the monitor appear different colors which means how the absorb the energy from the machine. We take difference between metal, organic and inorganic materials. Some of the airways only carry cargo on their way. The security screening is the same for the cargo stuff. There are three different system for checking them like: Medium X-Ray Systems, Fixed- site Systems and Mobile X-Ray Systems.

Metal Detector Gates: This equipment is also at the passenger security screening.

The metal detector's working principle is based on the pulse induction which product a magnetic field. High sensitivity, short-time current flows through in the transmitter and a receive coil which build the pulse induction system. The magnetic field is build from impulse. The impulse creates a contrary magnetic field in the object if metal object goes through in the metal detector. Reflected impulse is created after the magnetic field collapsed and the magnetic field of object totally let disappear the impulse.

Explosive and Drugs Detectors: The so-called "chemical sniffing" is used in a lot of airports. At first we pull the textile part of the detector through on the suspect object which can be different materials, like human skin, textile, plastic and metal. The checking's main aim is that the detector analyze the chemical part of the checked object that it includes maybe components of explosive and drugs. If the machine finds some dangerous or prohibited materials, it warns the security staff. We use this kind of equipment for detecting the abandoned bags.

Electro Magnetic Analyzer: Increasingly widespread X-Ray machines integrate mechanical and electronic items. 3 different techniques are connected to the liquid analyzer: object's detection status, digital signal processing displaying the image via computer. The magnetic resonance's principle is to analyze the different liquid's molecular structure. The shine goes through in a material, the wavelength of the transmitter and the receiver is going to be different. We can identify the different composition liquids based on this process .

4. EXPLOSIVES THROUGH THE AIRPORT SECURITY

The 5th and the 6th figures show how many different explosives get through on the passenger security and Hold-Baggage System and were used in the onboard bomb attack. The perpetrators use known technical devices, they create new methods and structures, develop tactics and carry out them. They use a wide range of devices from home-made bomb - created from commercially available household chemicals and fluids which are placed in the hand luggage located in the cabin - till dynamites in the cargo. From the 92 bombing attack we know that 18 different explosives were used in 49 cases which are the following: nitroglycerin, TNT, dynamite, C-4, SEMTEX, RDX, PETN, nitrocellulose bomb, timed Mk-7 type of bomb, acid mixed with gunpowder, hand grenades, ammonium nitrate, petrol, phosphorus, firecracker, liquid-based explosives, projectile weapons and homemade explosives. In the 5th diagram we can see for example if they used the PETN explosive in the device which worked with 40% efficiency because we can see on the 6th Figure from the 5 bombing attacks it happened twice when PETN caused people's death.

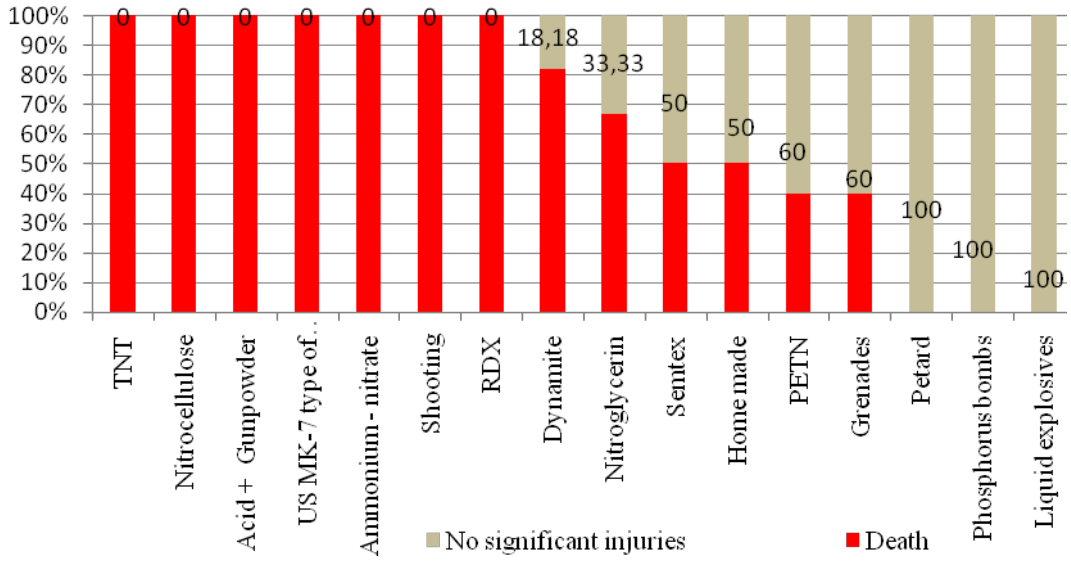

FIG.5. Different explosives efficiency percent

We can see from our database (Fig. 6) that the most commonly used explosive was the dynamite. The bombers used it in all 11 times. From these 11 occasions 9 times they were successful because people died in the bomb attack and only once just the bomber wounded and only once nobody injured in the attack. These explosives can be measured by explosive and drug detectors and electromagnetic analyzers.

Types of Explosives	Death	No injuries	Bomber died	Summary
Dynamite	9	1	1	11
PETN	2	3	0	5
Grenades	2	3	0	5
Nitroglycerin	2	0	1	3
C-4	1	2	0	3
RDX	3	0	0	3
Petrol	1	2	0	3
TNT	2	0	0	2

SEMTEX	1	1	0	2
Home made	1	1	0	2
Ammonium-nitrate	2	0	0	2
Shooting	1	0	0	1
US MK-7 type of timed bombs	1	0	0	1
Petard	0	1	0	1
Acid + gunpowder	1	0	0	1
Phosphorus bombs	0	1	0	1
Liquid explosives	0	1	0	1
Nitrocellulose	1	0	0	1

FIG.6. Used different explosives incidence

5. CONCLUSION

In the beginning there were two main reasons why airport security changed and become stricter. The first is connected all those hijacking trying the 1960's years and early 1970s. And this was the reason of establishing of Anti-Hijacking Program in USA by Federal Aviation Administration. The second biggest reason why the airport security became much stricter is the attack against of the Pan American Flights 103 over Lockerbie in 1988 where about 280 passengers died. From the year of 1933 at least 2854 people died and minimum 124 people wounded in only in aircraft onboard bomb attack till nowadays. This huge number could be avoidable using appropriate passenger security devices and as airport staff workers paying more attention to our colleges who can be potentially keep in touch with terror organizations. All those acts of terrorism show that passenger security screening needs to keep up with the methods and tools of attacks, which are always getting more difficult to be detected, in order to be able to avoid subsequent air disasters and mash crash. It is very important to train our human resources because the security is always less than 100%. We always need new technologies, smart sensors and we need to use the nanotechnology to prevent the further terror attacks.

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THE ISLAMIC STATE: GROWTH, RESOURCES AND MANAGEMENT

Mihai VIDESCU

"Mihai Viteazul" National Intelligence Academy, Bucureşti, Romania (ani@sri.ro)

Abstract: *When we talk about an organization one of the first things which pops up in our mind is „management" which roughly means the systematic operation of dealing with a certain problem or your own resources in order to achive a goal. In other words, management is indissolubly connected to one or more objectives and the means to fulfil those objectives. Many organizations want to obtain something in order to follow their ideology or dogma, that's why another concept tied up with the idea of an organization is „ideology". On one hand we have the term of „organization", on the other hand we have the terms of „management", „goal" and „ideology". Those notions would make us think about international organizations such as EU, UN or NGOs such as Green Peace or Amnesty International, but when it comes to terrorist organizations it is rather shoking to see that they somehow follow the same principles.*

Keywords: *organization, goal, management, terrorist organization, ideology*

1. ORGANIZATIONS. MANAGEMENT. TERRORISM.

To understand better the connections between organizations, management and terrorism a sum of definitions must be presented in order to establish the main ideas of this paperwork.

According to Oxford Dictionary an organization is '*an organized group of people with a particular purpose, such as a business or government department'* [1]. To achive that purpose it is important for the organization to have both resources and good management. Also, according to Oxford Dictionary, management means '*the process of dealing with or controlling things or people*'[2]. We have in both definitions the notion of '*people*', that's why it is easily perceived the fact that without people we have neither an organization nor its functionality. In other words, people are a key element when it comes to the management of an organization and the organization itself.

About the concept of terrorism many words were written and spoken. Nevertheless, the ambiguity in this notion must be mentioned, that's why I believe that the best definition for terrorism is '*[..]a crime and a holy duty; a justified reaction to oppression and an inexcusable abomination. Obviously, a lot depends on whose point of view is being represented. Terrorism has often been an effective tactic for the weaker side in a conflict. As an asymmetric form of conflict, it confers coercive power with many of the advantages of military force at a fraction of the cost. Due to the secretive nature and small size of terrorist organizations, they often offer opponents no clear organization to defend against or to deter*'. [3]

So when we talk about terrorism is important to understand that we have an organization which, from their point of view, it serves high, even holy purposes, but from the exterior of the organization it seems like it does only atrocities against their enemies. The human resource (people) is the main characteristic here as well. It is both the player of the 'game' and the instrument with which the game is played. Unfortunately, in this

horrible game many lives are lost or destroyed. It is unexpectedly simple how the mechanism of terror works:

Some people embrace an extremist ideology characterized by intolerance and violence, then they act by two coordinates: fighting their enemies to death and trying to convert those who are not their enemies or among their terrorist organization. The important question here is how they succeed in their relentless actions. The answer is: management.

2. THE GROWTH OF THE ISIL. ITS HUMAN RESOURCES

The most astonishing thing about the IS is the fact that in a realatively short period of time they have grown exponentially from an weak terrorist organization which joined al-Quaeda in 2004 into the most powerful terrorist organization at the moment. Given this fact, two question are important to ask: 'How did they succeed?' and 'Where does they power come from?'

It is pretty hard to answer to the first question because of the many perceptions about this organization, but it is not impossible to find the main causes which made the ISIL to be a problem not only in restrained areas such as Middle East, but in the entire world.

Firstly, despite the fact that in 2010 the reports were saying that from the top 42 leaders of the Islamic State, which was part of al-Quaeda then, 34 were killed or captured in US-Iraqi raids[4], the remaining leaders gathered their strengths and under their new leader, Abu Bakr al-Baghdadi they started reorganizing their agenda and strategies. A year later, in 2011, the interational context in the Middle East was propitious for the ISIL beacause of the Arab Spring[5]. Given the fact that Lybia and Syria were in civil war and Iraq was torn apart after 8 years of war, it was easy for the ISIL to seize the moment and, after a brief break to extend there. For example, in august 2011, al-Baghdadi started sending members specialized in guerilla warfare in Syria to establish bases there, then, in 2012, al-Baghdadi announced a new offensive in Iraq called '*Breaking the Walls'*. The governments from those countries were uncapable of fighting them becuas of the civil wars. So, the ISIL succeded in their growth through seizing a moment of crisis and weakness in the states in which they are based now.

Secondly, they could not succeed in their development without getting more and more members and sympathizers. Propaganda was a well-managed weapon for the IS. For example, the use of social media by the IS was described by some experts '*probably more sophisticated than [that of] most US companies'*[6]. Morover, James Comey, FBI director, said that their propaganda is '*unusually slick'*.[7]

Their propaganda machine is really good. The movies which are promoting the ISIL are made in a Hollywood like style with epic battle music and motivational speeches. In addition to that, they have been promoting a virtual magazine in more languages including English called *Dabique* in which there are a lot of articles about the *Islam*, *Sharia Law* and other dogmatic subjects. The most unique thing about the ISIL propaganda machine is the fact that it promotes not only violence against 'the infidels', but also a place which is emotionally attractive, a place where everyone belongs to everyone and if you are part of IS, you are 'brother' or 'sister' with everyone from that organization. So, the management of the media is indeed efficient as long as the most powerful psychological pitch (apart from the display of raw power) the organization uses is the promise of a good life inside the organization and a heavenly life if you die in the name of '*Jihad'* [8].

To conclude and to answer to the first question, it can be said that they succeded in their development through seizing a moment of turbulences in Middle East and North

Africa and using their full potential both mediatic and ideological (in addition to the military and economic potential).

Regarding the second question('Where does they power come from?') it is important to be said that apart from what is known as *soft power* [9] (media machine and Islamic propaganda) ISIL's main source of power is human power, the people who are willing to give up to their life in order to fight in the Jihad. According to a CIA estimation [10], in September 2014 IS had between 20000-31.500 members in Iraq and Syria. Some figures are much higher, for example Rami Abdel Rahman, the director of the Syrian Observatory for Human Rights, said that the IS has more than 50,000 fighters in Syria alone[11]. Hisham al-Hashimi, a security expert in Baghdad, said that the total membership of the Islamic State in Iraq and Syria may now be closer to 100,000 members[12]. The figures depend on one's view on 'IS member', for example, some sources don't count their sympathizers as 'members' or 'fighters'. Nevertheless, it is clear that IS has tens of thousands of members and that number is fastly growing as long as the propaganda machine and the oppressive system are getting more and more human power. Regarding human power, an important aspect is the fact that, through its propaganda and extremist speech, the IS managed to achive proselytes and members from all around the globe. For example, the CIA estimated in 2015 that almost 30.000 foreign fighters joined the IS [13] and according to *Global Terrorism Index*, in October 2015, 21% of fighters for the IS came from Europe, 50% from Middle East and North Africa and 29% from elsewhere. [14].

Another key element of power is the common ideology of *Salafism*, an ultra-conservative movement within the Sunni Islam which roughly means a fundamentalist approach to Islam which rejects religious inovations and seeks the implementation of Sharia Law) [15]. In the history of mankind we have a lot of examples of how a radical ideology succeeded to grow and gain followers from everywhere. In addition to that, the fact that within the IS views on life are inflexible and the opinions are basically the same, makes them a strong force united through a blind submission to their ideology.

In conclusion, the IS has a common ideology (*Salafism*), human power which seems to be growing, and a propaganda machine. But that's not enough to be a real force and a real terrorist organization. It may seem that their funds, military and economic resources were forgotten to be mentioned, but the next chapters of the present paperwork seek not only to present those aspects but also to explain the managemenet of those resources and how the international community manages the problem of the IS.

3. THE ECONOMIC AND MILITARY RESOURCES OF THE ISIL

Even if an organization has a terrorist agenda, it is obviously that it needs lots of funds to achive their goals. In fact, every organization needs finances to survive. In addition to that, a terrorist organization must have a lot of military power in order to impose its ideology in controlled territories and to commit acts of terror against 'the infidels' or other civilians.

The binomial finances-military is a vital part for the IS because without it they can not extend and, more important, they can not control their territories and, eventually, they will lose everything that they had been fighting for.

The fact that the IS had been growing since 2010 is a clue which shows us the fact that when it comes to money, its leaders know how to manage. For example, one of the main reasons of the success and growth of the IS is the various sources of incomes they use. According to the journalists of *Bussines Insider*, their main source of revenue is taxation. [16] The fact that the IS controles a vast territory (almost as large as the United

Kingdom) with almost 10 millions of people makes the taxation system one of the best ideas to obtain money. In other words, the IS 'ensures the peace and protection' of the civilians in their territories and, in exchange, they must pay a sum of money. Some estimates say that the IS gains between 800 and 900 millions of dollars annually through the taxation system[17].

Because of its easy access to petroliferous fields of Syria and Iraq, the second most important source of revenue for the IS is the sale of oil. According to *Financial Times*, almost 600 millions of dollar get in the pockets of the IS annually through oil trade[18]. The use of oil as a strategic weapon is a surprisingly smart move from a terrorist organization and it shows the evolution of the phenomenon.

Another sources of revenues are related to ransoms, sales of antiques or artifacts and donations, which, according to Jean-Charles Brisard and Damien Martinez are only 2% of their funds[19].

The diversity of their revenue sources and the fact that they succeded in establishing a system of control and taxation in their areas shows us that, indeed, the IS is the most powerful and innovative terrorist organization at the moment. Unfourtunately, they excelled in evil deeds also and the attacks in Paris from January and November 2015 are the perfect example.

From a military point of view, the IS is as organized as when it comes to their money. But, the most important aspect when it comes to the IS military power is the fact that they lack modern equipment. For example, the IS uses mainly weapons which were captured during the Syrian Civil War and post US-Iraqi insurgency, which are AKM assault riffles, RPG-7s, Humvees, T54/55, anti-tank weapons and surface-to-air missiles such as Stinger.

They have captured also some aircrafts MiG-21 and MiG-23 [20]. Nevertheless, the weaponry in posesion of the IS is more than enough to make a lot of damage when it comes to combat and to help them to fight their way to the *'Caliphate'*

Probably, the most terrifying thing about he weaponry of the IS is the fact that they are in posesion of nuclear material which they had stolen from the Mosul University in 2014 [21] and, moreover, they had shown no hesitation in using non-conventional weapons such as car bombs, suicide bombers and IEDs. In addition to that, they had seized chemical weapons from an Iraqi base[22] and might had used unidentified chemical weapons against kurds in Kobanî, Syria.[23]

The lack of modern equipment is compensated by a use of non-conventional weaponry which makes the IS more terryifing and more dangerous in the context of its rapid development.

To conclude, it is necessary to be said that the IS is a good example of good management and inovation when it comes to obtaining money by a non-state actor. Its military resources may not be as modern as Western's, but the fact that they are willing to use every mean necessary to win in combat, no matter the costs, makes them dangerous and a real threat to the security of international community.

Regarding the international community, in the following and final chapter of the present paperwork, its response to the IS will be presented alongside the management of that threat.

4. THE IS MANAGEMENT. THE MANAGEMENT OF TERROR. FINAL CONCLUSIONS.

As it was mentioned before, the IS's management is one of the reasons of its development. The IS has many differences compared to other terrorist organizations, that's why some analysts consider it as a non-state organization which has political goals and uses terrorism only as a weapon to achive those goals. The fact that a 'classical'

terrorist organization has from only hundreds to a couple of thounsands of members, do not hold territory, and attack mostly civilians makes the IS to look like a post al-Quaeda jihadist threat. [24] That change in the paradigm of terrorism is due to a good management of the IS leaders, due to the fact that the terrorists understood the importance of having a secure revenue system, a certain land, recruital through Internet, and propaganda that can offer members from all around the world. Even the fact that in 2010, most of the IS leaders where killed or captured shows that, unlike other terrorist organization, the IS leadership has a horizontal structure.

In the past, the terrorist organizations had a vertical leadership which roughly means that, usually, when the top leaders are dead or captured, the organization dissolves itself because no one can give orders and members don't have a unitary view on the future of the organization and they tend to fight for a more powerful position. Nowadays, organization such as the IS are organizaed horizontally which means that, when a top leader dies or is captured, another one is in line and picks up its job. In other words, in the horizontal organization the power is shared by more members. [25]

It is true that the IS has some top leaders such as Abu Bakr al-Baghdadi, but that doesn't mean that other members don't have access to power and don't have decisional rights. The direct consequence of this way of organize is an increase in stability.

This kind of horizontal management, alongside with the extremist ideology, efficient revenue system and propaganda are the main reasons which make the IS both a serious threat to the security of international community and a model for other terrorist organizations.

It is obvious that the international community could not stand still to such a growing threat, that's why a coalition was formed in 2014 to fight against the jihadist threat. This coalition is the key element in managing the terrorist threat.[26]

Coordinated by the USA, the coalition had started a number of airstrikes against the IS's territories. Other actions such as hostage rescue attempts, aerial surveillance, arming and training rebels had been done in order to weaken and destroy the IS's positions in Syria and Iraq. But that's not enough to defeat or destroy the IS.

The main reasons for the lack of decisive actions in Syria and Iraq is the fact that even if the international community had formed a coalition against the terrorism, the most important actors in the zone have divergent objectives when it comes to the future of the Middle East once the IS is destroyed and the Syrian Civil War comes to an end.

For example, USA's, UK's and France's main objective is to obliterate the IS, the end of the Syrian Civil war is the second on their agenda. West is against Bashar al-Assad regime in Syria, but Russia and Iran are against a regime change in Syria. [27]

Furthermore, there are other non-state actors who are fighting against the IS and they have their own view on the next organization of the Middle East. For example, Free Syrian Army (FSA) had been a real help in fighting the IS [28] and, once the Syrian Civil War is over, FSA would want a new establishment in Syria. Another example is Kurdish Peshmerga and Kurdistan Workers' Party (PKK) forces who also had fought against the IS. PKK had won every single battle against the IS, which shows the fact that they are a real help in the fight against terrorism, but the irony is that PKK is considered to be a terrorist organization by Turkish government because of its attacks which were done in order for Kurdistan to be recognisied as an independent state.

As final conclusions, it can be said that the problems in the Middle East are far from a solution because every state has its own interest in the zone, but, fourtunately, no state involved there supports the IS, so, in a way, the conflict is the ISIS against the whole world. This thing does not seem to bother the IS which has developed until now.

Probably, the fact that the coalition is reluctant to sending ground troops in the IS

territories is one of the reasons for the IS's powerful control in their zones from Iraq and Syria. Another aspect worth to be mentioned in final conclusions is the fact that even if it seems like the IS sells really good its ideology and promises, some members are disappointed by they and start leaving the organization. For example, a former member had leaked a great number of documents which reveal jihadist personal data. [29]

In conclusion, the IS is well managed, but that doesn't mean that it doesn't have internal problems and, giving the fact that the coalition had started striking them where it hurts the most (oil assets) [30], for the moment they are in decline. But, as the past had shown, the decline is not enough in the fight against the IS and the general phenomenon of terrorism because from its remains it can always arise again.

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OPTIMISM IN DAILY LIFE

Diana GRUIA , Andreea MUNTEANU

"Mihai Viteazul" National Academy of Intelligence, Bucharest, Romania
(andreea_ist27@yahoo.com, gaby_dyana@yahoo.com)

Abstract: *In this article we presented optimism as an important part of human personality and we made a short review of the studies on this aspect. We described the results of those studies, the variables which were linked with optimism, how does an optimistic person think and in the end we draw some conclusions. We intended to prove the necessity of optimism in a healthy and happy life and also the importance of a balanced attitude towards daily situations.*

Keywords: *optimism, happiness, life satisfaction, core self-evaluation, optimism bias.*

1. INTRODUCTION

Optimism is a part of human personality which refers to someone's expectations about the future. In the absence of manipulation, it remains stable for long periods of time, especially when there is no exceptional life situations. It is linked with motivation because is a fact that optimistic people are more willing to make effort, while the pessimist ones tend to avoid it. Optimism was also studied in relation with physical and mental health and it was proved that it has only positive effects on it. Recently, the scientific study on optimism was extended in the social psychology domain and it resulted that optimistic people have better social relations, just because they work harder to maintain them.

The origin of optimism can be related especially with childhood, while some authors believe that we can cultivate optimism by copying our parent's attitude.

Optimism can be easily compared with hope and self-efficacy, the difference being the fact that it focus on positives or negatives expectances about future, without paying attention to the reasons of their apparition. This is called *dispositional optimism* and it is explained by the trust that positives events are more likely to happen that the negative ones.[1]

2. THE OPTIMISM BIAS

Optimism bias is a cognitive illusion that 80% of human being have and it refers to our tendency to overestimate the probability of good events happening to us and underestimate our likelihood of experiencing bad events.[2] It is a natural instinct which makes us more optimistic than realistic, but we are unaware of this fact.

Another interesting thing about this bias is that we tend to be optimistic about our own future, our own families and pessimistic about the fate of our country or the future of the other citizens.[2] That's because optimism does not mean believing that good things will just happen to us, it means thinking that we have the unique ability to make things turn out okay.

This bias is quite widespread and it has been observed all over the world, in Western countries, in the Eastern ones, in blacks, in whites, in males, in females, in kids and in adults. This fact made many people wonder if it is good or bad for us. Some of them tend to believe that if you have low expectation, you cannot be disappointed so you will be happier. The neuroscientist Tali Sharot highlighted three counterarguments for this idea.

Firstly, there were the studies of Margaret Marshall and John Brown, two psychologists who proved that optimistic people attribute their success to their traits and their fails to unfortunate circumstances, while pessimistic people do exactly the opposite, attributing success to fortunate facts and fail to their traits.[2] So, the ones that have high expectancies manage to remain happier than pessimists even in case of failure.

Secondly, the behavioral economist George Lowenstein demonstrated that the act of anticipation makes us happy, so people who expect more are happy just thinking of what they can achieve.[2] For example, the majority of us prefer Friday instead of Sunday, even if Friday is a work day, because on Sunday all we can think about is that tomorrow is Monday and a new week of work begins, while on Fridays we make plans for the weekend and we think about ways to use our free time for relax.

And the third reason why lowering your expectations will not make you happy was marked out in controlled experiments which have shown that optimism can also lead to success in academia, sports, politics and so on.[2] In this context, maybe the most surprising benefit of optimism is health, because if we expect the future to be bright, stress and anxiety are reduced.

After Sharot proved that optimism is good, she tried to see what happens to optimism when it faces reality. So, she took a sample of people and asked them to estimate the chances of some bad events happening to them (like suffering from cancer or having a car accident) and then she provided statistic data to see if people change their beliefs when they learn something new about that matter. The results were quite surprising, because participants remembered the facts that they learn, but they didn't indentified themselves with those numbers. So, she concluded that we can take advantage of the fruits of optimism and remain hopeful by being aware of this bias, thus maintaining a balance between reality and optimism, and we strongly agree with her.[2]

3. STUDIES ON OPTIMISM 30 YEARS AGO

Optimism was a theme of interest even since the early days of psychology and there were created some ways to measure it. For example, Scheier and Carver created in 1985 the Life Orientation Test (LOT), which is composed of eight coded statements and another four “extra” items. In 1974, Beck, Weissman, Lester and Trexler created the Hopelessness Scale, which assess one’s affective experience and giving-up tendencies, while, in 1978, Fibel and Hale came up with the Generalized Expectancy for Succes Scale, which asks the respondents to present their expectations regarding some specific life domains.[3]

For years, researchers have wandered if optimism is really good and if pessimism does have some advantages and we believe that no one is able to provide an unanimous accepted answer, not even today. Thirty years ago, some people believed that optimism can bring negative outcomes if it is unrealistic or if we found ourselves in an unalterable situation. However, in 1989, Cantor and Norem claimed the concept of defensive pessimism, which they said it focuses around a particular life domain, such as academic performance.[3] So, the defensive pessimist in the academic arena is someone who anticipates and worries about negative outcomes, despite a prior record of high academic

success. Scheier and Carver criticized this in 1992 and they proved that it works only on short term and it has no better results than optimism.

Related to this subject, Neil Weinstein proved in 1980 that people tend to believe that an event is more likely to happen to them when they have had previous personal experiences with that kind of events, when the perceived probability of a fact is greater or when the perceived controllability of a happening is higher. Also, he demonstrated that when a negative event is more undesirable, people are tempted to believe that their own chances are under average and they think that they are more predisposed than others to positive facts.[4]

4. RECENT STUDIES ON OPTIMISM

Studies have shown that, although research about this theme began in 1985, before the apparition of the Big Five Model, that evaluates personality through five factors: extraversion, conscientiousness, neuroticism, agreeableness and the so-called "openness to experience", some authors believe that optimism is a mix between neuroticism and extraversion, while others said that is somewhere between conscientiousness and agreeableness.

There were some studies which highlighted the positive link between optimism and the probability to finish college, due to the fact that optimistic students are more ambitious in their academic and professional careers.

We can say that positive persons dispense their energy towards daily activities in a selective manner. They assume a bigger commitment regarding the high-priority objectives for them (therefore is increased the probability to achieve them) and they tend not to take pains for accomplishing the ones that have smaller importance in their vision. This way, optimists seem to choose where to invest their resources, increasing their efforts when they consider that circumstances are propitious for them.

Considering this kind of engagement towards the priority objectives, optimists are striving more in relationships. In this context, optimism creates a wider network of acquaintances, sometimes striding the age, educational and racial boundaries. But this association is functioning both ways, thereby strong social networks can increase the optimism. Up against the pessimists, positive people can successfully handle the crises in relationships and are more involved in the liaisons they have with their children.[1]

As we have said before, optimism refers to positive expectances and includes the faith that a less happy present can change in a better future. This does not imply preferential bearing to future without paying attention to the present, although optimistic persons are able to "pre-experiment" future positive events. A study related to this aspect has discovered an association between dispositional optimism and the activity of a brain's path linked with imagining future positives events.[1] This path of human brain influences the present too and it seems that optimistic persons have the ability to mentally detach from physical pain, using the placebo effect.

Previous studies found out that optimistic persons cope with health problems better than pessimists, because they have a proactive way to face them and they are less inclined to start smoking, more willing to practice some sports and so on. Another reason refers to the emotional answers that people use when they are dealing with troubles (less stress and more positive emotions), fact which proves that optimistic persons are healthier, psychologically and emotionally speaking, than the pessimistic ones. For example, in case of a high rate of unemployment, optimistic persons can maintain an increased life satisfaction level, because they can find advantages in every bad situation.

5. HAS OPTIMISM BAD EFFECTS ?

Researchers also wondered about the eventual bad implications that optimism can have. A common suggestion was that a bad result could affect so much the expectations of an optimist that the experience could become worst for him than for a pessimist, who was already expecting such a result. Although is a strong argument, there are no proofs to sustain it.

In 2004, Gibson and Sanbonmatsu suggested that, when it comes to problem gambling, optimism can cost a lot of money, because optimists are less likely to stop betting after poor results than pessimists, so they are risking too much.[5]

Also, there is the fact that sometimes optimists are so determined by their positive way of thinking to achieve their objectives, that they cannot admit that some goals are out of shot and the right thing to do is turn away from them and let go. For example, in 2006, Rasmussen, Wrosch, Scheier and Carver find out that for optimists is very hard to disengage from a goal or a task, although optimistic persons are able to discover, pursue and value new goals easier than pessimists.[5]

Another drawback of optimism can be the fact that usually it determines people to see only the full part of the glass and to ignore threats which, when it comes to health problems for example, can cause more troubles than necessary.

In sum, there is a need to further research until we can pronounce whether optimism has or has not bad effects, but it is certain that in some cases, if it's unfounded, too much optimism can harm one's faith.

6. OPTIMISM, LIFE SATISFACTION AND HAPPINESS

Another study searched social differences between dispositional optimism, life satisfaction level and happiness based on social and economic status. It started from the premise that optimism is a psychological resource which can explain why a high social status is linked with a healthy life.[6] So, it was proved that optimism can be used as an instrument whereby social advantage leads to a better health only if it is linked with education, race and income.

The study used a sample from United States that was divided by criteria like gender, race, education level and socioeconomic parameter. There were more women than men, and most of them were white, with a medium level of education and a medium level of professional prestige.

