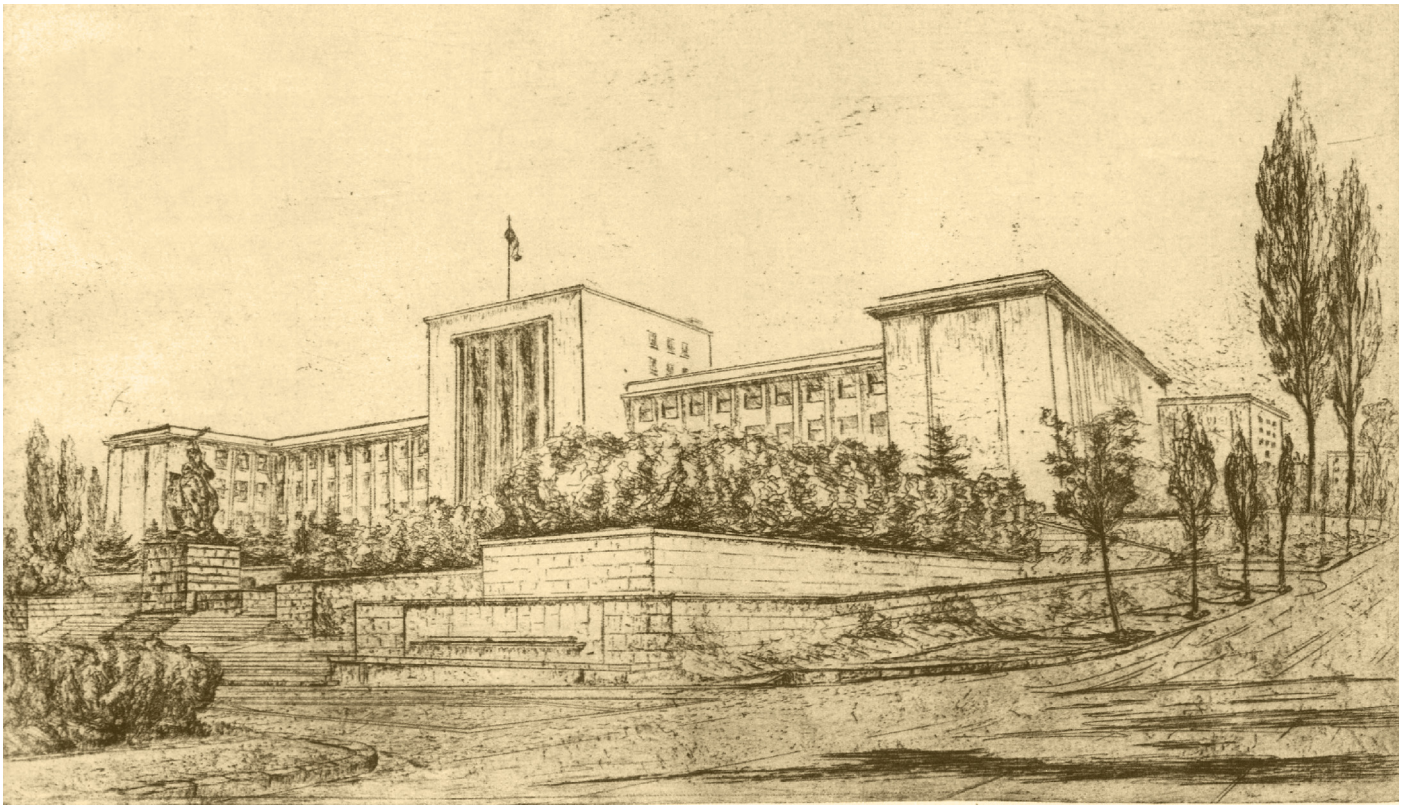
BULLETIN

OF
”CAROL I” NATIONAL DEFENCE UNIVERSITY

4 / 2021



SCIENTIFIC PUBLICATION HIGHLY ACKNOWLEDGED IN THE FIELD OF ”MILITARY SCIENCES, INFORMATION AND PUBLIC ORDER” OF THE NATIONAL COUNCIL FOR ATTESTATION OF ACADEMIC DEGREES, DIPLOMAS AND CERTIFICATES, INDEXED IN INTERNATIONAL DATABASES EBSCO, CEEOL, GOOGLE SCHOLAR, INDEX COPERNICUS, PROQUEST, DOAJ & ERIH PLUS

PUBLICATION FOUNDED IN 1937

”CAROL I” NATIONAL DEFENCE UNIVERSITY PUBLISHING HOUSE
BUCHAREST, 2021

Cover: Andreea GÎRTONEA

The articles published in the Bulletin of "Carol I" National Defence University, ISSN 2284-936X, L 2284-936X, are also found in full text – title, author, abstract, content and bibliography – in the Romanian version of the journal, ISSN 1584-1928.

EDITORIAL BOARD

1. HONORIFIC BOARD

Brigadier Gen. Dorin-Corneliu PLEȘCAN	"Carol I" National Defence University
Georgeta GAVRILĂ, PhD	Ministry of National Defence
Brigadier Gen.Prof. Constantin Iulian VIZITIU	Military Technical Academy
Brigadier Gen.Prof. Ghiță BÎRSAN, PhD	"Nicolae Bălcescu" Land Forces Academy
Commander Conf. Eng. Alecu TOMA, PhD	"Mircea cel Bătrân" Naval Academy
Commander Assoc.Prof. Marius ȘERBESZKI, PhD	"Carol I" National Defence University
Col.Assoc.Prof. Marius-Victor ROȘCA, PhD	"Carol I" National Defence University
Col.Prof. Valentin DRAGOMIRESCU, PhD	"Carol I" National Defence University
Col.Prof. Ioana ENACHE, PhD	"Carol I" National Defence University
Col.Assoc.Prof. Cosmin-Florian OLARIU, PhD	"Carol I" National Defence University
Col.Prof. Doina MUREȘAN, PhD	"Carol I" National Defence University
Col.Lect. Florin CÎRCIUMARU, PhD	"Carol I" National Defence University
Col.Prof. Marinel-Dorel BUȘE, PhD	"Carol I" National Defence University
Col.Prof. Lucian-Dragoș POPESCU, PhD	"Carol I" National Defence University
Lt.Col. Assoc.Prof. Niculai-Tudorel LEHACI, PhD	"Carol I" National Defence University
Col.Assoc.Prof. Ștefan-Antonio DAN ȘUTEU, PhD	"Carol I" National Defence University
Col.Assoc.Prof. Daniel ROMAN, PhD	"Carol I" National Defence University
Maj.Assoc.Prof. Marinel-Adi MUSTAȚĂ, PhD	"Carol I" National Defence University
Lect.Florian BICHIR, PhD	"Carol I" National Defence University
Col.Prof. Cezar VASILESCU, PhD	"Carol I" National Defence University
Inspector Carol Teodor PETERFY (Winner of the Nobel Peace Prize in 2013)	Organization for the Prohibition of Chemical Weapons – OPCW

2. SCIENTIFIC BOARD

Assoc.Prof. Iulian CHIFU, PhD	"Carol I" National Defence University
Prof. Daniel DUMITRU, PhD	"Carol I" National Defence University
Prof. Gheorghe MINCULETE, PhD	"Carol I" National Defence University
Prof. Teodor FRUNZETI, PhD	"Titu Maiorescu" Christian University
Prof. Sorin TOPOR, PhD	"Carol I" National Defence University
Prof. Marian NĂSTASE, PhD	The Bucharest University of Economic Studies
CS II Alexandra-Mihaela SARCINSCHI, PhD	"Carol I" National Defence University
CS II Cristina BOGZEANU, PhD	"Carol I" National Defence University
Pavel OTRISAL, PhD	University of Defence, Brno, Czech Republic

CONTENT

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-38

THE GEOPOLITICAL IMPACT OF THE EMERGING TECHNOLOGIES

Assoc.Prof. Alba-Iulia Catrinel POPESCU, PhD*

In addition to the cortege of disasters generated by the SARS-CoV-2 pandemic, the current global medical crisis has also had a positive effect. More than ever, it has brought up the fundamental role played by scientific and technological research in the progress of mankind and in its defense against disruptive threats. The modern technological age of the Third Millennium has changed the human-machine relationship. Today, technologies seem to go beyond their status as a tool of power, turning into active players, who determine policies, sharpen stakes, trigger competitions. Step by step, artificial intelligence (AI), 5G, cyber security, robotics, semiconductors and microprocessors, cloud computing, cloud combat and digital networks have taken over human activities and, by extension, international geopolitical dynamics. And, all the subsequent consequences of the technological "sprint" (political, strategic, economic and social) are involving states, international organizations and private companies. The dynamics of competition and international cooperation are being transformed. This article aims to present the impact of the state-of-the-art technologies on contemporary geopolitical dynamics and, in extenso, on Romania's security.

Keywords: technology geopolitics; strategic ores; disruptive technologie; emerging technologies; artificial intelligence; Romania.

The history of mankind was written by technology. From antiquity to the present, the great civilizations and, implicitly, the great powers have developed around two pillars: geography through topography and resources (water, food, energy, minerals) and a technology that was able to ensure a strategic advantage in front of direct competitors. If geography represented the fixed, immutable pillar, the "geographical axis of history" of each nation or empire, it was technologies that made the difference. Therefore, we can say that the geo-history of humanity is, in fact, a chronicle of technological progress expressed in political and strategic terms.

It took several millennia for the mankind to get, in 1698, into the modern technological age through the pressurized steam boiler, the invention of the French physicist Denis Papin (1647-1713). And another eight decades were to pass so that English engineers Thomas Newcomen (1663-1729), in 1712, and later James Watt (1736-1819), in 1776, might be able to build the steam engine, the machine that would radically transform human society and its history, through the race for wood (beech) and coal. It did not take the same millennia for the second industrial revolution to happen. After centuries of discoveries regarding electromagnetic field and electricity, in May 1834, the Prussian engineer, Moritz von Jacobi (1801-1874), built the first rotary electric motor, opening a new "era" in the technological development of mankind and launching the race for hydrocarbons. A few decades later, in the twentieth century, mankind entered the third industrial revolution, with the invention of transistors, semiconductors and the Intel 4004 microprocessor, which brought with them industrial computerization and automation and the need for copper, germanium, platinum. Nowadays, digitization places humanity in the fourth industrial revolution, of information technology, already announcing the fifth one, the artificial intelligence. The current industrial revolution became more visible than ever in the context of the current SARS-CoV-2 pandemic, when quarantine hypertrophied the role of technology in the daily life of mankind, from the development of online commerce, to the development of e-learning tools and telemedicine.

How is geopolitical dynamics reconfigured by the current industrial revolution? How prepared is Romania for the new technological era?

New raw materials: strategic ores

First of all, the new industrial revolutions brought up new raw materials and, implicitly, new geopolitical stakes.

**"Carol I" National Defence University*
e-mail: *albapopescu1@gmail.com*

Any lecture in geopolitics affirms the determining role of resources in shaping geopolitical processes. For example, in the 18th century, the pursuit for beech forests and coal brought the Habsburg Empire to the vicinity of the Black Sea, where it came into direct competition with the Ottoman Empire. In the twentieth century, the pursuit of hydrocarbons became a strategic imperative for all the great competing powers, transforming the coastal land of the continental mass of the Eastern Hemisphere, and especially the expanded Middle East, into theaters of military operations, some still active currently, such as those in Syria, Libya, Yemen, Somalia. The hydrocarbons' stake has created failed and collapsed states, cross-border migration, secessionism, poverty, underdevelopment and the emergence of ultra-conservative radical ideologies, as can be seen from the recent history of the Islamic area, the richest in these resources. Moreover, hydrocarbons have built states, such as the Persian Gulf monarchies, have created poles of regional power (e.g. Iran and Saudi Arabia), and have constituted geo-economic, geopolitical, and security formats, either state or non-state, such as the *Organization of the Petroleum Exporting Countries*[1] (OPEC) or *The International Association of Oil & Gas Producers*[2]. Hydrocarbons have become power tools, carefully played by manufacturers. This was demonstrated in 1973, after the Yom Kippur Arab-Israeli War (October 6-26, 1973), when OPEC (through Egypt, Syria and Tunisia) imposed an embargo on oil supplies to states that supported the Israelis. Or, the current gas crisis instrumented by Russian company Gazprom, based on European dependence on Russian gas. A dependence amplified by raising the interest of some European partners in Russian natural gas pipeline projects in Europe to the detriment of solutions that would have diversified gas sources and diminished dependence on Gazprom taps, such as the pipelines under the Three Seas Initiative, still on project stage[3] (BRUA, GIPL, Eastring Baltic Pipe, etc.).

This competitive environment, which dominated the twentieth century and the first decades of the current century, generated by the race for hydrocarbons, is reconfigured under the impact of emerging technologies and the need for strategic ores, the raw materials of current industrial revolutions. This has been a well-known issue at European level since 2010, when the Raw Materials Supply Group chaired by the European Commission issued the report entitled *Critical Raw Materials for EU: Report of the Ad-hoc Working Group on defining critical raw materials*[4].

This report stated that future technological development and the maintenance of European economic competitiveness depend on 41 strategic ores, of which 14 are considered critical - "critical" meaning "a non-fuel mineral or mineral material essential to the economic and national security, the supply chain of which is vulnerable to disruption, and that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for economy or national security"[5].

The emergence of new raw materials was later confirmed, in May 2018, by the US, through *Executive Order 13817* on *A Federal Strategy To Ensure Secure and Reliable Supplies of Critical Minerals*[6] (82 FR 60835). The document contained a list of 35 ores[7], considered critical for the American technological future, among which all the 14 ores nominated by Europeans in their own list are included.

In the following years, both Europeans and Americans continued to report the need for strategic ores, whose number increased to 44, these new raw materials being mentioned in strategic documents issued by specialized forums on both shores of the Atlantic[8].

The special importance of these ores is generated, both by the strategic character of the industrial, military and civil sectors, in which they are used (Annex no. 2), and by the competing, emerging powers' control over the extraction and processing of these minerals.

As it can be seen in the map in Figure 1 (and in the table in Annex no. 1), China dominates the extraction and/or processing of 29 strategic ores, representing two thirds of the total strategic critical ores globally (Figure 2). In the case of 24 of these ores, namely antimony, bismuth, cerium, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, non-metallic graphite, holmium, lutetium, thulium, ytterbium, magnesium, neodymium, phosphorus, praseodymium, samarium, scandium, silicon metal, terbium and tungsten, China dominates the global market with over 65% of the market shares!

And in terms of rare earths, China has a monopoly on the entire economic chain, from extraction and processing to obtaining finished products.

Therefore, *China is the leading global producer of strategic ores which the present and future technological advance of the world depends on!* an advantage translated in terms of state power by the ability to maintain or change the current world order. In 1992, Deng Xiaoping (1904-1997), the gray eminence behind China's transformation into today's Asian hegemon, said his country will benefit from rare earths, just as the Middle East has

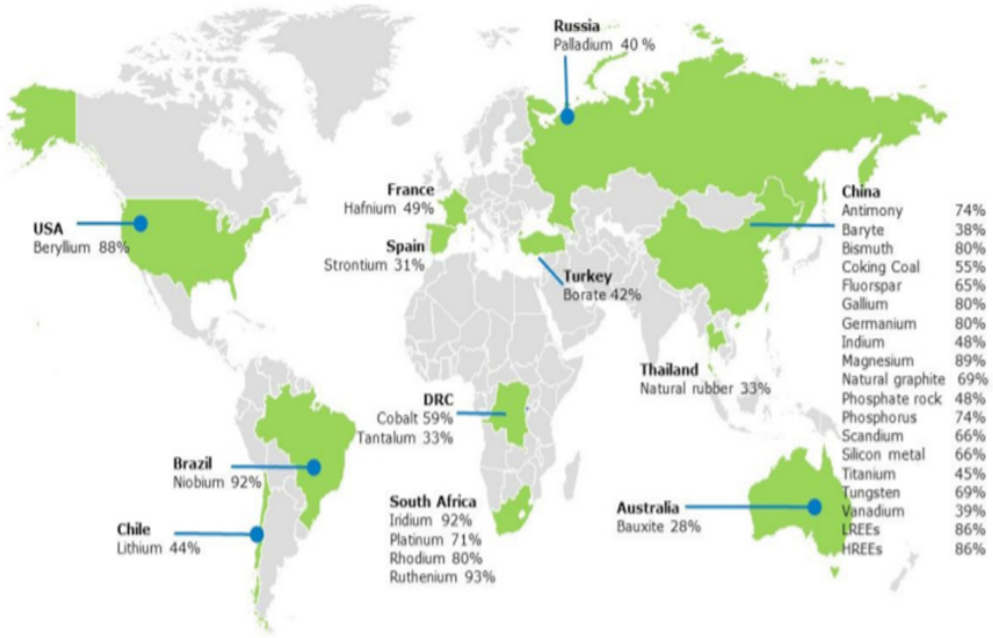


Figure 1 *Geographical distribution of strategic ore production in 2020*[9]

In turn, the US controls 88% of world beryllium production and Russia provides 40% of global palladium production.

These global players are joined by African states such as South Africa, which controls world production of platinum and platinum metals with market shares ranging from 71% to 93%, DR Congo, with huge cobalt deposits, representing 59% of global reserves as well as with coltan and tantalum, accounting for 33% of global reserves, and Guinea, with over 33% of global bauxite reserves. Or South American countries such as Brazil, which dominates 92% of global niobium production, and Chile, which provides 44% of global lithium production. States in which China is particularly present with investments and partnerships. For example, South Africa and Brazil are capacitated both in the BRICS[11] format and in bilateral strategic partnerships[12], and the other states are targeted by Beijing's investment strategies[13].

It is known that the states that dominate the production and processing of raw materials are the main beneficiaries of the industrial revolutions, benefitted from oil. Meaning that it will transform these minerals into a source of prosperity, a strategic weapon, a source of state power. The map in Figure 3 shows the European states' capacity to provide the need for strategic ores from their own production. Rarely, this capacity exceeds 1% of the need.

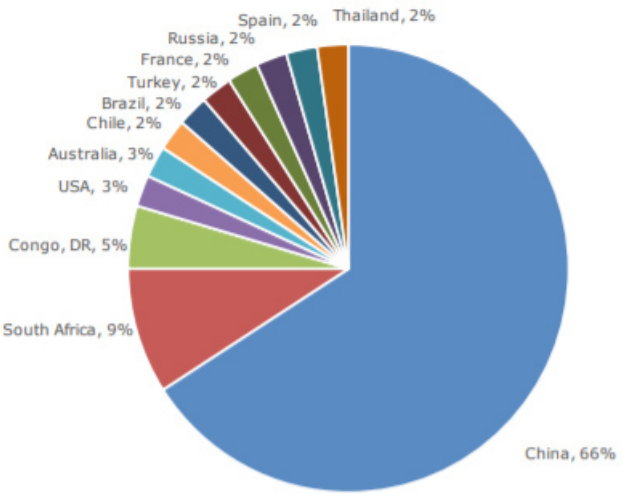


Figure 2 *Market share of the supply of critical raw materials at the level of 2020*[10]

And, we wonder how European countries will benefit from the advantages of these new technologies, as they depend on imports of raw materials from China and other competing areas? And how will China and other exporting powers use the strategic ore trump card?

In 2010 we had a first answer, when, for two months, Beijing stopped exporting rare earths to Japan, following a diplomatic dispute. The same happened when China stopped rare earth exports to the USA in 2010, amid trade frictions[15]. Decisions reminding of the Russian Federation's energy policy toward "recalcitrant" states in the Ponto-Baltic Isthmus region and demonstrating China's military use of strategic ores. Obviously, the direct economic consequences suffered by the Japanese and American industries forced the governments of these states to look for alternative suppliers in areas such as Africa, India, Australia, South America and to develop submarine extraction technologies. During all this time, from 2010 to the present, there has been no major paradigm shift in the policies developed by Westerners and Japanese in these alternative areas, in which China is increasingly present and dominant, such as Sub-Saharan Africa, South America, South China Sea, Indian Ocean.

Figure 3 *European producers of critical strategic ores*[14]

But it is not just China that owns the "rings" of future technological domination. For example, Russia's palladium reserves will become extremely important in the near future, as energy sources convert from carbon-based polluting technologies to "green energy". So are the osmium deposits of

Russia and South Africa. As a result of their ability to absorb hydrogen[16], the two platinum metals will become irreplaceable in technologies based on hydrogen batteries. This situation will generate a new European dependency on Russian and South African deposits – the African state that already has a monopoly on platinum production, a raw material present either in the composition or in the manufacturing process of one-fifth of all global consumer goods[17].

Moreover, the spatial ambitions, without which no future power will be internationally relevant, will depend on Brazil's monopoly on global production of niobium, the metal that generates the most intense and deepest magnetic fields. Being a type II superconductor, vortex generator and magnetic supercurrents generator when applying an external magnetic field, niobium is an irreplaceable raw material for space programs, super alloys, bolometers etc. American economist Jeremy Rifkin said, in 2014, that Internet technology and renewable energy, the "engines" of the third industrial revolution, heralded the end of fossil fuel dominance and of the current world order[18]. Nothing is more true and worrying, if we consider that the current Islamic area has been shaped by hydrocarbons and that states with more than 1.2 billion inhabitants, in the Middle East and Africa, mostly crushed by structural imbalances, poverty, neo-patriarchy and underdevelopment, depend largely on the oil industry. What will happen to this huge mass of people, how will the technological reconversion be achieved and how challenged will world order be? Hard to estimate. As equally difficult it will be to estimate how the "green" technologies for energy production will coexist with the polluting ones on the global market and how this binomial will be reflected in terms of stock market stability and the stability of the financial system.

Therefore, we can say that a first major geopolitical impact of emerging technologies is a new hierarchy of global areas relevant for the control and domination of raw material critical sources for the ongoing industrial revolutions, the Middle East being replaced by Asia-Pacific, followed by Africa and the two Americas. Or, in other words, the areas of marginality – described as such by the theorist of global areas, the American specialist in geopolitics Saul B. Cohen (1925-2021) – turn into areas of centrality in the equation of contemporary global domination. If it does not develop coherent strategies on alternative sources of African, South Asian and South American strategic ores, Europe will become increasingly irrelevant in terms of global power. Here we must mention the potential for influence lost by Romania with the withdrawal from Africa in the 1990s, a potential that could be restored, if there were a strategy and political will in this regard.

A second geopolitical impact is generated by China's emergence as the owner of two-thirds of the global resources of strategic ores which state-of-the-art military and civilian technologies depend on. This is a status of domination that cannot be overlooked and that must be taken into account in the event of an open confrontation with Beijing.

The third impact is related to the stakes of controlling alternative strategic resources and the risk of triggering future destabilizing geopolitical processes in more or less stable areas of South America, Asia-Pacific, Africa.

And, last but not least, we must remember the great geopolitical challenge addressed to the Islamic area, perhaps the least prepared for a change of energy paradigm and for the new societal transformations induced by disruptive technologies. Extensive destabilization of this area, in the immediate vicinity of the other civilizational areas of the Afro-Eurasian continental mass, would pose a serious threat to security and stability throughout the Eastern Hemisphere.

Disruptive emerging technologies

Disruptive technology is an innovation that significantly transforms sales markets, consumer behavior, the industrial structure of a territory. Always, a disruptive technology produces major, extensive, structural changes. The term "disruptive technologies" was introduced to the public circuit by the American economist Clayton M. Christensen (1952-2020), in the article called *The Innovator's Dilemma*, published in 1997. Since then, the term has become a buzzword in presentations, accompanying start-up business proposals that seek to create a highly attractive product.

If we remember the thesis of Jacques Attali from his reference work *A brief history of the future*, starting with the thirteenth century (when the first technological system for food production was built)

the dynamics of world economic hegemony poles was generated by the emergence of disruptive technologies against the background of economic and financial crises. Therefore, the progress of society is the direct result of the economic and technological factor. For example, says Attali, in the fourteenth century, economic hegemony migrated from Bruges (1200 - 1350) to Venice (1350 - 1500). Bruges was the place where the bourgeoisie was born through the industrialization of food production and the discovery of the built rudder. Venice was the place from where the conquest of the Orient began, through the caravels and the galleys built in its shipyards, and where the first banks, stock exchanges, trading houses, insurance companies were founded. Then, in the 16th century, economic hegemony reached Antwerp (1500 - 1560), where the mobile printing press was discovered. The mobile printing press industrialized the production of books, leading to religious reform. Later, the hegemony reached Genoa (1560 - 1620), where primary accounting through profit and loss accounts had been discovered. In the eighteenth century, economic hegemony moved to Amsterdam (1620 - 1788), the port that mass-produced the "flueth", the cheap and profitable ship, responsible for the great geographical discoveries. Then, in the nineteenth century, it reached London (1788 - 1890), where the force of steam and the manufacturing revolution produced structural transformations of the society. From that moment, bourgeoisie became the ruling class. This new political status-quo was followed by the separation of powers in the state, the constitutional monarchy, the market democracy, the peasant proletariat, the emergence of Marxism and the spread of colonialism.

At the beginning of the twentieth century economic hegemony left Europe, moving to the "New World". First, it moved to Boston (1890 - 1929), where the explosion engine and the electric motor had been discovered. These new inventions created a new product, the automobile, and a new raw material, the fuel. Then, it moved to New York (1929 - 1980), through the industrial use of the electric motor, the development of the household and audio-video equipment industry and the emancipation of women. And, finally, it reached Los Angeles (1980 - present), through the discovery of the microchip, the microprocessor, the internet, nano-technologies, space technologies and robotics[19].

Today, humanity is in the midst of economic and medical crisis. Crises over which new disruptive technologies overlap, such as e-commerce, social media platforms, GPS systems, e-learning platforms, telemedicine, cloud computing, fintech and blockchain – the technology behind Bitcoin. How close are we to the emergence of a new pole of economic hegemony? It remains to be seen.

In an increasingly technological society, at any time, that technology able to radically transform the market and the society can appear, regardless of the volume of start-up resources. Moreover, the great innovation is more likely to come from smaller, flexible, companies in emerging countries, than from a big company, that tends to focus on progressive improvements rather than revolutionary changes. And, as seen from the succession of global power centers described by Attali, disruptive technologies enhance the hegemonic transformation of the states that benefit from them, questioning, in the end, the *statu-quo* of the international system and the world order.

Such an innovation could become a "black swan", leading to an unexpected chain of consequences that require rapid adaptation, which means that systems that fail to adapt to the effects of disruptive technology may be faced with major losses. Such an innovation could be an alternative source of energy, that would effectively replace hydrocarbons, or a medical breakthrough that would cure chronic inflammation and remove entire segments of Big Pharma.

Yet, until a new economic hegemony emerges, current technologies will contribute to an even greater geopolitical and geoeconomic gap between the two "worlds", of rich and poor states, of rich and poor people. In this regard, it is enough to say that, currently, 592 million Africans[20], representing 42.8% of the continent's population, do not have access to electricity. And that 2.6 billion people worldwide, representing a third of humanity, do not have access to civilized conditions of cooking[21]. The situation is far from improving in the current period, when the SARS-CoV-2 pandemic has affected global economic macro-equilibria, including in states known as major donors in financial support funds for "third world" countries. In fact, a report by the International Monetary Fund, issued at the end of 2020, states that Africa needs $ 1.2 trillion to recover from the impact of the pandemic, and

World Bank experts say 43 million Africans are at risk of extreme poverty[22].

Therefore, the first and most important geopolitical impact of the emergence of disruptive technologies is the widening of the development gap between rich and poor countries. Thus, the rich become even richer, by concentrating wealth in a small number of technological power poles, while the poor become even poorer through an even deeper underdevelopment. An underdevelopment also amplified by a very low access to sanitation, medical services and education. On the other hand, in the world of the rich, population is decreasing and older, while in the world of the poor, population is increasing and younger. How will these two facets, demographic and economic, of the present and future world be reconciled? Most likely we will see great migration waves from the poor South to the richer North. And how will the North withstand the siege of illegal cross-border migration? Hard to anticipate. It may lead to a broad process of fragmentation of global zones and a return to the essence of the idea of state sovereignty and Westphalian order. Or, it may lead to a fundamental reconfiguration of the world order into a global governance able to manage the gaps and the security challenges generated by them. Or to other ways around.

But the development gaps are not to be found only among states. They are present even within societies. For example, in the US, about a quarter of low-income adults under $ 30,000 a year (representing 24% of the total adult population) say they do not own even a smartphone[23].

About four out of ten lower-income adults do not have broadband services at home (43%) a desktop or laptop computer (41%). Most low-income Americans do not own tablets. By comparison, each of these technologies is almost ubiquitous among adults in households earning at least $ 100,000 a year. And in April 2020, under the quarantine imposed by the pandemic, 59% of low-income American parents said they faced at least one of the three digital barriers to ensuring their children's online education, namely: the lack of reliable internet, the lack of a home computer, the lack of a smartphone to complete homework[24]. Therefore, in the context of the digitized society, *a new type of division* of the society appears, the digital one. Also, *a new indicator* appears, reflecting the accessibility to digital services. Where will this new gap lead? Most likely to an even greater social polarization and, subsequently, to a radicalization of the poor, who will feel increasingly marginalized and more unable to meet their social needs.

Therefore, a second geopolitical impact of current technologies is the deepening discrepancy between social strata, even more intense polarization of society, increasing social tensions and radicalization of poor strata, followed by increased risk of populist and extremist movements. These social phenomena are geopolitically translated into amplifying centrifugal forces that predispose to conflict, secessionism, state failure.

And, last but not least, we must remember the growing global dependence on manufacturers of subassemblies that are part of technological products. Therefore, there is not only a dependence on raw material suppliers, but also a global dependence on subassemblies manufacturers. For example, in the field of microprocessor production, the two market leaders, TSMC[25] in Taiwan and Samsung in South Korea, cover almost 75% of global production contracts[26]. TSMC is the largest global manufacturer of electronic contact chips, on which depend the productions of companies such as Apple or Huawei[27]. Moreover, the Taiwanese administration is heavily investing in technological research and, in particular, in the development of new manufacturing technologies using artificial intelligence (AI). A state policy that places the disputed island Republic, situated in the immediate vicinity of China, at the forefront of the future beneficiaries from the fifth industrial revolution. But what would happen if Taiwan and South Korea were involved in regional wars? What could be the geoeconomic impact of the total lack of semiconductors and microprocessors manufactured in the two countries? There could be only one answer – a cataclysmic impact. The global dependence on subassemblies produced in East Asia is becoming a tool of power for seemingly vulnerable nations.

Therefore, a third geopolitical impact of high technologies refers to their new status of *tools of power with exceptional defensive value* – through global dependence on subassemblies producers and through technological advancement. On one side, a collapse of the main subassemblies producers could lead to the collapse of global production chains of entire industries, with incalculable geoeconomic

and geopolitical consequences that could end up in hegemonic wars. On the other side, the technological advancement brings prosperity and creates the premises for maximizing state power. And, last but not least, technological dependencies can configure alliances, coalitions, security architectures, meant to preserve the status quo and to provide the security of technological zones with maximum geoeconomic and geopolitical importance. So, in the current global technological environment, technological status should be treated as an independent source and tool of power in any specific, professional, analysis.

Modern warfare in the age of artificial intelligence

Also, the current industrial revolutions left their mark on the way war is waged, perhaps the oldest way of *doing politics by other means*[28]. In this regard, the American analyst Harlan Ullman, theorist of the *massive attack of disruption (MAD) concept*, believes that the war of the future will be waged by these disruptive attacks. MAD are included into the *shock and awe* doctrine, by which the opponent's will to fight is paralyzed by the overwhelming magnitude of the attack. These massive disruptive attacks, described by Ullman as "the fifth knight of the Apocalypse" are generated by seven major disruptive forces: government failure, climate change, cyberspace, social networking, drones, terrorism and explosive indebtedness[29]. Forces that are targeting societal vulnerabilities and are acting synergistically through mutual empowerment, having a massive impact on the population. Forces acting on the "fabric" of interests and dependencies created by the interconnections of globalized, hyper-technological society. Forces that are terrifying precisely through the multitude of effects, on the domino principle, generated by the interference among technology, power diffusion and de-structuring of the Westphalian states[30].

The modern warfare, of the fifth generation, is a confrontation of the extended, interconnected and interdependent digital networks, which ensure in real time the collection and transmission of data, the detection and the evaluation of the impact, the transmission of the command; of combat-clouds that allow the extraction and addition of data by digitally activating key combat platforms; of multi-field combat tactics in the five synergistic operational areas – land, sea, air, space and cybernetics; of fusion – warfare, through the vulnerabilities generated by the command and control war, such as additional information flows, software incompatibilities and intrinsic vulnerabilities to attack and deception.

All these new facets of war are the result of the last industrial revolutions' technologies and bring with them a new and frightening challenge. If regarding the competition for critical raw materials, a state may or may not choose to join the race for resources and, regarding the technological advancement, it may try or not to align itself with emerging technological powers, in terms of warfare, the access to the state-of-the-art technology and artificial intelligence makes the difference between survival and annihilation.

What does this mean in terms of security and geopolitics?

First of all, the idea of collective security and alliances, the only formulas by which states can be able to withstand the current technological sprint.

Secondly, a potential sliding towards a "techno-civilizational" global order, made by technological nomoses, meaning global technological regions. This new global configuration of technological nomoses attracts a large number of international actors, united by common interests, principles and values and, in case of confrontation, huge battlefields, massive forces engaged in battle, massive destructions and huge costs[31].

Third, a new world order dictated by technological powers, which will be the future hegemons of the planet. A new world order which can take the current hegemonies out of the game, if they will not be able to keep up with the technological advance. A new world order which can bring to the fore other hegemonies – states or alliances.

Instead of concluding: what is the geopolitical impact of these emerging technologies for Romania?

In the last 30 years, Romania has lost at all the levels of technological power.

Romania left the African continent, where it was an active geostrategic player and where it could have used the capital of influence created with great financial efforts during the Communist time. The same foreign policy was also practiced in South America and South Asia, other "third

world" zones where Romania was player before 1989. Today, that capital of influence could have turned into a tool of power, given the future race for strategic ores in Africa, Asia and South America.

In terms of scientific research, Romania is experiencing a worrying decline, due to the lack of a strategy aimed at aligning the country's technological status to the average of Western states. In 2021, Romania was ranked 48th out of 132 states worldwide by the *Global Innovation Index ranking*. The ranking included states from conflict-ridden or underdeveloped areas of Africa, Asia and South America. Even so, this medium-leading position was the result, rather, of infrastructure (electrification, sanitation, transport infrastructure) and economic performance, than of human capital and research itself – where it ranks 76th in the partial ranking. Or based on the degree of sophistication of the market – where Romania is placed in position 76. Or based on the creativity – where it is in position 72[32]. Therefore, Romania's position in the mentioned ranking does not reflect in any way a performance, not even mediocre, in the field of scientific research, if we look at the worrying 76th position, in the second half of the ranking.

In the hyper-technological society of the future, the alignment to and the technological supremacy will constitute criteria of hierarchy and evaluation in the real-political decision-making process. Why would anyone consume time and resources to support, protect or ally with a third-world technological state, geopolitically positioned in the gray-zone of the Ponto-Baltic Isthmus, on the edge of Europe's ancient empires? Or, in other words, for how long will the benefits of such support/alliance outweigh the costs of ensuring the security of a technologically underdeveloped state? What would be those attractive resources that could recommend it for such support or how important will its geostrategic position be in the context of such an international fluid environment?

On the other hand, all the issues discussed above can turn into challenges to Romania's national security, from the race for strategic minerals and the risk of destabilizing the entire Islamic zone under the impact of a new global energy paradigm, to massive illegal cross-border migration and disruptive technologies of the fifth-generation war. A modern war which is no longer a matter of anticipation, already being waged in Transcaucasia between Azerbaijanis and Armenian separatists from Nagorno-Karabakh in September-November 2020. Security challenges that risk tipping the balance between centrifugal and centripetal forces acting on the national territory, a balance resulting in the maintenance of the statu-quo.

Therefore, in the post-pandemic technological society, Romania's future can only be a technological one! Such a future involves developing a strategy to recalibrate the education and research system to the new challenges of the era of artificial intelligence and high technologies. A strategy where the cyber component (cyberwarfare, cyber-defence, cyber-education) will play a fundamental role. And, very importantly, a strategy for financing and developing technological and fundamental research platforms, that will attract researchers from the country, the diaspora and the neighboring areas.

NOTES:

1 https://www.opec.org/opec_web/en/, accessed on 31.10.2021.

2 https://www.iogp.org/about-us/, accessed on 31.10.2021.

3 ******The Three Seas Initiative – Priority Interconnection Projects,*** http://three-seas.eu/wp-content/uploads/2018/09/LIST-OF-PRIORITY-INTERCONNECTION-PROJECTS-2018.pdf, accessed on 31.10.2021.

4 ******Critical Raw Materials for EU: Report of the Ad-hoc Working Group on defining critical raw materials***, http://www.euromines.org/files/what-we-do/sustainable-development-issues/2010-report-critical-raw-materials-eu.pdf, accessed on 31.10.2021.

5 ******A Federal Strategy To Ensure Secure and Reliable Supplies of Critical Minerals,*** Executive Office of the President on 12/26/2017, https://www.federalregister.gov/documents/2017/12/26/2017-27899/a-federal-strategy-to-ensure-secure-and-reliable-supplies-of-critical-minerals, accessed on 18.06.2019, apud Alba-Iulia Catrinel Popescu, *Analize incomode*, Military Publishing House, Bucharest, 2020, p. 96.

6 *Ibidem.*

7 ******Final List of Critical Minerals 2018***, Interior Department on 05/18/2018, https://www.federalregister.gov/documents/2018/05/18/2018-10667/final-list-of-critical-minerals-2018, accessed on 18.06.2019.

8 ******Critical Raw Material***, https://ec.europa.eu/growth/sectors/raw-materials/areas-specific-interest/critical-raw-materials_nl; ******Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability,*** https://ec.europa.eu/docsroom/documents/42849;******Critical Minerals and U.S. Public Policy,*** https://www.everycrsreport.com/reports/R45810.html, accessed on 31.10.2021.

9 ******European Commission, Study on the EU's list of Critical Raw Materials – Final Report (2020),*** file:///C:/Users/Alba.Popescu/Downloads/CRM%20list%202020_Final%20Report.pdf, p. 6, accessed on 31.10.2021.

10 *Ibidem.*

11 Cooperation organization named after the acronym for member countries: Brazil, Russia, India, China and South Africa.

12 ***China and South Africa Hold the Tenth Strategic Dialogue* 2019/10/30, https://www.fmprc.gov.cn/mfa_eng/wjb_663304/zzjg_663340/fzs_663828/xwlb_663830/t1712585.shtml; *China maintains with Brazil long-term and stable strategic partnership based on mutual benefit,* https://www.fmprc.gov.cn/mfa_eng/ziliao_665539/3602_665543/3604_665547/t18025.shtml, accessed on 31.10.2021.

13 Odette Magnet, *Chinese investment in Chile sparks opportunities, concerns*, Al Jazeera, 03.09.2021, https://www.aljazeera.com/economy/2021/9/3/chinese-investment-in-chile-sparks-opportunities-concerns; Aaron Ross, Helen Reid, *Congo's $6 bln China mining deal 'unconscionable', says draft report*, Reuters, 08.10.2021, https://www.reuters.com/business/congos-6-bln-china-mining-deal-unconscionable-says-draft-report-2021-10-08/, accessed on 31.10.2021.

14 *** *European Commission, Study on the EU's list of Critical Raw Materials – Final Report (2020)*, p. 7.

15 Gus Lubin, *China just banned exports of Rare Earth Minerals to the US*, Business Insider, 19.10.2010, http://www.businessinsider.com/chinas-has-just-started-ban-of-rare-earth-metal-exports-to-the-us-2010-10, accessed on 20.12.2014.

16 Kohei Kusada, Miho Yamauchi, Hirokazu Kobayashi, Hiroshi Kitagawa, Yoshiki Kubota, *Hydrogen-Storage Properties of Solid-Solution Alloys of Immiscible Neighboring Elements with Pd*, J. Am. Chem. Soc., 2010, 132 (45), p. 1 5896–1 5898, October 27, 2010, http://pubs.acs.org/doi/abs/10.1021/ja107362z, accessed on 17.06.2015.

17 ***Platinum-Group Metals,* U.S. Geological Survey, National Minerals Information Center, 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-plati.pdf, accessed on 17.06.2019.

18 Jeremy Rifkin, *The Third Industrial Revolution. How lateral power is transforming energy, the economy and the world*, http://www.thethirdindustrialrevolution.com/, accessed on 20.12.2014.

19 Jacques Attali, *Scurta istorie a viitorului*, Polirom Publishing House, Iaşi, 2016, pp. 49 - 75.

20 ***Population without access to electricity in Africa from 2000 to 2020 (in millions),* https://www.statista.com/statistics/1221698/population-without-access-to-electricity-in-africa/, accessed on 01.11.2021.

21 ***SEforALL Analysis of SDG7 Progress – 2021*, https://www.seforall.org/system/files/2021-08/Analysis-SDG7-Progress-2021.pdf, accessed on 01.11.2021.

22 [BBC] "Africa 'needs $1.2tn' to recover coronavirus losses", 10.10.2020, https://www.bbc.com/news/world-africa-54491053, accessed on 01.11.2021.

23 Emily A. Vogels, *Digital divide persists even as Americans with lower incomes make gains in tech adoption*, Pew Research Center, https://www.pewresearch.org/fact-tank/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/, accessed on 31.10.2021.

24 Emily A. Vogels, *op. cit.*

25 Acronym for Taiwan Semiconductor Manufacturing Company.

26 Matthias Sander, *Ready, set, compute: The global race for microchip dominance*, Neue Bürcher Zeitung, 26.04.2021, https://www.nzz.ch/english/microchip-production-grows-increasingly-important-in-us-china-ld.1613831, accessed on 31.10.2021.

27 Sarah O'Meara, *From plastic toys to Industry 4.0: How Taiwan is using science to upgrade its manufacturing*, Nature, 15.01.2020, https://www.nature.com/articles/d41586-020-00060-1, accessed on 31.10.2021.

28 Paraphrasing the words of Carl Philipp Gottlieb von Clausewitz, *Despre război*, Antet Publishing House, Bucharest, 2001.

29 Harlan Ullman, *Al cincilea cavaler al apocalipsei şi noul MAD*, Military Publishing House, Bucharest, 2021, p. 30.

30 Alba-Iulia Catrinel Popescu, „Observații despre războiul de a cincea generație şi cel de-al doilea Război din Nagorno-Karabakh", Bulletin of "Carol I" National Defence University No. 3, 2021.

31 Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, Simon & Schuster, 1996, *passim*.

32 ***Global Innovation Index2021,* Tracking Innovation through the COVID-19 Crisis, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf, accessed on 31.10.2021.

33 ***European Commission, Study on the EU's list of Critical Raw Materials – Final Report (2020),* file:///C:/Users/Alba.Popescu/Downloads/CRM%20list%202020_Final%20Report.pdf, p. 5, accessed on 31.10.2021.

34 *** "Platinum and its use", *Total Materia*, http://www.totalmateria.com/page.aspx?ID=CheckArticle&site=ktn&NM=237, accessed at 20.05.2015, apud Alba-Iulia Catrinel Popescu, *op.cit.,* p. 99.

35 ***Platinum-Group Metals,* U.S. Geological Survey, National Minerals Information Center, 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-plati.pdf, accessed on 17.06.2019, apud *Ibidem.*

36 Kohei Kusada, Miho Yamauchi, Hirokazu Kobayashi, Hiroshi Kitagawa, Yoshiki Kubota, *Hydrogen-Storage Properties of Solid-Solution Alloys of Immiscible Neighboring Elements with Pd*, J. Am. Chem. Soc., 2010, 132 (45), p. 1 5896–1 5898, October 27, 2010, http://pubs.acs.org/doi/abs/10.1021/ja107362z, accessed on 17.06.2015.

37 Luke Burgess, *Investing in Rhodium, the World's Most Expensive Metal: The World's Most Exotic Precious Metal,* WEALTHDAILY, 21.05.2010, http://www.wealthdaily.com/articles/rhodium-investing/2507, accessed on 18.06.2015.

38 Terence Bell, *Metal Profile: Ruthenium,* http://metals.about.com/od/properties/a/Metal-Profile-Ruthenium.htm, accesat la 18.06.2015; Tania Bossi, *25 Proeminent and Promising Applications Using Platinum Group Metals*, IPA FACT SHEET, 2012, http://www.stillwatermining.com/pdf/25_Applications_of_PGMs.pdf, accessed on 20.05.2015.

39 ***Antimony,* Mineral Commodity Summaries, February 2019, USGS Survey, https://prd-wret.s3-us-west-2.

amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-antim.pdf, accessed on 19.06.2019.

40 Brian W. Jaskula, *Beryllium*, U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-beryl.pdf, accessed on 19.06.2019.

41 Kim B. Shedd, *Cobalt,* U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-cobal_0.pdf, accessed on 18.06.2019.

42 *Gallium – Ga,* Lenntech, http://www.lenntech.com/periodic/elements/ga.htm, accessed on 28.06.2015.

43 Brian W. Jaskula, *Gallium,* U.S. Geological Survey, Mineral Commodity Summaries, January 2019, https://s3-us-west-2.amazonaws.com/prd-wret/assets/palladium/production/mineral-pubs/gallium/mcs-2018-galli.pdf, accessed on 28.06.2015.

44 Micheal W. George, *Germanium,* U.S. GEOLOGICAL SURVEY MINERALS YEARBOOK—2003, http://minerals.usgs.gov/minerals/pubs/commodity/germanium/germamyb03.pdf, p. 2, accessed on 28.06.2015.

45 ******Mineral Commodity Summaries 2015*, U.S. Geological Survey, January 2015, http://minerals.usgs.gov/minerals/pubs/mcs/2015/mcs2015.pdf, accessed on 28.06.2015, p. 74; ******Indium Element Facts,* Chemicool, http://www.chemicool.com/elements/indium.html, accessed on 28.06.2015 apud Alba-Iulia Catrinel Popescu, *op.cit.,* p. 19.

46 E. Lee Bray, *Magnesium Metal,* U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-mgcom.pdf, accessed on 28.06.2019.

47 ******Niobium (Columbium) and Tantalum: Statistics and Information*, http://minerals.usgs.gov/minerals/pubs/commodity/niobium/, accessed on 29.06.2015.

48 Abraham J. Padilla, *Niobium (Columbenit),* U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-niobi.pdf, accessed on 29.06.2019.

49 Abraham J. Padilla, *Tantalum,* U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-tanta.pdf, accessed on 29.06.2019.

50 Kim B. Shedd, *Tungsten*, *Mineral Commodity Summaries*, U.S. Geological Survey, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-tungs.pdf, accessed on 30.06.2019.

51 Michele E. McRae, *Fluorspar,* U.S. Geological Survey, Mineral Commodity Summaries, February 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/mcs-2019-fluor_0.pdf, accessed on 30.06.2019.

52 *Graphite Applications,* FORTUNE GRAPHITE INC, http://www.fortunegraphite.com/graphite_uses.php, accessed on 30.06.2015.

53 Marc Humphries, *Rare Earth Elements: The Global Supply Chain, Congressional Research Service,* 08.06.2012, http://www.fas.org/sgp/crs/natsec/R41347.pdf, accessed on 24.12.2014.

REFERENCES

******A Federal Strategy To Ensure Secure and Reliable Supplies of Critical Minerals*, Executive Office of the President on 12/26/2017, https://www.federalregister.gov/documents/2017/12/26/2017-27899/a-federal-strategy-to-ensure-secure-and-reliable-supplies-of-critical-minerals

******China and South Africa Hold the Tenth Strategic Dialogue 2019/10/30,* https://www.fmprc.gov.cn/mfa_eng/wjb_663304/zzjg_663340/fzs_663828/xwlb_663830/t1712585.shtml

*** *** China maintains with Brazil long-term and stable strategic partnership based on mutual benefit, https://www.fmprc.gov.cn/mfa_eng/ziliao_665539/3602_665543/3604_665547/t18025.shtml

******Critical Raw Material*, https://ec.europa.eu/growth/sectors/raw-materials/areas-specific-interest/critical-raw-materials_nl

******Critical Minerals and US Public Policy*, https://www.everycrsreport.com/reports/R45810.html

******Critical Raw Materials for EU: Report of the Ad-hoc Working Group on defining critical raw materials*, http://www.euromines.org/files/what-we-do/sustainable-development-issues/2010-report-critical-raw-materials-eu.pdf

******Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability,* https://ec.europa.eu/docsroom/documents/42849

******European Commission, Study on the EU's list of Critical Raw Materials – Final Report (2020),* file:///C:/Users/Alba.Popescu/Downloads/CRM%20list%202020_Final%20Report.pdf

******Final List of Critical Minerals 2018, Interior Department on 05/18/2018, https://www.federalregister.gov/documents/2018/05/18/2018-10667/final-list-of-critical-minerals-2018

******Global Innovation Index2021, Tracking Innovation through the COVID-19 Crisis,* https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf

******Population without access to electricity in Africa from 2000 to 2020 (in millions),* https://www.statista.com/statistics/1221698/population-without-access-to-electricity-in-africa/

*** "Platinum and its use", *Total Materia*, http://www.totalmateria.com/page.aspx?ID=CheckArticle&site=ktn&NM=237

***Platinum-Group Metals, U.S. Geological Survey, National Minerals Information Center, 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-plati.pdf

***Platinum-Group Metals, U.S. Geological Survey, National Minerals Information Center, 2019, https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs-2019-plati.pdf

****SEforALL Analysis of SDG7 Progress – 2021,* https://www.seforall.org/system/files/2021-08/Analysis-SDG7-Progress-2021.pdf

****The Three Seas Initiative – Priority Interconnection Projects*, http://three-seas.eu/wp-content/uploads/2018/09/LIST-OF-PRIORITY-INTERCONNECTION-PROJECTS-2018.pdf

[BBC] "Africa 'needs $1.2tn' to recover coronavirus losses", 10.10.2020, https://www.bbc.com/news/world-africa-54491053

Attali Jacques, *Scurtă istorie a viitorului*, Polirom Publishing House, Iaşi, 2016.

Bell Terence, *Metal Profile: Ruthenium,* http://metals.about.com/od/properties/a/Metal-Profile-Ruthenium.htm

Burgess Luke, *Investing in Rhodium, the World's Most Expensive Metal: The World's Most Exotic Precious Metal,* Wealthdaily, 21.05.2010, http://www.wealthdaily.com/articles/rhodium-investing/2507

Humphries Marc, *Rare Earth Elements: The Global Supply Chain, Congressional Research Service,* 08.06.2012, http://www.fas.org/sgp/crs/natsec/R41347.pdf

Huntington Samuel P., *The Clash of Civilizations and the Remaking of World Order*, Simon & Schuster, 1996.

Kusada Kohei, Miho Yamauchi, Hirokazu Kobayashi, Hiroshi Kitagawa, Yoshiki Kubota, *Hydrogen-Storage Properties of Solid-Solution Alloys of Immiscible Neighboring Elements with Pd*, J. Am. Chem. Soc., 2010, 132 (45), October 27, 2010, http://pubs.acs.org/doi/abs/10.1021/ja107362z

Lubin G., *China just banned exports of Rare Earth Minerals to the US*, Business Insider, 19.10.2010, http://www.businessinsider.com/chinas-has-just-started-ban-of-rare-earth-metal-exports-to-the-us-2010-10

Magnet O., *Chinese investment in Chile sparks opportunities, concerns*, Al Jazeera, 03.09.2021, https://www.aljazeera.com/economy/2021/9/3/chinese-investment-in-chile-sparks-opportunities-concerns

O'Meara Sarah, "From plastic toys to Industry 4.0: How Taiwan is using science to upgrade its manufacturing", *Nature*, 15.01.2020, https://www.nature.com/articles/d41586-020-00060-1

Popescu Alba Iulia Catrinel, „Observații despre războiul de a cincea generație și cel de-al doilea război din Nagorno-Karabakh", *Bulletin of "Carol I" National Defence University*, no. 3, 2021.

Popescu Alba Iulia Catrinel, *Analize incomode*, Military Publishing House, Bucharest, 2020.

Rifkin Jeremy, *The Third Industrial Revolution. How lateral power is transforming energy, the economy and the world*, http://www.thethirdindustrialrevolution.com/

Ross A., Reid H., *Congo's $6 bln China mining deal 'unconscionable', says draft report*, Reuters, 08.10.2021, https://www.reuters.com/business/congos-6-bln-china-mining-deal-unconscionable-says-draft-report-2021-10-08/

Sander Mathias, "Ready, set, compute: The global race for microchip dominance", *Neue Bürcher Zeitung*, 26.04.2021, https://www.nzz.ch/english/microchip-production-grows-increasingly-important-in-us-china-ld.1613831

Ullman Harlan, *Al cincilea cavaler al apocalipsei şi noul MAD*, Military Publishing House, Bucharest, 2021.

Vogels Emily A., *Digital divide persists even as Americans with lower incomes make gains in tech adoption,* Pew Research Center, https://www.pewresearch.org/fact-tank/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/.

https://www.opec.org/opec_web/en/

https://www.iogp.org/about-us/

http://minerals.usgs.gov/

http://www.fortunegraphite.com/graphite_uses.php

http://www.lenntech.com/periodic/elements

https://prd-wret.s3-us-west-2.amazonaws.com/

Annex no. 1

TYPES OF STRATEGIC ORES AND THEIR MAIN GLOBAL PRODUCERS BY 2020[33]

	Mineral	Stage	Main global producer	Market share		Mineral	Stage	Main global producer	Market share
1	Antimony	E	China	74%	23	Magnesium	P	China	89%
2	Barium	E	China	38%	24	Natural graphite	E	China	69%
3	Bauxite	E	Australia	28%	25	Natural rubber	E	Thailand	33%
4	Beryllium	E	USA	88%	26	Neodymium	E	China	86%
5	Bismuth	P	China	80%	27	Niobium	P	Brazil	92%
6	Borate	E	Turkey	42%	28	Palladium	P	Russia	40%
7	Cerium	E	China	86%	29	Phosphates	E	China	48%
8	Cobalt	E	D.R. Congo	59%	30	Phosphor	P	China	74%
9	Coke	E	China	55%	31	Platina	P	South Africa	71%
10	Dysprosium	E	China	86%	32	Praseodymium	E	China	86%
11	Erbium	E	China	86%	33	Rhodium	P	South Africa	80%
12	Europium	E	China	86%	34	Ruthenium	P	Africa de Sud	93%
13	Fluorspar	E	China	65%	35	Samarium	E	China	86%
14	Gadolinium	E	China	86%	36	Scandium	P	China	66%
15	Gallium	P	China	80%	37	Metallic silicon	P	China	66%
16	Germanium	P	China	80%	38	Tantalum	E	D.R. Congo	33%
17	Hafnium	P	France	49%	39	Terbium	E	China	86%
18	Ho, Tm, Lu, Yb	E	China	86%	40	Titanium	P	China	45%
19	Indium	P	China	48%	41	Tungsten	P	China	69%
20	Iridium	P	South Africa	92%	42	Vanadium	E	China	39%
21	Lanthanum	E	China	86%	43	Yttrium	E	China	86%
22	Lithium	P	Chile	44%	44	Strontium	E	Spain	31%

Legend	
Stage	E = extraction; P = processing
Heavy Rare Earths	dysprosium, erbium, europium, gadolinium, holmium (Ho), lutetium (Lu), terbium, thulium (Tm), ytterbium (Yb), yttrium
Light Rare Earths	cerium, lanthanum, neodymium, praseodymium, samarium
Platinum Metals	iridium, palladium, platinum, rhodium, ruthenium

Annex no. 2

INDUSTRIAL APPLICATIONS OF STRATEGIC ORES

As I presented in the volume entitled *Uncomfortable Analyzes*, published in 2020, at the Military Publishing House:

- Platinum has a wide use, both in the military and in the civilian industry. It is mainly used in the car manufacturing industry, to obtain automotive catalytic converters designed to reduce carbon emissions (also called "environmental metal"), but also to obtain fuel cells with platinum catalysts for submarines, ships, vehicles, aeronautical turbines[34], etc.
- Palladium is used as a cheaper substitute for platinum in the production of catalytic converters[35], in research on cold fusion and for creating alternative energy sources on the model of low-energy nuclear reactions (LENR), as a result of its ability to absorb hydrogen[36].
- Rhodium is used in the production of catalytic converters for diesel engines (where it cannot be replaced)[37].
- Ruthenium is used in the I.T. industry and electronics, in the production of hard disks and superconductors[38], etc.
- The main industrial application of Antimony is the production of fire-proof equipment, where it is the basic and irreplaceable raw material[39].

• Beryllium is used in the production of thermonuclear weapons, neutron sources for particle accelerators, CANDU reactors, in special alloys used in the production of aircraft, satellites, spacecraft, missiles; in the production of large mirrors for meteorological satellites and small mirrors for military optical guidance systems and fire control systems, space telescopes, solar panels; in the production of naval or terrestrial demining systems, high power radars, tools for high power microwave generating systems, semiconductors[40], etc.

• Cobalt is used in the military industry, in the manufacture of Cobalt-based nuclear weapons, high-strength permanent magnets for the military industry; of special alloys for the aerospace industry, medicine (prostheses), jewelry (platinum alloy), pigments for glassware, ceramics, radioisotopes for medicinal purposes[41], etc.

• Gallium (mainly extracted from bauxite and sphalerite) stabilizes plutonium, being used I confectioning the core of nuclear bombs[42]. It is mainly used in the production of optoelectronic devices, semiconductors and light emitting diodes L.E.D, integrated circuits used in the military industry, I.T. and telecommunications[43], etc.

• Germanium is used in the production of infrared optical fibers used in the defence industry in the manufacture of ballistic guidance systems, sighting systems and in the civil industry in the production of night vision systems, infrared spectroscopes, infrared detectors, optoelectronic devices, catalytic polymerization in the process of obtaining nanofibers in other chemical processes[44], etc.

• Indium is used in the production of metal alloys used in cryogenic and highly vacuum applications, in the electronics and electrical industry: touch-screens, LCDs, flat-screens, semiconductors, computer monitors, solar panels, batteries, superconductors, LEDs[45], etc.

• The main uses of Magnesium are in the military industry, in the production of warheads, incendiary bombs, pyrotechnic devices, missiles, in the aerospace industry (light aluminum-magnesium alloys), the pharmaceutical industry[46], etc.

• Niobium is used in the production of special steels (niobium increases the strength of steel) the automotive industry, the construction of gas pipelines, in the production of superalloys for the aerospace industry (engines for rockets and aircraft, gas turbines, rocket subassemblies, combustion systems, turbo systems)[47], space programs (Apollo, Gemini), in the production of superconductors for nuclear magnetic resonance medical equipment, particle accelerators, FLASH lasers, bolometers for detecting electromagnetic radiation in the THz frequency band used in the construction of high power telescopes[48], etc.

• The main areas of use of Tantalum are the manufacture of cutting tools, furnaces for furnaces, lenses for digital cameras, mobile telephony, glasses; Surface Acoustic Wave filters for mobile telephony, television, audio-video equipment[49], etc.

• Tungsten is used in the manufacture of glass-metal gaskets, filaments for electric lamps, cathode ray tubes, electric ovens, fluorescent lighting, X-ray lenses; when obtaining special alloys for rockets, oil, mining, metallurgy, special paints, lubricants for high temperatures (500° C)[50], etc.

• Fluorspar is used in the chemical industry, to obtain Hydrofluoric Acid used in the production of refrigerants, foaming agents, chemicals based on carbon fluoride and fluoride, in the metallurgical industry to obtain iron, steel and other metals, extracts impurities of sulfur and phosphorus from ores and increases the fluidity of slag, in the optical industry in the production of lenses for microscopes, telescopes, video cameras including for the spectrum of ultraviolet radiation[51], etc.

• Natural Graphite is used in the manufacture of refractory bricks, refractory crucibles, furnace liners, in the production of batteries (lithium-ion, zinc-carbon) and batteries for portable electronics (laptops, tablets, mobile phones, portable CD-players), in the production of special steels, the production of brake linings where it replaces asbestos (carcinogenic), lubricants[52], etc.

• Rare earths (REM), represented by Lanthanum, Cerium, Praseodymium, Neodymium, Promethium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium to which Scandium and Yttrium are added, have as main application military production of permanent magnets based on Samarium-Cobalt and Neodymium-Iron-Bromine.

Neodymium-based magnets, the most powerful permanent magnets, are essential in the production of offensive and defensive weapon systems. Samarium-based magnets are essential in the production of ballistic guidance systems, intelligent bombs and aeronautical components. Magnets based on Terbium, Gadolinium, Neodymium, Dysprosium are fundamental components in the production of generators for wind turbines, electrical and electronic components, in the I.T., telecommunications and satellite communications industries. Dysprosium is vital for ensuring the permanence of magnetism at very high temperatures[53].

