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*Dear readers,*

*Science & Military has been here for 5 successful years, which is an opportunity to review. What were the previous years of editing the journal like? What positive did they bring? What did we have to deal with?*

*The journal Science & Military did not arise just from day to day, but it followed the 30 years long history of volumes that were issued at the Armed Forces Academy since 1976. The original volume of the Military technical college originated because of the need for a journal that would be the platform and presentation of scientific and technical articles by teachers, scientific staff and doctoral students especially from the Military technical college. The change of environment, but also the changes the school underwent in 2004 of course required innovation of the journal.*

*The new title and form were by far not the only changes. The journal was mostly of local character and its format was not actively used for the development of scientific knowledge in the given field on the national, not to mention international level. Thus the goal of the new editorial board was to change the situation. Today I am pleased to say that we go on well regarding this goal. Science & Military has more and more contributors from abroad (Czech Republic, Poland, Hungary, Romania and Ukraine). An international editorial board supervises the quality and scientific proficiency of the articles. When evaluating the previous years I cannot leave out the important question of seriousness of reviewing the manuscripts by the reviewers. It is one of the factors that decide whether the journal Science & Military has the chance to be included in distinguished international databases such as Thomson Reuters or Scopus.*

*We started editing Science & Military in 2006 so to say „provisionally", but with a great drive and enthusiasm since it was the first and only journal of its kind in Slovakia. And that was our commitment. Thanks to the enormous effort of the whole editorial team and a good author background Science & Military soon won a wide range of fans.*

*The journal Science & Military created possibilities for publishing articles by slovak and foreign authors, who deal with the research in the field of armament and machinery, communication and information systems, military logistics, economy, management, national and international security and other branches.*

*By editing the journal Science & Military the Armed Forces Academy created a new platform of critical and creative thinking development of professional soldiers and professionals that complement the attributes of the Armed Forces Academy as the highest educational institution in the Ministry of Defence of SR.*

*We are sure that the scientific community matured enough not only to deserve such journal, but to keep it alive with their activity turned into publication outcomes. A new and young generation of scientific and university staff, the rising number of doctoral students as well as their increasing quality are the guarantee.*

*On behalf of the editorial board I wish the journal many good articles, readers´ interest and a positive feedback from professionals.*

*Assoc. Prof. Dipl. Eng. Pavel NEČAS, PhD.*
*Chairman of the editorial board*

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# NATIONAL AND INTERNATIONAL SECURITY IN A TIME OF GLOBALIZATION AND GLOBAL FINANCIAL CRISIS

Radoslav IVANČÍK

**Abstract:** The global security situation has significantly changed since the end of the Cold War and the bipolar division of the world. The fundamental changes in the global security environment have brought, besides a lot of positives, also a number of deformations, which have gradually started to assume the form of various asymmetric security threats. Occurring against the background of globalization and the ongoing global economic crisis, the emergence of new military and non-military threats is directly linked to the growth of requirements for national defense and security. As a result, national defense security, independence, sovereignty, combined with the protection of citizens' lives and property, belong to the basic roles which every state still needs to fulfill. For this reason, the author of the article deals with new security threats and analyzes the trends unfolding in the area of national and international security under the negative circumstances of globalization and the global economic crisis.

**Keywords:** Global security situation and environment, national defense, protection of citizens, military and non-military threats, globalization, global economic crisis.

## 1 INTRODUCTION

The consequential changes taking place on a global scale after the end of the Cold War and the bipolar division of the world at the end of the 1980s have been marked by an unprecedented acceleration of the development of human society in the early 21st century. Unlike in the past, today's profound qualitative advances in all walks of life become manifest in the life span of a single generation. With the intensifying dynamics of technical, scientific, economic and social developments the potential of change is so immense that every state needs to pay undivided attention to an analysis of these evolutional tendencies, particularly in the field of defense and national security[1]. This is especially true of the latter point, where the changes have been most far-reaching.

The last decade of the 2nd millennium was characterized by efforts to achieve stability in the world and to pioneer the transformation of the former Warsaw Pact countries, facilitating their transition from socialism to democracy, and centrally planned economies to market economy mechanisms. The gradual integration of the former Soviet Bloc countries into international institutions and their enlargement led to a conviction that this trend had increasingly contributed to fostering European and global security[2], with the threat of a worldwide conventional or nuclear conflict fading in the distance.

Unfortunately, the fundamental changes in the global security environment after the end of the Cold War and the collapse of bipolarity have brought, besides undisputed positives, also deformations. These have gradually become manifest in the form of different asymmetric security threats. While leaving a large number of long-term, regional conflicts unresolved due to a preoccupation with the East-West competition, the dynamic development and processes of globalization, social and economic modernization, political liberation, and technical and scientific advances have generated numerous negative side effects, including, notably, the constantly deepening economic and social differences in the development of human society, failing state institutions in the Third World countries, stagnation, and an inability to adapt flexibly to new conditions. These factors, combined with a sense of hopelessness over economic underdevelopment, have not only created favorable conditions for the existence of non-state actors, such as political, religious and nationalist extremists, but also transformed into phenomena referred to comprehensibly as new security threats[3].

## 2 PROVIDING NATIONAL AND INTERNATIONAL SECURITY IN A CHANGED SECURITY ENVIRONMENT

With the emergence of new security challenges, mainly resulting from international terrorism, organized cross-border crime, illegal migration and an increasing number of 'cyber' attacks on public and private computer networks, as well as from the use of the weapons of mass destruction, national defense and security, and protection of citizens have

[1] ŠTANCL, L. 2006. The Current Problems with the Theory of National Defense Economics at the Beginning of the 21st Century. In *Military Horizons*, 2006, Vol. 15, No. 3, p. 5-24. ISSN 1210-3292.

[2] OLEJNÍČEK, A. 2006. New Phenomena in the Defense Economics after the Disintegration of Bipolarity. In *Military Horizons*, 2006, Vol. 15, No. 3, p. 5-24. ISSN 1210-3292.

[3] CINGEĽ, J. 2006. Battle Groups: A Military Tool of the European Union. In *Euro Atlantic Quarterly*, 2006, Vol. 1, No. 3, p. 16-17. ISSN 1336-8761.

reached an absolutely new level. There is an ever increasing shift from the emphasis on providing defense against 'visible adversaries' (in terms of two military and political formations confronting each other) to providing defense against 'invisible adversaries' (in terms of new security threats)[4].

Mainly due to globalization, the contemporary developments in the world are accompanied by great economic disproportions. As a result, especially the Third World countries are exposed to increasing threats of local and regional conflicts, whose consequences may, more or less, spill over to other countries of the world. Another potential source of threat is represented by Islamist religious extremism and radicalism, which, to achieve its goals, uses whatever means available, including terrorism. Most importantly, this is not that kind of terrorism which has existed in the world for centuries but a terrorism which may affect anyone, anywhere and anytime, and which is, above all, aimed at delivering mass destruction of material assets and causing mass killings of innocent civilians. These are much more vulnerable than members of armed forces or law enforcement agencies. Similarly, civilian facilities are far easier targets than military installations or facilities of exceptional importance. At the same time, acts of terrorism attract the attention of media and spread fear and terror among the masses.

These consequential changes in the security environment, combined with the far-reaching economic changes, provoke not only new integrative but also disintegrative efforts in numerous countries and groupings. Even in this case the changes are linked to the phenomenon of globalization. This represents a highly dynamic multifaceted process, where political, economic, social, military-strategic, technological, ecological and other phenomena[5] overlap and mutually interact. The hitherto evolution of globalization demonstrates that economic factors, which significantly influence other factors, and on the basis of which a new system of international economic and political relations arises, exert a decisive impact on the course of globalization. This new system has been replacing the post-WWII model and is governed by the free market economy mechanism rather than by political and ideological decisions.

The consequences of the ongoing globalization process result, on the one hand, in deepening mutually beneficial economic cooperation and partnership (while at the same time prompting reciprocal economic dependence), as well as in the dynamic evolution of economic power centers, whereas, on the other hand, societies in other parts of the world are increasingly lagging behind and losing ground[6]. For this reason, the constantly deepening economic and social differences in the development of human society, exacerbated by the activities of non-state entities in failing states, may threaten not only national security in individual states and regional security but also the global security of the entire mankind. In the context of the prevailing global economic crisis, the possibilities for an armed conflict or a security crisis to arise are constantly multiplying. Yet another imperative factor contributing to the emergence of conflicts and crisis situations is excessive armament production.

While ensuring security at the national and international levels, it is also inevitable, in view of military (symmetric) threats, to underline the presence of non-military (asymmetric) threats, deemed as manifestations of armed violence for the elimination of which it is unsuitable or sometimes even impossible to apply military power. This also concerns the phenomena which may not assume the characteristics of armed violence but, once spread on a massive scale, may threaten the security of individuals, social groups and state bodies, and destabilize or even disintegrate society. To illustrate this point, consider natural, industrial and ecological catastrophes, and food, water, demographic and information shortages, or the exhaustion of non-renewable energy resources. In some parts of the world these have either reached or are now approaching critical levels. All things considered, the provision of national and international security is assuming a new dimension in today's multipolar geopolitical division of the world.

As, from the general point of view, national defense upholds the country's prospective survival, independence and sustainable development[7], each state must, in the interest of ensuring its own security, create the prerequisites for upgrading the system of defense, national security, and crisis response mechanisms of military and non-military character. The principal role of every state is to deliver national defense and security and to protect one's citizens. This role belongs not only to the most fundamental ones but also to the most expensive economic activities, since it requires that

[4] OCHRANA, F. 2006. Methodological Remarks on the Theory of National Defense Economics. In *Military Horizons*, 2006, Vol. 15, No. 3, p. 5-24. ISSN 1210-3292.

[5] ŠIKULA, M. 2005. Methodology Postulations on the Perception of the Phenomenon of Globalization. In *Economics Journal*, 2005, Vol. 53, No. 7, p. 663-679. ISSN 0013-3035.