The levels of optimism, life satisfaction and happiness were evaluated using tests that contained questions like "I'm expecting more good things than bad things to happen to me", "In the last 30 days, how long have you felt happy?" and so on.[6]

The results showed that younger participants reported a lower level of optimism, life satisfaction and happiness than the older ones. However, there were no differences between men and women regarding these psychological traits.

Also, the levels of optimism and life satisfaction were higher at white people than at black participants, nevertheless happiness was more increased at the black people.

Besides, the education level was positively associated with life satisfaction and optimism, while happiness was not influenced in a significant way. For example, participants who had graduated college declared themselves more satisfied and optimistic than the others.[6]

As for the occupational class, the ones with higher social position resulted to have an increased level of life satisfaction and optimism, while the relation between happiness

and this parameter didn't make any difference between persons with different social positions.

So, this study revealed the fact that optimism and satisfaction have a similar pattern in association with one's social status, whereas the positive affect (happiness) follows an unique path.

7. OPTIMISM AND CORE SELF-EVALUATION

Another research proved that the positive association between optimism and life satisfaction level is mediated by core self-evaluation. Core self-evaluation is a fundamental concept of human personality through which a person can evaluate his own abilities and his own value. This concept includes four dimensions of personality: self-esteem, locus of control (how much does a person believe that he can control the events and their outcomes), neuroticism and perceived self-efficacy (a person's belief that he is able to gather his cognitive and motivational resources in order to achieve his goals).[7]

The researchers have discovered that core self-evaluation can predict and indirectly influence the level of life satisfaction.[7] For example, individuals are more satisfied with their lives if they consider themselves capable and valuable.

Some scientists found proof that optimism is linked with self-esteem and locus of control, while it negatively correlates with neuroticism.

The fact that core self-evaluation mediates the link between optimism and the life satisfaction rate was proved by a study made on a sample of students from two Chinese universities. There were applied some debriefings and the results showed that the ones who had high scores on the optimism scale were more disposed to reach a high level of satisfaction.

The road from optimism to core self-evaluation, then to the satisfaction rate is significant and studies showed that the expectations regarding positive outcomes (optimism) and focusing on goals contribute at improving individual evaluation of personal abilities and values, which leads to an increased level of contentment.

8. CONCLUSIONS

In conclusion, considering the results above, we can say that optimism is a dimension of personality associated with stress resistance, health, higher life expectancy and with a better social life. People are generally tempted to make optimistic forecasts about relations, incomes, health and professional success, although there are no real facts that can sustain this prognostics. The optimistic acceptance implies perception restructuration, which culminates with the understanding of the situation. Accepting the fact that in some moments life can be compromised, but not in an absolute way, people develop some adaptation parameters, which maintain them close to their objectives. From this point of view, we reach the conclusion that optimism doesn't mean seeing only the full part of a glass, it means being aware of both parts of the situation and believing in your own capacity to face every obstacle that can come in your way.

We consider that it exists an excessive, fictive or unfounded optimism which could harm a person when an event doesn't have the expected results. By refusing to accept the reality of a situation, you feed a wrong perception of the world. In this case, the faith of optimists would suffer more than the faith of pessimists, who didn't have high positive expectations from the beginning.

So, optimism is generally associated with positive elements from the scope of life and it is considered the motivational base of the belief in a better future.

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STUDY REGARDING THE PERCEPTION OF THE MILITARY STUDENTS FROM THE A.F.A. AND THE L.F.A. OF THE GENDER RELATED STEREOTYPES

Gabriel-Ionel MĂRCULEŞTEANU*, Alina-Ioana BÎNDIU**

*"Henri Coandă" Air Force Academy, Braşov, Romania (m.gabbriel13@gmail.com)
**"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania (ioana.bindiu@yahoo.com)

Abstract: *It often happens that the relationships we establish inside a group, or even outside it, to be actually based on preconceived ideas about the persons involved. Certainly, we were put, at least once, in a context where we met someone and, after a brief conversation with that person, to be able to describe it and, moreover, to be convinced that he or she has some features or acts in a certain manner just because we know, for instance, that person's profession. It is all about how we perceive that person. Nevertheless, our perception is not an accurate reflection of the reality, it is rather stereotyping, and the most common form of stereotype is the gender related one. Our study is, basically, a research about the gender related stereotypes in „Henri Coandă" Air Force Academy Braşov and in „Nicolae Bălcescu" Land Force Academy Sibiu, and the results have been analyzed by comparison.*

Keywords: *perception, stereotyping, organization, army*

1. INTRODUCTION

The presence of stereotypes inside an organization has a bad influence on that organization in terms of group cohesion, efficiency and the ability to achieve the aimed goals. In what concerns the military environment, the gender stereotype is a problem that requires close study, because the army has always been considered a `man's field`. Consequently, a minimization of these effects it is to be attempted, minimization which can be achieved only by reducing the attention we give to stereotypes. Given the fact that the problem resides in people's mentality, the biggest challenge would be making them embrace the change and put aside the stereotypes, especially the gender related ones. An important thing is that the essential of stereotyping is in our perception.

2. STEREOTYPING

The perception is a subjective reflection of the actions, things and phenomena pertaining to objective reality. In fact, the perception is a process defined by interpretation. It has three parts: the perceiver, the situation and the goal.[1]

Basic predisposition that action on the perception of a person are:

- ✓ The priority effect
- ✓ The theory of the implicit personality
- ✓ The view

Stereotyping is a warped perception of the reality and it adverd to a bent for generalizing about people which come to a social category, bypassing their irregularity. A

few category on which a stereotype can be based are: age, race, ethnicity, caste, gender and occupation.[2]

Certainly, the creator of this concept is Walter Lippmann who thinks that stereotypes permmit a filtration of the reality because „we don't see before we define, we define before we see".[3]

Practically, there are three stages that we have to get through in stereotyping. Firstly, we discriminate a category of people, than we expect that they are defined by some features and, in the end, we perceive that every people which takes part of this category has these features.

A very important thing is that stereotypes are not completly disadvantageous. The big problem is that an advantageous stereotype will not be highlighted and conserved like a disadvantageous one.

The stereotypes action by:

- ✓ Direct discrimination
- ✓ Indirect discrimination
- ✓ Harssment at the job; the most popular type is *mobbing*

A stereotype is not native, but it come from self-experience or from the outside, the best example for the promotion of it is mass-media.

Stereotypes can be attached to:

- ✓ race and ethnicity
- ✓ age
- ✓ gender

2.1. Stereotypes of race and ethnicity

Important in the context of the globalization and presenting a remarkable stability over the years, the stereotypes related to race and ethnicity are most often negative. This stability of them is affected by the production of a major event like the war, which change. An illustrative example as regards the influence that may have the stereotype of Roma and the race is the following: in a study it has been found that the stereotype "blacks are not able to handle when are pressed" has been a part of the responsibility of their non-acceptance in senior positions.[4] It is important that the formation of such stereotypes do not require personal experience. This is precisely why, when, in the context of the study, some people they were asked to describes the features of ethnic groups, including some fictitious (pirenian , wallonian), they have assigned to the features even if they never seen anyone belonging to those groups. More than that, the features assigned to have been largely negative.[5]

2.2. The stereotypes related to the age

Stereotype linked to the age refers to the fact that the membership in a certain group of age entail certain physical capabilities, intellectual and mental disorders. Therefore, the workers older workers are perceived as being more rigid and less flexible, having a development potential less and less to achieve performance. However, not all stereotypes related to the workers of the elders are negative, since they are seen as being more honest, better prepared. This aspect is very common among the militaries, in view of the fact that the master older workers are considered more well-trained, having regard to the experience they have only the most young people, the latter wishing to learn as much from them.

2.3.Stereotypes related to gender

Stereotype linked to the gender is the problem that he faces in most any organization and is a system of beliefs and beliefs relating to the characteristics of the women and men. Having regard to the number of women in the labor force, can be easily notice that they have obviously more few representatives in posts quickness. The best known

concept with regard to the employment of a managerial positions by a woman is at the ceiling of the glass(glass ceiling - Singh, and Vinncombe, 2004) and refers to the possibility of ascension of women in those positions only up to a certain point. Some studies have shown that the stereotypes related to gender are responsible to a large extent on the discourage women in orientation toward a career in the field of business or in their desire to access on the career ladder of any organization by obtaining of some functions of driving. Thus, women are negatively affected by this Enlargement Oli Rehn as regards employment, development, and the promotion and stipulated and more than that, they will be forced to work more than and to make more compromises than men to be in a similar position with them. The reduction of such negative effects are to be carried out by the ability of the managers to have a concrete vision and correct on the activity of the women in the framework of the organization and on the manner in which they should be able to manage on the function to which eventually it.

An example in which was manifested stereotype of gender is the case of Anna Hopkins, which has been refused the status of a partner in the firm Price Waterhouse, in spite of the performance of the financial during the 5 years in which held the office of manager within the business of management consulting business. Anna Hopkins has been the only woman of the 88 employees nominated and occupied the first position from the point of view of the contraction of the new work. However, was not within the half which has reached the status of partner. Moreover, in the following year she has not been nominated, so resigned. Given the firm in judgment, accusing them of discrimination on grounds of sex in accordance with Title VII of the Law of civil rights and the court decided that she get 371 000 dollars, representing lost in so far as remuneration and the obligation of the company to grant it the status of partner. In the research of stereotypes of this kind is aimed at highlighting the associated roles each (e.g., the man bring money in the house and the woman is in charge for the care and upbringing of children and capacities which each kind in part has (the men have the driving and are more objective, while the women are more creative). Practically, these stereotypes are appropriated by the ages very small, because for the girls they buy clothes mainly color pink or red and the boys are dressed in blue and toys which they may receive are evident from the two categories, whereas the guys will receive machines, rifles or robots and the girls will receive more puppets. Later, the company is waiting for a specific behavior from each gender. It is for this reason that tolerance with respect to a behavior "Different" is not a thing sufficiently present, being invoked most often, for reasons such as "must not accept something out the pattern" or "does not have a normal behavior".

3. THE STUDY ABOUT STEREOTYPES

The subject of the study: Comparative analyze of the gender related stereotypes in "Henri Coanda" Air Force Academy and in "Nicolae Balcescu" Land Forces Academy

The objectives of the study:

- To detect existence of the gender stereotypes in the class 411/1 (A.F.A.) and in the class 25 (L.F.A.).
- To measure the level of disponibility of the students about equal opportunities.

Hypothesis of the study:

- Gender related stereotypes exist in these classes.
- Boys have more gender stereotypes than girls, in each class.

The universe of population and the sampling: The universe of population comprises students which belong to "Henri Coanda" Air Force Academy and to "Nicolae Balcescu" Land Forces Academy. We use an intentionality sampling, so our

investigations refers to 15 students from class 411/1 (A.F.A.) and to 20 students from class 25 (L.F.A.).

Selection of research method: We choose the investigation as a research method because the answers must be measurable and very clear, and we use an questionary to collect them.

Terms of reference: The central concept of our study refers to mark out an eventual existence of gender stereotypes in A.F.A and L.F.A.

Construction of the questionary: The questionary was made being based on problems and polemics which appear, generally, in either class. It tries to reflect as well as it is possible the atitude of the subjects about this problem. The questions refers not only at society, in a generally vision (for example, *question no.1: Do you think that the gender discrimination exists in our society?*) but also it refers to military organization (for example, *question no.6: Do you think that not only men but also women can shine in the army?*) and, moreover, it refers to A.F.A/L.F.A. (for example, *question no.2:Do you think that boys and girls have the same treatment in A.F.A./L.F.A.?*). We decide this kind of questions because we consider that this is the right way to real results.

QUESTIONARY

Good afternoon!

We realize a Gallup poll about gender stereotypes in Air Force Academy and Land Forces Academy. We ask you for honest answers because we wish we could obtain real results.

1-strongly disagree; 2-disagree; 3-neither agree nor disagree; 4-agree; 5-strongly agree

Gender: □male □female

Graduate of another military institution: □yes □no

1. Do you think that the gender discrimination exists in our society?
2. Do you think that boys and girls have the same treatment in A.F.A./L.F.A.?
3. Do you consider that women are gifted to come into a duty like commander?
4. Do you prefer to have a master whose gender is same as yours?
5. Are you a supporter of the equality in army?
6. Do you think that not only men but also women can shine in army?
7. Do you agree on same number of men and women in army?
8. Do you think that only men are gifted to become leaders?
9. Do you think that in society a few jobs are made only for men and others are made only for women?
10. Do you think that gender diversity is necessary in army?

Analisation of the results: The sample was studied in terms of two factors: gender (male/female) and graduate of another military institution (yes/no).

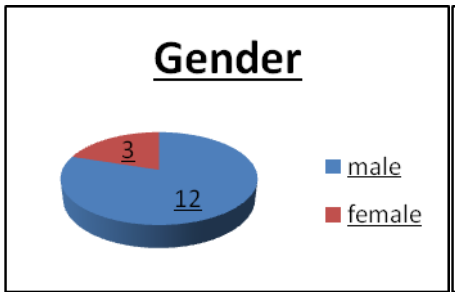

FIG. 1. Class 411/1 (A.F.A.)

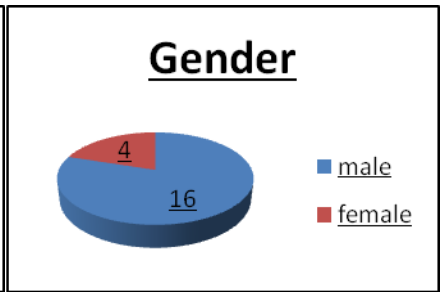

FIG. 2. Class 25 (L.F.A.)

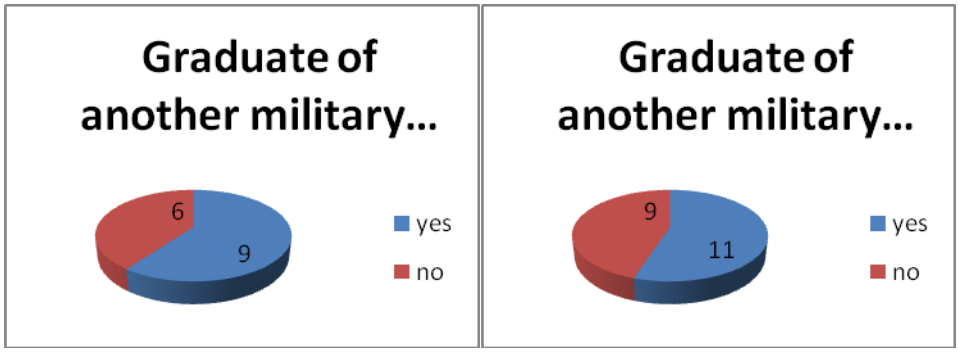

FIG. 3. Class 411/1 (A.F.A.) **FIG. 4.** Class 25 (L.F.A.)

The answers are represented in **FIG. 5.** and **FIG. 6.**

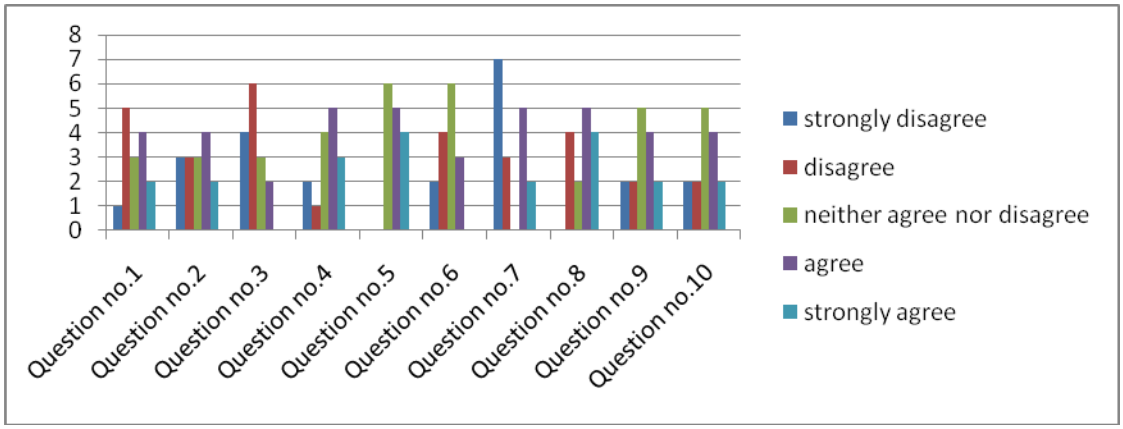

FIG. 5. Class 411/1 (A.F.A.)

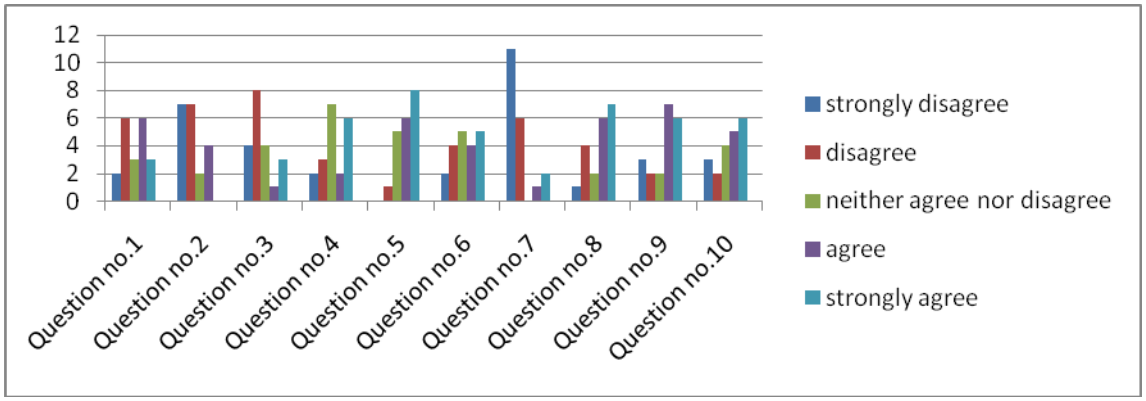

FIG. 6. Class 25 (L.F.A.)

We did an analysis in terms of two factor. Firstly, we speak about the gender.

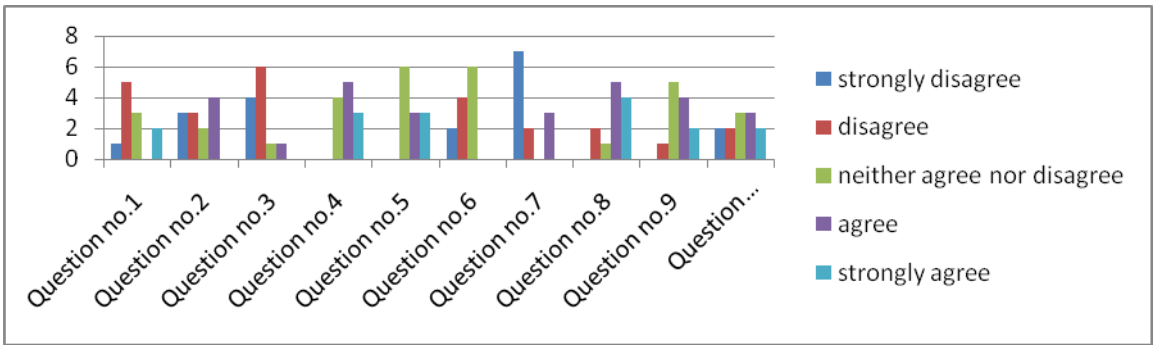

FIG. 7. Boys from class 411/1 (A.F.A.)

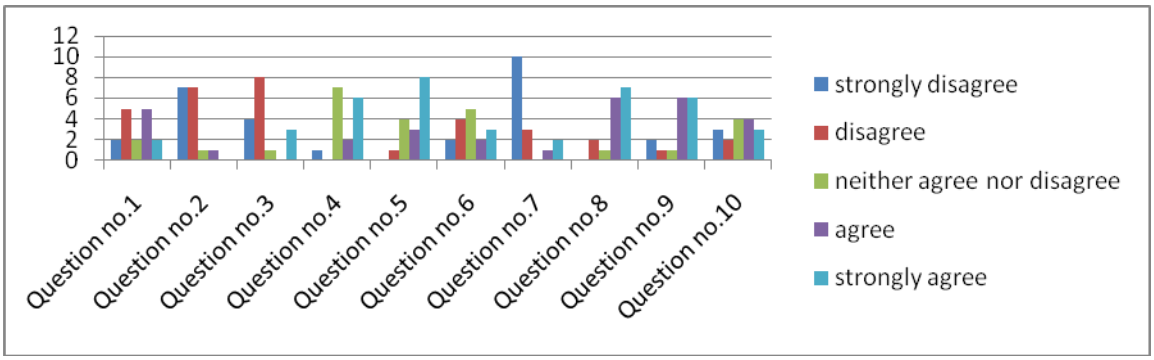

FIG. 8. Boys from class 25 (L.F.A.)

If we look at the L.F.A. chart, we can see that as for question no. 8 (Do you think that only men are gifted to become leaders?), for example, 13 boys consider that they are better for being leaders. Moreover, 12 boys consider that in society a few jobs are made only for men and others are made only for women (question no.9). Answers are the same for A.F.A. students, the only major difference refers to question no.2. If it comes to the treatment for students in A.F.A., 4 boys from class 411/1 admit that their treatment is, in a big way, like the treatment of the girls, but 14 boys from class 25 think that in L.F.A. they don't have the same treatment like girls.

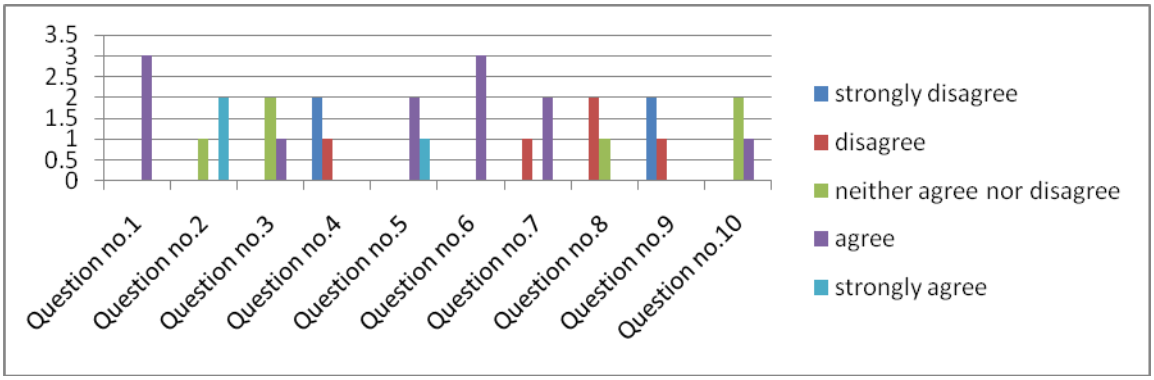

FIG. 9. Girls from class 411/1(A.F.A.)

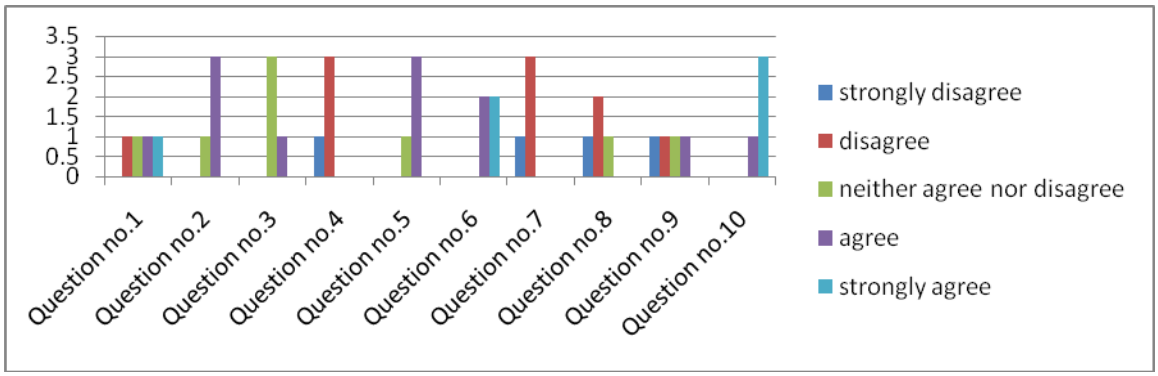

FIG. 10. Girls from class 25 (L.F.A.)

A difference between class 411/1 and class 25 refers to question no.1. All the girls from class 411/1 agree with the statement „The gender discrimination exists in our society.", but every girl from class 25 has another opinion. Furthermore, at the question no.10 we can see that no one from 411/1 strongly agree with the fact that gender diversity is necessary in army.

Boys from each class prefer to have a master whose gender is same as their, but girls strongly disagree or disagree with this statement.

Now, we refer to graduation of another military institution.

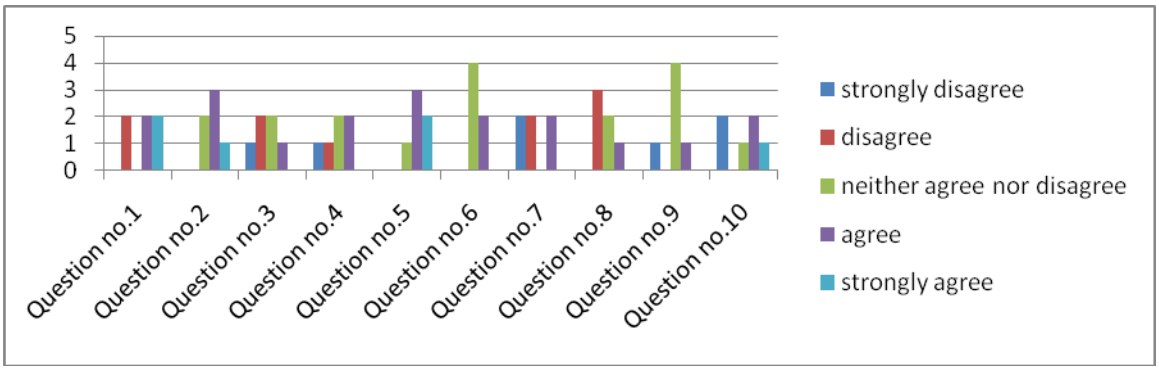

FIG. 11. Students from class 411/1 who have not graduated another military institution

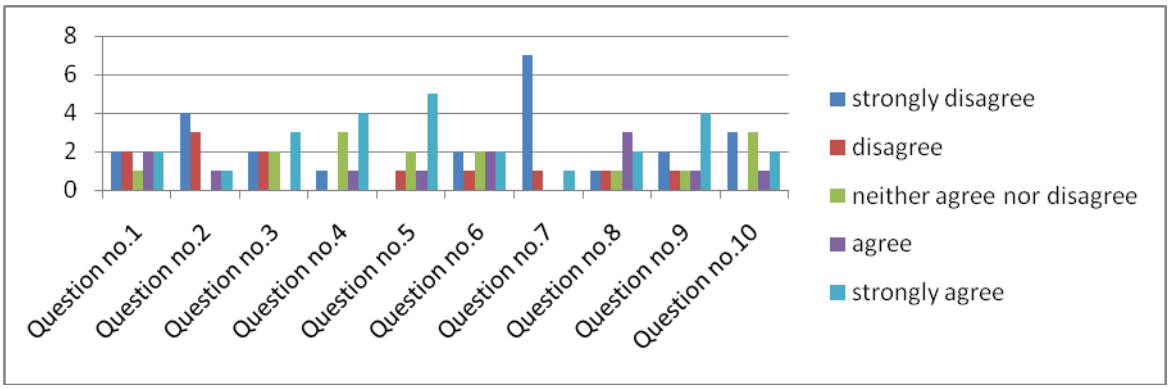

FIG. 12. Students from class 25 who have not graduated another military institution

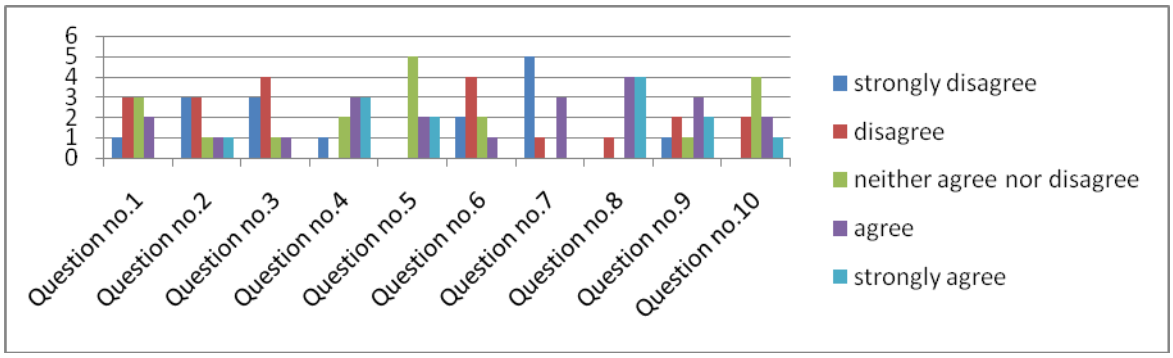

FIG. 13. Students from class 411/1 who have graduated another military institution

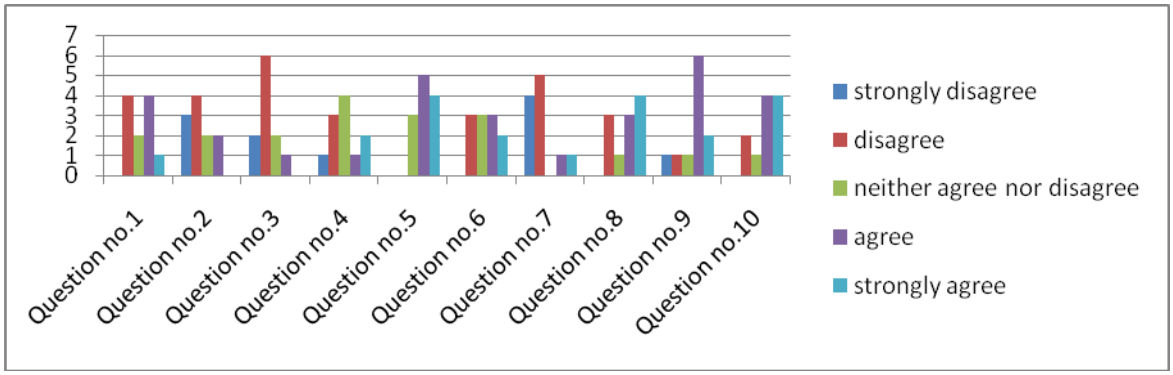

FIG. 14. Students from class 25 who have graduated another military institution

If it comes to students from L.F.A., a difference was highlighted at question no.5, about equality inside the army. There was no student who have graduated another military institution who said that he did not agree with the equality inside the army, but 3 students who have not graduated another military institution were against the equality. If it comes to students from A.F.A., there are not differences conditioned by this factor at question no.5.