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-39

PROMOTING DIGITAL DIPLOMACY THROUGH EDUCATION

Victor Adrian VEVERA*

The implementation of information and communication technologies in the field of international relations has generated important changes, including the emergence of digital diplomacy, which is accompanied by all the challenges of a new beginning. In this article we aim to analyze the extent to which diplomacy is prepared to deal with the contemporary world. In the same we will argue for the need to reconstruct the diplomats' training model so that it can become competitive regardless of the unexpected direction society could follow. From our point of view, the Romanian research organizations (INCD and universities with related specifics) are the ones that must give the directions to follow in conceptualizing the training programs for digital diplomats (including those formed before the emergence of the new platforms and tools dedicated to communication with the public).

Keywords: digital diplomacy; international relations; communication technology.

A country's foreign policy can be: "reduced to its fundamental ingredients (...): the national objectives to be achieved and the means to achieve them. The interaction between national goals and the resources to achieve them is the perennial subject of the state itself. The ingredients of the foreign policy of all nations, large and small, are the same"[1], and diplomacy is recognized as an important tool among the other.

Probably the most significant impact on diplomacy has been driven by innovations in ICT (information and communication technologies). It was somewhat natural for a domain, which operated mainly in the field of communication, to be impacted by the changes in the way people communicate and exchange information. The emergence of the possibility to exchange information at trans-national level has become an unmissable opportunity for all actors involved in international relations. That's why states have started using websites, blogs and social platforms such as Facebook, Twitter, Instagram, You Tube, Weibo, Flickr, Google+.

Increasingly, such tools are becoming a favorite in interstate communication, and digital diplomacy has become an essential tool of state foreign policy. Non-state entities also benefit from digitalization, so that the number of actors fighting for influence and power over the 3 billion people who use the Internet has multiplied in the online space.

Due to its consequences, digital diplomacy is distancing itself from the adjuvant status of classical diplomacy and is becoming an important tool in how states can defend their national interests. In order to achieve its objectives, it is necessary to benefit from a human resource trained in the spirit of the 21st century, with solid data science skills. In this article we will refer to the context that requires changing the training pattern of digital diplomats and we will highlight the issues that education should focus on so that diplomats' competencies are in line with current patterns of international relations.

Digitalization of diplomacy – a priority in the 21st century

The structural change in global communications driven by the Internet necessarily implies a fundamental reorientation of foreign policy instruments. Today's technological revolution has brought about many changes that affect domestic and international politics and, implicitly, diplomacy as a whole.

As a result, digitalization has led to changes in diplomatic practices and to an increase in the number of domestic and international actors involved in diplomatic exchanges. Much of the diplomatic activity has become accessible to the general public, an objective in itself being to influence it through all available channels.

**National Institute for Research and Development in Informatics – ICI Bucharest*
e-mail: *victor.vevera@ici.ro*

Currently, diplomacy can only achieve its goals if it manifests itself in accordance with the requirements of the time. Therefore, the digitization of the field must become a state priority, and diplomats must learn to reconcile sometimes opposing forces determined by the needs of individuals and states. In turn, states should encourage the initiation of public activities that facilitate the participation of individuals and communities in governance. In order to carry out activities that did not exist until recently, additional training of diplomats for specific skills is needed.

The implementation of an innovation generates emerging forces which support it, as well as some reactionary forces, which reflect the resistance of the system to change. But the success of this approach will always depend on the ability of decision makers to manage tensions and identify the windows of opportunity generated by change. To cope with these new realities, diplomats need to develop new thinking algorithms, generate and use new practices that determine the long-term success and resilience. On the contrary, the ignorance of such technologies by diplomats will have effects on an individual level, isolating them from the community of professionals. Worse, when the entire diplomatic corps is not interested in adapting to technology even national interest may be affected as the advantages of technological diplomacy are more than obvious. Some countries have understood this more quickly than others, but unfortunately there are still international actors who are not yet convinced of the advantages that these technologies offer.

Among the most serious arguments in support of the implementation of new technologies in diplomacy field are:

- *The emergence of the phenomenon of emotional commodification and its preponderance in relation to fact-based reasoning in the online environment*

Diplomatic activity involves understanding both the issue under negotiation and the dialogue partner, coupled with the willingness of diplomats to cooperate. The manifestation of too intense emotions can block the speech and can change the trajectory of the negotiation, moving the discussion away from the important topics. The online environment is a very good field for influencing the public through posts related to high-intensity emotions, whether they are positive or negative, which have a higher viral potential than those that contain low-intensity emotions[2]. Most often, the phenomenon of emotional commodification occurs, i.e. deliberate amplification of emotional content, which overlaps with emotional valence (as the degree of positivity or negativity of an emotion) can trigger the desired reactions from the public[3].

In this context, digital diplomacy will evaluate and manage the phenomenon of emotional commodification that can otherwise turn into a threat to achieving its objectives. An undesirable effect for the messages proposed by diplomacy would be to end up in the so-called echo chambers, where they can gain only the attention of too limited a number of supporters. Also, commodification of emotional messages may generate a post-truth audience, difficult for digital diplomats to access[4].

Under these circumstances, the following question arises: how can digital diplomats react to an emotionally charged form of social communication, especially given that the increasingly complex relation between emotions and social media?

Peter Salovey and David J. Sluyter developed the concept of Digital Emotional Intelligence (DEI)[5] which can offer a solution. DEI refers to the accurate perception of emotions, the correct use of emotional information, understanding the meaning of perceived emotions, the ability to manage their own emotions and those of partners in the online environment[6].

The existence of a high coefficient of online emotional intelligence of users will not lead to the disappearance of misinformation, but will differentiate between fake and real news, help to identify sources and adjust the level of answering to an emotional trigger in a given situation. DEI will allow someone to identify the right path online and lead the conversation to informed and well-founded reasoning. The importance of education in the spirit of DEI should lead states to invest in education programs for diplomats, giving them the ability to navigate correctly in the digital environment.

- *More and more frequent replacement of authentic robo-trolling relationships in the online environment*

Diplomacy is changing from a closed field dedicated to a small elite whose work was

fundamentally secret, into a domain where public has for the first time access to the internal mechanisms of diplomacy[7]. Accessing a very wide audience requires foreign ministries to undertake a significant repositioning, in accordance with the specifics of our time. With the opportunity to reach millions of people, directly and in real time, they need to redefine themselves in the digital age. This possibility could be greatly improved by more intensive use of algorithms, such as tools for monitoring the conversation, setting the agenda and disseminating messages. Of course, the perverse effects of using these tools appeared soon, with studies already showing that about 15% of Twitter accounts are actually robots rather than humans and that this number will increase in the future[8].

The dark side of the effects of digital technologies materialized in misinformation, propaganda or *info war tactics*, leads to increasing citizens' distrust of these technologies. According to the *NATO Strategic Center of Excellence* in Latvia, discussions regarding NATO on Twitter are led by robots, who already have the ability to develop content, starting from a series of initial ideas[9].

Another risk of using artificial intelligence is undermining trust between international partners or even discrediting the work of intelligence services that are based on data from both official and public sources, but also on secret information, so that their work is not always subject to machine learning[10]. Of course, no exception can be made to the military and intelligence nature of such activities, but diplomacy cannot remain indifferent when the goal is to discredit political institutions.

The digital information landscape is flooded with robot-trolls that distort the quality and / or quantity of content, the phenomenon being possible primarily due to the anonymization of information sources. It is important to identify this activity in a timely manner to take the necessary steps to limit the effects it may have. The good news is that any technology can be used both destructively and constructively. Thus, the technology also allowed the identification of solutions to combat the activity of robots, such as type 3A (activity-anonymity-amplification) techniques that allow the identification of boot and bootnet[11] or various other AI tools, such as Google Perspective, reaching even the blocking of digital content.

The huge changes of the diplomatic field require a new type of literacy for experienced diplomats and a different way of getting started in the field, which includes digital and media literacy, critical thinking, the skills of issuing and promoting clear strategic messages[12].

- *Strategic disorientation in the context of accelerating change*

Digital diplomacy should not be an objective in itself, but rather a tool to serve foreign policy objectives. The technology implemented in the absence of a strategy can become more toxic than no implementation at all. In order to achieve an efficient coordination of complex situations, a well-thought-out strategy is needed. The existence of clear plans has the role of ensuring an easier and syncope-free transition from the traditional approach to digitization.

The outcome of the confrontation between technology enthusiasts and digital skeptics strongly influences the success of digitalization. There are also approaches according to which there is no digital diplomacy, but only public diplomacy with a digital component[13].

Any analysis of the costs and benefits of digitization must be carried out in relation to the historical reference stage by a separate analysis of the means (tools of digital diplomacy) and of the results (what digital diplomacy achieves)[14].

Facilitating the achievement of the objectives of international political actors through digitalizing diplomacy

In other words, digital activities have reverberations beyond the online space, influencing foreign policy objectives. A coherent, balanced and constant approach to digital activities is leading to favorable changes for the results of states' foreign policy.

The innovation capacity and flexibility of states and foreign ministries is reflected in how they are able to exploit the opportunities offered by technology, while avoiding the negative effects that could arise. Thus, there may be either a chain reaction in which successes increase the appetite for technology and digitization, or one in which failures slow down the pace of innovation and the implementation of new technologies.

Although there is a general interest in digitalization in the diplomatic field, the positioning towards technology has been achieved mainly from the perspective of the political significance of the use of digital technologies, instead of simple application of digital tools in diplomatic practice.

Time can no longer be lost because history has already recorded the first electoral battles whose outcome was strongly influenced by the deeply unethical use of technology. Democratic elections and referendums in the United States and Europe through entities such as Cambridge Analytica have achieved their goals, but have undermined the confidence of people, institutions and states in digitalization. Following the media campaign on how to use personal data, most international actors have begun to review their views in favor of the implementation of new technologies and to look critically at previous approaches considered today too lax and confident.

Although everybody agrees on the usefulness of digital technologies, the negative effects that may occur have given rise to many moments of reflection on the appropriateness of their use to achieve the foreign policy objectives of states. On the other hand, any analysis must include the premise that the new generations are inextricably linked to technology and that its non-use in foreign policy in the way young people are accustomed will have the effect of narrowing the audience to which the technology could address.

On the other hand, in the extremely dense information context of contemporary society, new technologies offer a solution for information management and knowledge production with a major impact on international relations. Increasingly, international relations are expanding by incorporating socio-cultural elements.

Such a careful analysis of the need to implement technology in the field of international relations may seem unreasonable, since, over time, most inventions important to mankind have come to be naturally taken over by this field as well – telegraph, telephone, typewriter, computer are just some examples. And yet this time, the introduction of the use of social networks has a special specificity, as their impact is not found only in the interpersonal relationship level as in previous cases, but at the mass level. For this reason, digital diplomacy cannot be seen as an extension of public diplomacy, as it fundamentally changes the type of communication relationship – mass communication takes the place of interpersonal communication. The anonymity of the sources and the insecurity of the data circulated on the Internet induce low confidence in social media between diplomats, and in the absence of their digital literacy, the vision of diplomats could remain narrow and their activities insignificant.

Digital literacy – a condition of modern diplomacy

Especially after the Arab Spring, more and more entities responsible for foreign policy use the potential of social media to achieve their goals, using platforms as Twitter, Youtube, Facebook, but also algorithms such as PageRank from Google.

Therefore, diplomats can no longer limit themselves to the classical tools of diplomacy. They need to understand and be able to operate with the tools of today, but also of tomorrow, digital diplomacy. The simple use of today technical tools is no longer enough, because it is assumed that they will soon be replaced by more efficient ones. Digital diplomats must be able to encode, to imagine customized algorithms for data processing, so that they could be adaptable regardless of how diplomacy evolves in the future.

The correct and efficient use of new technologies is an essential condition for achieving the objectives of digital diplomacy, primarily because it provides diplomats with tools for collecting, organizing and interpreting various aspects of the socio-political space. Digital literacy in diplomacy refers to the individual's ability to use digital technologies, but also to understand how they are designed, the goals they can pursue, how they can be used by diplomacy or how it can limit their effects if necessary. Of course, the relationship should not be unambiguous: diplomacy must adapt to technology, but technology must also offer customized variants to the needs of diplomacy and provide increasingly efficient and appropriate tools.

Currently, most efforts of the foreign ministries of European states focus on the introduction of big data algorithms in foreign policy design, and the reason is easy to guess – in this way most variables will be taken into account in developing possible scenarios and choosing the directions to follow. Without technology this process was impossible, because no team of analysts can manage the vastness of existing data and information.

The role of research in the conceptualization of digital literacy programs in diplomacy

We have previously shown that digital diplomacy is a nascent field, in full transformation determined by technological developments, but also by the pace of change. Designing a training program for specialists in a field in the emergency phase is an extremely difficult and challenging task. Experts will need to be able not only to perform their duties today, but to manage future activities with a high degree of novelty, because the society will face such situations. Therefore, taking tools and practicing them to mastery is not enough anymore.

The field of foreign policy has a huge impact on the community – it can bring peace or conflict and even intervene in the well-being of the community. At the same time, there are increasing overlaps between diplomacy and intelligence. Sometimes constructive goals of protecting national interests can be perverted by engaging in acts that induce chaos and political and social disorder. Therefore, the foreign ministries have the task of thinking of strategies that capitalize on digital diplomacy, by highlighting culture, information and international partnerships.

Awareness of these stakes by states and the allocation of resources for the training of skills needed by specialists is a step that belongs to decision makers, but which needs to be done with greater care.

The absolute novelty of the field, the complexity of the environment in which the digital diplomacy activities take place, the factors that can intervene, the extremely diverse effects generated in various fields are just as many reasons to convince us that such an approach is necessary to start with research. Therefore, research entities in the field of information and communication technology, in the field of international relations, together with the universities with related specifics should cooperate to generate research programs in the field, in order to concretely identify trends, variables and, finally, those elements that can equip the diplomat with the skills that will allow him to manifest fully and with maximum effects.

Conclusions

With the absorption of communications technologies by diplomacy, we witnessed the birth of digital diplomacy. And, as in any other emerging field, the inherent challenges are not few. For Romania, the challenge is even greater as its status is somewhat curious – in a country with an impressive community of IT specialists, the field of international relations is still looking for its identity, brand and direction to follow. All these should be found in a digitalization strategy of the field, as coherent as possible and with clear implementation documents.

The implementation of a coherent strategy for digitization of the field, with clear milestones and implementation documents will create the necessary framework for the development of the field and will facilitate the achievement of national objectives through digital diplomacy. Beyond the need for infrastructures dedicated to digital connectivity, the training of diplomats' competence to use these new technologies (including those formed before the emergence of these new platforms and tools dedicated to communication with the public) is of overwhelming importance. In the context of Facebook, Twitter, YouTube, they are no longer just platforms, but have the potential to become real tools for promoting political interests, digital literacy of diplomats becomes a mandatory dimension of their training, in parallel with their preparation for new ways of public involvement and control of public opinion policy.

NOTES:

1 C.V. Crabb Jr., *American foreign policy in the nuclear age*, 3rd ed., Editor Harper & Row, New York, 1972, p. 1.

2 N. Davidson, "What Are the Key Emotional Triggers for Online Video?", *MWP Digital Media*, 4 December 2013, https://mwpdigitalmedia.com/blog/key-emotional-triggers-online-video/, accessed on 21.04.2021.

3 E. Ferrara, Z. Yang, "Measuring Emotional Contagion in Social Media", *PLOS ONE 10*, no. 11/November 2015, http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0142390, accessed on 21.04.2021.

4 C. Bjola, *Digital Diplomacy and the Bubble Effect: The NATO Scenario,* USC Center on Public Diplomacy, Los Angeles, 8 March 2016, http://uscpublicdiplomacy.org/blog/digital-diplomacy-and-bubble-effect-nato-scenario, accessed on 21.04.2021.

5 P. Salovey, D.J. Sluyter, *Emotional Development and Emotional Intelligence: Educational Implications*, Editor Basic Books, New York, 1997.

6 *Ibidem*.

7 C. Bjola, J. Cassidy, "Gone Digital: Digi-tal Diplomacy at the University of Oxford", *Border Crossing 1*, no. 2/2015, pp. 10-12.

8 M. Newberg, "As Many as 48 Million Twitter Accounts Aren't People, Says Study", *CNBC*, 10 March 2017, https://www.cnbc.com/2017/03/10/nearly-48-million-twitter-accounts-could-be-bots-says-study.html, accessed on 24.04.2021.

9 N.D. Jensen, N. Harmata, *What to Expect when You're Expecting Bots?*, Center for European Policy Analysis, Washington DC, 2017, http://infowar.cepa.org/EN/what-to-expect-when-youre-expecting-bots, accessed on 24.04.2021.

10 T. Valášek, *How Artificial Intelligence Could Dis-rupt Alliances,* Carnegie Europe, 31 august 2017, https://medium.com/@Carnegie_Europe/how-artificial-intelligence-could-disrupt-alliances-9fdb98b4c11d, accessed on 25.04.2021.

11 B. Nimmo, *#BotSpot: Twelve Ways to Spot a Bot,* Atlantic Council's Digital Forensic Research Lab, 2017, https://medium.com/dfrlab/botspot-twelve-ways-to-spot-a-bot-aedc7d9c110c, accessed on 22.04.2021.

12 C. Bjola, J. Pamment, "Digital Containment: Revisiting Containment Strategy in the Digital Age", *Global Affairs 2*, no. 2/2016, pp. 131-42.

13 C. Bjola, "Getting Digital Diplomacy Right: What Quantum Theory Can Teach Us about Measuring Impact", *Global Affairs 2*, no. 3, 2016, pp. 345-353.

14 P. Knoepfel, C. Larrue, M. Hill, F. Varone, *Public Policy Analysis,* Bristol University Press, Bristol, 2011, p. 11.

REFERENCES

Bjola C., *Digital Diplomacy and the Bubble Effect: The NATO Scenario,* Los Angeles: USC Center on Public Diplomacy, 8 martie 2016, http://uscpublicdiplomacy.org/blog/digital-diplomacy-and-bubble-effect-nato-scenario

Bjola C., "Getting Digital Diplomacy Right: What Quantum Theory Can Teach Us about Measuring Impact", *Global Affairs 2*, no. 3, 2016.

Bjola C., Cassidy J., "Gone Digital: Digi-tal Diplomacy at the University of Oxford", *Border Crossing 1*, no. 2/2015.

Bjola C., Pamment J., "Digital Containment: Revisiting Containment Strategy in the Digital Age", *Global Affairs 2*, no. 2, 2016.

Crabb C.V. Jr., *American foreign policy in the nuclear age*, 3rd ed., Editor Harper & Row, New York, 1972.

Davidson N., "What Are the Key Emotional Triggers for Online Video?", *MWP Digital Media*, 4 december 2013, https://mwpdigitalmedia.com/blog/key-emotional-triggers-online-video/

Ferrara E., Yang Z., "Measuring Emotional Contagion in Social Media", *PLOS ONE 10*, no. 11/November 2015, http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0142390

Jensen N.D., Harmata N., *What to Expect when You're Expecting Bots?*, Center for European Policy Analysis, Washington DC, 2017, http://infowar.cepa.org/EN/what-to-expect-when-youre-expecting-bots

Knoepfel P., Larrue C., Hill M., Varone F., *Public Policy Analysis,* Bristol University Press, Bristol, 2011.

Newberg M., "As Many as 48 Million Twitter Accounts Aren't People, Says Study", *CNBC*, 10 martie 2017, https://www.cnbc.com/2017/03/10/nearly-48-million-twitter-accounts-could-be-bots-says-study.html

Nimmo B., *#BotSpot: Twelve Ways to Spot a Bot,* Atlantic Council's Digital Forensic Research Lab, 2017, https://medium.com/dfrlab/botspot-twelve-ways-to-spot-a-bot-aedc7d9c110c

Salovey P., Sluyter D.J., *Emotional Development and Emotional Intelligence: Educational Implications*, Editor Basic Books, New York, 1997.

Valášek T., *How Artificial Intelligence Could Dis-rupt Alliances,* Carnegie Europe, 31 august 2017, https://medium.com/@Carnegie_Europe/how-artificial-intelligence-could-disrupt-alliances-9fdb98b4c11d

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-40

HUMAN RESOURCES MANAGEMENT IN ROMANIAN ORGANIZATIONS AND THE SPECIFICITY OF THE NATIONAL DEFENCE SYSTEM

Alina-Elena IONAȘCU (HULUBA)*

This paper is written from the contextual perspective of understanding and reviewing the processes associated with human resources management (HRM) in organizations. Consequently, the purpose of this paper is to explore the trends of HRM practices in order to identify the specific characteristics of Romanian organizations and to establish its specificity in the national defense system. In the first part of the paper we will refer to the research framework and point out the evolving and conceptual benchmarks that are of importance to this approach. The characteristics of human resources management in Romanian organizations are established by comparisons with other countries, while the central axis of comparison is represented by the member states of the European Union (EU). Starting from the results of this analysis, the particularities of HRM that are defense-related, identified through the study of the regulatory framework and comments regarding the current guidelines are made. In the conclusions, the paper will present main ideas resulted, personal contributions, issues addressed and research limitations.

Keywords: human resources management; organizations; Romania; defence; particularities; guidelines.

In a globalized world based on the interaction between states/organizations/individuals and in a European Union which is concerned with the integration of diverse members, understanding the dichotomy and identifying points of convergence between human resources management in civil and military organizations is an issue of interest when it comes to promoting collaboration, avoiding conflicts and maintaining lasting peace. For example, if a given organization has a specific approach to human resources management which is very different from trends at global/European level, and the foreign organizations with which it collaborates guide their actions in line with established guidelines rather than those that it already practices, deficiencies and difficult situations may occur.

Research gap

Although the issue of the particularities of human resources management in military organizations has been dwelled upon in articles published in our country and falls within the research concerns, I was not able to use them to the highest degree because the analysis of the military HRM in relation to trends in the civil environment, which are established at international level, was missing from these scientific approaches. Taking into account my personal interest in the issue of transforming military HRM, which, at national level, is seen as one of the main directions for developing defence abilities for the next 3 years due to its ultimate objective: ensuring high-quality staff able to meet the system's strategic need to face the new challenges of the security environment – I have decided to address this gap. This is related to the fact that researchers in the field acknowledge the need to explore how HRM practices manifest themselves in organizations in different countries in order to understand the comments on the specificity of the HRM in organizations, so that ideas applicable in relevant contexts can be extrapolated.

The general framework of the research

An expanding field in HRM is the extension of the interest from the analysis of theories and practices from a universal perspective to their contextual analysis. Taking these aspects into consideration, this paper fits in the debate "convergence versus divergence", from the point of view of the general scientific framework. This falls within the qualitative research, and the article covers a thematic analysis (it provides

** General "Andrei Popovici" Logistic Base 91 of the Air Force, Otopeni*
e-mail: *ionascu.alina.03@gmail.com*

conceptual and evolutionary frameworks and highlights the timeliness of the thematic approach), a comparative analysis and an empirical one through the observation and study of the specific regulatory framework. In order to reach this, the first part of the paper focuses on the comparative analysis of the trends reported by the organizations from the European and non-European space, and the objective is to highlight how Romanian organizations are, in terms of the practices specific to the HRM-associated processes. In the light of this context, in the second part of the paper, we will describe and explain the general specificity of HRM in the Romanian military organizations, through the bibliographic study of the specialized papers and of the normative framework in force. Therefore, the premise of this work is that a good understanding of the guidelines for HRM applied in Romanian organizations, in relation to those in the European and non-European space, can be useful to explore the specific HRM in military organizations and to review some topical guidelines that allow it to operate at the highest level. Naturally, I believe that it is difficult to conceive a project in order to transform the human resources management in the Romanian army, a project which is not based on the understanding of its specific characteristics and its development in accordance with the current trends, but at the level allowed by the specific characteristics of the mission assigned to it. Consequently, through this approach, the article is intended to be an early step towards a serious study aimed at identifying the most appropriate instruments, actions and processes needed to be adopted for the transformation of the HRM in the Romanian army, in accordance with the strategic objectives established.

Therefore, by writing this paper, my aim is to do the following: highlight the organization-specific HRM practices in Romania compared to organizations in the EU area and highlight the specificity of the HRM in military organizations, with implications for future research and applications (e.g. the aspects that can be revised for the transformation of HRM in the national defence system). From the point of view of the results that are expected, this paper aims to capture the successful trends of HRM at the level of the organizations in other countries, the characteristics of Romanian organizations, the specificity and possible guidance for the national defence system, by referring to methods, instruments, processes and actions relevant to the field.

Evolutionary and conceptual benchmarks on HRM

The importance of developing the theory and practices of using people in organizations has gradually become more acknowledged, as phenomena with a global impact on labor market activities emerge. The industrial development at the beginning of the 20th century drove both the increase of employers' interest in staff-related activities and the development of first scientific research on people's work. In that case, the Taylorist[1] versions reflect quite well the rationalization of work organization in the industrial environment, the emergence of the concept of administrative operation highlighted the importance of "planning, organizing, commanding and controlling the activities of groups of people"[2] for the success of businesses, and the development of the bureaucratic model by Max Weber did not only refer to staff for the first time, but it emphasized the role of specific activities of recruitment, selection and promotion of employees. The economic crisis that followed the First World War led to new responsibilities in terms of staff, and the studies showing the importance of individual relations at the workplace over productivity stood out[3]. The post-industrial economy after the Second World War led to the awareness of the status of a critical competitive resource for staff, and thus to the dissemination of the term "human resources"[4] and the emergence of independent functions specific to human resources management, such as selection, training, compensation and performance evaluation[5].

As a result, in line with the reasoning on the importance of focusing the HRM on those approaches and practices that contribute to the achievement of the desired results, in the current context, the path followed by researchers and practitioners continues to focus on identifying those ideas and tools that match the objectives of the business, which have the ability to improve organizational performance in a market associated with innovation, speed and adaptability. In literature, there are several relatively similar approaches to the concept of human resources management. In order to capture the timeliness of the topic, this paper refers to the comprehensive approach to human

resources management according to which it "represents the process of achieving organizational objectives by attracting, keeping, developing, removing and using human resources correctly in an organization"[6].

In other words, in this paper, I will take into consideration the analysis of specific processes of recruitment, selection, training and evaluation, from the perspective of the practices used (tools, processes, actions) in organizations – considered to be "a group of people working together"[7].

Trends in HRM and the characteristics specific to Romanian organizations

In this part I will analyze, from a comparative perspective, the international trends and the characteristics of human resources management practiced in Romanian organizations. In order to validate this analysis, I took into consideration the examination of the data provided by the last study published by Cranet, while also taking into account the literature in the field.

Cranet is a globally-known network for benchmarks provided in relation to the evolutionary aspects of international human resources management implemented by the employing organizations in Europe and countries in other parts of the world. Coordinated by the Cranfield School of Management in the United Kingdom, Cranet – a network based on the collaboration of over 40 universities and business schools located on six continents – was established in 1989 to respond to the need for information regarding the practice and performance of HRM in Europe and now in the world[8]. The Cranet research is based on data collected between 2014 and 2015, which was detailed in the report published in 2017. Using Cranet data, we will identify general trends, focusing on the data provided in general by organizations from countries integrated in the European Union, considered to be the main focus of the analysis.

Assuming that the Romanian HRM has some distinct features, we will analyze the approach of the organizations in our country in relation to the general trends reported by the other states participating in the study, with the focus on the organizations included in the main analysis axis.

In the report published in 2017, the Cranet research focused on a total of 35 countries: 21 of the 27 European Union Members (except for Poland, Bulgaria, Ireland, Portugal, the Czech Republic and Malta), 6 countries that are not part of the European Union (Iceland, Norway, Russia, Serbia, Switzerland and Turkey) and 8 non-European countries (Australia, Brazil, China, Indonesia, Israel, Philippines, South Africa and USA). The investigation tool used was a questionnaire divided into six sections, namely: the overall HRM activity in the organization, human resources practices, employee development, compensation and benefits, employee relations and communication, organizational details – and this addressed the HR managers of organizations with at least 100 employees.

Although the participating countries sent a total of 59.156 questionnaires, after removing the missing data, an overall response rate of 10,3% resulted. Compared to the EU response rate of 21,27%, Romania had a substantially lower rate of 7,76%. As regards the sectorial distribution of the sample, it is noted that around 70% of the responses came from private organizations, 20% from public ones and 10% from non-profit or mixed ones. This shows not only the greater interest of the private sector in such studies, but also the fact that there is consensus if we say that the specific tendencies of the HRM nowadays have their roots in the practices and policies of civil organizations. In the light of the scientific considerations on the concept of HRM, we will consider the following topics for the analysis of the data in the Cranet report: the recruitment and selections process, training and development of human resources and assessment from a performance-oriented perspective.

As regards recruitment and selection processes, the results appear to be converging.

Firstly, most companies prefer to recruit their managers from internal sources, and a key role is played by their own websites. Other popular methods are job trading sites and recruitment agencies, while social media are becoming more popular in EU countries, especially in the UK, Belgium and the Netherlands. The picture is easily diversified in the case of recruitment of the other categories of professionals, for which the organizations prefer, in addition to the aforementioned methods, verbal recommendations and social media, used by more than 20% of the participating organizations. Secondly, the most

frequently used methods of selecting managers and professionals are references and interview, competency, psychometric, technical, calculation tests and many more, and the online process is used less frequently. In addition, social media are used in the selection process in all countries, but they seem to be more widespread in Northern European countries, Belgium, France, the Netherlands and Sweden. For other categories of employees, selection methods such as recommendations, interviews, application forms and tests are widely used.

In this respect, the responses provided by the Romanian organizations show that the methods of recruiting managers are similar to those of European companies. For the recruitment of professionals and other staff, the most commonly used methods are verbal recommendations, websites of the companies and job agencies. Newspaper ads remain a method still used for recruiting staff other than managers and professionals. In the selection process of all staff categories, Romanian organizations stand out because the most frequently used method are job application forms, adjacent to verbal recommendations, one-on-one/panel interviews and competency/psychometric tests.

The second topic is the importance of training and developing human resources for the provision of employees with skills that they need in order to achieve their organizational objectives and to create a competitive advantage. Thus, giving a strategic role to the process of training and development of human resources is a key trend in today's HRM. On average, the vast majority of EU, non-EU and non-European countries (62,2%; 66% and 68%) have a written strategy in the field of training and development of human resources. Moreover, there is a very small percentage of companies in all countries, ranging from 3 to 6%, that completely outsource the training and development process, most of which make significant use of internal providers in such programs. In addition, investment in training and development of human resources amounted, on average, to 3,21% of the annual salary budget in EU countries, 3,34% in non-EU countries and 4,47% in non-European countries.

At the level of the organizations in our country, we can see a higher rate of investment in training and development than the average of EU countries by about 1,29% and a ranking in the top of those countries that have spent the most on training.

In general, organizations rely heavily on the assessment process in order to determine the training and development needs of human resources. On average, 74% of the companies in EU countries use their assessment systems to determine the needs for training and development. However, there are significant differences between the member countries. For example, while France, the Netherlands, Spain and the United Kingdom rely on this approach (89%, 85%, 87%, 86%), Sweden, Hungary, Finland, Romania, Slovakia, Slovenia and Cyprus are at the opposite pole (45%, 48%, 60%, 62%, 63%,62%, 61%).

As regards the techniques used in order to assess the effectiveness of the training and development processes, about 70,2% of the organizations in the EU countries use the evaluation at the end of the programs. Other popular assessment methods are: informal feedback from line managers, informal feedback from employees and the degree of achievement of targets (66,6%, 64,7%, 66,9%). The assessment methods used very rarely are: job performance before and immediately after the end of the training period, i.e. a few months after the completion of the training period, the number of training days and the viability of the investment (20,9%, 29,2%, 48,7% and 14%). Unlike this, in organizations in non-EU countries, the informal feedback from line managers is the most frequently used technique.

In comparison to the other UE countries, the Romanian organizations report that they prefer to use the following techniques: training days, assessment immediately after the completion of the training, the degree of achievement of targets and informal feedback from line managers (65,8%, 50%, 48,3%, 37,8%).

Ultimately, the responses of the organizations from EU countries show that, regarding the methods of career development for employees, most of them use the following ones: on-the-job training, teamwork projects, coaching, mentoring, special tasks (90%, 84,5%, 73,4%, 71%, 72,9%), with less emphasis on training in development centers (35,9%).

Comparatively, most Romanian organizations report that the most frequently used methods in employee career development are: on-the-job training, coaching, mentoring, teamwork projects and learning-enhancing projects (97,8%, 95,6%, 76%, 73,8%, 82,2%, 79,1%).

As regards the evaluation of the human resources, this takes into account the importance that companies attach to issues such as: providing performance-based rewards/remuneration/other pecuniary benefits and using methods of direct communication with employees.

Compared to the leveles reported by the Cranet survey between 2008 and 2010, in the study carried out in 2017, we can see that performance-based wage provision is generally more frequently used in most countries. Thus, we note that salary variability according to individual or collective performance ratings is much more frequently used (64%, 61%), compared to the possibility of being financially engaged by taking a percentage of the profit (30%), with a significant increase in this trend compared to the period 2008-2010. The survey also shows that this is done especially for key staff and less for the other staff categories.

As regards the ways in which pecuniary benefits are linked to performance, we notice a smilarity between the target groups of the survey and a different approach as far as Romanian organizations are concerned. This discrepancy in the methods chosen by Romanian organizations is most likely based on cultural differences related to the reluctance to accept these forms of variable payroll, as well as normative regulations, suggesting that there is an approach which is less oriented toward performance-based remuneration.

Compared to the average rate of the organizations in the EU countries that communicate information on business strategies, job performance and organization of the work of professionals and other staff categories (51,3%), only 25% of the Romanian companies have such an approach. As a rule, in the majority of organizations among target groups of countries, employees communicate their views to their supervisor directly. Other "bottom-up" communication methods are meeting and providing information via electronic means.

Although Romanian companies generally converge to trends specific to the EU countries, we can notice that there are some distinct aspects which are most likely related to cultural typology, the institutional framework inherited from the period before '89, the degree of technological development, the infrastructure or some regulatory determinants which have a bearing on the way in which organizations work nowadays – in the context of an economic environment in transition towards the West, which is supposed to be completed and continued with a process of perpetually shaping society[9].

On the one hand, convergence can be attributed to a large part of the high number of multinational companies, usually from economically dominant countries at the EU level and more, which infuze specific HRM mechanisms and practices. On the other hand, by analyzing the data provided by the Cranet survey, we can see that, in relation to Western organizations, there is a certain rigidity abouty moving towards an informal approach to HRM practices. There are general staff strategies in the Romanian organizations, but the frequency of specific recruitment, instruction or training strategies is visibly reduced.

Another important aspect is the decentralized responsibility for human resources. In fact, the cooperations of the HRM department with the line managers in Romanian organizations is subsequent, with the staff structure being responsible for the decisions related to employees, and with the communication still being marked by the formal hierarchical authority. In terms of recruitment and selection processes, even though organizations still use traditional methods such as job application forms, a trend towards using technology-based ones has been notices, such as social media networks.

From the point of view of the assessment, there is a lack of correlation between the results of the professional assessment and the establishment of the training needs, but also an openness of organizations to use very popular training methods such as mentoring and coaching. After all, we are in agreement with the ones presented in this section if we assert that the HRM practices reportedly used in Romanian organizations have good prospects of orientation towards optimizing performance at organizational level.

Therefore, from the contemporary perspective of the HRM, contextualization remains particularly important when considering research of some issues related to human resources management, as the continuous large-scale changes in the economic, technological, social, political and legal climate involve changes in the relation between the main parties. Therefore, the development of a scientific approach regarding a human resources management issue in military organizations

requires specific identification, both in terms of the aforementioned trends and characteristics and in terms of the specific nature of the armed forces' missions.

HRM in the national defence system Particularities and guidelines derived from the HRM specific to Romanian organizations

Although the relation between civil and military organizations was established by the divergent nature of the strategic missions in society, the changes had an inherent impact on conflict scenarios as well also marked the internal connotations of the armed forces. As a result, military organizations, like their civil counterparts, had to review their strategic approach in order to adapt to the uncertain security environment, strengthening their status and effectiveness at national and other levels.

Analyzing the evolution of the HRM in the Romanian army, we note that it has followed a gradual path, similar to the international process, from the managament stage promoted by the traditional school to that of staff management, continued with the entrepreneurial and post-entrepreneurial phase, which also marks the maturity of the concept in the '90s, and followed by the strategic approach[10].

From a broad perspective, we can say that in the 21st century, the specific nature of HRM in military organizations continues to originate in the general mission of the armed forces to legitimately manage national and collective defence. Despite this, it is noted that this character has been getting softer, as the armed forces have been more able to tolerate a more flexibile typology from the organizational point of view and the processes associated with HRM – as a consequence of technological development and increased transparency in order to respond adequately to the challenges of the international security environment.

Furthermore, it is important to bear in mind that this development requires special features inherent to the defence systems of individual states which, in order to represent the complexity of the phenomenon and to issue rigurous analytical considerations explaining them, can be analyzed from the perspective of concepts and provisions that shape important aspects of the HRM.

By virtue of this aspect, today's Romanian army is the product of the successive transformation of the defence system since the '90s, as a *sine qua non* condition of the need to adapt to the imperatives of the development of the international environment and to integrate into the Euro-Atlantic security architecture, by elaborating new strategies, doctrines etc., the modernization of force structures, the attention given to the use of financial funds, preparation improvement and so on. Inherently, all of these changes have made their mark on the HRM.

Moreover, the characteristics of HRM in the defence system will be determined in accordance with specific national regulations and possible guidelines will be spelled out in light of the general specificity identified in the previous sub-chapter and of NATO's guidelines.

Firstly, the recruitment and selection processes are carried out on the principles of matching a person and an organization (abbreviated P-O), i.e. matching the individual's skills/attributes and the requirements of a job (abbreviated P-J)[11], which seek to keep, out of a large number of candidates, only those who prove the potential to perform the next phase in terms of intellectual, commitment to the role, character and the ability to join the values of a reference group to particular through the tasks assigned. In this respect, recruitment takes into account having a diploma attesting the secondary educational training. Research[12] carried out by the research group coordinated by Giusepe Caforio on European officers from 10 countries (Czech Republic, Denmark, France, Greece, Italy, Lithuania, the Netherlands, Poland, Sweden and Switzerland), points to some major trends in recruitment. The first one refers to the decline in the recruitment of officers strictly from internal sources, which implies greater convergence with civil organizations. Like this phenomenon, the national defence system relies on recruitment from internal sources, even if the attraction of candidates from the civil world is increasingly successful, especially in the fields of administrative and technical studies.

In the selection process, the following methods are used: medical examination, physical training examination, proficiency and skill tests (psychometric, technical etc.), personality tests and, frequently, and interview. As a rule, these tests produce scores according to which the hierarchy of those occupying one of the positions open for competition is established. In short, the selection of

military personnel is based on a two-dimensional examination: past education achievements in relation to future potential and consideration of medical, physical and mental conditions and some basic knowledge needed for the future role at the time of the "current" assessment.

Because a key aspect of this section is the changing nature of the military HRM, we can note that even though the process of personnel recruitment and selection keep conventional elements such as internal sources of incorporation in their institutions or retention methods, the military can focus on integrating specific instruments and civil organizations. For example, using technologies to promote their offers and recruitment through social networks, so that the army remains competitive in attracting well-educated candidates.

Secondly, if we take a brief look at the action lines mentioned in the security strategy[13], for the defence area, we note that providing a high-quality resource is linked to the architectural adaptation of the force structure in a step-by-step manner and the adaptation of the training process to the challenges of the current and anticipated security environment.

Generally, a possible summary description of the specific nature of the military training process can be its focus on structuring doctrine concepts in order to create an optimal relation between the conventional and professional approach – based on "mobilizing resources in order to manage talent and skills"[14]. In other words, the training process is assimilated with training "performed by the army to achieve the capacity of the personnel/ forces to perform specific tasks/missions by using the equipment"[15]. According to NATO-specific references, this includes the development of the knowledge, skills, competencies and critical attributes that are necessary to fulfill common basic tasks, those with physical requirements and those associated with military expertise.

As for the guidelines, NATO's design of changing the armed forces through the transforming dimensions of the training process is aimed at individual training, which, in addition to the institutional dimension, is becoming more and more effective in terms of self-development. This is also supported by the use of technologies, which extend and improve conventional learning methods. One of the most important trends is the provision of distance learning, which, by using digitalized tools with synchronous, asynchronous and mixed interaction, joins NATO's intention to provide "learner-centered" training when and where necessary, increasing and supporting training in full force, regular army and spare part[16]. In this respect, e-training is gradually developing in our Romanian military organizations and is supported by digital platforms, but the way in which digitalized tools influence the achievement of training objectives and what actions need to be taken to manage performance at organizational level still need to be analyzed.

As regards evaluation, we believe that, similar to the civil environment, the results depend on drafting the objectives in terms of analyzing future skills needed, the methodological approach and the tools used to carry out the training process itself in line with the goals. The evaluation process in the national defence system is characterized by highlighting objectives, expectations, rules and values by translating them into measurable criteria, i.e. taking decisions as regards individual progress, rewards, sanctions, ranking and selection. Theoretically, this approach should focus on increasing the attention paid by the soldiers evaluated to the goals they have to achieve and on empowering the evaluators, who have the fundamental task to link performance standards to the tasks of their subordinates and the clear results expected. In essence, the transition from the annual assessment based on performance standards to the ongoing one is a possible forward-looking approach with multiple benefits in terms of organizational performance.

Therefore, the conventional approach continues to remain the fundamental attribute when looking at the specificity of the HRM in military organizations. Although in this section we have noted the limitations of convergence with civil organizations – as a consequence of the determinism of the culture and the missions of the military, the role of the parties involved, the dynamics of the security environment and the regulatory framework in examining variations in the processes associated with the management of military personnel, it is clear that there are also key similarities with current and future guidelines that arise when referring to technology and performance.

Conclusions

The processes associated with the HRM in Romanian organizations are largely converged with the specific characteristics of the EU countries, while the distinct characteristics are part of the gap in the recognition of the specific guidelines, of the review in line with them and of the transformation as new concepts and technologies emerge.

In terms of human resources management in military organizations, the military admits that people are the most valuable asset, and the adjustment of the specific processes, preferably as soon as the slightest impact of external changes on the performance of missions is noticed, is essential for the completion of missions. It is generally important to bear in mind that such an approach requires particularities inherent to the national defence system, but it has a number of characteristics and guidelines similar to those of different organizations, in the context of integrating instruments that facilitate access to information, employability, personal development and performance. In light of this aspect, it is unlikely that all conventional practices in the HRM spectrum will work, and the key is to harmonize them with new approaches and tools that are institutionally strengthened, so that the army remains a viable option in competing for attracting and keeping high-qualified human resources and building a defence system capable of responding adequately to the challenges of the current security environment.

To summarize, the paper provides the following personal contributions:

- approaching the field of methods of analysis of HRM characteristics at the level of Romanian organizations, as compared to organizations in other countries (predominantly members of the European Union) – an approach that has a complementary character as regards previous papers conceived from the perspective of the exploration of theory, macro-level observations of practice, examination of national models, systems (public, private, military) etc.;
- raising the problem of the specificity of HRM in national military organizations in the "convergence versus divergence" vision, pointing to the specificities and the current guidelines.

The paper presents research limitations due to the following aspects: the comparative analysis of the data included statistical generalizations (from 2015), which captured only general characteristics and trends, defined by combining data gathered from several individuals in organizations, but not related to specific reference standards, which may be less appropriate for those concerned by the issue; much of the regulatory framework specific to the management of national defence system staff is not made available to the general public, which has not allowed the creation of a highly accurate picture of the specificities and guidelines identified.

Finally, the main issues addressed are: deepening the overall scientific framework approached in the work; extending research into the analysis of the characteristics of HRM to military organization in other states, so that ideas applicable in relevant contexts can be extrapolated to understand "the best practice"; the development of comprehensive studies reflecting how the processes are associated with HRM and why, through appropriate adaption of the research methods.

NOTES:

1 Frederik Winslow Taylor, *The principles of Scientific Management*, New York, 1911, http://www.drluisortiz. com / doc/articlefrontpage.pdf, accessed on 06.06.2021.

2 Dominique Roux, *Analyse économique et gestion de l'entreprise*, vol. 2, Dunod Publishing House, Paris, 1988, p. 236.

3 Jacoby Sanford, *Business and Society in Japan and the United States*, *Institute for Technology, Enterprise and Competitiveness*, 2005, pp. 5-14.

4 Donald P. Rogers, *Human resource management*, *The Encyclopedia of Human Resource Management – Short Entries*, Editor Pfeiffer, San Francisco, vol. 1, 2012, p. 277.

5 Garry C. McMahan, Myrtle P. Bell, Meghna Virick, *Strategic human resource management: Employee involvement, diversity, and international issues*, HRMR, 1998, vol. 8(3), pp. 193-214.

6 Michael Armstrong, *Armstrong's handbook of human resource management practice*, Kogan Page Publishing House, London, 2014, p. 4.

7 Adriana Bădescu, Codruța Mirci, Gabriela Bogre, *Managementul resurselor umane – manualul profesionistului,* carried out in the Phare project 2005/ 017-553.04.02.02.01.529 *Întărirea rolului funcţiei de resurse umane în organizaţii,* Timișoara, 2008, p. 12, http://www.islavici.ro/cursuriold/ Managementul_Resurselor_Umane%20-%20curs.pdf, accessed on 15.09.2021.

8 https://businessapps.cranfield.ac.uk/cranet/, accessed on 04.08.2021.

9 Michael J. Morley, Noreen Heraty, "The anatomy of an international research collaboration: building cumulative comparative knowledge in human resource management", *International Studies of Management & Organization*, vol. 49 (1), 2019, pp. 341-354.

10 Gheorghiță Căprărescu, Daniela Stancu, Georgiana Anghel, *Managementul resursei umane*, University Publishing House, Bucharest, 2009, pp. 19-22.

11 Tomoki Sekiguchi, "Person-organization fit and pers on-job fit in employee selection: a review of the literature", *Osaka Keidai Ronshu*, vol. 54 (6), 2004, pp. 179-191, https://www. irepository.net/il/user_conte nts/02/G0000031Repository/ repository/keidaironshu_054_006_179-196.pdf, accessed on 20.10.2021.

12 Rene Moelker, Joseph Soeters, *Democratization of recruitment*, apud G. Caforio, *The European cadet: Professional socialisation in military academies*, Baden-Baden: Nomos, 1998, p. 91.

13 *** *Strategia Națională de apărare a țării pentru perioada 2020-2024. Împreună, pentru o Românie sigură și prosperă într-o lume marcată de noi provocări*, approved by *Decision 22* of the joint meeting of the Senate and Deputy Chamber on June 30th 2020, „Monitorul Oficial", Part I, no. 574, 01.07.2020, Bucharest, p. 42.

14 Emil Păun, *Școala – abordare sociopedagogică*, Polirom Publishing House, Iași, 1999, p. 143.

15 *** *Doctrina instruirii Armatei României*, Bucharest, 2006, p. 14.

16 *** *Army regulation 350-1*, Army Training and Leader Development, 2017, p. 140, https://www. armyresilience.army.mil/ard/images/pdf/Policy/AR%20 350-1%20Army%20Training%20and%20L eader%20 Devel op ment%20%20.pdf, accessed on 28.08.2021.

REFERENCES

*** *Army regulation 350-1*, Army Training and Leader Development, 2017, https://www. armyresilience.army.mil/ard/images/pdf/Policy/ AR%20350-1%20Army%20Training%20and%20 Leader%20Development %20%20.pdf

***Doctrina instruirii Armatei României*, Bucharest, 2006.

*** *Strategia Națională de apărare a țării pentru perioada 2020-2024. Împreună, pentru o Românie sigură și prosperă într-o lume marcată de noi provocări*, aprobată prin *Hotărârea nr. 22* a ședinței comune a Senatului și Camerei Deputaților, din 30 iunie 2020, Monitorul Oficial, Part I, nr. 574, from 01.07.2020, Bucharest.

Armstrong Michael, *Armstrong's handbook of human resource management practice*, Kogan Page Publishing House, London, 2014.

Bădescu Adriana, Mirci Codruța, Bogre Gabriela, *Managementul resurselor umane – manualul profesionistului,* realizat în cadrul proiectului Phare 2005/ 017-553.04.02.02.01.529 *Întărirea rolului funcției de resurse umane în organizații,* Timișoara, 2008, http://www. islavici.ro/cursuriold/Managementul_Resurselor_ Umane%20-%20

Caforio G., *The European cadet: Professional socialisation in military academies*, Baden-Baden: Nomos, 1998.

Căprărescu Gheorghiță, Stancu G. Daniela, Anghel Georgiana, *Managementul resursei umane*, University Publishing House, Bucharest, 2009.

Emil Păun, *Școala – abordare sociopedagogică*, Polirom Publishing House, Iași, 1999.

Jacoby Sanford, *Business and Society in Japan and the United States*, Institute for Technology, Enterprise and Competitiveness, 2005.

McMahan Garry, Bell P. Myrtle, Meghna Virick, "Strategic human resource management: Employee involvement, diversity, and international issues", *Human Resource Management Review*, vol. 8(3), 1998.

Morley Michael, Heraty Noreen, "The anatomy of an international research collaboration: building cumulative comparative knowledge in human resource management", *International Studies of Management & Organization*, vol. 49 (1), 2019.

Rogers P. Donald, "Human resource management", *The Encyclopedia of Human Resource Management – Short Entries*, vol. 1, Editor Pfeiffer, San Francisco, 2012.

Roux Dominique, *Analyse économique et gestion de l'entreprise*, vol. 2, Dunod Publishing House, Paris, 1988.

Sekiguchi Tomoki, "Person-organization fit and person-job fit in employee selection: a review of the literature", *Osaka Keidai Ronshu*, vol. 54 (6), 2004, https://www.i-repository.net/il/user_ contents/02/G0000031Repository/repository/ keidaironshu_054_006_179-196.pdf

Taylor Frederik Winslow, *The principles of Scientific Management*, New York, 1911, http:// www.drluisortiz.com /doc/articlefrontpage.pdf

https://businessapps.cranfield.ac.uk/cranet/

http://www.drluisortiz.com/doc/articlefront page.pdf

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-41

REMARKS ON THE FIFTH-GENERATION WARFARE AND THE SECOND NAGORNO-KARABAKH WAR

Assoc.Prof. Alba-Iulia Catrinel POPESCU, PhD*

The second Nagorno-Karabakh War, in the autumn of 2020, is considered a turning point in the conduct of warfare. Until then, the fifth-generation warfare was only a theoretical subject. Also, the traditional air-power doctrine, claiming that air superiority is a precondition for winning a ground war, had become a topic for military historians. But, the latest exacerbation of the Armenian-Azerbaijani conflict in Transcaucasia has radically changed the situation. The fifth-generation warfare, dominated by non-kinetic actions to the detriment of the kinetic ones and by high technologies to the detriment of the classical, conventional ones, is as real as possible and the theory of air power returns in force. This article aims to answer the following questions: what are the characteristics of the fifth-generation warfare and how did they manifest in the Second Nagorno-Karabakh War? And what was the impact of the military confrontation in Transcaucasia on the way the modern warfare was conducted?

Keywords: the fifth-generation warfare; Nagorno-Karabakh; digital networks; cloud combat; unmanned aerial systems.

About the fifth-generation warfare

The "generational" criterion in the history of warfare was relatively recently introduced in the academic studies. A team of American politico-military analysts led by William S. Lind structured the "changing face of war" based on a series of indicators regarding the size of armies, the nature of military equipment, the tactics used in waging war[1]. Thus, they said in 1989, in the millennia from antiquity to the present, the war had known only four generations, of which the last two had developed in the second half of the twentieth century, in parallel with technological advancement and new industrial revolutions of computerization and digitization. Or, in other words, the way the war was waged reflected how wealth was accumulated[2]. The century of speed also left its mark on war – perhaps the most conservative way of *doing politics by other means*[3], if we are to relate to war in human history. First of all, the linear warfare was abandoned at a tactical level, focusing on speed, on strategic surprise, on stealth technologies. Then, war was decentralized by asymmetry, by erasing the demarcation between combatants and civilians, by the disappearance of the conventions of warfare, which no longer have to be declared, which turn the whole society into a battlefield, military uniforms becoming optional. And nowadays, we are surprised to see that time is "impatient" and that we are already in the fifth generation of warfare, in which hybridization and non-kinetic military actions, such as social engineering, misinformation, cyber-attacks, along with emerging technologies such as artificial intelligence and fully autonomous systems, have outperformed kinetic military actions, turning warfare into a confrontation of information and multiplying the theater of operations in all sectors of society.

An ubiquitous battlefield, conceptually foreshadowed by the great Prussian strategist Carl Philipp Gottlieb von Clausewitz (1780-1831), the theorist of unlimited warfare (later re-theorized as absolute warfare and total warfare) – the warfare without neutral spaces and non-combatants, the military and civilians being engaged in the common effort of the complete defeat of the enemy, until the final victory[4]. This ubiquitous battlefield uses a mixture of kinetic and non-kinetic force, in which conventional military violence has decreased, but in return, political, legal, economic, informational and technological violence has increased – according to some authors even more devastating than a conventional war[5]. Ideas that have been theorized by two Chinese colonels in the People's Liberation Army, Qiao Liang and Wang Xiangsui, who argued in 1999 that unlimited war in the modern era offers to militarily and politically disadvantaged nations

* *"Carol I" National Defence University*
e-mail: *albapopescu1@gmail.com*

a chance to successfully attack a geopolitical superpower. A geopolitical superpower whose military doctrine is driven by technology and by the effort to develop new and new classes of weapons and vehicles, extremely expensive and difficult to integrate into the already existing systems. Remarks shared by American analysts Frank G. Hoffman[6] and Nathan Freier[7], under the name of hybrid warfare and disruptive attacks or by Russian General Valery Gerasimov, the modern nonlinear warfare theorist, who remarks in an article on this subject that "no matter what forces the enemy has, no matter how well-developed his forces and means of armed conflict may be, forms and methods for overcoming them can be found. He will always have vulnerabilities and that means that adequate means of opposing him exist"[8].

In the same vein, American analyst Harlan Ullman, theorist of *massive attacks of disruption (MAD)*, believes that the modern warfare will be dominated by these disruptive attacks, components of the *shock and awe* doctrine, whereby the opponent's will to fight is paralyzed by the overwhelming magnitude of the attacks. These massive attacks of disruption, described by Ullman as "the fifth knight of the Apocalypse", are the result of seven major disruptive forces: government failure, climate change, cyberspace, social networks, drones, terrorism, and explosive indebtedness[9]. Forces that target societal vulnerabilities, that act synergistically through mutual empowerment and have a massive impact on the population. Forces acting on the "fabric" of interests and dependencies created by the interconnections of globalized, hyper-technological society. Forces that terrify precisely through the multitude of effects, on the domino principle, generated by the interference of technology, the diffusion of power and the dis-structuring of the Westphalian states.

Ideas in full agreement with the concept of unlimited warfare and the direction in which the hyper-technological society of the future is heading.

The characteristics of the latest generation warfare

There are four major features of fifth-generation warfare:

• *Extensive, interconnected and interdependent digital networks* that ensure the collection and transmission of information, detection, impact assessment and transmission of the command.

The different elements of force are interactive nodes on networks that can receive, operate and transmit data. The more these nodes are, the greater the power of the network is – if we refer to Metcalfe's Mathematical Law, which states that the value of a communications network is proportional to the square of the number of users connected to the system[10]. The transmission of data from the theater of operations is done in real time, through video recording systems incorporated in the military equipment in action.

• *Combat cloud.* Networks can form a virtual combat cloud – similar to commercial cloud computing - that allows data extraction and addition by digitally activating key combat platforms – missile defence, air combat, unmanned systems, ground force connectivity with other categories of forces through data links.

• *Multi-domain combat*. There are currently five synergistic operational areas: terrestrial, maritime, air, space and cyber.

• *The fusion warfare*. The concept of fusion warfare describes the vulnerabilities generated by the command-and-control warfare (encompasses all military tactics using communications technology), resulting from additional information flows, software incompatibilities and intrinsic vulnerabilities to attack and deception[11] – Operations security (OPSEC), Military deception, Psychological operations (PSYOP), Electronic warfare (EW), Psychological warfare, Cyber Operations.

The impact of the transition to the fifth-generation warfare

The modern warfare brings new risks and vulnerabilities but also new challenges, respectively:

• vulnerability to cyber intrusion, which can steal, delete, modify or insert false data into the system. Data that can spread quickly on the network, causing confusion and distorting the information;

• the risk of extended detection and annihilation by precisely guided weapons in case of network compromise;

Thus:

• cyber security is becoming essential in the context of modern warfare, issue that may lead to:

- the creation of a new, independent, cyber-force category, with the mission of waging cyber warfare and ensuring cyber security, contributing fundamentally to the operational unification of all categories of forces;
- development of military disciplines and education in cyber field;

• there is a need to fragment large networks into small and independent networks, on a neural model, whose eventual compromise would generate limited damage. But in this case, the functionality within the system might be disturbed;

• the increase of the expenses for the top research in the cybernetic field and for the acquisition of state-of-the-art equipment;

• networks imply the ideas of collective security and coalition. If we were to take into account geopolitical forecasts, we could say that modern warfare slides towards the civilizational component, which attracts a large number of international actors, united by common interests, principles and values, huge theaters of operations, massive forces engaged in fight as well as massive destruction and huge costs[12];

• state-of-the-art technology does not necessarily ensure victory. It has been demonstrated in Vietnam. The invasion followed by the conquest can end in failure, if the civilizational component comes into play, an aspect that might become prevalent in the future.

To all these aspects, there are added the non-kinetic components of the modern warfare, subsumed by the concept of MAD, already mentioned in this article, which could include biological weapons attacks on humans, livestock, forests or crops.

Last but not least, we must remember the research in the field of transhumanism, which aims to develop technologies to improve human biology, such as increasing sensory, cognitive, psychological, radical improvement of human health and prolonging human life. Technologies that will surely have military applications and that will bring up the sixth generation warfare.

Given these issues, which until recently were considered to belong to the distant future, we understand why the recent confrontation in Transcaucasia has been considered a turning point in the military field.

Brief remarks on the Second Nagorno-Karabakh War

Until Ullman's anticipations of the dismantling of the current international system are fulfilled, the Second Nagorno-Karabakh War was waged in the pure Westphalian tradition, from September 27 to November 10, 2020, between Armenia through the self-proclaimed Artsakh Separatist Republic and Azerbaijan.

Nagorno-Karabakh is a mountainous region of Transcaucasia (South Caucasus), in the Southwestern Azerbaijan, with an area of about 4,400 sqkm. Following the 1994 War, due to Armenian occupation of the hilly and plain territories around the region, on the border with Iran and Armenia, but also in the North and East, the separatist Artsakh Republic had come to control 41578,223 sqkm[13].

Azerbaijan's War Plan aimed at occupying these low-lying regions, closing the Lachin corridor – which is the only road connection between Nagorno-Karabakh and Armenia, isolation and falling of Artsakh. The fleet of unmanned aerial vehicles and the force of precise tactical ballistic missiles were launched into battle, destroying the fortified positions and military equipment of the separatists, so that five weeks after the beginning of the conflict, Azerbaijani troops were near the Lachin corridor and in the sixth week, Azerbaijani special forces captured the strategic city of Shusha, from where they launched mortar attacks on the region's capital, Stepanakert. Hostilities ended with a ceasefire agreement and the *de facto* victory of Azerbaijan, which retained control of the recaptured areas in Nagorno-Karabakh and also obtained transport communications to Nakhichevan, its exclave, from the immediate vicinity of Turkey and Iran[15]. Nowadays, along the Lachin strategic corridor between Armenia and Nagorno-Karabakh, Russian peacekeeping troops have been deployed (see the map in Figure no. 1).

Following this escalating episode of the "frozen" Armenian-Azerbaijani conflict, the separatists lost more than 185 tanks (out of a total of 400 in Armenia) as well as numerous artillery pieces, air defence systems, missile launchers and infantry fighting vehicles[16]. It was the first war won, mainly, by unmanned aerial vehicles – unmanned aerial systems (UAVs). "The first postmodern conflict ... in which drones overwhelmed a conventional

Figure 1 *Political map of the Nagorno-Karabakh region on December 1, 2020*[14]

ground force, grinding it to impotence and paving the way for Azeri ground forces to move and take control of a strategic chokepoint"[17] as it was stated by military analyst Uzi Rubin. And an electronic warfare, which blinded Armenian radars, thus facilitating their destruction and the destructions of the anti-aircraft batteries. A war in which Yerevan was "out-fought, out-numbered, and out-spent"[18]. A real postmodern war, in which every action was filmed and transmitted in real time by the attacking UAVs.