[6] ŠTANCL, L. 2006. The Actual Problems of the Theory of National Defense Economics at the Beginning of the 21st Century. In *Military Horizons*, 2006, Vol. 15, No. 3, p. 5-24. ISSN 1210-3292.

[7] NEDBAL, J. 1998. National Security Economics. In *National Security Economics, Selected Chapters*. Brno : The Defense Academy of Brno. 1998. 325 p. ISBN 80-85960-06-00.

considerable human, material and financial resources[8] be allocated for this purpose. For this reason, one of the most crucial decisions made is that on the amount of the defense budget to be allotted for ensuring one's defenses and security, as well as the fulfillment of NATO's common political, military and economic interests.

## 3 THE INFLUENCE OF THE FINANCIAL CIRISIS ON THE PROVISION OF NATIONAL AND INTERNATIONAL SECURITY

Caused by fundamental changes in the global security environment after the end of the Cold War and bipolarity, new asymmetric security threats, combined with the negative side effects of globalization, modernization and liberalization of societies, are forcing individual countries and alliances to deepen and consolidate their security and defense policy[9]. The necessity to have the ability to respond to these asymmetric threats, appearing in the form of international terrorism, organized crime, illegal migration, religious extremism, and nationalist radicalism, or the use of the weapons of mass destruction, calls for generating military and security forces and capabilities which are capable of dealing with the above-mentioned threats.

Based on the publicized economic prognosis and security studies, there is a widening economic, political and social inequality gap between the developed and developing world. Naturally, this has serious repercussions, inasmuch as the instability of the international security environment increases. In other words, individual states need to adopt adequate political and economic measures to help shape suitable conditions for building commensurate capabilities for military and security forces, which will secure the countries' defense, independence, sovereignty, and protection of citizens and property, while at the same time furthering their political, economic and security interests abroad.

For these reasons, the economic requirements for supporting the preparation, training and education of military and civilian personnel, as well as for the modernization of the current and the purchase of new weapons, weapon systems and equipment, are constantly reaching new heights, with the result that the rising material and financial costs of deploying and sustaining NATO armed forces in the ongoing crisis management operations, or those of other law enforcement agencies directly involved in the execution of national or international security tasks, exert permanent pressure on budgetary expenditure. Obviously, the current decisions to reallocate the limited and at the same time precious human, material and financial resources between defense and security assets on the one hand and civilian assets on the other are determined considerably by the ongoing financial crisis.

As a result of globalization, all countries throughout the world have been affected, to a lesser or greater extent, by the global financial crisis. A marked decrease in the pace of economic growth, higher unemployment rates and budgetary deficits, a worsening balance of payments, and other negative consequences of the crisis have caused that all governments have had to and still have to adopt, through curtailing public expenditure, timely and moderate economic, political and legislative measures so as to alleviate the consequences of the crisis. One of the first steps to which most countries resorted was to consolidate public finances by introducing funding restrictions with regard to the state budget. From the economic point of view, the reason for this was clear – falling economic production goes hand in hand with falling state budget revenues.

The budgetary mathematics is equally merciless. A fall in revenues results in expenditure cuts. In this context, the planned and the already approved budgets thus seem to be unsustainable, and if individual states, as part of their responsible fiscal policy, are not to increase their debts by taking out additional loans to compensate for revenue losses, they have no other choice but to make budget cuts. Although hugely unpopular, these are inevitable, since any foreign loans to counterbalance the fall in the state budget revenues would result in the undesirable and, from the long-term point of view, even unsustainable state of affairs. In this regard it should be emphasized that eurozone countries must comply with the pact of stability and growth. Accordingly, the deficit of public finances may not exceed 3 per cent of GDP, nor may the total national debt-to-GDP ratio breach the 60-percent limit.

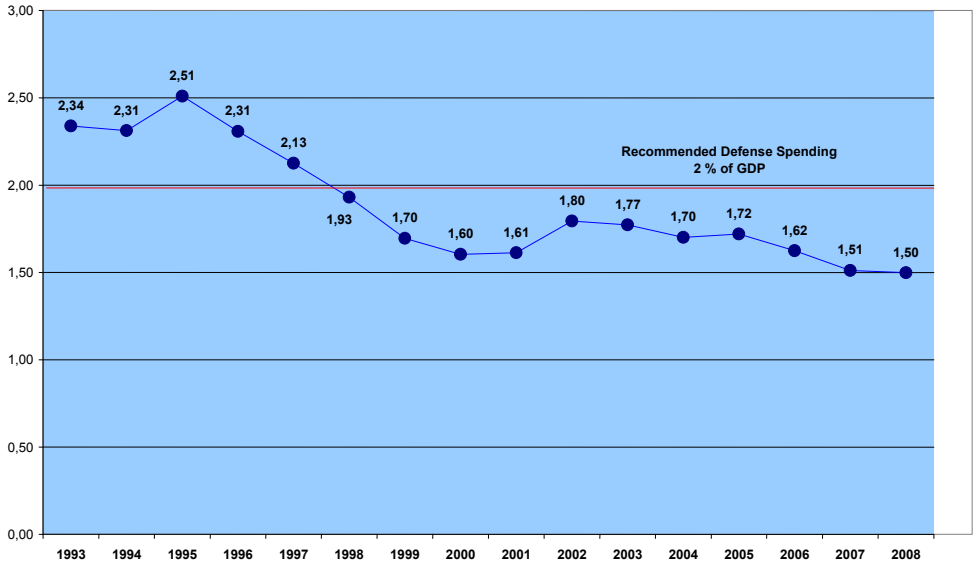
As a consequence, individual countries execute budget cuts in non-priority areas. Most countries have therefore resorted to cutting defense and security spending. For example, in the Slovak Republic, the 2009 budget of the Slovak Ministry of Defense, already decreased by approx. 60 million euros compared to 2008, was, as part of the adopted financial crisis package, decreased in the course of one year by a further € 100 million, following the Slovak Government Ordinance to reallocate funds

[8] LAŠČEK, L. 1999. Economics and Provision of National Defense. In *Society, Army, Personality.* Bratislava : Ministry of Defense of the Slovak Republic. 1999, p. 1.

[9] IVANČÍK, R. 2009. Funding the Military Operations of the European Union I. In *Obrana Magazine*, Bratislava : Ministry of Defense of the Slovak Republic. 2009, Vol. 17, No. 4, p. 18. Reg. No. 412/08.

inorder to sustain jobs and economic growth in Slovakia. Further cuts in defense budget took place in 2010, when the allotted defense budget amounted to approx. € 822 million, i.e. approx. € 223 million less compared to 2008. Moreover, the planned 2011 budget will be approx. € 310 million less compared to 2008 and, according to the macro-economic forecast and the planned public administration budget for 2011 – 2013, there are no rosy predictions for the Slovak MOD budget for the coming years.

Bearing in mind that the 2-percent GDP limit is deemed an adequate amount of defense spending, the Slovak Republic has failed to reach this expenditure level since 1998. In addition, defense spending has been constantly on the decline (see Graph 1), except for the 2005 defense budget. The public resources intended for defense and security spending have dropped, despite the fact that in its 2002 Government Goals the Slovak Government declared its commitment to allocate 2 per cent of GDP on defense. This pledge was directly based on the recommendations of the North Atlantic Alliance, the needs of the Slovak MOD and the reform requirements of the Slovak Armed Forces.




Graph 1 A demonstration graph showing the ratio between the amount of budgetary resources allocated from the state budget to the MOD budget and the amount of the Gross Domestic Product in Slovakia (in % rounded to 2 decimal places) in the years 1993-2008 and their comparison with the NATO-recommended 2 per cent of GDP on defense

With Slovak Government Ordinance No. 604 of 5 June 2002, giving the green light to the MOD Long-Term Development Plan, the Slovak Government made a commitment to allocate public funds for the MOD budget in the amount of at least 2 per cent of GDP, effective as of 2003. This commitment was confirmed by the National Council of the Slovak Republic, when the Council adopted Ordinance No. 2403 of 11 July 2002. As a result, the allocation of 2-percent GDP for defense spending became the basic planning financial input for delivering defense and security in the Slovak Republic, as well as the baseline rate for performing international obligations and agreements in favor of executing NATO's collective defense and international crisis management operations.

To ensure continuity of commitment, the Slovak Government issued Government Ordinance 133 of 25 February 2003, approving a timeline for defensereforms and reaffirming its pledge to allocate 2 per cent of GDP for defense spending. The reconfirmation of Slovakia's commitment became the main argument of NATO bodies in formulating Force Goals for the Slovak Republic within NATO's collective defense tasks and military and political objectives.

The next Slovak Government, which was formed after the parliamentary elections in 2006, officially approved the allocation of 2 per cent of GDP for defense spending. Government Goals stipulated that the Slovak administration would allocate the resources essential to delivering defense and security and performing Slovakia's international commitments. At the same time, the Government promised to ensure that the funds for conducting international crisis management operations and integrating selected units of the Slovak Armed Forces into the NATO Response Force (NRF) and

the European Battle Groups (EU BGs) would not be secured at the expense of the Slovak Armed Forces' sustainability and development programs.