In A.F.A.'s students situation, at the question no.p, 2 students who have graduated another military institution said that in society a few jobs are made only for men and others are made only for women, but 6 students from L.F.A. agreed with this idea.

In either case, we observe that students who have not graduated another military institution are more open-hearted to have a master whose gender is same as their.

The compilation of the report

After the study carried out on the sample which includes students 411/1 groups (A.F.A.) and 25 (L.F.A.), we consider that the objectives have been fulfilled. Referring us to the first objective and taking into account the distribution of the answers in the case of questions no.3, no.8 and no.9., the stereotypes of this kind is in group 25. For example, 12 of 20 of subjects are of the opinion that the women can do it in small and very small extent on the functions as well as the master by the unit (question no.3). Also, 13 of 20 considers in large and very much as status of leader is more suitable for men (question no.8) and that there are certain places of employment are intended solely for men and others only intended for women (question no.9). As regards group 411/1, the answers to these 3 questions were given in the same area. In conclusion, there has been a difference between the groups.

On the second objective, having regard to the answers to the question no.5 (Are you a supporter of the equality in army?) we can notice that the subjects in both groups give

proof of availability in view of equal opportunities. Another question whose answers strengthen this idea is the question no.10, (Do you think that gender diversity is necessary in army?) only 5 subjects of the L.F.A. and 4 subjects of the A.F.A. is of the opinion that this is necessary in the small and very small extent.

As regards the assumptions of the research, the premium was not validated. In view of the fact that there was a sampling rate of intentionality, the result can not be extrapolated the two academies.

The second hypothesis, the one according to which the boys form more stereotypes the gender than girls, was validated, evidenced by the answers to the questions no.4, no. 6 and no. 8. Thus in the case of group 411/1, no face not stated that she would prefer a commander of a platoon of the same sex (question no.4), considering that the army was a field in which both men and women can excel (question no.6) and is of the opinion that the status of leader is more suitable for men (question no.8). In exchange, from among the boys, 6 would prefer to have a commanding a platoon of the same sex, 8 considers that the status of leader is more suitable for men. The same result has registered and in the case of group 25, so that we can say that he is, indeed, the boys form more stereotypes the genre than girls.

4. CONCLUSIONS

In conclusion, our study regarding of the gender related stereotypes in Air Force Academy and Land Forces Academy marked out this existence. Considering that it is about military system, a system destinated in great measure to men because of the activity, the existence of gender stereotypes was imminent. A very important thing is that there are not differences between class 411/1 from A.F.A. and class 25 from L.F.A.

Nevertheless, this existence doesn't affect the activity in organisation. Stereotypes can be under control and the leader has the responsability because his orders and affirmations must suggest an equality between men and women.

Practically, the gender stereotype is, in our opinion, an approach problem for different situations, a mentality problem and a disponibility for change problem, so the existence of the stereotypes can be reduced, if somebody wants it.

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EUROPEAN POLITICAL ANTIESTABLISHMENT MOVEMENTS – AN ASCENDING TREND

Alexandru NICA

"Mihai Viteazul" National Intelligence Academy, Bucharest, Romania

Abstract: *Political antiestablishment movements have become increasingly popular over the past few years, having spread in all parts of Europe, from Denmark to Greece, from UK to Hungary. Criticizing immigration and income inequality, promoting nationalism and fighting conventional political elites, their success is easy to account for. Managing such movements is another hot topic on the already hectic agenda of the European Union. What is more, the policies that European politicians are expected to implement so as to fight the crises, be it the refugees' one, terrorism or the `Russian threat`, might fuel even more the radical movements' popularity. Therefore, it is of utmost importance that we understand such movements, their intentions and the way they act. For nowadays, not the left-right differences on the political spectrum may be fundamental in explaining political behavior of groups, but the conventional-antiestablishment ones.*

Keywords: *antiestablishment, radicalism, anti-immigration, impact on EU.*

1. CAUSES AND CHARACTERISTICS

The political spectrum in nowadays Europe is as colorful and volatile as it can be. In the last years there has been a spectacular rise in popularity for the antiestablishment parties and movements which could be noticed even in the voting polls. A short yet eloquent analysis of the last major events' impact on Europe in the last decade shows that the fore-mentioned popularity is understandable.

Firstly, the economic crisis from 2008-2009 affected a negative manner the economies of EU member states. Thousands of people were left unemployed and the income inequality increased. In 2012, in the Gini coefficient, considered to be the most widely used method for income inequality, EU member states were given scores ranging from 0.24 to 0.35 (where 1 means that one individual has all the income in a country and 0 that everyone has an equal income) [1]. In two of the countries with the highest score, Greece and Portugal, there are now popular anti-establishment movements with left-wing populist views, gaining their success from criticizing the way the moderate parties managed the financial crisis, For instance, Greece itself has now a total debt of more than 320 billion euros.[2]

Secondly, immigration is continually fueling the ascent of the antiestablishment movements, especially in Western Europe. According to statistics from the Eurostat presented by BBC, only in 2015 there have been almost 1,3 million asylum claims, most of them from Syrian and Afghan people, Germany being by far their most desired destination. What is more, the stats show that in terms of asylum applications per 100,000 local inhabitants Hungary, Sweden, Austria, Norway, Finland and Germany top the ranking.[3] Hence, does it really come as a surprise that there are right-wing anti-immigration movements in all these countries? For example, PEGIDA (Germany) states

its purpose even in its name: *`PatriotischeEuropäergegen die Islamisierung des Abendlandes`*which translates as `Patriotic Europeans AgainstIslamisation of the West`.

A third main cause which I have identified is the questionable stability of the EU that caused people to lose their confidence in the European project.[4] Initially created with the goal of a united peaceful Europe which was almost destroyed in those times by the Two World Wars, the project has evolved for decades. During the process, economic integration has been deepened, borders have almost vanished, a unique currency was adopted etc. Of course, these processes implied a transfer of sovereignty from the national states to the Union, with the ultimate purpose of creating a federation of states similar to the USA.

Ten years ago the European project seemed flawless and irresistible. Nowadays, the economic crisis, the chaos in the Middle East with the consequent flow of refugees and Russia's recovery have changed the initial data. EU has weakened and seems to have no viable solution to any of these issues. In this context, nationalism has re-emerged throughout the continent and the radical movements have gain momentum by criticizing conventional politics.

Based on the causes of their popularity, one can deduct the main characteristics of the antiestablishment political movements. There are both common and distinct features, the latter being determined by the ideological orientation. Left-wing parties, met especially in southern Europe (PODEMOS in Spain, Syriza in Greece etc.) fight for economic recovery and support populist measures. Right-wing parties (National Front in France, UKIP in the United Kingdom, Jobbik in Hungary etc.) promote anti-immigration ideas and they are Eurosceptic.

Regardless of the political spectrum, there are some common characteristics. First of all, they all despise political elites that they consider guilty of the current situation for their inability to address appropriatelythe societal problems. Additionally, these elites are also to blame for conceding power to European supranational bodies, which are labeled as unaccountable and unrepresentative. Hence, another common feature is the desire to return to nationalist rule. [5]

Secondly, antiestablishment parties pose in favor of direct democracy, for instance, consulting citizens via referenda. They also promise to combat corruption and remove the clientelistic ruling class.The strong ideological messages, the aggressive attitude, preferring confrontation to consensus, and the claim `to act on behalf of the silent majority` are common as well. [6]

It is interesting that, in spite of their apparently strong ideological orientation, antiestablishment parties tend to collaborate at a high level for their common goals. For example, Euroscepticism has brought together Marine le Pen, the leader of the National Front, a right wing French party, and Alexis Tsipras, the leader of Syriza, a left-wing Greek ruling party. [7]The two leaders have stated similar approaches to important political topics, such as the EU's relation with Russia, arguing for the softening of the economic restrictions imposed on the latter for its previous annexation of Crimea. [8]

2. VOTING RESULTS AND FUTURE PROJECTIONS

The adhesion from which antiestablishment parties benefit is easy to observe from the evolution of their political results. For this reason, I believe it is more than relevant to enumerate the results most important radical parties have obtained in both national and European elections in the last years.

❖ The National Front (France) obtained its second best result in history at the French Parliament election, overcome by a little only by the 1997 election's results. In addition,

at the Presidential election in 2012, Marine le Pen counted 17.9% of the votes, the best result in the history of the party, coming third in the Presidential race. What is more, in the 2014 European Parliament election, the right-wing party finished first with 24.86% of the French votes, occupying 24 out of 74 French seats. [9]In the first round of the regional elections in 2015 the party had an astonishing result winning 6 out of 12 regions. In the second round, however, due to some political alliances made between the other major parties, it did not win any region. However, it still counted 7 million votes; [10]

- PODEMOS (Spain) has become the second largest political party with more than 390.000 members. Being founded in 2014, the party took part in the European Parliament election when it got ~8% of the national votes (more than 1.200.000 votes cast). Its most impressive result was in December 2015, at the national parliamentary elections: 21% of the votes which placed it on the third place among voters' preferences. [11]
- Syriza(Greece) has become the most important party in Greece, governing the country. This fact simply speaks for itself, no voting results being needed;
- Seeing that UKIP (United Kingdom) has only 1 seat won in the 2015 UK elections for the House of Commons is more than deceiving. This result is due to their specific voting system. In fact, the party received almost 4 million votes, ~13% of the total, 10% more in comparison with the previous elections in 2010. Additionally, in the 2014 European Parliament election it ranked as the first party, almost doubling its number of votes and seats won compared to the previous election in 2009;[12, 13, 14]
- Although JOBBIK (Hungary) lost 24 seats in the 2014 parliamentary elections, it won more votes than in 2010. Regarding the European election, they had similar results in 2009 and 2014; [15,16]
- The Danish People's Party has also gained momentum in the last elections. It added 15 seats and more than 300.000 votes in the 2015 national parliamentary election compared to the 2011 ones. An evolution is also observed by comparing the last 2 European elections: 2 additional seats and approximately 250.000 extra votes.[17]

The analysis of the fore-mentioned results demonstrates some interesting facts. First of all, it contradicts that the popularity of these parties is a myth. With the exception of JOBBIK, all the other parties have improved significantly their election results, be they national or European. Therefore, their popularity is not only real, but also fast growing as it's their electorate. Beyond any doubt, the antiestablishment parties have become an important player in their national political games.

Secondly, when it comes to Parliamentary election, the quantum of votes is not always a decisive factor, as the UKIP example clearly demonstrates. However, as long as Presidential races are concerned, this changes. And even though there will not be such examples in UK, Spain or Denmark for they are monarchies, France is a big enough country to set a trend for the other republics of Europe. At the regional voting in 2015, Le Pen's National Front got 7 million votes which would make her a serious candidate for a second round in the 2017 Presidential election. What Marine le Pen as President of France would mean for the EU will be discussed in the third chapter of the present paper.

Thirdly, the December 2015 regional election in France deciphers the behavior of the radical parties' voters. After the first round results, I was almost sure that the National Front would win at least 3 or 4 regions. Seeing that, eventually, they got none simply baffled me. So I started looking for an explanation. Then I came to the conclusion that voters do not necessarily opt in favor of the radical parties, but they vote against moderate ones, trying to send a wake-up call. They were not sure if they wanted to see Le Pen and her acolytes ruling; they merely wished to express their discontent and distrust in the conventional parties. That was, in summary, the first round. However, in the second round, realizing that they risk leaving half of their country in the hands of radicals, the

citizens changed their options, helped by a needed political agreement between the other two major parties, which ceded to each other where they ranked weaker, somehow allying against The National Front.

3. IMPLICATIONS ON THE EUROPEAN UNION

The EU cohesion seems to be threatened by several issues the European community is facing, some of which have been mentioned before in the paper. The rise of radical antiestablishment movements adds another problem to the agenda. Hopefully, these problems won't turn into nails into the EU's coffin.

At the moment the projections are not favorable. As proven before, there are certain connections between EU's crises and the ascent of radicalism. Therefore, were action not to be taken, the crises would only worsen and radicalism would keep rising. Of course, the problems need to be solved both inside the countries but especially at the European level as a whole. However simple it may seem, keeping in mind that Eurosceptic parties have a word to say makes it a lot more difficult.

On June 23rd a referendum will be held in the UK regarding its member status in the EU, UKIP being one of the most vocal parts in favor of the `BREXIT`. In 2017 French Presidential elections will take place, Marine le Pen being one of the favorite candidates. These two moments are crucial for the future of the Union (the Czech prime-minister, BohuslavSobotka has already announced that in case of a `BREXIT`, a `CZEXIT` should be taken into consideration) [18] and, whether we like it or not, UKIP and The National Front can strongly influence the outcome. If we take into consideration that the two parties ranked no. 1 in the 2014 European Parliamentary elections in their countries, the projections are even less optimistic. Western Europeans simply started to view the Union as not the only efficientpolitical structure available and the antiestablishment movements benefit from it.

In 2014, Eurosceptics won almost 20% of the European Parliaments seats. If EU doesn't solve its problems urgently, or if at least it doesn't start to act more coherently, this is how a not so unrealistic scenario may look like in the 2019 elections. Some millions of refuges may have already come in Europe, bringing with them fear of terrorism, a raise in unemployment and greater social division; a France ruled by Le Pen and UK may have started their exit processes; a few murderous and horrible terrorist attacks may have been organized in Europe; and there's no need of a very imaginative mind to continue the scenario. Unfortunately, in this case, it would be only a matter of time until European Union would break into peaces. And a segregated Europe means an aggressive, nationalistic Europe filled with historical rivalries. And last time such a Europe existed, in the first half of the 20th century, two world wars were fought.

Of course, this is a far-fetched and overly pessimistic scenario. Unfortunately, the more time passes, the more crises must be dealt with and less solutions are found.

CONCLUSIONS

Political antiestablishment seems to be the new trend in Europe. Its ascent is a reality and the phenomenon has not reached its zenith yet. It exploits the crises and drawbacks of the EUincredibly efficiently. Income inequality, unemployment, massive immigration, distrust and dissatisfaction with political elites fuel these movements. This fact is easily observed in the electoral results of parties such as The National Front, Syriza, PODEMOS or UKIP.

I believe European radicalism is not strong enough at the moment so as to lead to the disintegration of the EU. Yet, we should acknowledge that we still live in a world where

propaganda and other similar methods are still used and some leaders from countries in Eastern Europe (i.e. Russia) are no strangers of that. [19]

It is high time that conventional moderate politicians lived up to the expectations and continued the European project which, not long ago, was considered the most appropriate and efficient one, a peace-maintaining and prosperity-bringing model to be adopted all over the world.

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THE EFFECTS OF MUSICAL PHENOMENA ON LIFE DIMENSIONS

Paul-Alexandru POPA

*"Henri Coandă" Air Force Academy, Braşov, Romania

Abstract: *In contemporary society, the concept of music becomes an essential factor of the human activity, a mental and social foundation at a global level due to the complexity of its influence produced on biocenosis. For the vast majority of people, music seem to be a phenomenon easy to understand, a domain easy to master, but in reality, it hides a series of mysteries, often manifesting unconsciously on the human psyche. Nowadays, people's need for music defines the interdependence between their own development and the standard at which the culture is situated. Moreover, music demonstrates the human tendency to associate his vision with a particular music genre.*

This paper proposes to approach the multitude of music effects throughout history in order to clarify the reason why the musical phenomenon exponentially propagated both in human destiny and in the development of plants and animals.

Keywords*: biocenosis, human psyche, music effects, development, complexity*

1.INTRODUCTION

Throughout its existence, the humankind have been in a constant discovery of their own barriers, adjusting to environmental requirements depending on material, social and intellectual resources of each period. Since ancient time, people were guided by primitive forms of music even if they were called sounds due to natural phenomena or noises produced by people or instruments. The philosopher Maurice Pradines, in his writing "The psychogenesis of music" shows that both sounds of nature and those produced by man or instruments had initially a signaling function. When the sound produces a pleasure in people, they try to reproduce in order to renew the delight. The theory of Maurice Pradines leads us to the idea that we cannot reject any sort of music, all the categories of this art being reflections of the human life and his communication with nature, people or divinity. The sphere of music is not limited to entertainment or simple sound sensations, it springs out from the need of human beings to externalize their moods. The passing of time demonstrated the interdependence between individual and sound, creating a deeper and deeper connection between the two factors due to the benefits of the primary forms of music so that thehuman evolution has also caused acoustics evolution. During thisevolution, music has seen a progress not only in terms of tools, but a large classification based on harmony, rhythm, shape or text, and thus, delimiting countless musical genres. But this classification produces delimitations among humans, oriented to a certain genre because of the message or the melody, having positive and negative effects both on the development and formation of an overview of life. In other words, even if it represents an extremely important factor in our evolution, the problem of music influence on human actions and the reasons why we tend to listen to it remain over time a

indecipherable mystery, a question without a clear answer, a topic that we will approach over the next chapters of this paper.

2.THE DEFINING ELEMENTS OF MUSIC

Nowadays, the concept of music was exponentially propagated in people's lives, it being found all over the world where people live, even if we refer to media player, private residence, office, restaurants, bars, shops so that each person knows what the music is and what the meanings of this phenomenon are. But few people are those who are able to explain it and assign a precise definition to music. The definition of music has known both scientific and poetic expressions, being likened to the murmur of nature or described as a group of cyclic sounds. But, objectively speaking, music represents a multitude of sounds, noises, or more exactly, sonorous vibrations based on the energy released through hitting, pinching or rubbing and which is transmitted through matter. Over time, there have been countless definitions attributed to musicwhich captures various essential aspects or some of its attributes, even if none can be considered perfect. Boris Luban-Plozza and Ioan Bradu Iamandescu define music as a sound architecture governed by specific laws targeting the rhythm, melody, timbral qualities or the harmony of sounds, having both mentally and organic impact on the listener. Another definition is the one chosen by Ludwig van Beethoven, who asserts that music represents a revelation higher than all wisdom and philosophy, it is the language of the soul, arousing not the instincts, but the deepest thoughts. From my point of view, music represents a means of communication, a harmonious combination between text and melody, meant to transmit a strong emotional message which has different effects on each person. Both melody and text give to our existence a special meaning, it allows not only the knowledge about the charm of surrounding world, but self-knowledge in the same time. Thus, the essence of music is found in themessage, and the amplitude of message depends not only on rhythm, tonality, text or harmony, but also on the emotional implication of the receiver.

3. EFFECTS OF MUSIC

3.1 The effects of music on people

Both individually and collectively, the effects of music vary and provoke major changes on the mental condition of people in a consciously or even unconsciously way, as we can see in figure 1. The diversity of its actions explains the reason why music becomes more and more present daily.

Firstly, music has a cathartic effect on the accumulated negative emotions, it succeeds in reducing or even in cancelling the discomfort in order to induce a relaxation when it comes to accumulation of fatigue. A group of researchers from Israel demonstrated through a study on truckers exposed to various stimuli that a good method to stay awake is to listen to rhythmic music with a fast tempo in order to maintain an optimal level of concentration and struggle against drowsiness when we drive at night. Moreover, it produces a mental stimulus both sensory by increasing the stamina, intellectual and volitional statuses through its mobilizing effect. This is the reason why people tend to listen to music when they perform sports activities or they wish to acquire certain amounts of information. Also, with the help of receiver, who amplifies the emotion of the message, music determines a force of evocation of some previous experiences, referring to a certain moment in the past with a special meaning for the subject. In this case, the message represents the present key to past experience because it contains elements that

light up a special memory listeneŕs mind . We should not skip the effect of music to intensify mental processes of happiness, love, sadness or longing with the occasion of special events throughout the human life. For example, if music during a wedding gathers people in a dancing floor, amplifying their happiness manifested through rhythmic movements, music during a funeral march enhances the feeling of missing and sadness of a group of people towards the death of a loved person. As it can be seen, there are a series of ways whereby music has a great impact on human activities, besides the encouragement of communication, increase of the heart rate and breathing rhythm or even the use of music therapy in order to treat various diseases and the list does not end here.

FIG.1. Influence of music on human psyche

Another approach to this subchapter focuses on music effects in military domain. A medieval poem dedicated to the valiant Cid Compeador, the hero of secular battle waged by the Spaniards in order to re-conquer the territories occupied by the Moors in Iberian Peninsula mentions the use of drums by Moor soldiers whose sounds caused an earthquake, provoking fear among enemies. Another older example is represented by theChinese writing which narrates about a battle that took place in 684 BC in which the noise of drums mobilizes their soldiers. Thus, we see the effects of noise of these periods in a social conflict based not only on fear of the opponent, but motivation of own army. Music induces strong desires, it incites people to fight, it can determine nostalgia or fraternity and it triggers a common hate. The appearance of scream in fights, patriotic songs or military band led to a complex use of music in the military domain. Today, the vast majority of subunits of armed forces identify with a patriotic song. The same phenomenon, on a large scale, is represented by the anthem of a state.

But music expresses through the inner voice of the listener, regardless of its use, it possesses a topic which the author encodes through the music and receiver recognizes it based onsome qualities of composer. In other words, music identifies with communication, involving items such as a transmitter, a code, a message, a receiver, a communication channel and last but not least the element which gives it a definition, called noise.

3.2 The effects of music on plants and animals

The effect of music is not restricted only to people, but intervenes in case of plants and animals, as well. Both plants and animals are strongly influenced by sound vibrations

in a positive or negative way depending on its physical and molecular structures. In India, tradition show that God Krishna used to provide music for the vegetation of his garden in order for it to become more and more luxuriant. In 1960, botanist Shingh realized a faster growth and a greater robustness of his plants exposing them to musical concerts and he also affirms and demonstrates through some experiments that the crops are richer if a musical background was used. Moreover, there have been a series of comparisons between the effects of two opposite musical genres on these two subjects.

The researcher Dorothy Retallack played rock music to her petunias and semi classical on the same type of flowers. The petunias exposed to semi-classical music flourished and at the end of the two weeks they were inclined toward the amplifier speaker. Flowers exposed to rock music did not flourish and at the end of two weeks they were inclined in the opposite direction of amplifier and after two weeks they withered. The same two genres were those that tested the effect of music on animals, ascertaining the fact that classical music increases milk production in cows and rock music decreases it. Furthermore, rock music made the laboratory rats to reproduce more than usual. It was also proved that a symphony concert and the waltz are well-perceived by dogs while cats prefer piano sounds. On the other side, rock music determines an increase of restlessness and disorder and even stimulates aggression.

The mechanism of music action could be based on resonance phenomena between frequencies associated with musical sounds and enzyme reaction cycles, both when it is used as a therapeutic agent at people and animals and when the music effect is used for growing plants. Intervening through a resonance mechanism, acoustic oscillations applied to biological organisms can influence the speed of enzymatic catalysis reaction.

4.CONCLUSIONS

The concept of music represented a factor with a great significance not only for people, but also for animals and plants since the moment of throwing the first stone which caused a click for humans until today, and its influence was manifested consciously or unconsciously in a positive or negative way. If the complexity of its effects can be found throughout this paper, the problem of understanding the music effects on a psychological level remains one which needs further attention and detailed studies. The concatenation of a group of sounds has different repercussions on life according to experience and particularities of the one who listen to it regardless of the elements which produced it, so that, in time, people succeeded in producing an evolution of sounds, from the primitive noise to real musical masterpieces such as the symphonies of Mozart or Beethoven, On the other side, music expresses not only through its melody, but through the text by which the composer transmits some messages to the listener, interpreted in relation to some of their qualities. The synergy between melody and text gives to music the status of art in a true sense, its beauty and effects reach the climax. In other words, to my way of thinking, music represents an act of communication attached to a soundtrack, a message with a strongly emotional power addressed to a huge crowd of people with similar visions of life, being able to influence the development of life on Earth.

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THE PREVALENCE OF CURRENT PATHOLOGIES AMONG MILITARY STUDENTS AND PROPHYLACTIC METHODS

Maria-Victoriţa TĂNĂSELEA, Elena VIŢELARU

Military Medical Institute Bucharest, Târgu Mureş

Abstract *: Purpose: In this paper, we aimed to analyze data regarding prevalence of certain pathologies that suit various organ systems of military students and also to expose prophylactic notions targeting these diseases.*

Introduction: Assuming that each domain has characteristic risk factors, we want to point out the importance of all the medical measures necessary for preventing and monitoring the dysfunctions that occur.

Methods: The retrospective statistical study conducted by applying a questionnaire of 10 items on a representative sample (150 people) has fundamented this research.

Results: Following interpretation of the obtained proportions we prioritized the possible disease categories (attention and/or concentration disorders - 56% of all central nervous system pathologies; anorexia / hiperorexia - 68% in the digestive system; burning when urinating - 47% in the urinary sphere; minor trauma - 51% of osteo-articular system), pointing also predisposing aspects, diagnostic, therapeutics and preventives.

Conclusions: According to the results above, there are three major considerations highlighted: the existence of cause-effect relation in the syndromes found, its materialization in the military environment and the importance of knowledge, and last, the application of prophylactic rules.

Keywords: *prophylaxis, military students, pathology, risk factors, therapy.*

1. INTRODUCTION

The War of Independence was marked by a high number of injured soldiers, due to the tactics employed in assaulting enemy entrenchments. Along with diseases caused by improper hygiene and unfavorable weather conditions (humidity, low temperatures, frequent precipitations), organizing personnel in large groups made them more susceptible to being infected by (and further transmitting) anthrax, smallpox and the flu. The situation was worsened by digestive problems (dysentery) caused by poor quality food and contaminated water. [1]

As time went on, an improving economy and advancements made in all medical fields (diagnostics, treatment, recovery), the number of recorded illnesses at a national level were on a steady decline, both in the military and the civil sector.

2. PURPOSE

This paper aims to show the prevalence of the main pathologies afflicting military students, so as to systemize them and propose measures for improving their condition and optimising their activities.

3. OBJECTIVES

The main objectives of this study can be surmised as follows:

- collecting and analyzing data obtained from a questionnaires filled out by students from the 5 higher military education institutions in the country (The `Henri Coanda` Air Force Academy – Brasov; The `Nicolae Balcescu` Land Forces Academy – Sibiu; The `Mircea cel Batran` Naval Academy – Constanta; The Military Technical Academy – Bucharest; The Military Medical Institute – Bucharest/ TarguMures)
- establishing the proportions of the each system organ diseases
- outlining the interrelation of risk and pathology, as well as upholding the importance of applying preventative measures to stop further infections and disease outbreaks

4. RESULTS

The 10 item questionnaire was applied to a sample of 150 people and yielded the following results:

- attention and/or concentration deficits accounted for 56% of pathologies concerning the central nervous system
- anorexia – 68% of those affecting the digestive system
- minor trauma - 51% of the afflictions of the osteo-articular system
- stinging during urination – 47 % of problems of the urinary system.

QUESTIONNAIRE

Hi! We would like to ask you to answer the following questions by submitting an "x" in the appropriate box according to your answer and we would like to identify yourself by filling:

Age
Sex
Year of study
Specialization / Branch
University / Academy

1. Do you consider that maintaining your health in the physiological parameters is one of the most important factors in your military career?

Yes
No
I do not know
I am not interested

2. Have you experienced having pathological consequences highlighted in your daily activities?

Yes
No
I do not know
I am not interested

3. On which organ system of those listed below do you consider that the military factors acted in a maximal way?

Central servous system
Digestive system

Urinary system
Osteo-articular system

4. From the point of view of the central nervous system you have experienced ...
... attention and / or concentrating disorders?
... depression?
... panic attacks?
... physical, emotional and mental exhaustion (burnout)?

5. Which of the following digestive symptoms did you have?
nausea / vomiting
anorexia (lack of appetite) / hyperpyrexia (overgrowth of appetite)
constipation / diarrhea
dysphagia (difficulty swallowing) / abdominal pain

6. In the urinary system were present...
... burning when urinating
... frequent urination
... oliguria (decreased level of eliminated urine within 24 hours)
... pain in the urinary tract

7. Regarding the osteo-articular system you have suffered...
... minor trauma (sprains)
... major trauma (fractures)
... pain in the various segments of the spine (cervical, thoracic, lumbar, sacral-coccygeal)
... bone deformities (kyphosis, scoliosis, lordosis)

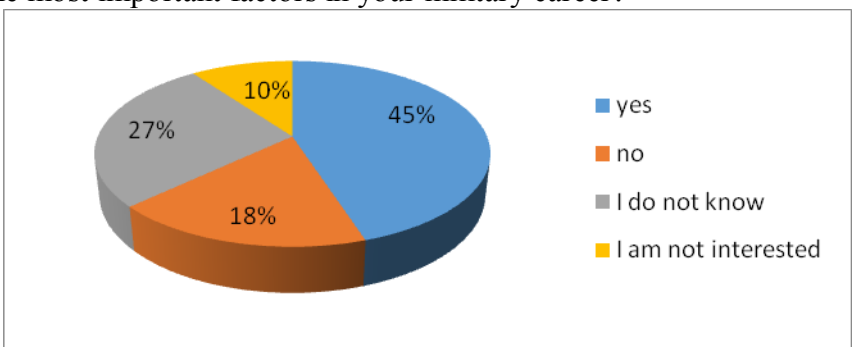
8. Do you believe that the repercussions of the daily schedule had a resounding:
maximum
moderate
minimum
meaningless

9. Which of the following characterize your attitude on those above?
indifference
latency
natural remedies
medical treatment

10. Do you consider that existing prevention methods at the moment are effective enough? Yes
No
I do not know
I am not interested

Thank you for your time !

1. Do you consider that maintaining your health in the physiological parameters is one of the most important factors in your military career?

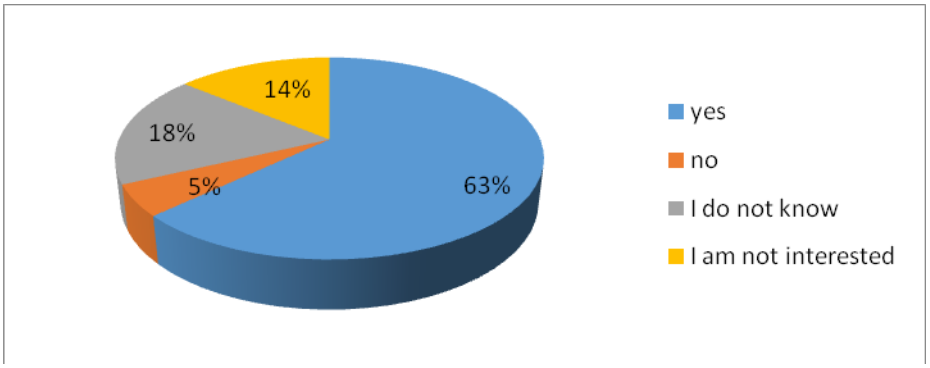


Most of the students military (45%) believe that maintaining physiological parameters of their health is one of the major determinants military career, 27% opted for the answer "I do not know", advocating for an insufficient knowledge of the implications of these variables, followed by 18% that answered "No" to this question, and choosing "I am not interested" representing 10%, which shows that these people are independent of the consequences that might arise in an imbalance.