As for the victory, it was not at all surprising, if we take into account the discrepancy in power between the two states, Azerbaijan being three times bigger[19], three times more populated[20], more economically efficient[21] and much richer in resources, especially energy, than Armenia.

Yet, it was an extremely surprising victory by the way it was obtained.

Basically, the war was won from the air and not on the ground, where the advance was by no means a *blitz-krieg*[22], confirming a geopolitical theory that was launched in the 1940s, belonging to a military man and businessman, American of Georgian descent, Alexander de Seversky (1894-1974). Seversky said that military strategy, defined as "the general plan that defeats geography to apply military force against the enemy" cannot be fully applied outside air power, "the supreme expression of military power". Therefore, air superiority is the condition for winning a war with minimal human and material casualties, as "today's air vehicles, airplanes or ballistic missiles, whether manned or not, can rise directly from their national bases and can hit any target in the world [...] today, the air force is the only strategic force and is the main instrument of national military power"[23], consequently, the target of any nation that wants to win a war it must be "the domination of air and space above it"[24]. Or, in other words, *he who owns the skies, will own the ground*.

Air domination, this time, was no longer achieved conventionally, by manned aircraft and helicopters, visible on radar and vulnerable to anti-aircraft defence, but by a very complex system of UAVs, which:

- *ensured the surveillance of enemy troops* (real-time intelligence, surveillance and SRI reconnaissance),
- *misled the Armenian defence* by radar-visible biplanes, propelled by propellers and equipped for remote control, which blocked radars on false targets while attacks were launched with sliding bombs from Turkish UAVs Bayraktar TB2 and floating "suicide" HAROP drones of Israeli origin, which destroyed Russian mobile air defence systems of all kinds, from the old SA 8 Osa, SA 13 Strela 10, to the modern SA 15 Buk – the missile system that shot down Flight 17 of Malaysian Airline over eastern Ukraine, in 2014 – or S-300 surface-to-air missile platforms[25].

The one behind this victory was overwhelmingly the Turkish KORAL electronic warfare system, designed to block radar and wireless communications channels[26], which blinded radars, making it impossible to detect Turkish and Israeli drones. And, of course, the effort of Azeri special forces, that hardly fought against the separatists' fortifications.

And, it must be remembered that neither Azerbaijan nor Armenia used ballistic missiles against any target in the national territories, outside the conflict theater, out of the desire not to escalate and internationalize the war, although on July 17, 2020, Azerbaijan openly threatened to hit Armenia's Metsamor nuclear power plant with precision ballistic missiles[27].

The impact of the military confrontation in Transcaucasia on the way modern warfare is conducted

The recent Nagorno-Karabakh confrontation has revolutionized the way warfare is waged by:

- demonstrating the vulnerabilities of the conventional armament to the latest generation one. Consequently, the maintenance/acquisition of outdated weapons systems is totally counterproductive and costly;
- the need for an integrated air defence system (IADS) to counter modern air threats – meaning cloud combat. Such a configuration, with different layers of modern capabilities (long, medium, short and very short range) and well connected to the network, would allow better management of the plethora of challenges, from traditional aircraft and radars, to swarms of UAV;
- the fundamental role of electronic warfare in modern warfare;
- reiteration of the traditional air power doctrine that air superiority is a prerequisite for winning a ground war, revealing a new, more cost-effective and painless way to achieve it, through the disappearance of aircrew victims;
- certification of the radical transformation of the battlefield, in which unmanned systems and electronic "witchcraft" already operate;
- the fundamental role of the human factor, responsible for the strategic planning of defence and the capacity of a state to economically ensure its defence in a present dominated by an extremely rapid technological advance, which entails the need for a flexible military education system, based on creativity, analytical thinking and strategic thinking, adapted to the new realities of war;
- the fundamental role of scientific research in the military and civilian field, which, in the future, will make the difference between survival and annihilation;
- the overwhelming importance of alliances / coalitions, without which no state will be able to resist in the conditions of the current and future technological "sprint".

And, as an immediate consequence, in 2021 there was an increase in global demand for armed and unarmed UAVs and for offensive and defensive electronic warfare systems.

It should also be remembered that the success of the drone attack also depended on the weather, which allowed a good optical transmission. This raises the issue of geo-climatic tactical weapons and their role in countering UAV attacks.

And, last but not least, we must remember that, the current industrial revolutions behind this technological boom, bring upfront the need for new raw materials – the strategic ores – and new geopolitical stakes. Which means new and new areas of confrontation and even greater volatility of the international environment.

These aspects confirm that the war of the fifth generation is a certainty that no longer belongs to war games and anticipation, remaining only a matter of time, not at all that long, until war reaches the next level, the sixth generation, when android robots and the transhuman man face off in theaters of operations.

How prepared will all of us be then? It remains to be seen.

NOTES:

1 William S. Lind, Col. Keith Nightingale, Capt. John F. Schmitt, Col. Joseph W. Sutton, Lieutenant Colonel Gary I. Wilson, "The Changing Face of War: Into the Fourth Generation", *Marine Corps Gazette*, October 1989.

2 Heidi Toffler, Alvin Toffler, *War and Anti-War: Making Sense of Today's Global Chaos*, Warner, London, 1993, passim.

3 Carl Philipp Gottlieb von Clausewitz, *Despre război*, Antet Publishing House, Bucharest, 2001.

4 *Ibidem.*

5 Qiao Liang, Wang Xiangsui, *Unrestricted Warfare: China's Master Plan to Destroy America*, People's Liberation Army Literature and Arts Publishing House, 1999, https://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.169.7179, accessed on 10.10.2021.

6 Frank G. Hoffman, "Hybrid Warfare and Challenges", *Joint Force Quarterly (JFQ),* Issue 52, First Quarter, 2009.

7 Nathan Freier, "Hybrid Threats and Challenges: Describe… Don't Define", *Small Wars Journal*, 06.01.2010, https://smallwarsjournal.com/jrnl/art/hybrid-threats-and-challenges-describe-dont-define, accessed on 10.10.2021.

8 "The «Gerasimov Doctrine' and Russian Non-Linear War»/Valery Gerasimov, "The Value Of Science In Prediction", *Military-Industrial Kurier*, 27 February 2013, https://inmoscowsshadows.wordpress.com/2014/07/06/the-gerasimov-doctrine-and-russian-non-linear-war/, accessed on 10.10.2021.

9 Harlan Ullman, *Al cincilea cavaler al apocalipsei şi noul MAD*, Military Publishing House, Bucharest, 2021, p. 30.

10 Peter Fisk, *Metcalfe's Law explains how the value of networks grows exponentially ... exploring the "network effects" of businesses like Apple, Facebook, Trulia and Uber*, 17.02.2020, https://www.peterfisk.com/2020/02/metcalfes-law-explains-how-the-value-of-networks-grow-exponentially-there-are-5-types-of-network-effects/, accessed on 10.10.2021.

11 Peter Layton, *Five fifth-generation warfare dilemmas*, ASPI, 25.07.2017, https://www.aspistrategist.org.au/five-fifth-generation-warfare-dilemmas/, accessed on 10.10.2021.

12 Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, Simon & Schuster, 1996, passim.

13 *** *Nagorno-Karabakh*, World Atlas, https://www.worldatlas.com/geography/nagorno-karabakh.html, accessed on 10.10.2021.

14 https://1.bp.blogspot.com/-G3rnm9O235Q/X8ctv896HUI/AAAAAAAADTU/a_J8SZKcE6Ub2GDnr_Qq4bE_SvP8AzBbwCLcBGAsYHQ/s0/2020-12-01_azerbaijan-armenia-nagorno-karabakh-map-artsakh-after-withdrawals.png, accessed on 10.10.2021.

15 Andrew E. Kramer, "Facing Military Debacle, Armenia Accepts a Deal in Nagorno-Karabakh War", *The New York Times*, 10.11.2020, https://www.nytimes.com/2020/11/09/world/middleeast/armenia-settlement-nagorno-karabakh-azerbaijan.html, accessed on 10.10.2021.

16 Uzi Rubin, *The Second Nagorno-Karabakh War: A Milestone in Military Affairs,* Begin-Sadat Center for Strategic Studies, Tel Aviv, 2020, https://besacenter.org/wp-content/uploads/2020/12/184web-no-ital.pdf, accessed on 10.10.2021. p. 11.

17 Uzi Rubin, *op.cit*., p. 5.

18 John Antal, *The First War Won Primarily with Unmanned Systems: Ten Lessons from the Second Nagorno-Karabakh War*, United States Special Operations Command, https://www.socom.mil/, accessed on 10.10.2021.

19 86.600 km^2 – Azerbaijan; 29.743 km^2 – Armenia. ***CIA WorldFactBook,* https://www.cia.gov/the-world-factbook/countries/azerbaijan/; https://www.cia.gov/the-world-factbook/countries/armenia/#geography, accessed on 10.10.2021.

20 10.282.283 inhabitants – Azerbaijan; 3.011.609 inhabitants – Armenia (estimated in July 2021). ***CIA WorldFactBook*, https://www.cia.gov/the-world-factbook/countries/azerbaijan/#people-and-society; https://www.cia.gov/the-world-factbook/countries/armenia/#people-and-society, accessed on 10.10.2021.

21 PIB total (estimated in 2019): 144.374 billion USD – Azerbaijan, 40.384 miliarde USD – Armenia; PIB/capita: 14.404 USD – Azerbaijan, 13.654 USD – Armenia. ****CIA WorldFactBook*, https://www.cia.gov/the-world-factbook/countries/azerbaijan/#economy; https://www.cia.gov/the-world-factbook/countries/armenia/#economy, accessed on 10.10.2021.

22 The distance from the initial point of attack to the farthest western point is about 100 km and was covered in four weeks. The distance from the point of initial attack to the northernmost point is about 80 km and was covered in six weeks. Uzi Rubin, *op.cit.*

23 Alexander de Seversky, *Air Power: Key to Survival with a Prologue on the Lesson of Korea*, Simon & Schuster, New York, 1950, pp. 36-37, apud Alba-Iulia Catrinel Popescu, *Tratat de geopolitica, Volumul I: Geopolitica puterii maritime,* Top Form Publishing House, Bucharest, 2020, pp. 164-165.

24 *Ibidem*, p. 81, apud *Ibidem*, p. 165.

25 Ben Ho, "The Second Nagorno-Karabakh War: Takeaways for Singapore's Ground-Based Air Defence", *Journal of Indo-Pacific Affairs*, Air University Press, 25.08.2021, https://www.airuniversity.af.edu/JIPA/Display/Article/2743721/the-second-nagorno-karabakh-war-takeaways-for-singapores-ground-based-air-defen/, accessed on 10.10.2021.

26 ****Electronic warfare killed Russian-made weapons in Nagorno-Karabakh*, Global Defence, 05.11.2020, https://www.globaldefencecorp.com/2020/11/05/electronic-warfare/, accessed on 10.10.2021.

27 ****Azerbaijan Threatens Missile Strike on Armenia's Nuclear Power Plant,* USC Dornsife Institute of Armenian Studies, 17.07.2020, https://armenian.usc.edu/azerbaijan-threatens-missile-strike-on-armenias-nuclear-power-plant/, accessed on 10.10.2021.

REFERENCES

*** *Azerbaijan Threatens Missile Strike On Armenia's Nuclear Power Plant,* USC Dornsife Institute of Armenian Studies, 17.07.2020, https://armenian.usc.edu/azerbaijan-threatens-missile-strike-on-armenias-nuclear-power-plant/

*** *CIA WorldFactBook.*

*** *Electronic warfare killed Russian-made weapons în Nagorno-Karabakh*, Global Defence, 05.11.2020, https://www.globaldefencecorp.com/2020/11/05/electronic-warfare/

*** *Nagorno-Karabakh*, World Atlas, https://www.worldatlas.com/geography/nagorno-karabakh.html

Antal John, *The First War Won Primarily with Unmanned Systems: Ten Lessons from the Second Nagorno-Karabakh War*, United States Special Operations Command, https://www.socom.mil/

Von Clausewitz Carl Philipp Gottlieb, *Despre război*, Antet Publishing House, Bucharest, 2001.

Fisk P., *Metcalfe's Law explains how the value of networks grows exponentially ... exploring the "network effects" of businesses like Apple, Facebook, Trulia and Uber*, 17.02.2020, https://www.peterfisk.com/2020/02/metcalfes-law-explains-how-the-value-of-networks-grow-exponentially-there-are-5-types-of-network-effects/

Freier Nathan, "Hybrid Threats and Challenges: Describe… Don't Define", *Small Wars Journal*, 06.01.2010, https://smallwarsjournal.com/jrnl/art/hybrid-threats-and-challenges-describe-dont-define

Gherasimov Valeri, "The Value Of Science in Prediction", *Military-Industrial Kurier*, 27 Februarie 2013, https://inmoscowsshadows.wordpress.com/2014/07/06/the-gerasimov-doctrine-and-russian-non-linear-war/

Ho Ben, "The Second Nagorno-Karabakh War: Takeaways for Singapore's Ground-Based Air Defence", *Journal of Indo-Pacific Affairs*, Air University Press, 25.08.2021, https://www.airuniversity.af.edu/JIPA/Display/Article/2743721/the-second-nagorno-karabakh-war-takeaways-for-singapores-ground-based-air-defen/

Hoffman Frank G., "Hybrid Warfare and Challenges", *Joint Force Quaterly (JFQ)*, Issue 52, First Quarter, 2009.

Huntington Samuel P., *The Clash of Civilizations and the Remaking of World Order*, Simon & Schuster, 1996.

Kramer Andrew E., "Facing Military Debacle, Armenia Accepts a Deal în Nagorno-Karabakh War", *The New York Times*, 10.11.2020, https://www.nytimes.com/2020/11/09/world/middleeast/armenia-settlement-nagorno-karabakh-azerbaijan.html

Layton Peter, *Five fifth-generation warfare dilemmas,* ASPI, 25.07.2017, https://www.aspistrategist.org.au/five-fifth-generation-warfare-dilemmas/

Lind William S., Col. Nightengale Keith, Capt. Schmitt John F., Col. Sutton Joseph W., Lt.Col. Wilson I. Gary, "The Changing Face of War: Into the Fourth Generation", *Marine Corps Gazette*, octomber 1989.

Liang Qiao, Xiangsui Wang, *Unrestricted Warfare: China's Master Plan to Destroy America*, People's Liberation Army Literature and Arts Publishing House, 1999, https://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.169.7179.

Popescu Alba-Iulia Catrinel, *Tratat de geopolitică, Volumul I: Geopolitica puterii maritime*, Top Form Publishing House, Bucharest, 2020.

Rubin Uzi, *The Second Nagorno-Karabakh War: A Milestone în Military Affairs*, Begin-Sadat Center for Strategic Studies, Tel Aviv, 2020, https://besacenter.org/wp-content/uploads/2020/12/184web-no-ital.pdf

Toffler Alvin, Toffler Heidi, *War and Anti-War: Making Sense of Today's Global Chaos*, Warner, London, 1993.

Ullman Harlan, *Al cincilea cavaler al Apocalipsei şi noul MAD*, Military Publishing House, Bucharest, 2021.

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-42

CONSIDERATIONS ON THE DESIGN OF THE AIR DEFENCE RESPONSE IN THE CURRENT AIRSPACE

Col.Assoc.Prof. Daniel ROMAN, PhD*

The unprecedented technological development in the field of weapons and ammunition used in the airspace, at low and very low altitudes, is one of the major challenges that the traditional air defense systems have to face. To this end, the military specialists of the modern armies pay special attention to the new types of air threats and seek solutions to maintain a balanced situation in the field of airspace security. In this regard, a number of transformations of the VSHORAD, SHORAD air defense missile systems are identified. The technical and tactical solutions mainly refer to increasing the capabilities of the weapons and ammunition systems, which can be used in achieving the specific algorithm of countering an air threat by applying certain specific methods, TEWA (Threat Evaluation and Weapons Allocation). This scientific approach highlights the possibilities of taking short and very short range air action as a starting point in the current development of the air defense systems, which by applying the operational art can temporarily compensate for the technological gap between the air threats and the air defense response.

Keywords: air threat; VSHORAD; SHORAD; TEWA; operational art.

The New Context of Airspace Combat

The need to expand the land battlefield has led directly to identifying the technological solutions in the close airspace, respectively to developing means of air action at low and very low altitudes. This is a reality of the modern battlefield, where more and more modern armies use phrases such as "tank-helicopter binomial". In this context, we can speak of an increase in user density in the airspace, especially at low and very low altitudes. In the spirit of the economy of a hypothetical opponent's forces and means used in a military conflict, there are several tendencies of airspace action, covering the entire spectrum of ranges. This is possible from the onset of the aggression by surprise, without resorting to previous measures of mobilization and formation of the joint task force.

In order to achieve air superiority during an offensive operation, it is expected that the first air strike employs the assets required to neutralize the air defence and to create gaps to penetrate the tactical depth of the battlefield, supported by bombings from medium and high altitudes. In order to maintain the initiative in the offense, one of the objectives is to achieve a maximum intensity of air strikes in the first 3 to 4 hours after the launch of the attack, using air assets with small radar cross sections, high velocities and increased maneuver capabilities under the protection of strong radio jamming. In this context, the most likely avenues of approach will be in the directions from which the attack is conducted and on the access routes to the objectives from the tactical, operational and strategic depth. Thus, it is expected that various types of weapons and ammunition will be used, mainly radio beam riding missiles, and last but not least, drones (as asymmetric air threats), observation sensors and long-range heavy artillery fire direction and surface-to-surface missiles.

Air Treat and Response in the Layered Air Space

Following the study of recent military conflicts, in this case the war in Nagorno-Karabakh (autumn 2020), new dimensions of the confrontation have emerged, in the sense of the existence of those technological changes in using the classical air means (multi-purpose aircraft and helicopters). The analysis of the conflict shows that a new generation of unmanned aerial vehicles (UAV) was introduced into combat. According to the military planners, the results of the analysis of air combat actions in the Nagorno-Karabakh war led to identifying three prospective areas, as follows:

** "Carol I" National Defence University*
e-mail: *danutroman2@yahoo.com*

the need for an integrated air defence system as a critical prerequisite in conducting operations; the increasing role of the electronic warfare as an aspect of the confrontation which must be emphasized in all phases of the operations, as well as the preparation of the human factor or the decision-maker in conducting operations[1]. The need for an integrated air defence system (IADS) is a reality of the modern combat space, vital for countering air threats, which requires a new configuration of the air defence layered on altitudes and focused mainly on network integrated collaborative work[2]. Working within an integrated network, as a method of combat, can be the variant through which the simultaneous use of the air and air defence resources takes place, which would allow a much more efficient management of the multitude of challenges, from multi-purpose aircraft to the multiple technological configurations of UAVs.

The classic variant of air threat emerging at low and very low altitudes involves breaking through the air defence system and engaging targets in the tactical depth of the battle space. This is expected from the first hours of a military conflict, which can be achieved through a maneuverable approach of dynamically altering the combat formation and the firing procedures. Most likely, the strategic reconnaissance aviation will perform aerial survey day and night, with isolated aircraft flying at speeds ranging between 700 km/h and 900 km/h at high and stratosphere altitudes (10,000 m and 18,000 m) with frequent changes of direction, speed, altitude and heavy use of radio jamming.

Depending on the relief of the confrontation area corroborated with the aircraft's homing and engagement capabilities, the avenues of approaching the target are identified by flying at low and very low altitudes (20 - 150 m) on different flight paths of the aerial targets. The use of low and very low altitudes of the avenues of approach when engaging targets limits the continuous searching and tracking of aerial targets, with regard to the maximum capabilities of the radiolocation stations and thus an impediment to the destruction of hostile aircraft by the air defence response system.

In order to develop the topic of "air threat" in the military action planning, we identified three distinct areas of approach, as follows: combat formation, their tactical deployment and the technical-tactical capabilities of the air enemy structures. Due to this, we covered four directions of analysis in the study of the air defence response: the air defended objective, the air enemy/opponent, the air and missile defence structures and the air space of responsibility. According to this approach, the study will focus on the airspace layered on altitudes and a dynamic evaluation of the possibilities to identify and visualize the trajectories of the aircraft, on combat sequences, together with the estimate of the most likely firing line of the aircraft. The war in Nagorno-Karabakh 2020 is also characterized in terms of its preliminary stages of technological preparation, which is why, starting 2010, there have been a significant number of high-tech weapons and ammunition acquisitions.

According to a report by the Stockholm International Peace Research Institute (SIPRI) published in 2018, "Armenia has received a large amount of military equipment from Russia, including two S-300PS/SA-10C air defence missile systems, 10 Tigr armored vehicles, 400 Igla-S/ SA-24 MANPADS, 25 Iskander ballistic missile units; 6 BM-30 9A52 Smerch 300 mm Multiple Launch Rocket Systems, 200 Verba SA-25 and an undisclosed number of 9M133 Kornet/ AT-14 anti-tank missiles"[3]. According to the Middle East Eye news office in London, apparently "although the Armenian army aimed to strike the Azerbaijani capital of Baku, with Iskander ballistic missiles in the last days of hostilities in November 2020[4], the Azerbaijani army succeeded to neutralize the Iskander ballistic missile in flight, using the "Barak-8" air defence system (an air defence system purchased from Israel)"[5]. This situation highlights the importance of the existence of an altitude layered air defence system. Depending on the final technical configuration of the air defence response system, the "Barak-8" weapon system has the ability to simultaneously engage several aerial targets such as: anti-ship missiles, aircraft, UAV drones and supersonic missiles.

To understand the tasks of air defence response systems in the VSHORAD, SHORAD integrated concept, we chose the "Barak-8" system used in the Nagorno-Karabakh war as a reference point for describing the new reality in the field of current airspace security. The situation analysis is based on the understanding of the extended configuration through the progressive launch areas of three types of Barak interceptors, namely "Barak MRAD"

(with single-stage rocket engine and a range of 35 km), the intermediate configuration "Barak LRAD "(with two-stage rocket engine and a range of 70 km) and the third configuration: "Barak ER" (the interceptor with the longest range, which has a two-stage rocket engine and an additional booster for a 150 km autonomy)[6]. The concept of the "Barak" air defence response has been developed in a new approach to airspace security. In order to meet the basic requirement of being able to deal with several types of air threats simultaneously, several types of radars and launchers have been integrated, which can build an optimized response against fighter jets, helicopters, UASs, cruise missiles, surface-to-air and surface-to-surface missiles. The possibility of a flexible configuration of the air defence response system on the three types of missiles (MRAD, LRAD and Barak ER) is based on the functional massing of the common elements of the subsystems: intelligence, command and control, fire and logistics. In the technical configuration performed on the four action subsystems, the significant advantage of continuous maintenance, training and solving training exercises by different users is generated. Such an innovative concept was developed based on "working on functional modules" which offers high flexibility in terms of technological but also operational integration. In the further development of the new weapons systems according to the same concept, a new

must air defend both a number of vital targets in the area of responsibility and also the troops conducting a military operation. The issue of assessing the performance of such air defence systems in a joint concept becomes a matter of paramount importance. The innovative aspect of the concept is the establishment of the BARAK Battle Management Center (BMC), where the airspace image is created through data/ pictures merged with sensors and interception coordinates, which analyzed electronically, help the decision-makers of the operational task forces to manage the engagement of the air enemy. Therefore, the open and innovative architecture of such an air defence system, based on the software of "BARAK MX", offers exceptional flexibility in operation and planning of the combat power in order to counter future air threats.

The Operational Art for the Design of Air Combat Action

The new current airspace security context calls for the development of new integrated and layered air defence structures appropriate to the range of air threats. Operational flexibility in this case may be one of the necessary solutions for modular design on combat functions, in a sequential air defence response algorithm, as follows: airspace reconnaissance, detection and classification of air targets, identification friend or foe of an aircraft,

Figure 1 *Representation of the "Barak-8" integrated modular concept for countering air threats with progressive range 30 – 70 – 150 km*[7]

much more efficient possibility of engaging the air defence systems results.

Due to the complexity of the work for an effective air defence response against the broad spectrum of air threats, the decision-makers

engagement and destruction of hostile air targets, assessment of the effects of the air defence fire, cessation or resumption of the air defence algorithm.

A first observation is that technologically there are two tendencies to achieve the air defence response

algorithm. The first variant refers to designing air combat on distinct sequences accomplished by specialized modules for each air defence operation, such as the older generation S-75 M3 "VOLHOV" air defence missile system, or the newer generation MIM-104 "PATRIOT". The second variant refers to the integration of all the functions into a single technological module/ war machine which will conduct the air defence response, such as the SA-8 "Osa-AKM" air defence missile system or the air defence artillery "GEPARD", respectively 2K22 "TUNGUSKA" system.

The method of the air defence response in both technological variants is based on the results of the application of the operational art in designing the air combat actions. In other words, the success of the defence against the air opponent consists in the achievement of the combat device or in other words, it is conditioned by the way of combining four system variables, namely: the air defended objective, the air enemy/opponent, the air and missile defence structures and the air space of responsibility. The operational art is applied in the field of airspace security in order to establish the methods and means necessary to achieve the air defence of the objectives effectively and within the limits of accepted risks. A2AD (Anti-access Area Denial) is not an absolutely new concept, and as a direct result of applying the operational art in the Black Sea area, concrete actions of the Russian Federation have resulted for the resuscitation of the early warning radar systems and the installation of modern electronic warfare equipment" as new capabilities in Crimea[8]. Combining the air space combat assets involves a series of projections and integrated analyses to identify the most effective ways to counteract the actions of a hypothetical opponent in the area of responsibility. Thus, it is expected that in the Black Sea area, "by deploying these capabilities, with the missile systems, Russia will be able to create a multilayered, interconnected defence network that can threaten or deny the presence of any other force inside the A2AD bubble"[9].

Therefore, the application of the operational art which promotes the joint action becomes essential for achieving the design of the airspace combat actions[10]. Observing the A2AD concept, we understand the spatial design and time synchronization of all specialized means that can engage a hypothetical adversary, on a large scale of the possible threats in an area of responsibility, such as the Black Sea. In this respect, we consider the fact that the application of the operative art results in the combination of the tactics, techniques and procedures with several services and capabilities, which jointly provide the development, establishment and execution of the so-called "kill box" area, which allows the timely engagement of a target.

Therefore, we observe there are two integrative methods for achieving the air defence response: one according to the "Barak-8/ BARAK MX" integrated modular concept and the second, according to the concept of achieving a "kill box" area with several weapons systems. In the "BARAK MX" variant with a flexible configuration of the air defence response system on the three types of missiles (MRAD, LRAD and Barak ER) there is the possibility of an extended "kill box" layered area, for a certain type of threat, a situation that is performed for a certain type of dedicated air defence response, by a single combat unit (Figure 1), progressively, with the three types of missiles. In both previously mentioned variants,

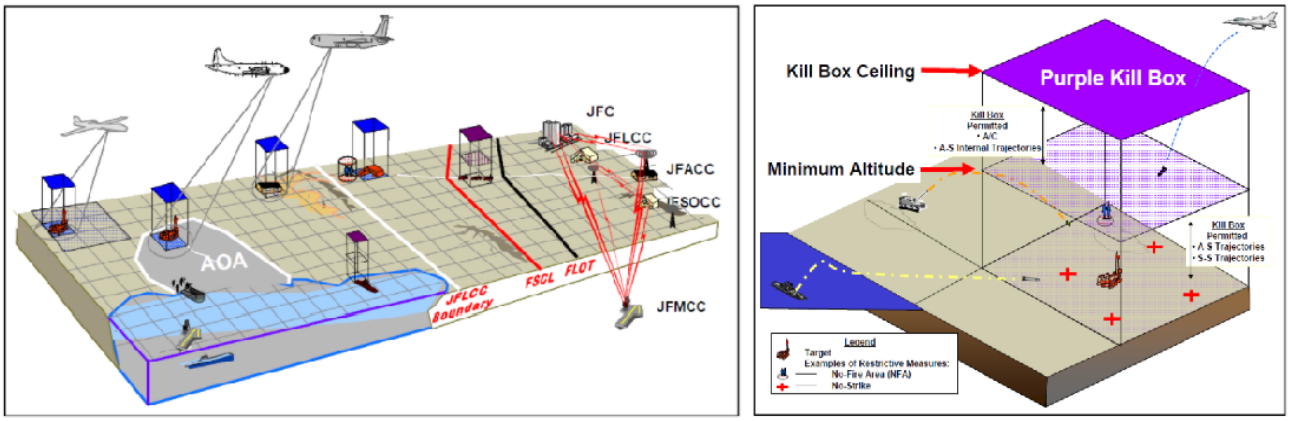


Figure 2 *Graphical representation of the concept of achieving a "Kill box" area*[11]

we note that in the situations of air defence and air defence response, the decision-makers estimate the air combat in computer assisted coordinates, depending on the objectives in the territory or the troops involved in military operations[12]. Thus, an appropriate report of assigning the available air defence firing units for each combat sequence is developed in real time against air targets.

In the literature, the intelligence preparation of the battle space ensures the proper decision making for the achievement of the combat formation and the positioning of the weapon systems in the combat space. One of the methods used for this purpose is the networking of the threat evaluation and weapon allocation systems (TEWA). The problem of evaluating the performance of the collaborative work by network connecting the air defence response or enemy engagement systems is one of the challenges of the contemporary battle space. A hypothetical air adversary will engage targets in the target area by gradually changing the combat tactics at different altitudes and speeds, depending on the terrain configuration and the maneuvering possibilities in order to avoid air defence fire from the surface. The integrated modular concept of the "BARAK MX" air defence response, as in Figure 1, contributes to understanding the need to redesign the entire air defence response system. One of the possible solutions in this regard can be using the model of the interconnected work of the air defence fire units and the development of a centralized system of data on the air situation, by the TEWA method, as shown in Figure 3.

Capitalizing on the unitary realization of an air defence collaborative network, by operationalizing the TEWA method, as it results from Figure 3, can be a transit solution from the classic air defence response systems to that unitary, automatic computer-assisted network system. This is based on the possibility of designing and executing several network information nodes, in which the common aerial picture is progressively composed, in the GUI (graphical user interface) module, which can be subsequently distributed to each of the six interconnected weapon systems, as in Figure 3. Depending on the flight altitude and other parameters of the air targets, according to the threat situation and the aggression in the layered airspace, we witness a progressive activation of the sensors and implicitly a triggering of the individual procedures for engagement, combat and destruction of air targets in the common airspace. According to the combat capabilities of each air defence system, they will contribute to the achievement of a progressive volume of air defence fire, the minimum necessary for an economy of effort per unit of combat and time. This results, in particular, for the situation of certain fixed objectives which need to be air defended in the area of operations. On the other hand, due to their mobility in the tactical field, in order to provide air defence to the troops conducting a military operation, the possibilities of air defence will decrease according to the terrain configuration and the dynamics of the military operations.

Therefore, there is a necessary situational compromise in achieving an effective air defence

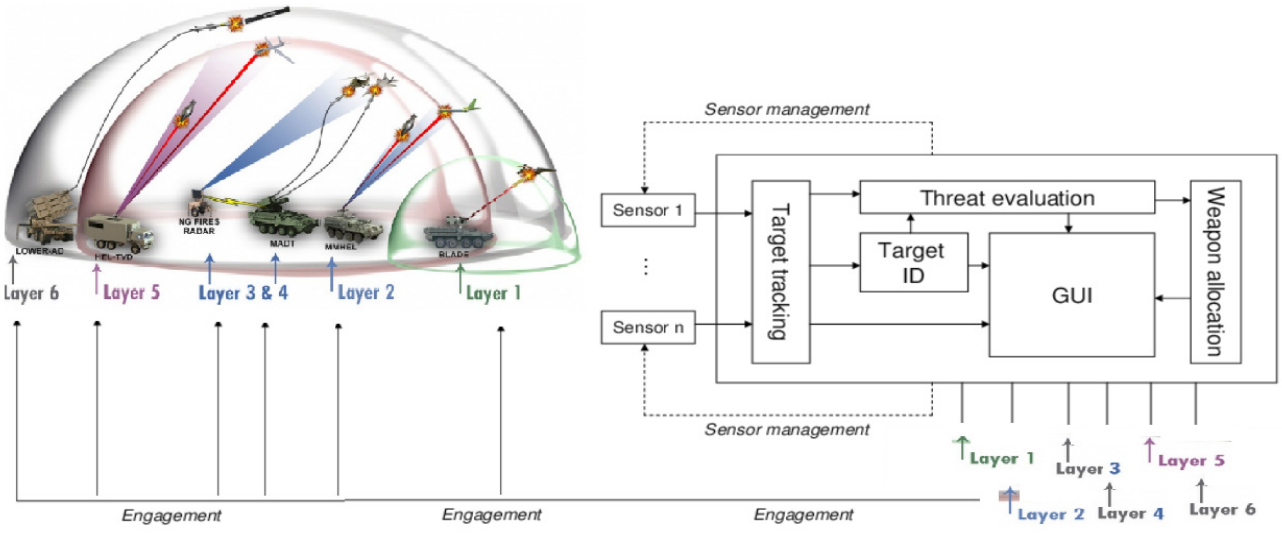


Figure 3 *Schematic variant for the interconnected work in the design of air defence response in TEWA concept*[13]

response against an air opponent that can act at different altitudes at different speeds and progressively changing the combat tactics[14]. In other words, conducting an air defence response through the TEWA method includes two distinct planning hypotheses regarding the engagement and destruction of air targets. In formulating the planning hypotheses, we will refer to the possibility of allocating air defence weapons as a reactive measure to the air threat. This weapon allocation process must answer a question in order to activate the most appropriate weapon system, i.e. which unit or units will engage a certain air target. For this approach, the first planning hypothesis was developed, where the air defence objective is stationary, which implies the activation of all available firing units in a single stage. Such activation has direct implications on the conditions of economy of effort and direction of restricted air defence fire.

In the second case, in which the objective to be air defended is involved in the dynamics of the operation (troops conducting a military operation) we can talk about a dynamic allocation of weapons according to the progress of the battle, so that each firing unit will be allowed a certain number of discrete stages of combat. Another division that can be made regarding the air defence firing resource is the one in which the allocation of weapons is based on the evolution of the air situation, in which the targets are distributed among the air assets available in each sequence of the operation. In both cases, the application of the TEWA concept implies the existence of a unitary decision-making platform, which would make the entire air defence response system vulnerable if the information node for the distribution of the decisions to engage hostile air platforms were dismantled and taken out of action. In order to avoid the withdrawal of the "center of gravity", respectively the decision-making hub for the air defence operations, we aim to redesign the network centered warfare. This is possible through a progressive connection of sensors, engagement systems and finally decision makers, as an effective unit, to the dynamics of the situation development in the airspace.

Conclusions

Following the above mentioned details regarding the possible evolution of the air defence collaborative work, we can foresee a new concept of the design of the air combat. Thus, a new development of the battle can take place based on the TEWA functionality, as a dynamic decision-making process aimed at the successful exploitation of the tactical resources (e.g. sensors and weapons) during the conduct of command and control activities. Extending the tactical field life of older generation air defence systems can be achieved in two ways. The first way refers to maintaining the initial configuration of the air defence systems and employing them in air combat by changing the parameters of the combat formation simultaneously with applying the tactics and maneuvers of direct protection and deception to avoid direct confrontation. The second way consists in identifying the technological upgrades by introducing a data reception and processing node in the information system, network connected, by means of which a separate air defence response can be carried out on combat stages in several "kill boxes", as shown in Figure 2.

In order to understand the new context of airspace combat, as in the Nagorno-Karabakh war in 2020, as well as other hypothetical conflicts based on modern weapons technology, a conceptual readjustment of the combat space is required. Due to the technological evolution of the air platforms and the way of managing the resources to engage targets in the enemy territory, one of the problems the commanders/decision makers have to face is the optimal use of the air defence response resources in complex situations, when lacking reaction time.

Another aspect is the introduction of a new generation of UAVs (unmanned aerial vehicle) into combat, which led to a series of important changes in waging war with the traditional means of air defence response without excluding the actions of the multi-purpose aircraft and helicopters. Bringing the TEWA method to the attention of the specialists in the field of airspace security in developing the operational art for the design of combat actions with a hypothetical air adversary, is the starting point for the re-conceptualization of the modern combat space. Also in this regard, it is worth paying special attention to the development of the A2AD (Anti-access, Denial Area) concept developed by the Russian Federation by "reviving the early warning radar systems and installing modern electronic warfare equipment" as new capabilities

under new coordinates of surface, respectively in the militarized area of Crimea.

The need to technologize the air defence response systems will determine the design of an open and innovative architecture based on the model of the air defence system, with the platform based on the "BARAK MX" software, as a reference variant that offers exceptional flexibility in operation and in designing combat power for future air threats. Therefore, the application of the operational art based on the TEWA concept, combines the tactics, techniques and procedures with several services and capabilities in a joint manner, which can ensure the development, the establishment and the execution of the "kill box" area as a three-step process: defining the threat, progressively assessing the threats and finally allocating the weapons and assigning them. Finally, we recommend adopting the concept of TEWA as a very effective tool for making decisions and achieving the economy of forces and means, but especially for saving reaction time in critical situations.

NOTES:

1 https://www.airuniversity.af.edu/JIPA/Display/Article/2743721/the-second-nagorno-karabakh-war-takeaways-for-singapores-ground-based-air-defen/, accessed on 03.11.2021.

2 Daniel Roman, *Riposta antiaeriană a forțelor terestre din perspectiva modelelor conceptuale de lucru colaborativ*, "Carol I" National Defence University Publishing House, Bucharest, 2017, p. 116.

3 https://caspiannews.com/news-detail/armenia-threatens-azerbaijan-with-use-of-ballistic-missiles-2020-9-28-45/, accessed on 09.11.2021.

4 https://www.middleeasteye.net/news/azerbaijan-armenia-israel-russia-missile-fired-shot-down, accessed on 09.11.2021.

5 https://caspiannews.com/news-detail/armenia-used-iskander-missiles-against-azerbaijan-in-karabakh-war-says-armenian-expert-2021-9-23-0/, accessed on 09.11.2021.

6 https://www.defesanet.com.br/en/iaie/noticia/36678/IAI-s-Barak-Air-and-Missile-Defence-System-uses-network-centered-technology-to-create-a-hermetic-shield/, accessed on 12.11.2021.

7 https://defence-update.com/20210419_barak-er.html, accessed on 12.11.2021.

8 Marius Şerbeszki, „Militarizarea Mării Negre", *Conferința Gândirea militară modernă*, București, 2019, https://gmr.mapn.ro/app/webroot/fileslib/upload/files/arhiva%20GMR/2019%20gmr/Conferinta%20GMR%202019/GMR_CONF%20ro_Serbeszki.pdf, accessed on 14.11.2021.

9 *Ibidem*.

10 Norman M. Wade, "The Battle staff", *SMARTbook third revised edition: Guide to designing, planning & conducting military operations*, The Lightning Press, 2019, pp. 2.29 - 2.40.

11 *** *FM 3-09.34 Kill Box Tactics and Multiservice Procedures*, https://publicintelligence.net/fm-3-09-34-kill-box-tactics-and-multiservice-procedures, accessed on 14.11.2021.

12 Stephen P. Robbins, *Organizational Theory: Structure, Design, and Applications*, Prentice Hall, New Jersey, 1990, pp. 10-16.

13 Fredrik Johansson, Göran Falkman, *SWARD: System for Weapon Allocation Research & Development,* University of Skövde School of Informatics, https://www.researchgate.net/publication/224218743_SWARD_System_for_weapon_allocation_research_development, accesat la 14.11.2021.

14 *** *Join/Interagency SMARTbook: Joint strategic & operational planing*, The Lightning Press Ferlemann, 2019, pp. 13-5 – 13-7.

REFERENCES

*** *FM 3-09.34 Kill Box Tactics and Multiservice Procedures*, https://publicintelligence.net/fm-3-09-34-kill-box-tactics-and-multiservice-procedures

*** *Join/Interagency SMARTbook: Joint strategic & operational planing*, The Lightning Press Ferlemann, 2019.

Iversen F. Thomas, *Mobile and Netted Air Defence Systems*, DK-8520 Lystrup, Denmark.

Johansson Fredrik, Falkman Göran, SWARD: System for Weapon Allocation Research & Development, University of Skövde School of Informatics, https://www.researchgate.net/publication/224218743_SWARD_System_for_weapon_allocation_research_development

Robbins P. Stephen, *Organizational Theory: Structure, Design, and Applications, Prentice Hall*, New Jersey, 1990.

Roman Daniel, *Riposta antiaeriană a forțelor terestre din perspectiva modelelor conceptuale de lucru colaborativ*, "Carol I" National Defence University Publishing House, Bucharest, 2017.

Şerbeszki Marius, *Militarizarea Mării Negre*, Conference *Gândirea militară modernă*, Bucharest, 2019, https://gmr.mapn.ro/app/webroot/fileslib/upload/files/arhiva%20GMR/2019%20gmr/Conferinta%20GMR%202019/GMR_CONF%20ro_Serbeszki.pdf

Wade M. Norman, "The Battle staff", *SMARTbook third revised edition: Guide to designing, planning & conducting military operations*, The Lightning Press, 2019.

https://www.defesanet.com.br/en/iaie/noticia/36678/IAI-s-Barak-Air-and-Missile-Defence-System-uses-network-centered-technology-to-create-a-hermetic-shield/

https://defence-update.com/20210419_barak-er.html

https://caspiannews.com/news-detail/armenia-threatens-azerbaijan-with-use-of-ballistic-missiles-2020-9-28-45/

https://www.middleeasteye.net/news/azerbaijan-armenia-israel-russia-missile-fired-shot-down;

https://caspiannews.com/news-detail/armenia-used-iskander-missiles-against-azerbaijan-in-karabakh-war-says-armenian-expert-2021-9-23-0/

https://www.airuniversity.af.edu/JIPA/Display/Article/2743721/the-second-nagorno-karabakh-war-takeaways-for-singapores-ground-based-air-defen/

https://www.researchgate.net/figure/A-number-of-OODA-loops-in-parallel-22_fig2_288970156

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-43

MILITARY ENGINEERING STRUCTURES WITHIN NATO COMMANDS IN ACCORDANCE WITH THE NEW DOCTRINAL PROVISIONS

Col. Cristian Gabriel CÎRJĂU, PhD Candidate*

According to the directives of the NATO Military Committee, ensuring the effective military engineering support required by the military engineering command and staff structures, as well as command-control (C2) arrangements at all levels. These C2 arrangements, the structural organization, and their general attributions are regulated in the new NATO Doctrine for Military Engineering, by which to recommend the implementation of the provisions in the organization of NATO commands, as well as of the commands within the NATO national armies. In the following lines, I intend to make a short presentation of the organization of military engineering structures within NATO commands, from different hierarchical levels, under the new doctrinal provisions, also, references to cooperation relations and some clarifications with on their general responsibilities. As the new NATO doctrinal provisions on the military engineering branch are being implemented in the Romanian Army, proposals are to be made to the decision-makers, to modify the military engineering command structures in the Romanian Army, to be similar to those within the NATO commands.

Keywords: NATO; ACO; ACT; SHAPE; JFC; LANDCOM; command-control; military engineering branch.

Military engineering activity is a function in support of operations and represents the totality of measures taken to model, configure the physical environment where operations are performed. As a function, it is led and coordinated by military engineering staff/command structures. Under the guidelines of the Military Committee, ensuring effective engineering support requires adequate leadership and military engineering staff structures and command-control arrangements (C2) at all levels[1]. These C2 arrangements, the organization of military engineering command structures, and their general responsibilities are regulated in the new NATO doctrine for military engineering (AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021), which recommends the implementation of provisions in the organization of NATO commands, as well as commands from NATO member national armies.

In the following lines, I intend to make a short presentation of the organization of military engineering structures within NATO commands, from different hierarchical levels[2], under the new doctrinal provisions, also short references to horizontal or vertical cooperation relations, and some clarifications regarding their general attributions, depending on the information they have at the moment. In general, the information about the organizational structures of some entities within the commands/staff has a high level of classification, so the information available to them is not always complete. However, by correlating and analyzing what is available, I believe that I have been able to make appropriate deductions about the organization and role of military engineering structures within NATO commands/headquarters.

As the new NATO doctrinal provisions on the line of military engineering are being implemented in the Romanian Army, the purpose of this approach is to make an analysis and a presentation for the most appropriate popularization of these provisions, and I will finally make proposals to the decision-makers, to modify the military engineering command structures in the Romanian Army so that they are similar to those within NATO commands.

Defence Staff
e-mail: *cirjau_cristian@yahoo.com*

NATO's military command structure

The North Atlantic Treaty Organization (NATO) is an alliance of *30 states* in Europe and North America. NATO's essential goal is to ensure the freedom and security of all of its members through political and military means, in accordance with the provisions of the treaty and the provisions of the United Nations Charter.

The civilian and military structures created within NATO allow member countries to cooperate to fulfill these fundamental tasks. Through them, the interests in the political, economic field, but also in other non-military fields are harmonized. Joint defence plans are also drawn up to establish the forces, infrastructure, equipment, and all facilities necessary for the conduct of military operations[3].

The North Atlantic Treaty Organization (NATO) is an alliance of 30 states in Europe and North America. NATO's essential goal is to ensure the freedom and security of all of its members through political and military means, under the provisions of the treaty and the provisions of the United Nations Charter.

The civilian and military structures created within NATO allow member countries to cooperate to fulfill these fundamental tasks. Through them, the interests in the political, economic, and other non-military fields are harmonized. Joint defence plans are also drawn up to establish the forces, infrastructure, equipment, and all facilities necessary for military operations.

NATO's Military Command Structure is the backbone of the Organization. It is composed of permanent multinational commands organized at the strategic, operational, and tactical command levels, geographically distributed and financed according to the adopted procedures[4].

It provides an opportunity for all allies to participate in and contribute to the command and control of operations, missions, and activities in all military areas of the Alliance.

Following the Summits that have taken place in recent years, NATO's Military Command Structure has been reformed and a robust, agile, and efficient command system was created. These reforms have also improved the interoperability of the NATO command structure with the NATO Force Structure. The latter is a distinct group of allied national and multinational forces, as well as the commands made available to the Alliance permanently or temporarily.

NATO's Military Command Structure is under the authority of the Military Committee, NATO's highest military entity, composed of Chiefs of Defence from all thirty member countries, which in turn is under the authority of the North Atlantic Council (NAC).

At the strategic level, we identify the command structure for operations, respectively Allied Command Operations – ACO and the command structure for the transformation of the Alliance, respectively Allied Command Transformation – ACT.

The ACO is organized on three levels (strategic, operational, and tactical) and includes commands, as well as other support structures. The ACO, under the command of the Supreme Commander of the Allied Forces in Europe (SACEUR), is responsible for planning and executing all NATO military operations in accordance with the instructions of the North Atlantic Council[5].

ACT is at the forefront of NATO's military transformation. It is under the command of the Supreme Commander of the Allied Forces for Transformation (SACT), who exercises his responsibilities at headquarters in Norfolk, Virginia (USA). The main responsibilities of the ACT include education, training, exercises, and promoting interoperability[6].

In the following lines, we will refer only to the commands on the line of operations, where we identify the military engineering structures that are the subject of this analysis.

At the strategic level, there is the Supreme Headquarters Allied Powers Europe (SHAPE) near Mons, Belgium, where SACEUR exercises its responsibilities.

At the next command level, the operational level, there are three Joint Force Commands (JFCs), which are located in Brunssum (Netherlands), Naples (Italy), and Norfolk (USA). These commands are led by a commander of the joint forces, who is supported by the staff of these commands. They can be deployable or non-deployable.

At the tactical level, there are the HQ Allied Land Command in Izmir (Turkey), the HQ Allied Maritime Command in Northwood (England), and the HQ Allied Air Command in Ramstein (Germany).

To all this, we can add the Commands of the Allied Corps (Rapid Deployable, EUROCORPS, Multinational) and also the Commands of the Multinational Divisions, to which we will refer in the following lines.

Military engineering structures within NATO commands

As mentioned above, the Alliance is based on a combination of leadership structures through which command and control are provided for

the execution of military operations. To ensure adequate military engineering support, effective coordination at all these levels of command is required. The most efficient use of all military engineering resources is achieved, in accordance with the doctrinal provisions[7] by a *chief of military engineering* (*senior military engineering advisor*) existing at each command level, who has the technical and coordinating authority for all available military engineering resources and can organize multinational capabilities in accordance with the general priorities of the commander during an operation. To manage all issues on the line of military engineering, the chief of military engineering is supported by specialized staff and staffed in dedicated command structures.

Chief of military engineering: roles and responsibilities[8]

Chief of military engineering, advisor on the line of military engineering at all levels of command. MC 0560/2, *Military Committee for Military Engineering Policy* stipulates that commanders need a military engineer adviser to be supported by a staff to ensure effective use of resources and military engineering capabilities that are limited. The effectiveness of the chief of military engineering and specialized staff at each command level will depend directly on good coordination and close cooperation between the staff at all levels and between all components.

Strategic level. At this level, the chief of military engineering together with subordinate staff contributes as experts to the operational planning process. They confirm that adequate engineering capabilities will be generated promptly to meet short, medium, and long-term requirements. The military engineering specialists at this command level work closely with the International Staff, the International Military Staff, and the Senior National MILENG Representatives. It also collaborates with national planning personnel for engineering capabilities intended for the execution of military operations.

Operational level. At this level, the chief of military engineering is the chief adviser to the Joint Force Commander (JFC) for all issues of military engineering. It coordinates the judicious allocation of engineering resources to meet the objectives set. Its main tasks are to identify the requirements for engineering support, to advise the commander of the joint forces on the availability of engineering capabilities and resources, and to coordinate the engineering effort on the entire territory of the components (land, naval, air, etc.). The chief of military engineering, on behalf of the Joint Force Commander, will have the coordinating authority to ensure the most efficient use of capabilities and resources. These forces may include the ability to cross large obstacles (modular bridges, pontoon bridges over watercourses); countermobility capabilities; specialized Explosive Ordnance Disposal (EOD) capabilities; specialized construction capabilities, etc.

The chief of military engineering must ensure that directives at the strategic level are transmitted in the form of clear tasks to all military engineering forces. Also, commanders at all levels need to know very well what the priorities are, to ensure the efficient use of military engineering capabilities. They must be planned centrally by the chief of engineering of joint forces and subordinate personnel throughout the operational planning process. The plotted tasks will be executed decentralized at the lowest command level. This may include the military engineering capabilities of NATO forces, host nations, contractors, organizations, and international agencies with which we cooperate. The effort of military engineering support can be changed between components according to the main effort set by the Joint Force Commander.

Tactical level. The chief of military engineering at the tactical level is responsible for coordinating military engineering capabilities that perform specific tasks in the domains of mobility, countermobility, supporting the survivability and sustainability of forces, and general engineering support, tasks that affect the operating environment. At this level, in the absence of a chief of military engineering, this role can be temporarily assumed by a commander of a military engineering unit.

Organization of military engineering command structures[9]

Military engineering, well-configured and robust command structures are essential for all-level controls. They are organized in an *independent Service* which must include the following capabilities:

Military engineering operations planning[10] *(section/office/compartment)*

The military engineering staff contributes to the planning process and provides the necessary military engineering data or information for all potential operations in collective defence, as well as for crisis management. The military engineering structure must be able to advise, plan, execute and report the activities of all military engineers. Depending on the tactical situation and the type of operation, it may be necessary to augment the structure with additional specialized personnel. The involvement of military engineering staff in the command activities in planning activities is essential for all operations, in order to determine the necessary military engineering resources.

Conducting military engineering operations

The main task of the military engineering staff within the commands is to synchronize the military engineering efforts and to advise on the employment of the military engineering units in operations. It also has up-to-date information on their operational capacity, necessary for the planning and execution of current operations. Depending on needs, in compliance with NATO security policies, it can disseminate certain military engineering intelligence to key non-NATO actors, in order to achieve adequate military engineering support.

Intelligence

The engineering staff within the command structures permanently cooperates with the intelligence staff within the dedicated intelligence structures and permanently manages all the engineering intelligence. The military engineering intelligence held is disseminated according to needs during all phases of the operation. These data and information refers to elements of road, airport, port, railway infrastructure, works of art, data on watercourses, military engineering capabilities of the opponent, data on threats with explosive munitions. Engineers contribute with the necessary intelligence to achieve Common Operational Picture.

Infrastructure

The military engineering staff is up to date with all the data and information about the infrastructure in the area of responsibility. It contributes with estimates to the operational planning process and also makes proposals regarding its development, data necessary for the elaboration of the infrastructure development plans.

Logistics

The military engineering staff within the command is constantly up-to-date with the requirements for the military engineering resources required in the theater of operations. He knows the situation of 4th class military engineering materials, as well as national ones, as well as the allocation priorities.

Explosive Ordnance Disposal (EOD)

Within the military engineering structure, an *EOD Cell* is established, which has the role of coordinating and integrating the efforts of EOD specialists on the line of specialized support in the assigned area of operations. For a group of multinational joint forces, a *Multinational EOD Cell* is established, which manages the EOD elements within the component commands, the national ones within the joint force, those belonging to the host nations, as well as other organizations. Through this cell, the chief of military engineering has the technical authority and coordination of EOD support throughout the area of responsibility[11].

The relationship of military engineering command structures at different hierarchical levels[12]

At the strategic level, military engineering personnel mediate the coordination of engineering activities between the politico-military and operational levels, as well as with other non-NATO organizations. The chief of military engineering at strategic level issues guidelines on engineering capabilities in the NATO Defence Planning Process, policy and doctrinal developments related to the military engineering branch, infrastructure issues of interest, planning, and leadership, at the strategic level, of all aspects of military engineering during operations and exercises.

Strategic engineering planning will define the general requirements for military engineering support for NATO operations and ensure that sufficient engineering capabilities are available for the operational commander.

Military engineering advice on operational infrastructure requirements will assist financial controllers at the strategic level in determining the funding required. Requirements normally generated at the tactical level are validated and approved at the operational level and then transmitted at the strategic level. They are analyzed and subsequently submitted for approval.

The directives and guidelines transmitted from the strategic level to the commanders at the operational level, allow them to initiate and carry out the operational planning process. Based on the strategic military directives, operations, including engineering support, are planned and executed to achieve the set strategic objectives. At the tactical level, tasks/missions are planned and executed in accordance with the Operations Plan (OPLAN)/ Operation Order (OPORD) and subsequent orders (FRAGO) received[13].

The chief of military engineering at the operational level will advise the Joint Force Commander on the tasks on the line of military engineering and on their prioritization. It will also advise and direct the operational components on all areas of expertise in the field of military engineering and will allocate the related engineering resources.

The support of military engineering at the tactical level will create effects, and they must support the achievement of operational objectives, contributing to the achievement of the desired final state.

The military engineering structure within SHAPE

Following the decisions taken at the NATO Summits, the Military Command Structures underwent an extensive process of transformation. At the same time, the organizational and military engineering command structures underwent organizational changes. Initially, they had a simpler organization, but having to manage several important and complex areas, it was necessary for these military engineering command structures to be reorganized and diversified.

According to the 2014 SHAPE organization[14], the military engineering structure within this strategic command had the following organization:

The Joint Military Engineering Division, organized into two branches: the *Military Engineering Plans Branch* and the *Military Engineering Operations Branch*, was part *of the Resources Directorate* headed by a two-star general[15]. The Joint Military Engineering Division was headed by a *Deputy Chief of Staff for Military Engineering*, with the rank of Brigadier General, who also *served as the ACO Senior Joint Engineer*.

The Military Engineering Plans Branch was responsible for supporting the strategic planning process by providing military engineering data and coordinating all military engineering contributions to all ACO plans. In addition, he provided specialized expertise in NATO policy, doctrine, defence planning, force generation, training, procedures, and standardization. Coordinate infrastructure aspects of the NSIP (NATO Security Investment Program) in NATO countries, packages, and capability plans of NATO command. It also plans, develops, and implements policies, doctrines, procedures, and standards on infrastructure requirements for its management and capability development, as well as for environmental protection.

The Military Engineering Operations Branch was responsible for strategic military engineering support for the command and control of all operations/exercises and provided feedback on all identified/learned lessons, on a specialized basis. Also, it had to manage all aspects of military engineering necessary for the development of information training; manage and coordinate NSIP infrastructure aspects in operations; provide expertise in Explosive Ordnance Disposal (EOD), and military engineering support for force protection, Counter Improvised Explosive Devices (C-IED) and military search operations.

Regarding the structure of military engineering within SHAPE in 2021[16], following organizational changes that occurred to streamline activities and to meet the challenges of the current security environment, in organizing the NATO command, there is an *Infrastructure and Engineering Division/ Strategic Enablement Directorate/SHAPE*, which is led by a *chief of engineering*. This division includes several branches/services/offices, as follows: *Infrastructure and Environmental Branch*; *Plans Branch*; *Operations Branch*; *Intelligence*; *Logistics (MILENG Logistics)*; *Explosive Ordnance Disposal (EOD)*.

Military engineering structures within the Joint Force Command

The Joint Force Command operates at the operational level and is able to effectively execute

the command and control over the assigned forces in order to obtain operational effects in the assigned Joint Operating Area[17]. Relations with other NATO Command Structures and NATO Force Structure Component Command Headquarters may differ depending on the situation: peace, crisis or conflict.

The Joint Force Command is headed by a commander with the rank of four-star general (there is also a deputy commander – a three-star general), who is seconded by a chief of staff (two-star general). The deputy chiefs of staff are subordinated to the line of planning, operations, and support (one-star generals). Several categories of forces are represented in the command, the basic ones being the land, air, and naval forces.

Directorates are divided into *joint* type departments led by officers with the rank of colonel. In the Support Directorate is *Joint Military Engineering Division*. The Support Directorate is responsible for planning, directing, monitoring, evaluating, and coordinating the functions of the support staff.

The Joint Military Engineering Division within the Support Department is headed by the *chief of military engineering of the Joint Force* (JFENGR) and, for example, in 2014 it organized the following branches/services/offices: *Operations*; *Plans*; *Infrastructure*.

The *Joint Military Engineering Division* is responsible for providing advice on issues related to force engineering support and combat engineering support for NATO activities and operations.

The military engineering structure was led by the *chief of military engineering of the joint force*. It was responsible for advising and coordinating all aspects of engineering for NATO's activities and operations within the area of joint operations, in the theater, and for events outside these areas, in NATO partnership commitments.

The Joint Force Commander will be advised by the chief of military engineering, on the issues on the line of military engineering related to the execution of operational responsibilities/tasks. Priorities for providing engineering support will be determined during the operational planning process. The chief of military engineering also acts as the coordinating authority for military engineering capabilities for all components.

The chief of military engineering prepares general guidance in the field of military engineering support, provides the military engineering data necessary to develop the concept of operation, planning, and organizing the process of generating force, and in particular, for generating military engineering forces. He represents the technical and coordinating authority for the means/resources of military engineering within the grouping of forces, in order to ensure their efficient use, balancing the military engineering support effort between the components of the force and orienting the military engineering support effort according to the needs dictated by the operational situation.

According to the recommendations contained in AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021, the Engineering Division within the Joint Forces Commands has the following structures: *Infrastructure and Environmental Branch*; *Plans Branch*; *Operations Branch*; *Intelligence*; *Logistics*; *Explosive Ordnance Disposal (EOD)*.

The responsibilities of these branches/services/offices are similar to those at the strategic level, but they are adapted to the needs of the joint level.

The military engineering structure within LANDCOM

The Allied Land Command (LANDCOM) is responsible for coordinating and synchronizing NATO and partner land forces, in order to enable the preparation, interoperability, standardization, and management of land space[18].

This command is led by a commander with the rank of three-star general (there is also a deputy commander – two-star general), who is seconded by a chief of staff (two-star general). The deputy chiefs of staff are subordinated to the line of planning, operations, and support (one-star generals, heads of directorate).

The directorates are divided into divisions and are headed by officers with the rank of colonel. Within the Operations Directorate, there are the G.2-Intelligence, G.3-Operations, and G- Engineering (GENG) Divisions.

G-Engineering Division (GENG Division) within LANDCOM is headed by *Assistant Chief of Staff G Engineer* – ACOS GENG) and is composed of the following services/offices[19]: *Operations & Training Branch*; *Infrastructure & Plans Branch*; *Coordination/Environmental Protection Office*.