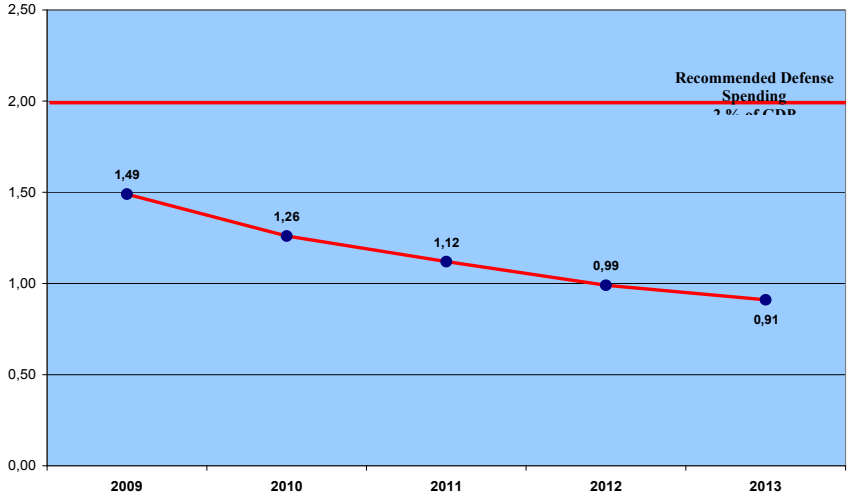
Towards this end, the Slovak Government adopted Ordinance No. 106 of 7 February 2007, pledging to allocate additional Skk 2,204 billion (€ 73,160,000) from outside the MOD budget in the years 2008 – 2013. This move was to support force deployment and sustainability within the framework of the NRF and the EU Battlegroups, or unplanned contingency operations under Force Goals in 2008 – 2013. However, Government Ordinance No. 867 of 11 October 2007 abolished Ordinance No. 106 of 7 February 2007, in other words, the funds to deliver force preparation, training, transport, material and equipment supplies, and service support to the units of the Slovak Armed Forces earmarked for NRF 10 and NRF 13 in the years 2008 and 2009 and the EU BGs in the years 2009 and 2010 had to be redirected from other defense programs from inside the MOD budget.

Apart from this, the Slovak Government pledged to create the conditions for generating national defense and security capabilities, which would allow the Armed Forces to respond to the situations threatening our citizens, state and Allies, and to eliminate emerging threats, including those outside the territory of the Slovak Republic, while at the same time ensuring that the Slovak Republic would adequately contribute to generating NATO and EU defense capabilities until 2010, and maintain fully fledged contributions well beyond the target date. Also, the Government agreed to actively involve its troops in NATO and EU rapid response forces and international crisis management operations. This was to be done under NATO Force Goals and the EU Headline Goals, which, in line with the current security challenges, are now placing emphasis on self-defense capabilities, internal national security, the abilities to deploy forces outside the Slovak Republic, to participate in several operations simultaneously, and to adjust flexibly, depending on the type of operation or mission, to the changing security situation.

Based on an analysis of the actual defense budgets allocated from the state budget in recent years it may be concluded that the actual amount of financial resources, whether planned or allocated, fails to meet the targets described above. Moreover, the analysis calls for goals, tasks, intentions and defense requirements to be reviewed, since the current situation will inevitably continue to increase the MOD's internal debt, despite the upgraded long-term development plan and internal redirections of funds in favor of the declared key defense priorities.

The shrinking military funds allocated from the state budget to the MOD in 2009 and 2010 and the planned financial resources from the state budget for the MOD in the years 2011 – 2013 (see Graph 2) will even more jeopardize or, in the best case scenario, only postpone the performance of the declared goals – the Slovak Armed Forces' professionalization, training, modernization, and the commitments vis-à-vis the North Atlantic Alliance and the European Union.

This will have a negative impact on the trustworthiness of the Slovak Republic as a partner of the international community and the credibility of the Slovak Armed Forces – the two institutions which have enjoyed the highest approval ratings in public opinion surveys conducted across Slovakia.




Graph 2 A demonstration graph showing the ratio between the amount of budgetary resources allocated from the state budget to the MOD budget and the amount of the Gross Domestic Product in Slovakia (in % rounded to 2 decimal places) in the years 2009 – 2013, and their comparison with the NATO-recommended 2 per cent of GDP on defense

It has been recognized that the commitment to provide for the defense of the Slovak Republic and to ensure protection of citizens is being challenged and undermined by underfunding. Defense and security funding is highly demanding not only in terms of providing for the defense and security of the Slovak Republic but also in terms of meeting international commitments and transforming the Slovak Armed Forces into a relatively small, professional, well-equipped force with expeditionary capabilities and sufficient combat potential, capable of meeting the requirements of compatibility and interoperability with NATO allied forces.

## 4 CONCLUSION

The European geopolitical and geostrategic area after the end of the bipolar world is seemingly safe. The new international political situation in Europe after the end of the Cold War has removed the immediate danger of a direct military threat to the Slovak Republic and its Allies. However, it cannot be ruled out that Slovakia's security and stability will not be challenged by threats and risks of a different character, one which is based on the worsening security situation in the world. Therefore, the provision of defense and security and the generation of military and security forces cannot be approached as secondary issues.

European and global security belongs to risk factors, whereas an inability to timely respond to an emerging crisis situation is likely to exert a highly negative impact on the entire world community. While the international security situation from the 1960s to the 1980s was referred to as the Cold War era, the international security situation at the end of the first decade of the 21st century, marked by a considerably rise in new security threats and especially non-military threats, is labeled 'Hot Peace'.[10]

In this context, Slovakia's shrinking military budget seeking to deliver NATO's collective defense and security in accordance with the Washington Treaty, the collective defense of the European Union in line with the Lisbon Treaty and, last but not least, the defense of the Slovak Republic seems to have strictly paradoxical implications. The bond between security recipients and security providers should not be confined to 'trouble-free periods' only but rather foster permanently stable and enduring relations. In this respect, the Slovak Republic should be a fully fledged partner for our Allies.

Despite the fact that the Slovak Republic has repeatedly pledged to allocate 2 per cent of GDP for the provision of national defense and security, the MOD budget cuts and the future predictions demonstrate that Slovakia is, instead of walking towards the targets, walking away from the targets. What lies behind the dramatic decrease in defense and security funding is Slovakia's sense of not being exposed to a direct threat. Undoubtedly, the global financial crisis has an important role to play in this trend.

On the other hand, Slovakia is not the only country to have reduced its military budget. NATO countries and European Union countries continually decreased defense expenditures already from the end of Cold War. Although in 2008, in the context of worsening global security environment, it was registered a modest growth of military expenditures, the financial crisis stopped that evolutional trend (see Graph 3). Therefore, throughout the last years, only five European Union countries regularly reached, in the area of defense budget, recommended level of 2 per cent of GDP, or higher (e.g. in 2008: Greece – 3,6 %, Great Britain – 2,5 %, Bulgaria – 2,4 %, France – 2,3 % and Portugal – 2 %). As for NATO countries, except of the mentioned European Union countries, only USA (4,3 % in 2008) and Turkey (2,2 % in 2008) reached or cross the frontier of 2 per cent of GDP.[11]

But in the contrast to the worsening security situation in the world, while other, especially non-NATO countries (e.g. China and India) keep their military spending at the level of 2 per cent of GDP, or higher, to support their defenses (see Graph 4), budget reductions of NATO defense ministries may result in the weakening of the defense capabilities of the entire Alliance, thus making the entire society more vulnerable. Due to the constant defense and security funding cuts, such countries, including Slovakia, may have to pay for this one day, since the provision of national defense and security cannot be taken for granted. But it will be too late when people realize that the 'symbolic jug of unity' has been broken.

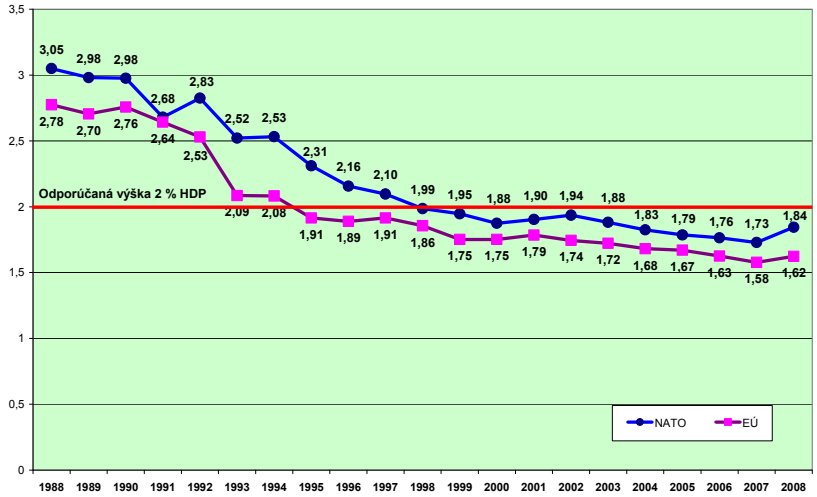
In conclusion, the global financial crisis is clearly increasing the vulnerability of societies as well as security risks at national as well as international levels. This is happening as a result of the constantly shrinking budgets of defense and law enforcement establishments and the adoption of strict saving measures, which are currently degrading security to its minimal levels. Although defense budget cuts may give the general public who wish to see more investment flowing into science, research, education, health care, unemployment support a sense of seeming satisfaction, this may

[10] ŠKVRNDA, F. 2008. The World on the Threshold of New Arms Race? *New Word*. 2008, Vol. 6, No. 26, ISSN 1336-2984.

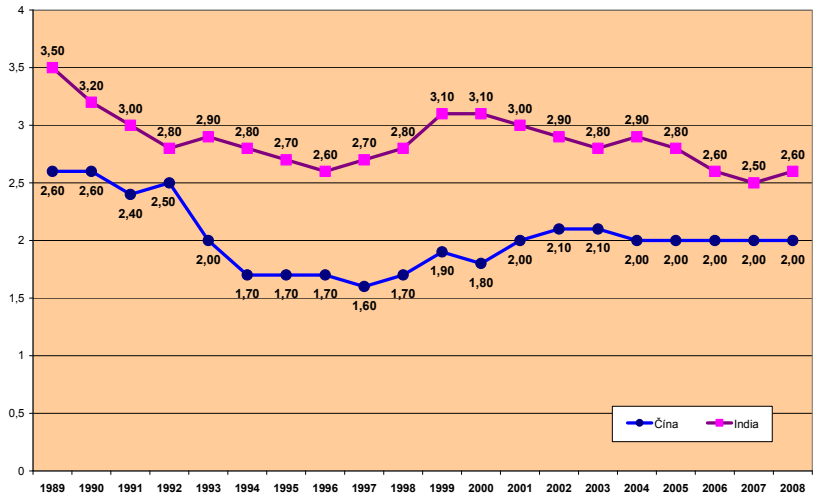
[11] www.sipri.org

lead to the countries' inability to duly and timely respond to asymmetric security threats to society.