The World Health Organization (WHO) provides in 1948 the consecrated health definition as: "the complete good state of physical, mental and social. It is not just the absence of disease or infirmity". The characteristics of this explanation are the following:

- it is accepted worldwide as a "aspiration"
- achieving it involves empowering society
- the definition emphasizes the positive and multiaxial character of health. [3]

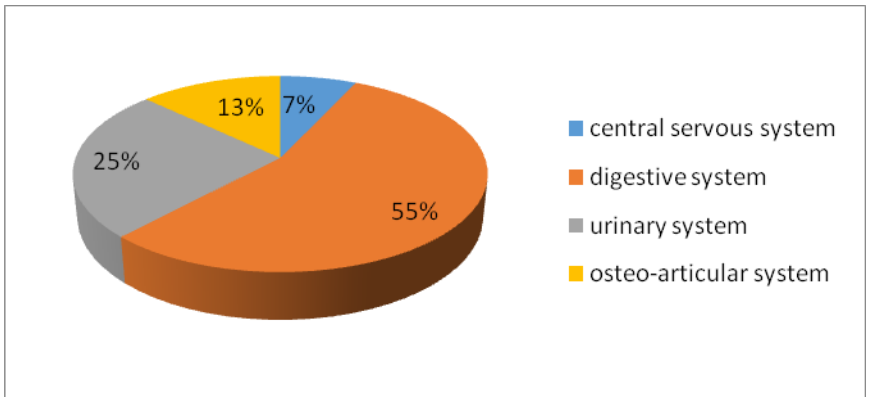
2. Have you experienced having pathological consequences highlighted in your daily activities?



Among the physiological factors that support work capacity is also the health status included, along with the psychological and the external nature ones (the work environment and socio-economic), in antithesis with the pathological factors which lead to diminishing the performances in a career.

Most of those surveyed had experienced pathological conditions with consequences highlighted in their daily activities (63%), and only 5% were not disturbed of such dysfunctions. 18% of participants can not decide if their schedule was influenced or not by negative symptoms, and 14% did not give importance to this aspect.

3. On which organ system of those listed below do you consider that the military factors acted in a maximal way?



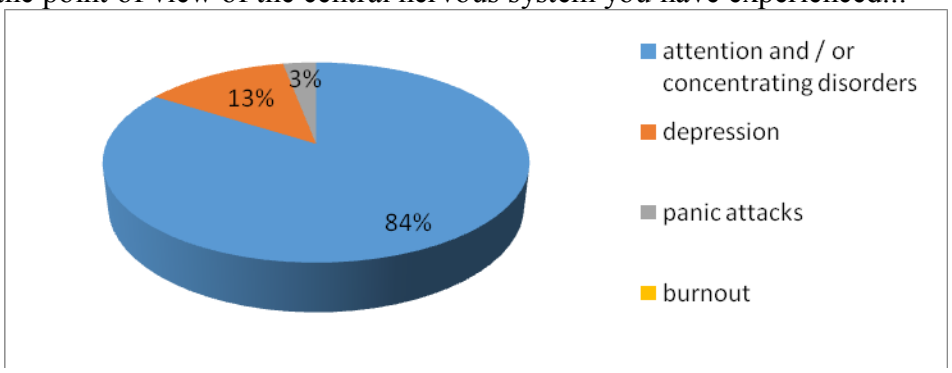
Each field shows, by its nature, a variety of risk factors, and the military system predispose also the appearance of various pathologies because of specific activities undertaken.

Predisposing factors can be classified into various categories, from which we remark:

- physical-factors: exposure to extreme temperatures, high humidity, excessive weather precipitations, intensity noise of over 90 dB (a normal conversation is about 65 dB)
- chemical-factors: toxic substances (irritating and asphyxiating), flammable (oil, petroleum)
- psycho-social factors: stress, disposed in collectivities, unpleasant tasks, the time needed to achieve the required pace of work. [3]

Notable is that the central nervous system is the last ranked at a ratio of 7%, and also gratifying because of the difficulty in treating these disorders, compared with the digestive system which, although occupyes a leading position (55%) does not exhibit usually a threat.

4. From the point of view of the central nervous system you have experienced...



Memory works by the following algorithm: information -> attention -> concentration -> storage and disrupting any steps can create disturbances with implications of different intensity. Thus, attention disorders (84%) involve two directions:

- hypertrophy of attention, including fixed ideas (simple, accompanied by emotions or impulsive form)
- atrophy of attention, admitting the impossibility of maintaining or even the constitution of attention.

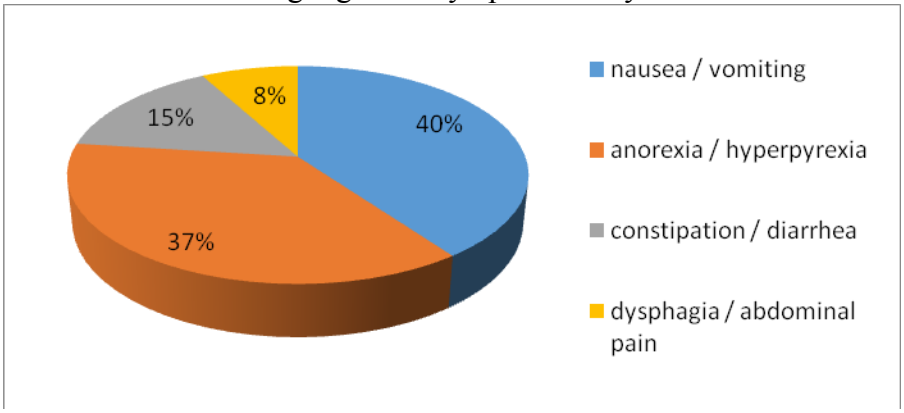
Concentration disorders may be caused by various factors, such as stress, anxiety, certain environmental factors (noise, sudden temperature increase or decrease), changing eating habits (quitting to drink coffee) and lack of sleep or disturbed sleep. [2]

Currently, major depression is the number fourth disease spreaded around the globe, representing one of the serious problems of contemporary man. According to estimates of the World Health Organization (WHO), in 2020, depression will be the second leading

cause of disability, soon after cardiovascular disease, with a prevalence twice as higher on women. [2]

13% of military students had at one time a depressive episode (diminution of interest in daily activities, sleep disturbances, psychomotor slowness, restlessness), 3% have accused the symptoms of a panic attack (palpitations, sweating, tremor, shortness of breath, imbalance, dizziness or fainting) and no recorded case of burnout (represented by physical and mental exhaustion and caused by prolonged exposure to stress, often accompanied by depression).

5. Which of the following digestive symptoms did you have?



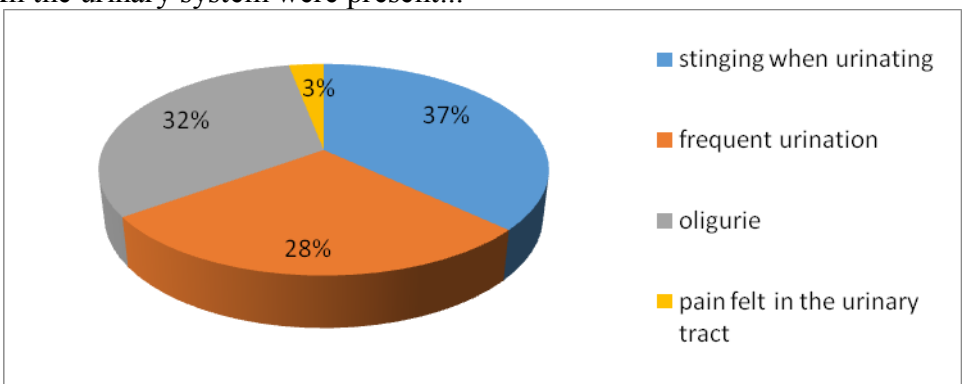
The percentage of 40% was represented by symptoms of "nausea / vomiting", which are, most often of short duration caused by indigestion, the latter being the result of several agents (too fast ingestion of food, smoking, gastritis and carbonated drinks); nausea and vomiting that last for a long period are reserved in cases of migraine, trauma, cancer etc.

Anorexia is an eating disorder with physical and emotional implications, having as main feature lack of appetite, unlike hiperorexie which involves uncontrollable need to ingest food in greater quantity, both with psychological substrate; 37% of students have opted for this answer.[3]

A balanced diet, rich in fiber, adequate fluid intake and maintained physical activity are some of the most important factors which prevent diarrheal syndrome and constipation, soldiers surveyed exhibiting these imbalances at a rate of 15%.

8% have enrolled variant response "dysphagia / abdominal pain", the first representing difficulty in ingesting food, both of which are generally caused by motility disorders, mechanical obstructions and disorders in the digestive tract.

6. In the urinary system were present...



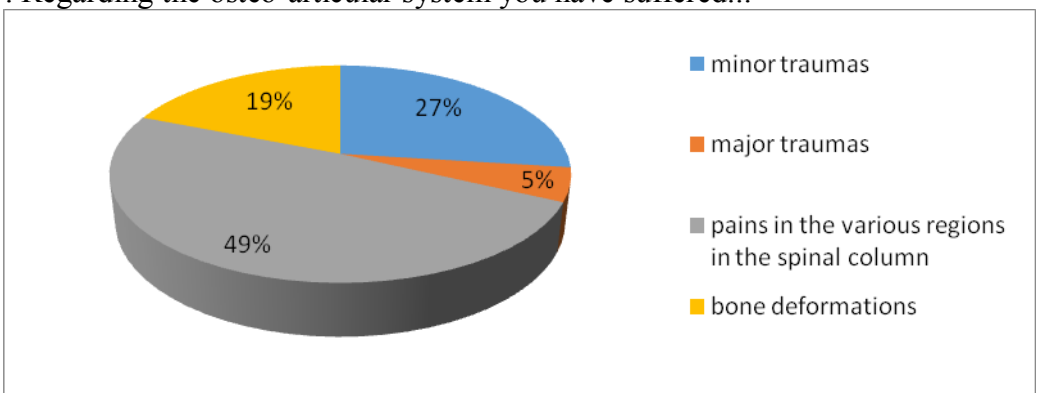
Stinging (37%) and frequent urination (28 %), along with pain felt in the urinary tract all suggest the presence of urinary infections. Statistics show that these are the most common types of infections worldwide, surpassing even those of the respiratory system, with females being more often affected (due mainly to anatomical reasons).

In 80% of common urinary infections are caused by Escherichia coli (E. coli), a bacteria usually found in the colon or anus area. [3]

Oliguria (32%) is the production of abnormally small amounts of urine in a 24 hour period (bellow 500 ml) and is most often due to an extremely low fluid intake, or by expelling liquids through other natural means (dehydration).

Pain felt in the urinary tract is usually experienced as a result of inflammations or from kidney stones . The present study shows the rarity of this type of condition.

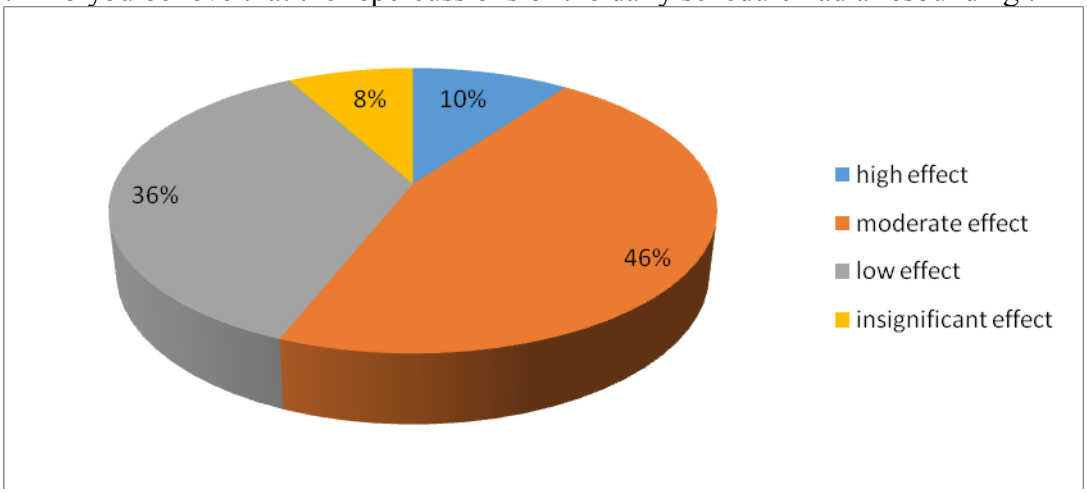
7. Regarding the osteo-articular system you have suffered...



Fortunately major traumas were only noted in 5% of the cases, followed by bone deformations (19%) and minor traumas (27%). Most common were pains in the various regions of the spinal column (cervical, thoracic, lumbar and sacral curve).

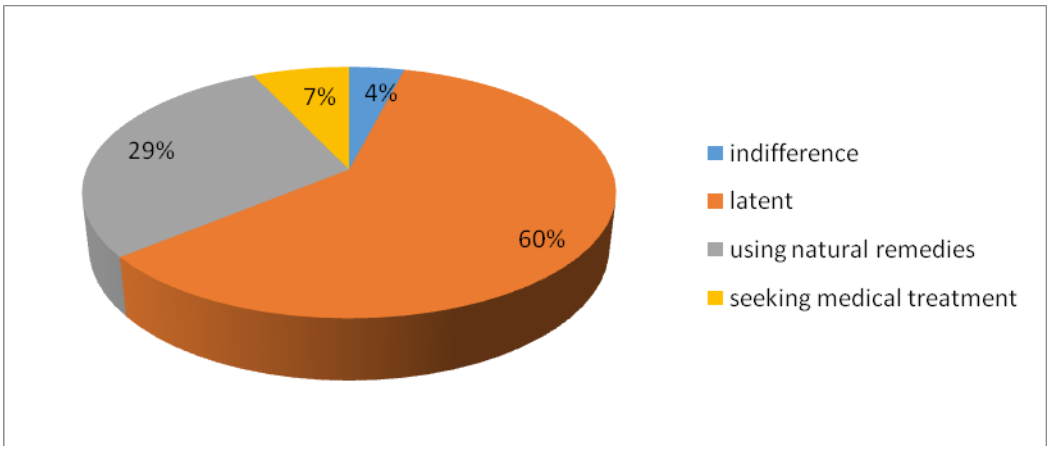
Bone deformations and spinal column pains are usually caused by improper posture and repeated pressure exerted by carrying heavy equipment, followed by unfavorable weather conditions and periods of intense physical activity. [3]

8. Do you believe that the repercussions of the daily schedule had a resounding :



The individuals questioned have stated that repercussions on the schedule have had either a high (10%), moderate (46%), low(36%) or insignificant effect (8%). This shows that they have varying individual capacities to adapt to changes, the gravity of their ailment influencing their choice.

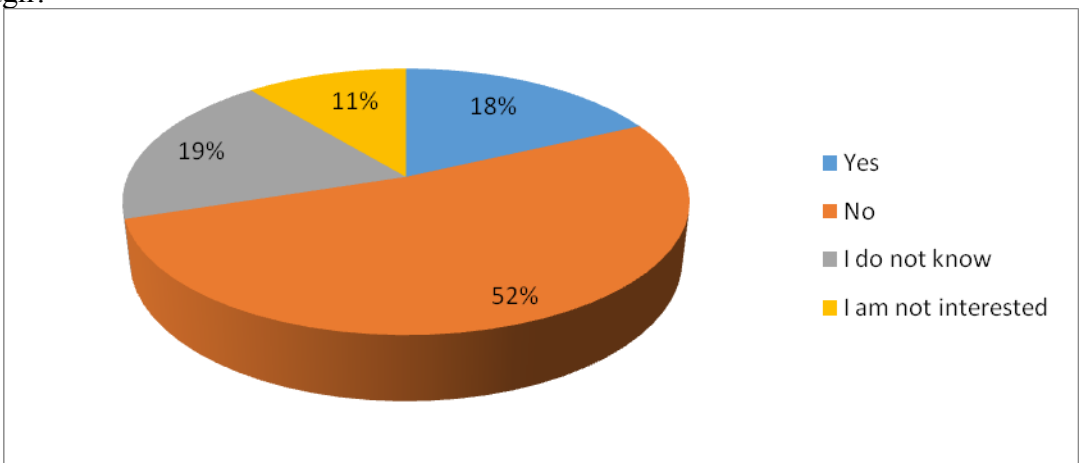
9. Which of the following characterize your attitude on those above?



The attitudes military students manifested as a response to the different afflictions:

- indifference (4%)
- latent (60%) – a state that can be viewed both in a negative, or positive light, as it is recommendable to avoid excessive treatment, but not to ignore the possible aggravation of the current affliction
- using natural remedies (29%) – a subject on the border between reality and myth (ex. products made from cranberries being used to treat symptoms of urinary infections)
- seeking medical treatment (7%) – choosing this answer shows that there were no severe pathologies noted, especially considering the lack of the comorbidities associated with these diseases in this age group. [2]

10. Do you consider that existing prevention methods at the moment are effective enough?



Prophylaxis represents all the measures taken to prevent disease and maintain a health. [2]

From the answers we have obtained, we can observe that prophylactic measures used at the present are not widely known. Only 18% claim to recognize the usefulness of these procedures, while 11% are not interested by them.

5. CONCLUSIONS

After conduction this study we can draw the following conclusions:

- prophylaxis is not a national objective at this moment, in regard to the afflictions and age groups presented previously. This calls for a bilateral implication to improve the situation
- the interdependence of the rick factor and pathology is confirmed, as a causal link was established and observed

- the study showed the variety of afflictions that military students suffer from. No extreme cases in large numbers were noted, however.

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ALGORITHM FOR CALCULATING THE NUMBER OF BOMBERS NEEDED FOR DESTROYING A RUNWAY

Ivan DIMITROV, Ivan STEFANOV

"Vasil Levski" National Military University, Faculty of Avtiation, Dolna Mitropolia, Bulgaria (darksage@abv.bg, isstefanof@abv.bg)

Abstract: *Runways are key point for the defense of any country's airspace. The destruction of a runway with a bomber is a result of long preparation and planning of the taken actions. Senior commanders have the task of calculating and analyzing the necessary resources and probabilities of accomplishing their mission. This paper talks about an algorithm for destroying a runway based on combination of parameters like: size of the runway, type of bomber, type of bombs and height of dropping. The goal is calculating the number of planes needed for destroying the runway without leaving a path, big enough, to be used for takeoff.*

Keywords: *algorithm, bombing, runway*

INTRODUCTION

For designing an algorithm you need both knowledge in the sphere and creativity for making the most efficient path. In our case we use four main components:

- Know your input – the technical caracteristics of the airplane, the parameters of the target and the influence of the weather.
- Understand your tools – our main tool will be Gaussian function ("randn" in Matlab) for setting up the expectation of hitting the target and extracting the coordinates on the runway.
- Understand the environment – we should put ourselves the task of creating the most realistic and fully described environment we can design. We are doing that by taking into account big amount of parameters and variables.
- Reducing the workload – in general, the goal of algorithm design is to complete a job in fewer steps, in the same time the simulation should keep it's correctness and realism.

For the purpose of the presentation we are using Matlab for simulating the project.

CREATING THE IMITATIONAL MODEL

For the needs of national security and the air forces in particular there are prebuilt plans of action. These plans indicate the necessary steps and resources for accomplishing the task. For more complex situations when a single or number of plans are not enough, there are prebuilt algorithms of action, which can adapt to the specific setup and needs. The absence of a method of analysis and simulation can lead to confusion, miscalculation and poor judgment. Making a decision based on a set of statistics and simulations, obtained from the algorithm, can be much quicker and grounded.

Input parameters.

For running the algorithm we need a number of input variables.

First, we need to take in account the type of the bomber used for the mission. That will give use the following information: number of bomb pairs, distance between the bombs on the wings, accuracy of the plane (it's an area in which it's expected the bomb to hit the ground, given by the manufacturer) and type of bombs (the destruction potential it has on the ground).

Second, are the parameters of the target. That will be the length "L" and width "W" of the runway.

Last, we need the weather condition (wind and temperature of the ground). These parameters can affect the deviation of the bomb and the destructive power it has.

Generating the coordinates of the hits.

After importing the input characteristics it's time to apply them in a simulation of the following events.

For simulating the hits on the runway we are using the Gaussian function which is normally distributing of random numbers (FIG.1). This gives us the possibility of changing the characteristics of the bombing and applying the potential variations. The graph represents symmetric "bell curve" shape.

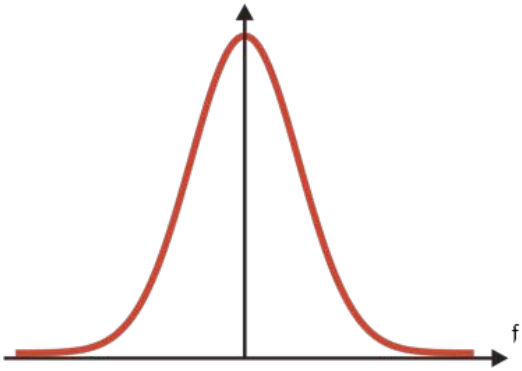

FIG.1

It is a function of the form:

$$f(x) = ae^{-\frac{(x-b)^2}{2c^2}}$$

Where the parameter "a" is the height of the curve's peak, "b" is the position of the center of the peak and "c" (the standard deviation, sometimes called the Gaussian RMS width) controls the width of the "bell".

This function is applied on every single bomb drop and represents the abnormalities and the distribution of the eventual hit. What we are most interested in is the position of the center, which we will be moving with every drop and is estimated by the pilot, and the width of the "bell", which is defined by the accuracy of the plane and the weather conditions. Taking in credit the power, the direction and the variability of the wind we can change the range of the function or directly apply it on the variable "b" and guide the center of the function to the expected point. On other hand with quite unpredictable wind in the area of the target it is safer to increase the value of "c" and getting more unbalanced environment. For the purpose of the presentation we assume that the pilot will calculate where to drop every pair of bombs taking into account only the length of the runway.

ALGORITHM OF TESTING

According to the value of L we calculate the segment P, P = L/ (N+1), which is pointing the aiming coordinates of the first pair of bombs, as well as the distance between every next pair of bombs. This coordinates are used for setting up the center point of Gaussian function.

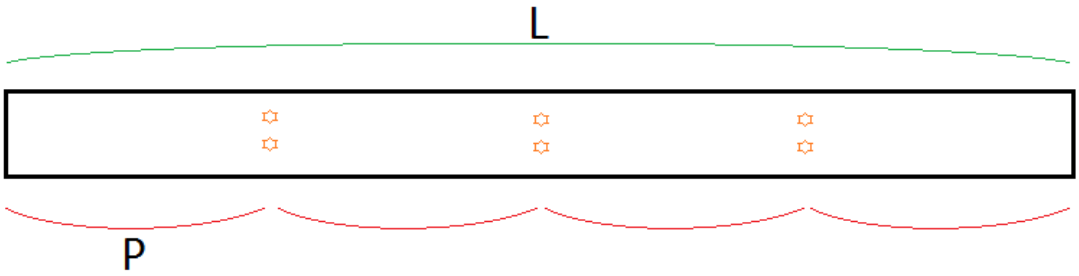

FIG.2

After generating the random numbers we mark a circle of damage around the hit, which represents the unusable part of the runway (FIG.2). These circles depend on the size and the type of the bombs. For example in our simulation we are using FAB-500 M62 which makes a circle with radius from 15 to 20 meters.

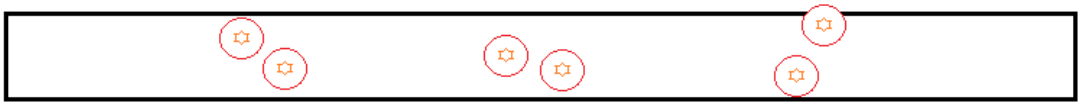

FIG.3

When we have impact on the runway it is time to have some checks of damage and the usability (FIG.3). We separate the dealt damage by latitude and longitude.

- Latitude – The easiest way we found to test the runway on latitude was to indicating 3 different zones.

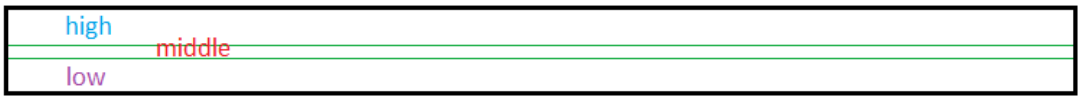

FIG.4

The principle is if there is a hit in "high" or "low" that will guarantee that the runway is unusable only in that zone, which means that there are more than 10m of width left (enough space for a fighter to takeoff, FIG.4). A hit in the middle zone will guarantee that none of the zones are usable (FIG.5).

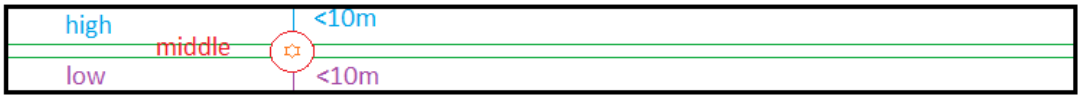

FIG.5

The widths of the zones are changeable, but are recommended “high” and “low” to be around 25 meters. That comes from the fact that the most used runways for fighters are between 60 and 80 meters of width. In our simulation we are using a runway with a width of 60 meters and the zones are accordingly: high – 25m, middle – 10m, low – 25m. That way even a shot near the border of a zone will leave the zone with less than 10m of width (FIG.6).

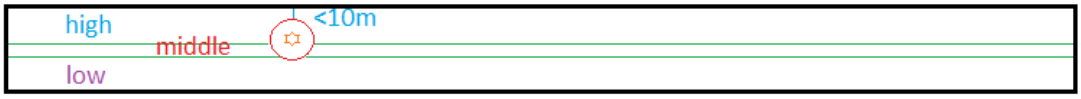

FIG.6

- Longitude – On this test we are checking the “x” coordinates or the longitude coordinates of the strikes to check if the “x” distance between them or them and the start/finish of the runway is less than 500m (FIG.7, needed distance for takeoff, this is changeable according to the type of fighter)

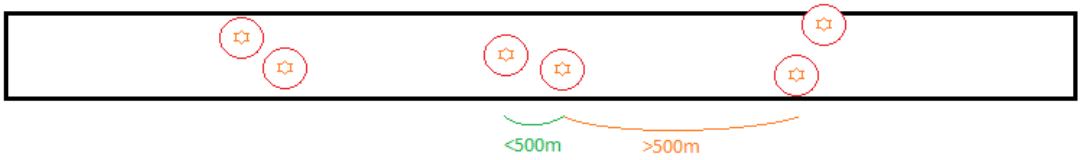

FIG.7

- Mix of both – Separating the hits while doing the tests is critical for not leaving a way for takeoff. For example if there is a strike in “high” zone we check the “x” distance only in the next “high” or “middle” strike, passing the “low” zone ones and if the distance is more than 500m we take that segment for long enough and therefore usable, meanwhile the "low" segment with similar x coordinates, but a distance of less than 500m between the hits is considered not enough for takeoff (FIG.8).

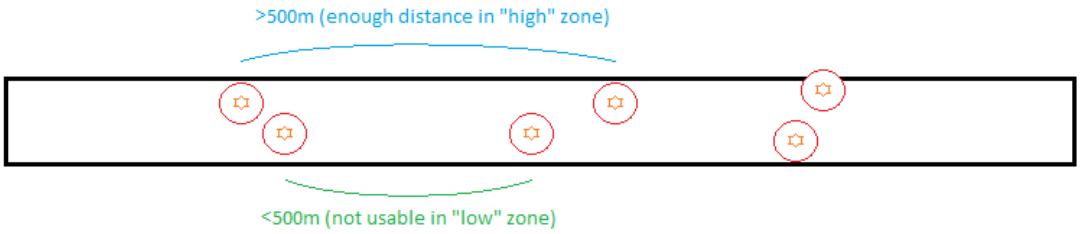

FIG.8

The perfect situation would be all strikes positioned in the "middle" zone, but that would be hard to achieve, because of the normally distribution of the numbers, the wind and even the distance between every pair of bombs (FIG.9).

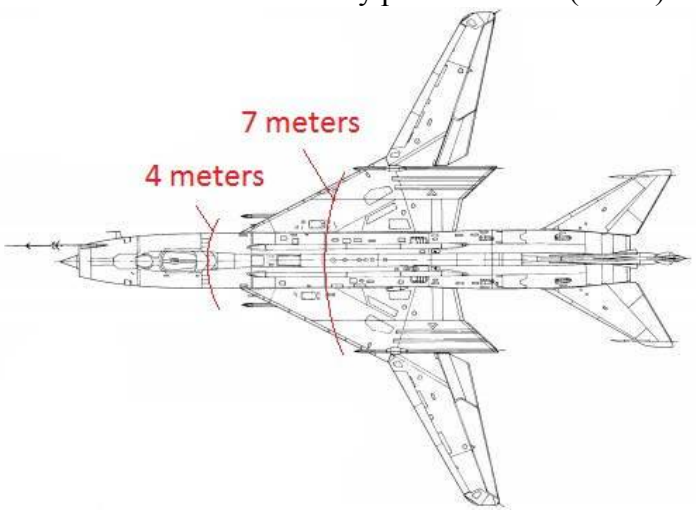

FIG.9

The main goal is filling the opponent`s runway with unusable segments (less than 500 meters, with less than 10 meters on the sides, on width).

After generating the coordinates of the strikes we separate them in 3 arrays by their "y" or latitude coordinates. The number of the strikes on the runway so far forms an array of zeros, which describes all the created segments, having in mind the first and the last one are the beginning of the runway to the first hit and the last number describes the segment between the last hit and the end of the runway (FIG.10). Testing them first is easier, because we know the coordinates of one of the ends. Next step is to test individually every fragment and if they are unusable we change the indicating place with "1". If there is even one zero in the array the testing stops and we simulate a second bomber, having in mind that the array is getting bigger, because there are more segments to test, however there is a higher chance of them getting smaller. This process continues until the indicating array is full with ones.