The Engineering Division has as current responsibilities the monitoring and evaluation of the necessary military engineering skills. It provides specialist advice and support for force protection, CIMIC, and other specialized areas as needed. Provides engineering advice on environmental issues and coordination of this field. It also provides feedback to NATO engineers on all identified/learned lessons, on a specialized line.

The Division Plans coordinates and synchronizes all actions related to military engineering support to contribute to the implementation of operations plans, which include military engineering support for the development and maintenance of infrastructure in the Joint Operations Area (JOA), as well as support for ensuring freedom of maneuver/ movement. Engineers are involved in activities carried out at a strategic and operational level in the event of the deployment of NATO forces. In addition, there are inherent tactical employment issues that need to be understood in order to fully appreciate the skills and abilities of engineers in response to employment.

Assistant Chief of Staff G Engineer (ACOS GENG) is the *chief of military engineering (Chief Engineer)* and *Senior Advisor* of the Commander in all matters of military engineering, of the G-Engineering Division (GENG Division). He is subordinate to the Deputy Chief of Staff Operations (DCOPS Ops) together with the *chief of intelligence* (G.2-Intelligence) and the *chief of operations* (G.3-Operations). *The G-Engineering Division* is responsible for all military engineering issues on the command line, including matters as necessary.

The military engineering structures within the Multinational Corps Commands

The Commands of NATO Multinational Corps have a high degree of operationalization and can deploy rapidly at the command of SACEUR, in an Area of Operations assigned to conduct joint or combined operations[20].

They may be deployed as command of the Multinational Corps, as a command for the land component, as a joint command for NATO Force Structures, to command a small-scale joint operation and as a command capable of supporting a NATO command structure, a Joint Forces Command, to lead a major joint operation or to increase forces for ongoing operations.

These commands are led by a commander with the rank of three-star general (there is also a deputy commander – two-star general), who is seconded by a chief of staff (two-star general). Subordinate to the Chief of Staff are his deputies on the line of planning, operations and support (generals with one-star heads of divisions) and other divisions with special destinations.

The divisions are split into services led by officers with the rank of colonel. Depending on the command, the *Engineering Service (G-ENG)* is located within the Combat Support Division (at NRDC-T) or within the Operations Division (at NRDC-GR)[21].

The *Engineering Service (G-ENG)* within a Multinational Corp is headed by a *chief of military engineering*, who is also *Assistant Chief of Staff Engineer* – ACOS ENG, and is composed of the following branches/departments/offices: *Operations*; *Plans*; *Infrastructure & Environmental Protection*; *Intelligence*; *EOD.*

The G-ENG has a smaller number of people in peacetime, but in the event of displacement or crisis, it will increase with additional staff.

The G-ENG has as current responsibilities the monitoring and evaluation of the necessary military engineering skills. He provides specialized advice and support for force protection, CIMIC and other specialized areas as needed and provides engineering advice on environmental issues and coordination of this field. It also provides feedback for all identified/learned lessons, on a specialized line.

The G-ENG plans, coordinates and synchronizes all actions related to engineering support to contribute to the implementation of operational plans, which include military engineering support for the development and maintenance of infrastructure in the Area of Responsibility (AOR), as well as engineering support for ensuring freedom of maneuver/movement.

Conclusions

According to the military engineering policies issued periodically by the Military Committee[22], commanders at all hierarchical levels (strategic, operational, and tactical) need a military engineering advisor, namely the *chief of military engineering* who, together with a specialized staff, must be able to manage efficient use of

military engineering resources. Experience shows that military engineering resources are usually limited, so they must be planned and used wisely. The effectiveness of military engineering staff at each level will depend on good coordination and close horizontal and vertical cooperation. The involvement of military engineering staff throughout the operational planning process is essential. Planners are responsible for involving engineers to support planned operations.

The chief of military engineering at the Strategic Allied Command is responsible for directly advising the commander and command team on all military engineering issues and also for guiding and coordinating the military engineering staff of the command.

At the operational level, the military engineering staff of the Joint Forces Commands must constantly collaborate with all other staff elements to plan, coordinate, integrate and synchronize the military engineering support during the operation. The staff of military engineering in the Joint Forces Command must also cooperate and coordinate closely with the authorities of the host nation, the contributing nations with troops, civilian organizations, and agencies.

In cooperation with the staff of military engineering at the operational level and the staff of military engineering at the tactical level, the chief of military engineering at the level of the joint forces exercises his coordinating authority over all the military engineering structures in the theater.

NOTES:

1 *** MC 0560/2 *Military Committee Policy for Military Engineering,* 2017, p. 3.

2 The military engineering at the strategic level or higher than the NATO Command Structure (NCS) is regulated by the Allied Command Operation Directive (AD) 084-001 Military Engineering.

3 https://nato.mae.ro/node/416, accessed on 03.11.2021.

4 *NATO Encyclopedia 2014-2019*, NATO Headquarters, Brussels, Belgium, *passim*.

5 *** AJP-3 (C), *Allied Joint Doctrine for the Conduct of Operations*, February 11, 2019, pp. 1-4 – 1-6.

6 *Ibidem*.

7 *** AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021.

8 *Ibidem*, pp. 2-1 – 2-2.

9 *Ibidem*, pp. 2-2 – 2-3.

10 *The operation of military engineering* shall mean all military engineering activities circumscribed to a specific objective of engineering support of a joint operation or the operation of a large unit of combat forces.

11 *** AJP-3.18, *Allied Joint Doctrine for Explosive Ordnance Disposal Support to Operations*.

12 *** AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021, pp. 2-3 – 2.4.

13 *** AJP-3, *Allied Doctrine Joint for Conduct of Operations*, 2019.

14 *** AJP-3.12 (B), *Allied Joint Doctrine for Military Engineering*, 2014, p. 2-2.

15 *Ibidem*.

16 *** AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021, p. 2-2 – 2.3.

17 https://jfcbs.nato.int; https://jfcnaples.nato.int; https://en.wikipedia.org/wiki/Allied_Joint_Force_Command_Naples, accessed on 03.11.2021.

18 *** *The LANDCOM Handbook*, Izmir, Turkey, 2019; https://lc.nato.int/, accessed on 03.11.2021.

19 *Ibidem*, pp. 97-100.

20 https://www.nato.int/cps/en/natohq/topics_50088.htm; http://www.hrf.tu.nato.int/vision-mission.html, accessed on 03.11.2021.

21 https://nrdc.army.gr/; http://www.hrf.tu.nato.int/index.html, accessed on 03.11.2021.

22 *** MC 0560 *MC Policy for Military Engineering,* 2008; MC 560/1 – *MC Policy for Military Engineering*, 2012; *** MC 560/2 *MC Policy for Military Engineering*, 2017.

REFERENCES

*** AJP-3, *Allied Doctrine Joint for Conduct of Operations*, 2019.

*** AJP-3 (C), *Allied Joint Doctrine for the Conduct of Operations*, 11 February, 2019.

*** AJP-3.12 (B), *Allied Joint Doctrine for Military Engineering*, 2014.

*** AJP-3.12 (C), *Allied Joint Doctrine for Military Engineering*, 2021.

*** AJP-3.18, *Allied Joint Doctrine for Explosive Ordnance Disposal Support to Operations*.

*** APP-6, *NATO Glossary of Terms and Definitions*, 2019.

*** ATP-3.12.1 *Allied Tactical Doctrine for Military Engineering,* 2016.

*** ATP-3.2.2, *Command and Control of Allied Land Forces*, Edition B Version 1, 2016.

*** *Brussels Declaration on Transatlantic Security and Solidarity*, NATO Public Diplomacy Division, Brussels, Belgium, 11 July 2018.

*** MC 0560 *MC Policy for Military Engineering,* 2008; MC 560/1 – *MC Policy for Military Engineering*, 2012.

*** MC 0560/2 *MC Policy for Military Engineering,* 6 September 2017.

*** *NATO Encyclopedia 2014-2019*, NATO Headquarters, Brussels, Belgium.

*** *NATO Summit Guide, Warsaw, 8-9 July 2016*, NATO Public Diplomacy Division, Brussels, Belgium, 2016.

*** *Strategic Concept for the defence and Security of Members of the North Atlantic Treaty Organization Adopted by Heads of State and Government at the NATO Summit in Lisbon 19-20 November 2010*, NATO Public Diplomacy Division, Brussels, Belgium, 2010.

*** *The LANDCOM Handbook*, Izmir, Turkey, 2019.

*** *The Secretary General's Annual Report 2011-2019*, NATO Public Diplomacy Division, Brussels, Belgium.

https://www.nato.int

http://www.mae.ro/sites/default/files/file/pdf/TRATATUL%2520NORD-ATLANTIC.pdf

https://www.mae.ro/node/5337

https://shape.nato.int

https://www.act.nato.int/

https://jfcbs.nato.int

https://jfcnaples.nato.int

https://lc.nato.int/

https://www.nato.int/cps/en/natohq/structure.htm

https://shape.nato.int/military_command_structure

https://nrdc.army.gr/

http://www.hrf.tu.nato.int/index.html

https://en.wikipedia.org/wiki/Allied_Joint_Force_Command_Naples.

https://en.wikipedia.org/wiki/Allied_Joint_Force_Command_Brunssum

https://www.nato.int/cps/en/natohq/topics_50088.htm

http://www.hrf.tu.nato.int/vision-mission.html

https://lc.nato.int/

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-44

MANAGEMENT THROUGH LEADERSHIP – THE ESSENCE OF THE CONCEPT

Assoc.Prof. Elitsa PETROVA, PhD*

This article aims to clarify the concepts of management and leadership, pointing out significant similarities and differences between the concepts themselves, both as theoretical terms and as actions, and on this basis to suggest assuming the concept of management through leadership as adequate, efficient and effective option for managing an organization. The research methodology includes systematization of scientific statements about management and leadership; study and presentation of etymology, origins and meaning of basic concepts; consideration of the relatively new modern integrated psychological theory of leadership. Demonstrating the logic of acceptance, building and introducing authentic and shared management through leadership in every organization and system, including the military one, is a result that the authors aim at.

The etymological explanation of the basic concepts and terms, revealing their meaning and origin using emphatically authoritative literary resources is of particular importance.

Keywords: manager; leader; commander; management through leadership; authentic and shared leadership.

„The best way to help one person to overcome his or her weakness is to offer him or her a new way of thinking, a new way of life, a new value system"[1].
Educational textbook on Christian ethics

The effectiveness of the functioning of any complex organization is directly and decisively dependent on the correctly formulated policies and their implementation in the existing management system. The severity of the problem of increasing the managerial efficiency of the activities of organizations is exacerbated by the sharply increased requirements for the quality of management decisions, the shortage of certain resources and the need for their intensive and rational use[2].

Any change in the organizational system and functioning of a particular organization stems from the specific situation in which the organization finds itself, and the main reasons that necessitate changes in the structure and functioning of an organization are usually related to changes that occur in its environment[3], as the changes are usually related to the progress of society and the need for continuous improvement of an individual and society. Today, more than ever, we need to look at a new concept of management – management through leadership. In terms of content and implementation, both phenomena are very different, but although they may exist separately, this is not the goal of the modern organization, which strives for continuous improvement, development, progress and rise. Undoubtedly, both phenomena must be seen as inextricably linked, because otherwise the organization is doomed to failure, and it must be recognized that each of them contributes to the fuller functioning of the organization.

* *"Vasil Levski" National Military University, Veliko Tarnovo, Bulgaria*
e-mail: *elitsasd@abv.bg*

Management and leadership – essence, similarities and differences

The successes and failures of an organization depend on a large extent on its leadership, which is one of the most important parameters determining organizational appearance, development and functioning. There are a number of similarities between management and leadership, but also significant differences. The most important difference between the two phenomena is that a manager is an officially appointed person and management is regulated in a formal way, while a leader is informally elected by a group. The manager's power is legally and officially established with a high degree of mandatory tasks and secured with administrative sanctions. The power of the leader lies mainly on personal qualities and resources to highly impact social and psychological aspects. The leader's authority is due

to socially significant qualities and a significant contribution for achieving group goals. The leader is an example, ideal, expert, recognized by the followers.

Etymologically examined and looking at the origin and meaning of the term "manager" shows that it is often used as a synonym or substitute for "director", "head", "boss", "supervisor", "administrator". To manage is a much more institutionalized, formal and rational act, while to lead is a much more informal, unregulated act which relies on emotional commitment. The manager was officially appointed to the position and if one wants to be a leader should be influenced not only by legal, rewarding and forcing power, given formally to him or her, but should hold the expert and reference power, based on personal qualities. While management is rather directing and coordinating the work of team members, leadership can be determined as a process of such influence in one organized group, which make people strive to achieve a goal is a process of social influence[4].

manager (noun)

Meaning: a person who directly manages an institution, enterprise, organization, etc.; someone who controls resources; director; decision-maker; someone who administers business; a person in charge of running a company, etc.[5] It is logical that a manager is a person who "manages" or takes responsibility for something. The origin of the word manager comes probably from the Latin word "manus", which means "hand; manual; guiding hand". It is connected with the Italian word "maneggiare" which means "to control" and is used especially in terms of training and work[6].

Synonyms: ruler, lord, master, director, chief, overseer, curator, administrator[7].

Etymology: In the early 1580s it acquired the meaning "one who leads or controls". The specific meaning of "a person in charge of running a business or public institution" is from 1705.

manage (v.)

In the 1560s, it meant "to handle, train, or direct; horse training; equestrian skill". The word derives from the Old French language word "manège" – "horse mastery" and from the Italian language – "maneggio" and „maneggiare" with meaning "processing". The word expanded its meaning with "control or direct influence through abilities" and management of any kind of business by the 1570s. The meaning "effect through effort" (hence „success in achievement") dates back to 1732[8].

In general, management should be defined as a process of influencing subordinates so that the goals set in advance can be achieved, thus coordinating the joint activities of the people and is a type of human activity aimed at facilitating the achievement of positive results by an organization. In all its forms, it presupposes gathering people and uniting them to achieve common goals and objectives.

But what makes a man or woman rise above others and take on the mantle of leadership, and what makes an ordinary manager a leader?

A more traditional managerial view of leadership is that it is something possessed by a person because of his knowledge, skills, experience, role and authority.

According to the Cambridge Dictionary "leader" is[9]:

- someone or something, co-agent which won at time of contest or other situation in which people are competing;
- a person, who manage or control other people, due to ability or position;
- a person, who controls a group, country or situation;
- a person, who is responsible for the group, state, situation.

The word „leader" origins from an old English word "lædere" and means "one, which leads, first or best known for", originating from "lædan" – "to manage, to lead". It has been known for "head of an authoritarian state" since 1918 (Fuhrer, Duce, Caudillo, etc.). Meaning "writing, a statement intended to start a discussion or debate" is established from the end of the 13th century. The word "leader" has been in use since 1837[10]. The term „leadership" appeared in 1821 with the meaning of "position of leader, to command". Its meaning is enriched at the end of the 19th century when associated with "performance, necessary for to be a leader and ability to lead"[11].

leader (noun)

Meaning: leader, leader of a political party or socio-political organization; the one who leads, the one who attracts.

Synonyms: chief, boss, chief[12].

Etymology: Derived from an old English word "lædere" to mean „one, who leads, first or best-known to manage"[13].

leading (verb)

Meaning:

to be in front;

to control a group of people, a country or a situation;

to show a path to reach or doing something;

to take someone somewhere having gone and with him;

to move and in a certain direction or there is a certain achieved result;

winning position during a competition;

act of showing a person or group of people is nothing to be done;

act of managing or controlling a group of people;

to be the one who decides and who others choose to follow;

to be paving the way for something to happen;

to be responsible for a group of people, organization or situation;

to influence someone to do something;

to achieve greater progress than others in the development of something.[14]

Etymology: The term "lead" comes from Old English word "lædan", which means „drive you; march ahead, go and stand in front of others; to guide; to accompany; to go on; to go forward". The timeless meaning of "act as a leader" dates back to the 1570s. Meaning "direction given by example" dates from 1863 and meaning „the key to the solution or something that must be followed" is from 1851."[15]

Leadership is both a research area and a practical skill that encompasses the ability of an individual, group or organization to lead and influence or lead other individuals, groups, organizations. It is a process of social influence in which one can attract the help and support of others in performing a common task[16]. Leadership involves setting and achieving goals, taking action, and beating the competition. It provides direction for an organization and provides a positive example for followers. Effective leadership involves showing a strong character on the part of the manager. Leaders show honesty, integrity, reliability and ethics. Leaders act in a way that speaks, listens to staff members, answers questions and concerns, empathizes, uses effective communication skills to move the organization forward, supports their followers, and is truly concerned about the well-being and prosperity of people who manage.

The lack of a standard definition of construction, the too narrow focus of research on leadership and the tendency to theorize unnecessarily lead to a number of hesitations about its significance and contribution to public life. Some of the criticisms levelled at leadership research go as far as formulating it as an artistic rather than a scientific phenomenon[17]. Equating it as a main function of management gives it a more tangible look and shape, but at the same time simplifies it from a complex, dynamic and process-oriented construction and equates it into an element that is not amenable to special development.

Leadership, although widely talked about, has been described as one of the least understood concepts in all cultures and civilizations. According to some scholars, leadership is determined by the distinctive characteristics available at birth, however, there is evidence to show that leadership develops through hard work, careful observation and self-observation. Unlike individual leadership, some organizations have adopted a group form of leadership – so-called shared leadership, in which more than one person gives guidance to the group as a whole. It is also characterized by shared responsibility, cooperation and mutual influence between team members.

Leadership represents the elevation of the human imagination to greater heights, striving for higher standards of performance, forming a personality beyond its normal shape. Therefore, leadership must be a part of management, and it is not a random part, but mandatory for the effectiveness of an organization.

Evolutionary perspectives on leadership

The study on both management and leadership concepts dates back to the works of Plato, Sun Tzu, and Machiavelli but it has become the focus of consideration by the modern academic world in the last 60 years of the 20th century and especially in the last two decades. Research on management and leadership has created many theories for both

phenomena based on a variety of qualities and traits, situational interaction, function, behaviour, values, charisma, collaboration and mutuality. Compared to the Roman tradition, Confucian views of the right way of life most often refer to the ideal of the leader as an individuality. According to Sun Tzu, leadership is a matter of intelligence, reliability, humanity, courage and discipline consequently and:

"Relying solely on intelligence leads to rebellion. The exercise only of humanity leads to weakness. Fixing trust leads to stupidity. The dependence of courage on strength and power leads to violence. Excessive discipline and strictness in command lead to cruelty. When one has all five virtues combined, then one can be a leader"[18].

Some of the earliest management and leadership studies include:

- Theory of great people;
- Theory of traits;
- Attributive model for leadership;
- Theories of behaviour and style;
- Situational theories for leadership;
- Theories of leadership roles;
- Functional leadership theory;
- Theories of transactional and transformational leadership;
- Theory of leadership through social perception;
- Shared leadership;
- Integrated psychological theory of leadership.

Leadership is related not only to human survival, but also to social adaptation in the environment, where people need to recognize and identify a certain amount and quality of leadership potential. Although it is evolutionarily important to identify potential leaders in the group, it is also important to consider why people often place themselves in the subordinate position of followers of leaders. In human domination-oriented hierarchies, leadership evolves from prestige-based tribal leadership, goes through formalized and hereditary-based leadership (kings and military leaders), and reaches the level of a centralized, democratic leadership structure (state and business leadership, management, governance)[19].

The theory of the great man, or the trait theory explains leadership with genetic differences between individuals and inherited physical characteristics, i.e. with heredity.

Using factor analysis to explain the variability of the observed relationships, the behavioral approach to leadership adopted by a team of researchers at Ohio State University explored different specific leadership behaviors and derived two directions in them: attention (concern for people) and initiating structure (concern for the task).

Another wave of leadership research focuses on factors in the situation that can change the effects of a leader's behavior and planned outcomes. In other words, the most appropriate style of leadership, behavior, approach to decision making is considered dependent on the situation.

For the first time, Fiedler combines leadership traits with situational variables. Leaders are thought to exhibit either task-motivated or relationship-motivated style, which is measured by the least-preferred colleague scale (the person the respondent least prefers to work with). It is believed that those who describe their least preferred colleague in a more positive way use a human relationship-oriented style, while those who use more negative ones are dominated by the desire to achieve the goals of the task. Fiedler does not believe that leaders can change their leadership style. Instead, leaders should be chosen for situations that suit their style[20].

The field of leadership was on the verge of scientific collapse and practical inappropriateness before the development of the ideas of charismatic and transformational leadership. What these approaches have added to the study of leadership is an emphasis on important and neglected aspects of inspiration, identification and vision.

For the first time, the vertical dyad of the leader-follower relationship was introduced through the theory of exchange between them, which explores in more depth the processes of creating new roles between the leader and his followers. According to the theory, leaders develop exchange relationships with some of their subordinates, and over time, their relationship can develop into a mature partnership.

Some researchers approach leadership as a fundamentally socio-perceptual phenomenon. In other words, leadership is in the eyes of the perceiver and is defined as a process of perceiving by others a person as a leader. Although this is too extreme a definition and ignores important aspects of leadership behaviour, what makes this approach compelling is that it recognizes the essential role that followers play in the leadership process, because it is through them that leadership can build or lose[21].

The process of recognizing a leader is a process of shaping and consolidating the perceptions of followers, and success is a key feature of these theories of leadership, as it is difficult to maintain a perception of a leader if you are a failed leader.

The idea for more inclusive forms of leadership is to show how followers can be actively involved in this process. Followers are vital to the success of the organization and need to be shown that they too can become leaders. In this case, leadership smooths out a two-way, not a one-way, relationship.

The traditional view is that leaders serve to improve leadership in teams by acting on followers. A different approach is based on team leadership, how leaders act to create a leadership team. This particular type of leadership is shared leadership, in which leadership emerges through the interactions of group members, rather than flowing from the leader to the followers. In this way, leadership exists as a result of effective social processes and structures, and not just as a contribution from the individual leader who helps the team work more effectively. This is shared leadership in its purest form, as there is no one recognized leader. Leadership lies in the connections and relationships between team members, not in the actions or behaviours of any individual[22].

Integrated theory of leadership – a scientific basis for understanding management through leadership concept

An integrated theory of leadership is an attempt to integrate the strengths of the older theories, i.e. theories of traits, behavioural theories, situational and functional theories, introducing a new element – the need to develop leadership presence, attitude toward others, and behavioural flexibility through the practice of psychological mastery. Integrated psychological theory began to attract attention after the publication of the model "Three Levels of Leadership" by James Scouller in 2011.

In reviewing older theories of leadership, Scouller highlighted some limitations regarding the development of leadership skills and effectiveness[23]:

- Trait theory: this approach fails to develop a universally consistent list of leadership qualities, and because trait theory gave rise to the idea that leaders were born, Scouller argued that the integrated approach is more appropriate for choosing leaders than for developing them.
- Behavioural theory: Blake and Mouton proposed five leadership styles based on two axes: task care versus human care. They supposed that ideal management and leadership style is "teamwork style" which balanced the concerns for the task and concern for people, but this ideal approach could not meet all the conditions imposed by the situation.
- Situational theories: Most of them suggested that leaders can change their behaviour on their own desire to respond to different circumstances, but for many people it is difficult to apply even after training, because the behaviour was unconsciously rooted in human beliefs, fears or habits.
- Functional theories: They assume that once a leader understands and has been trained in the necessary leadership behaviour, he or she will apply it when necessary, regardless of their personality. However, as with situational theories, many people cannot do so because of hidden beliefs and old habits, so most leaders may need to master their inner psychology if they want to adopt unfamiliar behaviour at will.
- Leadership presence: The best leaders usually possess something outside their behaviour – something distinctive that draws attention, earning the trust of the people, and enables them to lead successfully, which is often called "leadership presence." This is probably the reason why the trait approach has become the starting line of researchers for the sources of the leader's effectiveness. But this presence varies for different people and studies show that it is difficult to determine general characteristics of the individual, so that the approach of bounds failed to capture the elusive phenomenon of presence.

According to Scouller, trait theories that tend to reinforce the idea that leaders are born, not created, cannot be useful in building leaders; the ideal style would not be ideal in all circumstances; most of the situational and functional theories suggest that leaders can change their behaviour to respond to different circumstances or expand their range of behaviour at will, which for many is difficult to do in practice. None of the old theories successfully meet the challenge of developing leadership that challenges attention, inspires people, gains their trust, and makes followers want to work.

Scouller proposed a three-level leadership model that aims to summarize what leaders need to

do, that is, not only to attract followers to their group or organization, but also to develop technically and psychologically with them as leaders. These levels are public, private and personal leadership. The first two levels – public and private leadership are external or behavioural levels. Public leadership refers to the actions or behaviours that leaders take to influence two or more people at once. Private leadership refers to the individual attitude of the leader towards individuals. The third, the so-called personal leadership, is an internal level and refers to a person's growth. It is based on the leader's self-awareness, his progress towards self-control and technical competence and his sense of connection with others. This is the inner core, the source of the leader's external effectiveness. Personal leadership deals with the technical, psychological and moral development of a leader and his impact on his leadership presence, skills and behaviour. Personal leadership has three elements: technical know-how and skills; the right attitude towards other people; psychological self-control. The idea of the theory is that if leaders want to be effective, they must work in parallel on all three levels[24].

The model accepts the premise that the best leaders have something in them (the "presence of leadership") that makes followers see them as credible, inspiring, and reliable human beings. However, it is assumed that the "presence" is unique to each person and cannot be reduced to a short list of common traits. The model supports the idea of behavioural flexibility according to the requirements of the circumstances, but is based on the idea that the key to achieving it is to go beyond behavioural learning and also work on the inner psychology of man (i.e. limiting beliefs and emotions) as this controls our tendency to adhere to firm, defensive behaviour. Scouller argued that self-control was the key to increasing leadership presence, building trusting relationships with followers, and allowing for behavioural flexibility in changing circumstances while remaining connected to a person's core values (in other words, remaining authentic).

To support the development of leaders, he presented a model of the three levels of leadership, where "presence" is not the same as charisma. The leaders can be charismatic by relying on position, fame, skilful acting, or by projecting an aura of specialty but the presence is something deeper, more authentic, more fundamental, and more powerful and does not depend on social status. He suggested that the authentic presence of each person is unique and outlined seven qualities of presence: personal power – the command of one's thoughts, feelings and actions; high but real self-esteem; the desire to be more, to learn, to grow; a balance of an energetic sense of purpose with a concern for the service of others and respect for their free will; intuition; to be in the present moment; achieving inner peace of mind[25].

"What is presence? It is based on integrity – a rare but achievable internal arrangement of self-identity, purpose and feelings which ultimately leads to liberation from fear. It reveals itself as the magnetic, radiant effect you have on others when you are authentic, giving your full respect and attention, speaking honestly and letting your unique character traits flow"[26].

According to the model, presence is developed through the practice of personal leadership. The real presence of leadership is synonymous with authenticity – to be real and to express its highest values and to serve one's followers.

Management through authentic and shared leadership

In fact, the concept of leadership is almost impossible to escape in our modern world. The terms "leader" and "leadership" are used everywhere, sometimes as a clear call for what is most absent and necessary in society, and other times as a harbinger of the most necessary social evils[27].

The concept of leadership is well appropriated and preserved by military science and practice. Its beginning is set by the concept of "command", which is still used today. In the field of security and defence, and specifically in military affairs, the term "commander" is clearly distinguished from the terms "manager" and „leader". Let us point out some of its peculiarities, bearing in mind that initially, in the 19th century, when constructing the basic management functions, Henri Fayol included in them the "command" function.

commander (noun)

Meaning: head of a military unit, leader of a group formed for some activity; an officer in charge of a military operation, or an officer of a certain rank in the navies of many countries[28].

Synonyms: general, military leader, strategist, tactician, chief, commander in chief[29].

Etymology: Meaning "one, who has the power or authority to command" dates back to the beginning of 14th century. It comes from the Old French word with meaning „commandant; order; command". The term originated in 1300s with the meaning "have power" from the Latin language "commendare" with the meaning "to recommend, to entrust to, to be involved, to confide". The intransitive sense of "to act or to have authority to command, to have or to exercise supreme power" dates from the end of the 14th century. It has also been used since the end of the 14th century as "within the scope of one's influence". The meaning "control, compulsion to obedience" is from the middle of the 15th century. The meaning "control, knowledge of the situation" is from the 40's[30].

The last decade has seen an increase in publications on authentic leadership, creating new models, definitions and theories. The concept of "authenticity" can be traced back to ancient Greece. Ancient Greek philosophers emphasized authenticity as an important condition, emphasizing the control of one's own life[31].

Authentic leadership is an approach to leadership that emphasizes building the legitimacy of the leader through honest relationships with followers built on an ethical basis. Authentic leaders are positive people who encourage openness. By building trust and generating enthusiastic support in their subordinates, authentic leaders can improve individual and team results. Authentic leadership is a growing field of research in academic leadership research, which has recently grown from complete obscurity to a fully mature concept[32].

Several characteristics of the leader can be important for the emergence of authentic leadership behaviour. Leaders must first be aware of their values and beliefs in order to be perceived as authentic by their followers and must demonstrate consistency between their values, beliefs and actions. Some empirical research supports a construction of authentic leadership that includes the following four components[33]:

- Self-awareness – an ongoing process of reflection and reconsideration by the leader of his own strengths, weaknesses and values;
- Relational transparency – balanced sharing by the leader of his own thoughts and beliefs, by minimizing inappropriate emotions;
- Balanced processing – requirement to express opposing views and fair consideration of these views by the leader;
- Internal moral perspective – resistant to external pressure, a positive ethical basis to which the leader adheres in his relationships and decisions.

Ken Blanchard described why the leader should tailor his style to the needs of the individual, how to diagnose the situation correctly, when to delegate, support and direct, and the symbol of the "One-minute manager" – one-minute reading from the digital clock face aims to remind each of us to take a minute of our day to look at the faces of the people he leads and to realize that they are the most important resource he has[34]. In this regard, the validation of "Know Yourself" and "Know Your People" must also be supported, as must be the belief that in order to be a leader, you must know your people well. The weight of the evidence clearly falls aside from the positive relationship between leadership and empathy of the leader, and leaders are required to:[35]

- know what the followers want;
- understand their different motives;
- be perceptive;
- be sensitive;
- take into account the opinion of the group.

Further research shows that leaders who act in accordance with the three components of positive psychological capital – hope, optimism and resilience are more likely to become authentic leaders. Leaders who can effectively explain their goals create a more promising environment for their followers. Optimistic leaders have a greater ability to motivate their followers and are better prepared to function in a changing environment as well as to support their followers. The high degree of self-control in the individual is also accepted as a precursor to authentic leadership.

Authentic leadership has been shown to foster team members' faith in their ability to succeed. Authentic leadership encourages team performance, trust in the group and the organization, increases loyalty to the organization. Authentic leaders evoke an emotional and psychological response in their followers, leading to increased individual and

team outcomes. Leaders who practice authentic leadership usually lead teams that perform better than teams with leaders who do not[36]. Authentic and shared leadership is a type of leadership that distributes leadership responsibility so that people in a team or organization are guided by each other. Therefore, the emphasis should not be on the existence of subordinates, but the followers. In this regard, we explain the meaning, origin and etymology of the terms "subordinate" and "follower".

subordinate (noun)

Meaning: with a lower or less important position, role, status; a person who has a less important position in an organization; a person who has less power or a lower position than anyone else in an organization; subdue – to put someone or something in a less important position; to treat someone or something as less important than something else[37].

Etymology: The origin of the term is found in the middle of the 15th century with the meaning of a person with a "lower rank", derived from medieval Latin "subordinate, placed in a lower order or place; below someone; order, rank, series, arrangement". To subordinate means "to be placed in a subordinate position, to be made of lesser value, to be made dependent"[38].

follower (noun)

Meaning: someone who is very interested in something; someone who supports, admires, or believes in a particular person, group, or idea; a person who does what someone else does or offers; someone who likes, approves, supports and follows another person or his ideas; a person who has an active interest in something; a company or product that only makes new changes, enters the market, etc.; a person who watches something closely to see how it develops[39].

Etymology: The term comes from an old English word "folgere", which means "adhere servant, disciple heir, accompanied student; a man who moves in the same direction, follows pursued, subject not to rule or law a person acting in accordance with something"[40].

Although the definition for authentic and shared leadership obviously has several variants, they all make the fundamental distinction between it and more traditional notions of hierarchical leadership. All definitions of shared leadership consistently include a "process of influence" that is built on something more than a downward influence on subordinates or followers of an appointed or elected leader. Almost all concepts of shared leadership presuppose the practice of "broad sharing of power between a set of individuals, rather than centralizing it in the hands of an individual who acts in the clear role of a dominant superior.

With the complexity and ambiguity of the tasks that teams often experience, it is becoming increasingly apparent that a leader is unlikely to possess all the skills and traits to effectively perform the necessary leadership functions. Shared leadership is defined as the optimal model of leadership when the characteristics of knowledge of interdependence, creativity and complexity meet. In this way, shared leadership is becoming increasingly popular in teams, as many team members emerge as leaders, especially when they have the skills, knowledge and expertise that the team needs.

Conclusions

Management and leadership studies originate from the social sciences (sociology, psychology), the humanities (history and philosophy), and from professional and applied fields of science (management, education management, pedagogy, military science). Today, there are numerous academic programs covering these subjects and many academic institutions related to them.

Leadership is as old as humanity itself, universal and inevitable because it exists everywhere. Leadership is directly related to a person's need for power, as one of the needs that must be met in order for a person to move on to meeting other needs in order to feel complete, approved and followed by other people.

Most traditional theories of leadership explicitly or implicitly promote the idea of the leader as the only hero and as the man with all the answers. In theory, and perhaps soon in practice, we will no longer speak of a leader and subordinates, but of a leader and followers, and here lies the key to understanding leadership – this is the purely human ability to inspire the people and let them follow you. Military science is an area in which leadership has

gained strong attention and where it is expressed in a holistic and integrated view, including both the psychological and physical presence of the leader and the influence one exerts. The conceptual abilities require the presence and development of agility, adequate judgment, innovation, knowledge, cultural and geopolitical consciousness.

Some of the research on management and leadership focuses on research at the individual and group level, trying to identify certain leadership traits or typical leadership behaviour, but in such models followers are missing and we must recognize that such approaches to these phenomena are limited and their study and application requires multidimensionality in research to help build more realistic pictures in organizations.

"I never force those who don't want to do something to do it, but I want my followers to follow me voluntarily and freely"[41] (*St. Simeon the New Theologian*).

Today, management through leadership has moved away from its status as a "hero who owns and saves" and the status of "leader who is voluntarily followed", considered not only as a category owned by a single entity, but as a comprehensive process with a focus on followers, the social organizational environment, the diversity of areas of human activity in which it is appropriate, taking into account its diverse nature. It is a complex interaction between the manager who is a leader and the social organizational environment of which the followers are a part and at the same time a strongly developing dynamic process, which is not limited to a specific object, subject or position.

In the future, the theory and practice of management through leadership need to develop integrative strategies for building a theory that extends to the approaches that include all the basic components of management processes; moving towards more integrative and inclusive theories of leadership of various kinds; consideration of management and leadership in dynamics, as a multilevel and multidisciplinary construction. And as Dugan says: "The journey continues"[42].

NOTES:

1 D. Kirov, D. Svilenov, E. Korudzhiev, *Educational textbook on Christian Ethics*, Sofia, 2003.

2 Stoyko Stoykov, *Science and Knowledge in Management Security System*, Publishing Complex of Vasil Levski National Military University, Veliko Tarnovo, 2018.

3 Tomasz Jałowiec, Ireneusz Miciuła, Piotr Maśloch, Henryk Wojtaszek, "Model of Military University Management", *37th IBIMA Conference*, 30-31 May 2021, Cordoba, Spain, 2021.

4 S. Dzhonev, *Social psychology*, Volume II, Sofia, 1997.

5 *** *Cambridge Dictionary Manager*, Cambridge University Press, 2021, https://dictionary.cambridge.org/dictionary/english/manager, accessed on 11.08.2021.

6 *** *Vocabulary Manager*, Vocabulary.com, Inc., 2001-2021,https://www.vocabulary.com/dictionary/manager, accessed on 11.08.2021.

7 *** *Online Dictionary*, Manager. OnlineRechnik.com, 2021, http://www.onlinerechnik.com/duma/%D1%83%D0%BF%D1%80%D0%B0%D0%B2%D0%B8%D1%82%D0%B5%D0%BB, accessed on 08/11/2021.

8 *** *Online Etymology Dictionary*, Manage. Douglas Harper, 2001-2021, https://www.etymonline.com/word/manage, accessed on 11.08.2021.

9 *** *Cambridge Dictionary Leader*, Cambridge University Press, 2021, https://dictionary.cambridge.org/dictionary/english/leader, accessed on 08.08.2021.

10 *** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/leader, accessed on 08.08.2021.

11 *Ibidem.*

12 *** *Online Dictionary Leader*, OnlineRechnik.com, 2021, http://www.onlinerechnik.com/duma/%D0%BB%D0%B8%D0%B4%D0%B5%D1%80, accessed on 11.08.2021.

13 *** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/leader, accessed on 11.08.2021.

14 *** *Cambridge Dictionary*, Lead. Cambridge University Press, 2021, https://dictionary.cambridge.org/dictionary/english/lead, accessed on 11.08.2021.

15 *** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/leader, accessed on 11.08.2021.

16 R. Chin, "Examining teamwork and leadership in the fields of public administration, leadership and management", *Team Performance Management*, 21 (3/4), 2015, pp. 199-216.

17 D. Day, *Leadership, University of Western Australia, 2016.*

18 Sun Tzu, *The Art of War: Complete Texts and Commentaries*, translated by Thomas Cleary, 2005, https://www.pdfdrive.com/the-art-of-war-complete-text -and-commentaries-e176229621.html, accessed on 08.08.2021.

19 D. Day, *op.cit.*

20 *Ibidem.*

21 *Ibidem.*

22 *Ibidem.*

23 J. Scouller, *The Three Levels of Leadership: How to Develop Your Leadership Presence, Knowhow and Skill*, Cirencester: Management Books, 2011.

24 *Ibidem.*

25 *Ibidem.*

26 *Ibidem.*

27 John Dugan, *Leadership Theory: Cultivating Critical Perspectives*, John Wiley & Sons, Incorporated, New York, 2017.

28 *** *Cambridge Dictionary Commander*, Cambridge University Press. https://dictionary.cambridge.org/dictionary/english/commander, 2021, accessed on 11.08.2021.

29 *** *Online Dictionary*, Commander. OnlineRechnik.com, 2021, http://www.onlinerechnik.com/duma/%D0%BA%D0%BE%D0%BC%D0%B0%D0%BD%D0%B4%D0%B8%D1%80, accessed on 11.08.2021.

30 *** *Online Etymology Dictionary*, Command. Douglas Harper, 2001-2021, https://www.etymonline.com/word/command?ref=etymonline_crossreference#etymonline_v_17217, accessed on 11.08.2021.

31 M.H. Kernis & B.M. Goldman, *A multicomponent conceptualization of authenticity: Theory and research*, apud M.P. Zanna (Ed.), *Advances in experimental social psychology*, Vol. 38, San Diego: Academic Press, 2006, pp. 283-357.

32 W.L. Gardner, C.C. Cogliser, K.M. Davis, M.P. Dickens, "Authentic leadership: A review of the literature and research agenda", *Leadership Quarterly*, 22, 2011, pp. 1120-1145.

33 F.O. Walumbwa, B.J. Avolio, W.L. Gardner, T.S. Wernsing & S.J. Peterson, "Authentic leadership: Development and validation of a theory-based measure", *Journal of Management*, 34, 2008, pp. 89-126.

34 Ken Blanchard, *Leadership and the One Minute Manager*, Blanchard Management Corporation, United States of America, 1985.

35 Paul F. Murphy, Bernard M. Bass, "Stogdill's Handbook of Leadership: A Survey of Theory and Research", *Naval War College Review*, Vol. 38: No. 2, Article 12, 1985, https://digital-commons.usnwc.edu/nwc-review/vol38/iss2/12.

36 M.A. Campion, G.J. Medsker, A.C. Higgs, "Relations between work group characteristics and effectiveness: implications for designing effective work groups", *Personnel Psychology*, 46(4), 1993, pp. 823-847.

37 *** *Cambridge Dictionary Commander*, Cambridge University Press. https://dictionary.cambridge.org/dictionary/english/commander, 2021, accessed on 11.08.2021.

38 *** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/leader, accessed on 08.08.2021.

39 *** *Cambridge Dictionary Commander*, Cambridge University Press. https://dictionary.cambridge.org/dictionary/english/commander, 2021, accessed on 11.08.2021.

40 *** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/leader, accessed on 08.08.2021.

41 D. Kirov, D. Svilenov, E. Korudzhiev, *op.cit*.

42 John Dugan, *op.cit.*

REFERENCES

*** *Cambridge Dictionary*, Cambridge University Press, 2021, https://dictionary.cambridge.org/dictionary/english/

*** *Online Dictionary*, OnlineRechnik.com, 2021, http://www.onlinerechnik.com/duma/

*** *Online Etymology Dictionary*, Leader, Douglas Harper, 2001-2021, https://www.etymonline.com/word/

Blanchard Ken, *Leadership and the One Minute Manager*, Blanchard Management Corporation, United States of America, 1985.

Campion M.A., Medsker G.J., Higgs A.C., "Relations between work group characteristics and effectiveness: implications for designing effective work groups", *Personnel Psychology*, 46(4), 1993.

Chin R., "Examining teamwork and leadership in the fields of public administration, leadership and management", *Team Performance Management*, 21 (3/4), 2015.

Day D., *Leadership, University of Western Australia, 2016.*

Dugan John, *Leadership Theory: Cultivating Critical Perspectives*, John Wiley & Sons, Incorporated, New York, 2017.

Dzhonev S., *Social psychology*, Volume II, Sofia, 1997.

Gardner W.L., Cogliser C.C., Davis K.M., Dickens M.P., "Authentic leadership: A review of the literature and research agenda", *Leadership Quarterly*, 22, 2011.

Jałowiec Tomasz, Ireneusz Miciuła, Piotr Maśloch, Henryk Wojtaszek, "Model of Military University Management", *37th IBIMA Conference*: 30-31 May 2021, Cordoba, Spain, 2021.

Kernis M.H., & Goldman B.M., *A multicomponent conceptualization of authenticity: Theory and research*. Apud Zanna M.P. (Ed.), *Advances in experimental social psychology*, Vol. 38, Academic Press, San Diego, 2006.

Kirov D., D. Svilenov E. Korudzhiev, *Educational textbook on Christian Ethics*, Sofia, 2003.

Murphy Paul F., Bass Bernard M., "Stogdill's Handbook of Leadership: A Survey of Theory and Research", *Naval War College Review*, Vol. 38, No. 2, Article 12, 1985, https://digital-commons.usnwc.edu/nwc-review/vol38/iss2/12

Scouller J., *The Three Levels of Leadership: How to Develop Your Leadership Presence, Knowhow and Skill*, Cirencester: Management Books, 2011.

Stoykov Stoyko, *Science and Knowledge in Management Security System*, Publishing Complex of Vasil Levski National Military University, Veliko Tarnovo, 2018.

Sun Tzu, *The Art of War: Complete Texts and Commentaries*, translated by Thomas Cleary, 2005, https://www.pdfdrive.com/the-art-of-war-complete-text-and-commentaries-e176229621.html

*** *Vocabulary Manager*, Vocabulary.com, Inc. 2001-2021, https://www.vocabulary.com/

Walumbwa F.O., Avolio B.J., Gardner W.L., Wernsing T.S. & Peterson S.J., "Authentic leadership: Development and validation of a theory-based measure", *Journal of Management*, 34, 2008.

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-45

THE CONCEPT OF HUMAN RESOURCES MANAGEMENT

Elena-Alexandra MAZILU (ALEXANDRESCU)*

The concept of human resources management has developed over time starting from personnel management, focusing much more on human resources planning, recruitment and selection, but also on evaluating professional performance and career management. The efficient implementation of human resources management at organizational level depends very much on the analysis of jobs. Job analysis provides elements that underlie the establishment of human resource needs and can be done through several methods, namely observation, interview or questionnaires. The recruitment and selection process can be improved by job analysis, because managers more objectively identify the knowledge, skills, abilities needed for a job and can structure tests based on job analysis results; they can state a more accurate job description.

Keywords: human resources management; recruitment; selection; job analysis.

Over time, it has been concluded that people are the most important resources of an organization and for this reason a process has been created that focuses exclusively on the activity of human resources, to manage their efficient use within an organization. Human resources specialists have tried to replace the term personnel management with the term human resource management (HRM). In this regard, experts such as Armstrong (1987)[1] associated human resource management with "an old wine in new bottles", while Guest (1987)[2] argued that human resource management differs in some ways from personnel management. It is practically suggested that most human resources activities involve the administrative part, such as selection, recruitment, promotion, retirement.

In its fully developed form, HRM functions as a system. As Schuler (1992)[3] states, HRM connects, integrates, and unites.

From another perspective, Storey (1995)[4] defines human resource management as follows: "Human resource management is a distinct approach to managing people in a company, which aims to gain a competitive advantage by strategically placing qualified and loyal staff using a holistic set of cultural, structural and personnel techniques". In the opinion of R. Mathis, HRM represents the process of continuous improvement of the activity of all employees in order to achieve the mission and organizational objectives[5].

As Boselie (2005) explained, HRM: "…responds accurately and efficiently to the organization's environment, complements other organizational systems (contingency theory) and provides "added value" through the strategic development of the organization's scarce, inimitable and irreplaceable resources, simply in its staff (resource-based perspective)".[6]

According to G. A. Cole, HRM includes a set of specialized activities, which aim to design, implement and support the essential objectives of the organization regarding the use of its employees[7].

According to Boxall (2007), human resource management is: "the management of work and people, in the sense of the desired limits"[8]. From another perspective, according to Grimshaw and Rubery[9] (2007), human resource management addresses the way organizations manage their workforce. According to Wayne F. Cascio, whose work was cited by Aurel Manolescu[10] (2001), human resource management requires the development and evaluation of programs in at least five areas:

- humanization of the post;
- performance rewards;
- flexible work programs;
- flexible reward plans;
- career planning.

The concept of human resource management is very complex and includes several activities. Depending on the specifics of each organization,

**** Communications and Informatics Command, Bucharest***
e-mail: *alexandra.alexandrescu89@gmail.com*

each activity is developed at a certain level and is carried out in a certain way. The most important activities underlying this process are human resource planning, recruitment, selection, evaluation of professional performance, reward and career management.

The strategic management of human resources needs consists of forecasting human resources needs over several years and it is an important component of human resources management. If this activity is not emphasized, there are various imbalances at the level of organizations, such as the employment of too many people at the level of certain departments or the lack of different employees specialized in certain fields. This has an impact on the entire organization and there are imbalances both financially and organizationally.

Job analysis is an important step in the strategic management of human resources needs because it provides certain elements that underlie the establishment of human resources needs, having an impact in the process of determining salary scales and in the process of recruitment and selection of staff, in the development career, performance appraisal and job design. The analysis of a specific job can be done by several methods, namely *observation, interview or questionnaires.*

Observation is a direct method of analysis that can be used for jobs that contain repetitive work cycles and although it allows a deep understanding of job requirements, it has a major disadvantage, namely that the results of this analysis can be subjective.

The questionnaire is very useful when analyzing a very large number of posts and consists of a written survey containing a set of questions arranged in a logical order. The questionnaire must be completed by the incumbents in order to develop modern techniques in the field of human resources management and will not be used in the process of evaluating professional performance. The structure of a questionnaire differs depending on the specifics of the organization, the purpose for which the questionnaire is used – design or redesign of the post and depending on the degree of detail required.

The interview consists of a dialogue in which the interviewee must answer a set of a maximum of 20 questions that will give him the opportunity to freely express his opinions. It is recommended that the questions be formulated clearly and concisely so that there is no room for vague interpretations or answers.

According to the results obtained in the job analysis process, managers may review job descriptions, so that they include, for each task assigned to the employee, the responsibility and related competence.

In the opinion of university professor Mihail Dumitrescu, PhD, the three vectors of success of an organization are management, technology and intelligent use of human resources and they are based on the contribution of staff[11]. An organization's strategy must take these factors into account and regularly invest in the development of these three vectors, so as to increase organizational performance.

In the development of a human resources management system within a company, several factors are involved. First, top management needs to establish the results it wants to achieve over a longer period of time and try to come up with solutions to find the balance between productivity and satisfaction.

It has been found that productivity and satisfaction do not have to depend on each other. Moreover, we can say that they can be two different objectives of a human resources management system. On the one hand, the human resources department has the role to follow the needs of the general management and on the other hand to manage the needs of the employees. Several activities are involved in the management of these two processes. Among the most important activities there are the administrative activities (necessary staffing, preparation of job description documents, management of employee files), those related to the analysis and design of jobs, recruitment and selection, human resource development and career management.

The realization of these activities depends on several types of resources (internal, external, financial) and that is why certain processes become more and more complex and their development can be achieved in the long run.

The human resources activity is not very simple within an organization and involves many processes that must be carried out by several responsible factors. In order to have an efficient communication at the level of the human resources department, in

order to efficiently manage the human resources in an organization, it is necessary to have a human resources manager whose role is to coordinate the entire activity of the human resources team and efficiently manage human resources within the organization.

Human resources management also involves the activity of recruitment and selection of human resources. There are organizations that carry out this process through an internal recruitment and selection department, but which can sometimes also turn to specialized recruitment agencies.

Sometimes there is a need in the case of recruiting niche positions to use the services of recruitment agencies because they have a very well developed database and can have much more complex recruitment applications, given that they have a very large number of customers.

Over the years, recruitment and selection as an initial activity has become very important within organizations, taking into account the fact that it has developed itself a lot through digitalization. Many applications have been created that have come to support the recruitment activity, moving most of the specific recruitment activities to the online environment.

Moreover, it was found that in the recruitment and selection process, besides interviews, another method of collecting data might be used, using different instruments of psychological evaluation (personality tests, psychological tests) and job-specific tests. In order to perform job-specific quality tests, it is necessary to have very good communication between the human resources specialists responsible for the recruitment process and the managers of the departments that have open positions.

Also, intelligence, personality and situational tests are most frequently used. Most of the time, intelligence and personality tests are not customized according to the specifics of each job, so they can be applied for several jobs. Instead, it is necessary for the situational tests to be personalized at the level of each job because in this way, the candidate is placed in different situations specific to the job which he/she applied for and the behavioral reactions and the way the candidate makes certain decisions are analyzed. In the case of certain jobs, practical tests are very useful, giving the candidate the opportunity to point out their skills.

The recruitment and selection process can be *improved* by job analysis, because thus managers identify the knowledge, skills, abilities needed for a job more objectively and can structure tests based on job analysis results as well as state a more accurate job description.

Career training and development programs can be more easily designed by managers through job analysis, as career opportunities may be recognized earlier when you have a detailed list of job skills and accountability requirements.

The selection of human resources consists in choosing the most suitable candidates according to certain criteria established for each position. During this stage you can use the selection interview, psychological and aptitude tests, questionnaires.

In the evaluation centers, the selection activity is carried out with a larger number of participants and involves the organization of group debates, simulations of situations, practical applications which evaluate certain qualities that candidates should have for a position.

Job tests are another assessment technique used in the selection process, through which interviewers test candidates' skills. It is used both for the category of workers and for the specialized personnel, being able to test the visual acuity, the memory, the distributive attention, the speed of reaction, etc.

Modern recruitment methods

One of the modern methods of recruitment is *head-hunting* – "headhunting" is a method of recruitment that involves approaching candidates who at that time are not interested in a career change or may not have expressed a desire to change the job. Therefore, this technique involves identifying those candidates who have the necessary knowledge and skills to be able to participate in the selection process for a particular job. Using this method is a bit more difficult for the recruiter because it involves having specific skills, so that you can easily identify candidates and then use different tools to convince them to participate in the selection process, "to whet their appetite for the job".

At the same time, in the field of recruitment, the *linked-in* is frequently used, a social media channel, a recruitment platform used especially for filling senior positions, those of specialists. For

entry-level junior or beginner positions, the best results are obtained by using sites that promote jobs (BestJobs, ejobs), by participating in career fairs and by creating partnerships with universities in order to achieve internship programs.

Over time, it has been found that in the case of candidates whose personality corresponded to the position they held, their satisfaction was increased, they were satisfied that they performed a job that corresponded to their personality and their migration was minimal. Six personality types were identified – realistic, researcher, communicative, conventional, entrepreneurial and artist.

In order to achieve an efficient management, *a matrix of professional competencies* can be achieved at the level of each department, based on which it is possible to analyze how many people are specialized in certain fields and where it is necessary to hire competent people in other fields. This matrix is very useful in the sense that it generates an accurate vision of the employment at the level of a department and, based on it, the human resources manager can establish an action plan with the measures to be established at the level of each department.

The professional skills matrix is a very useful management tool that helps to make the most of internal human resources, in the sense that it provides a much clearer view of the professional skills of employees. It can also be used in the training process, both in establishing the exact needs in the field of training, and in order to use its own employees in the role of in-house trainers.

At the same time, the matrix of professional skills can be used very well in the recruitment process because it can more easily identify the need for manpower, it can establish the criteria used in the recruitment process, but also the criteria used in the evaluation process of the professional performance.

Thus, the use of the matrix of professional skills can lead to a balance of work teams and can more easily correlate the skills of employees with organizational goals. There is the possibility of creating this matrix at the level of each department, but also at the project level, being much easier to create a working group.

Creating such a matrix of professional skills involves two main steps: establishing the professional skills that are required for a particular job or project and analyzing the professional skills of currently existing employees.

For example, certain levels specific to certain competencies that correspond to certain qualifications can be identified, as follows[12]:

Competence level 1 – Not qualified for this operation;

Competence level 2 – Could do it, has basic knowledge;

Competence level 3 – Executes correctly, but needs guidance, supervision;

Competence level 4 – Executes very well, has experience;

Competence level 5 – Performs very well, has experience and can teach others.

The interpretation of the data consists in identifying the number of people with high skills (≥ 4), (Table no. 1).

Table no. 1

QUALIFICATION OF PERSONS BY COMPETENCIES

	Competence				
	1	2	3	4	5
Operation	Number of people				
Document management in the classified documents compartment	9	3	2	2	0
Administration of domestic and international courses	6	6	1	1	2
.....	..	..	..	..	..

Table no. 1 shows how many people are qualified for each competency. For example, on the door mounting side we have 9 people who were assessed with competence 1, 3 people who were assessed with competence 2, 2 people who were assessed with competence 3, 2 people who were assessed with competence 4 and 0 persons who were assessed with competence 5.

This table can help us get a much clearer view of how we can form work teams. Depending on the results obtained by achieving this matrix of professional skills, internal trainings can be established, mixed teams can be established, mentors can be established to teach those who have less experience in certain fields, other specialized people can be hired in certain areas or professional retraining may be proposed for other types of employees. Over time, it has been found that in-house training is very effective both financially and organizationally.

At the level of recruitment, training and improvement of human resources, it is important to establish clear procedures at the organizational level, to emphasize decision-making transparency, so that employees feel safe and have no doubts about the violation of certain rights.

Conclusions

In order to ensure national security, the main objective of human resources management is to train human resources who may follow to realize the national security objectives.

Strategic planning defines the organizational directions, respectively the objectives to be achieved and has an important role within an organization. These objectives not only provide the basic data for determining the necessary financial resources, but they also cater for determining the necessary workforce. Important information needed to develop the employment plan comes from the strategic plan of the organization.

Strategic planning requires an adequate understanding of the organization's objectives, anticipated changes in mission, objectives and goals for the next period, and the ability to express them in the form of manpower. Consequently, human resource planning is of strategic importance because it transposes strategy into action by identifying human resource and training needs.

The concept of human resources management refers to a multitude of activities carried out by human resources departments, being a very complex process regardless of the level of the organization. In order to be able to carry out an organized activity, it is necessary to establish clear and concise procedures, so that the objectives set at the level of general management are very well known.

NOTES:

1 Michael Armstrong, *Armstrong's Handbook Of Human Resource Management Practice*, London, 1987, p. 4.

2 David E. Guest, *Journal of management studies*, Wiley Blackwell, London, September, 1987, p. 59.

3 Randall S. Schuler, *Strategic Human Resource Management*, Blackwell Publishing, 1992, p. 28.

4 John Storey, *Human Resource Management. A Critical Text*, Routledge Publishing House, London,1995, p. 97.

5 Robert Mathis, Panaite Nica, Costache Rusu, *Managementul resurselor umane*, Economics Publishing House, Bucharest, 1997, p. 3.

6 Paul Boselie, *Human Resource Management Journal*, 2005, p. 299.

7 Gerald A.Cole, *Managementul personalului*, 4th Edition, CODECS Publishing House, Bucharest, 2000, p. 4.

8 Peter Boxall, *Strategy and Human Resources Management*, 2007, p. 78.

9 Damian Grimshaw, Jill Rubery, *Undervaluing women's work. Equal opportunities commission working paper series*, no. 53, 2007.

10 Aurel Manolescu, *Human Resources Management*, Economics Publishing House, Bucharest, 2001, p. 57.

11 Octavian Nicolescu, *Managers and human resources management*, Economics Publishing House, Bucharest, 2004, p. 145.

12 Viorel Lefter, Alecxandrina Deaconu, Cristian Marinaş, Ramona Puia, *Human Resources Management*, Economics Publishing House, Bucharest, 2008, p. 28.

REFERENCES

Armstrong Michael, *Armstrong's Handbook Of Human Resource Management Practice*, London, 1987.

Boselie Paul, *Human Resource Management Journal*, 2005.

Boxall Peter, *Strategy and Human Resources Management*, 2007.

Cole Gerald A., *Managementul personalului*, 4th Edition, CODECS Publishing House, Bucharest, 2000.

Grimshaw Damian, Rubery Jill, *Undervaluing women's work. Equal opportunities commission working paper series*, no. 53, 2007.

Guest David E., *Journal of management studies*, Wiley Blackwell, London, September 1987.

Lefter Viorel, Deaconu Alecxandrina, Marinaș Cristian, Puia Ramona, *Managementul resurselor umane*, Economics Publishing House, Bucharest, 2008.

Mathis Robert, Nica Panaite, Rusu Costache, *Managementul resurselor umane*, Economics Publishing House, Bucharest, 1997.

Manolescu Aurel, *Managementul resurselor umane*, Economics Publishing House, Bucharest, 2001.

Nicolescu Octavian, *Managerii și managementul resurselor umane*, Economics Publishing House, Bucharest, 2004.

Schuler Randall S., *Strategic Human Resource Management*, Blackwell Publishing, 1992.

Storey John, *Human Resource Management. A Critical Text*, Routledge, London,1995.

Bulletin of "Carol I" National Defence University
10.12753/2284-9378-21-46

THE IMPORTANCE OF ERGONOMICS IN HUMAN RESOURCES MANAGEMENT

Mariana FRASZIN (GURĂU), PhD Candidate*

The role of human resources management is to have competent and motivated staff for maximum results and this objective is supported by the application of management policies and strategies at the organizational level. The importance of ergonomics in human resource management has been specified in numerous presentations of researchers, especially in the military field. This article presents some aspects associated with human resource management and the positive effects that ergonomics has in optimizing working conditions. It also describes the correspondence between increasing the performance of the organization and ergonomic interventions in the interaction between technique/equipment and staff.

Keywords: ergonomics; human resources management.

The efficiency of human resources management is a determining factor in increasing the productivity of the organization, but this in turn is conditioned on the one hand by the skills and abilities of the staff and, on the other hand, by the ergonomic design of the equipment used by the human resource.

Employee competencies and skills are key elements used by organizations in implementing long-term human resource management strategies. In fact, all activities in the workplace are based on the skills of employees. Therefore, one of the most challenging tasks of human resource management is to develop the skills of employees so as to achieve maximum efficiency[1].

Ergonomics includes several areas, being oriented to the anthropometric and biomechanical characteristics of man, mental processes, perception, memory, optimization of socio-technical systems, policies and processes and organizational structures[2].

These aspects of ergonomics are oriented towards human resource management and have a special importance in decision-making at the organizational level, with considerable effects in stimulating employee morale and implicitly in increasing productivity at work.

A device that meets the ergonomic characteristics facilitates the interaction between man and machine, thus obtaining remarkable results. Improper use of equipment at work can lead in time not only to decreased individual productivity, but also to the occurrence of absenteeism or health problems of employees. Recently, attention has been focused on the relationship between the implementation of ergonomic principles in the workplace and the quality of the product or service.

Efficient human resource management is extremely important in the company's ability to maintain its competitive advantage at a high level as well as to adapt to the continuous evolution of technological requirements. Investing in people has proven to be the surest way to ensure the survival of an organization or to ensure its competitiveness and future, which has led Naisbitt and Aburdene[3] to say that: "In the new information society, human capital has replaced financial capital, as strategic resource".