This argument should be brought into focus especially in a time of the global financial crisis when, rather than deepening the sense of insecurity and uncertainty, national defense and security should be resting on stable foundations and approached with growing urgency.




Graph 3 A demonstration graph showing the ratio between the amount of budgetary resources allocated from the state budgets to the MoD budgets and the amount of the Gross Domestic Product in NATO and EU countries (in % rounded to 2 decimal places) in the years 1988-2008 and their comparison with the NATO-recommended 2 per cent of GDP on defense




Graph 4 A demonstration graph showing the ratio between the amount of budgetary resources allocated from the India and China state budgets to the MoD budgets and the amount of the Gross Domestic Product in India and China (in % rounded to 2 decimal places) in the years 1989-2008

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# HYBRID POWERTRAIN CONCEPTUAL DESIGN FOR UNMANNED GROUND VEHICLE

Martin BUGÁR, Vladimír STAŇÁK, Viktor FERENCEY

**Abstract:** The paper presents conceptual model of powertrain system for UGV (Unmanned Ground Vehicle). The paper presents results of processed work in the own research feasibility study finished at TRL 2-3. UGV is designed for use in non-military crisis situations or in the military and security operations. Examined UGV (Unmanned Ground Vehicle) uses the modified TATRAPAN chassis. Serial hybrid powertrain with ZEBRA batteries is the main power source of UGV. In a series-hybrid system, the combustion engine drives an electric generator instead of directly driving the wheels. The generator provides power for the driving electric motors. In short, a series-hybrid is simple, the vehicle is driven by electric motors with a generator set providing the electric power. Engine is designed to perform across a wide range of operating conditions. The vehicle is equipped with two electric motors and can operate on and off road. The vehicle can carry a payload of up to 500 kg. The UGV can carry a wide variety of sensors, including video and thermal cameras. UGV can also be manually controlled by remote control system. Simulations were realized with presented powertrain.

**Keywords:** UGV, serial hybrid, powertrain, smart control system, sensors.

## 1 INTRODUCTION

Different sorts of the operations controlled in the course military and non - military conflicts, its alternation and mutual intersect are throwed back and in the wide spectra activities as large movements, wandering, or alternation tactical wholes, space outside battle, management stacked against the diversionary activities, battle in the encircled, exploring activity and management various form tactical activities limited power. Diversity form of various tactical activities, its mutual intersection and alternation will be one of the major characteristic in the future operations and battles.

With reason oneself will put assume, that in future operation oneself will increase movement rail battles activities, which is conditional and raising mobility one and tactical wholes. Factors, which are allowing the increase in mobility armies belongs its outfit mobile centers. These mobile resources will be equipped with effective weapons system, the system on protection of carried persons, assembly will secure high capacity in the terrain as well as equipped cap good conditions for activity service vehicle.

UGV – Unmanned Ground Vehicle is unmanned wheeled vehicle, which characteristic notes are absence humane crew, armor protection, firepower and good maneuverability (Fig. 1). These ground facilities must be considered to be in a certain mutual harmony. Degree of harmony is divided in the every stage development vehicles and depend primarily for the purpose and manner operational uses of vehicle and up to the mark technical progress. Vehicle has low silhouette, excellent terrain driving, which be given choices of chassis conception. Other feature characteristic is advanced system drive and electronic outfits, for viewing or direction and weapons the system [1].

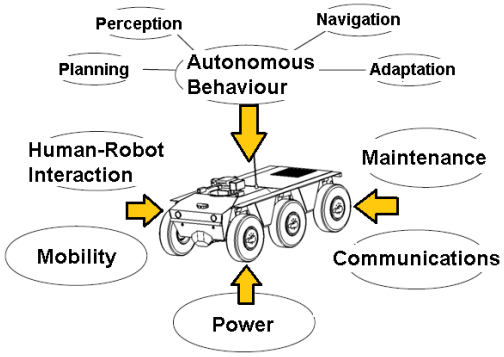


Fig. 1 Areas of technology needed for UGV

## 2 CONSTRUCTION OF CHASSIS AND DRIVE SYSTEM IN UNMANNED GROUND VEHICLE

Vehicle chassis is formed of three swinging axles with the six wheels (Fig. 2). Swinging axles are made from vehicle Tatrapan. Priorities of this conception are : robustness, attested construction, good movement in terrain , resistance stacked against the explosion mine [4, 10]. Disadvantage is stand weight (approximately 7 tons) , tread change by the compression travel and bigger tire wear. Conception spinal chassis with carrying pipe transfers a part of powers functioning between wheels and roadway, what enables one applying simple and easier supporting frame. Supporting frame is three - dimensional composition and is made riveting from sectional steel. On the frame are joined components of driving system, supporting systems of vehicle and armor.

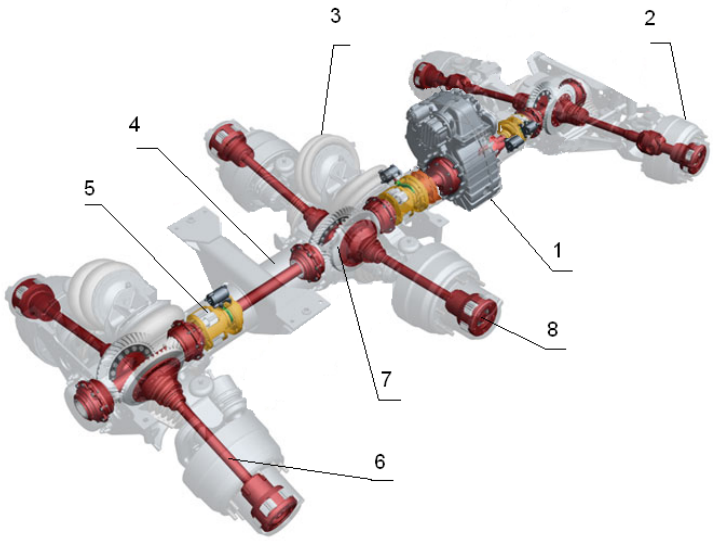


Fig. 2 Construction of vehicle chassis and drive system
1 – inter-axle differential, 2 – wheel hub, 3 – air axle suspension, 4 – central torque tube of backbone-type frame, 5 – axle differential , 6 – axle , 7 – final drive housing, 8 – final wheel drive

Final drive gear consists of couple conic transfers with Oerlikon- Spiromatic gearing. Axle is equipped with wheel reduction, with planetary gearing. Differential shipped with axle has position with exploitations balance.

## 3 DESIGN OF HYBRID POWERTRAIN FOR UNMANNED GROUND VEHICLE

Advantages of series hybrid electric propulsion power train are characteristics torsional moment electric motor and in posse relatively silent run through the accumulators without having activities of internal combustion engine (Fig. 3).

The advantage of a series hybrid is the lack of a mechanical link between the combustion engine and the wheels. The combustion engine runs at a constant and efficient rate, even as the vehicle changes speed. During stop-and-go driving, series hybrids are relatively the most efficient.

Serial hybrid powertrain system has smaller dimensions than parallel system.

Vehicle is powered by series hybrid electric propulsion, who be formed by two of master electric motor and joint with conjunctive speed-gearbox, small capacity internal combustion engine, generator, accumulator and necessary electronics.

A series hybrid with a battery could run the engine at constant speed in its most efficient range. The battery could then be used to store extra energy from the engine at light load conditions or from regenerative braking. When extra power is needed for acceleration, the battery can provide this (Fig. 6)

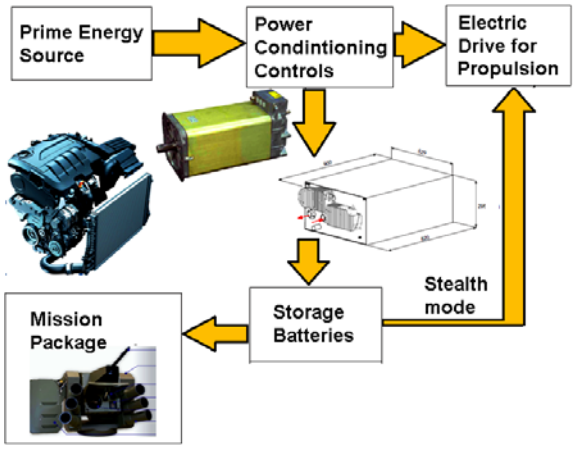


Fig. 3 Possibility of application of serail hybrid powertrain system for UGV

In ascending shaft electric motor is classic arrangement driving system with the clutch, speed-gearbox, final drive housing and differentials. Electric motors are set in the vehicle axle side by side and its performance is transferred over mechanical speed-gearbox on inter-axle (central) differential and further on wheels. Internal combustion engine drives generator, who he adds electric current for accumulator and electric motors (Fig. 5).

Hybrid drive system enables one cut - down fuel consumption, extension endurance distance, chances of the energy recovery. Wheels are powered through the two electromotor/generators type-Siemens 1PV5135- 4WS28, which are coupled

through the connecting gearbox with single - shaft output.

Performance of one electromotor/generator is 67 kW in the continuous term / 120 kW for a peak term. By the effectiveness 95 % be its input power about 126,3 kW. Regulation of revolutions and power governing of electromotors is solved over invertor from same producer (Fig. 4) [2, 3].

Energy for continuous operation is obtained from electric generator powered by internal combustion engine.

Generator is one, it is Siemens 1FV5139-6WS28 and it gives in the continuous term 85 kW (for a peak term 100 kW) by the 2500 revolution per a minute [7]. It is concerned alternating synchronous machine, therefore it is advisable tension direct - in the for remembered for invertors, whose effectiveness is 96 %.

For performance peaks and for quiet drive be intended accumulator. It is to size on voltage - 619 volts in the in the continuous terms and 696 volts for a peak terms.

This configuration (accumulator is compound of several smaller) will put performance about 35,5 kW, during peak term this is able to give power too more, on the contrary in the continuous term less power.