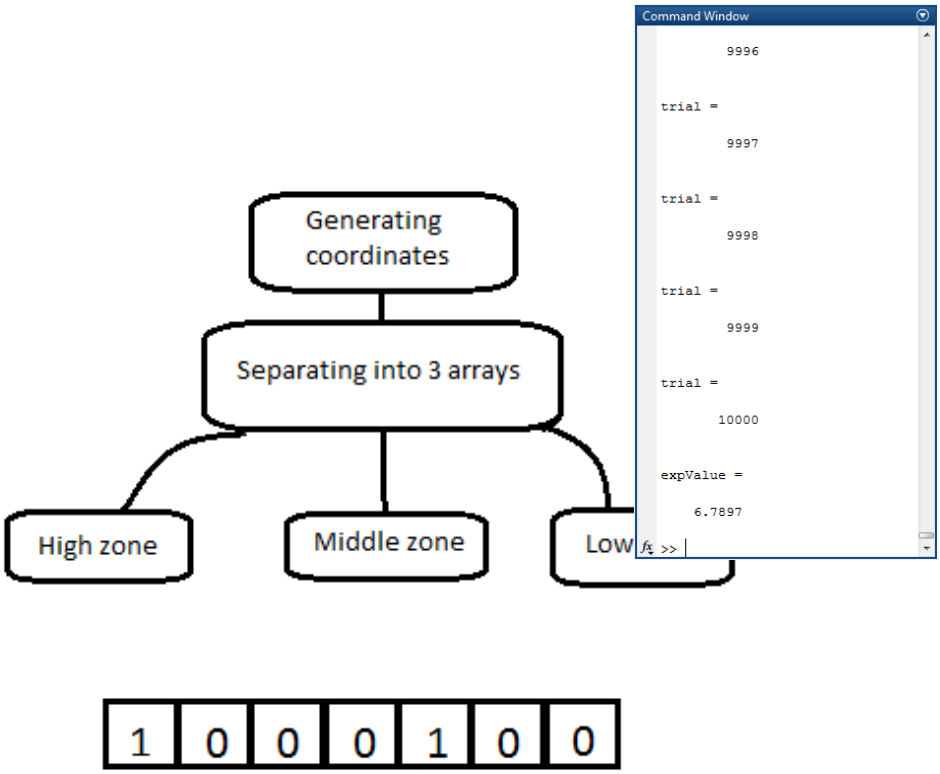

FIG.10

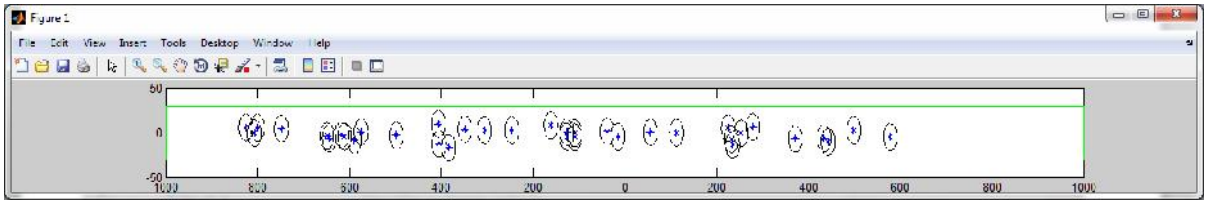

FIG.11

Here we can see a simulation of a full destruction of a runway on Matlab (FIG.11). There is no section long or width enough for takoff. In this case it took us 6 approaches, all the bombs are evenly spread and we can assume the ranway is no longer usable.

STATISTICAL ANALYSIS

Finishing with the creation of imitational model we have an idea of the base we are going to use for extracting the statistical information. Four main points we are going to consider are „expected value“, „number of trials“, „confidence level“ and „confidence interval“.

Expected value

The expected value of a discrete random variable is the probability-weighted average of all possible values. In other words, each possible value the random variable can assume is multiplied by its probability of occurring, and the resulting products are summed to produce the expected value.

Running the model on Matlab multiple times can give us an accurate expected value of needed approaches over the runway intending to destroy it. Doing the test 10 000 times gives us a value of 6.7897, which we are going to use for further calculations (FIG.12).

That can also be taken as the mean of the population of tests made over the imitational model.

Number of trials

The bigger the number of trials is, more accurate the test results will be. The problem we can meet increasing the number is the lack of calculating power in the computer.

For our needs we decide to stop at 10 000 samples.

Confidence level

A confidence level refers to the percentage of all possible samples that can be expected to include the true population parameter. For example, suppose all possible samples were selected from the same population, and a confidence interval were computed for each sample. A 95% confidence level implies that 95% of the confidence intervals would include the true population parameter.

α	0.60	0.70	0.80	0.85	0.90	0.95	0.99	0.997
t_α	0.84	1.04	1.28	1.44	1.65	1.96	2.58	2.97

In our case we choose to use 95% for confidence level and that refers to $t_\alpha = 1{,}96$.

Confidence interval

A confidence interval is a type of interval estimate of a population parameter. It is an observed interval, in principle different from sample to sample, that frequently includes the value of an unobservable parameter of interest if the experiment is repeated.

To calculate the confidence inteval first we need to find the variance of the data.

$$S^2 = \frac{1}{(N-1)} \sum_{k=1}^{N} (X_K - \overline{m}_X)^2$$

Where N is the number of trials, X_K is independent sample and m_x is the mean.

For the need of applying the formula in the program we use:

$$S^2 = \frac{1}{(N-1)} (\sum_{k=1}^{N} {X_K}^2 - \frac{1}{N} (\sum_{k=1}^{N} X_K)^2)$$

For which we will need a lot less computer memory.

As we see earlier „Sigma“ (FIG.13) in the results (which is variable for $S^2 = \sigma^2/$) equals 1,6867. This number we can directly apply in:

$$N = {t_\alpha}^2 \sigma^2 / \varepsilon^2$$

Where ε is the confidence level or in our case equal to 0,00331.

As we see the algorithm gives us very small confidence interval on confidence level, this

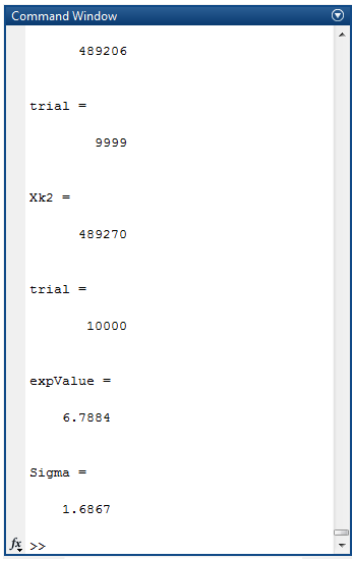

FIG.13

show amasing accuracy and it makes it trustworthy

CONCLUSIONS

In times of modern warfare military airports are key points in reaching air superiority. Having a statistical background before making a crucial decision of this scale is really important. This algorithm can be used for improvement of the combat abilities and reducing the costs of technical usage.

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COANDA EFECT OPTIMISATION OF A (UAV) FLYING SAUCER

Nicolae IACOB

Engineering and Agronomy Faculty of Brăila, „Dunărea de Jos" University of Galați, România

Abstract: *P This articleexemplifiesastudyof a CFD(Computational FluidDynamics) analysisofthe fluidflowover the hull of aflying saucer shapedrone. Authors designed 10three-dimensionalmodelswith the help of NX 7.5 Siemens software and then analysed them inANSYS CFX, in order to obtain an optimumCoandă effect.From the CFD simulation were obtained representations for velocity, pressure andturbulence distributions as also the fluid pathlines. To obtain more realistic results from the CFD analysis, we simulatedalso the flight of this unmanned vehicle. The study of the fluid flow over the upper hull of the vehicle is very important to us because, if we control theCoandă effect over the hull, we may increase the sustentation forces and efficiency of the flight.*

Keywords: *UAV, Coandă effect, CFD,twin propellers, pathlines*

1. INTRODUCTION

A drone is an unmanned aircraft (Unmanned Aerial Vehicle - UAV), which can be seen as a flying robot able to move without being necessarily controlled from outside - what in terms of speciality is called steered by an autopilot or being guided by RC or by other control device.

The characteristics which differentiatefirst and foremost drones of other flying vehicles, even unmanned, are theirreduced size and thevery low weight. The power supply is usually an on-boardaccumulatoror a thermal engine. Alternatively, the power may beproduced on-board, e.g. using photovoltaic cellsand rarely by methods that include fuel cells.

Leaving aside military drones, which are more efficient and have a much larger autonomy than those for civil applications, we may underlinethe following characteristics:

- Drones are equipped with an on-board computer efficient enough to control the simultaneously use of sensors and other devices such as cameras or high-resolution video or infrared rangefinders,radar,etc.

- Finding and keeping its positionor moving along a path isa process usually based on an inertial system, or on a GPS system (Global Positioning System), which enables accurate navigation anywhere.

- Data transmission or communication with the Ground Control Centre is done either by radio or via the internet and can be used fromcontrolling devices including PCs, tablets and smartphones.

- They are capable of independent return-to-home, a necessary function since power is supplied from accumulatorsand they have a reduced period of operation (tens of minutes up to one or more hours).

- They are able to hover and remain stable or loitering at a fix altitude or above a certain location;

The main users of civilian drones are public administration, public security forces such as police, fire, civil protection, etc., research institutions, civil construction, agriculture, journalism, real estate agencies and, of course, individuals - at least so far.

Usual examples of civil applications of drones are:

- Collecting meteorological data; inspecting infrastructure lines (power lines, gas, aqueducts, roads, channels),monitoring national parks and wildlife;
- Delivering small important items (as water, food, a first-aid kit) in critical areas hit by natural disasters (earthquakes, floods, etc).
- Prevention and detection of unauthorized constructions, wildfires or criminal activities.

In the EEA Grants project no. 3462/2015 we use drones to obtain an aerial footage of the Small Wetland of Braila, at very high resolutions, and also geotagged, in order to create 3D maps of the ground level and evaluate the evolution of semi-aquatic habitat during yearly cycles. We now use aircraft type drones, as flying-wings, airplanes and multirotor,but in the future we will introduce aerodyne type ones.

2.1. OPTIMIZING THE AERODYNESUSTENTATION THROUGH AN IMPROVED COANDĂ EFFECT

In this paper we are presenting how we optimized through CFD analysis the shape of a aerodyne, in order to maximize the Coandă effect, which improved the sustentation. We realized more than ten 3D models, and the results of their comparative analysis helped us to choosethe idealprofile.Picture 2.1 presents the main dimension of the hull of aerodyne.

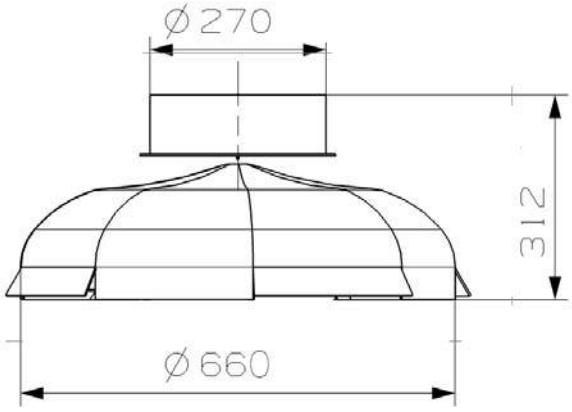

Fig. 2.1 The main dimension of the hull of the aerodyne

The variables of Coandă effect are velocity, static pressure and dynamic pressure. From these variables we determined the sustentation forces along the x, y and z axis.

The propulsion of the aerodyne is obtaine dusing two counter rotating propellers. The optimum distance between propellers was calculated with CFD analysis and it is in the range of 62-80 mm, but this analysis will be presented in a further study. The scheme of the CFD analysis may be seen in the Fig. 2.2.

We analysed the fluid flow over the hull. Therefore we created a 3D model which simulates the air flow through the propeller and around hull, which is equivalent with a virtual aerodynamic tunnel test (see Fig. 2.3.)

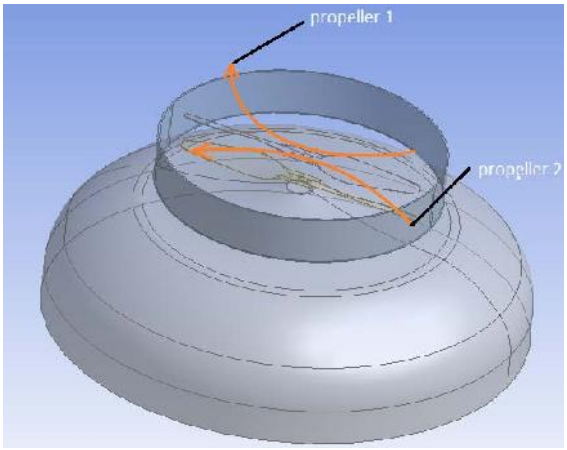

FIG. 2.2 The 3D modeland scheme of propeller propulsion

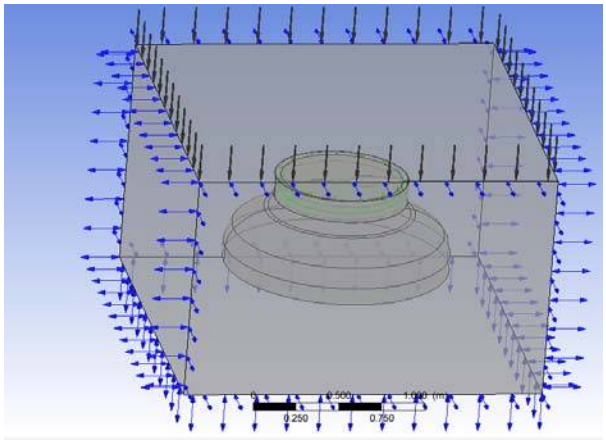

FIG. 2.3. The 3D simulation model

The 3D model which simulates the air had a mesh with 163913 nodes and 866423 finite elements. This simulation was made in atmospheric condition pressure. It is a transient analysis with 50 seconds and 5 steps.

The first propeller is rotating clockwise, with a rotational speed of 6000 rot/min, while the second (according our studies) must be rotating counter-clock wise, with 5800 rot/min., i.e. the second (lower) propeller must have a 4% smaller rotational speed than that of the first (upper) propeller. The air from the first propeller must also have a certain delay before in going into the second propeller.

Because in this analysis are more rotating elements we had to establish a link between elements. There fore, we consider the propeller 1 interfaced with a certain mass of air and propeller 2 interfaced with the same mass of air, i.e. the mass of air is the link between both propellers(1 and 2).

2.2. THE RESULTS OF ANALYSIS

In the postprocessor of analysis we have the results of velocity, static pressure and total pressure.

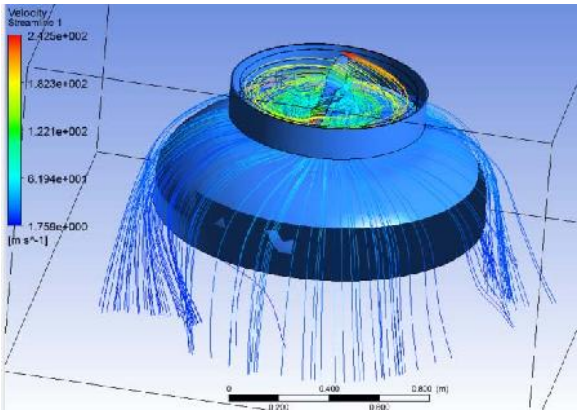

FIG. 2.4 The path lines of the optimized hull

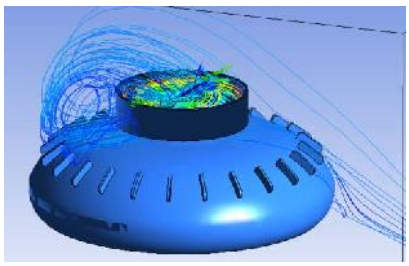

FIG. 2.5 Shape 1

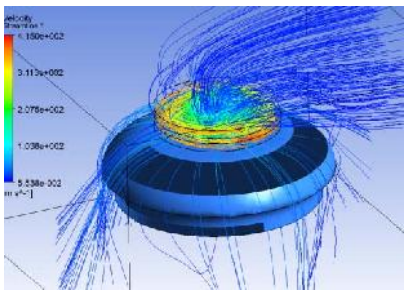

FIG. 2.6 Shape 2

Fig. 2.4 shows the path lines of the flow. As can see, the path lines are straight and follow the form of the hull, an optimum for a better flight, with less energy consumption.

In the Fig. 2.5 and 2.6 we can see two different shapes which were analysed in the same condition like the presented case, but the results obtained were different.

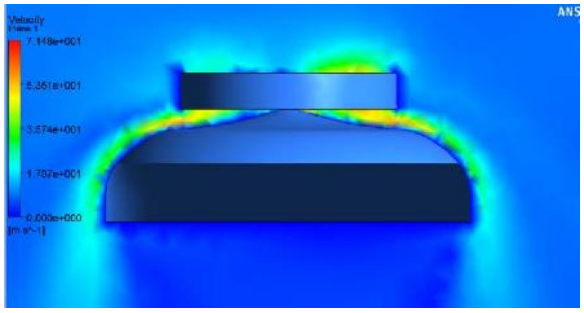

Fig.2.7 Velocity of fluid flow (Coandă effect)

In the Fig. 2.7 we can see the velocity of fluid flow. As you can see the maximum velocity has a red colour for the speed of 7.14 m/s. The velocity distribution follows the shape of the hull. The minimum velocity is 1.78 m/s. The Coandă effect may be proved from the shape of the flow velocity. We obtained in this case a better Coandă effect.

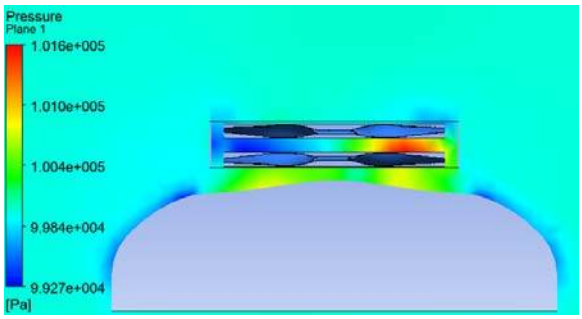

FIG.2.8 Static pressure and Coandă effect

In figure 2.8it can be seen the static pressure. As one can see, on the hull is created a vacuum equivalent with (1-0.99270)bar. This vacuum it created by the Coandă effect and increases the payload of the UAV and the efficiency of flight along the Z axis.

In the Fig. 2.9 it can be seen the total pressure of the fluid flow. The maximum value is 1.036 bar and is marked red in the propeller area. As one can see the pressure distribution follows the boundary layer of the hull, as well.

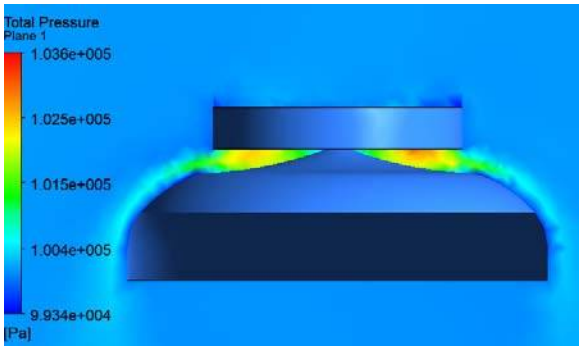

FIG.2.9 Total pressure

In the Fig. 2.10 and 2.11 we can see the sustentation Z forces calculation of the propellers. In the first case, the value is 228.96N=22.9 daN.

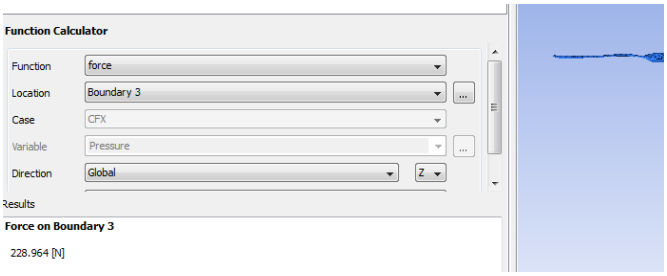

FIG.2.10 SustentationZ forceof propeller 1

The second propeller have a smaller sustentation force because is reduced by mass flow of the first propeller and have a value of only 65N=6.5 daN.

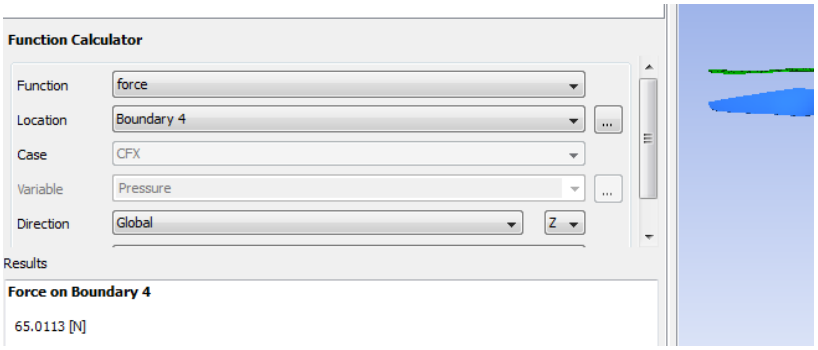

FIG.2.11 SustentationZ forceof propeller 2

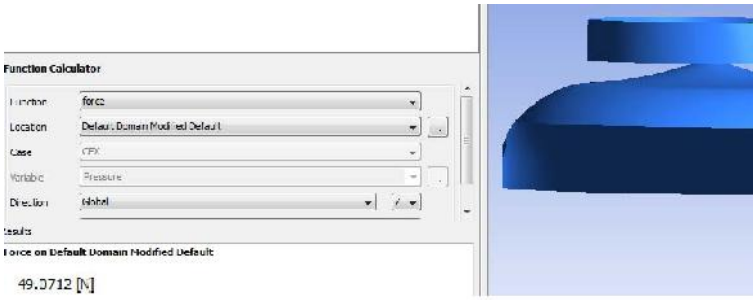

FIG.2.12 SustentationZ force of the hull

Fig. 2.12 depictssustentation calculation on Z axis of hull.The value is 49N=4.9 daN. Theresultant of sustentation force on Z axis is the sum:
$F_{tz}=F_{pz1}+F_{pz2}+F_{hz}=22,9+6,5+4,9=34,3$ daN.

3. CONCLUSION

1. From this CFDanalysiswe optimized the shape of the hull and wemaximizedthe Coandă effect.Wedesigned also the 3D prototype of the aerodyne based on the result of this analysis (**Fig. 2.13)**

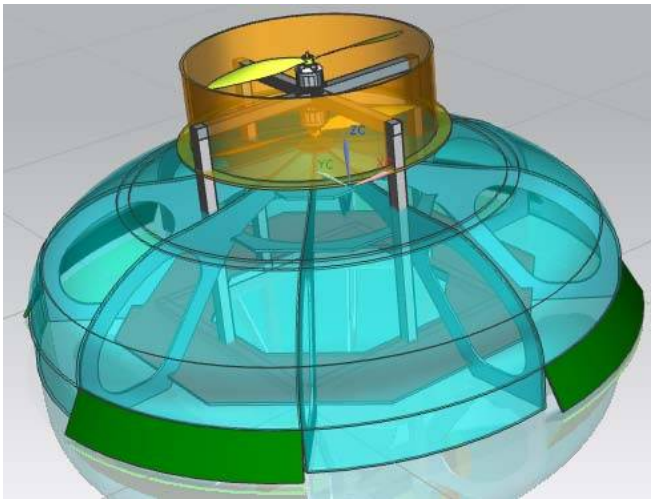

FIG.2.13 The 3D prototype model

2. We increased the sustentation force on Z axiswith 16%,with the help of the Coandă effect applied on the optimized hull.
3. We obtained also straight pathlines without turbulence.
4. Using CFD methods for fluid flow simulation and analysis makes it a fast and highly efficient procedure, thus producing significant reductions of effort in design, material and energy consumption.

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OBTAINING THE EQUATION OF THE POSITION FUNCTION OF A DOUBLE-CONTOUR PLANE RETRACTION MECHANISM OF THE LANDING GEAR USING THE ANALYTICAL METHOD

Ionuț MOROIU, Doru LUCULESCU

Abstract:*With the continuous development in aviation, the role of the landing gear has become increasingly complex.Therefore, the kinematic elements of the retraction mechanism of the landing gearmust be designed carefully in order to fulfill the standards. The current paper aims to presentthe kinematical elements of the landing gear and an analytical method to obtain the position function of the retractable mechanism of the landing gear.*

Keywords:*kinematic elements, analytical method, position function, retraction mechanism, landing gear*

1. INTRODUCTION

The landing gear is one of the aircraft's major component (such as wing, tail, fuselage and propulsion system). The landing gear is the last major component which is being designed because its design mainly depends on the type, the weight and the geometry of the aircraft. Furthermore, the aircraft most aft cg and most forward cg must be known and, in some instances, the landing gear design may drive the aircraft designers to change the aircraft parameters in order to satisfy the landing gear requirements.

With the continuous development in aviation, the role of the landing gear has become increasingly complex. The increase of the landing speed and the aircraft weight drove to an increase of the inertial force; therefore the landing shocks and the landing distance are much higher than before.

Currently the primary functions of the landing gear are:

1. to keep the aircraft stable on the ground and during loading, unloading and taxi;
2. to allow the aircraft to maneuver during taxi, through the steering of the nose/tail-gear or the differential breaking of the wheels of the main gear;
3. to absorb the landing shocks;
4. to safely stop the aircraft after the touchdown by braking the wheels of the main gear;
5. to provide a safe distance between the ground and other aircraft components such as wings and fuselage in order to prevent any damage caused by ground contact.

The stress to which the landing gear is subjected,together with the requirements enforced by the aviation developmenthave as a result a great variety of land gear configurations. Although the landing gearis a crucial component during landing and take-off operations, during airborne flight operations, it is a dead weight. For this reason, it is advisable to retract the landing gear during flight, in order to reduce the aircraft drag and to increase its performance. [3]

For the study of the retraction mechanisms, in most general cases, the system is made of three subassemblies:

1. driving mechanism, made up of an oscillatory cylinder mechanism;
2. main mechanism, made up of a linkage;
3. wheel-turning mechanism.

Considering the kinematic chain of the landing gear and its complexity, there are three main categories such as:

1. simple-contour plane retraction mechanism (simple)
2. double-contour plane retraction mechanism (compound) , made up with second aspect dyad (RRR/RRT)
3. triple-contour plane retraction mechanism (complex) [1]

The retractable mechanism of the landing gear that will be analyzed is a double-contour plane retraction mechanism, made up with a second aspect dyad (RRR), and it is presented in Fig. 1. The whole mechanism is retracting in the fuselage or the wings, along the Y axis.

This paper, starting from the geometrical analysis of the retraction mechanism, deals with the kinematical elements (driving mechanism, main mechanism) of the landing gear and with the obtaining of the position function of the retractable mechanism of the landing gear.

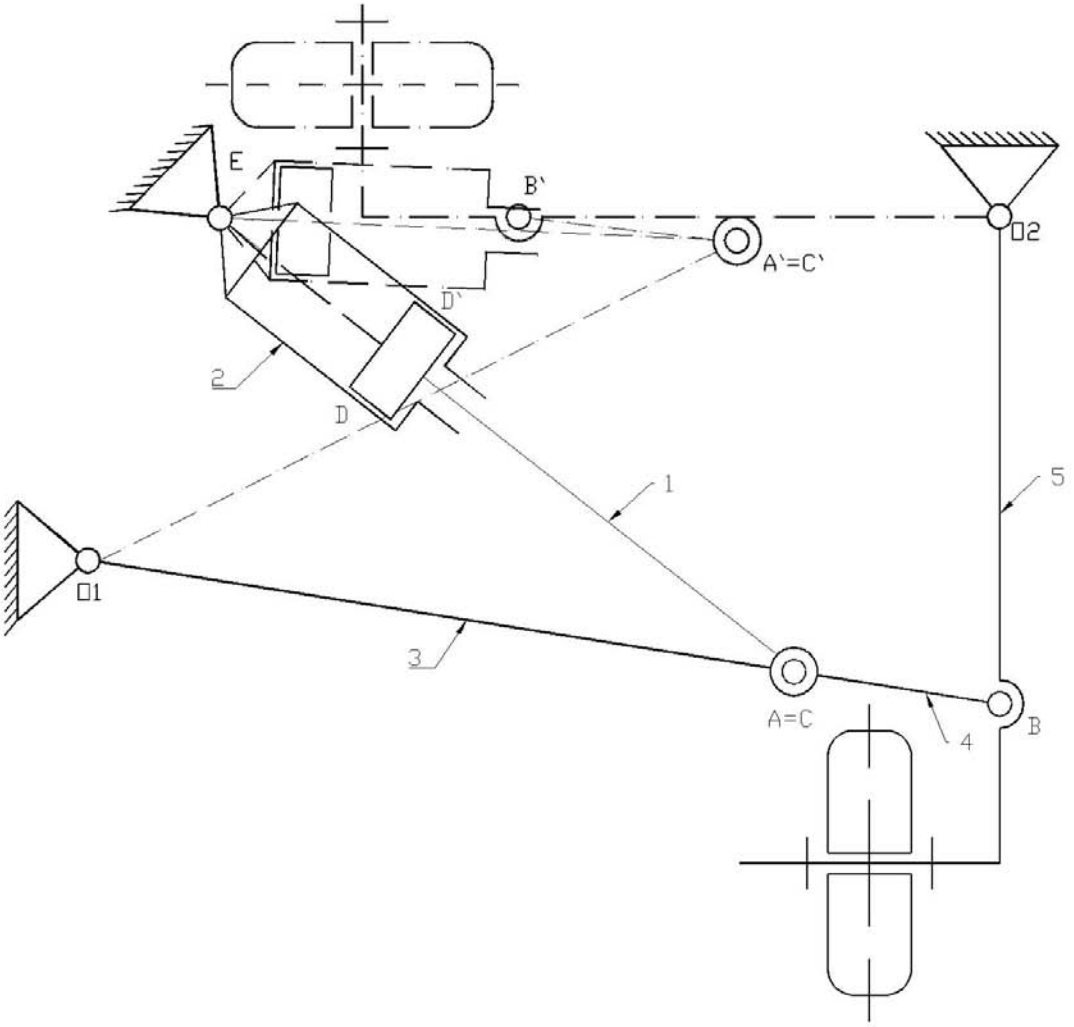

FIG. 1. Kinematic scheme of a double-contour plane retraction mechanism, made up with a second aspect dyad (RRR)

2. OBTAINING THE MOBILITY OF THE RETRACTION MECHANISM

In order to obtain the equation of the position function, we must identify the number of individual parameters which are defining the position of the mechanism, so we must calculate the mobility of the mechanism.

The mobility is obtained with the relation: [1]

$$M = \sum_{i=1}^{n} f_i - \sum_{k=1}^{m} s_k \quad (1)$$

where:

- $\sum_{i=1}^{n} f_i$ is the sum of the joint mobilities;
- $\sum_{k=1}^{m} s_k$ is the sum of the contour spatialities.