When we refer to human resources management in the traditional vision, we think of recruitment, selection, staff motivation, but also staff retention. There is also the concept of human resource management based on skills that focuses especially on the individual and less on the workplace. Competence is the determining factor for human resources management in the recruitment, selection and performance processes of the organization. Human resources contribute to the achievement of the organization's objectives by qualifying staff, performing functions and performing tasks. Moreover, the notion of human capital refers to the knowledge and skills that a person has, being useful to solve problems that arise in the workplace, thus adding value to the organization[4].

**"Carol I" National Defence University*
e-mail: *guraumariana4@gmail.com*

The goal of human resource management is to achieve maximum performance and maintain the competitive advantage in the market given the constant and rapid changes in all areas. As a result, in the contemporary vision, in addition to the traditional role, human resources management is also concerned with supporting staff in all activities, whether it refers to working conditions, security, comfort and even the general well-being of employees. Now all the activities related to the personnel and the performance of the organization fall within the attributions of the human resources management, and this is possible through the *ergonomic interventions*. Therefore, the importance of ergonomics in human resource management is observed in the way of organizing activities, the quality of equipment, security and working conditions that bring comfort and motivate staff.

Ergonomic interventions at the level of human resources can be considered primary measures to improve results and they can lead to:

- performance that represents the economic goal of ergonomics, constantly pursued, whose presence inevitably and non-stop stimulates the process and ensures the competitive and sustainable success of any modern organization;
- improving human well-being which can be considered the social goal of ergonomics because well-being is associated with safety, health and comfort, which are particularly important for employees.

Ergonomics is directly connected to human resource management. Even if at the beginning it referred more to production management, in recent decades the ergonomic principles refer to all working conditions that are provided to employees. The ergonomic aspects of human resource management are related to the adaptation of work to human body, namely to the physical and mental characteristics so as to obtain optimal working conditions not only for performance, but also for employee comfort.

Ergonomics has seen a continuous expansion in all areas, especially in recent decades, helping to develop the protection, safety and general well-being of employees, all resulting in the motivation and performance of employees and, consequently, the efficiency of company results.

In recent decades, it has been observed that not paying special attention to the working conditions of staff leads to poor management with repercussions on the final results of the organization.

Although it aims to avoid accidents and occupational diseases, ergonomics should not be confused with health and safety at work, the objectives of ergonomics being much more complex, for example[5]:

- improving working conditions so that they are a source of comfort and satisfaction which leads to increased staff motivation;
- technological development that leads to the efficiency of the activity carried out at the workplace;
- the main objective is to optimize the relationship between man - technique - work environment.

Achieving ergonomic goals at work has the following advantages[6]:

- staff motivation;
- development of socio-psychological relationships
- increase performance and productivity.

A good application of ergonomics increases not only the quality of work performed at work, but also the comfort of staff which leads to motivation and increased efficiency.

Productivity increases with the use of ergonomic principles and the adaptation of working conditions to the human body, so that physical wear and tear is reduced and staff efficiency is increased. And, last but not least, an ergonomic culture of the organization is developing, ensuring employees' safety and trust.

The military environment has always been a technological one. For this reason, the relationship between the military and combat technique is of special importance for military performance.

This approach fully justifies the need to pay special attention to ergonomics, especially when the issue of the purchase of military equipment and apparatus is raised, in order to ensure maximum efficiency in their use.

A concrete case in this regard was reported in the Australian military when the company producing military equipment did not consider the application of ergonomic principles to the needs of the military. Although the equipment met the security requirements, it was too heavy and bulky, considerably reducing the military's performance[7].

Another example[8] refers to the design of the ground control station interface of unmanned aircraft. The interface has a multitude of aspects to consider such as: shape, color, modes of operation. Although all these details are well established and

the operators are trained to a high level, there were still problems of an ergonomic nature, which were identified, namely:

- the existence of red graphics on a blue background;
- control lever that was not adapted to the shape of the hand;
- extremely close placement of two switches, one for the light and the other for the energy source.

In order to obtain maximum results after the implementation of the ergonomic principles, it is essential to involve the staff that benefits from the new working conditions; through the acquired feedback, working conditions or equipment with significant benefits at organizational level can be developed.

The performance of socio-technical systems depends decisively on the interactions of the components (military, combat technique) with social system components (working conditions, safety and protection factors, activity planning, performance monitoring, training and evaluation of military personnel).

The ergonomic realization of the combat technique involves the approach of the entire military system – combat technique – environment of action, because only the knowledge of the characteristics of the combat technique in close correlation with the other two components of the system can lead to performance. If this necessity is disregarded, the combat technique will produce disturbances, frequent disturbances within the system, which will negatively influence the execution of missions by the military.

Based on these considerations, the ergonomic study of the combat technique considers all three components of the system in their interaction. Through this interaction, the components of the military system – combat technique – environment of action, a common goal is achieved, which is the very raison d'être of the system. The effectiveness of the whole system depends on the quality of the information received by the military and the combat technique, on the way the system acts as a result of the information received and on the speed with which the main functions of the military system-combat technique-action environment are realized.

Although ergonomics aims to study the interaction between man and the work environment, its role is much broader within the organization. Ergonomics is not limited to improving the working conditions of staff, but also takes into account the general well-being of employees so that they are motivated and work to their full potential to achieve optimal results[9].

The purpose of ergonomics is to increase productivity, but also to maintain the well-being of employees at work.

The implementation of ergonomic aspects at the level of human resources management has led to the improvement of working conditions having a positive impact on employees and their performance.

Conclusions

Improper use of means of work leads not only to decreased employee productivity, but it can also take other forms, such as frequent absenteeism, health problems, etc. Only in recent years has the focus been on examining the relationship between the implementation of ergonomics in the workplace and the quality of the product/service provided by the organization.

In conclusion, ergonomics is essential when it comes to employee comfort and efficiency. The implementation of ergonomic principles leads to ease of use of equipment and contributes to the safety and comfort of staff.

Therefore, the importance of ergonomics in human resource management can be seen by achieving concordance between man and his work environment, so results can be achieved such as performance, quality, reliability, on the one hand, and well-being, safety and health, staff trust on the other hand.

NOTES:

1 Łukasz Sienkiewicz, Anna Jawor-Joniewicz, Barbara Sajkiewicz, Katarzyna Trawińska-Konador, Krzysztof Podwójcic, *Competency-based human resources management. The lifelong learning perspective*, Educational Research Institute Warszawa, 2014, p. 5, http://researchgate.net/publication/313791834_competency_based_human_resources_management_The_lifelong_learning_perspective, accessed on 15.05.2020.

2 https://iea.cc/what-is-ergonomics/ accessed on 15.05.2020.

3 J. Naisbitt, P. Aburdene, *Re-Inventing the Corporation: Transforming Your Job and Your Company for the New Information Society*, Little Brown & Co,1985, p. 36.

4 B. Binczycki, "Ergonomics in Human Resources Management", *7th International Quality Conference*, University of Kragujevac, Kragujevac, 2013, pp. 263-266.

5 *Ibidem.*

6 C. Vijayakumar, T. Vignesha, A. Murugesan, N. Bavana, "Effect of Erroneous In Ergonomics and Its Remedies to Workers in Industries – A Literature Survey", *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 3, no. 1, January 2015, pp. 368-377.

7 *** *Proceedings of the AHFE 2020 Virtual Conference on Ergonomics in Design*, USA, July 16-20, 2020, pp. 17-23.

8 A. Hobbs, B. Lyall, *Human factors guidelines for unmanned aircraft systems. Ergonomics in Design*, 2016, pp. 23-28.

9 H.A. Anup, dr. K.V.S. Rajeswara Rao, "Infuence of ergonomics on workplace productivity: A human resource management perspective", *Advance Management Practices in Business*, Book Hill Publishing House Braunschweing, Germany, pp. 49-54.

REFERENCES

*** *Proceedings of the AHFE 2020, Virtual Conference on Ergonomics in Design*, USA, July 16-20, 2020.

CTAN, "Effect of Erroneous In Ergonomics and Its Remedies to Workers in Industries – A Literature Survey", *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 3, no. 1, January 2015.

Anup H.A., dr. K.V.S. Rajeswara Rao, "Influence of ergonomics on workplace productivity: A human resource management perspective", *Advance Management Practices in Business*, Book Hill Publishing House Braunschweing, Germany.

Binczycki B., "Ergonomics in Human Resources Management", *7th International Quality Conference*, University of Kragujevac, Kragujevac, 2013.

Hobbs A., Lyall B., *Human factors guidelines for unmanned aircraft systems. Ergonomics in Design*, 2016, http://journals.sagepub.com

Jan Dul W., Neumann P., *Ergonomics contributions to company strategies*. Apud *Applied Ergonomics*, 2009**.**

Naisbitt J., Aburdene P., *Re-Inventing the Corporation:Transforming Your Job and Your Company for the New Information Society*, Little Brown & Co, 1985.

Sienkiewicz Łukasz, Anna Jawor-Joniewicz, Barbara Sajkiewicz, Katarzyna Trawińska-Konador, Krzysztof Podwójcic, *Competency-based human resources management. The lifelong learning perspective*, Educational Research Institute Warszawa, 2014, http://researchgate.net/publication/313791834_competency_based_human_resources_management_The_lifelong_learning_perspective

Vijayakumar C., Vignesha T., Murugesan A., Bavana N., "Effect of Erroneous In Ergonomics and Its Remedies to Workers in Industries – A Literature Survey", *International Journal on Recent and Innovation Trends in Computing and Communication*, vol. 3, no. 1, January 2015.

http://iea.cc/what-is-ergonomics

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-47

COMMAND STRUCTURES OF MILITARY ENGINEERING BRANCH, FROM THE ROMANIAN ARMY, IN THE PERIOD 1941-1946

Col. Cristian Gabriel CÎRJĂU, PhD Candidate*

The situation during the years 1941-1946 was particularly complex, a period in which the Romanian Army participated in military operations, both in the Eastern campaign against the Russian Army and in the Western campaign against the German Army, which was allied to us for a time. For the leadership and coordination of military actions, the existing Romanian commands, or those established according to current needs, cooperated closely with both the German and as well as the Russian ones from the moment we turned our weapons against the Germans. During both campaigns, the structures within the Romanian commands were some newly established and others organized and reorganized according to the needs required by the current situation. Among these structures, there are those of military engineering, who led and coordinated all specific activities. In this study I aimed to identify the organization and role of military engineering structures, within the Romanian commands, in leading and coordinating engineering actions during 1941-1946, in order to make later, in another study, a comparative analysis with the military engineering structures of the Romanian Army existing at this date.

Keywords: command and control structures; engineer branch; pionniers; fortifications; commanders.

The difficult situation of the country and the deeper involvement of Romania in the military campaign in the East and later in the West had special consequences in terms of organizing the Army, structures of command and control, as well as troops. During the period when the Romanian Army participated in the war, during the two campaigns, the military leadership was ensured, alternately and simultaneously by the General Headquarters and the General Staff, in accordance with the evolution and operational requirements, with the relations of collaboration, cooperation, and subordination to German and Soviet commands. Various factors determined the reorganization, organization, and implicitly the attributions of these structures, especially of the services, sections, and offices in the composition, during the whole duration of the participation in the Second World Conflagration[1]. Among these, we also identify the military engineering command structures, which are the subject of our study, but we will also refer to other military engineering command structures, permanent or temporary, that existed at that time.

The reason for elaborating this study was to identify the military engineering structures within the Romanian Army commands, during 1941-1946, their organization, their attributions, and the role they played in leading and coordinating the engineering troops. To identify the military engineering structures within the commands of the Romanian Army, I studied a series of documents in the archives and also a series of general and special military works.

In this study I want to make a detailed analysis of the military engineering command structures that the Romanian Army had, then collate data and information with others already emerged from other studies; a comparative analysis will be made with the command structures of military engineering today in the organization of our army, as well as in the organization of NATO commands or the national armies of some NATO member states. Subsequently, after performing the comparative analysis of all the military engineering command structures, both Romanian and foreign, concrete proposals will be made for the reorganization and resizing of structural military engineering within the Romanian Army commands.

Organization of command structures of the military engineering branch at the beginning of 1941

On April 1st, 1941, according to the battle order[2] officials, the command structures of the military engineering branch and also the other

Defence Staff
e-mail: *cirjau_cristian@yahoo.com*

structures within the branch were organized and subordinated as follows: at the Ministry of National Defence, within the State Undersecretariat for the Army, there were as superior command structures the *Superior Directorate of Military Engineering* and the *Directorate of the fortifications*. Within the State Undersecretariat of Air we identify the *Directorate of Aeronautical Engineering*, and within the State Undersecretariat of the Navy, *the Engineering and Signal Service*.

As a force structures, there were six pioneer regiments, a pioneer guard regiment, and a battalion of motorized military engineering in the Army Corps and Army Divisions. Within the mountain corps were four battalions of mountain pioneers, and in the organization of the two brigades of fortifications, we find two battalions of military engineering fortifications.

Within the Air Force (Aeronautics), we identify the Aeronautical Engineering Regiment with the Aeronautical Engineering Training Center.

Within the Royal Navy, the Danube Division Command is subordinated to the Marine Military Engineering Regiment.

In the coordination of the Superior Directorate of Military Engineering was the Engineering Training Center with subordinate units, the School of Engineering Officers (active and in reserve) with subordinate units, the Military Engineering Arsenal with the Industrial Military High School, Mogoșoaia Central Engineering Materials Depot, Iași Engineering Materials Depot, and the Sibiu Military Engineering Materials Warehouse. As troops the 1st, 2nd, 3rd Pioneer Brigades were organized by regiments and battalions, the Railway Brigade was organized by regiments and battalions, and the Signal Brigade was organized by regiments.

According to other sources[3], the following engineering structures were included in the land troops on 1 April 1941: *the General Inspectorate of Military Engineering*, the military engineering schools, the training centers, the military engineering arsenal, the military engineering and fortification battalions, and the warehouses of military engineering materials, and for the direct coordination and control of the units of military engineering there were the commands of the brigades of pioneers, signals, and railways, specialties which were organized into independent regiments and battalions.

The pioneer regiments and the mountain pioneer battalions within the pioneer brigades were directly subordinated to the corresponding army corps, respectively to the mixed mountain brigades, so they had double subordination. The pioneer brigades depended directly on the General Inspectorate of Military Engineering. There was also a battalion of moto military engineering and two battalions of pioneer fortifications, recently established, they depending on the 1st Armored Division and, respectively, the 1st and 2nd Fortifications Brigades. The Pontoneers Regiment was subordinated to the 1st Pioneer Brigade.

At the same time, the *General Inspectorate of Military Engineering* have in the organization: one *Staff*, *Pigeon Service*, *Studies and Experiments Department*, *Administration Service*, *Military Engineering Directorate*, who in turn has the composition: *Office 1 Pioneers*, *Office 2 Communications*, *Office 3 Signal*, *Office 4 Administration*, *Registry*.

The *Directorate of Fortifications* operated at the General Staff[4].

All the troops of military engineering had peaceful tasks of mobilization. They had to organize, equip and mobilize the units and subunits of military engineering (pioneers, signals, pontoneers, railways) needed for war large units and land troop units. The Aeronautical Engineering Regiment and the engineering units of the navy (signals, pioneers, underwater weapons, and cars) carried out the mobilization for their own needs.

Following the analysis, it appears that at the beginning of 1941, the military engineering structures within the commands were organized hierarchically, had a complex organization, and contributed to the leadership or coordination of engineer units. Their general attributions consist in leading and evaluating the training activities of the troops, endowing them with specific technique and materials, managing the ammunition, engineering equipment and materials, elaboration of studies, projects, and specialized instructions.

Situation of command structures and troops during the campaign

In the mobilization tables, the 1941 edition, it was recorded how the system of the general management of the war and the armies of operations was to be realized. This system included the General

Staff with its directorates and sections, the general inspectorates of branches, the commands of the large operational and tactical units.

Based on the documents of that time, on April 1, 1941, they were established for the leadership of military engineering troops[5], the following structures: at the General Headquarters – Echelon I: *Military Engineering Command* and *Signal Command*, consisting of cadres from *the General Inspectorate of Military Engineering* and *the Signal Brigade*; at the General Headquarters – Echelon II: *Direction of Fortifications*; at the State Undersecretariat of the Army: *Military Engineering Directorate* (*General Inspectorate of Military Engineering*) and *Signal Service*; at the Army Headquarters: *Military Engineering Service*, *Signal Service* and *Radio-gonio Service*, and as commanders of the military engineering and signal services were appointed commanders of the military engineering brigades and, respectively, of the signal regiments; at *Army Headquarters*: *Military Engineering Command*, *Military Engineering Service*, *Signal Command* and *Signal Service*. Commanders of military engineering and signals were the commanders of the military engineering regiments and the senior officers of the brigade and signal regiments, respectively; at the General Headquarters of the Cavalry Corps: *Military Engineering Service* and *Signal Service*; at the infantry division (Bg.Mx.M., Bg.Cv. and other types of independent brigades) no organs of military engineering and signals were provided, the corresponding problems were to be solved by the commanders of the battalions (squadrons) of pioneers or signals, they have the role of chief of branches.

The concentration of the commands of the military engineering and the signals within the Great Headquarters – Echelon I was foreseen for June 14, 1941[6].

At that time, Brigadier General Barbu Alinescu was employed as *Commander of Military Engineering*, also holding the position of General Subinspector of Military Engineering, and Colonel Vasile Diaconu, from the Signal Brigade, held the position of *Commander of Signals*.

The *Command of the Military Engineering of the Armies of Operations* appears as a necessity during the campaign on the eastern front for the liberation of Bessarabia and Northern Bukovina from Soviet occupation. In this campaign, the military engineering troops performed numerous specific missions for the benefit of the fighting forces but also of the fighting support forces.

For the leadership and coordination of the troops that carried out these specific missions, on July 11th, 1941, General Grigore Georgescu was appointed by General Antonescu with the order of General Antonescu with number 1911/C, *Commander of the Military Engineering of the Armies of Operations*.[7]

The *Military Engineering Command of the Operations Armies* had the following organization: the *Office of Engineering Studies and Projects*, the *Office of Studies and Signal Projects,* and a secretary-typist.

Colonel Nicolae Cojocaru was appointed *commander of the signals*. The head of the *Office of Engineering Studies and Projects* was Major Gr. N. Popescu, and head of the *Office of Studies and Signal Projects* - Major George Slapciu[8].

The *Military Engineering Command of the Operational Armies* functioned during the campaign from 1941, until December when the General Staff abolished it, and all its attributions would be taken over by the *Superior Directorate* and the *Military Engineering Command*.

In December 1941, according to the *Ministerial Decision no. 3000* regarding the *Organization and functioning of Ministry of National Defence*, the military engineering command structures had the following structure[9]: at the State Undersecretariat of the Army there were the *Superior Directorate* and the *Military Engineering Command*, organized by the War Preparation Section, the Military Engineering Directorate, the Fortifications Service, the Pigeon Section, the Administrative Service, subordinated to the military engineering commands and troops that did not enter in the composition of large units (Engineering Training Center, Officer and Non-Commissioned Officer Schools, Industrial Military High School, CF (railways) and MLP Art Guard Battalions, Military Engineering Arsenal, Engineering Material Depots); *Directorate of Military Fields and Constructions* with the Studies and Projects Service, the Records Execution Service, the Verifications, Receptions, Exploitation Service and the Administrative Service; at the Undersecretariat of State of the Air Force, under the subordination of the *Superior Aeronautical*

Directorate, was the *Aeronautical Engineering Directorate* with the Signals and Surveillance Section, the Aeronautical Engineering Section, the Infrastructure Section, the Land Section; at the Undersecretariat of State of the Navy we identify the *Military Engineering and Fields Service*.

In addition to the Higher Directorate of Arms, "there was an *Advisory Committee* which gave opinions on matters relating to the tasks of that Directorate"[10].

On April 1, 1942, Major General Gheorghe Zaharescu was appointed to lead *the Superior Directorate* and *the Military Engineering Command*, whose term of office would be until 1946. He had served as Chief of Staff of the 3rd Romanian Army at the declaration of the war[11].

Following the experience of war, the General Staff, the *Superior Directorate, and the Military Engineering Command* took a series of measures regarding the reorganization of the engineering troops, in accordance with the economic and military potential of the country.

The main measures were aimed at[12]: adapting the leadership, organization, and deployment of engineering troops, arranging for the defence of the territory of Bessarabia and Moldova, and equipping troops with new categories of engineering equipment, equipment, and materials.

a) *Adapting the leadership, organization, and deployment of military engineering troops*[13] was achieved at all hierarchical levels.

In July 1943, we identified in the organization of the Army, the following leadership structures of the military engineering branch[14]: to the Undersecretariat of State of the Army, the *Superior Directorate and Command of Military Engineering,* and the *Directorate of Military Domains and Constructions*; at the State Undersecretariat of the Air Force, subordinated to the *Superior Aeronautical Directorate* was the *Aeronautical Engineering Directorate*, and at the State Undersecretariat of the Navy, the *Engineering and Fields Service*.

As can be seen, the command structures of the military engineering branch at the ministry level did not change between December 1941 and July 1943, but soon changes were made to improve the leadership and coordination of troops[15].

Thus, in the autumn of 1943, some changes took place within the Superior Directorate and the Military Engineering Command. *The General Staff* has kept its organization since 1941, with the six compartments: *Office 1 Organization-Mobilization*, *Office 2 Intelligence*, *Research, Work*, *Office 3 Training, Schools, Regulations*, *Office 4 Services, Stewardship*, *Pigeon Service, and Fortifications Service*, while the *Military Engineering Directorate* is reorganized into seven compartments instead of four, namely: *Office 1 Pioneers*, *Office 2 Communications*, *Office 3 Signals*, *Office 4 Phone* (MND subscription charges), *Office 5 Contracts*, *Office 6 Studies and Experiments* and *Ajutantură*. Thus, we notice the emergence of new structures, namely the Office of Pioneers which separates from communications due to the increasing role of pioneers in operations, and also the Office of Contracts which will deal with endowment issues[16].

Also in the same period, the *Mountain Pioneers Group* was set up, willing to make peace in Brașov, whose main attributions were "instruction and mobilization in the sedentary parts of the mountain pioneers"[17].

Another newly established structure was the *Special Intervention Corps*, commanded by General Virgil Stănescu (former commander of the 4th Romanian Army military engineering in the 1941 campaign). Later, in 1944, it will change its name to the *Construction Corps*, and its units will become detachments (battalions) of constructions.

The Construction Corps had 149 officers, 139 non-commissioned officers, and 3197 troops. The command of the corps had staff with offices: *1 – Organization-Mobilization*, *2 – Studies-Execution*, *3 – Training*, *4 – Services and Organs of Administration and Sanitation*.

The mission of the Construction Corps was to execute, equip, and complete fortification works inside the country. In the initial version of the *Intervention Special Corp,* its mission was to remove the consequences of the bombings by collecting unexploded bombs, defusing and destroying them, demining, removing debris, rebuilding buildings, extinguishing fires[18].

A new measure was the peaceful reorganization of the pioneer and signal regiments.

According to the *Decree-Law on the organization of the Armed Forces* in October 1943[19], military engineering and signals branches as combat branches appear in the land troops.

The military engineering included units of pioneers, guard pioneers, pontooners, railways (hypo or motorized) grouped in regiments, and separate corps battalions.

Signals include wired and wireless signal units, grouped into separate corps regiments and battalions.

On November 14, 1943, by *Ministerial Decision no. 2067/1943*, the *Signal Command* established by *Royal Decree no. 3818/1942*, is subordinated to the General Staff, from the point of view of organization, mobilization, and training, and the other points of view will depend on the Undersecretariat of State of the Army through the Superior Directorate and the Command of Military Engineering[20].

b) *Arrangement for the defence of the territory of Moldova and Bessarabia*[21]. After the victory at Stalingrad, Soviet troops successfully continued offensive operations against the Germans and their allies, prompting the Romanian General Staff to focus on organizing to defend the country, and especially the East area.

A special role was played by the *Fortifications Service* within the *Superior Directorate* and the *Military Engineering Command*, which in January-August 1943 led and coordinated important activities, among which we mention:

- rehabilitation of fortification works in the area of Moldova and their extension through the execution of other new works, based on their conception;
- execution of landscaping works against the air landing (against paratroopers) of the districts with important objectives: aerodromes, anti-aircraft artillery batteries, ammunition depots, explosives, weapons, fuels/lubricants, communications nodes, factories, and industrial enterprises with production war, radio stations, etc.

c) *Equipping the troops with new categories of technique, equipment, and engineering materials*[22].

At the beginning of the war, the troops of military engineering were properly equipped with rudimentary tools and materials of military engineering, which were produced in our country. But they did not have enough engineering machines, explosive and firing devices, means of research and detection of mines, and means of transmission. At the end of 1941 and during 1942, some of these means and materials will be made available to the troops of military engineering, by Germany, on the front, in accordance with the protocols established at the beginning of the war. However, military engineering troops continued to face major shortages of engineering, equipment, and materials.

In connection with the endowment of the forces with equipment and materials, the *Superior Directorate* and the *Military Engineering Command* coordinated the research activity for the realization of new means of military engineering and signals. Noteworthy is the invention of the battery phone and the portable phone with lamps by Lieutenant (ret.) Marinescu-Stoiceni.

During 1943-1944, the *Superior Directorate* and the *Engineering Command* intensified the procurement of engineering materials and means from various companies in Germany, Italy, Austria, and Czechoslovakia.

On the evening of August 23, 1944, a coup d'état took place in Bucharest, in which Marshal Antonescu and other members of the Romanian government were arrested. Shortly afterward, King Michael, 1st broadcast on the radio a proclamation stating that Romania was siding with the Allies, turning its weapons against Hitler's Germany. Following this, the Chief of the General Staff issued Order no. 678 563 transmitted to all the Romanian land, air, and naval forces, ordering that "the fight and any act of aggression against the Soviet forces cease"[23]. These events represented the change of the political regime in the country and the transition of Romania into the sphere of influence of the former USSR, which dictated the conditions of the armistice, which ended on September 12, 1944.

The consequences of the use of military engineering troops in the eastern campaign

During the period 1941-1944, the numbers of military engineering troops increased steadily, year by year. In June 1941, the engineering troops numbered 72,962 people, of which 57% were operating in the area of operations, reaching in July 1944, reaching several 148,847 people, of which 37% were employed in the area of military actions.

In the actions carried out on the eastern front, as well as in the Iasi-Chisinau operation[24], the military engineering branch, like all other combat branches, suffered heavy casualties of thousands of men (dead, missing, prisoners), totaling 624,770 people lost by the operating armies[25].

Also during the eastern campaign, the engineering troops suffered heavy material losses. Some units of military engineering lost almost entirely their equipment, materials, and equipment. Following the Iasi-Chisinau operation, the loss of life was very high, units and large units of the Romanian Army lost almost entirely their fighting capability and ceased to exist. The same fate befell the engineering troops, especially the pioneer and signal units[26].

For this reason, the General Staff through a series of special orders and instructions would restore a new structure of the Army[27], both for the area of operations and inside, taking into account the human and material possibilities of Romania at that time and in accordance with the provisions of the Armistice Convention.

As for the troops of military engineering, the human and material damage was so great that the battalions of divisional pioneers failed to recover. Of the remaining numbers and the new number of recruits from the sedentary parties, the divisions only managed to form a pioneer company. Instead, a corp of pioneers and a battalion of signals remain in the army corps. To successfully form battalions and pioneer companies, it was necessary to transfer staff between units. The reorganization of the military engineering branch was done "on the fly", in a very short time, the deadline for its completion is set for mid-October 1944.[28]

On November 1, 1944, the *Special Instructions no. 17200* recorded the abolition of the *Superior Directorate* and the *Command of Military Engineering* and the re-establishment of the *General Inspectorate of Military Engineering* which depended on the Undersecretariat of State of the Army[29].

The organization of the *General Inspectorate of Military Engineering*[30] on 1 December 1944 was as follows: *Directorate of Materials and Engineering Works* headed by a Director, with *Section 1 – Engineering Works*, having *Office 1 – Road Communications*, *Office 2 – Railways*, *Office 3 – Instruction* and *Section 2 – Engineering Materials*, having *Office 1 – Pioneering, Destruction and Military Engineering Materials*, *Office 2 – Studies and Experiences*, *Office 3 – Bridge and Railways Construction Materials*, *Office 4 – Administrative*, *Office 5 – Signal Materials*; *Pioneer Directorate* headed by one director, with two offices, *Office 1 – Organization*, *Office 2 – Instruction*; *Staff* led by a Chief of Staff, with two offices and a service, *Office 1 – Organization, mobilization, adjudication*, *Office 2 – Instruction, schools, regulations*, *Material Service*; *Signals Department* headed by a director, with five offices, *Office 1 – Organization*, *Office 2 – Instruction*, *Office 3 – Wired broadcasts*, *Office 4 – Radio signals*, *Office 5 – Equipment*; *Stewardship service.*

Subordinated to the *General Inspectorate of Military Engineering* were[31]: Military Engineering Training Center with Center Regiment; School of Military Engineering Officers; School of Engineering Non-Commissioned Officers; 1st Pioneer Brigade organized by regiments; 2nd Pioneer Brigade organized into regiments and battalions; 3rd Pioneer Brigade organized by regiments and battalions and also having the Mountain Pioneers Group; Railway Brigade organized into regiments and battalions; Construction Corp; The Arsenal of Military Engineering; Central Warehouse of Engineering Materials; Signal Command subordinated to School of Signal Officers; School NCOs; regiments and signal battalions.

The pioneer regiments and the Mountain Hunters Corps had double subordination: to the command of the Army Corps and the Mountain Corps, respectively.

According to the *Ministerial Decision no. 2580 of December 2*, 1944, on the organization and functioning of the Ministry of War[32], subordinated to the State Secretariat of the Land Army, was the *General Inspectorate of Military Engineering* which consisted of: the General Staff; Stewardship and sanitary services; The Directorate of Military Engineering; Directorate of Works; Military Engineering Advisory Committee.

The *Directorate of Military Fields and Constructions*[33] appeared as a separate structure at the level of branches inspectorates and consisted of: Studies and Projects Service, Works Execution Service, Barracks Records, Technical Checks, Reception Service, Operation, Organization, Mobilization, Personnel, Registry, and Administrative Service.

Changes in reorganization, deployment and structure of military engineering troops

The period after August 23, 1944 and 1945 will bring important transformations for the Romanian

Army but also for the military engineering branch which consisted in the abolition or merger of military units, as a result of the implementation of the Armistice Convention and the introduction of the political apparatus in the Romanian Army structure.

On September 12, 1944, the Armistice Convention was signed[34], in Moscow, by the representatives of the Romanian government and the Allied Powers, requesting the reduction of the Romanian Army to a number of 120,000 soldiers for Land Forces, 5,000 for Air Defence, 8,000 for Air, 5,000 for the Navy. These requirements were also provided in the Peace Treaty between Romania and the Allied Powers, signed on February 10, 1947, which consented to Romania's status as a defeated country, although the great powers appreciated its military contribution and economic and financial efforts to shorten the war and defeat Fascist Germany.

In this context, the General Staff passed to the reorganization of the Romanian Army, a fact that naturally extended to the engineering troops, the action being carried out based on Special Instructions no. 70,200 of November 1, 1944[35].

The reorganization of the military engineering branch included the dismantling, establishment, transformation, and re-subordination of units and large units.

In the autumn of 1944, a series of pioneer units, railways, and all battalions and detachments especially set up for fortification works were disbanded. The Moto Pioneer Regiment merged with the Military Engineering Training Center, and the Construction Corps and Signal Command were subordinated to the General Inspectorate of Military Engineering[36].

In February 1945, all the Training Centers and Military Schools of Military Engineering Officers and Non-Commissioned Officers, signals and military engineering guards were merged, and the School of Military Engineering Officers and Non-Commissioned Officers was established.[37]

Between March and September 1945 a number of units and large units of pioneers, pontooners, river bridges, signals, roads and railways, naval engineering, aero signals, motorcycle and mountain signals, Signal and Pioneer Commands, Directorate of Works, Construction Corps were disbanded.[38]

With the troops from the disbanded commands and units were organized: *Military Engineering Directorate*, with regiments 1, 2, 5, 6 and 7 Pioneers; *Signal Direction* with regiments 1-5 Signals; 2 Pontoneers Battalions; Railway Brigade with Regiments 1-5 Railways and Guard; 1st Airborne Transmission Regiment, 2nd Airborne Pioneer Regiment, Marine Engineering Battalion, Engineering, and Signal Educational Institutions, and Engineering Materials and Works Directorate[39].

In the period 1945-1946, the reduction of military personnel and therefore of the military engineering branch continued, and also the process of democratization of the Army began, a process that had special implications for the branch as well.

Following the Armistice Convention and later the Peace Treaty, the strength of the Romanian Army was drastically reduced. By *Decree-Law no. 128 of February 12*, 1945, signed by King Michael I, and later by *Law no. 433 of June 12*, 1946, also promulgated by the king, many officers, non-commissioned officers, and petty officers were made available. Some of them were engineers and railroads[40].

Regarding the command structures of the branch, in September 1946, Brigadier General Grigore Ionescu was appointed to lead the *General Inspectorate of Military Engineering*, in place of Major General Gheorghe Zaharescu. The new inspector of military engineering was a valuable officer who participated in both campaigns during the war.

A new structure appeared in the structure of the inspectorate for the first time, namely the *Education, Culture, and Propaganda Service*. The structure of the Inspectorate was as follows: *General Staff*, *Education, Culture and Propaganda Service*, *Second Commander for Instruction,* and *Second Commander for Endowment and Technical Works*. The *Works Department* was transformed into *a Works Department*.

The inspectorate kept some units and large units of military engineering in direct subordination, and others only from the point of view of instruction[41].

Conclusions

Since the beginning of 1941, the military engineering structures within the commands of the Romanian Army had a complex organization,

with attributions on several lines, necessary for the leadership and coordination of all activities undertaken by the military engineering troops. Subsequently, after the mobilization of the force structure and after the involvement in the military actions carried out within the eastern campaign, these military engineering structures within the commands were continuously adapted according to the current needs.

During this period, the center of gravity was focused on the military engineering command structures, namely the *Superior Directorate* and the *Military Engineering Command*. Following the accumulation of war experience, through these structures, a series of measures were taken regarding the reorganization or establishment of new command structures, as well as engineering troops. The main measures were the adaptation of the leadership, organization, and deployment of the engineering troops, the arrangement for the defence of the territory of Bessarabia and Moldova, and the endowment of the troops with new categories of technique, equipment, and engineering materials.

After August 23, 1944, and until the end of the period under analysis, following the dissolution of the Superior Directorate and the Military Engineering Command, the *General Inspectorate of Military Engineering* was established, which will contribute to the reorganization of the military engineering branch, which included abolitions, establishment, transformations and reorders of units and large units.

The success of the Romanian Army in both campaigns in which it participated, of the engineering troops as well as of all the branches, was based on economic, moral, and military factors. Of particular importance were the firm and supple leadership exercised on the whole scale of the commands, the special skill with which the Romanian commands achieved the cooperation, in a first stage, with the German commands and later, with the Soviet ones.

The commanders of the Romanian engineering units, from all echelons, had theoretical training and a lot of experience in leading the troops. They knew and competently applied the principles of leading and using military engineering troops in operations and combat[42].

There was uninterrupted knowledge by the commanders of the detailed situation of the forces and means of military engineering, the measures taken to prevent moments of crisis, requiring early reinforcements from the upper echelons, or engaging the local population and administration structures in the areas of operations.

The commanders of the military engineering of the armies or army corps, personally or through their assistants, were in the troops at the times and places where the most important and decisive missions were carried out, even risking their lives.

The military engineering branch in World War II had significant human and material losses. The losses of the engineering troops amount to a number of thousands of soldiers, respectively officers, non-commissioned officers, and troops.

NOTES:

1 Ion Giurcă, Maria Georgescu,. *Romanian General Staff (1859-1950). Organization and functional attributions*: Military Publishing House, Bucharest, 2012, p. 229.

2 [The General Staff of the Army], *The Order of battle of the Armed Forces in Peacetime on April 1, 1941*, Printing House of the General Staff, Bucharest, 1941, *passim* (pp. 10-44).

3 [Arch. M.Ap.N.-M.St.M.], File no. 475/1, *Brochure no. 26 with the order of battle of the armed forces*, apud Col. (ret) Petre Zaharia, Col. (ret) Emanoil Ene, Col (ret) Florea Pavlov. *History of the military engineering branch in Romania*. Vol. II, Military Publishing House, Bucharest, 1995, pp. 90-92.

4 *Ibidem*.

5 *Ibidem*, p. 101.

6 *Ibidem*, p. 103.

7 *Ibidem*, p. 120.

8 *Ibidem*, pp. 120-121.

9 [Ministry of National Defence], *Organization and functioning of the Ministry of National Defence*, MAN Printing House, Bucharest 1941, p. II-VII, pp. 24-27, 44, 60 (details on the attributions of military engineering command structures).

10 *Ibidem*, p. 25.

11 Col. Marian Gargaz, Col. Mircea Sclipcea, Col. Dorin Cheţa, Col. Benone Burtan, *The military engineering branch of the Romanian Army. 150 years of sacrifices and glory*, Publishing House of the Army Editorial Technical Center, Bucharest, 2009, p. 160; Col. Petre Zaharia et al., *op.cit.*, pp. 155-156.

12 *Ibidem*, p. 188.

13 *Ibidem*, pp. 188-190.

14 [General Staff], *Order of Battle of the Armed Forces in Peacetime, on July 1, 1943*, Printing House of the General Staff, Bucharest, 1943, pp. 4-5.

15 *** *Law on the administration of the armed forces*, Printing Service, Bucharest, 1943.

16 Col. Petre Zaharia et al., *op.cit.*, p. 188.

17 *Ibidem*.

18 *Ibidem*, p. 189.

19 [Ministry of War], *Decree-Law on the organization of the armed forces* of October 27, 1943, t: Typographic Service, Bucharest, 1943, pp. 23-24.

20 *** *Historical Register 1859-1945. The history of the General Staff of the Army, from its establishment until today*, Bucharest, 1945, pp. 75-76.

21 Col. Petre Zaharia et al., *op.cit.*, pp. 190-194.

22 *Ibidem*, pp. 195-196.

23 Coord. Maj. Eftimie Ardeleanu, LTC Alexandru Oşca, Res Dumitru Preda,. *History of the General Staff. Documents. 1859-1947*, Military Publishing House, Bucharest, 1994, pp. 352-353.

24 Col. Nicolae Ciobanu, PhD et al., *Course on the history of military art*. Vol. III, Bucharest, 1988, pp. 146-149.

25 Col. Petre Zaharia et al., *op.cit.*, pp. 204-206.

26 *Ibidem*, p. 226.

27 *Ibidem*, p. 227; Coord. Maj. Eftimie Ardeleanu et al., *op.cit.*, pp. 353-356.

28 In the General Staff. *The order of battle of the Army in peacetime on December 1, 1944*, Defence Staff Library, no. IV/088/1, *passim*, a guard pioneer regiment appeared at the Army Corps, four pioneer regiments, at the Mountain Corps a Mountain Pioneer Group appeared with three mountain pioneer battalions.

29 *Ibidem*, 17; Col. Petre Zaharia et al., *op.cit.*, p. 227.

30 *Ibidem*, p. 228.

31 [General Staff], *The order of battle of the Army in peacetime on December 1, 1944*, pp. 17-18.

32 [Ministry of War], *Organization and functioning of the Ministry of War* (contains details on the attributions of military engineering command structures), 1944, pp. 35, 41-42, 51-54.

33 *Ibidem*, pp. 57-58.

34 Col. Petre Zaharia et al., *op.cit.*, 331.

35 *Ibidem*.

36 [General Staff], *The order of battle of the Army in peacetime on December 1, 1944*, pp. 17-18.

37 [General Staff of the Army], *The order of battle of the Army in peacetime, on March 1, 1945*, Bucharest: Printing House of the General Staff, 1945, 33; Col. Petre Zaharia et al., *op.cit.*, p. 331.

38 *Ibidem*; [General Staff of the Army], *The order of battle of the Army in peacetime, on March 1, 1945, passim*.

39 Col. Petre Zaharia et al., *op.cit.*, p. 331.

40 *Ibidem*, p. 343.

41 *Ibidem*, p. 345.

42 [Higher War School], *Military Engineering Tactics Course*, Defence Staff Library, Bucharest, 1945, quota SV 213/1, pp. 5-7.

REFERENCES

*** *Law on the Administration of the Armed Forces*, Printing Service, Bucharest, 1943.

*** *Historical Register 1859-1945. The history of the General Staff of the Army, from its establishment until today*, Bucharest, 1945.

[General Staff of the Army], *Order of the Armed Forces in Peacetime on April 1, 1941*, Printing House of the General Staff, Bucharest, 1941.

[General Staff of the Army], *Order of the Armed Forces in Peacetime on July 1, 1943*, Printing House of the General Staff, Bucharest, 1943.

[The General Staff], *Order of Battle and the Peace Dislocation of the Army on December 1, 1944,* Defence Staff Library.

[Ministry of War], *Decree-Law on the organization of the armed forces* of October 27, Printing Service, Bucharest, 1943.

[Ministry of War], *Organization and functioning of the Ministry of War* (contains details on the attributions of military engineering command structures, 1944.

[General Staff of the Army], *Order of Battle and the Peace Dislocation of the Army on 1 March 1945*, Printing House of the General Staff, Bucharest, 1945.

[War School], *Military Engineering Tactics Course*, Defence Staff Library, Bucharest, 1945.

[Historical Service of the Army], *Historical Register 1859-1945. The history of the General Staff of the Army, from its establishment until today*, Bucharest,.

Coord. Maj. Eftimie Ardeleanu, LTC Alexandru Oşca, Res Dumitru Preda,. *History of the General Staff. Documents. 1859-1947*, Military Publishing House, Bucharest, 1994.

Col. Ciobanu Nicolae, PhD at al, *Course on the history of military art*. Vol. III, Bucharest, 1988, 1988.

Col. Marian Gargaz, Col. Mircea Sclipcea, Col. Dorin Cheţa, Col. Benone Burtan, *The military engineering branch of the Romanian Army. 150 years of sacrifices and glory*, Publishing House of the Army Editorial Technical Center, Bucharest, 2009.

Giurcă Ion, Georgescu Maria, *Romanian General Staff (1859-1950). Organization and functional atributions*, Military Publishing House, Bucharest, 2012.

Coord. Col. Popa Costică, PhD, *Course on the history of military art*, vol. III, Military Academy Publishing House, Bucharest, 1988.

Col. (ret) Zaharia Petre, col. (ret) Ene Emanoil, col. (ret) Pavlov Florea, *History of the military engineering branch in Romania*, vol. II, Military Publishing House, Bucharest, 1995.

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-48

MILITARY ENGINEER CAPABILITIES PARTICIPATING TO OPERATIONS IN SUPPORT OF THE LOCAL AND CENTRAL AUTHORITIES IN EMERGENCY SITUATIONS. PRESENT AND FUTURE

Col. (ret) Lect. Andrei Th. CONSTANTIN, PhD*

Climate change over the last two decades, coupled with the health crisis caused by the SARS COV-2 virus, requires central and local public authorities to involve all resources are available to preserve the health and life of the population, as well as for the protection of their material and cultural values.In addition to the fact that the Romanian Army performs support functions, it has unique capabilities whose use becomes indispensable for the management of civil emergencies[1]. Compared to the tasks to be performed, in order to limit and eliminate the consequences caused by disasters, the military engineer structures in the Romanian Army represent the most adequate capability, by the fact that they are able to intervene in most situations. However, the military engineer capabilities must be constantly perfected and adapted so that they are able to respond to the new types of risks that may arise.

Keywords: emergency situation; emergency intervention; military engineer structures / military engineer capabilities.

Considerations on emergencies and intervention to limit and eliminate their effects

The current situation, to which we refer, reveals the fact that, in the last twenty years, the number of events generating emergencies have started to occur on our planet four times more often than before.

Scientists and researchers have discovered that there is a direct relationship between global warming and the growing number of natural disasters on our planet. If in the 80's there were 120 natural disasters in the world every year, today the number of natural disasters is about 500 cases a year[2]. Moreover, starting with the end of 2019, humanity is facing a large-scale health crisis generated by the SARS-CoV-2 virus.

For this reason, events such as natural disasters, serious disasters can simultaneously hit one or more areas of the national territory without warning.

An analysis of the risks that can generate such emergencies highlights the following types of events: vegetation fires, heavy rainfall causing floods, massive snowfalls, earthquakes, tornadoes, accidents and technological explosions, landslides land, epidemics/epizootics, the failure or sinking of ships, falling objects from the atmosphere or the cosmos[3].

Depending on the magnitude of the event, its consequences can be unpredictable and can culminate in serious damage to the life and health of the population, as well as significant material damage. For these reasons, most emergencies require urgent intervention to prevent a worsening of the situation, although sometimes mitigation may not be possible and the structures called upon to intervene may only provide palliative care for the aftermath.

A common, inter-institutional approach to emergencies is the right and viable solution. In this way, expertise and capabilities are brought together, duplication of relief efforts is avoided and it is also ensured that assistance meets the needs of those affected. Therefore, pooling capabilities allows the state to have a strong and coherent collective response. Moreover, it contributes to the coordination of disaster preparedness and prevention activities and contributes to the exchange of good practices. This facilitates the continuous development of high common standards, enabling intervention teams to better understand different approaches and work interchangeably in the event of a disaster.

At national level, the prevention, monitoring and management of emergencies is carried out in an inter-institutional and interdepartmental framework

**"Nicolae Bălcescu", Land Forces Academy, Sibiu*
e-mail: *cnstntnandrei@yahoo.com*

by the National Emergency Management System[4], whose main responsibilities are to restore normalcy after a disaster.

The Romanian Army is a part of the National Emergency Management System, and the support of local and central authorities in civil emergencies is one of its basic missions[5]. In this sense, the Ministry of National Defence, in order to fulfill its responsibilities, at the central level, constitutes a ministerial committee that operates under the leadership of the Minister of National Defence and also provides structures capable of participating in limiting and eliminating the effects of disasters.

The tasks that can be performed by the structures of the Romanian Army are in correlation with the risks mentioned above, and these are: monitoring the risks and dangers generating emergency situations; searching for and rescuing people; evacuation of the population and material goods affected by disasters; providing emergency medical assistance; participation in locating and extinguishing fires; ensuring the transport of forces and means of intervention, evacuated persons and other resources; creating facilities for accommodation and shelter for people affected by disasters; decontamination and depollution of land, equipment and materials; logistical support for restoring public order; intervention logistics; rehabilitation of the affected area.

The intervention of the structures of the Romanian Army, in order to limit and eliminate the effects produced by the events generating emergency situations, is carried out gradually on types of potential risk, the magnitude of the effects produced and with the achievement of a saving of forces and means.

Military engineer structures are the basic component of the Armed Forces that can intervene to limit and eliminate the effects of most types of accidents that can occur in our country.

Engineering support missions and their association with the support functions assigned to the Ministry of Defence in emergency situations

The analysis of engineer support missions, from the perspective of using military engineer capabilities to limit and eliminate the effects of calamities and disasters allows the association of specific missions of military operations with activities carried out during interventions in disaster areas. As a result, there is a correspondence between missions and support functions assigned to the Ministry of Defence in emergency situations generated by disasters. This correspondence explains the fact that in tradition, in the Romanian army, the military engineer structures represent the main force that can act in these situations. At the same time, military engineers can act as needed to fulfill other non-specific missions.

In the list of engineer support missions, in the two forms of manifestation (combat support and force support)[6], one can identify areas common to the participation of engineers both in military operations and in civilian emergencies. Therefore, the engineering support missions find a correspondent in the support functions assigned to the Ministry of Defence for emergency situations generated by calamities and can be as follows:

- operations of reconnaissance, identification, location and collection of data and information on areas affected by disasters and calamities, monitoring of specific hazards and risks, as well as their negative effects, evacuation the population in imminent danger;
- restoration of the civil communication routes and the construction of the temporary access roads to/from the calamity areas;
- restoring the continuity of communication routes to isolated localities/areas, by arranging the crossing points on temporary bridges or gates;
- unblocking of communication routes by eliminating the effects of landslides, the destruction of ice bridges/blockages on frozen rivers and the remains of damaged buildings/installations that endanger the safety of the population;
- protection/consolidation of the banks/dams/slopes/bridges/hydro technical and hydropower works with protection and support systems;
- arrangement of the camps for the victims, of the field hospitals (sanitary points) deployed in support of the calamity population;
- arrangement of the evacuation areas of the victims, of the storage points of the humanitarian aid (materials, equipment, installations);
- regarding water purification, storage and transport;
- installation and servicing of the means and equipment for the supply of electricity.

Correspondence between engineer support missions in military operations and support

functions of the Romanian Army in emergency situations leads to the opportunity to widely use military engineer capabilities to limit and eliminate the effects of disasters or other serious disasters.

Military engineer capabilities for the performance of engineer support missions, which may be associated with support functions assigned to the Ministry of Defence in civil emergency situations

The Romanian Army was engaged and acted permanently to manage the events generating emergencies using the necessary and sufficient human and material resources to return to normalcy.

The analysis of military capabilities, which can be made available by the Ministry of National Defence for the performance of assigned support functions, reveals that military engineer structures are among the most suitable for emergency response.

The use of military engineer capabilities is a determining factor in limiting and eliminating the consequences of disasters. The intervention of military engineer structures, for the management of emergency events, demonstrated and validated their usefulness, with a major impact on the return to normalcy and the resumption of daily life by the affected population, the most significant of which are presented below:

- the construction by the soldiers of the 3rd Engineer Battalion "General Constantin Poenaru" of military bridges over the Buzau River. They re-established the road connection between the historical provinces of Muntenia and Moldova, as a result of the floods produced in the summer of 2005 and which had the effect of destroying the concrete road bridge over the river Buzau, near Maracineni located on the road communication DN 2- E85. For their construction, the military used the PJM-72 metal bridge deck complete;
- distribution of basic food, mineral water and blankets by the soldiers of the "Bucharest Fortress" 96th Engineer Battalion in Teleorman and Bacau counties in the summer of 2005, The military also participated in the evacuation of civilians from areas affected by floods, such as and the evacuation of alluvium from individual households;
- the evacuation of the population affected by the floods and its material goods, by the soldiers of the "TISA" 52nd Engineer Battalion, in the summer of 2005 from Timis County in 2005;
- the evacuation of the population and of the material goods by the soldiers of the "Panait Donici" Engineering Training Center, in December 2005, as a result of the landslides produced in Ocnele Mari locality, Vâlcea county;
- unblocking/clearing, in the winter of 2006, by the soldiers of the "Bucharest Fortress" 96th Engineer Battalion, with the help of explosives of road and railway communication routes on the Olt Valley as a result of landslides caused by heavy rainfall;
- participation of the military of the "General Constantin Savu" 72nd Engineer Battalion to limit the effects of floods in the summer of 2010 by building the pontoon floating bridge using the bridge park of pontoons PR-71, over the river Suceava, in Dornești on DN 17A Siret- Rădăuți;
- the participation of the military from the "Lower Danube" 10th Engineer Brigade in unblocking the roads in Brăila County, and saving lives after the massive snowfalls of 2012, 2014, 2016;
- the participation of the soldiers of the "Danubius" River Crossing Battalion in the winter of 2012, in the unblocking of the river navigation routes, between Km 170 and km 176 using the Tugboat "Eftimie Croitoru";
- the participation of the soldiers of the "Bucharest Fortress" 96th Engineer Battalion in the construction of the infrastructure for the installation and operation of the Military Campaign Hospital at the Ana Aslan Institute during the pandemic generated by COVID-19.

The examples mentioned above are sufficiently eloquent and highlight the fact that military engineer structures have multiple and diversified capabilities for intervention in civil emergencies.

As a recognition of the high capacity for intervention, for the management of emergency situations, on 01.07.2002, the 52nd Genius Battalion "TISA" is established. Its birth certificate consists of the signing on 18.01.2002 l, by the defense ministers of Romania, Ukraine, Hungary and Slovakia of *the Agreement for the establishment of a multinational engineer structure*[7], able to intervene to limit the effects of major floods in the basin river basin of the Tisza River.

The potential of military engineer structures to make available to local and central authorities military capabilities, on types of probable risks,

in order to limit and eliminate the consequences of disasters and natural disasters, is high and may target the following activities:

- reconnaissance and monitoring of specific dangers and risks on watercourses, roads, works of art, extra-urban lands, dams, banks, etc.;
- evacuation of the affected population and material goods;
- arrangement of disaster camps and warehouses for material goods;
- arrangement of platforms and installation of field hospitals;
- arranging landing platforms;
- restoration/arrangement of some road sections and/or of some works of art;
- strengthening/consolidating some banks/ dams;
- arranging and servicing some crossing points on fixed supports/floating bridges and river vessels;
- diversion of watercourses in order to prevent household floods;
- controlled destruction of dams, banks or ice sheets to prevent the formation of dangerous water accumulations;
- clearing the access roads with the help of explosives;
- water supply to the affected population;
- electricity supply.

Trends in the development of military engineering capabilities for participation in emergency management

In order to fulfill the tasks related to the mission of support of local and central authorities in civil emergencies, it is necessary for the Romanian Army, in general and military engineer structures in particular, to continue the transformation process, in order to achieve adequate and adapted capabilities to all risks and potential hazards the national territory is subject to.

Military transformation is a complex process that covers, among other things, the areas of structural reorganization and endowment with modern equipment.

Equipping units with military engineer equipment must be aimed mainly at[8]: modernization and improvement of existing military equipment; production/purchase of new military engineer equipment adapted to the contemporary operational environment and complying with NATO standards; high maneuverability and skill; large-scale introduction of new technologies in the production process of military engineer equipment through cybernetics and robotization.

Beyond the modernization of the equipment from the endowment of military engineer structures, it is necessary to create entities and organizations, following the model of states with consolidated experience in the field of emergency intervention.

An example of good practice is Austria, which in 1990 set up a military disaster response structure called the *Army Reaction and Disaster Response Unit* (ARDRU)[9]. Also in the US, the US Army Corps of Engineers and the National Guard play a particularly important role in disaster response.

At the level of the European Union, the decision was taken in June 1999 to set up a capability to intervene in military and civilian crises. The meeting of foreign ministers held in 2000 ended with the establishment of a common mechanism to improve cooperation in civil assistance and protection interventions[10]:

The mechanism also contributes to the coordination of disaster preparedness and prevention activities of national authorities and contributes to the exchange of good practices. This facilitates the continuous development of higher common standards, allowing teams to better understand different approaches and work interchangeably when a disaster strikes. As an additional asset for the mechanism, the EU has established a European reserve of additional capacity ("rescEU reserve"). The reservation includes firefighting aircraft and helicopters and medical equipment. We are currently developing medical evacuation capabilities[11].

During COVID-19, the EU distributed tens of thousands of protective masks, medical gloves and 30 fans from strategic rescEU distribution centers currently hosted by 9 EU Member States to countries in need. To ensure a better response to future challenges, new EU civil protection legislation – in force since May 2021 – gives the EU additional capacity to respond to new risks in Europe and the world and stimulates the rescEU reserve[12].

By similarity at the level of the Romanian Army, in addition to the existing military engineer structures, intended to meet the operational

requirements of the army, entities can be created exclusively for intervention in emergency situations.

The establishment of these structures will bring benefits both in terms of the availability of military engineer capabilities for intervention and the promptness of response to limit and eliminate the effects of disasters. The arrangement and value of these structures will have to respect the principle of territoriality, the classification will be made with active and reserve soldiers, and the endowment will be made according to the potential risks of each geographical area.

Another positive aspect is the avoidance of affecting the operational capacity of the basic military engineer structures.

Conclusions

The intervention of the central and local authorities, for the management of the events generating emergency situations, has a decisive role for the saving of human lives, material goods and the return to normalcy.

The experience of the last years clearly shows us that the Romanian Army, through the military engineer structures in particular, represents the component best adapted to respond to the needs of the population affected by disasters.

The diversity and complexity of potential risks necessitate the constant adaptation of capabilities and response modalities, so that loss of life and property damage is kept to a minimum. Therefore, military engineer structures must go through a permanent process of structural adjustment and endowment with modern equipment, in order to be able to cope with all potential types of risk, generating disasters or other serious issues.

The set-up of the military engineer structures, intended exclusively for emergency intervention, becomes an essential requirement for a prompt and timely intervention, with major consequences in saving lives and returning to normalcy after disasters. Newly created structures should be arranged and equipped in accordance with the map of potential risks that may affect the national territory.

NOTES:

1 ***Ordonanța de Urgență no. 21 privind Sistemul Național de Management al Situațiilor de Urgență*, from 15 April 2004, published in Monitorul Oficial no. 361, from 26 April 2004.

2 Madhumitha Jaganmohan, *Global number of natural disasters events 2000-2020*, https://www.statista.com/statistics/510959/number-of-natural-disasters-events-globally, accessed on 19.10.2021.

3 *** *Ordonanța de Urgență nr. 21 privind Sistemul Național de Management al Situațiilor de Urgență*, from 15 april 2004, published in Monitorul Ofcial no. 361, from 26 april 2004.

4 *Ibidem.*

5 *** *Strategia Militară a României*, Bucharest, 2021, p. 7.

6 *** *Land Force Military Engineer Doctrine*, ATP 52 (B), pct. 109, 18 December 2008.

7 *** *Revista Armei Geniu* no. 21/2012, Râmnicu Vâlcea, 20012, p. 29.

8 Col.Assoc.Prof. Mircea Vladu, PhD (coord.), *Înzestrarea forţelor de geniu potrivit cerinţelor războiului viitorului*, "Carol I" National Defence University Publishing House, Bucharest, 2006, pp. 25-30.

9 https://www.bmi.gv.at/204_english/start.aspx, accessed on 15.10.2021.

10 *** *European Civil Protection and Humanitarian Aid Operations*, https://ec.europa.eu/echo/what/civil-protection/mechanism_en, accessed on 15.10.2021.

11 *Ibidem*.

12 *Ibidem*.

REFERENCES

*** *Carta Albă a Apărării*, 2021.

*** *Land Force Military Doctrine*, ATP-52(B), 18 December 2008.

*** *Strategia Militară a României*, Bucharest, 2021.

*** *Strategia Națională de apărare a țării pentru perioada 2020-2024*.

****Ordonanța de Urgență no. 21 privind Sistemul Național de Management al Situațiilor de Urgență*, from 15 april 2004, published in Monitorul Oficial no. 361, from 26 april 2004.

*** Colection *Revista Armei Geniu* no. 16-30, Râmnicu Vâlcea, 20012.

Col.Assoc.Prof. Vladu Mircea, PhD (coord.), *Înzestrarea forţelor de geniu potrivit cerinţelor războiului viitorului*, "Carol I" National Defence Univesity Publishing House, Bucharest, 2006.

https://www.statista.com

https://www.bmi.gv.at

https://ec.europa.eu

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-49

MODULAR COMMAND AND CONTROL STRUCTURES AND FORCE ORGANIZATION USABLE IN OPERATIONS AT HIGH ALTITUDES

Col. Cezar POPA, PhD Candidate*

Mountainous areas located at high altitudes, hardly accessible, are used as safe heavens and staging areas by various asymmetrical groups. Addressing these challenges in areas of operations located at high altitudes requires the existence of specific capabilities for command and control. C2 based on mission command must be adapted to the current requirements generated by conflicts with variable geometry, mosaic type conflicts, composite, multifaceted, multi-layered, multi-domain conflicts. Command and control systems should have architectural flexibility, intelligent digitised platforms and its modules should be perfectly functionall and interoperable (based on self-sufficiency – extended capability to operate over time). We believe that, at high altitudes, the architecture of a complex command and control system must be modular and designed as a coherent integrator of sensors, decision-makers, performers and support capabilities, interconnected in subsystems that ensure the planning, preparation, execution and effective evaluation of military actions. In the conditions of diversification of risks and threats in the multidimensional operational environment, the architecture of the command and control systems must be permanently adapted in order to ensure real-time, horizontal and vertical communication between forces, support structures and command-control structures.

Keywords: command and control system; high altitudes; mountain operations; artificial intelligence; technique; technology.

To emphasize the importance of developing complex C2 systems adapted to operational environments located at high altitudes, we have identified some representative military art historical landmarks related to conducting combat operations at high altitudes as well as some current conflicts. The limitations in exercising command-control and in conducting military operations identified by the study of current conflicts have implicitly led to the need to develop C2 systems. The specific capabilities required by a C2 to ensure success in actions/operations performed at high altitudes also emphasize the need to develop that modular system of command and control systems, starting from the combination of current concepts with state-of-the-art technology.