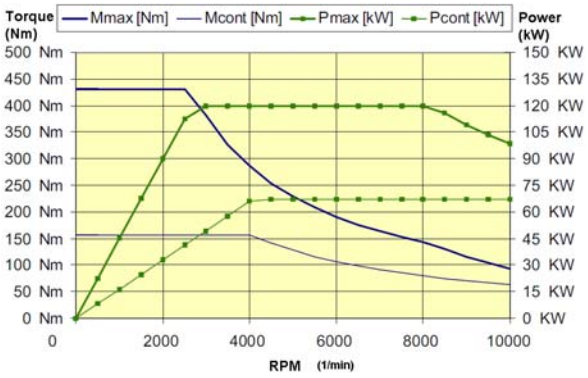


Fig. 4 Characteristic of electromotor/generator Siemens 1PV5135- 4WS28

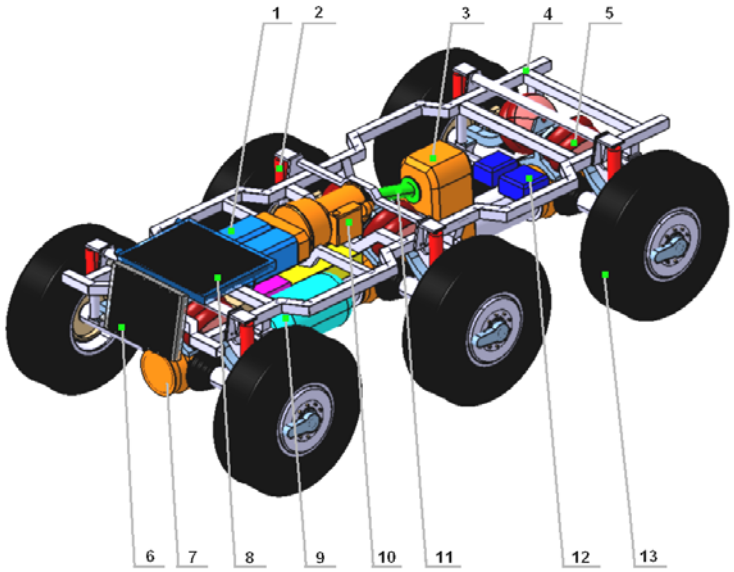


Fig. 5 Conceptual model design of powertrain for Unmanned ground vehicle
1 – electromotors/generators SIEMENS, 2 – hydraulic shock-absorber of vehicle suspension, 3 – inter-axle differential , 4 – spaceframe of vehicle, 5 – air axle suspension, 6 – radiator of internal combustion engine, 7 – central torque tube of backbone-type frame, 8 – radiator of electric power train components, 9 – fuel reservoir, 10 – automatic five gear transmission, 11 – drive line, 12- electronic control units of weapon components, 13 – wheels

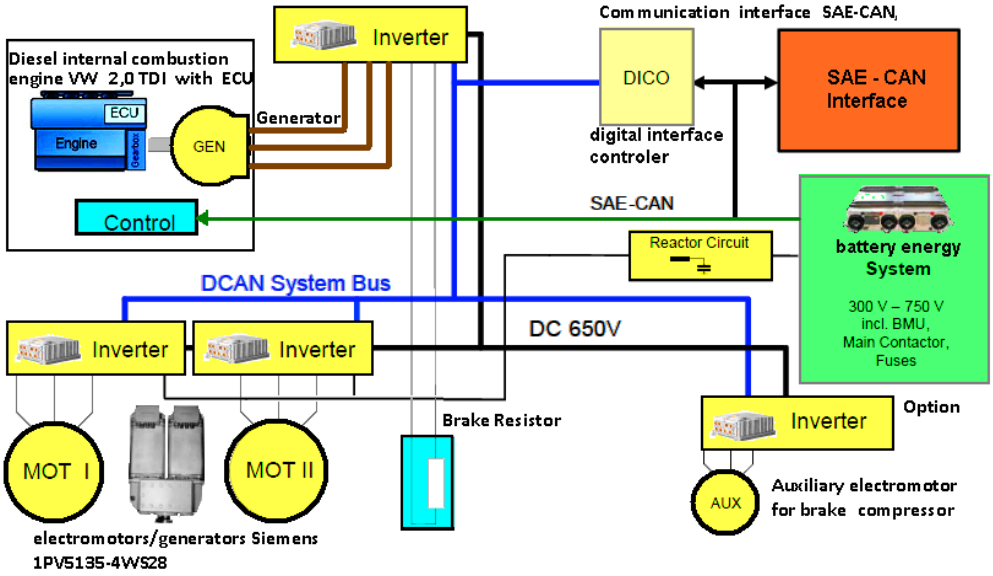


Fig. 6 Powertrain wiring diagram with connectivity of components

To achieve the requested combinations of vehicle driving parameters to be selected in building the drive mechanism automatic transmission with five gears. As the optimum option for the necessary gearing drivetrain system vehicle is based on ZF gearbox with the type designation 6 AS 710 BO ZF-AS Tronic lite. As the power generating set (EG) is used internal combustion engine (ICE). The highest efficiency and the lowest specific consumption has diesel ICE. This engine emitted into the atmosphere less greenhouse gas CO2. The idea of eco-drive vehicle can be seen on one side so that the vehicle does not its operation to pollute the environment.

Series hybrid with diesel ICE will be able to operate at constant speed. In terms of structure and parameters of the engine seems to be the most used from the manufacturer VW 2.0 TDI. Diesel engine has maximal torque - 360 Nm / 2500 rpm and maximal power 133 kW / 4200 rpm. Engine meets emission standard – EURO 4 (Fig. 7).

Elements of cooling, intake and exhaust tract will be for the conceptual design of the vehicle UGV have to be specially adapted.

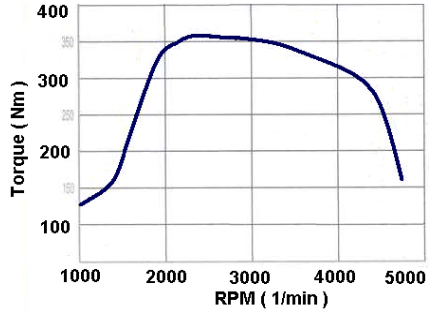


Fig. 7 Diesel engine torque characteristic

## 4 MODELING AND SIMULATION OF DRIVING CHARACTERISTICS WITH SERIES HYBRID POWERTRAIN SYSTEM

In this section are calculated and necessary parameters for driving resistances acting on the vehicle when driving on different surfaces. Calculations are made according to those relationships for driving on asphalt, field by road, groomed snow, sand, mould and the meadow (Fig. 10, Fig. 11).

Another of the basic performance parameters is considered torque. Presentation of this parameter is gradeability which the vehicle is capable of achieving. This parameter is for special off-road vehicles for use in rough terrain and difficult conditions are especially important (Fig. 9).

Gradeability of vehicle reaches a maximum at the maximum driving force, which is the maximum engine torque.

The total tractive effort is the sum of all these forces (Fig. 8):

$$F_{te} = F_{rr} + F_{ad} + F_{hc} + F_{la} + F_{\omega a}$$

Where:

- $F_{rr}$ is the rolling resistance force;
- $F_{ad}$ is the aerodynamic drag;
- $F_{hc}$ is the hill climbing force;
- $F_{la}$ is the force required to give linear acceleration;
- $F_{\omega a}$ is the force required to give angular acceleration to the rotating motor.

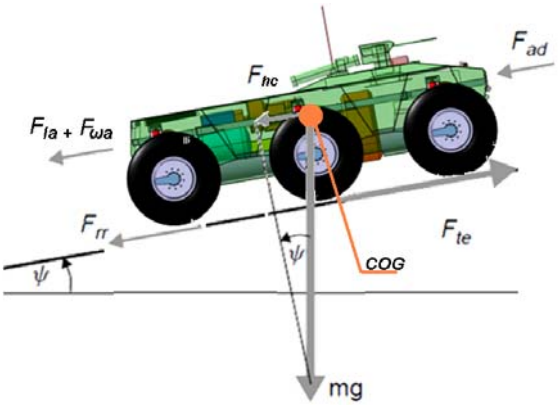


Fig. 8 The forces acting on a vehicle moving along a slope

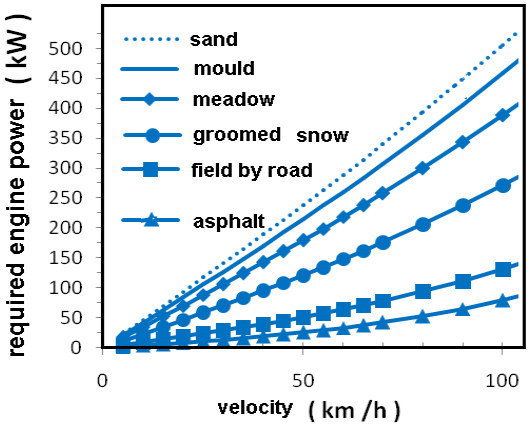


Fig. 9 Required engine power calculated from the rolling resistance on the surface and vehicle speed

Tab. 1 Maximum gradeability of vehicle achieved on various surfaces [6]

| Driving surface | Asphalt | Field by road | Groomed snow | Sand | Mould | Meadow |
|---|---|---|---|---|---|---|
| Traction coefficient μ | 0,95 | 0,8 | 0,3 | 0,3 | 0,5 | 0,5 |
| Maximum gradeability s (°/%) | 31/56 | 27/49 | 15/27 | 6/10 | 18/32 | 22/40 |