The kinematic jointsof the mechanism have the following mobilities:

A : f= 1(θ_z); B : f= 1(θ_z);
C : f= 1(θ_z); D : f= 1(S_x); (2)
E : f= 1(θ_z); O_1 : f= 1(θ_z);
O_2 : f= 1(θ_z).

The landing gear retraction mechanism is constituted of 2 contours:

– 1st contour: O_1, A, D, E
– 2nd contour: E. C, B, O_2

The grade of the kinematic space of the mechanism for both contours is: [4]

$$S=\sum_{k=1}^{m} S_k = S(\theta_x, \theta_y, \theta_z, S_x, S_y, S_z) = 6 \quad (3)$$

The mobility of the mechanism becomes:

$$M = \sum_{i=1}^{n} f_i - \sum_{k=1}^{m} s_k = 7 - 6 = 1 \quad (4)$$

Because M = 1, there results that only one parameter is needed in order to obtain the equation of the position function.

3. OBTAINING THE EQUATION OF THE POSITION FUNCTION OF THE RETRACTION MECHANISM

For the considered mechanism is needed to find an analytical relation between the cylinder strut "l_1" and the "φ_5" angle which determines the position of the gear from the horizontal axle $l_1 = l_1(\varphi_5)$.

In order to analytically determine the position function, the vectorial methodis used. This method consists of the vectors of the contour sides, keeping in mind their respective positioning angles (Fig.2). Because it is an enclosed contour, the vectorial sum is null and because the mechanism mobility is one (M=1), there results a system of two equations with two unknownφ_5 andl_1. [2][4]

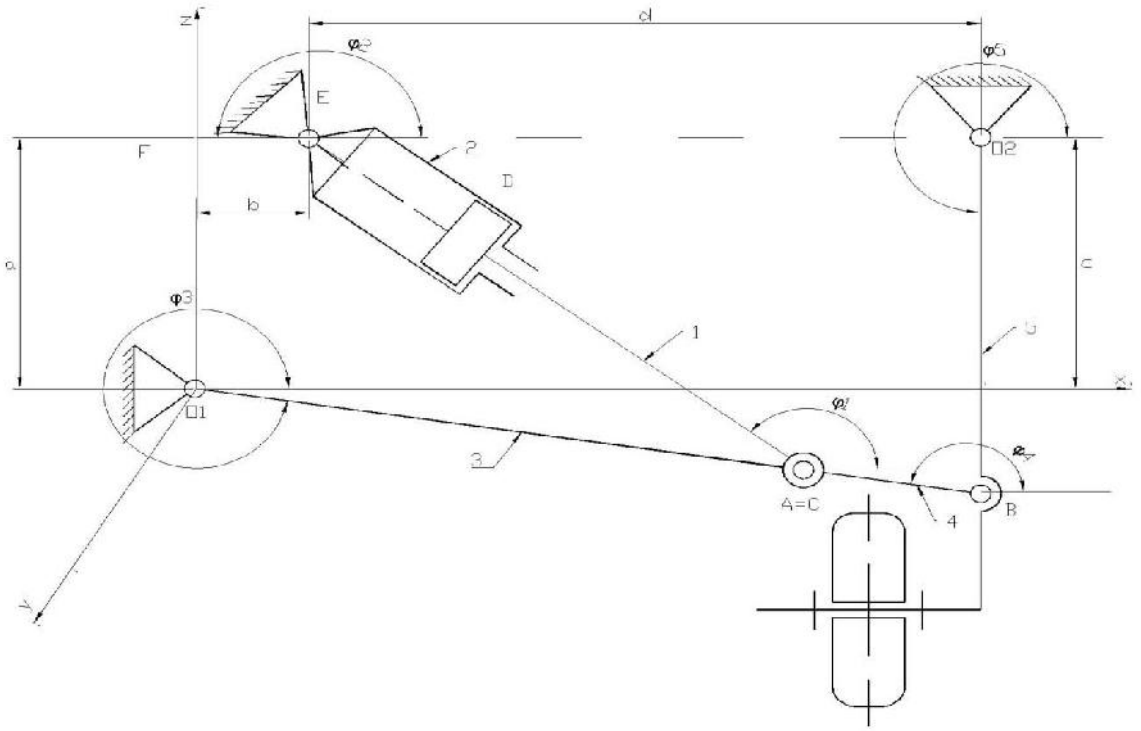

FIG. 2. Setting the positioning angles of the kinematic elements for the retraction mechanism

In addition, it must be specified that in the "out" position $l_1 = l_{1_{max}}$ and in the "retracted" position $l_1 = l_{1_{min}} = 0$.

For the vectorial sum of the 1st contour, the vectors that are going to be taken in to account are:

$$\overrightarrow{O_1A} = l_3cos\varphi_3\vec{i} + l_3sin\varphi_3\vec{j}$$
$$\overrightarrow{AE} = l_1cos\varphi_1\vec{i} + l_1sin\varphi_1\vec{j} \quad (5)$$
$$\overrightarrow{EF} = -b\vec{i}$$
$$\overrightarrow{FO_1} = -a\vec{j}$$

Because the vectorial sum of the contour is null, the equation becomes:

$$\overrightarrow{O_1A} + \overrightarrow{AE} + \overrightarrow{EF} + \overrightarrow{FO_1} = 0; \quad (6)$$
$$(l_3cos\varphi_3 + l_1cos\varphi_1 - b)\vec{i} + (l_3sin\varphi_3 + l_1sin\varphi_1 - a)\vec{j} = 0 \quad (7)$$

The system of equations for the 1st contour is:

$$l_3cos\varphi_3 + l_1cos\varphi_1 - b = 0 \quad (8)$$
$$l_3sin\varphi_3 + l_1sin\varphi_1 - a = 0$$

For the vectorial sum of the 2nd contour, the vectors that are going to be taken in to account are:

$$\overrightarrow{EO_2} = d\vec{i}$$
$$\overrightarrow{O_2B} = -l_5cos\varphi_5\vec{i} - l_5sin\varphi_5\vec{j} \quad (9)$$
$$\overrightarrow{BC} = -l_4cos\varphi_4\vec{i} + l_4sin\varphi_4\vec{j}$$
$$\overrightarrow{CE} = l_1cos\varphi_1\vec{i} + l_1sin\varphi_1\vec{j}$$

Because the vectorial sum of the contour is null, the equation becomes:

$$\overrightarrow{EO_2} + \overrightarrow{O_2B} + \overrightarrow{BC} + \overrightarrow{CE_1} = 0; \quad (10)$$

$(d - l_5 cos\varphi_5 - l_4 cos\varphi_4 + l_1 cos\varphi_1)\vec{i} + (-l_5 sin\varphi_5 + l_4 sin\varphi_4 + l_1 sin\varphi_1)\vec{j} = 0$(11)

The system of equations for the 2nd contour is:

$$\begin{aligned} d - l_5 cos\varphi_5 - l_4 cos\varphi_4 + l_1 cos\varphi_1 &= 0 \\ -l_5 sin\varphi_5 + l_4 sin\varphi_4 + l_1 sin\varphi_1 &= 0 \end{aligned} \quad (12)$$

From (8) and (12) relations the following system is built:

$$\begin{aligned} l_3 cos\varphi_3 + l_1 cos\varphi_1 - b &= 0 \\ l_3 sin\varphi_3 + l_1 sin\varphi_1 - a &= 0 \\ d - l_5 cos\varphi_5 - l_4 cos\varphi_4 + l_1 cos\varphi_1 &= 0 \\ -l_5 sin\varphi_5 + l_4 sin\varphi_4 + l_1 sin\varphi_1 &= 0 \end{aligned} \quad (13)$$

It can be seen that in the "out" position the angle φ_5 between the horizontal axis and O_2B has the value of 270° and when the landing gear is in the "retracted" position the angle has the value of 180° . From these values and after the dimensioning of the landing gear the position function of the retraction mechanism is solved.

4. CONCLUSION

From the results presented above, this paper shows that the position function of a double-contour plane retraction mechanism of the landing gear can be determined using the analytical method.

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GENERAL NOTIONS RELATED TO PHENOMENA OCCURRING IN ROCKET NOZZLES

Marian POTOLINCA

"Henri Coandă" Air Force Academy, Brașov, Romania
(cosmin_marian_potolinca@yahoo.com)

Abstract: *The work discusses some aspects of rocket engines, types of propulsion systems and the flow of fluid through the rear part of the rocket body. It is necessary to concentrate on the flow of a compressible fluid as it goes through a rocket nozzle, in order to analyze the variation of pressure, temperature and Mach number. This can be done by using a real life conditions simulator. The simulation results will be compared to theoretical calculations to highlight the discrepancy between these two sides.*

Keywords: *converging-diverging nozzle, propulsion systems, compressible flow, ANSYS.*

1. INTRODUCTION

To flow, rockets are thrust by the ejection of a gaseous continuum material from a nozzle at a constant rate.This affirmation is based on Newtoon's third law of motion, which states that for every action, there is an equal and opposite reaction.

The function of the propulsion system is to combine energy with matter to produce a directed stream of high-speed particles. That portion of the propulsion system that performs this function may be called accelerator or nozzle.

The ideal rocket thrust is defined as the force required to held a rocket at rest as the rocket expels a propellant rearward under the following assumed conditions:

a. Atmospheric pressure acts everywhere on the rocket's external surface.There is no interaction between the gas issuing from the rocket nozzle and the air in contact with the external surface of the rocket.

b. The propellant flows from the rocket at a constant rate in uniform one-dimensionalflow at the nozzle exit section.

c. The rate of change of the momentum within the rocket is negligibly smalland may be neglected.

The ideal rocket thrust (F_i) is

$$F_i = \frac{\dot{m} V_e}{g_c} + (P_e - P_a) A_e \tag{1}$$

The equation gives the thrust in terms ofthe propellant flow properties, the exit area and the ambient pressure.

There are thermal propulsion systems and electric propulsion systems for the necessity to convert the energy stored onboard the vehicle into a form that is compatible with the particular mechanisms used to accelerate the exhaust particles. In other words, this classification is based on the mechanism used by the accelerator to impart kinetic energy to the exhaust stream.

The thermal propulsion system relies on the energy from a chemical reaction or from a nuclear reactor, or even from an electric arc discharge to elevate the temperature of the propellant.The individual particles of the propellant thereby obtain considerable kinetic energy in the form of random thermal motion. The propellant is then expanded through a convergent-divergent nozzle whose purpose is to convert the random thermal energy of the propellant into a more or less unidirectional stream of high-speed particles. In this context, a thermal system is a hot gas generator with a nozzle trying to make an ordered state of affairs out of the chaos of random thermal motion. A key parameter in the analysis of propulsion systems in general is specific impulse. The specific impulse of a thermal system is proportional to the quantity $\frac{T_c}{M}$, where T_c is the propellant combustion chamber temperature and M is its molecular weight. To produce a high specific impulse in a thermal system, it is then desirable to have a high operating temperature in connection with a low molecular weight of exhaust products.

Electric propulsion systems are characterized by an accelerator that depends on the interaction of electromagnetic fields and charged particles. The electric charge on a particle provides a way for an electromagnetic field to regulate and direct the motion of the particle. In particular, it is possible to accelerate the particle to a high speed and eject it from a rocket vehicle.

Ionized particles are provided at the entrance of the accelerator. We know that electromagnetic fields are capable of accelerating charged particles to a very high specific impulse. However, it is necessary to supply the energy to the accelerator in electric form and hence it is necessary to carry an electric power plant onboard, which is the key to the problem.

According to the propellant used, there are liquid-propellant rockets and solid propellant rockets.

Liquid propellant rockets can be classified into two general propellant categories: bipropellant (fuel and oxidizer) and monopropellant. Ordinarily, bipropellants are used for applications requiring high thrust, such as launch vehicles, and monopropellants are used for small control rockets.

In accordance with bipropellant category, fuel and oxidizer are burned and produce high temperature and pressure gas that it is expanded through the rear part of the rocket body.

Solid propellant rockets contain the propellant to be burned within the combustion chamber or case. The propellant charge contains all of the chemical elements required for complete burning and it is formed into a solid mass called the grain. Once the propellant is ignited, it burns on the surfaces of the propellant that are not inhibited by the case. The rate of burning is proportional to the exposed surface area.

2. COMPRESSIBLE FLOW IN A CONVERGING-DIVERGING NOZZLE

The purpose of a nozzle is to increase the velocity of a fluid as its pressure is simultaneously reduced and convertedinto high kineticenergy. Very high velocities can be achieved in a properly designed nozzle.A nozzle must have a converging-diverging geometry in order to achieve supersonic velocities. So, the fluid flow parameters are assumed to change significantly along only one spatial dimension, namely the nozzle length.

The converging-diverging nozzle is called a de Laval nozzle after Gustaf de Laval, who invented it. As subsonic flow enters the converging duct and the area decreases, the flow accelerates. Upon reaching the minimum area of the duct, also known as the throat

of the nozzle, the flow can reach Mach 1. If the speed of the flow continues to increase, fluid density must decrease in order to obey conservation of mass. To achieve this decrease in density, the flow must expand, and to do so, the flow must pass through a diverging duct.

The maximum achievable velocity of a gas($V_m = \sqrt{2c_pT_t}$, where c_p is the specific heat of the gas and T_t is the stagnation temperature of the flow) depends on its energy content, hence it is limited to a certain maximum velocity due to energy conservation low.

For isentropic flow, the mass flow rate is:

$$\dot{m} = \frac{P_t}{\sqrt{RT_t}} A\sqrt{\gamma} M \left(1+\frac{\gamma-1}{2}M^2\right)^{\frac{\gamma+1}{2-2\gamma}} \quad (2)$$

where M is the Mach number, γ is the ratio of specific heats (1.4 for air), A is the area of the duct and P_t is the stagnation temperature.

In ideal gas cases, the mass flow rate, stagnation specific enthalpy, and specific entropy of the fluid flowing through an isentropic nozzle are constant. The equation of state for an ideal gas is

$$p = \rho RT \quad (3)$$

where R is the gas constant.

For some back pressure (the pressure applied at the nozzle discharge region) values, abrupt changes in fluid properties occur in a very thin section of a converging-diverging nozzle under supersonic flow conditions, creating a shock wave.When the back pressure is reduced to critical pressure (which is the pressure at the nozzle throat, where the Mach number is unity, in other words, it is a condition for the back pressure in order to increase the fluid velocity to the speed of sound at the throat), the mass flow reaches a maximum value and the flow is said to be chocked. Further reduction of back pressure does not result in additional changes in the pressure distribution.

There are normal shock waves (waves that take place in a plane normal to the direction of flow) and oblique shock waves (for example when a space shuttle travels at supersonic speed through the atmosphere, it produces a complicated shock pattern consisting of inclined shock waves). For normal shock waves, the larger the Mach number before the shock, the stronger the shock will be. In the case M=1, the shock wave simply becomes a sound wave.

3. COMPUTATIONAL FLUID DYNAMICS MODELING

We can simulate the flowing of high speed air through a convergent-divergent nozzle using ANSYS Fluent fluid flow analysis system. This softwareapplication helps as simulate countless real life condition processes in a considerably short amount of time and at almost no costs. The simulator provides, based on the entry elements, the results corresponding to our problem specifications, which will conclude the type of rocket engine along with the internal and external data that meets our necessity.

Our 2D model includes the following edges of the surface: inlet, outlet, wall and axis. The inlet is the region where enters the high speed air and the outlet is the area where the fluid leaves the rocket nozzle. Related to the wall, this part of our rocket engine undergoes the action of the internal and external pressure and conditions. The axis is the median line of the designed model that indicates symmetrical data on the other side.

The chosen fluid that goes all through the designed model is air with the density of that specific to ideal-gas. It is pressure is that of atmospheric pressure. The high speed

flow is highly compressible allowing it to experience significant variation in pressure across the domain.

Taking into account that the stagnation pressure at the inlet is 101,325 Pa, the static pressure at the exit is 3, 738.9 Pa and the stagnation temperature at the inlet is 300 K, we will calculate the Mach number, pressure and temperature distribution in the nozzle and compare the solution to quasi-1D nozzle flow result.The Reynolds number for this high speed flow is large. As a result, we expect viscous effects to be confined to a small region close to the wall, so it is reasonable to model the flow as having no viscosity.

In quasi - one dimensional flow for this converging-diverging nozzle, we anticipate the Mach numberat the inlet to be subsonic ($M < 1$) and accelerating until it reaches at the minimum nozzle area (the throat), where the flow becomes sonic with $M = 1$. At that point, we expect that since the nozzle starts to diverge, the flow will continue accelerating until at the exit, the flow continues as supersonic ($M > 1$).

4. INTERPRETATION OF RESULTS

As we create and insert specifications for the nozzle, we obtain data consisted in numerical results and graphs. From this we analyze the behavior of the compressible flow through the convergent-divergent nozzle.

The below graphic (Fig. 1) is the outcome of run calculations, where it is shown the progress across a number of 150 iterations.

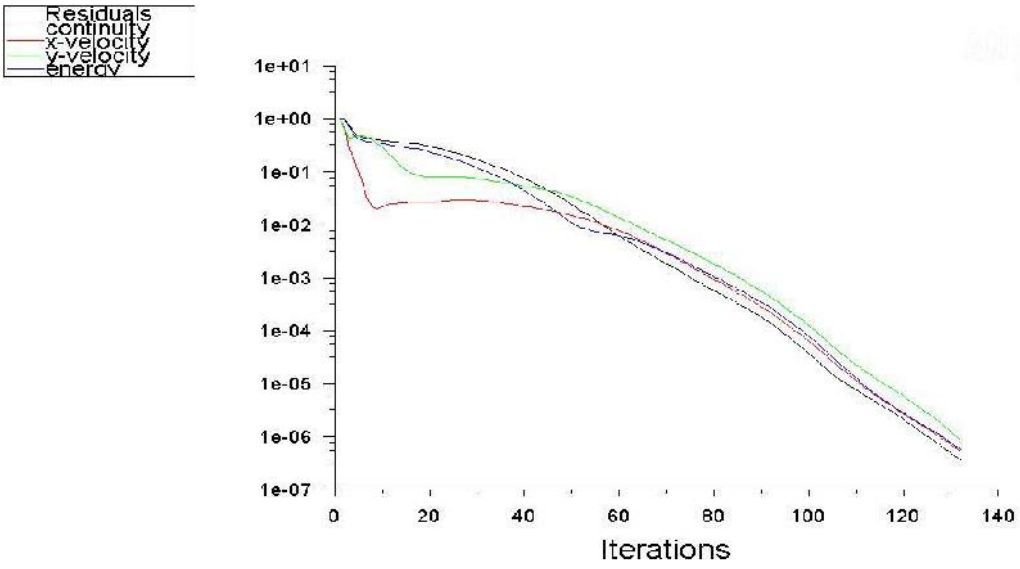

FIG. 1. Scaled residuals

The variation of Mach number is displayed below (Fig. 2). The gradient of Mach number is shown across the wall and the axis. It is easily inferred that the progress of Mach number across the wall attains a higher value than that along the axis. Quasi 1D results are right in between the two lines, so the numerical results obtain from the simulation are not too different from theoretical calculations.

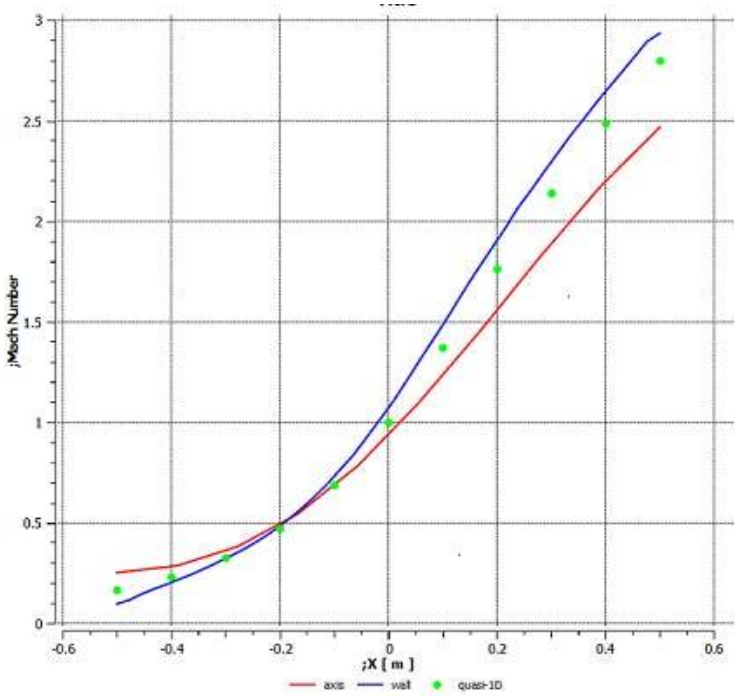

FIG. 2. The progress of Mach number according to 3 cases

The graphic from Fig. 2 is presented in 2D view (Fig. 3). The flow is supersonic towards the exit and almost reaches 3 M, as the red hue intensifies at the outlet corners.

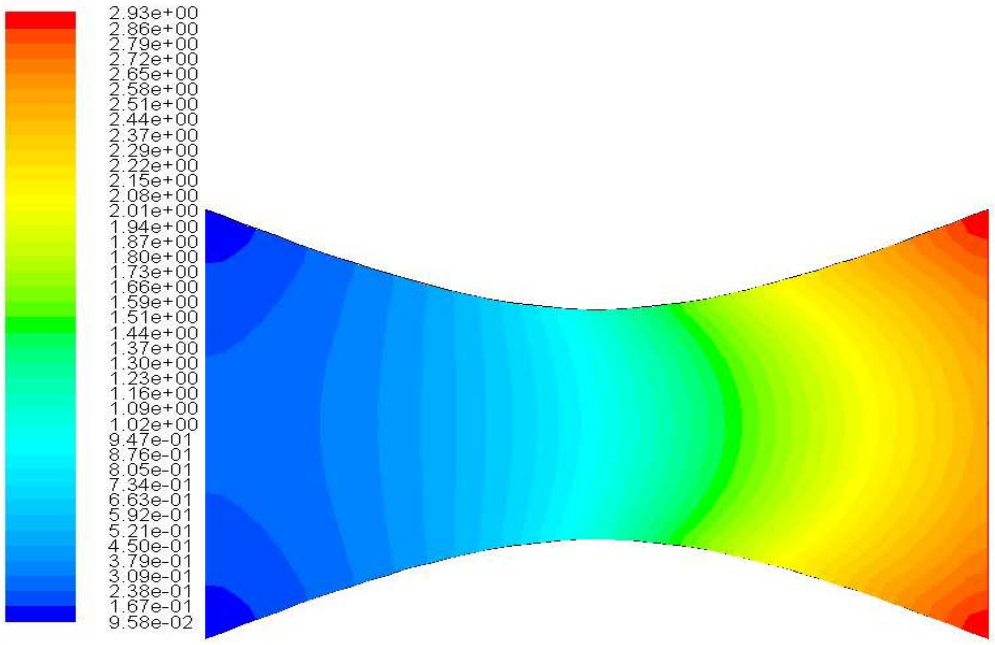

FIG. 3. Contours of Mach number

Static pressure undergoes a continuous decrease from the inlet all the way to the exit of the nozzle, as the beneath graphic depicts (Fig. 4). At the outlet, the static pressure gets close to almost zero Pascals. The static pressure experiences different drops in value, depending where we analyze it. Across the entry wall, static pressure is just a little bit larger than at the inlet axis, but vice versa towards the outlet section, where static pressure's value along the wall is below that along the axis.

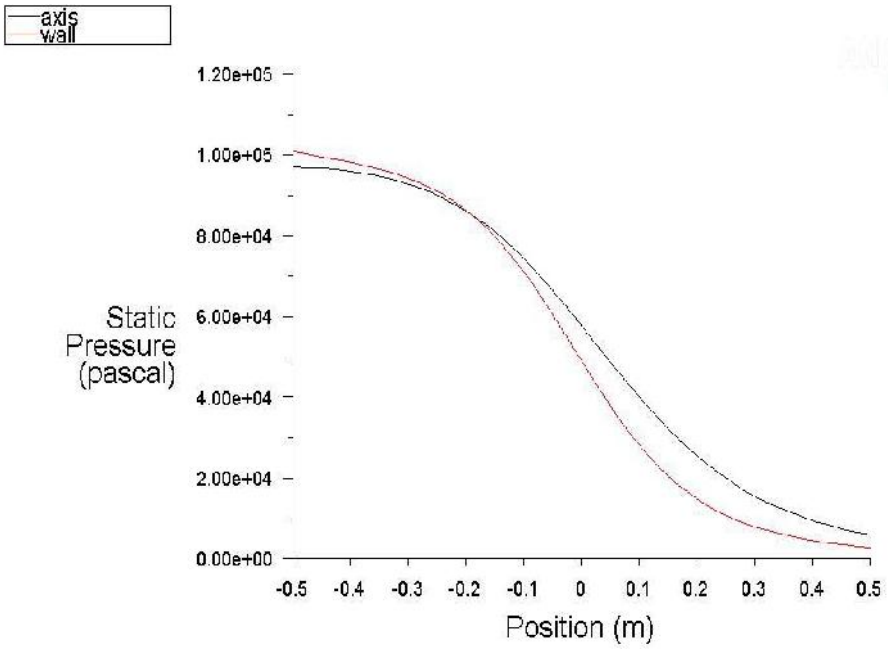

FIG. 4. Graphic of static pressure

A more comprehensive and colorful image of the variation of static pressure is shown in Fig. 5. It is also easy to observe the normal shock wave, both in Fig. 5 and Fig. 3.

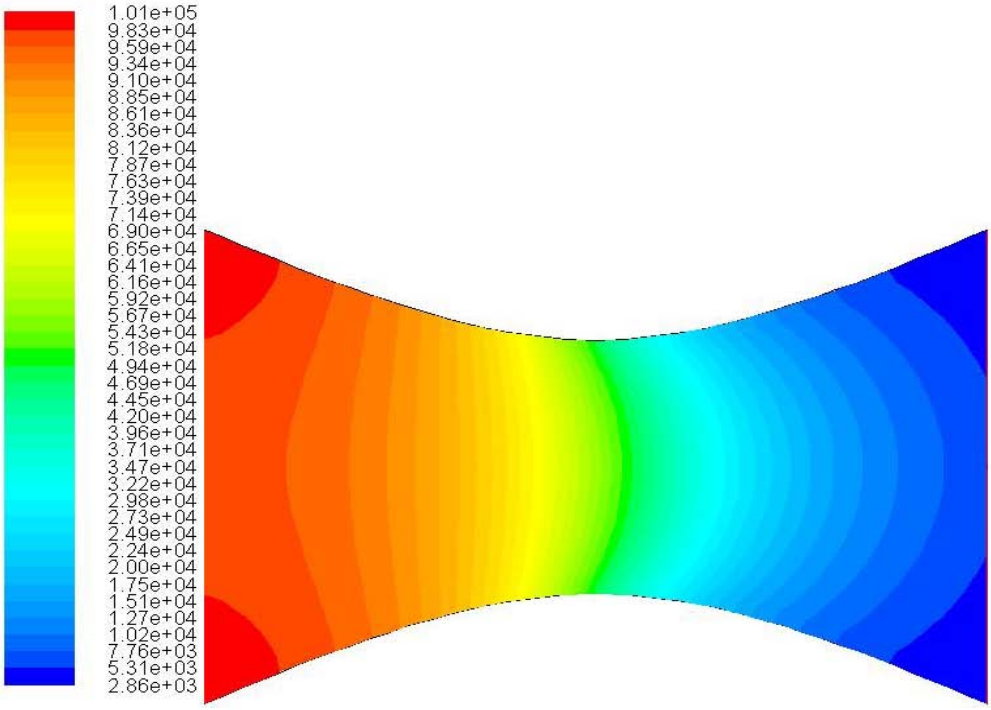

FIG. 5. Contours of Static Pressure

CONCLUSION

The foundational axioms of fluid dynamics are theconservation of mass(it states that for any system closed to all transfers of matter andenergy, the mass of the system must remain constant over time, as system mass cannot change quantity if it is not added or removed), conservation of linear momentum (also known as Newton's Second Law of

Motion - the net force on an object is equal to the rate of change of its linear momentum in an inertial reference frame) and conservation of energy (also known as First Law of Thermodynamics - states that the total energy of an isolated system remains constant. Energy can neither be created nor destroyed; rather, it transforms from one form to another).

ANSYS Workbench clarified how the internal parameters' values of fluids changed as they passed through a converging-diverging nozzle. The selected compressible fluid attained supersonic speed at the exit section of the nozzle, considering that it was subsonic at the inlet. This shows how significant the design of a nozzle is in obtaining variations of Mach number, pressure and temperature, to meet the problem requirements. But forcing a fluid through a converging-diverging nozzle is no guarantee that the fluid will reach supersonic velocity. The state of the nozzle flow is determined by the back pressure, which depends on the given inlet conditions. This software application offers the opportunity to analyze in detail the flow of fluids through a duct which will lead to developing new concepts of rocket engines based on the flow properties and fluid characteristics.

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COMPARATIVE ANALYSIS OF PORTABLE MISSILE SYSTEMS

Gabriel ALDEA

"Henri Coandă" Air Force Academy, Braşov, România

Abstract: *Annihilation of enemy aircraft is nowadays possible by various means, ranging from the size of snowboard length man-portable missiles up to massive missile batteries. The difference of their usage is given by certain technical characteristics that can provide efficacy to the anti-air defense missions. The purpose of this paper is to establish a comparison between the Mistral Surface to Air Missile System, Igla-S, and Stinger Missiles and to identify their degree of lethality and value in combat. Focus will be set on the missiles' guidance system, warheads, maximum speed, maximum effective range, fusing, and rate of fire. Based on these criteria, the findings of this study will show that Mistral is more lethal, whereas the reputation of the most effective man-portable system is held by Mistral. The accomplishment of the current research was possible due to a multi-criteria analysis elaborated by professor ZWICHY, specialized in astrophysics and it represented an objective analysis.*

Keywords: *Portable missile system, performances, comparative analysis.*

INTRODUCTION

The Man Portable Air Defense System (MANPADS) missile is a highly effective weapon proliferated worldwide. The missile offers little opportunity for a warning before impact. Impacts are often lethal. Examples of lethality include: The Afghan Mujahedeen killing of 269 Soviet aircraft with 340 such missiles, Desert Storm evidence that IR missiles produced 56% of the kills and 79% of the Allied aircraft damaged and civil aircraft experiencing a 70% probability of kill given a MANPADS hit. For the sake of comparison about manufacturing, Mistral was manufactured in France at MBDA, FIM-92A, while Stinger was made in the U.S.A. and Igla-S was produced by Russia, the latest one being made in 2004. While each example was expected to enhance transport aircraft survivability, proposed vulnerability reduction techniques needed to be prioritized based on various orders of merit. Highly ranked concepts were to be evaluated using modeling and simulation to identify probabilities of effectiveness as compared to unprotected aircraft systems. A smaller number of MANPADS feature guidance systems that require the operator to direct the missile all the way to the target. More than 40 civilian aircraft have been hit by MANPADS since the 1970s, resulting in at least 28 crashes and more than 800 deaths worldwide.