It is known that over 25% of the land area is covered by mountains, about 85% of the world's borders are classified as mountainous, and about 12% of the world's population lives in areas with high altitudes. On these facts, we consider that it is absolutely necessary to develop the capabilities of a force operating in the mountain environment, especially at high altitudes and implicitly of related command and control systems. Mountain forces were developed mainly in the last quarter of the nineteenth century, especially with the mission of defending the borders. In 218 B.C. Hannibal's army demonstrated an unexpected capability to cross the Alps and performed one of the most impressive maneuvers executed in a historic offensive operation. World War I confirmed the defensive attitude of the mountain troops, exceptions being the Battle of Mount Krn (1915)[1] or the conquest of Mount Matajur by Erwin Rommel[2]. Conducting military operations to high altitudes often led to changes in the situation and radically influenced the outcome of the battle[3]. In World War II, mountain troops operations were mainly conducted in cold weather (the Russian campaign) but also resulted in counter-insurgency operations in the Alps and the Balkans. For example, the Battle of Narwik in Norway, can be considered a JOINT operation involving naval, air force and mountain troops units in a synchronized operation. The battle of Mount Cassino along the German "Gustav" defensive line in Central Italy[4] represents another lesson related to the capabilities of conducting combat operations

***"Bucegi" Mountain Warfare Center**
e-mail: *cesarp07@gmail.com*

at high altitudes that made the difference between the participating forces[5] (forces trained for such situations and forces facing the situation of fighting at high altitudes for the first time).

At the end of the 20th century and the beginning of the 21st century, significant examples of battles fought at high altitudes were those of Central Asia (Kashmir Region, the fighting scene between India and Pakistan, for the Siachen glacier, that even generated a new concept – "oropolitical" or climbing with a political purpose). The mountains of Afghanistan (many peaks exceeding 6.000 m altitude and mountain plateaus often exceeding 3.000 m altitude) were an operating area during the Invasion of the Soviet Union in 1979 and the Enduring Freedom campaign[6]. In the Caucasus area (mountains with altitudes that constantly exceed 4.000 m altitude) the Russian army reconsidered the maneuvering ability of the mountain troops to secure their southern flank[7].

At present, there are many ongoing conflicts in the mountain environment at high altitudes that need to be seriously monitored. Afghanistan itself, recognized worldwide as a strategic area, is still unstable and represents an area of interest to many parties involved[8].

Border conflicts such as India-China[9] (at over 4.000 m altitude) and the Nagorno-Karabakh region (South Caucasus area) are also sensitive issues. The immigrants' routes from Asia and Africa to Europe pass mainly through mountainous regions, even at high altitudes. Other conflicts identified worldwide are mainly related to water sources, natural resources and critical infrastructure in the mountains (e.g. the conflict in Peru – altitudes above 5.000 m).

Consequently, many countries are in a process of adapting and improving their forces for the new scenarios[10] specific to high altitudes mountain environment fighting in state-of-the-art, variable geometry, extended multinational and based on opportunities conflicts. In this context, we believe that the development of the capabilities necessary to conduct operations in this particular and specific environment is up-to-date and NATO has taken this into account[11]. There are multiple issues arising – the survivability of the forces, their maneuverability, their support of any kind, the increase in combat capabilities and a high-performance C2 in this harsh environment. For the force, this requires specific training, adequate equipment, as well as a specific approach to the doctrine of combat in the mountain environment (especially for operations conducted at high altitudes) and the tactics (specific techniques and procedures). Some NATO member states are constantly developing the techniques, tactics and procedures specific to combat in the mountain environment, but at the alliance level efforts are limited (they are exercised on a small scale on the coast in support of naval operations in the North Sea).

Limitations in exercising command-control and in conducting military operations/actions at high altitudes

The mountain terrain channels the movement and limits the maneuver of forces, and high elevation terrain is often impractical for the nowadays equipment/vehicles. The movement or maneuver of dismounted forces is grueling for the human resource and time-consuming.

Climate and bad weather can negatively affect actions/operations conducted at high altitudes, but they can also offer tactical advantages.

The difficult mountain environment and high altitudes have a strong physical, physiological and psychological effect on the military personnel. Living in isolation and/or conducting military operations at high altitudes without prior training (long-term) considerably affect the human factor from a physical, physiological and mental point of view. Unfavorable environmental conditions (cold, dampness, fog, persistent rain or snow) lead to the onset of fear, depression and/or even to the decrease in the morale of the human factor involved in both the command-control act and the execution (at the force level). However, proper specific training and very good physical condition create self-confidence and optimism. Leadership must combine healthy reasoning with a thorough understanding of the characteristics of the mountain environment which will lead to achieving efficiency in the command. Leaders must demonstrate the optimal ability to command in isolated circumstances, hard-to-reach terrain and in the most difficult weather conditions to address the physical, physiological and psychological impact on units.

Due to the rugged terrain (large uncovered areas, high altitudes, narrow valleys, steep slopes), the tactical actions within a larger operation are conducted divided, mainly with decentralized

command (command by mission) and relatively small forces (section, platoon, company level) or *battle groups* constituted according to the requirements or specificity of the mission (on the principle of disintegrated forces with rapid integration capacity). We can exemplify by organizing patrols (reconnaissance, combat, or tracking[12]), by organizing patrol bases[13] or by task organizing force on the Mosaic principle (partially or totally robotic/autonomous weapons). These forces, regardless of how they were constituted, must have long-lasting and self-sustaining capabilities. In these situations, mutual support and relocation of forces is very difficult or even impossible, and the separate action (command-control-execution) of these elements is inevitable. They can be *centralized* or *decentralized led*, but most of the time *they act in a decentralized manner*. These specific procedures determine the specificity of C2 and the effective command of forces during the planning or conducting phases of military actions at high altitudes. Frequent and rapid changes in the weather lead to changes in combat and operating conditions and often require an adjustment of operations planning, command – control, as well as a change in combat techniques and tactics. For example, fog, low cloud ceiling and precipitation often lead to a sharp visibility decrease, observation and the use of conventional weapons being severely limited. The forces placed in high positions may lose the dominant role and will be forced to maneuver the opponent (close observation and close combat are to be conducted) in order to meet the set objectives. In these weather conditions, helicopters cannot be used. Other environmental factors that can significantly influence the military actions /operations in the mountain environment: heavy rainfall, snow, torrents from the melting of snow, sudden increase or decrease in temperature, hail, large or even small avalanches, etc.

High altitude, extreme weather conditions and the terrain restrict mobility, overload forces and equipment that need to be replaced more often or replaced by other forces. In the context of the acceptance and implementation at the level of the forces fighting at high altitudes of the *mosaic warfare concept*[14], these forces must be disaggregated but with the capacity of rapid aggregation according to the mission specifics, partially or totally robotic/ autonomous weapons, and the command and control systems used need to be modular, maneuverable, have high energy autonomy and be assisted by artificial intelligence (AI) by supporting the C2 architectures with smart digital platforms. The purpose of implementing AI at the command-control level is to optimize the decision-making process (increasing its efficiency through speed, creating algorithms, immeasurably higher analysis capacity, synthesis, interpretation of data and information, instant access to databases, etc.) and to have an adequate control over the force, especially over the partially or totally robotic one.

Specific capabilities necessary to conduct actions/operations in the mountain environment

At this moment, the emphasis is on developing and maintaining the existing capabilities, but I believe that it would be appropriate to predict and implicitly develop the capabilities necessary to face the new challenges of the modern conflict with variable geometry manifested in all environments of confrontation, implicitly in the mountain terrestrial environment at high altitudes. It is necessary for these capabilities to be generated according to a clear concept of high altitude combat that generates an appropriate doctrine and strategies for in-advance or crisis response operational planning (collaborative-extended at the level of PMESII institutions, coordinative, multi-tier- in parallel or successively, opportunity-based or combined) that fit the entire spectrum of operations, carried out simultaneously or successively[15]. These capabilities should be able to operate in a common manner (at NATO level) and combined, in environments with high altitudes, across the globe or other similar environments (arctic environment). This should be resolved at C2 level (i.e. C5I2SR) including cooperation and interoperability[16]. It is necessary that this system, in addition to the current capabilities (command and control of forces, shared common operating picture with its interpretation, intelligence, surveillance, reconnaissance, operational and tactical planning, air situation and missile defence, joint fires and management of air, naval and ground targets, effects management, maneuver and synchronization, information operations, force protection, resource coordination, medical assistance, etc.) introduce the *cooperation and interoperability* elements and

extend *the recognition and surveillance to macro-supervision elements,* at least at regional level if not globally, in all conflict environments. The creation of command and control system architectures in which digitalization and artificial intelligence (AI) are given the right role will enable them to fulfil this goal. The combination of the *mission command concept and mosaic warfare*, the use of digitized C2 platforms and artificial intelligence, as well as the use of the latest technologies in the development of autonomous weapons, partially or totally robotic, will lead to generating that disaggregated force (with rapid aggregation capacity) and its control during planning, preparation and execution phases of missions (classical, surgical or of any other nature), with maximum efficiency, with low consumption of resources, with the maximum reduction in human losses and in any conditions generated by the physical environment of confrontation (in this case located at high altitudes). Moving towards the future of the conflicts in this environment involves the development of these command and control capabilities and of fighting in an efficient and sustainable manner. At the level of *operational planning* it is necessary to precisely establish the dimensions and structure of the force (according to the mission specifics), intended for fighting at high altitudes (future forces destined to fight should have a balanced set of capabilities to successfully operate against a variety of threats and instability situations). The force generation and the task assignment must be fully integrated at the command and control level in the operational planning process, at the appropriate level (tactical, operational, strategic). It is necessary that all structures that would conduct high altitude military operations as well as related systems be trained through exercises carried out in that environment and supported by operating procedures (constantly updated or allowing optimal adaptation to the rapid changes produced in the geometry of the future conflicts).

The capabilities considered critical (to cover the full range of other tasks that could be assigned[17]) and necessary to achieve this desideratum may relate to:

- Exercise of C2 in joint/combined operations at high altitudes, in all weather conditions, within a degraded electromagnetic spectrum and in periods of limited visibility.
- Off-road movement and maneuvering at high altitudes, in compartmentalized terrain, in all weather conditions[18], including the provision of combat technical assistance for mobility, countermobility and survivability of forces.
- Direct or indirect fire support, carried out with organic units specialized in all-weather high-altitude operation.
- Following the information cycle[19] and conducting ISTAR[20] ops in high altitude, compartmentalized and difficult terrain and in variable (unstable) weather (with degraded or non-existent infrastructure), exploiting all the opportunities to meet the commander's information requirements.
- Ensuring an adequate level of force protection[21], support for the search and recovery of personnel and their rescue through the integration and use of all weather, high altitude equipment and procedures.
- Conducting logistic support in all terrain and all weather conditions.
- Conducting a wide range of electromagnetic operations in all terrain and all weather conditions.
- Force generation for a wide range of specific actions/operations (interoperable forces for multiple and long-term operations under conditions generated by high altitudes and/or arctic areas).

If we are talking only about the human factor, it is necessary to consider *the resilience and the adaptability* in order to solve the issues related to the stress and threats that force faces. Resilience itself should be a requirement at both the individual level and the unit level. The ability to adapt should become a requirement for any soldier. Exercising the command and control / leadership at all levels is essential.

Flexibility (the ability to disperse and concentrate forces) in a complex high altitude mountain environment is absolutely necessary, therefore modularity (C2, weapon systems and other resources) is recommended.

The task organization of forces must be carried out in such a way that they possess firepower and self-sustainability. Military intervention and obtaining the necessary information at the desired time and place is necessary to achieve critical superiority, subsequently rapidly dispersing to avoid counter-action by the enemy. Small, agile, powerful and resilient units can overcome the movement/

maneuvering limitation. The compartmentalized terrain requires decentralizing execution to sub-tactical units. Remotely controlled, partially or fully robotic autonomous systems/weapons, smaller modular units and variable lethality munitions will increase this capability. Forces operating at high altitudes must be composed of multi-domain trained units, capable of conducting specific missions, in different stages of aggregation or disaggregation, configured or reconfigured according to the requirements and circumstances of the missions or in continuously evolving situations. The command and control system must comply with the same requirements in order to provide the force with necessary mission planning, coordination, management and evaluation. Within the mission command concept, in order to successfully operate at the operational environment required pace and complexity, forces must be able to make quick decisions and adapt to ever-changing tasks. It is necessary to achieve an increased capability to react/respond to the often changing situations in the evolution of the conflict.

Decisive actions specifically require (at high altitudes) the decentralization of execution and an increase in the skills and capabilities of small units and their commanders. The mission staff must evolve (and this can be achieved by compartmentalizing, digitizing and modularizing the command-control), allowing subordinates to exercise their initiative in unforeseen situations and in a dispersive environment, while maintaining an unchanged intention.

The agility and unpredictability of the maneuver is another factor that leads to success in fighting at high altitudes. It is necessary for the C2 and the forces to respond efficiently to dynamic and complex operational challenges, exploiting opportunities through efficient and effective decisions and actions. By developing specific climbing skills, the human factor can overcome any challenge and achieve a surprise effect. Controlling the dominant terrain creates the tactical advantage of increasing the opponent's vulnerability and enables freedom of action. Also, a robust communication infrastructure to collect, process and disseminate information and to provide support for the exercise of command-control is absolutely required.

Requiring a high level of tactical mobility, combat units operating at high altitudes cannot rely on mutual support, while logistic support is difficult. We are therefore talking about the need to achieve *self-sufficiency*. This is achieved by building-up substantial reserve forces at all levels, engaging only the minimum necessary and self-sustaining forces (for a certain period of time), while maintaining the remaining forces and assets in a supporting role.

The operations conducted at high altitudes are characterized by the independent engagement of the units or tactical elements (disaggregated force with the capability of rapid aggregation), the symbiosis[22] of command[23] - combat - support (organization of tasks), isolated actions, vertical maneuver, the need for frequent replacement of forces, the lack of infrastructures, the control of the road / transport network, of the gorges and dominant heights, difficult supply chain (logistic support carried out with great difficulty), difficult connections or even lack of communications with isolated tactical elements, the lasting effect of terrain and weather challenges, difficult medical support.

In this context and at this time (with the current organization and the present mountain troops equipment) it is suitable to implement the concept of *mission command*. In the context of implementing capabilities specific to the concept of mosaic warfare, at the C2 level we will find digitized platforms and the presence of AI in symbiotic connection with the disaggregated force (with rapid aggregation capacity, in the composition of which we include autonomous weapons, partially or totally robotic, robots, drones, etc.). This aspect will lead to its control during the mission preparation and execution (classical, surgical or of any other nature), with maximum speed and efficiency, with low consumption of resources, with the maximum reduction of human casualties and in any conditions generated by the physical confrontation environment.

The challenge is how extensive knowledge of the characteristics and special requirements of military actions carried out at high altitudes, capabilities, performance and performance standards necessary for tactical elements for carrying out actions, techniques, tactics, procedures, methods and principles imposed by the characteristics of the environment and the specifics of the mission will be integrated with such a modular and interconnected

system, with the experience gained, the flexible, proactive and prudent way of thinking as well as with the initiative and the modeling effect.

In particular, it is necessary to solve problems such as the communication challenges due to weather and terrain conditions, the execution of the maneuver, required by the dynamics of the fight, the reduction of risks caused by the increase in the physical and mental tension of the personnel and the provision of additional equipment and adequate means of transportation.

I believe that command and control systems created on the basis of digitized architectures and which have embedded AI, should task the artificial intelligence the analysis (in the decision-making process) variables such as: correct and timely assessment of the parties to the conflict, estimation of the enemy, combat strength and operational effectiveness, the C2 structures and force mobility (especially vertical mobility), the possibilities of conducting resupply, channeling in certain directions, hard-to-reach terrain, isolated engagement areas, potential landing sites for small maneuvering elements, rapid changes in the dynamics of the fight, the need to perform observation at a distance/or of the entire area of operations (observation on the back, flanks and back), the increased time required to build positions and shelters necessary for personnel protection, the effects of weather on the technique and the human factor (including the change of visibility conditions), etc. In particular, these aspects can be translated into: materials and equipment (to be transported/supplied), mobility (including means of transport), measures to preserve combat power and the use of weapons and ammunition.

The creation and task organization of force according to the concept of mosaic warfare could be a reliable solution to these requirements.

Modularity of command and control systems usable in operations at high altitudes and the need for their containerization

An efficient organization of a deployable C2 system could be on functional and integrated modules. The digitized platforms that can build up the modular architecture ensure the interconnection (close or remote) of the modules in order to enable collaborative and selective[24] planning at the same time.

The main advantage of C2 systems modularization is that these modules have capabilities to solve situations independently (each on its own specifics), collaboratively selectively[25] (on Rubik[26] or mosaic model) or in an integrated manner (all interconnected modules or the entire modular system interconnected with other C2 systems).

The modular system of systems is like a *Rubik cube*. It has the possibility of changing or adapting three-dimensionally its architecture according to the *typology* or *typology of the action/operation*. Using the same components, the Rubik cube can display a considerable number of solving solutions, constantly changing its faces. In this regard, the command and control system will quickly change its structure (faces) using the same modules (components) and generating adaptation capacity and the capabilities necessary for facing the challenge. Literature offers several variants of modular organization of command and control systems. In this respect, the functional modules could result in:

- the C2 module subsystem comprising: communications and IT, information management, decision support personnel and liaison officers;
- information activities module subsystem consisting of: PSYOPS, information and public relations, intelligence, CIMIC, electronic warfare, OPSEC, INFOSEC, special operations;
- the intelligence module subsystem at the level of which the collection, analysis, production and dissemination of intelligence products, weapons research products and electronic warfare actions are conducted;
- force protection module subsystem which includes: CBRN defence, combat engineers, cyber defence, information protection, military police, occupational safety and health;
- maneuver module subsystem composed of: current operations, synchronization of operations, future operations, combat engineer, planning, evaluation of operations;
- the fire support module subsystem at the level of which planning, coordination, integration, synchronization take place: engagement of the opponent, lethal and non-lethal engagements, target management, anti-aircraft defence and air support;
- the resource module subsystem composed of: personnel, logistics, medical support, administrative support of the command post.

Regarding the *integrated modules,* we can bring into discussion the *current operations module*, *the future operations module and the plans module*.

The main combat elements at high altitudes are support by fire and maneuvering, the use of barriers and the fight for information superiority. The assessment of the tactical commander over the ground operational picture is of particular importance in the decision-making process. The integration of the data resulting from the execution of reconnaissance in the procedures of a modular and digitized C2 (assisted by AI) as well as the rapid and selective transfer of data and information within the system of C2 systems allow decision-making and enable timely execution of actions/ operations. We believe that the possession by a party to the conflict of *informational superiority* is the key to ensuring success at least at the level of the activities carried out at C2 level. The exchange or transfer of data and information actually obtained from the field can have a key impact on a moment of combat at high altitudes if the decision is made in due time. Therefore, command and control must operate in optimal conditions. One of the conditions is, as we have previously presented, modularity. From a physical and architectural point of view, we believe that these modules should be containerized so that they can operate permanently – static or on vehicles suited to the terrain, climate and high altitudes (certain components can be robotic in order to ensure accessibility in areas with very high altitude where the human body does not resist for a long time). The operation of containerized modules (built on the principle of at least energy self-sufficiency) leads to the maximum exploitation of the results obtained through strategic and operational reconnaissance (in addition to those obtained through own reconnaissance), electronic warfare reconnaissance, air and land reconnaissance. These data and information, supplemented by the results obtained through the reconnaissance conducted in the area of operations, the technical reconnaissance, the surveillance / control of the airspace, unquestionably change the situation in favor of this type of system of modular C2 systems compared to one built on the classical model.

Fire support is conducted (alternate and fast) both in close combat and for engaging the enemy at a distance. The fire-support module of a modular C2, digitized (assisted by AI) and functional at high altitudes (containerized and self-sufficient) ensures the planning, coordination, integration, synchronization of the opponent's engagement with the specific means (lethal and/or non-lethal). Target management, air defence and air support are tasks of this module that are solvable both independently but especially in a collaboratively integrated way both at the level of the C2 to which it belongs but also at the level of other similar modules horizontally or vertically. It is essential to achieve this integrated and collaborative way of working due to the barriers imposed by the characteristics of the terrain at high altitudes and by frequent changes in weather conditions, the systems having to be interconnected both horizontally and vertically in order to be able to substitute or support each other. Depending on the dynamics of the battle, mountain artillery, partially or totally robotic autonomous weapons, armaments on combat machines, etc. can be engaged alternately or simultaneously.

As for the *maneuver*, the high altitude terrain restricts movements and channels forces to a very large extent. The speed of movement is reduced and the axis of movement can be interrupted by natural obstacles (flooded mountain rivers, landslides and avalanches). In order to be performant, the *C2 maneuver module* specific to high altitude areas, must operate on all its components. From a technical point of view, we believe that in order to obtain the maneuvering capability of the C2 in high altitude areas, both the system as a whole and its modules should be able to operate separately and integrated, but there should be a remote connection. For example, the human personnel and the digital platforms of the maneuver module with its functional and /or integrated submodules (current operations, synchronization of operations, future operations, combat engineer and planning and evaluation operations) are to be distributed on separate containers, smaller, easier to transport by specific means of transport at high and very high altitudes. Dispersed over a certain electromagnetic range they can interconnect and work enabling both force protection and high maneuverability. The maneuverability of small elements and their high self-sufficiency is suitable at high altitudes on the same consideration for which there is a need to plan and execute combat actions by small, easily maneuverable tactical structures with high

firepower. The combat type that best suits these situations is a separate maneuver-joint action. The maneuver must be thoroughly planned with timely preparations and reconnaissance. Planning is relatively difficult and requires a lot of experience. The maneuver must be executed in such a way that the mission is accomplished and sustainability is ensured at the same time.

The force protection of at high altitudes and the survivability of the personnel are determined by the quality of the existing infrastructure and equipment more than in any other confrontational environment. In order to ensure operational - tactical presence in the entire mountain operations area for a prolonged period of time, command-control systems and forces must have the survivability capability in order to maintain combat capability. Passive and active protection increase the chance of survival. The C2 *force protection module* must work and act like the other modules discussed above. The principle would be *functional and actionable sub-modularity* on: CBRN defence, combat engineer, cyber defence, information protection, military police, occupational safety and health. The management of specific situations through passive protection measures[27] and active protection measures[28] as part of direct management, is manifested during reconnaissance activities, during combat or tracking patrols, during the establishment of patrol bases or the effective use of reserves. Acclimatization is very important for the human factor (as one of the major problems) and must be part of the operational plan. It also includes the preparation of reserves and replacements. Replacement of forces at high altitudes by air transport, without prior acclimatization, do not work. The personnel would be compromised from the start in terms of physical and mental health.

As for *communications* as part of the C2 module within the command and control system, they are subject to restrictive condition imposed by high altitude areas. Most of the time it is necessary to use relay/repeater stations and other connecting elements (liaison officers, combat patrols, etc.) in addition to communication and IT elements of the C2 module. Helicopters are often used for reconnaissance missions, *mobile command posts* and for the personal contact between commanders, but they cannot always be used due to weather and vulnerability against the adversary. Therefore, we support the possibility of using communication systems, on a functional submodular model, on robotic or partially robotic systems, with extensive capabilities to execute the maneuver and to support themselves for a long time in areas located at high altitudes. The measures adopted to *ensure sustainability, supply, adequate infrastructure, protection against mountain environmental factors*, as well as the C2 measures adopted *to preserve combat power* are of decisive importance in conducting military action/operations in this type of environment. At the level of the operational planning process within the resources module (personnel, logistics, medical support, administrative support of command post), logistical situation and estimates should be produced by personnel with experience in mountain operations, but also involving digitized and AI assisted platforms (if we want to implement the concept of decision-centered planning (such as mosaic warfare). A deployment of elements/ forces fighting autonomously in remote areas, combined with the risk of disrupted supply chains, requires logistical sustainability based on self-sufficiency and self-sustainability (supply cannot be guaranteed). Therefore, planning must be carried out on self-sufficiency, durability, and independent maneuvering elements must be strengthened by logistical supply forces, with mountain skills and capabilities and/or handling forces (on the ground or in the air) partially or totally robotically disaggregated (with aggregation capability and rapid action). At this moment, helicopters are the most efficient mean of transportation at high altitudes, but it is a *monolithic*[29] type (discovery-determination, decision and action) that once compromised will compromise the task/mission assigned to it. However, the use of helicopters can be restricted by bad weather, high altitude and enemy's activities. For as long as possible, the advantages of supply vehicles and all other appropriate means of transportation (such as tractors, vans, platform trucks, snow vehicles, quads, snowmobiles, cable transport, transport animals, robots, drones, etc.) should be exploited. The C2 resources module manages the reconnaissance, security of special equipment and the personnel and equipment evacuation, while risking falling on steep slopes.

Maintenance and repairs are not advisable to be carried out at high altitudes unless robots are conducting them. The objective is to ensure the

necessary degree of availability of the material and the operational availability of devices, weapons and equipment. From the point of view of the replacement (if necessary) of the human resource, the replacement personnel must have had the same high altitude training and have the same equipment as the forces already deployed. The conditions generated by an environment make it substantially more difficult to provide medical support.

The need for a new approach to combat at high altitudes is imperative. Today, the most significant operational challenges that forces face in such an environment, include those related to sensors and networks, and those related to autonomous high precision weapons, partially or fully robotic. For example, China is using these capabilities as part of a comprehensive system of systems, designed to attack perceived vulnerabilities in adversary's forces. Russia complements its long-range precision weapons and sensors, the proxy and paramilitary forces it uses to implement "gray zone"[30] tactics to gain territory and influence by challenging disputed territories or destabilizing neighboring countries[31].

Instead of destroying an opponent's forces until he can no longer fight or succeed, a decision-centric approach to war would impose multiple dilemmas on an enemy to prevent him from achieving his goals. War based on classical maneuvers is designed to thwart the enemy's operations by disrupting its centers of gravity, such as support or command and control (C2)[32]. This can be viewed as attacking the cohesion of an adversary's combat network[33]. The transition to the approach to combat/conflict in areas at high altitudes, through concepts centered on quick decisions, is inevitable. In contrast, network-centric warfare is based on the commanders of theatres of operations (on their awareness of the situation(s) over large areas and on the ability to communicate with all the forces under their command). However, centralized decision-making will be neither possible nor desirable during future conflicts in extreme environments such as those at high altitudes. Improving adversary's capabilities in terms of electronic warfare (EW), other counter-C2 and intelligence, surveillance and reconnaissance capabilities (C4ISR) will reduce the ability of commanders to understand newly created situations or communicate in the area of operations especially in in high altitude locations (due to natural environmental factors). These actions will restrict the commanders' ability to exercise control over elements of own forces. While network-centric warfare requires a high degree of clarity and control, decision-centric warfare (generated by opportunities) induces uncertainty in enemy's forces and improves the adaptability and survivability of own forces by harnessing the distribution of force, dynamic composition and recomposition, reductions in electronic emissions, and actions against C4ISR. These aspects lead to a substantial increase in the complexity and uncertainty that an opponent would have in its own decision-making process. Autonomous weapon systems (unmanned vehicles) and the management of communication network systems could help forces to conduct dispersed actions with devastating effects on the adversary. The use of AI-managed autonomous systems at C2 level, allows for the aggregation of force according to the specifics of the mission, on the principle of economy of forces (disaggregation of the capabilities of traditional platforms and units with more missions in larger numbers and less multi-functional and costlier). In this context, our opinion is that decision-making support needs to be achieved with the help of AI. Decision-centric warfare addresses the limitations of command through mission with a new C2 structure, that combines human command with the control of artificial intelligence. The decision based on the involvement of AI and its support tools would allow commanders to control dispersed forces, adapt to environmental conditions at high altitudes or to the adversary, and to make enemy's decision-making process more complex.

The *Mosaic Warfare concept* provides a decision-driven approach[34] to conflict, that can be successfully extended to the high altitude environment. The central idea of Mosaic warfare is to create adaptability for own forces and complexity or uncertainty for the enemy by quickly composing and recomposing a disaggregated military force using *human command and machine control.* The implementation of the *Mosaic warfare* concept or other decision-centered warfare concepts will require substantial changes in the design of C2 forces, structures, architectures, and processes. If the design of the force is carried out *without modifying the associated C2 process*, commanders and personnel of the general staff will have difficulty managing a greater number of elements

of a disaggregated force compared to a traditional force. Without automated and AI-assisted control systems, commanders would be much less able to properly manage the new force structures resulting from decision-centering (to create complexity for the adversary) or recomposing the force in response to the enemy's actions and countermeasures. The example below illustrates a model of AI assisted, human command decision-making process (participates in the development of courses of action and the mission task organization) and control exercised through artificial intelligence over the execution of the mission by the mission specific aggregated force.

The idea presented in the previous example was validated by three war games conducted by the CSBA (Center for Strategic and Budgetary Assessments) that compared, in plausible, high-powered scenarios and based on a potential future regional conflict[36], the performance achieved by the C2 systems and conventional forces of the U.S. and those of the mosaic forces (with the related C2 processes). The war games were built to test five assumptions about the feasibility and operational benefits of the Mosaic War concept[37]: commanders and planners can gain confidence in a machine-activated control system; Mosaic Warfare will increase the complexity of the force and degrade the opponent's decision making processes; Mosaic Warfare will allow commanders to engage several actions at once, creating additional complexity for opponents and overwhelming their decision-making process; mosaic force design and the C2 process will increase the reaction speed of forces and decision-making process; Mosaic warfare will allow more commanders to apply more diverse combat methods and tactics, strategies compared to those executed with a traditional force.

Another opportunity offered by the concept of Mosaic warfare is the execution of actions or operations through maneuvers. Forces could create uncertainty for the opponent and discourage aggression by using decision-centered approaches, such as successive and/or simultaneous maneuvers executed with mosaic-like forces. Two fundamental applications of maneuver warfare are deploying or preventing the enemy from achieving the desired goal at the desired time and disrupting or attacking the enemy's center of gravity. This can be viewed as attacking the cohesion of an opponent's combat network.

In conclusion, all these challenges especially arising from bringing military action to the high

EXEMPLE OF A CONTEXT-CENTRIC C3 APPROACH[35]

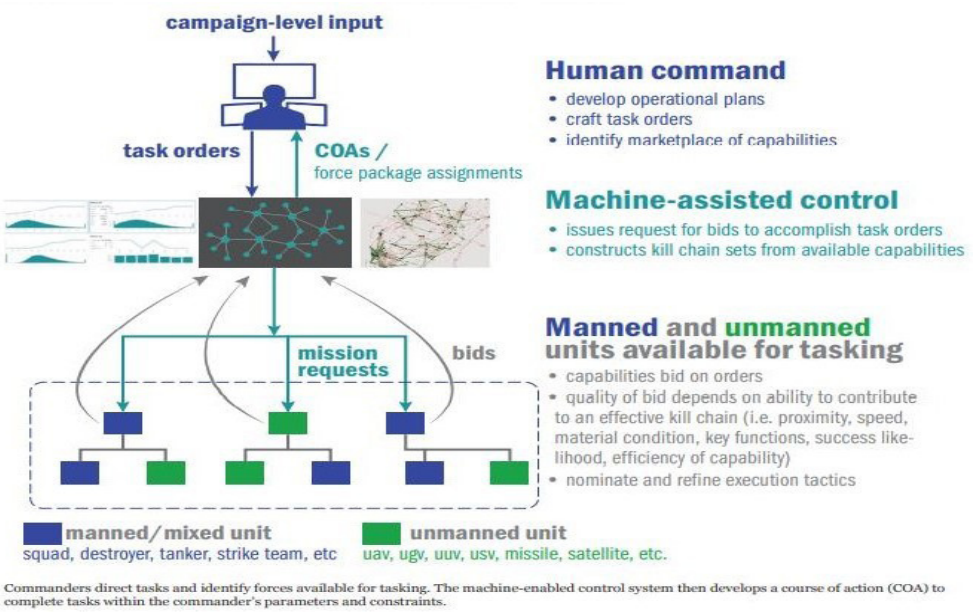


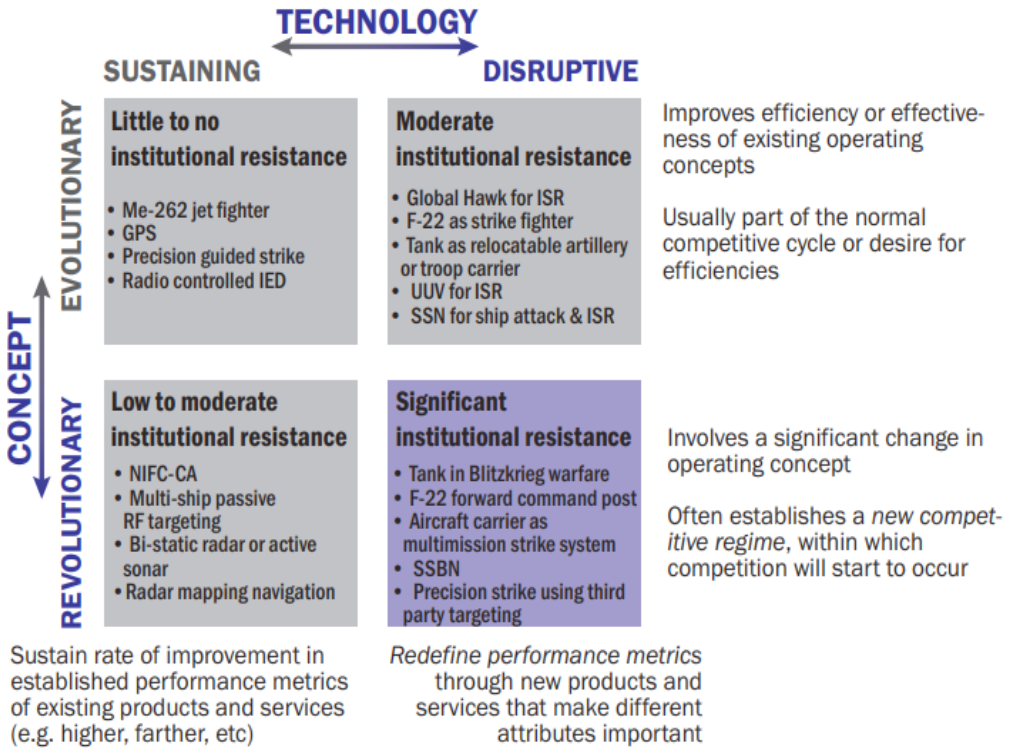
Figure 1 *Example of a context-centric C3 approach which uses human command and artificial intelligence control over disaggregated force with mission specific aggregation capability*

altitude environment can be managed by modular, digitized and artificial intelligence assisted command and control systems, given that the fight will be approached by corroborating the latest concepts specific to state-of-the-art conflicts with the latest technological discoveries.

Combining concepts with technology

Supportive technologies provide progressive improvements to current systems and use similar mechanisms to achieve combat effects. Disruptive technologies use new mechanisms to provide military value using different vectors than previous technologies. For example, on a current radar, the *jammer*[38] can be rated (like its predecessors) by how well it hides or misleads the target. On the other hand, the performance of a *stealth platform*[39] is evaluated according to how well it avoids being detected or targeted by radar. New supportive or disruptive technologies can be combined with evolutionary operational concepts that introduce changes in the use or capabilities of the equipment (such as the use of radar to locate navigational means) or revolutionary, operational concepts that pursue military objectives in entirely new ways (such as using satellite for navigation). One way to visualize the relationship between technologies and operational concepts is shown in Figure 2[40]. A parallel is made between the supporting and disruptive technologies based on revolutionary and evolutionary concepts, some of the resulting effects also being portrayed.

Recent efforts to develop AI and autonomous systems have focused on improving modes of operation rather than developing new combat concepts. For example, Project Maven, an early DoD-enabled program (US's Department of Defence) uses AI to improve speed and accuracy in the interpretation of images compared to human analysts. Many of these images are gathered by autonomous satellite or UAV sensors, that perform the same functions as those with human crews, but can do so more or on wider areas. This approach does not fundamentally change the way DoD gathers or uses information. Maven and autonomous sensors combine precision weapons and sensors in



Military innovations combine a sustaining or disruptive technology with an evolutionary or revolutionary operational concept. The combination of a revolutionary concept with a disruptive technology has the potential for initiating new competitive regime but is also the most challenging innovation to implement. This figure is based on the discussion in Richard H. Van Atta et al., *Transition and Transformation: DARPA's Role in Fostering an Emerging Revolution in Military Affairs*, vol. 1, *Overall Assessment*, Paper P-3698 (Alexandria, VA: Institute for Defense Analyses, November 2003), available at https://fas.org/irp/agency/dod/idarma.pdf.

Figure 2 *Military innovations from the combination of types of technologies with new combat concepts*

the network and manage information differently, to gain a substantial advantage in decision making[41]. The superiority of the decision adopted through the command-control architectures specific to the concept of mosaic warfare starts from the central idea of the concept, namely to create adaptability and flexibility to own forces and complexity or uncertainty for an enemy, by quickly composing and recomposing, if necessary, the disaggregated forces that use *human command and artificial intelligence control*.

The significant changes required for the design of C2 forces, architectures and processes will be difficult to implement quickly in a high altitudes environment conflict. Consequently, in order to assess efficiency and effectiveness, an experimental force can be initially set up to act in such an environment, to carry out operations specific to decision-centric operational concepts and to command by mission. This method was used during previous changes in the US military (the development of Air Land Battle by the US military and the implementation of stealth and precision strike capabilities by the US Air Force)[42]. At this time, most of the existing forces worldwide are made up of multi-mission units, with crew such as planes, ships and formations of troops that are autonomous, or monolithic, incorporating their own sensors, C2 capabilities and weapons or electronic combat systems.

In the U.S. military, power elements that are not autonomous multi-mission units must be part of a pre-designed System of Systems (SoS) in accordance with DoD requirements and procurement policies[43]. The relatively inflexible configuration of monolithic multi-mission units compared to SoS, limits the variety of courses of action for that force, reduces force adaptability, actions/operations performed are predictable, and decreases the likelihood of misleading the enemy (as part of operational concepts focused on gaining a decision-making advantage). By breaking down some of today's multi-mission monolithic units into a greater number of smaller elements with fewer tasks, one could better track decision and informational superiority and achieve the expected effect in confusing the opponent. For example, at high altitudes, a group of fighters could be replaced by a fighter acting as a C4ISR platform along with combat drones, UAVs equipped with sensors and electronic warfare (EW) equipment. A force operating in the mountains could be made up of small formations that operate using combat drones, UGVs and/or UAVs to improve their self-defence, ISR and logistics capabilities.

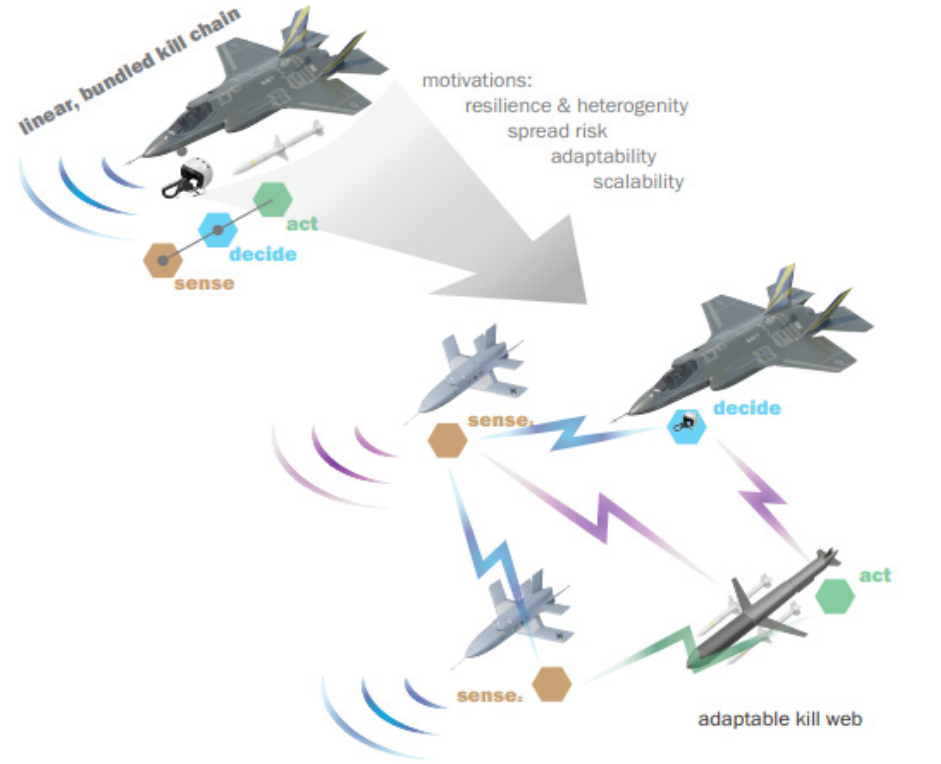
Figure 3 shows the difference between a monolithic unit and an aggregated force based on the mission specifics (*composable force* – is the term used in the specialized literature of the U.S. Army) in terms of the act of discovery-determination target, decision and action (sense, decide, act). Disaggregating units with multiple missions could increase the flexibility and adaptability of the force and create a complex situation for the opponent. The traditional "monolithic" fighter (left) is replaced by a bundle of forces aggregated on the mission specifics (right) in which the attacker acts as a C2 core (commanded by the human factor and controlled by AI) for one or more groups of UAVs. This aspect is illustrated in the Figure 3.

Conclusions

Units designed to fight at high altitudes are designated to perform specific actions/operations in an extremely hostile environment. The human factor engaged in combat must have special equipment and must be trained in the terrain and weather conditions specific to this environment. C2 at high altitudes must be able to exercise command and control in operations, in degraded electronic spectrum and in harsh weather conditions (fog, frost, blizzard, etc.). This capability requires a complex operational planning process and the assignment of specific tasks for the execution of actions/operations under any weather conditions. A common operating picture is a key component of C2, whether the forces are of monolithic type or especially for the composable forces.

We propose two scenarios of force build up and exercise of control command:

- reinforced units, especially established on the mission specifics (small, supple, mobile, with high self-sustainability, with high firepower and high maneuverability) having a modular C2 but supported by classical architectures and platforms (based on the concept of mission command);
- disaggregated forces with rapid aggregation capability (depending on the specificity of the mission) in the composition of which to also add partially or totally robotic autonomous weapons,



Disaggregating multi-mission units could increase the flexibility and adaptability of the force and create a more complex situation for the adversary to assess. In this graphic, traditional 'monolithic' strike-fighter (left) is replaced with a more composable force package (right) in which the strike-fighter acts as a C2 node for one or more groups of UAVs.

Figure 3 *Monolithic units versus aggregate force packs on the mission specifics*[44]

over which to exercise human command and artificial intelligence control, at the level of a modular system of command and control systems, supported by digitized platforms and operational within the mosaic war concept (based on decision) specific to conflicts with variable geometry.

Harnessing disruptive technologies, artificial intelligence and autonomous systems is the new competition arena for modern armies. New operational concepts will be essential in order to fully exploit the potential of these technologies. AI and autonomous systems must not be limited at improving current operational approaches. Decision-centric operational concepts, such as the *mosaic war concept*, could harness the benefits of AI and autonomous systems while reducing the impact of their potential disadvantages. For example, by disaggregating monolithic (manned) platforms and troop formations into smaller, less multifunctional units, the design of the decision-centered force would reduce the pressure put on an individual autonomous system necessary to replace an entire multi-mission platform. Combining human command with a degree of control given to artificial intelligence, C2 will process decision-making algorithms, harness human creativity in the execution of tasks, allocate the necessary forces and easily conduct military actions as part of an operation. Moreover, using predictive scenarios in the planning process (to which AI will have a substantial contribution in both analysis and prediction) will avoid surprise and will create solutions to solve possible, probable and imminent situations.

The implementation of decision-centred operational concepts is likely to be evolving. In terms of conducting military actions to high altitudes, a *decision-centered force design* and a C2 system (*modular and digitized*) with a related process (*procedural, algorithmic but also intuitive based on experience and knowledge*) could be adopted in the first phase to implement the concept of mission command. Decision-centered concepts may not fully correspond to the requirements of new types of conflict, but they can be developed, combined or replaced by other new concepts, depending on the continuous evolution of technology and the evolution of conflicts.

Command and control systems must be based on modular architectures and digitized platforms (supported by artificial intelligence in both the operational planning process and the execution) that allow them to permanently adapt to the requirements of a conflict with variable geometry. We believe that the *modular and submodular* organization of a command and control system designed to conduct military actions/operations at high altitudes and beyond, built according to *Rubik or mosaic architectures* (allowing them to combine and recombine quickly according to the mission specifics or to the actual or predicted situation) and supported by *intelligent digital platforms* (in which AI is implemented with a clearly defined role in the decision-making process and control of the force) is the scenario that offers an optimal solution in the asymmetry and unpredictability of situations generated by modern conflicts, multifaceted and with an extremely variable geometry of actions.

NOTES:

1 The 3rd Italian Alpine Troops regiment executed a surprise attack at night. Using the most difficult routes they managed to conquer this strategically important peak.

2 The famous raid in which the Württemberg Mountain Battalion managed to infiltrate the Italian trenches.

3 In 1915, The High Italian Commandment did not adequately exploit the gained advantage and moved on to conquer the next positions, in accordance wit the time doctrine. Two years later, the in prompt exploitation of the difference between austro-hungarian and the german troops conducted to the fall of the entire eastern italian front.

4 The Apennine mountain range, impeccably defended by general Kesselring's forces, proved to be an insurmountable obstacle to many Allied divisions.

5 German paratroopers gained important experience in the Apennines, which allowed them to last so long. The Mountain Troops, arrived from the Russian front, were not so efficient, because, being dislocated in the steppe for a long time, they were not used to fight in impractical and compartmentalized environments.

6 In a famous interview, General Massod, the hero of Panshir, when asked how he managed to resist for so long with a few poorly armed fighters in front of the world's largest and most powerful armed forces, replied that their power lies in the nature of that place, narrow valleys and harsh mountains, "How Afghanistan defeated the Soviet Union", *Deutsche Welle*, 2021.

7 Blandy, *North Caucasus: The Advent of Mountain Brigades*, Defence Academy of the United Kingdom, 2007, pp. 1-5.

8 http://unep.ch/publications/UNEP_Afghanistan_NRM_ guidance, 2021, accessed on 09.11.2021.

9 The Ladakh area, along the line of real control (LAC), where we see the confrontation between these emerging superpowers.

10 *** Russian Exoskeleton Project, *Russia's latest combat exoskeleton to boost fire accuracy by 20%,* TASS Russian news agency, 2021.

11 *** *Brussels Summit Declaration*, 2018.

12 Reconnaissance Patrol – Provides the commander with accurate and timely information about the enemy and the terrain in order to produce a plan (they can be of two types for researching the routes of the areas); Combat patrol – it is necessary that any subunit of a suitably strengthened platoon level execute missions such as ambush and raid (absolutely necessary in mountainous terrain and materialize in tasks such as: destroying / capturing the opponent or military equipment / installations; harassing the opponent; ensuring the protection / security of the upper echelons); Tracking Patrol - the platoon or section can be assigned to track/find the opponent who has broken the contact in order to re-establish contact with him.

13 Patrol base - position organized at section / platoon level during halts or for a longer period (no more than 24h and never twice the same position) for the control of important objectives and the preparation of future decisive actions (offers the advantage of covering large areas with small subunits and maintaining control of them).

14 Bryan Clark, Dan Patt, Harrison Schramm, *Mosaic warfare exploiting artifcial intelligence and autonomus system to implement decizion – center operations*, Center for Strategic and Budgetary Assessments, 2020, pp. 8-13, 56-58.

15 Cezar Popa, *Strategii, concepte și procedee de efcientizare a procesului decizional*, Raport de cercetare științifcă nr. 2, "Carol I" National Defence University, Bucharest, 2021, p. 22.

16 Niculai-Tudorel Lehaci, *Tendințe în evoluția sistemului de comandă și control la nivel operativ*, "Carol I" National Defence University Publishing House, Bucharest, 2015, p. 65.

17 Rapid response, Arctic/subarctic or urban control operations.

18 Including arctic conditions.

19 Intelligence cycle consists of directing, collecting, processing and dissemination phases (NATO Allied Joint Doctrine for Intelligence Procedures AJP-2.1).

20 ISTAR – Intelligence, Surveillance, Target Acquisition and Reconnaissance (NATO Allied Joint Doctrine for Intelligence, Counter-Intelligence and Security AJP-2(A)).

21 This includes implementing air defence, OPSEC, INFOSEC, COMSEC, Cyber Defence, CBRN, CIED and health protection policies and standards.

22 Symbiosis is also achieved at action level (command-combat-support) and at man-artificial intelligence-machine level (C2 systems – autonomous weapons, partial or totally robotic - robots- drones- satellites, etc.).

23 In the sense of the term command, in this context, I wish to include the command and control modular systems built on complex digitalized architectures, in which is implemented artificial intelligence and which are close connected (symbiotic) with the command element of the force of execution.

24 Only the modules that are needed at a given time depending on the time available, the specifics of the mission and/or the concrete situation on the ground are involved in the operational planning process.

25 It connects those modules that are needed at some point to solve a situation.

26 Cezar Popa, *Structuri, sisteme, echipamente și tehnologii moderne în compunerea sistemelor de comandă și control*, Report for scientific research no.1, "Carol I" National Defence University, Bucharest, 2020, p. 34.

27 Preventive preparation/prevention and adaptation measures.

28 Tactically proactive measures aimed at discouraging an opponent from effectively attacking or counteracting the effect of an attack.

29 *Monolític*, adj. Regarding the monolith; of monolithic. Well-rounded, unitary, *Explanatory Dictionary of the Romanian Language*, https://dexonline.ro/definitie/monolitic, accessed on 11.11.2021.

30 The area between peace and war or erratic war. The tactics used are the information flows and the channels of influence along with the cyber, economic and psychological ones with the involvement of the public opinion, morals and legal processes, https://adevarul.ro/international/asia/china-poarta-razboi-neregulat-sua-principiile-inarmarii-zona-gri-1_609a101a5163ec4271e9ae60/index.html, accessed on 09.11.2021.

31 James Mattis, *Summary of the 2018 National Defence Strategy of the United States of America*, Washington DC, DoD, 2018, p. 7, https://dod.defence.gov/Portals/1/Documents/pubs/2018-National-Defence-Strategy-Summary.pdf., accessed on 27.10.2021.

32 Robert Leonhard, *The Art of Maneuver*, *Maneuver Warfare Theory and AirLand Battle*, Ballantine Books, New York, 1991, pp. 66-74.

33 Tiago Cavalcanti, Chryssi Giannitsarou, Charles R. Johnson, "Network Cohesion", *Economic Theory 64*, no. 1, 2017.

34 DARPA, *Strategic Technology Office Outlines Vision for Mosaic Warfare*, August 4, 2017, https://www.darpa.mil/news-events/2017-08-04, accessed on 25.10.2021

35 Bryan Clark, Dan Patt, Harrison Schramm, *Mosaic Warfare expoiting artifcial intelligence and autonomous systems to implement decision – centric operations*, Center for Strategic and Budgetary Assessments, 2020, p. 16.

36 In order to increase the number of participants about to gain experience in the design of the Mosaic and C2 force, the Mosaic force was divided into three teams. The Traditional team received the whole traditional force.

37 Bryan Clark, Dan Patt, Harrison Schramm, *Mosaic Warfare exploiting artificial intelligence and autonomous systems to implement decision - centric operations*, Center for Strategic and Budgetary Assessments, 2020, p. 17.

38 Jamming equipment.

39 Increasingly complex smart platforms with low dependence on monolithic platforms.

40 Bryan Clark, Dan Patt, Harrison Schramm, *op.cit*., p. 37.

41 Cheryl Pellerin, *Project Maven Industry Day Pursues Artifcial Intelligence for DoD Challenges, DoD Newsroom*, 2017, https://www.defense.gov/Newsroom/News/Article/Article/1356172/project-maven-industry-day-pursues-artifcial-intelligence-for-dod-challenges/, accessed on 01.11.2021.

42 Charles W. Sasser, "The F-117 Nighthawk's Near-Perfect Combat Record", Military Times, 2018; David Johnson, "An Army Caught in the Middle Between Luddites, Luminaries, and the Occasional Looney", *War on the Rocks*, 2018.

43 [US Joint Staff], *Charter of The Joint Requirements Oversight Council (JROC) and Implementation of The Joint Capabilities Integration and Development System (JCIDS)*, CJCSI 5123.01H, 2018, pp. D-1–D-3; DoD, *The Defence Acquisition System*, DoDD 5000.01, 2018, http://acqnotes.com/wp-content/uploads/2018/11/CJCSI-5123.01H-Charter-of-the-Joint-Requirements-Oversight-CouncilJROC-and-Implementation-of-the-JCIDS-31-Aug-2018.pdf, accessed on 04.11.2021.

44 Bryan Clark, Dan Patt, Harrison Schramm, *op.cit*., p. 47.

REFERENCES

*** *Brussels Summit Declaration*, 2018.

*** *NATO Allied Joint Doctrine for Intelligence Procedures AJP-2.1.*

*** *NATO Allied Joint Doctrine for Intelligence, Counter-Intelligence and Security AJP-2(A).*

*** Russian Exoskeleton Project, *Russia's latest combat exoskeleton to boost fire accuracy by 20%*, TASS Russian news agency, 2021.

[DARPA], *Strategic Technology Office Outlines Vision for Mosaic Warfare*, August 4, 2017, https://www.darpa.mil/news-events/2017-08-04

[US Joint Staff], *Charter of The Joint Requirements Oversight Council (JROC) and Implementation of The Joint Capabilities Integration and Development System (JCIDS)*, CJCSI 5123.01H, 2018; DoD, The Defence Acquisition System, DoDD 5000.01, 2018, http://acqnotes.com/wp-content/uploads/2018/11/CJCSI-5123.01H-Charter-of-the-Joint-Requirements-Oversight-Council JROC-and-Implementation-of-the-JCIDS-31-Aug-2018.pdf

Blandy, North Caucasus, *The Advent of Mountain Brigades*, Defence Academy of the United Kingdom, 2007.

Cavalcanti Tiago, Giannitsarou Chryssi, Johnson R. Charles, "Network Cohesion", *Economic Theory 64*, no. 1, 2017.

Clark Bryan, Patt Dan, Schramm Harrison, *Mosaic Warfare expoiting artificial intelligence and autonomous systems to implement decision – centric operations*, Center for Strategic and Budgetary Assessments, 2020.

Johnson David, "An Army Caught in the Middle Between Luddites, Luminaries, and the Occasional Looney", *War on the Rocks*, 2018.

Lehaci Niculai-Tudorel, *Tendințe în evoluția sistemului de comandă și control la nivel operativ*,

"Carol I" National Defence University Publishing House, Bucharest, 2015.

Leonhard Robert, *The Art of Maneuver: Maneuver Warfare Theory and AirLand Battle*, Ballantine Books, New York, 1991.

Mattis James, *Summary of the 2018 National Defence Strategy of the United States of America*, Washington DC, DoD, 2018, https://dod.defence.gov/Portals/1/Documents/pubs/2018-National-Defence-Strategy-Summary.pdf

Pellerin Cheryl, *Project Maven Industry Day Pursues Artificial Intelligence for DoD Challenges*, DoD Newsroom, 2017, https://www.defence.gov/Newsroom/News/Article/Article/1356172/project-maven-industry-day-pursues-artificial-intelligence-for-dod-challenges/

Popa Cezar, *Strategii, concepte și procedee de eficientizare a procesului decizional*, Scientific report no. 2, "Carol I" National Defence University, Bucharest, 2021.

Popa Cezar, *Structuri, sisteme, echipamente și tehnologii moderne în compunerea sistemelor de comandă și control*, Scientific report no. 1, "Carol I" National Defence University, Bucharest 2020.

Sasser W. Charles, "The F-117 Nighthawk's Near-Perfect Combat Record", *Military Times*, 2018.

https://unep.ch/publications/UNEP_Afghanistan_NRM_guidance

https://www.defence.gov/Newsroom/News/Article/Article/1356172/project-maven-industry-day-pursues-artificial-intelligence-for-dod-challenges/

http://acqnotes.com/wp-content/uploads/2018/11/CJCSI-5123.01H-Charter-of-the-Joint-Requirements-Oversight-Council JROC-and-Implementation-of-the-JCIDS-31-Aug-2018

https://dod.defence.gov/Portals/1/Documents/pubs/2018-National-Defence-Strategy-Summary

https://www.darpa.mil/news-events/2017-08-04

https://adevarul.ro/international/asia/china-poarta-razboi-neregulat-sua-principiile-inarmarii-zona-gri-1_609a101a5163ec4271e9ae60/index.html

https://dexonline.ro/

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-50

THE SOCIAL CONSTRUCTION OF REALITY

Lt.Col. Constantin MIREANU*

Defining reality and the mechanisms by which people perceive it is a difficult and challenging task in this age of post-truth, where everything is relative, interpretable, and dynamic, without generally accepted norms. However, there is a close relationship between the human and the social environment. This binomial is a construction that integrates the human mind, body, spirit and environment. The continuous interaction between the human and the social environment creates the reality that manifests itself as a continuous process of coding and decoding. But, the way we interpret a situation determines the consequences of our actions and even the way things can evolve, so starting from the wrong premises, from a wrong interpretation of a situation, people behave accordingly. Therefore, in this material starting from the way the representation of the individual is formed about the environment, society, world from the perspective of neuroscience, social psychology, cognitive sociology, the main aspects of how to construct reality will be reviewed.

Keywords: reality; social construct; perception; emotion; semiotics.

Reality is a social construct, a continuous process of coding and decoding, and its perception involves understanding the data, situations, experiences with which we get in touch, analyzing the differences between them or the common points and after processing these data and situations in our own coding system the result should be whole.

According to John Fiske, codes built on perceived reality contain not only functions for organizing and understanding data, but also social and communication functions[1]. For example, the codes for nonverbal communication are gestures, eye movement, facial expression, appearance, orientation towards the interlocutor, posture, proximity, etc.

John Searle shows that the process through which an individual comes to believe different things about the world can be described as a social construction of reality. The author distinguishes between things that simply exist in the most concrete way without having received symbolic importance, such as mountains, rivers, clouds, etc. and things made by people, invested with certain social symbols, which owe their existence to the values attributed by people, such as money, social position, rare metals, jewelry, etc. Thus, we assign codes, symbols, interpretations, meanings to information coming from different sources based on the context in which we received them, on previous experiences, intellectual level, environment, age, etc. In fact, "the biological capacity to symbolize – or to signify, to express – something beyond itself is the fundamental capacity found not only at the foundation of language, but of any form of reality"[2].

Language has a defining role, the repository of accumulation of meanings and experiences shared and transmitted over time. It diminishes the subjectivity of individuals in perceiving reality and building, even for a short time, a common reality because "the continuous production of voice signs in conversation can be well synchronized with the current subjective intentions of those who discuss. I talk while I think, and so does my conversation partner"[3]. Each of the interlocutors hears what the other is saying and, at the same time, has his own thoughts, ideas, beliefs related to the subject, even if he does not fully express them. Thus, language contributes to a better rationalization and knowledge of one's own ideas, of one's own subjective meanings, which, once expressed, become more real. So it can be said that language makes my subjectivity "more real" not only for my discussion partner, but also for myself.

The role of language is to exteriorise personal experiences thus passing them into the ordinary, into anonymity. A personal, actual, unique experience of family quarrel is linguistically typified with the formula "trouble with mother-in-

* ***The Press Trust of the Ministry of National Defence***
e-mail: *dan_mireanu@yahoo.com*

law". Thus it becomes an anonymous conflict, an experience familiar to any character in the "son-in-law" category. As a matter of fact, personal, human experiences are continuously grouped into general categories of meanings that can be perceived both objectively and subjectively. In fact, due to its ability to transcend the "here and now", language connects different areas of everyday reality and integrates them in a whole meaning. These transcendences have spatial, temporal and social dimensions[4]. Language can transcend the reality of everyday life, integrating symbols and experiences in the lives of individuals, that were not actually lived, which they did not witness, but in which they took part indirectly. Likewise, language is the basis of a solid foundation of symbolic representations, from another world but integrated into everyday reality, such as religion, science, art and "thus symbolism and symbolic language become essential constituents of reality of life and of the daily current perception of this reality. The individual lives daily in a world of signs and symbols"[5].