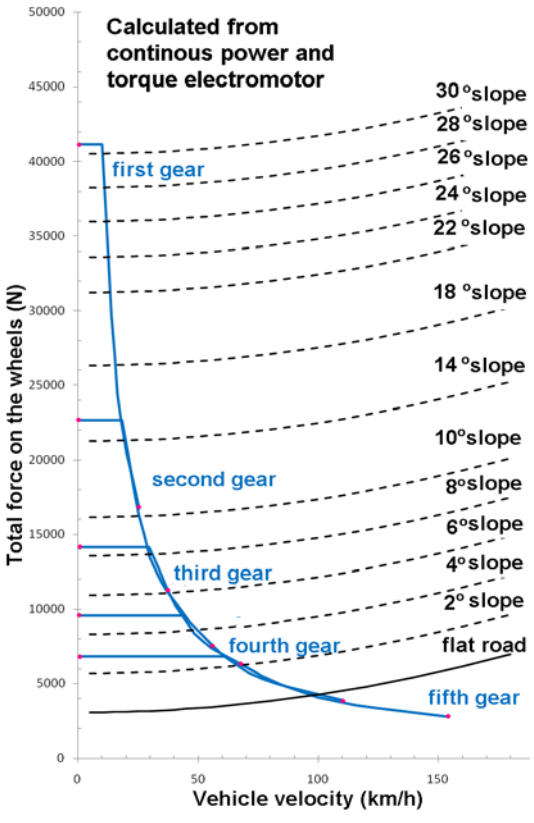


Fig. 10 Traction characteristic on asphalt

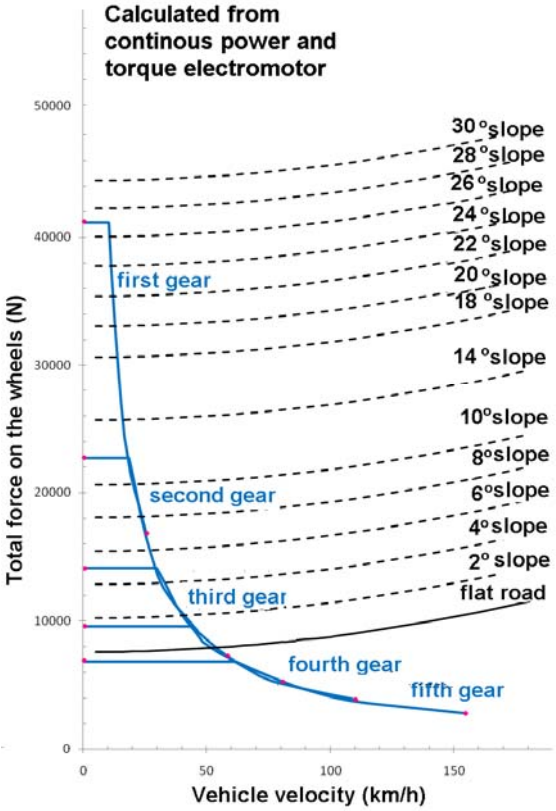


Fig. 11 Traction characteristic on filed by road

Maximal velocity of UGV with series hybrid powertrain system is calculated up to value 95 km/h on asphalt surface. Calculated acceleration characteristic on asphalt is on Fig. 12.

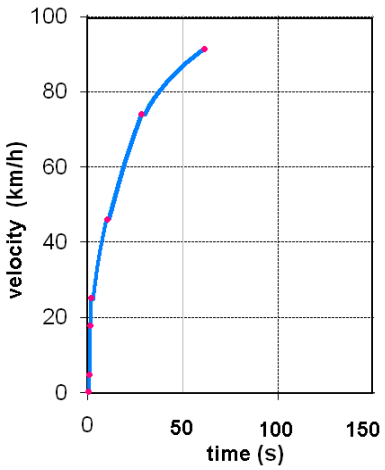


Fig.12 Acceleration characteristic of UGV

For unmanned ground vehicle is suitable to use series hybrid powertrain system with batteries [9].

For this drive conditions, course torque and performance of power are basically convenient. In this application internal combustion engine would be worked in persistent revolution, but apparently in the various loads. It will be over electro-generator works in these modes:

1. Power of the electromotor with permanent input power = charging battery = full load.
2. Power of the electromotor with partial input power = light load.
3. Under braking trailing of electromotor plus charging battery = light load.
4. Under braking trailing of electromotor plus charging battery = zero load.
5. Internal combustion engine would be switch off in the event that the vehicle will ride over long drive down road.
6. By the stop vehicle trailing of electromotor plus charging battery = light load.

Vehicle´s fuel tank of Unmanned ground vehicle has 100 liters. Operation ability of internal combustion engine , makes it around 5 hours of vehicle operation drive.

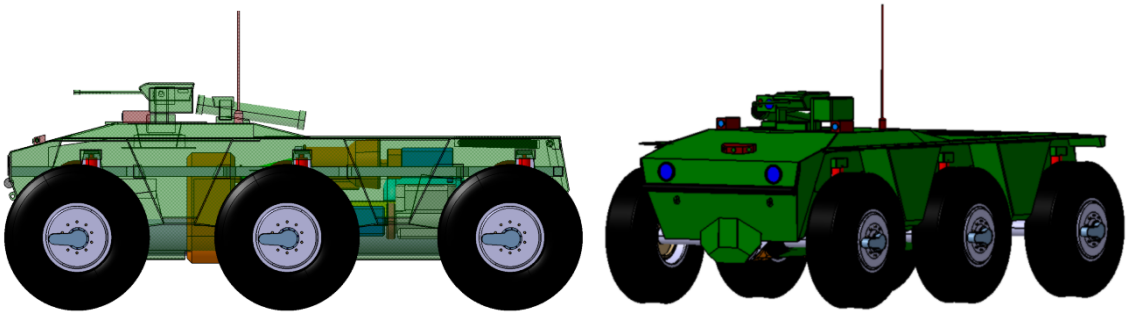

Fig. 13 Side view and front view of Unmanned Ground Vehicle (Unmanned ground fighting vehicle)

## 5 CONCLUSION

Individual components of a serial hybrid drive were designed to store vehicle components, mainly by dimensional options with the effort the best use of interior space. Furthermore, the pursuit of weight distribution so that of the vehicle was approximately in the middle. However, this depends on several aspects such as the imposition of the propulsion system, although this is the center of gravity contributes about as much as possible. When designing a conceptual design for a serial hybrid vehicle for unmanned 6x6 design was evaluated and justifies to choose presented design chassis and drivemechanism. A serial hybrid is such a vehicle is more appropriate than a parallel hybrid [5]. The serial arrangement of power has been achieved satisfactory results. Trend in serial hybrid drive in the future provides the complete elimination of the internal combustion engine, which is also the reason why the development does not only parallel hybrid, which is now, also used in common practice. This change would bring a new revolution in automotive systems, which vehicle would have worked only on electric power and its operation would be incomparably more economic and environment friendly (Fig. 14).

Making an unmanned vehicle driving simulation UGV created the models in the MSC ADAMS. This model includes a hopper car with an appropriate weight and CG position and chassis parts, including suspension and wheels.

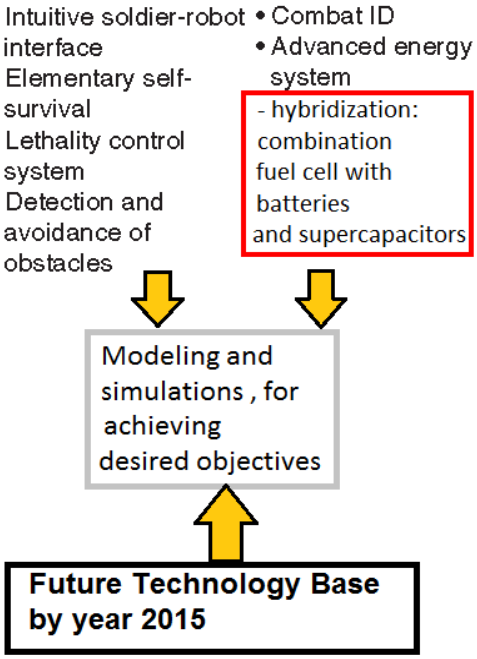


Fig. 14 Determining future objectives

Stimulated by the urgent need for more electric power vehicles that produce fewer harmful emissions and hybrid vehicles, plug-in electric vehicles and fuel cell-powered vehicles are being investigated in many researches and development programs. The combination of a reversible energy storage source with a fuel cell, referred to as hybridization, may greatly benefit in fuel cell technology and in technologies for powertrain of unmanned vehicles. In the future objectives of the work it is necessary to design final configuration and simulate the driving characteristics of the UGV to meet the eligibility of the system. Furthermore, it is necessary to equip the vehicle armor protection, smart control systems of the powertrain, etc.

## ACKNOWLEDGEMENT

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# SUPPLY CHAIN OPTIMIZATION MODELS IN THE AREA OF OPERATION

Tomáš DVOŘÁK, Martin VLKOVSKÝ

**Abstract:** Main idea of this paper is to choose both suitable and applicable operations research methods for military logistic support in the area of operation. Proposed model is based upon Combined Joint Task Force-7 data as the interim U.S. military formation in Iraq between June 2003 and May 2004.

**Keywords:** Supply chain, optimization, operations research, heuristics.

## 1 INTRODUCTION

Optimization of supply chain in the area of operation can be viewed as an effort to find the best distribution solution. The level of logistical support generally depends on time and resources as key factors for optimization. The Operational Decision -Making Process (ODMP) should include an appropriate design of an optimal distribution model as early as possible. In case the distribution dependent system components are stationary (e.g. bases, security stations) the so-called ex-post optimization has to be put into consideration.

The main idea of this paper is to find suitable methods of operations research which could be used to design a distribution strategy for a fixed (non movable) structure. Models were generated and tested using WinQSB 2.0. The authors set as a restrictive condition the fact that the Euphrates river does not influence the model proposal.

## 2 OPTIMIZATION MODEL – GENERAL SCENARIO PREMISE

For a model of fixed structure case a scenario of Joint Security Stations (JSS) around the city Baghdad (Iraq) area was chosen. The JSS originally combat outposts are resistant sites estabilished to support and back the Combined Joint Task Force 7 (CJTF-7). JSS were dislocated around the Joint Operations Area (JOA) to manage effective control among the city. As a basis a plan of given area (resized for paper layout purposes) was chosen. Left bottom corner represents two-dimensional Cartesian coordinate system (x,y) zero.

From the point of view of distribution strategy optimization the operations research provides two applicable methods:

- Method for optimal distribution system structure (Object Localization models – e.g. distribution centre localization);
- Method for transportation routes optimization (Optimal distribution chain between system elements – typically Travelling Salesman problem).