1. MAIN SYSTEMS CHARACTERISTICS

- **Stinger**

1.1 Functioning:

The Stinger system features a proportional navigation system, integrated Identification Friend or Foe (IFF) interrogation, and threat adaptive guidance. Proportional navigation enables the missile to effectively hit moving targets by injecting a multiplier factor into course corrections so that the missile overcorrects for a target's evasive maneuvers, leading the target to a successful interception. The integrated IFF subsystem allows the Stinger operator to query a target aircraft to determine if it is friendly or not.

1.2 Technical and tactical specifications:

- Guidance system: Fire-and-forget passive infrared seeker
- Warhead: High explosive
- Maximum speed: 750 m/s
- Rate of fire: 1 missile every 3 to 7 seconds
- Maximum effective range: 4000 m
- Fuse: Penetration, impact, self destruction

FIG. 1

- **Igla-S**

1.3 Functioning:

The SA-24 Igla-S man portable air defense missile system is designed for use against visible targets such as tactical aircraft, helicopters, unmanned aerial vehicle. The SA-24 Igla-S features high effectiveness and increased range against small targets, such as remotely piloted vehicles. The SA-24 Igla-S is able to engage targets at night.

1.4 Technical and tactical specifications:

1. Guidance system: Passive IR homing device and night vision (operating in IR range)
2. Warhead: HE fragmentation
3. Maximum speed: 570 m/s
4. Rate of fire: one missile with reaction time of 5-10 s
5. Maximum effective range: 6000 m
6. Fuse: impact/proximity

FIG. 2

- **Mistral**

1.5 Functioning:

The Mistral is a short-range air defense weapon missile system. It features a lightweight man portable launcher, which can be operated by a single soldier. The Mistral missile is a fire-and-forget type weapon with a high technology infrared homing seeker, which is fully autonomous after firing. The missile is lightweight and is very accurate. The missile has a 3 kg High Explosive (HE) warhead with high density tungsten balls for increased damage. It uses a laser proximity detonation mechanism which reduces the chance of premature detonation.

1.6 Technical and tactical specifications:

- Guidance system: Infrared homing
- Warhead: High explosive
- Maximum speed: 850 m/s
- Rate of fire: possibility of refuel at 20 s
- Maximum effective range: 6500 m
- Fuse: proximity and laser remote fuse

FIG. 3

2 MULTI-CRITERIA ANALYSIS BETWEEN THREE PORTABLE TYPES OF LOW-ALTITUDE AIR DEFENSE SYSTEMS

Multi-criteria analysis method was elaborated by Professor F. ZWICHY and is used to substantiate a decision related to engaging on basis of parameters or criteria. That method of analysis gives an objective character to results because:

- Order of criteria is established by comparing those on pairs;

- The relative position of two criteria may know only tree situations (one criterion is more important than the other, both criteria are equal, one criterion is less important than the other);
- The analysis is made separately when is benchmarking various variants.

2.1 Determining criteria:

Criteria used for that analysis are:

- Guidance system (G)
- Maximum speed (S)
- Rate of fire (R)
- Fuse (F)
- Maximum effective range (E)

2.4 Determining weight of criteria

The weights of criteria are set on a grid with 3 values. We compared each criterion with the others and awarded each of them one of those values 0, 0.5, and 1 according to the importance of each. Finally, we calculated the weight coefficients (γ) by FRISCO method:

$$\gamma = (p + m + \Delta + 0.5)/(-\Delta 1 + \frac{N}{2}) \quad (1)$$

Where:
p – The sum of points obtained by the element which is taken into account;
m – number of criteria outclassed by the criterion taken into account;
Δ – difference between the score of element taken into account and the score of element in the last position;
-Δ1 – difference between the score of element taken into account and the element in first position;
N – number of criteria.

Table 1. Determining weight of criteria

	G	S	R	F	E	Points	Level	Weight
G	0.5	1	1	0	1	3.5	1	2
S	0	0.5	1	1	1	3.5	1	2
R	0	0	0.5	1	0	1.5	3	1
F	1	0	0	0.5	1	2.5	2	1.5
E	0	0	0	0	0.5	0.5	4	0.5

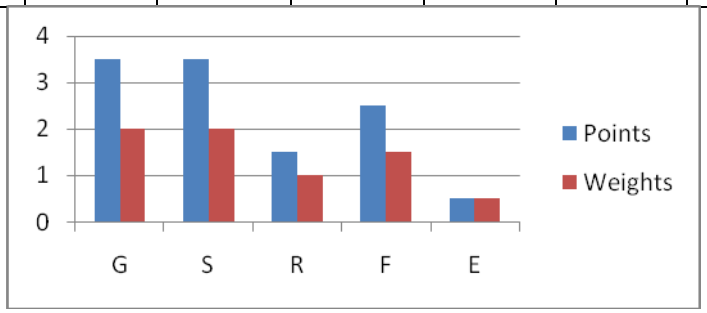

FIG.4

2.3 Grading

The grade must be a number between 1 and 10 and is given to each criterion on basis of technical and tactical specifications. In this case we gave a grade to each variant such as:

Table 2. According notes

	Stinger	**Igla-S**	**Mistral**
Criterion	N	N	N
G	9	8	8
S	8	6	9
R	9	7	8
F	8	7	9
E	6	8	9

2.4 Determining the matrix of references:

For calculating the matrix we determined the product between grades given and weight coefficients. In the end, there resulted a sum of those products and we established a final ranking. On basis of that final raking we determined the result of our analysis.

Table 3. Calculating final results

	Stinger	**Igla-S**	**Mistral**
Criterion	N,x,γ	N,x,γ	N,x,γ
G	18	16	16
S	16	12	18
R	9	7	8
F	12	10.5	13.5
E	3	4	4.5
Final Decision	**58**	**49.5**	**60**

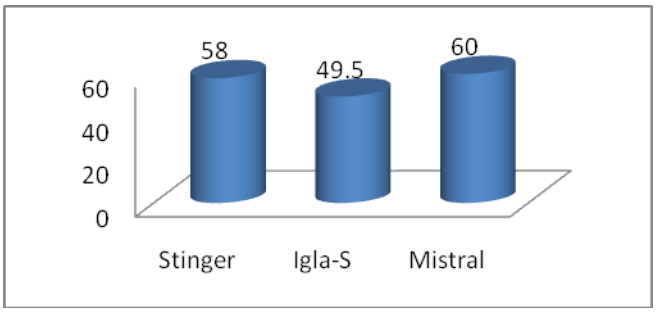

FIG. 5

3 CONCLUSIONS

We may observe from the graphic above that the air defense missile Stinger is the winner of our comparative analysis. The selection of criteria and the weights were made from the perspective of the system operator. Judging by another point of view, we can consider that Stinger is better, but in that case the French system Mistral was the winner. Throughout time, these systems have been improved a lot and they still represent the most important weapons for the Land Forces. As evidence, there is the big number of countries which chose to use them. The Mistral system has a disadvantage represented by its rate of

fire and this makes it more slowly, in terms of number of missiles launched per minute but from perspective of deadly effects, it is the best, helped by the speed of the missile and its maximum effective range. The ranking resulting from the present analysis shows that modern systems, adapted to the always-in-change requirements, have prevailed.

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COMPARATIVE STUDY BETWEEN THE ANTIAIRCRAFT WEAPON SYSTEMS S-400 TRIUMF AND 9K720 ISKANDER-M (SS-26 STONE)

George-Adrian MARIN

"Henri Coandă" Air Force Academy, Braşov, Romania (cpop@afahc.ro)

Abstract: *This article provides a comparative study between two complexes of missiles used by the Russian army. Over time, air defense systems have reached an extensive development due to the fast process of technology growth and of the necessity for defense systems that can be able to eliminate any type of air threat. This article aims at analyzing the combat capabilities of various aerial threats, mainly, the mobility and efficacy of two anti-aircraft missile systems.*

Keywords: *S-400 Triumf, 9K720 Iskander-M, Russian army, missile, ballistic, anti-aircraft, air defense systems.*

1. INTRODUCTION

Two of the most appropriate examples of modern missile complexes are: S-400 TRIUMF and 9K720 ISKANDER-M (SS-26 STONE) which can be found only in the endowment of the Russian army. Ballistic missile threats are increasingly evident in the global context because there are several countries such as: China, India, Iran, Israel, Pakistan and Saudi Arabia that have complexes of ballistic missile. The missiles types: S-400 TRIUMF and 9K720 ISKANDER-M (SS-26 STONE) became part of the Russian army in the interval of 2006-2007, being some of the most modern systems which are capable to fight against different types of missiles or aircraft which may pose a threat to Russia. These two complexes also hold good protection against electronic warfare, thus becoming very difficult to be countered.

2. DESCRIPTION

S-400 TRIUMF system development began in the late of 1990s and on 12 february 1999 the first test was performed in Astrakham which was reported as successful. S-400 TRIUMF is the fourth generation surface-to-air missile that replaced the Defense Force S-300 PMU (SA-1O) and the Army S-300 (SA-12). The system consisted of 3 missiles which are able to cover its entire performance envelope medium range 9M96 missile , long range 48M6 missile, extremely long range 9M96, a launcher and autonomous observation and trucking vehicles. The missiles used by this fourth generation system are the same as the S-300, but they possess capabilities against low RCS stealth aircraft, small cruise missiles and low RCS re-entry vehicles. The electronics used by S-400 missiles is based on new technology and they use new solutions to the tracking, detection and guidance problems. Missiles are guided by aboard inertia navigation unit with radio command during the cruise phase and active radar holding in the final approach to the target. The regular S-400 battalion consists of a mobile command post and at least 8 launchers with 32 missiles.

The complex ISKANDER-M (in Russian classification) or SS-26 STONE (in NATO

classification) is a tactical ballistic missile with a radius of action up to 400 km (although some sources indicate 500 km). The system was developed to replace the SCUD system and its successor, Oka system (SS-23 SPIDER) and it is considered to be the most advanced system of its type currently in the armed forces of a state. The Russian army used the rocket type ISKANDER-M, with a reach of up to 500 km and warheads up to 700-1300 kg. The ISKANDER has several different conventional warheads, including cluster, electro-magnetic pulse, and fuel-air explosive and bunker-busting. Despite the fact that this will violate the NIF (intermediate nuclear forces) treaty it can also carry nuclear warheads. The missile is guided by a baseline system which is electronic and which greatly enhances accuracy, likelihood circular error (CEP) is about 2-7 M in this case. The system is fully mobile, the missile command and control equipment being installed on military trucks. Each road mobile missile system is equipped with two ballistic missiles which include fire power of the missile unit. Its nearest equivalent is the American rocket tactics MGN-140 ATACLS, but its performances are noticeably lower.

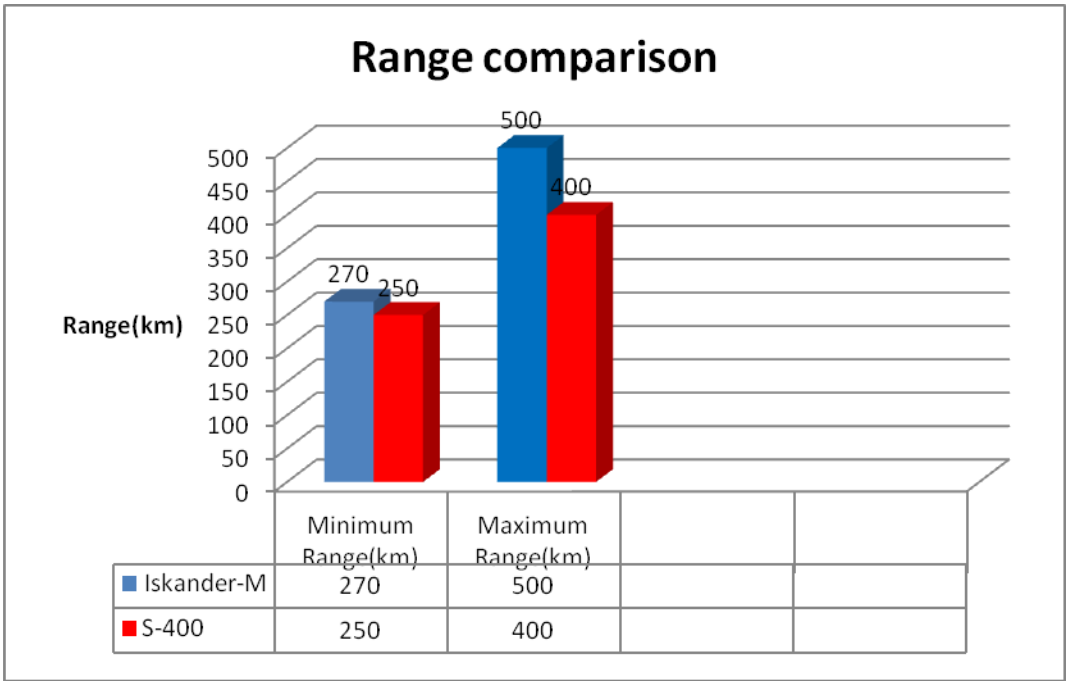
3. COMPARATIVE STUDY BETWEEN S-400 TRIUMF AND 9K720 ISKANDER-M

These two complexes of missile are some of the most advanced; they manage to seriously threaten the security of some NATO states due to the performances with which they are endowed. In terms of the radius of action of the missile used by the 2 complexes, those that act on a longer distance are the rockets used by ISKANDER-M, their beating reaching up to a distance of 500 km. The specific missile complex S-400 TRIUMF has a maximum range of 400 km, being inferior to from this perspective. Due to the fact that the ISKANDER missile has a greater operating range, Russia chose to place them in Kaliningrad to react against the shield location of missile defense in Europe. The road mobile missile system for S-400 TRIUMF is equipped with 4 missiles and for ISKANDER with 2 missiles, making that S-400 be one step ahead because its 4 missiles can allow it fight or attack multiple targets. In this case, we must take into account that each missile can carry more warheads, which increases the difficulty in fighting against them and can cause much greater damage in the tactical field. Another criterion that can differentiate the two types is the circular error (CEP) which, in case of the TRIUMF missile varies between 5-20 m, and in the case of the variant ISKANDER it is between 2-7 m due to the electron optical system which guides it to the target. In the embodiment export of ISKANDER type rockets, more precisely ISKANDER-E, that following the agreement procedures of MCTR (missile technology central regime) accuracy decrease at CEP up to 70 m. The fact that ISKANDER-M has a smaller circular error it makes it to be the best if the desire is to hit some important strategic points (major bridges, nuclear command centers, hospitals) of the enemy. Mobility of 2 types of supply facilities is very high because all equipment is located on military trucks, which facilitates placement in the tactical field and helps modify its position if it poses an immediate threat.

FIG.1- S-400 TRIUMF

MISSILE	CIRCULAR ERROR POINT
S-400 TRIUMF	5-20(m)
9K720 ISKANDER-M (SS-26 STONE)	2-7(m)

FIG.2- 9K720 ISKANDER-M



4. MISSILE THAT HAVE CAPACITIES TO FIGHT AGAINST S-400 TRIUMF AND 9K720 ISKANDER-M

The military equipment is in constant development; both the anti-air missiles and military aircraft in the area provide developing countries some benefits in case of war. A proof of this development in these areas are the rocket complexes that we compared, which feature highly advanced and sophisticated devices as some of the best systems of this type currently. In order to protect them from threats such as ballistic missiles there is an attempt to develop defense systems able to counter such threats. One anti-aircraft system that could be capable of intercepting missiles is these types of PATRIOT (Fig.2) systems. The PAC-3 (later PAC-3 MSE) has significant anti-ballistic missile capabilities and it is a variant of the PATRIOT interceptor with significant upgrade over the PAC-2. The advertised interception range for aircraft engagement is probably over 150 km and against ballistic missile is around 30 km. Because of the significant battle experience of the older PATRIOT variants, the new PAC-3 interceptors can provide a reliable defense for friendly forces under its protection. Therefore PATRIOT system is capable of addressing threats to systems such as the S-400 TRIUMF (Fig.1) and 9K720 ISKANDER-M (SS-26 STONE – Fig.3).

FIG.3- PATRIOT

5.CONCLUSION

Considering the performances and the equipment of these 2 complexes we cannot question their capacity of fight. Considering also the fact that both complexes came into the usage after the year of 2006, we can say that S-400 TRIUMF and 9K720 ISKANDER-M are some of the most efficient of this type of ballistic missiles of the Russian army. These 2 missiles complexes represent an answer given by Russia in reply to the sophisticated system used by the United States of America and its NATO allies. These systems of missile were developed for the negation of the technological advantage of NATO and USA in symmetry with the conventional forces of Kremlin. From the military point of view, these systems of missiles were developed to attack military and civilian objectives that are in use under the alliance, while using lower theoretical costs; these targets can need a usage on a big scale of the aircraft and the use of intelligent missiles if they want to destroy them (this supposes a high financial effort and high standard technique effort which can be expensive for Russia). 9K720 ISKANDER-M (SS-26 STONE) and S-400 TRIUMF can neutralize these missiles, using in fact lower resources.

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NIGHT-VISION OPTOELECTRONIC SYSTEMS WITH IMAGE INTENSIFIERS

Lavinia-Andreea MIHAI

"Henri Coandă" Air Force Academy, Braşov, Romania

***Abstract**: Over time there have been many armed conflicts where technology had a decisive role in terms of the final outcome. Through retrospective analysis of these conflicts it can be argued that we are in a continuous evolution of optoelectronic devices used in the military field. This is reflected as a response to the requirements imposed by the fight, especially at night or in low visibility or poor atmospheric transparency. Based on these considerations, equipment, night vision and thermovision systems gained an important place in optoelectronics specific underlying military systems. Top fields of contemporary art are marked by optoelectronics spectacular dynamics and their role in the life of society is expected to be powered by the unique benefits they offer. This is a topical issue, the need for optoelectronic devices in the military environment becoming more visible.*

***Keywords**: optoelectronic devices, intensifier, performances, radiation.*

1. INTRODUCTION

From the point of view of systems with intensifiers tubes, the radiation from the stars, a remanent one, is reflected by the target and absorbed by the night-vision optoelectronic device's lenses, even in the dimmest vision conditions. The lenses focus the radiation on the image intensifier's photocathode which will emit electrons according to the illumination level. Inside the image intensifier, the number of electrons emitted by the photocathode is increased, so that while the outcome, on the tube's display, the target image has an optoelectronic parameters level (brightness, contrast, size, signal/sound) which makes it viewable by the human's eye through the eyepiece. [1]

Over evolution, the whole generations of image intensifiers functioned on the same rules, and in the last half a century they developed, by time, superior performances. The main reason which leads to the image intensifiers development was using them in the military field, by introducing them in night-vision military equipment which helps to continuously observe the medium in the IR spectrum or which permits the image transmission and post on monitors or specific display devices.

The first night-vision devices, called *sniperscope*were classified as 'The zero generation'. They were introduced by the Americans in the World War II against the Japanese army. The image intensifying tubes were built from an anode and a photocathode, which usually was formed from Ag, Cs and O, used to accelerate the electrons. These devices were active and used an infrared radiation source to illuminate the targets. [1]

'The I'st Generation' meant the apparition of the first passive systems, being used for the first time during the Vietnam war(1960). There were used image intensifiers with photocathode which permitted results of light amplification factor raise to 1000x. This generation's devices didn't used an own infrared radiation source, but were based on the

ambiental light. Their disadvantages were the large dimensions and the fact that they depended by the moon light to correctly work.

2. TECHNICAL GENERATIONS OF IMAGE INTENSIFYING TUBES

The performances increase of the photo-multipliers tubes by using micro-channel plates (MCP) and S-25 photocathodes got to the apparition of ' The 2'nd Generation', at the end of the 70's. The caught images were more brightful, and the sensor could be used also in reduced illumination conditions, the moon light being unnecessary. The resolution and the reliability increased, and the light amplification factor raised to 20000x. Nowadays, we find and use the image intensifiers a lot in modern devices, being often seen in the ICCD(Intensified Charge Coupled Device) cameras. [1]

'The III'rd Generation' appeared in the 90's and suffered some changes, so that it has a gallium arsenite photocathode, which improved the resolution. Also, the micro-channel plate is filmed to block the ions, so the life period of the tube is increased. The amplification factor values are between 30000x and 50000x.

By developing the day and night performances, a new generation appears, 'the IV'th Generation'. The ions battery is cut out, the background noise is reduced and the number of incident electrons on the amplification pitch is increased. So that, it results a more brightful and less distorted image. At the same time, a new supply system is introduced in order to permit the intensity applied to the photocathode to be quickly in gear or out of gear, which offers to the device the possibility to quickly answer at the light fluctuations of the supervised medium [1].

Of course, there were other generations which weren't changed so much, only improved after the previous ones. In the following image, you can observe the quality of the images, obtained with different technical generations of night-vision optoelectronic systems with image intensifiers.

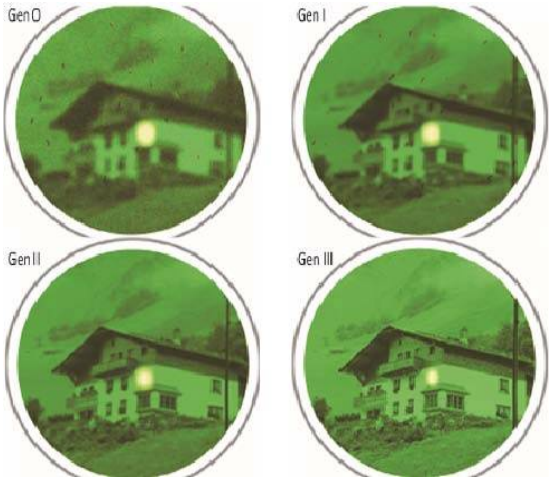

FIG. 1. Technical generations of night-vision optoelectronic systems with image intensifiers

At the same time with the new amplification procedure, with the micro-channels plate (which defines the second generation) and through the other generations development, there were built the basics of portable night-vision optoelectronic systems with image intensifiers, with reduced dimensions and which satisfied the requirements of the hostile battleground[2].

- Biocular night-vision equipment with image intensifiers.

They are formed from lens, an image intensifier, an optical system which separates the image and two oculars. They have large aperture lens which helps to intake a big quantity of radiation from the target. The image intensifier permits doubling the observing distance, because it is more sensitive in the IR closer zone.

- The night-vision goggles with image intensifiers.

The ones in the air force equipment are formed from two identical ways, which are both formed from lenses, image intensifier and ocular. They are fitted on the flight helmet. The others in the infantry equipment are night-vision goggles with lenses, an image intensifier, a system which separates the image for the both eyes and two oculars. They are intended to observe, drive the vehicles, read the maps, fix some technical defections in dim vision conditions. There is another constructive version, which uses lenses, an image intensifier and an ocular, being positioned in front of an eye, the other one being free and adapted to the existing visibility conditions [2].

- Telescopic sights for infantry weapons.

They highly developed by time, becoming more practical because they reduced their weight from 2-3 kilos to 1 kilo. For example, the F4965 sniper made by I.T.T. for the infantry weapons, has an magnification of 3,6x and a visual field of 8° and is able to find from 2600m the contrast target 100% despite from the background, at the stars light.

- Night-vision devices with image intensifiers on the armoured cars

They are designed to help to the vehicle driving at night, to observe the areas, to fire control, aiming and firing. Usually, these devices are built in order to work with the fire control system. To drive the vehicle, the used device can offer a large image of the visual area, with an only image intensifier; to observe the area it is used a biocular system; to fire control it is mainly used the double-channel day/night version, and for aiming it can be used the double-channel version, but also night devices, with a periscope construction, a frontal mirror, lenses, an image intensifier, an ocular and a reticule system for aiming. [2]

If it is used as an intermmediate receiver, after the image intensifier, a CDD device(Charge-Coupled Device), it appears a new system, called ICCD(Intensifier Charge-Coupled Device), which permits posting the information on a TV display. The first ICCD devices were based on image intensifiers from the 2'nd generation. Taking the image from the intensifier tube's display by the CCD permits the processing and interpretation of the image.

The aspherical, the diffraction or with the variable refraction index optics, also called unconventional optics, is considered to be the solution to reduce the jig and the weight of the portable devices(observing snipers, aiming snipers for the infantry weapons, glasses), because the unconventional optics principles will permit the use of night-vision optoelectronic devices very often, and also they will be range finders with laser diodes and mini displays which offers redundant information about the battle ground. It will be developed the so-called 'integrated headsets' for pilots and even the infantry soldiers.

3. THE NIGHT-VISION OPTOELECTRONIC SYSTEMS WITH IMAGE INTENSIFIERS STRUCTURE(SOVTNII)

Functionally, these systems are based on the amplification process of the low level of the existing residual radiation to the necessary value to observe the target by human eye. The radiation emitted by stars and reflected by the target is collected by the lens and focused on the image intensifier's photocathode. Then, the number of incident photons increases so that, the image parameters from the image intensifier's display get to the necessary values to detect the target.

The principle scheme of a night-vision system with image intensifiers for the direct sighting: Illumination source ⟶ Secondary source ⟶ Signal propagation medium ⟶ Lenses ⟶ Image intensifier ⟶ Ocular.

3.1 The illumination source. Analysing the nocturnal radiation sources shows a great interest, because the night-vision with image intensifiers equipment is based on the amplification process of the existing residual radiation's reduced level by night as far as the human eye can detect the targets.

The illumination level is conditioned by the type of season, the latitude, the angle between the sun and the horizon. Big latitude areas are defined by adding a strong light flux which fluctuates and which comes from aurora borealis, specific phenomena to these areas.

It is proved that a young observer, well trained, can pick out big dimension objects, highly contrasted, even at an illumination level of 0,0001 lux. At 0,1 lux, he is able to distinguish the capital letters from a sheet of newspaper and starts to distinguish the colours (they can be well distinguished at 1 lux). For illuminations above 1 lux, the visual acuity is good and reaches the optimal value of 100 lux. [2]

The moon is the most powerful source of nocturnal radiation.

The artificial light is very important, because the sky brightness above the cities is bigger than naturally because it depends on the cloud layer, the dust particles quantity, the weather. The effect is felt from many kilometres around big cities, being also present in the camouflage situations. Another artificial sources can be: the weapons blast or fires, explosions, car headlights.

3.2 Secondary sources. The remanent night radiation is reflected by the targets and used to form their images through the night-vision systems which use image intensifiers. So that, the field object become secondary radiation sources.

Let's presume that we have a r radius disk that radiates. In one point of the object axis, where its radius subtends the Θ angle, the illumination *E* is given by the next ratio. [3]

$E = \pi B_0 \sin^2 \theta$, where B_0 [cd/m^2] is the circle brightness.

As a punctiform source, the illuminating intensity of the disk, I_0 [cd], can be calculated with the following ratio:

$I_0 = \pi r^2 B_0$

The brightness in an axial point, situated at distance 1 is:

$E = \pi r^2 B_0 / l^2$

Notation: $\operatorname{tg} \theta = r / l$

It results:

$E = \pi B_0 \operatorname{tg}^2 \theta$

For the angle $\theta = 5{,}7^\circ$, it results $\sec^2 \theta = 1{,}01$, and if the 1% accuracy is considered enough, then those ratios of the illumination are similar to each other. So that, an extended light source which subtends to the observer a complete angle about $2\theta = 11{,}4$ grades can be treated as a punctiform source, being accepted an 1% brightness error value. While night-vision, when the targets brithness is low and their dimensions are under 11,4 grades, the calculus can be done as if we had a punctiform source. In this situation, energetical,just the reflectivity of the target is important, according to the wavelength of the incidence radiation on it. As example, the reflexion factors for a plate and a cloth khaki suit were calculated,with a scotopic receiver, into a field with the natural illumination of 0,003 lux . The results were about 11% and 17% .[3]

In the next table, there are the results, determined on the calculus made into the field about the reflection factors for some categories of vegetation which can be the capital in the observing practice situations. The calculus was made in starred sky, without moon, with the Spectra Pritchard model 1980A photometre, with an error lower than 5%.

Wave length / Sample	460 nm	Scotopic 520 nm	Fotopic 555 nm	600 nm
Green chestnut leaf	0,06	0,10	0,11	0,10
Green poplar leaf	0,11	0,14	0,15	0,15
Conifer leaf	0,04	0,08	0,10	0,09
Green cherry leaf	0,07	0,10	0,11	0,10
Green maple leaf	0,06	0,13	0,16	0,14

FIG. 2. Calculus made into the field about the reflection factors

3.3 Signal propagation medium- the atmosphere. The atmosphere is a component part of SOVTNII, because it is essential that the optical transfer function (FTO_{atm}) show the atmosphere effect about the image quality.

Due to Earth's atmosphere wherethrough the streaks which form the light pass, the image resolution of a distant object, obtained throughan optoelectronic system, will be smaller than the resolution of the same object obtained in a labratory.

Earth's atmosphere is made of a gaseous layer with 96.000m depth. It is formed of 20% oxygen, 78% azoth, and the rest are rare gases (helium, neon, argon, kripton, xenon), carbon dioxide, ozones and fumes. The fumes quantity fluctuates by time between large limits. Even when the atmosphere doesn't contain condensate fumes, dust, fume, the direct light is dispersed by the gas molecules. Rayleigh proved that the quantity of this dispersion is proportional with $\lambda^{1/4}$, where λ is the wavelength of the emitted radiation. This means a powerful dispersion of the lower wavelengths than the bigger's, and when the atmosphere contains condensate steam, dust or fume, the particles are big enough, so that the difusion value is almost the same for all the wavelengths from the visible spectrum and close infrared. In this case, the sky's colour fluctuates from a light blue-grey, through white, to dark grey, depending on the quantity of particles to diffuse. It can be said that the atmosphere is completly clear when it doesn't contain condensate steam or dust. The calculus proved that its transmittance is about 90%. [2]

The clear atmosphere is when it contains medium quantities of gaseos components or vapours, without steam as water drops, ice crystals, dust particles or fume. Its transmittance is about 80%. The atmosphere can be and must be considered as a part of the optoelectronic system and characterized through the wave aberration and FTO.