In order to better understand the neurocognitive mechanisms regarding the subjective perception of reality, we turned to the studies of the neurologist Antonio Damasio, who dealt in his research with the way cerebral functioning interacts with the physiological one, in a continuous relationship with the social environment. Inside the brain, as well as between the brain and the body, there are a number of neural networks that transmit information continuously. We are aware of a part of the information that circulates, whether we receive it or transmit it, while of another part we are not. However, the brain constantly updates the physiological parameters in all regions of the body as well as the body's relationship with the environment, in order to constantly have the latest information on the functioning of each subassembly in the body. Damasio suggests that as an emotion unfolds, the brain immediately builds a pattern, a map. The author notes that there are no major differences between what maps the brain and the actual state of the body, although the boundary between them is sometimes blurred. Thus, a mapped wound in the brainstem which is perceived as pain leads to several reactions coordinated by the brain in the body. Emotional reactions that occur will immediately change both the physical state of the body, the functioning of certain systems, and the mood of the individual. Thus, says Damasio, it is impossible to be happy when we are hurt, because "in general, these processes lead to the assembly of distinct maps in terms of quality, contributing to the substratum of experiences of pain and pleasure"[6]. Sometimes, the construction of a body map can occur before emotional changes take place in the body, which shows the brain's ability to simulate, in some somato-sensitive areas, certain states of the body, as if they actually appeared.

Based on studies and collaboration with Damasio, Manuel Castells analyzes our interpersonal relationships, the formation of our impressions, attitudes and reactions to certain stimuli, including media messages or advertising. The brain processes information from the body's sensors, but also from the environment, in order to constantly monitor the body, to balance it and to produce a good condition. Thus a multitude of networks appear where images, ideas and feelings associate and become connected in time, making up neural patterns of thinking that structure emotions, feelings and consciousness. "Thus, the mind works by creating a network between brain patterns and sensory perception patterns that derive from contact with networks of matter, energy and activities that make up past, present, and future experience (by anticipating the consequences of certain signals based on images stored in the brain)"[7]. Therefore, reality could be defined, in this context, as a reaction to current events, internal or external, which the brain reflects according to its own patterns: "So, reality is neither objective nor subjective, but a material construction of imagery that combines what happens in the physical world with the material representation of experience in the brain circuits" [8].

Neural connections create new experiences. Spatial and temporal connections are established between perceived objects, events, experiences. Equally important are the experiences we have only witnessed. Mirror neurons are responsible for indirect experiences as well as for feelings of empathy. In an attempt to show how mirror neurons work and what role they play, Damasio recalls an episode in the lab. One afternoon, as he got up from his chair and started walking, the image of his former lab colleague, Dr. B, popped up in his mind, without having thought or seen him recently. He tried to explain the origin of this completely random

thought. The conclusion was that his movement in trying to get up faithfully imitated the gestures that B made in a similar situation. Even the gait had been imitated at that moment. Technically, it had generated a somatosensory image[9]. This discovery would reveal the close links between the actual movement of the body, the representation of that movement and the memories that can be evoked in connection with one aspect or another of those representations. The episode is relevant to the fact that connections between people are not only reduced to language, visual images and logical deduction, but also to our body.

Damasio also defines emotion and feeling, with an emphasis on the distinction between the two terms. "Emotions are actions accompanied by ideas and ways of thinking, while feelings are perceptions of what our bodies do while we are overwhelmed by emotions, but also perceptions of our mental state in the same time frame"[10]. Therefore, emotions make their presence felt when the images processed in the brain put into action a number of regions that trigger them. When these regions are activated, there are certain consequences, secretions of certain chemicals by the endocrine glands that are distributed to the brain and body. Thus, the body receives certain commands spontaneously, such as freezing or running, and certain facial expressions are displayed. People, in these moments, instantly come up with different ideas and action plans, depending on previous experiences or training for a certain situation. A negative emotion experienced in a moment of panic will lead to the recollection of ideas about negative facts, while a positive emotion leads to the recollection of pleasant situations. As an emotion develops, certain types of mental processing automatically appear. Sadness, for example, slows down thinking and can cause the person to sink even deeper into the state that caused it. Joy accelerates thinking and reduces attention to unrelated events. All these actions that take place in a short time constitute an "emotional state". It gradually disappears until new stimuli appear that initiate another chain reaction.

As for the connection between emotions and memory, in order to be easily recalled, an event must be emotionally striking. "If a scene has a certain value, if there was enough emotion at that moment, the brain will capture images, sounds, touches, tastes, smells, etc. multimedia and will play them at the right time. Over time, the memory may fade. Over time and with the imagination of a narrator, things can be embroidered on the edge of the material, it can be fragmented and recombined in a novel or a script"[11]. It is one of the reasons why the presentation of atrocities in the media, the show, death arouse the public's attention and remain imprinted in the memory.

Regarding the media and the emotions intentionally transmitted by journalists, Castells points out that the public shows different degrees of attention depending on the type of report presented in the media. Thus, the most striking reports are those that present situations that seem to threaten consumer safety or those that violate social norms. Reactions to events that endanger survival mobilize cognitive resources that induce the individual's attention. Violence, hatred, anxiety, fear are retained in long-term memory. Thus, when emotional mechanisms are triggered in the brain's surveillance systems, the individual pays more attention to information and is more interested in researching it in depth. In most cases, the stimulus is sufficient to activate and generate reactions even in the absence of a certain socio-political context. It is important that the stimulus awaken the feeling of danger for the individual and for his relatives. Reports that predict the apocalypse, economic, political, social forecasts made by televisions, often without reflecting the reality, articles from the "hot areas" of the Globe are easily captured and remembered by the general public[12].

Emotions in relation to memory are processed in the brain, which means that feelings include associations with other events, some experienced directly, others genetically or culturally transmitted. "Emotions are deeply rooted in the human brain, because they were induced by the instinct to survive during the evolutionary process. (...) Thus, the six basic emotions are fear, disgust, surprise, sadness, happiness and anger" [13]. Images are stimulated by events or objects. The brain processes events based on existing networks of associations and structures them. If the events are negative, the norepinephrine[14] circuit transmits negative emotions to the brain, if they are positive, the dopamine[15] circuit transmits positive emotions. The mind has the ability to think in the "future", to make connections between predictable events and the conceptual correspondences of the brain.

According to Damasio, we perceive things around us through involvement, not through passive receptiveness. For self-awareness to exist there must be some communication protocols in the human mind between the brain and its perceptions. These are called, in terms of neuroscience, metaphors. A metaphor actually means repeating a neural pathway until it becomes irreversibly imprinted on the structure of the brain.[16] Metaphors arise as the same path of information in the brain is activated.

The synapses of the neurons in the pathway are consolidated to form a permanent circuit, which is called neural recruitment. The more neurons enter this path, the better this circuit called metaphor is consolidated, resulting that metaphorical thinking is physical, i.e. the information is written like on hard disk. Simple metaphors combine and result in complex metaphors. These metaphors are essential for connecting language with brain circuits. Narratives are made up of cognitive frames, i.e. from the structures of the resulting narratives, imprinted in the brain over time. Narratives define social roles in social contexts. That is why the models during childhood, the patterns of thinking in the family, school, social environment are very important in explaining attitudes towards different events[17].

Paul Watzlawick was also one of the researchers concerned with how we perceive reality. According to the researcher, reality is a fantasy that we consolidate all our lives, adapting the facts around us to our image of reality and not the other way around. "Of all the illusions, the most dangerous is to believe that there is only one reality. In fact, what exists are different versions of reality, some contradictory, all being effects of communication, and not the reflection of objective and eternal truths"[18].

Perception and understanding of reality are closely related and depend on the culture we are part of, the language used, the context in which a particular event takes place. Perception tends to be influenced by desires, needs, attitudes, mood at a given time. This fluctuation in perception depending on different factors leads to different people reacting differently to the same message. This is why communicators cannot fully anticipate the effects of messages on the public[19].

Exposed to the same stimuli, people act differently because they process information differently as it is analyzed according to the individual's previous experiences. Relevant to exemplify the different reaction to the same stimulus is the Berkley experiment. One man holds one hand under a stream of hot water and the other under a stream of cold water. Both hands are then placed in a bowl of water at room temperature. The subject involved will feel cold in the hand that was under the hot water jet and warm in the hand that was under the cold water jet. The same individual subjected to the same stimulus will feel different, depending on previous experiences. "The sensory characteristic is never structured in itself and for itself, but only on the basis of previous experience"[20]. During the communication act, each participant practically reconstructs the communication situation.

Communication is understood in this perspective as an interaction between social actors who have a certain identity, motivations and interests according to which they interpret in a particular way the social practices, values and symbols shared at a given time in society. In fact, "in a constructivist analysis, the message exists insofar as we rearrange the context or in other words, create a new context, reconstruct both a symbolic universe and the actual situation in which we communicate, with its various contexts"[21]. Constructivism considers, according to the direction given by the Palo Alto School, that individuals construct the world having the impression that they perceive it and what they define as reality is, in fact, their own interpretation, based on communication.

The Palo Alto school emphasizes that man is "condemned" to communicate even when he does not want to do so, through gestures, attitudes, reactions, facial expressions, postures, etc.[22] Human behavior thus becomes the foundation of the study of communication. By analyzing human behavior constantly we build the meaning of the things around us, of the world, we obtain our own representation of the universe in which we live. People are constantly trying to understand and explain the behaviors of others, entering the role of the naive psychologist who attributes causes, often imaginary, to a certain situation.

The continuous relating to the other person in the vicinity, to the event that takes place, to the position of a political leader in a complex situation or to the way we have the impression that society is evolving is a deeply subjective one. "These primary

orientations that constitute a selective relating to a social object (event, personality, institution) and that determine a model of behavior are called social attitudes"[23]. By examining this construct, Gavreliuc shows that one can better understand the cognitive mechanisms that anticipate our behaviors, as well as the fact that people's relationships to the world are often based on stereotypes, prejudices that produce a series of unfair behaviors towards others discriminated on the basis of sex, ethnicity, political affiliation, etc. This new logic of communication according to Watzlawick's axiom "One cannot not communicate" would open new avenues for communication.

C.H. Cooley is the author of the looking-glass self theory. He is the researcher who initiates the theories according to which the identity of the subject is defined by the interaction with the other and is continuously shaping, in the middle of a process of mutual mirroring and re-mirroring. Therefore, the subject and the society form a whole, the attitudes and behaviors being the result of a social construct. They are born of interactions and not of solitude. The strongest metaphors, patterns of thinking through which the dominant values and attitudes are transferred to the self are due to primary groups, such as family, social environment, neighbors, friends. These groups play a crucial role in the development of the individual's personality. Thus, the other becomes the mirror in which the self is reflected. In other words, the behavior, the character, the expectations are projected and reflected continuously in the relationship partners, being in a permanent dynamic[24].

Here, in fact, is the starting point of symbolic interactionism: the close relationship between the individual and the social environment. We could say that the social environment has its own reality, from which the individual subjectively selects a certain part. Interactionism involves a creative, constructive response to various environmental stimuli. Also, people interact subjectively, using symbols, meanings in social relationships. In this process of symbolic interaction the self is constantly developing. A part of the self will be found in the environment it is part of, with which it will identify, while another part of the self will be in opposition to others and to the environment.

A continuous game, referred to by G.H. Mead when he introduces the concept of the role played by each individual in different situations[25]. During the role play, the individual manifests contextually a behavior in relation to the attitudes of others. Thus his conduct is articulated according to personality, role and reference group. The self is continuously modeled, gaining coherence and unity through others. The interaction takes place through symbols, in which the subject looks at himself through the eyes of others and develops a series of strategies of successive adaptation of the self to the expectations of those around him[26].

Regarding the performative act played daily by each individual in public, this is, according to Goffman, a social *face* that includes, like a play, a scenography, props, a role, an attitude, etc. Sometimes the dramatization of an attitude, trade, situation requires quite an extensive sacrifice. In order for a radio discussion to seem as spontaneous as possible, simple, without inhibitions, the moderator prepares for hours, creates a well-developed scenario, practicing spontaneity for a long time. Another example that Goffman gives about the dramatization of everyday life and role-playing games is that of a famous model displayed on the cover of "Vogue" magazine, who portrays excessively through clothes, posture and facial expression a perfect understanding of the book he has in his hand. In reality, those who strive to express themselves so adequately will no longer have time for the actual reading[27].

Goffman also refers to the selection of roles according to profession, social status. "Thus a specialist may want to present a modest image on the street, in a store or at home, but in the social sphere that includes the display of his professional skills will be more concerned with providing an effective show"[28]. It is, moreover, the case of television stars, movie stars, who, knowing they are admired want to give the impression of worldly people, modest, sociable, playing the role of the humble man, with nothing out of the ordinary. Just as there are cases of individuals who invest in clothing, car or house more than they can afford, for the sake of a spectacular representation in the eyes of others.

Blumer considers that the individual has a creative role in society, because through interactions with the environment he not only reacts but also acts, producing his own behavior. The idea of an actor, for the individual, becomes central. The

author emphasizes that people act according to the meanings that different social objects hold to them. These meanings, in turn, are socially constructed, within the interactions of the environment. Also, these meanings are reinterpreted in their turn through the prism of the schemata, the thought patterns of each individual[29].

R.K. Merton believes that people, through their faith, can force reality to fit in new frameworks of definition[30]. Therefore it is possible that certain false premises give birth to truths. Merton proposes a scenario for example. During the economic crisis of 1930, in the USA, a bank is faced with an unexpected situation. A rumor appears that the bank has financial problems. The director refutes, but once this rumor is out in the public space, the main shareholders withdraw, the most important partners do the same, and, in the end, regular customers follow their example, thinking that, of course, if those who know, are influential and have money have retired, it is time for them to do the same. So, in a very short time, an institution without any problem goes bankrupt, thus confirming the prophecy.

Conclusions

The social environment has its own reality out of which the individual subjectively selects a certain part by reacting to the interaction with different environmental stimuli. Dialogue partners also constantly build a sense of communication. They constantly define and redefine the relationship, everything being a continuous negotiation.

Perception and understanding of reality are closely related and depend on the culture we are part of, the language used, the context in which a particular event takes place. Therefore people act differently when exposed to the same stimuli because they process information differently, which is analyzed according to the individual's previous experiences.

The language used by an individual has the role of exteriorising personal experiences and thus passing them into the ordinary, into anonymity. Another feature is that it can transcend the reality of everyday life, integrating in the lives of individuals symbols and experiences that were not actually lived, which they did not witnesses but to which they took part indirectly. Therefore, language has the ability to transcend time and space, linking different areas of everyday reality and integrating them into a whole meaning.

When people are convinced that their predictions will come true, whether they refer to certain family situations, attitudes of colleagues, situations, than they will be confirmed, even if people are not aware that they have acted so that the profecy is fulfilled. The individual manages, therefore, through a series of presented items to build a reality according to the factors that acted on him in the first years of life, the social environment, education, group membership, etc. This reality can be, in certain situations, a real battlefield that the media, through specific means, can potentiate, recreate, influence.

NOTES:

1 John Fiske, *Introducere în ştiinţele comunicării,* Polirom Publishing House, 2003, p. 91.

2 J.R. Searle, *Realitatea ca proiect social,* Polirom Publishing House, 2000, p. 179.

3 P.L. Berger, T. Luckmann, *Construirea socială a realităţii: Tratat de sociologia cunoaşterii*, Univers Publishing House, 1999, p. 58.

4 *Ibidem*, p. 60.

5 *Ibidem*, p. 61.

6 A. R. Damasio, *Sinele: Construirea creierului conştient*, Humanitas Publishing House, 2016, p. 119.

7 M. Castells, *Comunicare şi putere*, Comunicare.ro, 2015, p 140.

8 *Ibidem*, p. 141.

9 *Ibidem*, p. 123.

10 *Ibidem*, p. 128.

11 *Ibidem*, p. 151.

12 *Ibidem*, p. 140.

13 *Ibidem*, p. 142.

14 Noradrenaline or norepinephrine is a neurotransmitter; it differs from adrenaline in that it lacks an amino-related methyl. (...) As a stress hormone, it involves parts of the brain where attention and reaction controls take place. Together with epinephrine, it causes the "attack or escape" response, activating the sympathetic nervous system to increase the heart rate, releasing energy as glucose from glycogen and increasing muscle tone. Noradrenaline is released when a series of physiological changes are triggered by an event. Source: https://educalingo.com/ro/dic-it/noradrenalina, accessed on 03.01.2020.

15 Neurotransmitter in the group of catecholamines, a precursor of norepinephrine, having a fundamental role in the brain for motor control and used in therapeutics for its stimulating action on the cardiovascular system. Source: https://www.csid.ro/dictionar-medical/dopamina-11555116, accessed on 03.01.2020.

16 M. Castells, *op. cit.,* p. 143.

17 *Ibidem*, p. 141.

18 Paul Watzlawick, Don D. Jackson, Janet Helmick, *Une logique de la communication*, Éditions du Seuil, Paris,

1967, p. 46.

19 W.J. Severin, J.W. Tankard, P*erspective asupra teoriilor comunicării de masă: Originile, metodele şi utilizarea lor în mass media*, Polirom Publishing House, Bucharest, 2004, p. 81.

20 A. Gavreliuc, *Psihologia socială și dinamica personalității*, Polirom Publishing House, Bucharest, 2019, p. 63.

21 C. Beciu, *Sociologia comunicării și a spațiului public*, Polirom Publishing House, Bucharest, 2011, p. 22.

22 P. Dobrescu, A. Bârgăoanu, N. Corbu, *Istoria comunicării,* Comunicare.ro, 2007, p. 357.

23 A. Gavreliuc, *Psihologia socială și dinamica personalității*, Polirom Publishing House, Bucharest, 2019, p. 101.

24 *Ibidem*, p. 45.

25 B. Kenneth, *The methodology of Herbert Blumer*, Cambridge University Press, 1990, p. 13.

26 A. Gavreliuc, *op.cit.*, p. 101.

27 E. Goffman, *Viața cotidiană ca spectacol,* Comunicare.ro, 2007, p. 68.

28 *Ibidem*, p. 68.

29 B. Kenneth, *The methodology of Herbert Blumer*, Cambridge University Press, 1990, p. 86.

30 R.K. Merton, "The Self-Fulfiling prophecy", *The Antioch Review*, No. 74(3), 2016, p. 3.

REFERENCES

Baugh Kenneth Jr., *The methodology of Herbert Blumer*, Cambridge University Press, 1990.

Beciu C., *Sociologia comunicării și a spațiului public*, Polirom Publishing House, Bucharest, 2011.

Berger P.L., Luckmann T., *Construirea socială a realităţii: Tratat de sociologia cunoaşterii*, Univers Publishing House, Bucharest, 1999.

Castells M., *Comunicare şi putere*, Comunicare.ro, 2015.

Damasio A.R., *Sinele: Construirea creierului conştient,* Humanitas Publishing House, Bucharest, 2016.

Dobrescu P., Bârgăoanu A., Corbu N., *Istoria comunicării*, Comunicare.ro, 2007.

Fiske John, *Introducere în ştiinţele comunicării*, Polirom Publishing House, Bucharest, 2003.

Gavreliuc A., *Psihologia socială și dinamica personalității*, Polirom Publishing House, Bucharest, 2019.

Goffman E., *Viața cotidiană ca spectacol*, Comunicare.ro, 2007.

Kenneth B., *The methodology of Herbert Blumer*, Cambridge University Press, 1990.

Merton R.K., "The Self-Fulfiling prophecy", *The Antioch Review*, No.74(3), 2016.

Searle J.R. *Realitatea ca proiect social,* Polirom Publishing House, 2000.

Severin W.J., Tankard J.W., *Perspective asupra teoriilor comunicării de masă: Originile, metodele şi utilizarea lor în mass media*, Polirom Publishing House, Bucharest, 2004.

Watzlawick Paul, Jackson Don D., Helmick Janet, *Une logique de la communication*, Éditions du Seuil, Paris, 1967.

10.53477/2284-9378-21-51

ENVIRONMENTAL SECURITY CONSIDERATIONS IN EASTERN EUROPE

Col. Viliam PASTOR, PhD Candidate*

In recent years, more and more complex threats to security have emerged, highlighting the need for stronger and closer security cooperation at all levels. The crisis caused by virus SARS COV-2 brought to the forefront security in Europe, testing both the resilience once the infrastructure of critical complicated, and preparation for crisis situations and the means for managing them. Eastern Europe, plagued by various conflicts in recent decades, still faces many challenges today, such as uncontrolled population growth, declining living standards and climate change due to global warming. The latter will exacerbate the situation in the future. As environmental security is an emerging concern that cannot be addressed with traditional solutions, new ways of dealing with it need to be developed. Cooperation forms the core of such means, aiming an intersectoral approach and ensuring broad stakeholder participation in order to integrate the principle of sustainable development into national policies.

Keywords: security; military power; cooperation.

"To secure peace is to prepare for war".
Carl von Clausewitz

Since the beginning of Russia's aggression against Ukraine in 2014, the geopolitical and security situation in Eastern Europe and in Europe as a whole has changed. For more than seven years, it has not improved and even had a tendency to gradually worsen, which was demonstrated during the Russian-Belarusian military exercises "West-2017", respectively by the presence of significant Russian military forces on the border with Ukraine in 2021. A security vacuum has emerged after the collapse of the collective security system in Eastern Europe, despite continued efforts by the Organization for Security and Co-operation in Europe (OSCE), European Union (EU), North-Atlantic Treaty Organization (NATO) and even United Nations (UN). Accordingly, it was estimated that the main cause of the deteriorating security situation in the region was Russia's aggressive policy, correlated with the weakness shown by the main international organizations – the United Nations (UN), the Organization for Security and Co-operation in Europe (OSCE) and the Council of Europe (CoE). NATO should play a key role in regional security in Eastern Europe in the forms of NATO's enlargement to the East, strengthening NATO's role in the region and/or developing its special partnership with NATO. According to them, the EU should also play an active security role by strengthening sanctions against Russia, reducing dependence on Russian energy resources, assisting countries in the region in strengthening their national resilience and managing security challenges. There are thoughts for supporting the idea of establishing a new regional security format, but without Russia, under the EU/NATO umbrella. While responding to the question regarding the place and role of Ukraine in the security system in Eastern Europe, Ukraine is considered a security provider in Eastern Europe, a key component and a most important actor in the European security, a new Eastern European pillar of transatlantic security, an Eastern outpost against new challenges and threats with a key role in discouraging Russia's aggressive policy and demonstrating an alternative to Russia's development model for other post-soviet states. Ukraine is becoming an example and a source of experience in combating all types of hybrid warfare. Thus, the settlement of the Russian-Ukrainian conflict would contribute to strengthening regional security in Eastern Europe.

The outcome of any effort to create a new security architecture is therefore, of course, uncertain, but it should be tried nonetheless. Western leaders should follow this path confidently

**** "Carol I" National Defence University***
e-mail: *vili_pastor@yahoo.com*

and without apology. If Russia refuses to negotiate or fails to live up to any agreement it may initially support, little will be lost and options will remain for a tightening of future policy against Russia[1]. Indeed, a number of such responses should be developed in advance, including the possibility of accelerating consideration of NATO membership for neutral states that are subsequently constrained or attacked by Russia. It would be preferable, of course, to avoid this. The current strategic situation involving most of the world's major economies and several of Europe's nuclear-weapon states is quite dangerous and will not become less dangerous if it is simply left on autopilot.

EU interests and objectives in Eastern European countries

The EU's core interest in its Eastern area is to be surrounded by a "ring of friends", as the President of the European Commission stated in 2002[2]. The following year, when it launched its neighborhood policy, the EU announced that resolving conflicts was one of its key priorities. Since then, there has been a significant increase in conflict in their vicinity – but there has been no parallel increase in the level of ambition of Member States to address this sensitive area. For the EU, the transition of post-soviet countries from communism to competitive democracy, rule of law administrations and functioning market economies will not only increase peace and stability, but also promote economic growth, sustainable development, inter-societal and cultural ties, and strong lasting relationships in its neighborhood.

While EU support for this transformation has yielded mixed results, the parties must recognize that a total failure of the process in its Eastern neighborhood is possible and would have serious consequences. Belarus can serve as a warning story of what can happen when a political and economic transformation fails. Now that Lukashenko is approaching old age and facing a rapid decline in his legitimacy due to the suppression of opposition protests, there are questions about the problems of succession, Belarusian sovereignty in the EU state and the sustainability of the country's economic model. At best, Belarus will remain a weak and poor country on the EU border. At worst, it will become a co-belligerent client state that Russia uses to directly threaten and challenge the EU's sovereignty and territorial integrity. Ukraine, Moldavia and Georgia could form an area of Moscow dominated instability – from which the Kremlin could organize clandestine subversion and conventional military operations. Without a territorial isolation comparable to that offered by the Mediterranean, this would pose a stronger threat to Eastern European states.

Such turmoil contradicts arguments in favor of "authoritarian stability". Even in separatist regions closely controlled by Russian intelligence services, local authorities are often provoked and sometimes stricken by public riots. In South Ossetia, protests against the 2012 elections ended with the death of the opposition candidate (who could have won that vote). In Abkhazia, the elected "president" was ousted twice – in 2014 and 2020, respectively – by popular uprisings sparked by allegedly rigged elections. Even if the EU put an end to support for political and economic transformation in its Eastern neighborhood, the popular desire for responsible government would not disappear, nor would the instability created by failed political processes.

The EU's main goal in its Eastern area is to create the "common space of common democracy, prosperity and stability"[3] which the European Council recently referred to. For some European leaders, political transformation is still a precondition for efforts to achieve other goals. Efforts to fight corruption, organized crime and money laundering in both the EU and its Eastern neighborhood have garnered some media attention following the Mueller Report and the scandal surrounding President Donald Trump's 2019 decision to dismiss the USA ambassador in Ukraine. Ultimately, the integrity and professionalism of local investigative and judicial authorities will be a key factor in whether the EU can achieve its goals in Eastern Europe.

EU objectives in Eastern Europe also cover issues such as labor mobility and migration, infrastructure, youth, education, ethnic minority groups, digitization steps towards aligning economic, health care, especially in relation to Covid-19 and equality of gender. However, these are rather apolitical bureaucratic portfolios, which show little about Europe's ability to implement its foreign policy. This is partly due to the fact that Belarus and Azerbaijan generally respect different political norms towards the EU, but are formally part of its Eastern neighborhood.

In terms of the EU's efforts to gain political influence over Eastern European decisions, energy ties with Russia are the only strategically important issue covered by the agreements between the parties. However, energy transit is an area that Moscow is using to put pressure on Eastern European states. In other words, energy disputes concern whether the EU can and should support Eastern European states in their transition to liberal democracy, an open society, the rule of law and free markets, or whether they should maintain close ties with Moscow.

EU support for political and economic transitions in the Eastern area has never been undisputed. Russia sees the instability, vulnerability, weakness and dependence of these countries as a key mechanism for exerting its influence in its immediate neighborhood. Russia has used economic dependencies – especially on oil and gas – to gain control of Georgia, Ukraine and Belarus. Moscow has also used targeted corruption, information warfare, election fraud and intelligence operations to discredit, extort or intimidate political actors in order to secure the power of those it believes will protect Russian interests. As if that was not enough in itself, Moscow also used military force to gain some advantages. Needless to say, the reforms related to the rule of law, free markets and the political system that the EU envisages for its neighborhood would reduce the vulnerability of Eastern European (Eastern Partnership) countries to pressure from Russia.

Russia's tactics, combined with the lack of constructive initiatives in the region, have earned it a reputation as a "strategic deflector"[4]. This label is particularly suitable in terms of covert operations, clandestine networks that are built in a country to weaken the institutional, political, economic and security organizations. The purpose of these operations is to make the country yield to foreign pressures or, if it does not trigger an "internal" conflict providing a pretext for an intervention.

Ukraine provides many examples of how Russia applies these tactics. Events during President Viktor Yanukovych showed that, the Kremlin has ample opportunity to use local strong men, oligarchs and public figures willing to help him achieve his goals. Centralization of power, capture of the state, systemic corruption and attacks on the independence of the press and the judiciary are attractive to local elites and powerful people trying to monopolize power. While there is a blurred line between domestic weakness and foreign-induced vulnerability, much of the success of undercover operations is based on exploiting pre-existing divisions in a country. In practical terms, this border does not matter for EU policy-making; it must mitigate the institutional weaknesses of the Eastern Partnership, regardless of their origin.

The EU has sometimes tried to negotiate transitional arrangements that would turn competition with Russia into a mutually beneficial situation. It has done so through direct involvement with Russia, providing economic and societal concessions and assistance for reform and modernization – as set out in the CFSP Joint Strategy. The parties also tried to negotiate peace agreements for protracted territorial conflicts, giving Russia a co-management position in the common security institutions, as stipulated in the 2010 Meseberg Memorandum. However, when they tried to implementing such initiatives, Russia and the EU have failed to create a common vision for the region. This is due to their profound ideological differences regarding the European security order. Instead of encouraging cooperation, these failed efforts have increased mutual suspicion.

The security environment in Eastern Europe

In order to address Russia's clandestine operations in Eastern European countries, a counter-subversion policy is needed that can protect their economic, financial, societal and political reforms. This requires not only a more active and coherent position on existing policy, but also an expansion of influence in five key areas:

- media and information activities;
- cyber security;
- security and information;
- defence;
- energy.

In the first area, European efforts have focused on supporting investigative journalists. This support came on a bilateral basis or through a coalition of countries with the same views, as seen in initiatives such as the Visegrad Fund. However important these measures were, they failed to achieve the intended effects. This is because the content they produce (most of which is available online) reaches only a small audience. As conventional television is still one of the most important sources of information for the citizens of Eastern European countries, it

is important that they address this environment directly. Establishing public television stations that are editorially and financially independent of the government through broadcasting fees is only the first step in this process. There is also a need for broader support in the form of advice, expertise, program content and quality control mechanisms.

The expansion of TV content must take into account the diversity of society. One model that has been particularly evident in Georgia and Moldavia is that Russian misinformation on TV targets ethnic and linguistic minorities. Without the ability to provide fact-finding services in the native languages of viewers, the state has abandoned these information bubbles. In Western countries, public service broadcasters are responsible for providing accurate and accessible information to minority ethnolinguistic groups. For strategic reasons, they should do the same in Eastern European countries.

While such impartial public services would provide more accurate content than oligarchs' television stations or foreign broadcast channels, they would not make these sources of misinformation disappear. However, changes in the regulatory framework could make it much more difficult to spread misinformation using the current business models of these outlets. First, the rules on media ownership, purchasing of the media, advertising and financing would make it more difficult for foreign powers or oligarchs to secretly acquire these assets. Second, the rules on the financial self-sufficiency of media companies would prohibit oligarchs from funding news agencies to manipulate public debate. They will force media companies to make a living from their own income, either through subscriptions or from third-party advertisements. It is unlikely that Eastern European states to adopt such legislation itself because TV propaganda is an important source of power and legitimacy of the ruling parties. Only pressure and conditionality can change this.

In Ukraine, several EU Member States support a variety of local NGOs that have developed considerable expertise in identifying and tracking Russian and local misinformation. However, the EU does not have the necessary structures to absorb the information generated by its local partners, to adapt its communication strategy accordingly and, more importantly, to help local actors improve their strategic communications to protect the political process of interference. Although there are capable local actors in Ukraine with whom the EU can work in the field of information security, there are few such actors in other Eastern European countries, as is especially evident in Georgia and Moldavia. The EU needs to launch capacity-building programs in this sector.

In parallel, *cyber operations* are an essential part of the undercover war of the 21st century. This can be seen in destabilizing efforts that involve everything from using data to assess citizens' moods and prejudices (and thus exploiting them through intelligence operations) to espionage, to sabotaging missions that paralyze government branches or strategic infrastructure. Improving cyber security and cyber resilience in Eastern European countries is needed to counter subversive action.

The EU has made slow progress in this area. However, it does not provide technical assistance to help Eastern countries implement their cyber defence system.

In order to improve their national cyber capacity, Eastern European countries need to partner with local IT companies. But in this respect, there are few such companies that governments can turn to, with the exception of Ukraine, which has a significant and rapidly growing IT sector. (Moldavia adopted a law to facilitate the growth of the sector in 2019, but it remains to be seen whether this is sustainable under the new government of the country.) Therefore, the countries of Eastern Europe are dependent on companies and IT services in the US, Europe, Russia and China. And the use of Russian and Chinese companies raises particularly acute concerns about cyber security.

Many of the measures that Eastern European countries need to take are first and foremost about internal cyber security and cyber sovereignty. They should create the legal framework and administrative structures to certify software and hardware programs; institutions to quickly coordinate national CERT teams through a "super CERT" across the country and set up cybercrime and forensic bodies. These structures could audit cyber security authorities and legislation, develop clear benchmarks and targets for organizational reforms, engage in capacity-building programs, provide critical information on emerging and imminent cyber threats, and liaise with local certificated authorities. They could also help

adopt EU standards for the implementation of 5G infrastructure in these countries. It is beyond the capacity of Eastern European states to conduct a full technical assessment of complex supply chains – networks not only for 5G, but also, inter alia, for government, military and intelligence communications. As a result, they need help from external stakeholders, such as EU joint cyber security research institutions.

Functional cyber security structures also have an important role to play in combating money laundering. The links between national banks and cyber intelligence units have proven important for detecting financial crimes. Foreign-influenced operations often rely on the same opaque and illegal financial channels to provide money for operational costs: sources of payment; corrupt individuals; funding frontal organizations (such as NGOs and the media) and the purchase of storage facilities, armaments and other assets to prepare for armed insurgencies. The types of covert operations described above are expensive business. Discontinuing financial support networks would be an effective way to combat them. Eventually, cyber security authorities and financial supervisors will prevent foreign secret operations only if local law enforcement agencies arrest the perpetrators, confiscate their assets and close illicit cover organizations.

All Eastern European states suffer from conflicts of interest between the powers of their investigative and law enforcement agencies, low public sector salaries (which increase the vulnerability of institutions to corruption), opaque procedural laws, complicated bureaucratic investigation procedures, full criminal codes gaps and contradictions, little or no institutional cooperation between law enforcement bodies, hierarchical, centralized structures, in which several high-ranking decision-makers can block or impede investigations in the whole branch of services and significant political control over investigative bodies. There have been few in-depth reforms of investigative and law enforcement agencies in Eastern European countries, and where such reforms did take place (as they did under Minister Vano Merabishvili of Georgia or General Attorney Ruslan Ryaboshapka of Ukraine), they were subjected to intense campaigns of obstruction and defamation by local business elites and established political forces. Without intense pressure from abroad, not even minor reforms would have taken place.

In a challenged environment, such as Eastern European countries, *the information and security sectors* are essential. Without reliable and effective information Eastern states have no chance to resist Russia's destabilizing operations. By constantly monitoring the situation of threats, intelligence agencies play a central role both in informing decision-makers about hostile operations and in giving up law enforcement and financial security services for the investigation and prosecution of guilty persons and networks. The problem is that the internal intelligence services of Eastern European countries are either insecure because they are actually part of the political system (making them vulnerable to corruption and abuse for political and economic gain), or have only poorly developed capacities and capabilities.

The EU therefore needs to urgently support reform and develop capacity-building programs for Eastern countries in these areas. The EU should provide capacity-building programs, structural coordination on threats, technical assistance (especially in the field of cross-border signal intelligence) and military intelligence – in exchange for a thorough reform of intelligence and security services. Such a reform would entail increased democratic accountability, a reduction in the overlap between the powers and procedures of law enforcement agencies and provisions aimed at reducing corruption. In Ukraine, the European Union Advisory Mission (EUAM) proved of invaluable significance, being in touch with local services in relation to their needs and in assessing progress (and unfortunately regression) intelligence reform. Based on the experience of EUAM, the EU could appoint Tbilisi and Chisinau liaison offices. It should set up an information support and coordination cell in the Eastern neighborhood of Brussels, to coordinate assistance (as does the support group) and to facilitate practical exchanges of information. The EU could expand the EU's Common Information School, a PESCO project for children, beyond close cooperation between the Eastern Mediterranean states – to cover Eastern European countries where Russia has strategic interests. The school would then be suitable for training intelligence staff in Eastern European countries.

In addition, the EU needs to dramatically increase its intelligence capabilities in its Eastern neighborhood. Where necessary, the intelligence agencies of the Member States would have to compensate for the shortcomings of domestic intelligence services of the Eastern countries in particular counter-intelligence services.

This is especially important in situations of revolutionary change in which new administrative and other structures appear – something that is still a distinct possibility in all Eastern European countries. This situation gives Russia the opportunity to use front organizations to networks – and put allies in new structures and hamper efforts to reform from within. The EU has been too reactive in these scenarios, leaving it unable to effectively monitor the development of the situation and the people driving change. Of course, there is always a significant chance of error in a turbulent environment. But the EU's lack of adequate information hinders success. In the past, Eastern European countries have often offset this on the basis of US information.

Moscow sees undercover operations as the main way to destabilize governments and expand its influence. However, it also disturbs them in more open ways. As described above, Moscow uses open-ended threats to a country's territorial integrity and sovereignty to intimidate governments. Even without invading other countries, Russia sometimes uses a show of military force on the borders of neighboring countries to emphasize the dominance of its escalation and thus influence their decisions.

Some European diplomats believe that transforming Eastern European countries into non-aligned or neutral states would help stabilize the region. However, this would not happen automatically and Moscow is unlikely to observe such a misalignment. Indeed, misalignment would only be a viable option for Eastern countries if it strengthened its capacity *to defend itself against* external subversion.

There is an urgent need to reduce the vulnerability of Eastern European countries to the threat of forces such as those in Moldavia and the Russian army in Georgia and Ukraine. Of course, it is difficult to imagine a situation in which Eastern states would be immune to the military attacks of a large regional power that holds nuclear weapons like Russia. Like many non-aligned states during the Cold War, they should make military preparations to convince potential aggressors that military aggression would cost too much. Ukraine showed the value of this approach in 2015 and 2016. Russia theoretically maintained dominance of escalation in Ukraine, but any subsequent escalation would have required a much greater Russian effort, one for which the Kremlin would have needed justification from its own people. However, the case of Ukraine also showed that the issue of increasing the effectiveness of a country's armed forces is not only about equipment, but also about a comprehensive, long-term commitment to military and defence support.

Assistance in comprehensive defence planning is especially needed for Georgia and Moldavia. Because Moldavia is not directly bordered by Russia and separatist forces in Transnistria pose a different threat to conventional Russian military units, the Moldavian army must become a highly trained mobile force that coordinates well with the police to quickly counter hybrid threats. In contrast, Georgia is particularly vulnerable due to its geographical position, with considerable Russian military forces deployed on its territory and across the border. Georgia's defence policy has undergone a chaotic series of changes and restructuring, with its holistic concept of territorial defence (comparable to that of Sweden, Finland and the Baltic countries) still in the early stages of implementation. Because the Soviet army was never organized for territorial defence, the Eastern countries did not inherit any tradition of thinking in this area.

Last but not least, the EU faces challenges related to the *energy security* of Eastern European countries. In an ideal world, energy transit would allow for constructive cooperation between Russia, the West and Eastern European states: Russia depends on cheap and secure facilities for exports to Europe, Europe needs reliable energy sources (both oil and gas) and Eastern European countries want to earn transit fees by connecting the two. But due to the gas transit crisis through Ukraine that erupted in 2006 and 2009, as well as fears that some Member States' high dependence on Russian gas, oil and electricity makes them vulnerable to blackmail, the EU has begun to implement a common energy policy. In general, the policy is designed to create a

transparent, interconnected and competitive internal energy market, which breaks the monopolies of certain energy companies and diversifies supply. The legal framework of this energy policy turned into foreign policy because neighboring countries may join EU energy community by adapting rules and governance structure on their energy markets. Inclusion in a wider EU market should lower the cost of energy for Eastern European countries (some of which currently have to pay among the highest prices for natural gas in Europe) and should significantly strengthen their efforts in the negotiations on energy purchases.

Some progress has been made in this area: Georgia is now much better connected to neighboring countries and has diversified its offer, Ukraine has implemented painful reforms to the internal energy market and pricing regulations, while breaking monopolies and eliminating corruption schemes that have proven to be a major political responsibility. However, Moldova's attempts to connect with the Romanian gas market were interrupted when a pro-Russian government came to power in November 2019.

However, in the coming years, the bigger issue with energy transport will be whether Eastern European countries will play a role in energy transfer or whether Russia will be able to bypass the region as a whole by completing the TurkStream and North Stream 2 pipeline networks. Eastern European countries fear that if they do not need other post-Soviet states (especially Belarus and Ukraine) for energy transit, Russia will be released from a major constraint on its attempts to intimidate them, including by using military force. Last year, Russia and Ukraine avoided a confrontation over the latter's role in gas transit only at the last minute, reaching an agreement that lasts until 2024 and sets a minimum level of annual gas transit to maintain energy infrastructure in Ukraine.

While the EU brokered negotiations as a broker, the US was the real facilitator of the agreement. Pending US sanctions on new Russian gas pipelines (which mainly target Nord Stream 2 but may also complicate the maintenance of TurkStream), it was risky for Russia to bypass Eastern Europe altogether. Given that there was a growing consensus in Washington on the need for such sanctions and that Germany had little EU support for Nord Stream 2, Russian President Vladimir Putin had to protect himself against possible future developments. Maintaining a minimum gas transit role for Ukraine was part of this coverage process. Therefore, Russia has postponed its final decision on the transit issue – and the dispute is likely to continue for some time.

Conclusions

It is not an easy task to change the blockade through mutual support on strategic issues at the level of Eastern European countries. However, Member States may begin to do so by recognizing that some of them have special experience and expertise in dealing with various EU partners. Eastern European Member States should generally trust France, Italy and Spain in matters involving the Mediterranean, Iran or the Middle East peace process, and France, Italy and Spain should pay attention to Eastern European countries in anticipation of Russian movements and interests, as well as in relations with Eastern European countries. Eastern European states should consult Brussels in advance on planned movements and policies related to strategic sovereignty, in order to relieve them of unpleasant surprises.

Member States need to expand their portfolio in key areas, as they have done throughout the history of its existence. France and other Mediterranean countries should agree to increase EU resources and operations in Eastern European countries; instead, they should make a greater contribution to French missions in Africa, maritime security operations in the Mediterranean and other initiatives. However, it should fall as a defence of the status quo's legal European security order.

The role of the European Commission should be strengthened in order to avoid protracted bilateral disputes between EU Member States. For example, if Germany had allowed the European Commission to take responsibility for negotiating and launching new pipeline projects, other Member States may now be more willing to help such initiatives withstand external pressures.

NOTES:

1 [Consiliul European, Consiliul UE], *Cooperarea Uniunii Europene în materie de securitate și apărare*, 2020, https://www.consilium.europa.eu/ro/policies/defence-security/, accessed on 14.10.2021.

2 https://library.fes.de/pdf-files/bueros/bukarest/12413.pdf, accessed on 19.10.2021.

3 *Ibidem*.

4 https://books.google.ro/books?id=l9T_IH6ZdiEC&pg=PA54&lpg=PA54&dq=rusia+deflector +strategic&source=bl&ots=jUH3wlpl1m&sig=ACfU3U1bmmf05lzeymG76D74SJxSNFKQ1Q&hl =ro&sa=X&ved=2ahUKEwjK1rbej_nzAhUOsaQKHcHRAHsQ6AF6BAgWEAM#v=onepage&q =rusia%20deflector%20strategic&f=false, accessed on 19.10.2021.

REFERENCES

[Cologne European Council], *Conclusions of The Presidency*, June 3-4,1999, https://www.europarl.europa.eu/summits/kol2_en.htm#an3

[European Commission], *Un fond european de apărare: 5,5 miliarde EUR pe an pentru stimularea capacităților de apărare ale Europei*, 2017, https://ec.europa.eu/commission/ presscorner/ detail/ro/IP_17_1508

[European Council, UE Council], *Cooperarea Uniunii Europene în materie de securitate și apărare*, 2020, https://www.consilium.europa.eu/ro/policies/defence-security/

[European Council, UE Council], *Concluzii – Reuniunea Consiliului European*, 28 June 2018, https://www.consilium.europa.eu/media/35954/28-euco-final-conclusions-ro.pdf

[European Council, UE Council], *Joint UE-NATO Declarație*, Bruxelles, 2018, https://www.consilium.europa.eu/media/36096/nato_eu_final_eng.pdf

[European Council], *Fifth progress report on the implementation of the common set of proposals endorsed by EU and NATO Councils on 6 December 2016 and 5 December 2017*, https://www.consilium.europa.eu/media/44451/200616-progress-report-nr5-eu-nato-eng.pdf

[European Council, UE Council], *Cooperarea la nivelul UE în domeniul apărării*, 2017, https://www.consilium.europa.eu/ro/press/press-releases/2017/06/08/military-mpcc-planning-conduct-capability

[European Council, UE Council], *Politica de Securitate și Apărare Comună Civilă*, 2018, https://www.consilium.europa.eu/ro/press/press-releases/2018/11/19/civilian-common-security-and-defence-policy-eu-strengthens-its-capacities-to-act/

[European Council, UE Council], *Taking EU-NATO cooperation to a new level*, 2016, https://www.consilium.europa.eu/en/press/press-releases/2016/12/13/tusk-juncker-stoltenberg-opinion/

[EEAS], *A Global Strategy for the Europeen Union's Foreign and Security Policy*, 2016.

[European Defence Agency], *Mission*, https://www.eda.europa.eu/Aboutus/Missionandfunctions

Bădălan E., PhD & Frunzeti T., PhD, *Forțe și tendințe în mediul de securitate european*, "Nicolae Bălcescu" Groud Forces Academy Publishing House, Sibiu, 2003.

Bogzeanu C., *Evoluția relației NATO-UE față de determinarea polilor de putere*, "Carol I" National Defence University Publishing House, Bucharest, 2013.

Dr. Duțu P., Bogzeanu C., *Reforma instituțională a UE din perspectiva Politicii de Securitate și Apărare Comune*, "Carol I" National Defence University Publishing House, Bucharest, 2011.

Horoșanu G., *NATO-UE a smarter collaboration*, Tritonic Publishing House, Bucharest, 2014.

Mureșan M., Țenu C., Stăncilă L., *Securitatea europeană la începutul mileniului 3*, "Carol I" National Defence University Publishing House, Bucharest, 2006.

Dr. Pavel Gh., *Mediul de securitate european și euroatlantic*, "Carol I" National Defence University Publishing House, Bucharest, 2007.

Stoica Al., *Marii actori statali și Uniunea Europeană în competiția globală de interese*, "Carol I" National Defence University Publishing House, Bucharest, 2014.

https://ec.europa.eu/info/strategy/priorities-2019-2024/promoting-our-european-way-life/european-security-union_ro

https://www.consilium.europa.eu/ro/press/press-releases/2021/05/10/security-and-defence-eu-to-move-forward-on-common-security-and-defence/

https://books.google.ro/books?id=l9T_IH6ZdiEC&pg=PA54&lpg=PA54&dq=rusia+deflector+strategic&source=bl&ots=jUH3wlpl1m&sig=ACfU3U1bmmf05lzeymG76D74SJxSNFKQ1Q&hl =ro&sa=X&ved=2ahUKEwjK1rbej_nzAhUOsaQKHcHRAHsQ6AF6BAgWEAM#v=onepage&q=rusia%20deflector%20strategic&f=false

https://library.fes.de/pdf-files/bueros/bukarest/12413.pdf

10.53477/2284-9378-21-52

CONSIDERATIONS REGARDING NATO'S ADAPTATION TO CURRENT THREATS

Col. Viliam PASTOR, PhD Candidate*

The alliance faces the most complex and unpredictable security environment since the end of the Cold War, with growing geo-political challenges, more sophisticated and disruptive cyber and hybrid threats, and exponential technological changes that are rapidly transforming the way wars are fought and won. NATO continues to adapt and prepare for the future, strengthening its position of deterrence and defence, projecting stability and combating terrorism, investing more in defence and modernizing the Alliance's structures.

Keywords: NATO; security environment; stability; defence.

„NATO is the most important military alliance in world history".
Mitch McConnell

NATO is entering the eighth decade of its existence, both with a semi-success aimed at terrorism and with a wider range of imminent challenges than its founders could have foreseen when they signed the Washington Treaty in April 1949. In the thirty years since the fall of the USSR, the Western Alliance has defied countless predictions of its imminent loss. It ended two wars and an ethnic conflict in the Western Balkans, expanded its partnership with countries close to Russia and other former adversaries, reduced the threat of terrorism against NATO territory, and engaged in international conflicts, including in Afghanistan and responded with clarity, unity and speed in resolving the threat posed by Russian aggression in the Euro-Atlantic region. Today, NATO is the most successful alliance in history, comprising nearly a billion people and a half of global GDP in an area stretching from the Pacific coast of North America to the Black Sea.

However, future uncertainties call for NATO to develop further. The world of the next ten years will be very different from the world that the Alliance lived in both during the Cold War and in the decades that immediately followed. It will be a world of great competing powers, in which assertive authoritarian states with revisionist foreign policy agendas seek to expand their power and influence, and in which NATO allies will once again face a systemic challenge that crosses security and the economy. Known threats such as terrorism, in all its forms and manifestations, will persist, even as new risks arise due to pandemics and climate change, and emerging and disruptive technologies (EDT) present both dangers and opportunities for the Alliance[1].

In this ever-changing context, NATO has experienced internal turmoil. In recent years, the Allies have engaged in disputes that partly reflect concerns about their long-term strategic future. Some Europeans are worried that the United States is reorganizing its strategy and that its commitment to their continent will diminish as it focuses more on the Indo-Pacific. Some Americans worry that Europeans will shirk their responsibilities for common defense or even pursue a path of autonomy in a way that divides the Alliance. Within NATO, differences have emerged regarding the political and social development of member states, which has led to doubts about democracy within the alliance. In many ways, it can be said that the Alliance is formidable in terms of military force, but it is far from invulnerable to such political turmoil.

Despite these challenges, NATO remains indispensable. In fact, NATO's fundamental goal is more clearly demonstrable today than it has been for decades. NATO has withstood stormy times, surviving the Soviet threat, the Suez crisis, Allied divisions during the Vietnam War, dictatorships in its own right, or disagreements over enlargement

* ***„Carol I" National Defence University***
e-mail: *vili_pastor@yahoo.com*

and the Iraq war, to name a few. Now, as then, the Allies have remained bound together by a combination of common principles, democratic institutions and the benefit that all Allies derive from collective security. Looking to the future, the need for a collective defense alliance to protect Europe and North America from threats to their physical security and democratic way of life is as strong as ever.

However, NATO will have to continue to adapt. In a world of systemic challenges and proliferating threats, the Alliance, in complementarily with the comprehensive military adaptation it has undergone, must strengthen its capacity to act as the main political forum for the strategic and geopolitical challenges facing the transatlantic community. Fulfilling this role will require even greater cohesion than NATO has had in recent years. As it has happened since the establishment of NATO, cohesion lies in the ability and willingness to act collectively against common threats. This is the way to ensure the vitality, credibility and sustainability of the Alliance.

In recent years, the Allies have strengthened NATO's military component and should continue to do so. But at the same time, it must focus on strengthening NATO's political dimension, including its foundations based on common democratic principles, consultation mechanisms, decision-making processes and political tools to respond to current and emerging threats. If it does so, NATO will be in a strong position to protect the freedom and security of its members and will act as an essential pillar of an open and stable international order.

To produce this article, I conducted extensive consultations using documents related to issues both inside and outside NATO-specific sites, including papers by scientists, business and technology leaders, parliamentarians, military officials, and government officials from most states partners of NATO and non-Alliance countries. During the study, I briefed myself daily on news related to the Alliance's progress and relations with countries inside and outside it.

Due to the COVID-19 pandemic, the entire study process was conducted exclusively from online sources, giving the article a "virtual" character.

During this process, I acted independently, all the information provided on the adaptation of NATO, respectively on the future of this Alliance are a reflection of my own thinking, having a greater or lesser probability of taking place in the future.

NATO's adaptability to the current security and political environment

NATO's external security environment has changed dramatically since the advent of NATO's latest strategic concept. This concept recommended the adoption of a strategic partnership with Russia, making only limited references to the fight against terrorism and made no mention of China's economic and political development. Since then, there have been fundamental changes in NATO's security environment, which are likely to increase over the next decade and require greater efforts, both in terms of political cohesion and adaptations to NATO's strategy.

Transnational threats and risks continue to be a major challenge for the Alliance, from terrorism to the security challenges posed by the pandemic, climate change and migration flows. Changing instruments of state power – such as cyber and space capabilities – will continue to shape the nature of conflict. However, the main feature of the current security environment is the resurgence of geopolitical competition – that is, the abundance and escalation of state rivalries and disputes over territory, resources and values. In the Euro-Atlantic area, Russia faces the deepest geopolitical challenge. While Russia is, through economic and social measures, a declining power, it has proven capable of territorial aggression and is likely to remain a major threat to NATO over the next decade. Russia maintains a strong military arsenal, which poses a threat to NATO. The Alliance has made progress in addressing gaps in deterrence and defense on this side, and this must continue to be a priority for partner countries. Russia is also threatening NATO in non-kinetic areas in ways that blur the lines between war and peace. NATO's attempts to build a significant partnership and involve Russia in creating post-war Euro-Atlantic security architecture were rejected. In 2014, Russia illegally annexed Crimea and invaded and occupied parts of Eastern Ukraine.

The Russian government seeks hegemony over its former Soviet states and undermines their sovereignty and territorial integrity, trying

to block the path of nations wishing to turn to NATO. As Russia's aggression in Ukraine and Georgia continues, Russia's assertive behavior has intensified in the North Atlantic, with air and naval accumulations in and around the key points of the Barents Sea, the Baltic Sea, the Black Sea and the Mediterranean Sea. In the last three, Russia has placed anti-access/area denial (A2AD) capabilities, extended hybrid warfare and threatened critical energy and infrastructure. In parallel, it tried to create satellite states near NATO territory, including the so-called frozen conflicts, and violated arms control regimes, which led to the end of the INF Treaty. Russia has also sought to establish a foothold in the Mediterranean basin and in Africa, including through the use of Russian private military companies. In addition to the conventional military threat, Russia is obviously making use of a set of hybrid tools, including cybernetics, assassinations and poisonings, using chemical weapons, political constraints and other methods to violate Allied sovereignty.

The return of geostrategic competition has also led to a proliferation of hybrid attacks. This gray area activity has eroded the traditional boundaries of the conflict. Domestic and international security is under threat. The line between civilians and combatants is ambiguous, through the use of private military companies, misinformation and subversion. All this and the hybrid activity of terrorist organizations seek to weaken and divide the allies from within, undermining the social cohesion and way of life of the Alliance countries. Thus, NATO has had to spend an increasing amount of time developing political and non-political tools to counter hybrid activities, such as new allocation approaches, hybrid deterrence and the disinformation approach.

China's growing power and assertiveness is the other major geopolitical development that is changing the Alliance's strategic calculation. At their London meeting in December 2019, NATO leaders said that China's growing influence and international policies present both opportunities and challenges that need to be addressed as an alliance. China presents a different kind of challenge to NATO than Russia; unlike the latter, China is not currently a direct military threat to the euro area. However, China has an increasingly global strategic agenda, backed by its economic and military strength. It has shown its willingness to use force against its neighbors, as well as intimidating economic coercion and diplomacy beyond the Indo-Pacific region. Over the next decade, China is likely to challenge NATO's ability to build collective resilience, protect critical infrastructure, address new and emerging technologies such as 5G, and protect sensitive sectors of the economy, including supply chains. In the longer term, China is increasingly likely to project global military power, including potential in the Euro-Atlantic area.

China's industrial policy and the military-civilian merger strategy (MCF) are central components of this systemic challenge. Its military modernization in all areas, including nuclear, naval and missile capabilities, introduces new risks and potential threats to the Alliance and strategic stability. Its approach to human rights and international law challenges the fundamental premise of a rules-based international order. China poses serious risks in some critical sectors such as telecommunications, space, cyber defense and IT, as well as disinformation campaigns. Since the beginning of the COVID-19 pandemic, China has carried out a disinformation campaign in many allied states. It has also committed widespread intellectual property thefts, with implications for Allied security and prosperity, as well as cyber-attacks on NATO governments and societies that have been attributed by the Allies as originating in China.

At the same time, due to its size and economic trajectory, China is a driver of global growth, trade and investment and a significant investor in many NATO countries. It has begun to develop a strategic trade presence in the Euro-Atlantic area through the Ring Roads and Motorways Initiative, numerous bilateral agreements and its MCF strategy. The Allies will continue to seek relations with China, build economic and trade ties, and seek to work with China on issues such as climate change and biodiversity. China's actions are keys to the prospects of addressing global challenges, such as green development goals, as it produces one-third of global emissions and nearly half of global investment in green technology.

Terrorism has been and remains one of the most important asymmetric threats facing the Alliance, repeatedly hitting inside NATO and causing deep concern among Allied populations.

While acts of terrorism in the Euro-Atlantic area have diminished in recent years, following military failures by the so-called Islamic State of Iraq and Syria (ISIS) or Daesh due to the coalition's efforts, the attacks of non-state terrorist actors motivated by religious or political causes remain a major source of danger in both Europe and North America and are manifesting with dramatic results. There are other risks to consider, including illegal mass migration, proliferation of weapons of mass destruction (WMD) and the geopolitical race for resources. Illicit trade of weapons and narcotics, transnational organized crime and piracy also have implications for the Alliance's security.

Against the background of geopolitical competition, other threats and challenges persist, and some become more intense. Such challenges are posed by NATO's „Southern Zone", a term that refers to the extended geographical area of the southern part of the globe, including North Africa and large parts of the Middle East, extending to sub-Saharan Africa and Afghanistan. Although there is great diversity in this region, large parts of the southern neighborhood are characterized by fragility, instability and insecurity. Instability in Libya, Iraq, Syria and Afghanistan continues to generate illegal migration, which is acutely felt throughout Europe, but especially by those allies bordering the Mediterranean.

In the south, the challenge includes the presence of Russia and to a lesser extent China, exploiting regional fragility. Russia has reintroduced itself to the Middle East and the Eastern Mediterranean. In 2015, it intervened in the Syrian civil war and remained there. Russia's policy in the Middle East is likely to exacerbate political tensions and conflicts across the region, as it expands a growing number of political, financial, operational and logistical assets to its partners. China's influence in the Middle East is also growing. It has signed a strategic partnership with Iran, the largest importer of crude oil in Iraq, has been involved in the peace process in Afghanistan and is the largest foreign investor in the region.

Over the next decade, the development of new emerging and disruptive technologies (EDTs) will play an increasing role in the security environment, both in systemic competition and in exacerbating cross-border security threats. Since the founding of NATO, the West has been at the forefront of research and development in critical innovations for stability and security. But China and, to a lesser extent, Russia are now devoting significant and growing resources to this area in an effort to transcend the West, including illicit technology transfer and intellectual property theft, to improve already powerful unconventional tools. New technologies will change the nature of war and allow new forms of hypersonic missile attack and hybrid operations. New technologies play a significant role in space, which has become an operational area for NATO, which will continue to evolve as Russia and China increase their capabilities there. NATO populations expect to be protected from new threats, such as cybernetics and misinformation, and expect their NATO-backed governments to develop tools for attribution and deterrence. Resilience must be found in both society and the state itself.

Climate change is becoming a threat multiplier. It is possible to accelerate the lack of resources and food and water insecurity worldwide. With rising ocean levels and declining landfall in various parts of the globe, migration flows could accelerate to NATO territories. New areas of competition will emerge as glaciers melt and new transport corridors open, such as the North Sea Route, which geopolitical rivals are trying to control and exploit. While some allies seek to reduce carbon emissions, NATO policy needs to continue to adapt, including through the adoption of green technologies.

The COVID-19 crisis has demonstrated, in a dramatic and unexpected way, the detrimental effects that pandemics can have, not only on the public health of NATO citizens, but also on resilience and social security, both by reorienting political attention and limited resources. This crisis has accelerated the digitalization of NATO companies and could reduce defense spending in the coming years.

In this beginning of an emerging decade of renewed systemic rivalry and growing cross-border threats and risks, a functioning and robust NATO will be more important to the security and prosperity of those within the Alliance. No Ally can address all these threats alone. The Alliance needs a common understanding of threats – along with adaptability, creativity, strategy and a desire to share the burden and risk, in order to prepare for future challenges.

In order to adapt to this changing security environment, NATO will need to maintain its

unity and address potential obstacles to collective action. NATO's unity derives from the allies' unwavering common commitment to the common values enshrined in the North Atlantic Treaty: "democracy, individual freedom and the rule of law". The fact that the Allies remain committed to these core values is the most important factor in ensuring the sustainability of the Alliance. A common democratic identity is what distinguishes the Alliance from the main threats and challenges it faces.