Cost optimum does not need to be the only criteria however its use is the most common because it reflects travelling distance/time savings. For object localization there will be searched its Cartesian coordinates $(x_i,y_i)$ in proper units. In case there are geographically oriented databases available the coordinates could be acquired by the use of algorithms which are commonly implemented in the geographic software. Even the distance matrix Fig. 1 suitable for the network graph construction can be generated.

| # | 01 | 02 | 03 | 04 | 05 |
|---|---|---|---|---|---|
| Amman 01 | - | - | - | - | - |
| Ajloun 02 | 73 | - | - | - | - |
| Aqaba 03 | 328 | 396 | - | - | - |
| Azraq 04 | 103 | 155 | 48 | - | - |
| Irbid 05 | 89 | 32 | 193 | 412 | - |
| Jerash 06 | 51 | 22 | 109 | 374 | 132 |

Fig. 1 Distance matrix example

### 2.1 Object localization model

By this model a 2D object localization method will be applied. General premise for a localization model:

Let $i=1,2,...m$ new objects which connect to $j=1,2,...n$ existing places so that costs for their connection are minimized. In case we search for an optimal distribution depot (warehouse) the distribution system model called "single object localization" is employed [2]. I.e. we need to place one object $m=1$ which will connect to $n$ existing elements (JSS). That means we search for coordinates of this new object $N\equiv(x,y)$ which will connect with elements with known coordinates $M_j\equiv(x_j,y_j)$, $j=1,2,...n$. In the data input-table Tab. 1 we can ignore the columns that are concerned with flows between existing facilities (if there are any)- here all flows are from the existing facilities to the new facility.

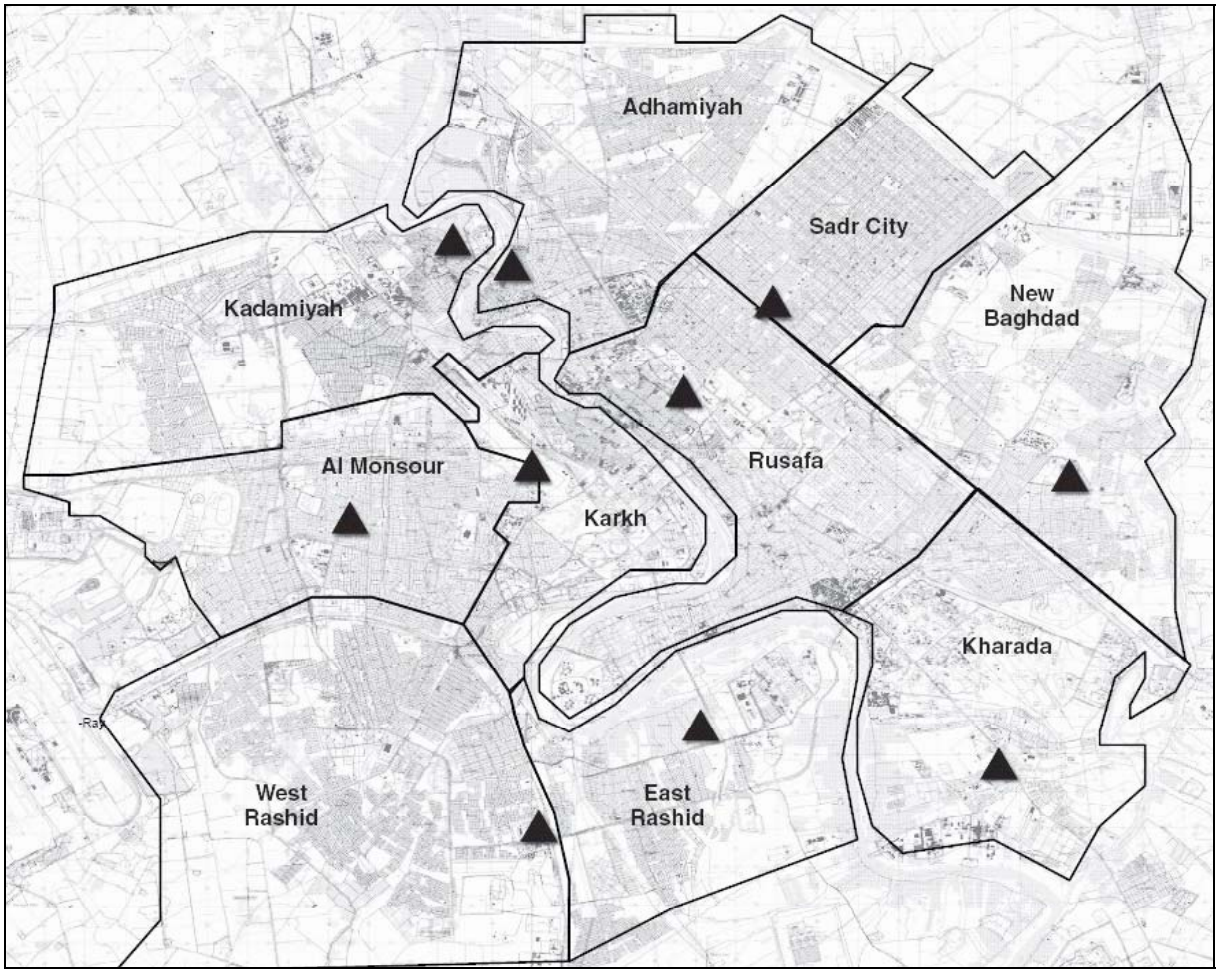



Fig. 2 Joint Security Stations – Baghdad (Iraq)

Tab. 1 JSS coordinates with quantified material requirements *w*

| Facility Number | Facility Name | To Existing 1 | To Existing 2 | To Existing 3 | To Existing 4 | To Existing 5 | To Existing 6 | To Existing 7 | To Existing 8 | To Existing 9 | To Existing | To New 1 | Location X Axis | Location Y Axis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing 1 | JSS-1 | | | | | | | | | | | | 7 | 2 |
| Existing 2 | JSS-2 | | | | | | | | | | | | 9 | 3 |
| Existing 3 | JSS-3 | | | | | | | | | | | | 13 | 3 |
| Existing 4 | JSS-4 | | | | | | | | | | | | 14 | 6.5 |
| Existing 5 | JSS-5 | | | | | | | | | | | | 4.5 | 6 |
| Existing 6 | JSS-6 | | | | | | | | | | | | 7 | 6.5 |
| Existing 7 | JSS-7 | | | | | | | | | | | | 9 | 7.5 |
| Existing 8 | JSS-8 | | | | | | | | | | | | 10 | 8.5 |
| Existing 9 | JSS-9 | | | | | | | | | | | | 6.5 | 9 |
| Existing | JSS-10 | | | | | | | | | | | | 6 | 9.5 |
| New 1 | DC | 7 | 5 | 5 | 10 | 9 | 8 | 3 | 6 | 9 | 6 | | | |

Generally there are 3 types of distance model measures [2]:

- Rectilinear - objective function:

$$\min z = \sum_{j=1}^{n} \left( |x - x_j| + |y - y_j| \right) \tag{1}$$

- Euclidean - objective function:

$$\min z = k \sum_{j=1}^{n} w_j \left( (x - x_j)^2 + (y - y_j)^2 \right)^{0,5} \tag{2}$$

- Squared Euclidean - objective function:

$$\min z = \sum_{j=1}^{n} w_j \left( (x - x_j)^2 + (y - y_j)^2 \right) \tag{3}$$

The rectilinear distance measure is used for warehouses or cities which were designed in the form of a rectangular grid. The Euclidean distance measure is used where a straight line route is possible. The squared Euclidean distance measure is used where a straight travel is possible but where it is needed to omit excessive distances (squaring a

large distance number results in larger distance number and recall that we use the distance number in the objective which we are trying to minimize).

This model proposal tests and compares all three distance measures.

Tab. 2 Rectilinear distance summary

| | New Facility | X Axis | Y Axis |
|---|---|---|---|
| 1 | DC | 7 | 6,50 |
| Total | Flow to&from | New Location | = 68 |
| (by | Rectilinear | Distance) | |

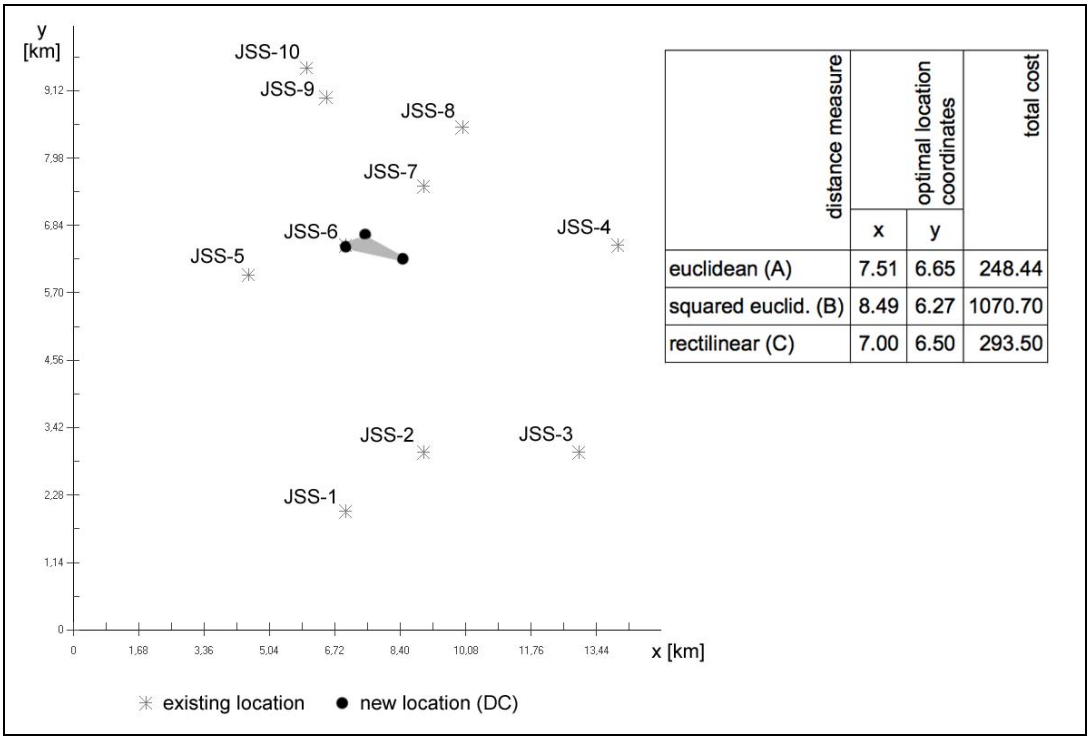
Tab. 3 Squared Euclidian distance summary

| | New Facility | X Axis | Y Axis |
|---|---|---|---|
| 1 | DC | 8,49 | 6,27 |
| Total | Flow to&from | New Location | = 68 |
| (by | Squared | Euclidian | Distance) |