3.4 The lenses. Even if the lenses are one of the most important part of the night-vision optoelectronic system, they are omitted or incorrectly evaluated and calculated very often.They capture the radiation reflected by the target and form its image on the image intensifier's photocathode. They are essential to choose the adequate time of the lens, the right parameters and made his calculus correctly, in order to realize the performance level of the whole system. The image intensifier must amplify the brightness of an image showed by the lenses, and if it is not optimal for a random atmospheric conditions set, the result will be innaplicable, because it will amplify a low qualitative and noisy image. [4]

The night-vision lenses must have:

- Raised opening (1/1,4-1/1,0);

- FTO adapted to the device use(to correctly transmit the spatial frequencies and elimination those which make noise into the final image);
- Uniform brightness in the image plan;
- Maximum quantum yield into the spectral domain;
- Low gabarit and weight.

The design types of lenses destined to the night-vision optoelectronic devices are the dioptric andcatadioptric ones. The dioptric lenses for SOVTNII offer the possibility to obtain a big visual field(50° to the night-vision goggles), have simple execution and building-up, but on large relative openings, they require many corrective lenses. The catadioptric lenses represent a combination of eyeglass and mirrors. [4]

3.5 The image intensifier. The image intensifiers are optoelectronic devices through the man can see and accomplish his activities on low vision. Even if they are not built to work in total darkness, the image intensifiers permit the obtaining of a useful image while minimum brightness circumstances, which actually exists during the night.

Since the 50's, there were used high electric voltages (10-20 kV) for the image intensifiers in order to accelerate the electrons emitted by the photocathode. So that, at their impact with the displays material, a larger number of photons than the ones which are incident on the photocathode will be released. Thereby the target's image becomes noticeable. The target's radiation is focused by the lens on the tube's entrance and redirected through the fiber window to the multialkalin semi-transparent photocathode. It emits electrons due to the brightness form and the quantum yield of the image. Thanks to the high electric voltage between the focusing electrodes, the emitted electrons are accelerated towards the aluminized phosphorus display and an intensified image is been created. [1]

3.6The ocular. The ocular parameters choice is also very important because it must be keep into account the image characteristics on the image intensifier display and the parameters achievement of the entire device (the ocular must ensure on the image intensifier display the view of an image of particular size, brightness and contrast. The image on the display is discreet and inevitably noisy, an improperly value of the ocular increase will produce blurred images, so that, only details will be observed, but not the complete image. The focal length and the oculars diameter will be chosen due to the magnification, the visual field, the distance and the exit eyeball diameter of the system.

The oculars efficiency of absorbing photons is given by the quantum yield of the ocular (η_{oc}) and can be defined by the next ratio:

$\eta_{oc} = d_p/\left(4f_{oc}^2\right)$, where:

d_p is the exit eyeball diameter;

f_{oc} is the focal length of the ocular.

4. CONCLUSIONS

Even if all this night-vision systems with image intensifiers have a pretty big disadvantage instead those based on thermal image due to lower observing distances, it is considered to keep having the same importance in the optoelectronic night-vision equipment because of their gauges and lower prices. It is expected the calculus optimization and the new optoelectronic pieces realization in order to improve the performances of these systems.

The atmosphere differently affects the radiation which diffuses through it, by its spatial frequency; the FTO knowing of atmosphere is important to the corect calculus of

the night-vision optoelectronic system and to obtain the right image; the FTO knowing of atmosphere, aside the FTO and the others parts of the optoelectronic system, permits an objective and quick evaluation of the final image quality by multiply them with systems theory and properties of Fourier transformation.

The experimental observations prove that the small target detection(small spatial frequencies) is more powerful affected by the atmosphere effects than the big ones(big spatial frequencies). The atmosphere effect into the target detection models can only be considered a brightness constant damping.

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POSSIBILITIES OF FIGHTING AND DESTRUCTION WITH AIR DEFENSE SYSTEMS PLACED ON SELF-PROPELLED CHASSIS

Nicolae - Cristian MILEA

"Henri Coandă" Air Force Academy, Braşov, Romania

Abstract:*Today when the technology is in a constant descent of precision - guided weapons play an increasingly important role in recent conflicts and the attention focuses on the defense systems development to increase efficiency as much as possible. Combat possibilities of Anti-Aircraft Artillery and Surface - to - Air Missile systems represent the potential of research, discovery, indication, and destruction of enemy air assets, and the ability to maneuver forces and means, in order to surprise the aerial threats and prevent research and attack action for defending the assigned objective in area of responsibility of the group of forces, established by mission. This paper is mainly focused on a comparative study of artillery systems and Surface to Air Missiles placed on the same chassis in the battlefield.*

Keywords: *Anti-Aircraft Artillery, Surface - to - Air Missile, integrated systems, comparative analysis*

1. INTRODUCTION

The combat possibilities of the aerial targets with anti-aircraft artillery systems are expressed by the maximum number of targets over which execute shootings from the fighting device accomplished during an air attackin a given period of time.

Those are determined on directions, heights and to certain alignments (the probable alignment of bombing, battle alignment), taking into account: the opportunity for service; existing ammunition over a determined period of time, usually 24 hours.

The aerial targets combat possibilities with Surface-to-AirMissiles represents the maximum number of targets over which is executed launches (simultaneously or successive) during rejection of an air attack in a certain time from battle device adopted by theSurface-to-AirMissiles unit.

2. AIR-DEFENSE INTEGRATED SYSTEMS

2.1 Artillery Component. The combat possibilitiesare determined by:

- the characteristics of aerial threats (duration ofthe attack, the number of targets involved in the attack, composing, height, speed, the time interval between targets, the maneuver and radio-electronic jamming executed by enemy);
- the number of artillery batteries and type of the combat equipment from their endowment;
- the battle device made by subunits and within these, battle devices of the pieces;
- readiness of the battle team;
- quality research system by radar and visual of the airspace;
- duration of the firing cycle.

The calculation of the kill probabilitywith anti-aircraft artillery systems is determined by formula [1]:

$$N_{T/A} = \frac{N_P}{N_{PT}} \tag{1}$$

where:

$N_{T/A}$ =maximum number of destroyed targets;
N_P = number of existing projectiles at subunit;
N_{PT} = number of projectiles that are fired in a target in a shooting.

The number of projectiles that are fired in a target in a shooting is determined by the relation:

$$N_{PT} = \left(1 + \frac{t}{\frac{1}{C_T} \cdot N_{LSP} + T_S} \right) \cdot N_{LSP} \cdot N_T \tag{2}$$

where:

t = flight duration;
C_T = rate of fire, in shots/second;
N_{LSP} = numberofshotsin series, for a cannon;
T_S = break between series, in seconds;
N_T = number of cannons.

The flight duration (t) depends ondistance in fire area, D_{ZT} andtarget speed V_T.

The kill probabilities are expressed by the number of destroyed or damaged air assets, the total countered targets during of an air attack carried out by the enemy (in a given period of time) and depend on:

- the technical-tactical characteristics of combat equipment from the endowment of subunits (rate of fire, effective range, Single Shot Kill Probability (SSKP);
- duration of the fire mission against the target;
- characteristics and vulnerability of air assets;
- action mode of enemy in fire area.

The kill probabilities of targets, with „n" projectiles, which use radio-electronic jamming, by the piece / anti-aircraft artillery subunit are determined from the relation [2]:

$$P_{N(D)/A} = 1 - e^{-N \cdot P_1} \tag{3}$$

where:

$P_{N(D)/A}$ = kill probability of target with „n" projectiles;

P_1 = kill probability of target with a projectile;

N = number ofexecuted shots;

The target is considered destroyed if the kill probability is equal to 0.8.

The kill probability of aerial targets depends oncombat possibilities of aerial targets $T_{N(D)/A}$ and kill probability of a target that doesn't employs radio-electronic jamming or kill probability of a target that employs radio-electronic jamming (jamming conditions) $P_{N(D)/A \text{ sau } N(D)_{CB/A}}$.

2.2 Surface-to-Air Missiles Component. The combatpossibilitiesare determined by the following factors:

- characteristics of the air attack: height, way parameter, target speed, time interval between targets;
- technical characteristics of the missilessystem, depth zone of destruction, fire cycle, the number of launch ramps and recharging time required;
- the readiness of fighting team and framing in scales of search, catching and passing to the accompanying of targets.

Those are determined by the number of available missiles, according to relation [1]:

$$N_{T/R} = \frac{N_{R_D}}{N_{R_L}} \cdot \varphi_R \tag{4}$$

where:

$N_{T/R}$ = The maximum number of destroyed targets;

N_{R_D} = The number of available missiles;

N_{R_L} = The number of launched missiles to combat the air targets;

φ_R = Safety coefficient in exploiting of missiles.

Kill probability of aerial targets, with "n" missiles, which uses radio-electronic jamming by launch installations / Surface-to-Air Missiles subunit is determined from the relation:

$$P_{N(D)/R} = 1 - \prod_{i=1}^{N} \left(1 - P_1\right) \tag{5}$$

where:

$P_{N(D)/R}$ = Kill probability of aerial targets with "n" missiles;

P_1 = Kill probability with a missile;

N = Number of missiles.

The kill probability of aerial targets $T_{N(D)/R}$ - the number of targets destroyed – depends on the maximum number of destroyed targets $N_{T/R}$ and kill probability of an aerial targets, which doesn't use radio-electronic jamming $P_{N(D)/R \text{ sau } N(D)_{CB/R}}$.

3. COMPARATIVE ANALYSIS OF THE KILL PROBABILITY WITH A SINGLE CANNON OR MISSILE WILLING ON A SELF-PROPELLED CHASSIS

To achieve this comparative study I considered the following:

a) The use of two service channels for the artillery component and for missile system, in execution of concentrated fire. In this situationkill probabilityis calculated with relation:

$$P(R \bigcup T) = P(R) + P(T) - P(R \bigcap T) \tag{6}$$

b) The use of two service channels for the artillery component and for missile system, when it's executed the distributionof the fire. Thekill probabilityis calculated with relation:

$$P(R \bigcap T) = P(R) * P(T) \tag{7}$$

I considered that the target flies in fundamental assumption, moves uniform rectilinear horizontally.At all anti-aircraft artillery systems,shooting is executed without fire control system.

In case the enemy uses radio-electronic jamming I considered that jamming is passive and that it reduces the working capacity of CRT with 25% and preparedness of combat systems by 20% in conditions of shooting.

3.1 Kill probability of the 2 x 35 mm anti-aircraft cannon (Gepard) without using radio-electronic jamming by enemy. Taking into account the technical characteristics of the 2 x 35 mm anti-aircraft cannon and the single shot kill probability of the cannon shown in this chapter, all summarized in table 3.1, are obtained kill probabilities with one cannon, without using radio-electronic jamming by the enemy, shown in table 3.2.

Table 3.1 [4]

Rate of fire [shots/min]	550
Shooting distance on a target[m]	4000
Target speed [m/s]	350
Number of pieces	1
Single shot kill probability	0.0022

According to the relation below flight duration of the target within range (t) is11,429 s,

$$t = \frac{4000}{350} = 11.429\,s$$

The rate of fire in shots/second is 9,

$$\frac{550}{60} = 9.167 \cong 9$$

The number of projectiles fired bysingle cannon is obtained by multiplying the duration of the flight within range (11,429 s) with rate of fire (9 shots/s) and number of cannons (one cannon) and it is equal to 103.

$$11{,}429 \cdot 9 \cdot 1 = 102.861 \cong 103$$

According to the relation 3, the kill probability to a burst of 21 projectiles is 0.045:

$$P_{21} = 1 - e^{-0.0462}$$
$$P_{21} = 1 - 0.955 = 0.045$$

The aerial target is not destroyed because the kill probability is less than 0.8.

Table 3.2 Kill probabilitywith one 2 x 35 mm anti-aircraft cannon, without jamming

Number of fired projectiles	21
Kill probability	0.045
Target is destroyed?	NO

3.2 Single missilekill probability within the air defense missile subunits.I considered the same conditions as the previous case. At all missiles I took into account the kill probability with one missile, and in case of using radio-electronic jamming by the enemy,I considered the factors involved to obtain the destruction possibilities as close to the real situation.

In case the enemy uses radio-electronic jamming I considered that the jamming is passive and reduces the working capacity of the SRC with 25%, working capacity of SRD with 25% and preparedness for fight of systems is reduced by 20 % and thesafety coefficient in the operation of the launch installation with 10%.

3.3Kill probability of the anti-aircraft complex SA-7 GRAIL (CA-94) with a single missile, without using radio-electronic jamming by enemy. Considering the kill probability with a single missiles complex SA-7 GRAIL (CA-94) in the two situations (target which execute maneuvers and target which fly rectilinear) are obtained kill probabilities, without using radio-electronic jamming by enemy, shown in table 3.3.

a) The target does not change its angle from horizontal flight:

In this situation, the kill probability with a missile is 0.7. The target is destroyed because the probability is greater or equal to 0.7.

b) The target changes its angle from horizontal flight:

In this situation, the kill probability with one missile is 0.4. The target is not destroyed because the probability is less than 0.7. The number of missiles required for the destruction of aerial target is 3.

$$1 - (1 - 0.4)^3 = 0.784$$

Table 3.3 Kill probabilitywith one CA-94 missile, without jamming

	a)	b)
The kill probability	0.7	0.4
The target is destroyed?	YES	NO
The number of missiles required to destroy the target	1	3

Table 3.4Kill probability with two CA-94 missiles, without jamming

	a)	b)
The kill probability	0.91	0.64
The target is destroyed?	YES	NO

3.3 Mixedkill probabilities(concentrated and repartition) with a shot and a missile / 21 shots and 2 missiles

According to relation (7), we'll obtain,

$$P(R \bigcup T) = 0.7 * 0.0022 = 0.00154$$

-for a shot and a missile

$$P(R \bigcup T) = 0.91 * 0.045 = 0.041$$

-for 21 shots and two missiles

Table 3.5 Mixedkill probability by repartition of fire

	one shot and one missile	1 shots and 2 missiles
The kill probability	0.00154	0.041
The target is destroyed?	NO	NO

According to relation (6), we'll obtain,

$P(R \bigcup T) = 0.7 + 0.0022 - 0.7 * 0.0022 = 0.706$-for a shot and a missile

$P(R \bigcup T) = 0.91 + 0.045 - 0.91 * 0.045 = 0.914$

- for 21 shots and two missiles

Table 3.6 Mixedkill probability by concentration of fire

	one shot and one missile	21 shots and 2 missiles
The kill probability	0.706	0.914
The target is destroyed?	YES	YES

The variants examined in the study of the kill probability are plotted in Fig. 1 , 2, and

3.

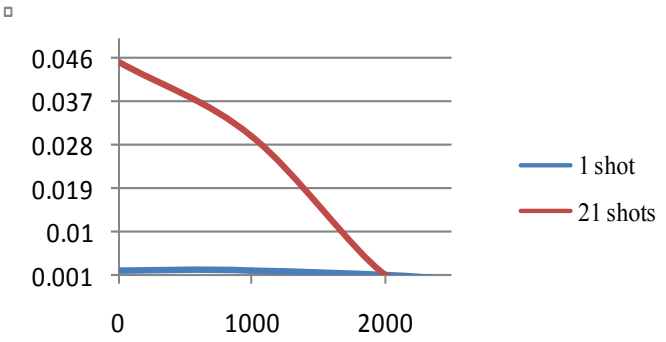

FIG. 1 The kill probability with a shot respectively a burst of 21 shots

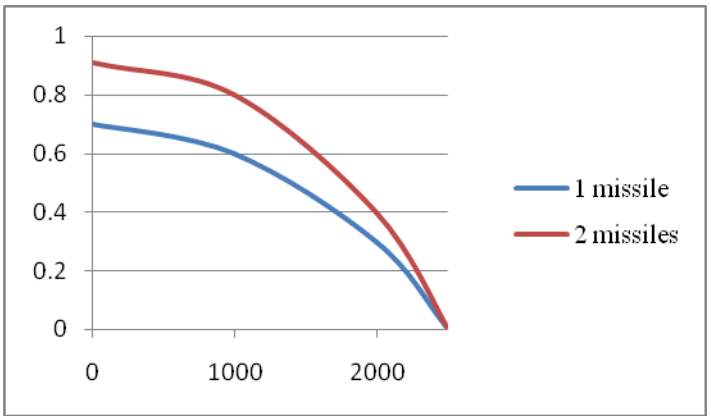

FIG. 2 The kill probability with missile respectively 2 missiles

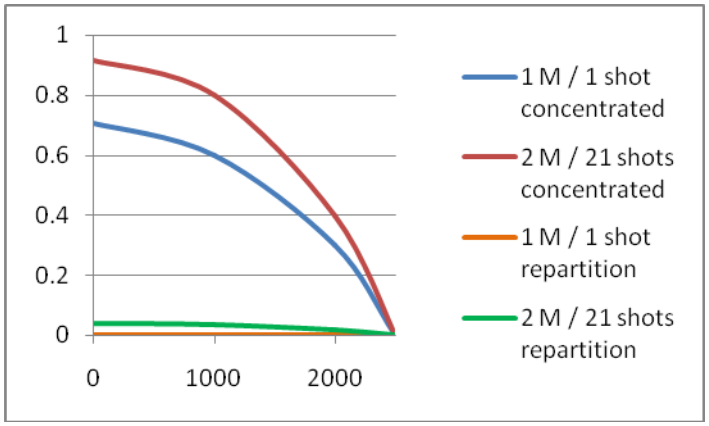

FIG. 3 Kill probability with a missile and a shot or two missiles and a burst of 21 shots in situation of concentrated fire respectively by repartition

CONCLUSIONS

The situation is different if the beneficiary has one or more of the following capabilities: military group program management, capable scientific group in the respectively domain, and industrial facilities, crews trained, able to highlight some deficiencies, tactics consultants to direct the program to specific requirements of troops or imposed by land.

Even if some of these capabilities are missing at a certain time, the political leadership can use such a program in order to create a basis for future developments.

To achieve this comparative study I considered two options aimed at employing two channels of service for artillery component or missile system, in condition of concentrated fire and fire distribution according to relations (6) and (7).

It can be noted that variant of using the mixed system with concentrated shooting with 2 missiles and a burst of 21 projectiles is the most effective providing a probability of 0.914.

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THE IMPLEMENTATION OF THE ELECTROMAGNETIC RAILGUN ON TYPE 22 FRIGATES

Marian SAVA[*], Ana-Maria ȘERBAN[*]

[*]"Mircea cel Bătrân" Naval Academy, Constanța, România (marian.vasile.sava@gmail.com), [**]Military Technical Academy, București, România (anaa.serban@yahoo.com)

Abstract: *A railgun is an electromagnetic projectile launcher based on similar principles to the homopolar motor. A railgun comprises a pair of parallel conducting rails, along which a sliding armature is accelerated by the electromagnetic effects of a current that flows down one rail, into the armature and then back along the other rail.The United States Navy has been developed this railgun and tried to implement on their warships. After a lot of surveys they succeeded to built a railgun in 2006 and they demonstrated a test with it. The main problem the U.S. Navy has had with implementing a railgun cannon system is that the guns wear out due to the immense pressures, stresses and heat that are generated by the millions of amperes of current necessary to fire projectiles with megajoules of energy. Currently the only US Navy ships that can produce enough electrical power to get In our case, we are interested if the Romanian Navy can develop such a weapon on the type 22 frigates. For this improvement we are going to study the possibility of locate the rail gun in the bow, the electrical power that can be generated by the ship and the resources needed.*

Keywords: *railgun, electromagnetic, frigates, modern weapons, research*

1. INTRODUCTION. RESEARCH PURPOSES

Romanian Navy is a category of armed forces of Romanian Army which performs operations particularly in the Black Sea and the Danube River. The official name of "Romanian Navy" was given by the Romanian People's Republic authorities and held since 1989. Until 1948 it was called the Romanian Royal Navy and before 1880, the Royal Fleet.

Currently, the Navy continues the significant tradition significant for this category of military forces in the interest of the nation and the defense of generous ideals such as security of borders, river security and developing complex military-diplomatic relationships in Black Sea and wherever the Romanian state geostrategic interests are.

In our opinion, our work summarizes well the theme proposed fitting all aspects necessary for the purpose that we have proposed.

Our determination to approach this issue came from the need of development of the Romanian army and also the Navy in the global context.Concidering Romania's membership in the largest military group in the world, NATO, our army must align to all group partners to increase the efficiency of the North Atlantic Aliance.

On the other hand the subject was a challenge for us to demonstrate our knowledge and training in military education institutions to which we belong, namely the Military Technical Academy and Naval Academy "Mircea cel Batran". Also challenging was the fact that the work was done remotely, cooperation between us was only through media communication.

In order to achieve this theme was required an interdisciplinary collaboration. From here comes our partnership. Applicability of the subject goes to the Romanian Navy but it`s about a weapons problem, therefore cooperation between a marine engineer and one weapons engineer was ideal for this work as well.

THEORETICAL APPROACH

RAILGUN

A railgun is a projectile launcher based on similar principles as the homopolar motor. A railgun comprises a pair of parallel conductors rails, along which a sliding armature is accelerated by the electromagnetic effect of a current down along one itself, then returns along the other.

Railgun is being researched as a weapon that does not use any explosives or substances such fuels, but based on electromagnetic forces to achieve a very high kinetic energy of the projectile. While guns explosive-based propulsion can not get too easy a velocity of over 2 km / s, railgun may slightly exceed 3 km / s.

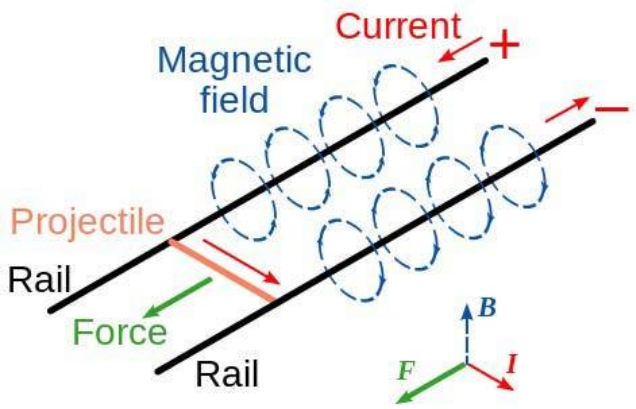

FIG. 1 – Operating principle of the RAILGUN

A railgun needs a source of direct current, pulsed. For any applications, sites of interest because railgun may be obtained initial speeds much higher than those obtained with conventional guns based on chemical propellants. Therefore, the military electromagnetic guns are designed to achieve initial speeds between 2000 and 3500 m / s with an initial energy between 5 – 50 MJ.

Applications

Surface warfare Division of the US Naval Forces executed a cannon firing demonstration electomagnetic 8 MJ projectile 3.2 kg in October 2006 as a cannon protopip of 64 MJ which would enter into equipping naval vessels US.

Currently, the only US naval vessel that is able to produce enough electric power to reach the desired performance is Zumwalt class destroyers; they can generate a power of 78 mega watts, much higher than required for electromagnetic cannon. Engineers are working to derive military technology already developed for the series of destroyers DDG-100 in a

battery system so that weapons and equipment to enter other vessels. The current destroyers of the US Navy have provided only nine MW of additional power, while energy would be needed approximately 25 MW to launch a projectile at the desired maximum beating.

Type 22 Frigates

Characteristics:

• Dispacement: 4900 tdw
• Lenght: 148,2 m
• Maximum speed: 30 kn
• Beam: 14,7 m
• Weapons
• OtoMelara – 76mm fastgun
• Torpedoes lunch sistems
• Jamming equipments TERMA
• Electronic warfare sistems
• Puma Naval helicopther

FIG. 2 – Type 22 Frigate "Regele Ferdinand"

Missions

The frigates can perform a variety of missions, capabilities these ships insured by combat systems against surface vessels (ASuW), anti-submarine warfare (ASW), anti-aircraft defense (AAW), the detection and avoidance of Mines (MCM), electronic warfare (EW) but also facilities for special operations.

1. Collective defense missions in support of peace within NATO or under UN, EU and OSCE
2. Crissis missions
3. War missions

APPLICATIVE APPROACH

1. Financial aspect

The Navy is interested primarily a low price, not advanced technologies. This time, however, the two go hand in hand. The gun uses electromagnetic speed and no explosives in order to destroy targets, leading to a financial advantage. The principle works is the Lorentz force, so the force acting on a charge carrier moving in a magnetic field.

Modernization plan

Considering the advantages of naval procurement program, we propose a program over 4

years, which is intended to implement an electromagnetic gun on a Type 22 Frigate. To complete the project, taking into account the following:

1. NATO partnership
2. Production of a RAILGUN by the Research and Design Institute for Shipbuilding - ICEPRONAV and acquire ammunition from the US.
3. Collaboration with the US Navy Research Center in Dahlgren, Virginia

2. Technic aspect

Upgrade procedure of Type 22 Frigates with a electromagnetic railgun involves technical issues such as space for such a weapons system on board. If we take the ship in its current state (with all equipment and systems on board) is not capable of mounting the Railgun. The only possibility that makes this possible is to extract naval artillery installation type 76/62 SRGM placed in the bow, with stores projectiles. As an important factor in placing the gun in place of the existing one (bow) is the ideal strategic position to provide a large range and space to handle the gun turret.

Loading naval artillery 76/62 SRGM OttoMelara facility is currently undergoing a chain hoist, arms projectiles coming from the circular magazine. The firing of the electromagnetic railgun is very simple in that it uses bands that are willing projectiles.

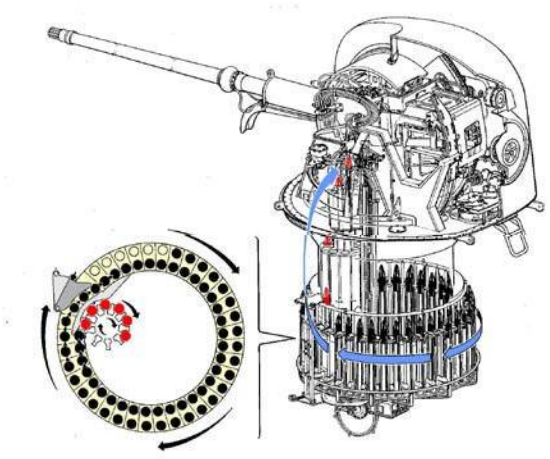

FIG. 3 – OtoMelarare willing projectiles.

To achieve all these changes in the frigate, all work will be done in Mangalia shipyard by military engineers and soldiers but also civilians. Calculation of trim and stability is absolutely necessary because the ship will take another load on board.

In conclusion railgun weapons system implementation is technically possible, by inserting necessary space available in the ship's structure by removing the artillery plant OttoMelara. Changes in the structure of the ship can be made easily in Mangalia shipyard military civilians by military engineers respectively.

3. Energetic aspect

Considering the technical characteristics of the Railgun presented in the first part, system integration cannon armament of the type 22 frigate modernization implies a power source capable of fueling this gun.

Currently, Romanian frigates are mounted on board four diesel generators of 1MW each 450V / 60 Hz / 3 phases. This power, 4 MW (under simultaneous operation of the 4 DGs) is more than sufficient for ship consumption. But our cannon requires a much higher energy of the order of 15 MW.

For it will aim to eliminate the 4 DGs and replace them with others with higher performance and more modern. Consulting offer from HYUNDAI HEAVY INDUSTRIES CO., LTD., In their list of products a diesel generator type HSJ7 805-10P. First the energy it develops the diesel generator is more than 6 times higher than current DGs of our frigates, about 6.5 MW.

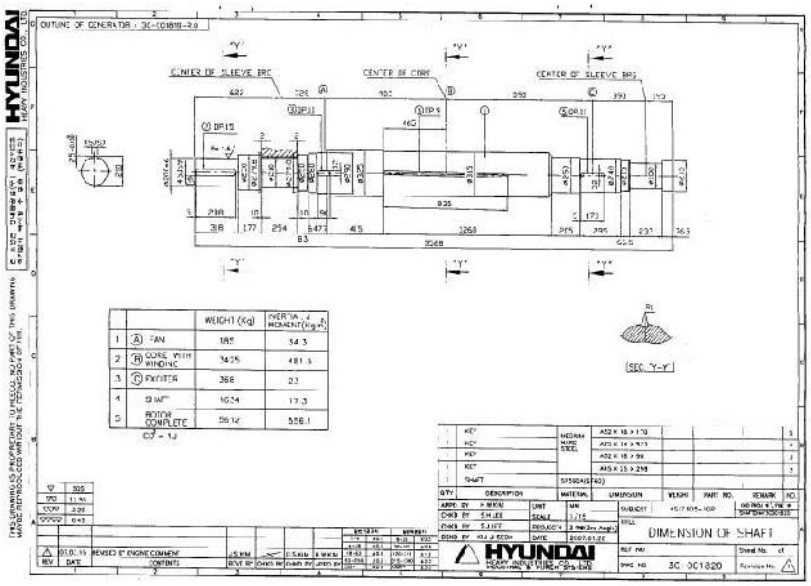

FIG. 4 - Diesel generator type HSJ7 805-10P

In order to change the current diesel generators aboard the type 22 frigate with the Hyundai brand will be able to work simultaneously with those presented in the previous section, the military shipyard in Mangalia.

Secondly, HYUNDAI HEAVY INDUSTRIES offer generator CO., LTD. It is modern, with a low diesel consumption, so an economic generator. Thirdly, the design DG is very economical in terms of the space occuped in the engine room of the ship.

Therefore, in terms of energy, railgun weapons system installation is possible only with the purchase of new diesel generators fully satisfy electricity requirements of this weapon system.

4. Specialized staff

It is necessary and carry out staff training to operate new weapons systems from the type 22 frigate. In this regard, it will initiate projects funded by NATO investment, as well as projects that will be achieved through national investments during 2016 -2020. For this, a detachment of six officers and 10 NCOs Navy will benefit from courses in the US Navy Research Center in Dahlgren. Long-term plans to expand specialization in our country, therefore the Ministry of Defence will take steps to create new degree programs both within the Military Technical Academy, and in the Naval Academy "Mircea cel Batran". Thus, in these two military institutions of higher education will create new departments to operate as best new weapon system, as presented in the following table

	Naval Academy	Technical Academy	Year of study
1	The theory of modern weapons systems	Electromagnetism	1st
2	HighVoltage Diesel Generatoars	Electromagnetic weapons systems	2nd
3	Electromagnetic weapons systems	The theory of modern weapons systems	3rd

CONCLUSIONS

Considering the context of military in the world and the necesity to modernize the armed forces in order to align at the standards imposed by the European Union and especially the North Atlantic grouping of which Romania is member, this work comes with a modern and workable solution.

After analyzing the subject proposed, the conclusion ist hat the naval forces and more specifically a Romanian frigate can pe equipped with an modern weapon system is in terms of financial, technical, energy and staff instruction.

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ROMANIA
"Henri Coandă" Air Force Academy

160 Mihai Viteazul st. Brasov 500183
Tel +40 268 423421
www.ahafc.ro/afastud/arhiva.html