As befits a community of sovereign democratic states, NATO has never been able to achieve complete harmony and has gone through periods of tension and divergence. In the past, the Allies have disagreed on interests and values, and there are sometimes tensions within the Alliance. Another key to NATO's success is that it has been resilient to many challenges, as the Allies do not deviate, even under tense conditions, from an inviolable commitment to defend their mutual security. Therefore, alongside a basic platform of common values, there is also the willingness to take collective action.

The last few years have been marked by a number of political challenges faced by NATO allies and periods of unusual turmoil in Western societies. Part of this is the result of the actions caused by the global financial crisis of 2008, which led to a questioning of aspects of the international order. Confidence and trust in democratic and international institutions have declined, along with increased tensions over trade and competition for resources, exacerbated by EDT developments and the spread of misinformation.

Broadly speaking, the confidence of the post-Cold War era – in which it was believed that the spread of democracy and free markets would continue inexorably – was greatly diminished, with the so-called "democratic recession", global erosion of norms and increasing authoritarianism. In some ways, NATO's political role is more like the period before 1989, when it was a bastion of democracy against a provocative, authoritarian environment. Therefore, it is vital that the Allies, even if they are more cautious about the export of democracy, do not allow it to be eroded (intentionally or unintentionally) and change their own policies. While the Alliance is stronger, to reflect a plurality of views and different political structures, any withdrawal from the democratic core of the North Atlantic Treaty will have a corrosive effect on unity, collective defense and security.

The reflection process identified a strong common understanding between national governments, stakeholders and experts on the nature of the strategic environment and threat assessment[2]. However, the way in which those allies assess different threats – and the different emphasis they place on them – is likely to lead to divergences in certain circumstances. As the future security environment becomes increasingly challenging and unpredictable, NATO will need to be even more deliberate and determined than it has been in the past to establish common ground on prioritizing threats. Without a full and honest discussion of these challenges, there is a danger that the difficulties of the security environment will create an opportunity for NATO opponents to encourage division and prevent collective action. However, as seen in the response to the 9/11 attack, the illegal annexation of Crimea in 2014 and the adaptation to hybrid and cyber threats, NATO has a strong track record of strategic adaptation. This tradition must be continued in the coming years[3].

Another potential strain on the Alliance's unity is the extent to which the Allies are prepared to invest their national resources in maintaining defense capabilities, which make NATO an effective guarantor of their security. This political commitment of the Allies to each other is partly symbolized by the commitment agreed at the 2014 Wales Summit for the Allies, with the aim of reaching by 2024 two percent of GDP for defense spending and twenty percent of their annual spending on major new equipment. The promise is an unwavering commitment by each ally to collective defense, and the Allies have made substantial efforts for a more equitable division of tasks since these goals were set. COVID-19 has created serious economic problems that are likely to impact the budget of all allies. However, the security threats that led the Allies to decide to increase defense spending have not disappeared.

In addition to specific national interests or disputes between allies, another development that NATO needs to manage is given by changes in the strategic approach of allies that could lead to divisions. The last ten years have been marked by questions about the United States' commitment to

defending the European continent, the impact of the European Union's development as a security actor on NATO's future, the commitment of European allies to share common defense tasks and the development of deeper political incursions of NATO rivals on Alliance territory.

In order to maintain unity and further strengthen collective action, the Allies must constantly reaffirm and demonstrate, both through action and verbally, their commitment to the political identity and strategic objectives of the Alliance. NATO must remain robust enough to provide a strong platform and withstand a plurality of views and perspectives. The ultimate responsibility for this lies with the allies themselves and their willingness to take advantage of the opportunities for consultation and discussion offered by the Alliance. NATO's political consolidation will leave the Alliance ready for the next decade.

In conclusion to this subchapter, we can say that one of the secrets of the longevity of the North Atlantic Treaty Organization (NATO) was its ability to continuously adapt to the ever-changing external security environment and the needs of its members. This is all the more necessary today in a world that is both more complex and more interconnected. Over the next decade, NATO's ability to adapt and remain relevant for the future will depend on both external and internal factors of cohesion and division. External reasons include the threats and opportunities faced by the alliance and its individual members, the availability of other competent security and defense partners and the degree of compensatory influence of competitors. NATO's internal motives include identity and common values, political cohesion around common interests, the presence or absence of US leadership, the degree of sharing of responsibilities in NATO; and the orientation and cohesion of national governments. Taken together, these factors create centrifugal and centripetal forces that can alternately lead NATO countries to common sense or separate them[4].

NATO's political goal in the 21st century

Managing current and future challenges requires strong cohesion within the North Atlantic Alliance. In order to fulfill its mission, NATO must continue to intentionally update its political paths, means and goals. This reassessment must be in line with past NATO policies; its outlines generally correspond to the two main political dimensions of the Alliance, as identified in the Harmel report[5]: maintaining political solidarity and pursuing long-term stability of the external environment.

NATO will benefit from continuing this effort proactively, rather than expecting a reactive approach to political deficits in times of crisis or even greater uncertainty. In this task, the Alliance would benefit from adopting a long-term perspective and re-embracing NATO's vision of previous decades as a preventive tool for shaping its environment, rather than a tool for crisis management once they have already erupted. This proactive mindset should be seen in the way allies think about strengthening NATO's political role, cohesion and unity, as well as future consultation and decision-making.

The ever-changing strategic environment requires NATO to re-evaluate the way it conceives of its political mission and the tools it needs to sustain its overall goal: ensuring collective defense. The key to NATO's political and strategic credibility is to keep up with a dramatic and fundamentally changing strategic environment. This is all the more important in the context of a paradigm shift in the way allies think about their security. To do this, the Allies will need to continue to adopt a truly strategic mindset that goes beyond risk and crisis management. NATO must maintain a geopolitical perspective and a common vision for NATO's strategy, while improving its ability to understand and manage long-term cross-border threats. Only with this clarifying strategic framework will NATO be able to make full use of its available resources to shape its external environment.

Conclusions

The Reflection Process concludes at an important inflection point in world affairs and Euro-Atlantic relations, in which the future role of NATO is of growing importance to a stable and open international order. The effects of COVID-19 will echo through the decade ahead, exacerbating existing trends, potentially heightening international competition, and causing long-term scarring to the global economy.

While the historical record suggests room for optimism about NATO's long-term future, it also cautions against complacency and self-congratulation. Political adaption is in the lifeblood

of NATO but it is also a baseline requirement of its survival. In 1949, twelve countries established the Alliance: binding post-War Europe to a Western trajectory and cementing the transatlantic bond. Seventy-one years later, twelve have become thirty, standing together to defend the security and prosperity of a billion people.

Throughout this time, NATO has gone through phases of renewal and reorientation, while always delivering its central mission and never deviating from its founding principles. The Alliance has remained strong and resolute at each turn, always challenging itself to be the best it can be. This ability to respond, adapt, and renew its internal bonds has been NATO's hallmark over the last seven decades.

The urgency of this effort is driven by an evolving security environment which has become more challenging and complex in recent years. Alongside the potent threat from Russia, China requires particular attention as its influence and presence grows. Terrorism in all its forms and manifestations remains an immediate threat. More space is being contested physically, as the line between peace and war continues to blur, with disinformation and subversion posing serious challenges to our democracies. Hybrid attacks need new thinking about deterrence and defence, driven in part by new and emerging technologies. Agreeing a shared response to these challenges has at times tested NATO unity, with Allies taking positions that reflect anxieties about their long-term strategic futures.

No single Ally can address these challenges alone. So it is essential that all Allies recommit to the spirit as well as the letter of the Washington Treaty, reaffirm their political commitment to one another, sustain their commitment to democratic values, and glean the benefits that come from the projection of collective strength. As our report describes, NATO needs to enhance its ability to respond to both existing and new threats, from both state and non-state actors, increase its range of political tools to deter adversaries and defend the Alliance in the modern threat environment. The Alliance will maintain the capacity for continual adaptation to reflect changing strategic circumstances.

In our recommendations, we have set out ways in which NATO could respond to emerging technology and hybrid attacks, including by working more effectively with partners. A balance also needs to be found between the vital contribution North America continues to make to the security of Europe, and the increasing share of the burden which European Allies themselves will be taking in the years ahead. This should come together under a new Strategic Concept, which recognizes the progress made and the new challenges since 2010[6] and equips the Alliance to deal with those to come.

In the face of attempts to divide, competing priorities, criticism and intense scrutiny, Allies need to retain their confidence in the durability and vitality of the Alliance, manage differences, rise above disagreements and close their ranks against threats affecting them, as they have for more than seventy years. The peace that most of Europe has enjoyed for the last seven decades is a historical exception, not the rule. NATO remains the guardian of that precious asset. As we submit our recommendations, we have every confidence that NATO will move from reflection to further action, so that it can continue to be the cornerstone of Allies' collective defence and for the preservation of peace and security for decades to come.

NOTES:

1 https://www.csis.org/analysis/nato-futures-three-trajectories, accessed on 12.10.2021.

2 *** *Statement made after the NATO Summit in Brussels*, 14 June 2021, https://www.presidency.ro/ro/media/politica-externa/comunicatul-summitului-nato-de-la-bruxelles-14-iunie-2021, accessed on 20.10.2021.

3 Horațiu Bontea, *NATO – Necesitate sau gloria trecutului*, 17 decembrie 2020, thenewfederalist.eu, accessed on 20.10.2021.

4 https://cepa.org/an-agenda-for-natos-next-generation/, accessed on 15.10.2021.

5 https://monitorulapararii.ro/daca-nato-nu-ar-fi-existat-ar-fi-trebuit-inventat-perioada-razboiului-rece-la-aniversarea-a-70-de-ani-de-la-crearea-aliantei-nord-atlantice-1-12756, accessed on 18.10.2021.

6 NATO, Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organization , adopted by Heads of State and Government at the NATO Summit in Lisbon, 19-20 November 2010, http://www.nato.int/strategic-concept/pdf/Strat_Concept_web_en.pdf.

REFERENCES

*** *Statement made after the NATO Summit in Brussels*, 14 June 2021, https://www.presidency.ro/ro/media/politica-externa/comunicatul-summitului-nato-de-la-bruxelles-14-iunie-2021

[Financial Services - Information Sharing and Analysis Center/ FS-ISAC (2013)], *Evolution and*

Revolution of Cyber Threat Intelligence, http://www.nymissa.org/wpcontent/uploads/2013/02/FSISAC-EVOLUTION-CYBER-THREAT-INTEL-201303020-finalsantized.pdf

[NATO], *Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organization*, adopted by Heads of State and Government at the NATO Summit in Lisbon, 19-20 November 2010, http://www.nato.int/strategic-concept/pdf/Strat_Concept_web_en.pdf

Mureşan Mircea, Văduva Gheorghe, *Viitorul războiului, războiul viitorului*, "Carol I" National Defence University Publishing House, Bucharest, 2005.

Popa Vasile, *Tehnologie şi inteligenţă în conflictele militare*, "Carol I" National Defence University Publishing House, Bucharest, 2004.

http://cert.europa.eu/cert/plainedition/en/cert_about.html

https://cepa.org/an-agenda-for-natos-next-generation/

https://www.csis.org/analysis/nato-futures-three-trajectories

http://www.ccdcoe.org/

https://dnsc.ro/vezi/document/RFC2350-CERT-RO

http://www.nato.int/cps/en/natolive/topics_78170.htm

http://www.insaonline.org

https://monitorulapararii.ro/daca-nato-nu-ar-fi-existat-ar-fi-trebuit-inventat-perioada-razboiului-rece-la-aniversarea-a-70-de-ani-de-la-crearea-aliantei-nord-atlantice-1-12756

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-53

TRANSLATING THE FUNCTIONAL MOVEMENTS OF THE MILITARY INTO SPECIFIC CrossFit TRAINING

Lt.Col.Sup.Instr. George-Florin BĂIȚAN, PhD*

CrossFit is a branded physical training program that is "extensive, general, and comprehensive", including a series of exercises and workouts with increasing intensity, which can be an effective form of exercise for military personnel seeking a various training routine. Based on the biomechanics of the human body translated into functional movements and exercises, which allow the daily tasks to be performed efficiently, constantly varied and performed at a high intensity, CrossFit can also have positive mental and emotional effects, raising the level of certainty of the military in relation to their own abilities, capabilities and judgments. CrossFit means a lot more than just pulling the strings in the gym, it's a great way to get in shape, gain muscle mass or lose weight, and live a healthy lifestyle. The CrossFit community is well known for its close relationships with its members, for promoting patriotism, and for supporting the local community and military veterans, working hard in a variety of ways to uphold these values.

Keywords: CrossFit; physical training; training; military physical education; functional movements; fitness.

Since the founding of the military, physical training has played an important role in preparing the military for battle. However, throughout history, the methods and means used in physical training at the level of military subunits have changed and evolved so that they are prepared for the rigors of modern ground combat. Since the beginning of this millennium, the realities of modern combat have challenged many military leaders, specialists in the field of military physical education, who are part of NATO organizations, to rethink physical training and its relationship with combat training. This thinking has led to a revival of functional fitness programs and their implementation by some NATO armies (Canada, USA, etc.). These have shifted from traditional military physical training, which focuses on endurance training with long-distance running, to functional physical training, which focuses on combat training.

Although different from these programs, the development of the CrossFit physical training program in some countries whose NATO armies took place coincided with the transition of some armies to functional physical training, and today many members of the military use it regularly (in their free time) CrossFit program.

CrossFit is both a high-intensity form of training, which includes basic physical exercises for the development of motor skills (especially strength and endurance), and a competitive sport. Created in 1995 by an American fitness trainer, Greg Glassman, with the stated goal of developing a general fitness and being a means of social inclusion, this type of fitness could best prepare the military for situations in which any unforeseen event involving a physical stress would occur (including the unknown and the unknowable).

In 1995, Greg Glassman opened the first CrossFit affiliated gym in Santa Cruz, California, USA, and in 2001 he presented his fitness program on the Internet[1] and began publishing a monthly journal and holding seminars at a local gym. Since then, CrossFit has grown steadily, now reaching over 15,000 affiliates worldwide. The founder attributed this increase to his fitness program, on the one hand to the launch of his website and, on the other hand, to the onset of the military conflicts in Iraq and Afghanistan. From his perspective, it was at this point that people began to take physical training much more seriously[2]. In addition to its functional military applications, many attribute the popularity of the CrossFit program to its simplicity and variety. Soldiers who are on a mission abroad and are in an austere area have found that the CrossFit program, because it is not based on a lot of equipment or long-distance running and can be performed almost anywhere.

The particular feature of CrossFit is not the specialization of the military in a certain field; instead, hand-to-hand combat with or without

***"Ferdinand I" Military Technical Academy**
e-mail: *baitan_george_florin@yahoo.com*

portable weapons, military pentathlon, sports games, etc., are activities that force the military physical education specialist to deepen some restricted aspects of the field and to create in the military certain characteristic features. The CrossFit method is unique because it focuses on maximizing the effects of the nervous system (in interaction with the endocrine system) on the body, on the development of strength, on Cross-training (a training method that combines elements of strength, cardio-respiratory fitness and body weight exercises), on a constant and functional exercise training and on the development of successful diet strategies.

The concept of CrossFit training

CrossFit is a lifestyle characterized by simple and effective exercise and a healthy diet. "Nutrition can be considered both a positive factor, which can stimulate or increase military performance, and a negative one, which affects the efficiency of military actions. The quality of the food, its availability, as well as the rational planning of the military feeding can contribute to the fulfillment of the objectives of the missions"[3]. CrossFit can be used to achieve any goal, from improving health or losing weight to achieving greater physical performance. The program works for everyone, both beginners and those who have been training for years.

The training concepts of Cross Fit's fitness are based on three standards that are used to determine the level of physical fitness of the military. The first standard refers to the ten general physical abilities and basic motor qualities, such as: strength, speed, cardio-respiratory endurance, mobility, suppleness, strength, coordination, agility, balance and accuracy. According to this standard, it is determined how prepared a military man is, depending on how competent he is in these ten skills. The second standard promotes the idea that the level of physical training is given by the achievement of good performance in a wide range of physical tasks. CrossFit refers to this standard as an "extraction urn". If someone put in a ballot box all the physical tasks that can be imagined, would mix them, and then randomly remove a load from the ballot box, I would measure the level of physical training of a soldier, depending on his ability to perform constantly any of the tasks removed from the ballot box. The third standard is the ability of the military body to perform well on the three metabolic pathways that provide energy for all human activities (catabolic, anabolic and amphibole). According to the latter standard, a military man is just as prepared as these metabolic pathways have the ability to synthesize molecules with the use of energy or to break down complex molecules by releasing energy in the process[4].

In order to achieve the general objectives of CrossFit, during specific military training they are determined to perform constantly functional, varied and high-intensity movements. In general, these movements fall into one of three categories (or modalities): gymnastics, dumbbells (an Olympic sport in which weights are lifted, from the ground to the top of the head) and metabolic conditioning ("cardio"). Metabolic conditioning refers to those dosages of training in which exercise periods alternate with rest periods to provoke a certain response from the body. The body has several different methods of obtaining energy, and this expected response is usually to maximize the efficiency of a particular energy system[5].

In a specific CrossFit workout, a general warm-up is performed first (preparing the body for effort), then a skill or motor quality is developed, and at the end, the "workout of the day" (WOD) is performed[6]. The composition of the WOD varies from day to day, and usually includes a mixture of functional exercises, performed with a high level of intensity over a period of 5 to 20 minutes. CrossFit workouts can be modified to help each soldier achieve their goals and can be tailored to any age group or level of fitness. The key to this training method is the idea that CrossFit is the "sport of fitness", trying to capitalize on the competition, the pleasure of doing sports and the feeling of friendship with the comrades with whom the military shares this experience, by scoring, timing training and defining performance rules and standards.

Another key element of CrossFit training is the spirit of sport and competition. In this sense, most CrossFit gyms use some strategic actions, such as: displaying tables with performance statistics and posting winners on social networks, used rather as motivational factors to increase productivity and satisfaction, than as a reward system. So, if competition motivates you to get better, and the spirit of winning and the desire to win pushes you to push your limits physically, then CrossFit can

prove to be a great way to lead you so as to get fast results.

As with all high-intensity workouts, CrossFit also involves the risk of injury. A study found that about 20% of those who performed specific CrossFit training suffered various sports injuries, mostly fairly mild acute injuries (however, a fairly high percentage for recreational activity)[7]. The factors that led to these injuries were mainly an incorrect exercise technique and a wrong dosage of effort.

When it comes to avoiding trauma, the right form of execution is essential. The most important things to look for in order not to miss the execution technique are: rounding of the lumbar spine (it produces a huge load on the muscles and ligaments in the lumbar area, which are not designed to support it) and an increased translation of the knees forward during exercises, such as kneeling or straightening. As you squat, if your knees move forward over your toes, then the load on your knees becomes huge, and your joint often cannot cope. Most often, both injuries occur due to the fact that the lack of mobility and stability of the hips or ankles is compensated.

All CrossFit exercises are great when they are dosed and performed correctly. Here is a problem with inexperienced coaches who increase the volume and intensity of effort too quickly and cause the military to complete all repetitions of an exercise, even if they have a state of general fatigue (a temporary state of decreased functional potential of the body).

When you first enter a CrossFit workout gym, you may hear some specific words / phrases or see certain acronyms written on a board, the meaning of which should be known before you get engaged in such a program. Here are some of the most common[8]:

- WOD = *Workout of the Day*;
- EMOM = *Every Minute on the Minute*. The challenge is to complete a certain number of repetitions of an exercise in less than a minute. The time remaining after the end of the repetitions and up to 60 seconds is considered to be a break, being intended for the recovery of the body. This is an effective training style, as it requires a lot of effort to achieve a longer recovery time, allowing the military to become creative in training, and thus making it more difficult increasing their level of physical training;
- AMRAP = *As Many Rounds / Reps as Possible*. It consists of going through as many series / repetitions of a certain training sequence or circuit in a certain period of time;
- "Box" = A word that defines a CrossFit fitness room equipped with the bare essentials (materials, equipment, facilities) to perform all WODs;
- "Ladder" = in steps. Word that defines the execution of an exercise in series, in which the number of repetitions increases by one unit each time is performed a new series (continuous increase method);
- "Zone Diet" = the diet that CrossFit promotes, which is based on the basic components of the daily diet, a combination of macronutrients (carbohydrates, fats and proteins). "To reduce excess body fat, the combination of diet and exercise has proven to be the most effective method"[9];
- PR = *Personal Record*. This refers to the time when the best personal performance, recorded for a certain physical exercise is exceeded (for example: performing a certain number of squats in one minute);
- "Hero WOD" = the name of some training given after the names of some heroes / veterans (mostly military) who sacrificed their lives for their country.

Even if the military is not ready to start a classic CrossFit training or the unit does not have a sufficient material base in this regard, there are various elements of CrossFit that can be incorporated into their own training programs. One of these elements is *functional movements*. These are the movements you make in your daily life without realizing it. When performing a basic movement in a workout (such as squatting or lifting a heavy object off the ground), the muscles will be able to move in the same way as when you have to do the same movement in everyday life, thus reducing the risk of injury. Other elements that can be borrowed from the structure of CrossFit workouts are the "EMOM" method (described above) or the "Race against the clock" method. The latter consists of performing as many repetitions of one exercise (or more) over a given period of time[10].

CrossFit in its relationship with the army

Similar to the principles of training in combat disciplines or the instruction to shoot with the equipment provided, the movements performed in

CrossFit training are safe and effective only when performed correctly. This means that the military must first form the skills needed to perform the movements correctly and consistently, and then add intensity when performing those movements (performed with greater or faster weight). Moreover, establishing an effective training plan is as important as achieving effective results. Therefore, it is essential that sports instructors be properly trained in order to establish an effective training program and to develop a correct movement mechanics in the military.

The implementation of a functional fitness program (the basis of CrossFit training) in operational units should be done in three stages, as follows[11]:

- the training of training instructors, who in time will practice and improve their technical training, and the acquisition of the necessary equipment. The selected instructors should be leaders in the units, respected by the other military, and it is not necessary for them to have previous experience in conducting functional physical training programs as long as they are physically fit;
- building credibility by conducting scientific research involving the military within a subunit, in order to highlight the effectiveness of the program. During this time, unit commanders will observe, evaluate, and become accustomed to the idea of functional physical training;
- complete implementation throughout the unit.

Given the common body of sports science that has incorporated both military physical education from the army and the CrossFit community, there are some aspects of the CrossFit methodology that the military could adopt to modify, refine, or correct assessment tests of military personnel and, more importantly, to contribute to a long-awaited review of the concept of military training.

The challenge of assessing the level of physical training of military personnel (abbreviated: TEN. PF.PM) in the Romanian Army is to find a way to persuade the military not to train (sometimes exaggeratedly) only for the specific movements required by the test. Physical training sessions usually consist of performing only the exercises (push-ups, sit-ups and endurance running) that will be assessed during the test. Being one of the shortcomings of the current TEN.PF.PM, the army has to approach new and varied training strategies to prevent the military from doing the same motor actions, identical to the set of movements or actions produced by the body within TEN.PF.PM.

CrossFit contains numerous verification tests that assess all forms of manifestation of basic motor skills, as well as the degree of mastery of many motor skills. CrossFit is based on a constantly changing training strategy, with an emphasis on providing an effective stimulus for each set of exercises and the possibility of recovery after training, which results in significant increases in fitness. Daily workouts are almost always different, but they include the basic movements and key components of the physical training needed to develop all the basic motor skills. Simply put, improving performance in every move does not just mean doing that move over and over again. The increase of sports performance, which is obtained in the three tests within TEN.PF.PM, involves the improvement of all body systems that are involved in performing those physical activities.

The second aspect concerns centralized programming. In the army, specialists in the field prepare specialized documents for planning and conducting military physical education sessions. They are based on documents developed by the central structure of this field within the Ministry of National Defence (the concept of physical education in the army, military physical education regulations, sports calendar, etc.), as well as their education, training and personal experience. In a brigade, the physical training of the military in each subordinate unit can vary greatly depending on the guidance of the unit's specialist.

Instead, CrossFit involves centralized programming. In most affiliated gyms, each work group over the course of a day will perform exactly the same training program (including warm-up and return-to-body sequences). This daily program is usually designed by an experienced coach who has the highest level of skills and knowledge (CrossFit certificate – level 4), based on key programming methods built around general physical training. There are also numerous websites and blogs through which CrossFit affiliates can conduct daily, weekly, and monthly training programs[12].

In the army, when all the soldiers in a unit would do the same type of training, this would reduce the obligations of those who lead the military physical education activity and allow them to focus more on

conducting a series of exercises. Also, by doing the same standardized training, at the end of the program, all soldiers will achieve the goals set regardless of their level of physical training. Achieving optimal performance and improving the workplace is the key to reaching this point, but training itself can also help keep all military personnel focused on the same desired stimulus. Probably, not every unit has an experienced specialist (teacher, instructor, coach, etc.) who will effectively lead all military physical education activities, so centralized programming should be an important component in building a strong sports culture and consistent throughout the army.

The third aspect that could be adopted by CrossFit is the preparation of daily training programs structured on levels, depending on the performance achieved, which also have a competitive character. In most CrossFit gyms there is a large board on which a single workout is written (the one that will be done by all groups on that day), along with which will be displayed a ranking of the performance obtained by all those who have training has already taken place that day.

Intensity is the key to improving performance, and varying the intensity of effort is the key to better fitness. On some days the body's demand is high, while on others it is moderate or low, but when you compete against your teammates or to establish a high performance (personal or in the group), you will be more motivated than usually, which will increase the duration and intensity of the effort in training, producing better performance and an increase in resistance to physical exertion.

Competition is a vital component of success in military training. In a CrossFit gym, you compete against the clock, against your own previous performance, against the results written on the board, and against your teammates. Incorporating these aspects into military physical education through the organization and intentional management of serious competition can greatly increase individual and team physical performance. In this sense, the placement of a blackboard in a subunit and the conduct of daily competitions (individual and team), will allow the military, by making physical efforts, to demonstrate their qualities of being remarkable or extremely good.

In relation to the performance obtained, a simple rule must always be followed, according to which the military constantly needs a judge who is impartial and who motivates them to follow the results achieved. TEN.PF.PM is administered only once every six months, which, in order to improve performance, it is an activity (in which competition intervenes or may interfere) that is very rare. Therefore, the integration of regular sports competitions in the military training program, to be run between the two annual TEN.PF.PM, will lead to an improvement in their level of physical training.

One last aspect noticed at CrossFit is its center of gravity, namely the body of trained and certified instructors who lead the activity. Having an experienced coach and a low ratio of instructor to number of participants is ideal in any physical education activity. A small number of participants will allow teachers to have easier-to-manage tasks and more time to work with them individually, involving them more in various physical activities, which may not be feasible in a larger group. It takes time to develop the skills to lead a group effectively.

From a logistical point of view, specialists in the field should be able to train everyone effectively and safely. They must explain the technique of performing the movements, offer each individual an option adapted to his level of physical training and impose those methods, so that there is no risk of unnecessary injuries. This can be done effectively with a larger group of participants, but to do this, you need an experienced coach who has the right knowledge and communication skills. In this regard, CrossFit is based on a multi-skill training and certification program for instructors.

In addition to officers licensed in military physical education, the military also relies on sub-unit sports instructors who have varying levels of experience in the field to conduct physical training activities. The Army organizes annually, through the *Center for the Training of Military Personnel in Physical Education and Sports in the Army (CPCMDEFSA)*[13] specialization courses with military physical education officials / instructors (for petty officers, non-commissioned officers and soldiers/volunteer ranks), in order to place certified coaches, "from the company level to the central management / educational structure level, with attributions that require different levels of competence" [14], so that they can lead the general

program of physical training of the military within the subunit. In one of his papers, Professor Alin-Dumitru Pelmuș made a comparison between the training of specialists in physical training in the Romanian Army with their training systems in some NATO member armies, concluding that "this way of training the so-called specialist it has serious repercussions on the system and does not fit into the NATO military"[15].

Conclusions

The principles of CrossFit are designed to help the military perform daily movements with greater strength and stability. The unique training helps to avoid boredom and creates an attachment behavior of the military that come to love the training sessions. It offers an excellent alternative to traditional training processes and can help the military to overcome the training plateau, thanks to the use of various movements and the use of high intensity. It is a fascinating approach to the concept of training and all soldiers should try it at least once.

CrossFit training develops a developed mental tenacity in the military to effectively deal with stressors, challenges and pressure (regardless of the prevailing circumstances), an ability to overcome exhaustion in a variety of high-intensity workouts that make up most of the systematic CrossFit training processes. Training hard and not giving up develops a form of mental toughness and endurance that fits perfectly into the character of the fighter.

Performing physical activity in the military with the mentality of being competitive, either fighting for the first time against the clock or against other comrades, or to get the best personal physical performance or prizes, is a beneficial thing. Also, being a person who comes quickly to help teammates or other members of the military is a moral trait rooted in CrossFit group training programs. There is nothing wrong with training to be competitive, and being a good team player with colleagues is a necessity for all military personnel.

There is an orientation among the military to want to train, using different means of physical education, to discover the most effective and appropriate training method. Most soldiers want to do everything, not just run the same distance or just do the same push-ups or sit-ups. CrossFit, one of the biggest fitness trends in recent years, with phenomenal success in promoting the idea of functional full body fitness, allows the military to educate their motor skills and abilities without diminishing the idea of progress, challenge and competition. For the military who practice performance sports or for those who excel in a particular sport, CrossFit can be a solid foundation of general training. The image of CrossFit is that of high-intensity workouts, and it is true that it is not ideal for the weakest in terms of fitness or for those who want to just run lightly and sweat as much as possible less.

Of course, the military does not have to become the largest affiliate of CrossFit in the world, but there are certain means, principles, and methods that the CrossFit community uses to accomplish its goals and that military physical education would could easily take over and integrate into the physical training of the military. This would improve the path that the army has already started by introducing the new concept of physical education and sports in the Romanian Army, building a stronger, better and more physically fit army.

NOTES:

1 http://CrossFit.com, accessed on 07.11.2021.

2 B. Mitchell, "CrossFit workout craze sweeps the Corps", *Marine Corps Times*, June 22, 2008, p. 12.

3 G.C. Ciapa, *Guidelines and opportunities for physical training of the military*, "Carol I" National Defence University Publishing House, Bucharest, 2019, p. 79.

4 https://ro.hrvwiki.net/wiki/Metabolic_pathway#Major_metabolic_pathways, accessed on 07.11.2021.

5 https://www.mensjournal.com/health-fitness/metabolic-conditioning-the-key-to-better-performance, accessed on 07.11.2021.

6 In English: "Workout of the Day", abbreviated WOD.

7 https://journals.sagepub.com/doi/full/10.1177/2325967114531177, accessed on 08.11.2021.

8 https://www.nbcnews.com/better/lifestyle/what-crossfit-it-right-you-here-s-what-you-need-ncna1070886, accessed on 08.11.2021.

9 I. Andrei, *The importance of physical training in the process of military training*, "Carol I" National Defence University Publishing House, Bucharest, 2015, p. 24.

10 http://fitworkshop.com/what-is-crossfit, accessed on 11.11.2021.

11 https://garagegympower.com/crossfit-beginners-guide, accessed on 11.11.2021.

12 https://blog.feedspot.com/crossfit_blogs, accessed on 10.11.2021.

13 https://unap.ro/index.php/ro/facultati-si-departamente/centrul-de-pregatire-a-cadrelor-militare-in-domeniul-educatiei-fizice-si-sportului-in-armata, accessed on 12.11.2021.

14 A.D. Pelmuș, *Military physical education – past, present and perspective*, "Carol I" National Defence University Publishing House, Bucharest, 2019, p. 69.

15 *Ibidem*, p. 70.

REFERENCES

*** *Military Physical Education Regulations*, Publishing House of the Technical-Editorial Center of the Army, Bucharest, 2013.

Andrei I., *The importance of physical training in the process of military training*, "Carol I" National Defence University Publishing House, Bucharest, 2015.

Băițan G.F., *Admission to military educational institutions from the Ministry of National Defence – sports tests,* "Carol I" National Defence University Publishing House, Bucharest, 2020.

Ciapa G.C., *Guidelines and opportunities for physical training of the military*, "Carol I" National Defence University Publishing House, Bucharest, 2019.

Gale C., *1600 Wods – 7 years of tried and tested functional fitness programming*, Lulu.com, Paperback, 2020.

Madden R., *CrossFit: Military CrossFit Workouts for Beginners – Strength and Endurance Training*, Kindle Edition, 2016.

Mitchell B., "CrossFit workout craze sweeps the Corps", *Marine Corps Times*, June 22, 2008.

Pelmuș A.D., *Military physical education – past, present and perspective*, "Carol I" National Defence University Publishing House, Bucharest, 2019.

Wayne V., *CrossFit:The Beginner's Guide: Exercises and Techniques to lose Weight and Gain Ultimate Strength*, Kindle Edition, 2016.

Williams Tj., *Cross Training: 1,000 WOD's To Make You Fitter, Faster, Stronger*, Createspace Independent Publishing Platform, Scotts Valley, California, US, 2015.

https://ro.hrvwiki.net/wiki/Metabolic_pathway#Major_metabolic_pathways

https://www.mensjournal.com/health-fitness/metabolic-conditioning-the-key-to-better-performance

https://journals.sagepub.com/doi/full/10.1177/2325967114531177

https://www.nbcnews.com/better/lifestyle/what-crossfit-it-right-you-here-s-what-you-need-ncna1070886

http://fitworkshop.com/what-is-crossfit

https://garagegympower.com/crossfit-beginners-guide

https://blog.feedspot.com/crossfit_blogs

https://unap.ro/index.php/ro/facultati-si-departamente/centrul-de-pregatire-a-cadrelor-militare-in-domeniul-educatiei-fizice-si-sportului-in-armata

http://CrossFit.com

https://www.nbcnews.com/better/lifestyle/what-crossfit-it-right-you-here-s-what-you-need-ncna1070886

Bulletin of "Carol I" National Defence University
10.53477/2284-9378-21-54

PLYOMETRICS AND CALISTHENICS – PHYSICAL TRAINING METHODS SPECIFIC TO THE PHYSICAL TRAINING OF THE MILITARY

Lt.Col.Sup.Instr. George-Florin BĂIŢAN, PhD*

The physical training of the military must be extremely hard, as it is a support for military training programs. Moreover, he must prepare the military to deal with any situation they may encounter on the battlefield: from climbing a 3-meter-high wall under enemy fire to running on the varied ground, with a 30 kg backpack and individual weapons in his hands. In addition, maintaining or improving the physical performance of professional military personnel in various military settings is crucial to general military training. When we start a military-specific training program, we are confident that we are on the fastest track to serious results. The military will become stronger, with great physical strength, having a robust and harmonious physical constitution. In this article, we will briefly present two of the physical training methods specific to military training (plyometrics and calisthenics), which military physical education specialists should use on a permanent basis, so that fighters reach a higher level of physical training.

Keywords: plyometrics; calisthenics; physical trening; trening; military physical education; physical exercises.

Pliometry is a term that is not found in the Explanatory Dictionary of the Romanian language, but it is widely used among professional athletes or fitness enthusiasts. Although the term plyometrics is relatively new, the basics are old. It comes from the English word "plyometrics"[1] coined in 1975 by athletics coach Fred Wilt, after he noticed Soviet athletes performing a warm-up program consisting of various types of jumps at a competition, in the end winning numerous medals for that competition. Collaborating with biomechanics expert Dr. Michael Yessis and translating from Russian the research of Professor Yuri Verhoshansky[2] (considered the inventor of plyometrics training, the Russian researcher was a prominent figure in explosive force training and one of the greatest experts in sports training theory), whose ideas were later implemented and expanded), the two Americans introduced this concept to the United States to pass this information to American coaches[3].

Calisthenics is a method of physical training that uses gravitational force and body weight to increase the level of physical training of the military. The term "calisthenics" comes from the Greek words "kalos" which translates to beauty (to emphasize the aesthetic pleasure that derives from the perfection of the human body, the beauty of the moving body) and "stenos", which expresses strength, mental strength, courage and determination. It is the art of using body weight as a resistance to physical development.

For hundreds of years, calisthenics has been the main way people improve and maintain their fitness. Even though the term has been used since antiquity to describe one of the methods of maintaining health or was used as the main source of physical training of soldiers, and later (in the nineteenth century) included in various courses/ educational programs Women's gymnastics or a branch of gymnastics, the first calisthenics programs appeared in the 1960s in the Canadian Air Force, helping to launch the modern fitness culture.

During military physical education sessions held in military units, field professionals often conduct calisthenics with military subunits as a method of synchronized physical training to increase group cohesion and educate the military in the spirit of discipline. In addition, two of the calisthenics exercises (floats and abs) are used as assessment tests in the mid-year checks on the level of physical training of military personnel.

*"Ferdinand I" Military Technical Academy
e-mail: *baitan_george_florin@yahoo.com*

Plyometrics – jump training

The concrete definition of plyometrics is a movement performed quickly and forcefully, which involves a pre-stretching of the muscle, thus activating its stretching-shortening mechanism.

Plyometrics training, abbreviated as "plyometrics", is a form of training that often requires the military to jump. This is why plyometrics is often referred to as jump training (or "shock training"), as much of the plyometrics exercises are based on the jumping technique (for example: bending kneeling, rope jumping, jumping back to 180^0, platform jumping, "burpees" exercise, etc.). It is a technique that can be practiced in many ways, so it is important to remember that plyometrics does not only mean jumping, but also includes activities that require explosive movements (for example: throwing the medicine ball, sprints, various types of floats, etc.).

Plyometrics exercises are those that allow the muscles to perform and develop intense and fast movements, in the shortest possible time, with the greatest power and strength. After performing a jump, the muscles are stressed each time they touch the ground, which gives the next jump even more strength. This combination of stretching and shortening/contracting the muscles leads to a better toning of the body. This cycle causes the muscle to initially stretch (eccentric activation) and then contract (concentric activation). The movements that follow this pattern cause the muscles to contract, involving a much greater force and power.[4]

Included in military training programs and performed systematically, plyometrics exercises improve their physical performance, but in addition, they have many other benefits, as they:

• *increase the agility of the body*. We refer to the ease with which the military performs the movements and their ability to move quickly, due to the fact that the plyometrics exercises train the main muscles of the lower limbs, generating an explosiveness that determines the performance of a specific movement. On the battlefield, agility makes the difference between a fall or just a simple stumbling block or imbalance;

• *improve cardiovascular health*. Physical workouts that contain plyometrics exercises are considered cardio workouts because all the major muscle groups in the body are required. This, together with the diversification of the intensity and speed of the execution of each movement, causes a heart rate similar to that during running or rowing;

• *develops proprioception*. Proprioception is an important component of balance, coordination and agility, and is necessary for the safe performance of plyometrics exercises. This refers to the orientation of the body and the movements of the military in space, in relation to other objects around, the ability of the muscles to contract and relax to stabilize the body according to the given situation. With this well-established and trained connection, the military gains better stability and control over its own corps. By including plyometrics exercises in the military training program, they will learn how to move more efficiently, develop a better awareness of where they are, while improving their reaction speed;[5]

• *diversify training,* when developing a training routine. The body's body quickly adapts to the stress and stimuli to which it is subjected, and if its challenge is not continued in new ways, then the physical performance will become static and unchanging. The introduction of these new plyometrics exercises is excellent because it manages to keep the mind and body occupied in a state of agility;

• *increases the anabolic effect*, which consists of increasing muscle mass and strength. The introduction of plyometrics exercises in the weekly military training program, when muscle growth has slowed down and regular strength training does not bring the expected results, will help to overcome the stagnation caused by the adaptation of the body, because the explosive load will slightly affect muscle growth. The muscles will be more toned, the strength of the whole body will improve, and the muscle mass will increase. At the same time, it is not recommended to do these plyometrics exercises every day, because after a session of explosive movements, the muscles of the body need a break to recover[6];

• *prevent the occurrence of some forms of injury*. By constantly practicing such exercises, the body will learn to respond to different levels of impact. Given that repeated jumps will have a continuous impact on the joints, we must keep in mind the principle of progressivity and use appropriate sports shoes that cushion the impact with the ground (so that the ankles and knees suffer less). The muscles of the military will develop, the

strength and elasticity of the tendons and ligaments will increase, which will reduce the likelihood of injuries during military actions (muscle strains or ruptures, micro trauma or trauma to the ligaments and tendons);

• *promotes rapid weight loss*. Plyometrics exercises activate almost all muscle groups, being very intense and requiring high energy consumption (burning a large amount of calories in a workout), so it is an excellent tool for weight loss and muscle mass definition. Pliometric workouts are considered to be the most effective way to burn fat in the lower torso and lower limbs (for the upper body, exercise should be used using the medicine ball);

• *improve balance and coordination*, if the exercises are performed with good concentration and attention. At first, these exercises may seem difficult to the military, but by working constantly, they will become much easier to do, and the movements will become more efficient and agile, at which point, under the guidance of a military physical education specialist, it is recommended to gradually increase the number of repetitions;

• *allow training without the need for additional equipment*. Pliometric exercises are an excellent, but also fun, alternative to weight training. In order to perform plyometrics exercises, the military only need their own body weight and a free space in which they can move. Using minimal equipment, a truly effective plyometrics workout can be done anywhere in just 15-30 minutes (including at home), which is perfect when time is running out. After a while, various weights or a stepped platform can be used to perform the jumps, but at the beginning, for most plyometrics exercises, the equipment is not necessary.

These exercises are not recommended for the military that have a low level of physical training or are in the recovery period after suffering an injury, because their execution requires a certain level of coordination, balance and strength. The reason why plyometrics exercises are quite popular among the military is that they allow a muscle to reach its maximum strength in a very short time.

The extremely wide range of plyometrics exercises includes any motor action that includes jumping and dynamism. We will further present the most used plyometrics exercises by military physical education specialists, which do not require the use of expensive equipment and which we often see in gyms. These are[7]:

• squats: with side jump, with one leg raised, front with shoulder thrust, using two weights kettle bell / Olympic bar, with dumbbell resting on shoulders;

• lunges: lateral, forward with jump, walking with dumbbells, back from deficit;

• „Burpees" (an exercise that includes a push-up, a jump from a supine position with a palm rest in a squat and a jump with the arms up);

• plyometrics push-ups (with jump) with the detachment of the palms from the ground. They can also be performed with a slap in the face;

• jumping on the spot: like a "ball", in one leg, from one foot to the other, from one foot with landing on both legs, with the knees raised to the chest (simultaneously/alternately), with the legs swinging back by touching the buttocks with the heels (simultaneously/unilaterally), with shears (also known as "Jumping Jacks" – from the standing position – jumping far to the side with the arms raised side by side – returning to the initial position), with the bar in the back, with the rope;

• the „Plank Jumping Jacks" exercise – from the supine position with palm/forearm support (flat position) – moving the legs apart and closer by jumping;

• jumps from the spot: landing on an aerobic stepper or a box, in height from a squatting position, touching higher objects (head, hand or foot), sideways over certain obstacles or various platforms;

• long jumps from the ground: in linear depth, with landing in the sand pit or on mattresses, landing after signs drawn on the ground, over low obstacles (fences), of the "hopscotch type" (using materials such as: circles, stairs or even drawing on the ground certain geometric figures), swinging a medicine ball with both hands, preceded by a jump down from a box, preceded by a jump back;

• jumping on the steps of the stairs on both legs or in one leg (on each step, in two steps, etc.) or short sprints on an inclined plane;

• zigzag side jumps from one leg to the other;

• jumping on a sitting platform (box, crate) with a dumbbell on the chest (difficult exercise, not recommended for beginners, because it requires good physical condition, mobility and coordination).

As can be seen from these examples of plyometrics exercises, all this requires knowledge

of the technique of performing all phases of a jump, especially landing (shock damping in contact with the ground by the mechanism of triple flexion). Being more intense, these types of movements will increase the heart rate, which means that more calories will be burned, thus obtaining a more efficient cardiovascular training.

The main purpose of plyometrics training is to increase the excitability of neurological receptors for improved reactivity of the neuromuscular system. A plyometrics exercise consists of three phases, which are the basic mechanism of plyometrics training, as follows[8]:

- the eccentric phase (landing phase) which involves the preloading (energy is stored) of the agonist muscle groups. The maximum force that a muscle can develop is reached during a rapid eccentric contraction;
- the damping phase (transition phase) is represented by the time elapsed between the two phases (eccentric and concentric). This time must be as short as possible, so that the energy stored during the eccentric phase is dissipated as little as possible so as not to reduce the plyometrics effect;
- the concentric phase (take-off phase) uses the stored energy to increase the force of the movement. When a concentric isotonic contraction occurs (involves shortening the length of the muscle) immediately after an eccentric (or negative, isotonic contraction in the muscle, it elongates, bringing it back to its starting position), then the force generated can increase dramatically.

These plyometrics exercises can be integrated in a lot of ways in the content of training programs for the development of strength in the military or you can create a circuit (or a classic training Tabata) consisting only of plyometrics exercises, depending on the training objectives and the level of physical training of the military. The basis of this training method (shock method) is the principle of progression and the rule of patience, because the plyometrics exercises must be performed for a longer time until the expected results are seen[9]. It is important that the plyometrics exercises that are performed are as close as possible to the movements that the military could make on the battlefield, in order to considerably increase strength and performance.

These plyometrics exercises can be integrated in a lot of ways in the content of training programs for the development of strength in the military or you can create a circuit (or a classic training Tabata) consisting only of plyometrics exercises, depending on the training objectives and the level of physical training of the military. The basis of this training method (shock method) is the principle of progression and the rule of patience, because the plyometrics exercises must be performed for a longer time until the expected results are seen. It is important that the plyometrics exercises that are performed are as close as possible to the movements that the military could make on the battlefield, in order to considerably increase strength and performance.

Weight training and plyometrics exercises can be combined into complex training sessions to develop explosive power. Pliometry can be combined with strength training (never with aerobic / cardio training), as it consists of mostly anaerobic exercises, as are strength exercises[10]. Before starting a plyometrics program, as a precondition, it is recommended that Klatt tests[11] be administered to the military in order to initially assess the degree of balance and stability of the jump. Tests include basic plyometrics movements, so if these cannot be performed, it can be assumed that the military is not yet physically prepared to complete a plyometrics program.

Calisthenics – body weight training

In the beginning, calisthenics was a way to promote the normal physical and physiological state of a healthy body, but over time, it has evolved into a training method that has many aspects in common with gymnastics. In contrast, calisthenics can be practiced outdoors (anywhere, anytime), and is also known as "street trening". It is one of the few ways in which you can build muscle mass and develop physical strength without using weights.

A good thing about calisthenics is that you do not need the latest equipment to start a specific workout. Most of the equipment needed is in almost all military units, namely: a fixed bar and two parallel bars. Over time, in order to diversify your exercise and move to an advanced level, you can buy some elastic bands for fitness (on different levels of endurance) and a set of gymnastic rings designed for cross-training.

The principles of calisthenics evolved greatly in the nineteenth century, based on studies in

the fields of physiology, anatomy and classical mechanics, and the greatest influences for performing a calisthenics physical training came from the Swedish method of gymnastics. It was divided into four parts (pedagogical and educational gymnastics, medical and orthopedic gymnastics, aesthetic gymnastics and military gymnastics) and had very similar objectives to calisthenics, created in order to be accessible to all people, to improve health and to develop harmonious body. The following principles have been adopted to structure the calisthenics[12]:

• *the principle of selection* – refers to the fact that the exercises must be chosen carefully, and the series of exercises performed must not only be a group of repetitions performed one after the other, but also to develop in the military the ability to know notions related to health education; prevention, recreation or the environment, natural and social;

• *the principle of precision* – implies that the exercises must be performed perfectly according to the instructions, after receiving the best explanations regarding the correct execution technique, in order to achieve the agility and suppleness proposed by the calisthenics;

• *the principle of totality* – is highlighted in the daily calisthenics training program, which is designed to produce a general effect on both large muscle mass and to educate elegance / balance in motion and correct posture (essential for good health);

• *the principle of progression* – refers to the intensity of the effort which must be increased gradually, both by the number of exercises performed and by the increase in the speed of execution and the complexity of each exercise, while avoiding the occurrence of excessive overload;

• *the principle of adaptation* – which will take into account the age, sex and specialty of the military.

A study conducted in 2017 at an Italian university for research in the sciences of sport and exercise found that calisthenics training is an effective training solution to improve strength, posture and body mass, without using major equipment training[13].

The choice of the best calisthenics exercises that the military can perform depends primarily on their level of experience. Beginners will need to start with the basics, and those who have been training for some time can move on to more complex and challenging calisthenics exercises. The most well-known and most frequently performed calisthenics exercises (each with different execution variants) are: push-ups, crunches, squats, "Burpees", forward bends, "Plank", rope jumps, rope lifts, "Jumping Jacks", traction at the fixed bar, floating at the parallel bars, standing on the hands, lumbar hyperextension, lifting the legs from the supine position, climbing by turning / straightening at the fixed bar, hanging on the fixed bar with the body parallel to the ground, with "Front/Back lever", from the ring support position – shift to the square position – hold and return, "Beep" endurance test, etc.

Collaborative calisthenics refers to those calisthenics exercises that involve two or more soldiers helping each other to perform a motor action. Such physical exercises are also known as partner exercises, consisting of transporting the partner or performing movements that are hampered by the weight or resistance of the partner, being used as a way to develop motor skills. A disadvantage of such exercises is that the resistance of the partner is difficult to measure compared to the multifunctional equipment in the gyms, but on the other hand, they can be just as easily performed outdoors or in a gym and are versatile enough to allow them to be used for other training purposes than simply strength training.

By practicing calisthenics, after a while you will reach a maximum point of muscle growth, because the muscle mass comes from the progressive resistance offered by your own body weight. In order to increase the percentage of body weight that needs to be lifted, creativity is needed in terms of the progressive increase of the difficulty, duration and intensity of the exercises.

Calisthenics is the perfect way to functionally train movement, as most calisthenics exercises are compound muscle movements, which means that several muscle groups work at the same time. Functional training involves training in a way that directly improves the way daily tasks or physical requirements specific to the battlefield are to be fulfilled (*Train as you will fight!*). With these functional movements, the military becomes stronger and more flexible, loses weight and gets optimal fitness in the most natural way possible, without affecting their joints through gyms.

When performed incorrectly or too often, absolute strength training ("refers to the greatest force that the neuromuscular system can generate in the body through maximum voluntary contraction"[14]), in which too much weight is used, can create some imbalances that they will put extra stress on the tendons and ligaments. On the other hand, calisthenics develops physical strength only in proportion to the military system of the military, with its authentic and natural movements, significantly reducing this risk of injury that may occur. The beauty of body weight exercises is that the overall risk of injury is low and your workouts are safer.

Calisthenics training develops those fine motor skills that require the body and brain to work hard, thus improving the connection between the brain and the body. Almost all forms of manifestation of basic motor qualities are educated at a high level in a body trained in the art of calisthenics. "The development of strength programs, based on exercises considered calisthenics (…) can lead to improved military effort capacity, as well as the development of physical skills necessary for situations during missions – patrol with heavy equipment, climbing with combat equipment, equipped swimming, transporting the wounded"[15].

Due to its complexity, the field of physical education seems to be full of trends and methodological guidelines, as well as advice on revising the diet or restoring the capacity for effort. All of these issues can cause confusion among military physical education specialists. Very similar and often confused with each other, calisthenics and plyometrics are two popular methods of physical training specific to the physical training of the military. However, there are differences between them and it is beneficial to understand what they are, in order to be able to choose the type that best suits the proposed objectives.

Calisthenics and plyometrics are performed without any equipment and only body weight is used. The difference between them is defined by the action of one object that comes in contact with the other, by the "impact" of the body with the objects in the environment (floor, facilities and sports equipment, etc.). Calisthenics has a low impact and focuses on the basic movements for strength development. Pliometry is one step above it; it has a high impact by incorporating these basic movements with training to improve jumping and increase agility. At the beginning, you need to prepare using the calisthenics exercises and once you feel comfortable, you will start to add jumps and fast movements.

Calisthenics are basic and build a solid foundation for more advanced exercises. At this level, learning the correct form of execution and developing strength are the main goals for a general physical training. If the military is a beginner, if they are recovering from an injury, or if they are returning to training after a longer break, then it is ideal to begin physical training at this point. Also, knowing how to perform basic exercises correctly helps prevent injuries and severe pain caused by damage to muscle fibers (muscle fever).

Pliometry is the building block of physical training that adds to the calisthenics, making it more challenging and interesting to do basic exercises. A calisthenics exercise, such as knee bends, can be transformed into a plyometrics one by adding a jump, and turning it into a jump knee. Once calisthenics is mastered, advanced pliometric movements can be performed, thus obtaining a much better defined training, because pliometry has the additional advantage of supporting the proper functioning of the cardiovascular system.

Finally, plyometrics is about jumps and explosive movements that consume a lot of energy, and calisthenics focuses on the technique of performing basic movements. Therefore, it is advisable to start with calisthenics exercises and gradually incorporate plyometrics movements, in order to quickly gain strength and endurance.

Conclusions

Being in the military often means staying away from the peace and security of your home, and most of the time, you do not have access to all the facilities that a fitness room or gym has. Despite the fact that they work in inhospitable places, the military must be and stay in shape at all times. The performance of plyometrics and calisthenics exercises is not conditioned by the possession of any equipment (these can be performed anywhere and anytime), which makes them ideal for their inclusion in the physical training programs of military personnel.

The calisthenics training fits perfectly with the daily activities carried out by the military on the training ground. In this situation, it is not just about

using body weight to develop motor skills and increase physical fitness, but also to teach the military how to be more agile, coordinated and balanced in their movements, physical skills which, will certainly, be needed in concrete combat situations.

Pliometric training provides modern methods and means of developing the motor skills of the military. Punctual knowledge of plyometrics, understanding how plyometrics movements should be performed correctly, and compliance with safety measures while performing plyometrics exercises will increase the level of physical training in the military. Pliometric exercises are an excellent way to improve the athletic performance of the military and their level of physical training by developing basic motor skills (strength, speed, flexibility). Such a plyometrics workout (which aims to reduce the gap between strength and power) can be a real plus for any fitness program, if it is performed correctly and is focused on technique and accuracy. It is obvious that pliometric training offers significant benefits to the military, as most of the movements they perform, to be successful during military action, are based on fast and strong movements.

A favorable result obtained due to performing a physical training specific to the physical training of the military, in which the methods of plyometrics and / or calisthenics are used, is to provide a space for them to develop their thinking skills and feel free to shares his/her personal beliefs and opinions with the rest of the comrades, as well as with the military physical education specialist who leads the activity. While the military is famous for indoctrinating troops to remain disciplined and obedient and simply carry out orders, I believe that both orders issued and responses to them should always be well thought out and contribute to the objectives specific to the military system.

The two methods of training (plyometrics and calisthenics) should not be considered as goals in themselves, but as part of a general program of physical training (in addition to the development of motor skills, recovery after exercise and adequate nutrition). Soldiers who possess adequate levels of physical qualities will perform more successfully pliometric and calisthenics exercises. In addition, combining these types of exercises with others allows the military to optimize performance, regardless of the physical requirements they are subjected to or the activity they have to perform.

NOTES:

1 *Plyo* – comes from the Greek word plythein, which means "to increase" (Plio in Greek means "more"), and metric literally means "to measure".

2 http://www.verkhoshansky.com/CVBibliography/tabid/71/Default.aspx, accessed on 21.10.2021.

3 F. Wilt, M. Yessis, *Soviet Theory Technique and Training for Running & Hurdling*, Championship Books, Publisher: Stoyles Graphic Services, 1984, p. 92.

4 https://tiptar.com/ro/what-are-plyometrics-and-how-to-include-them-in-your-routine, accessed on 22.10.2021.

5 https://proteic.ro/exercitii-pliometrice, accessed on 23.10.2021.

6 https://ro.healthy-food-near-me.com/plyometric-training-the-pros-and-cons-exercises-training-program, accessed on 23.10.2021.

7 G.F. Băiţan, *Admission to military educational institutions from the Ministry of National Defence – sports tests*, "Carol I" National Defence University Publishing House, Bucharest, 2020, p. 31.

8 https://www-brianmac-co-uk.translate.goog/plymo.htm?_x_tr_sl=en&_x_tr_tl=ro&_x_tr_hl=ro&_x_tr_pto=nui,sc, accessed on 24.10.2021.

9 T.O. Bompa, C.A. Buzzichelli, *Periodization: Theory and methodology of training*, Lifestyle Publishing, Bucharest, 2021, p. 152.

10 https://www.abc.es/bienestar/fitness/abci-pliometria-202006110754_noticia.html, accessed on 23.10.2021.

11 https://enterprisefitnessacademy.com/eclass-2-klatt-test-assessment, accessed on 24.10.2021.

12 https://blogeducacaofisica.com.br/guia-definitivo-calistenia/, accessed on 26.10.2021.

13 https://www.researchgate.net/publication/317321468_The_effects_of_a_calisthenics_training_intervention_on_ posture_strength_and_body_composition, accessed on 25.10.2021.

14 M.C. Istrate, "Force – motor quality with decisive impact on military activity", *Bulletin of "Carol I" National Defence University*, no. 3, Bucharest, 2020, p. 208.

15 G.C. Ciapa, *Guidelines and opportunities for physical training of the military*, "Carol I" National Defence University Publishing House, Bucharest, 2019, p. 54.

REFERENCES

*** *Military Physical Education Regulations*, Technical-Editorial Center of the Army Publishing House, Bucharest, 2013.

Băiţan G.F., *Admission to military educational institutions from the Ministry of National Defence – sports tests,* "Carol I" National Defence University Publishing House, Bucharest, Bucureşti, 2020.

Bompa T.O., Buzzichelli C.A., *Periodizarea: Teoria şi metodologia antrenamentului*, Lifestyle Publishing, Bucharest, 2021.

Bowman A., *Calisthenics Workout: Building Muscle & Getting Ripped Without a Gym* (Simple

Bodyweight Exercises to Gain Strength, Size and Balance), Tomas Edwards Publishing House, 2021.

Ciapa G.C., *Guidelines and opportunities for physical training of the military*, "Carol I" National Defence University Publishing House, Bucharest, 2019.

Goldman J., *Calisthenics: Calisthenics Guide: BodyWeight Exercises, Workout Progression and Training to Be Fit,* Kindle Edition, 2016.

Istrate M.C., „Forța – calitate motrică cu impact determinant în activitatea militară", *Bulletin of "Carol I" National Defence University* no. 3, Bucharest, 2020.

Kalym A., *Complete Calisthenics*, Second Edition: The Ultimate Guide to Bodyweight Exercise, North Atlantic Books, 2019.

Neagu N., *Fundamentals of plyometrics training*, Discobolul Publishing House, Bucharest, 2020.

Pelmuș A.D., *Development of the motor capacity of the military personnel*, Technical-Editorial Center of the Army Publishing House, Bucharest, 2021.

Radcliffe J.C., R. Farentinos, *High-Powered Plyometrics*, Human Kinetics Publishing House, 2015.

Wilt F., Yessis M., *Soviet Theory Technique and Training for Running & Hurdling*, Championship Books, Publisher Stoyles Graphic Services, 1984.

http://www.verkhoshansky.com/CVBibliography/tabid/71/Default.aspx

https://tiptar.com/ro/what-are-plyometrics-and-how-to-include-them-in-your-routine

https://proteic.ro/exercitii-pliometrice

https://ro.healthy-food-near-me.com/plyometric-training-the-pros-and-cons-exercises-training-program

https://www-brianmac-co-uk.translate.goog/plymo.htm?_x_tr_sl=en&_x_tr_tl=ro&_x_tr_hl=ro&_x_tr_pto=nui,sc

https://www.abc.es/bienestar/fitness/abci-pliometria-202006110754_noticia.html

https://enterprisefitnessacademy.com/eclass-2-klatt-test-assessment

https://blogeducacaofisica.com.br/guia-definitivo-calistenia/

https://www.researchgate.net/publication/317321468_The_effects_of_a_calisthenics_training_intervention_on_posture_strength_and_body_composition

Editor-in-chief: Laura MÎNDRICAN
Editor: Irina TUDORACHE
Proof-reader: Mariana ROŞCA
Sub-editors: Gabriela CHIRCORIAN
Florica MINEA
Cover: Andreea GÎRTONEA

ISSN (online) 2284-9378
ISSN (print) 2284-936X
L 2284-936X

The publication consists of 150 pages.

"CAROL I" NATIONAL DEFENCE UNIVERSITY
Bucharest, no. 68-72 Panduri Street, sector 5
e-mail: *buletinul@unap.ro*
Phone: 319.48.80/0215; 0453

C. 237/2021