Tab. 4 Euclidian distance summary

| | New Facility | X Axis | Y Axis |
|---|---|---|---|
| 1 | DC | 7,51 | 6,65 |
| Total | Flow to&from | New Location | = 68 |
| (by | Euclidian | Distance) | |

The result of an optimal placement of the distribution centre (DC) is an area defined by boundary lines. That particular area shows where the cost function is minimized - the cost of potential supply will therefore be minimized. As mentioned above, the deployment of this model must be preceded by consideration about how the distribution will be done. Whether supply will be transported on roads or, for example air (mostly straight line flight – e.g. helicopter dropping material). This decision will set conditions for the problem formulation. Fig. 3 shows all three DC locations with respect to the existing JSS. It is not really crucial to determine the DC position 100% accurately (the data is probably not accurate enough anyway). Instead the grey triangle indicates the approximate region where it would be sensible to site the DC.




| distance measure | optimal location coordinates | | total cost |
|---|---|---|---|
| | x | y | |
| euclidean (A) | 7.51 | 6.65 | 248.44 |
| squared euclid. (B) | 8.49 | 6.27 | 1070.70 |
| rectilinear (C) | 7.00 | 6.50 | 293.50 |

Fig. 3 Localization results diagram with costs

## 2.2 Optimal distribution chain between system elements

If it is not possible for any reason to use the services of a distribution center (typically the deteriorated security situation in the neighborhood), it is essential to find another way to supply the JSS. Usually it is necessary to get along with a limited transport capacity. The following model considers a helicopter fully occupied with the entire amount of

specific supply items (e.g. pharmaceuticals, antidotes, etc.), which comes into the area and flies gradually dropping supplies to all JSS. What will be its flight plan in order to minimize the route? This model example can be characterized as a so-called Traveling salesman problem (TSP), which is defined as follows. The map [Fig. 2] shows 10 JSS and the table Tab. 5 shows distances between each of them. Traveling salesman problem solution determines the order of visits of individual cities, each city has to be visited just once, the final length (price ticket, ...) has to be the shortest and the salesman (helicopter) returns to the starting point. The problem belongs to the category of Non-linear programming with a typical computational complexity. Even for a small number of nodes number of solutions is high and grows exponentially. Therefore, we will try to find other approach, however not ensuring hundred percent certainty of the shortest part, which may lead to a sufficient suboptimal solution. In the next step an optimal helicopter´s route is counted.

As mentioned above the table Tab. 5 indicates aerial distances between each of the ten JSS (V1-V10). It represents the input matrix for software solutions. In the next step a proper algorithm for the calculation tasks is chosen [1]:

- Closest neighbor method.
- Heuristics.
- Two-way heuristics.
- Branch and bound method.

Each algorithm provides a different result because of its nature arising from different approach. Based on the testings a two-way heuristics algorithm proved to be the most cost effective (see Tab. 6).

Tab. 5 Aerial distance matrix between JSS

| From \ To | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | | 5 | 2 | 4,5 | 7 | 5 | 6 | 7,5 | 7,5 | 8 |
| V2 | 5 | | 3 | 7 | 3 | 5 | 4,5 | 5 | 7,5 | 8 |
| V3 | 2 | 3 | | 4 | 5 | 3 | 3,5 | 5 | 6 | 6,5 |
| V4 | 4,5 | 7 | 4 | | 6,5 | 2 | 4 | 4,5 | 3 | 3 |
| V5 | 7 | 3 | 5 | 6,5 | | 5 | 4 | 4 | 5,5 | 6 |
| V6 | 5 | 5 | 3 | 2 | 5 | | 1,5 | 3 | 2,5 | 3 |
| V7 | 6 | 4,5 | 3,5 | 4 | 4 | 1,5 | | 1,5 | 2 | 3 |
| V8 | 7,5 | 5 | 5 | 4,5 | 4 | 3 | 1,5 | | 2,5 | 3,5 |
| V9 | 7,5 | 7,5 | 6 | 3 | 5,5 | 2,5 | 2 | 2,5 | | 0,5 |
| V10 | 8 | 8 | 6,5 | 3 | 6 | 3 | 3 | 3,5 | 0,5 | |

Tab. 6 Solution for Two-way heuristics

| 06-08-2010 | From Node | Connect To | Distance/Cost | | From Node | Connect To | Distance/Cost |
|---|---|---|---|---|---|---|---|
| 1 | V10 | V4 | 3 | 6 | V3 | V2 | 3 |
| 2 | V4 | V9 | 3 | 7 | V2 | V5 | 3 |
| 3 | V9 | V7 | 2 | 8 | V5 | V8 | 4 |
| 4 | V7 | V1 | 6 | 9 | V8 | V6 | 3 |
| 5 | V1 | V3 | 2 | 10 | V6 | V10 | 3 |
| | Total | Minimal | Traveling | Distance | or Cost | = | 32 |
| | (Result | from | Two-way | Exchange | Improvement | Heuristic) | |

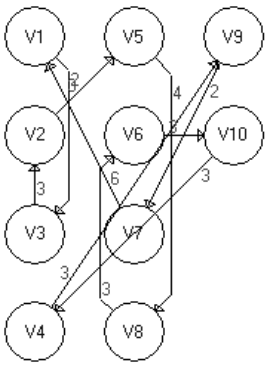



Fig. 4 Graphic interpretation for a two-way heuristics solution

The optimal route solution is in the order V1, V3, V2, V5, V8, V6, V10, V4, V9, V7. The total distance will be using Two-way heuristics 32 Km.

## 3 CONCLUSION

This paper deals with the use of operations research methods in the operational area logistic support. The paper demonstrates two ways of optimization. First example applies non-linear programming object localization method the second uses the Travelling Salesman Algorithm for aerial supply logistic support. Presented findings and proposed approach will be further elaborated in author's Ph.D. thesis.

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# SECURITY IN EASTERN EUROPE FROM THE PERSPECTIVE OF THE EUROPEAN UNION

Wojciech GIZICKI

**Abstract:** The European Union, having a common external border with the countries of Eastern Europe, i.e. Russia, Belarus, Ukraine, Moldova, is interested in not only the security of its borders, but also stability in the region. Hence the interest in the problems of Georgia. This article attempts to approximate the practical actions taken by the EU for the stability and security in Eastern Europe. The problems presented constitute a selected portion of the EU activity, taken in the interest of both the states of the region and the whole Europe.

**Keywords:** European Union, Eastern Europe, global and regional security.

## 1 INTRODUCTION

Eastern Europe has been a region of interest to the European Communities and the European Union since their establishment. This interest has come from the phase of confrontation during the Cold War to cooperation today. The need to lay a good relationship with Eastern European countries has indirect implications for security. Cooperation was strengthened especially after 2004 and 2007, in connection with the EU enlargement with Central and Eastern European states (1). Perhaps in future it will be completed with next accessions, particularly of Ukraine. Nevertheless, essential for security is also cooperation between the EU and Russia.

This article attempts to approximate the practical actions taken by the EU for the stability and security in Eastern Europe. The problems presented constitute a selected portion of the EU activity, taken in the interest of both the states of the region and the whole Europe (2).

The European Union, having a common external border with the countries of Eastern Europe, i.e. Russia, Belarus, Ukraine, Moldova, is interested in not only the security of its borders, but also stability in the region. Hence the interest in the problems of Georgia. The EU therefore seeks, among others, to engage in solving the crisis in Transnistria, South Caucasus, the problems in Belarus. In view of the above, it has appointed special permanent representatives in these regions and leads the operational missions. These actions appear to be necessary because of the ambitions of the EU to play an increasingly significant role in this part of Europe. Of great significance for the EU is to highlight and support the activities of non-military relevance to security: strengthening and consolidating democracy, stability, rule of law, economic growth. This applies to all countries of Eastern Europe. The EU is also interested in laying an effective relationship with Eastern Europe, especially Russia, because of the need to pursue the energy security policy.

## 2 EUROPEAN SECURITY STRATEGY

The document, adopted in 2003, clearly sets out priorities for the EU security policy (3). It states that in Europe there are neither phenomena nor incidents, which could lead to a conflict involving a large number of states. Nevertheless, possible threats include terrorist attacks, increased use of weapons of mass destruction, regional conflicts, loss of sovereignty of states and organized crime (4). Some of them may emerge in Eastern Europe, which is a natural pathway for the development of these threats in the direction of the EU. The document clearly states that there is no alternative to Euro-Atlantic relations. Therefore, the possible inclusion of Ukraine and Georgia, among others, in NATO is so important. At the same time an obvious condition for strengthening stability and security in the European area is to engage in conflict curbing in the Middle East and strengthening cooperation within international organizations.

## 3 EUROPEAN NEIGHBOURHOOD POLICY

The document, adopted also in 2003, is a kind of clarification of the strategic objectives contained in the European Security Strategy for the Eastern policy. It should be stressed that the ENP is a tool for the elimination of new divisions. This is obviously related to the EU enlargement to the East. The ENP assumes cooperation with Eastern European countries, but not only (5)[1].The European Neighbourhood Policy does not offer and is not supposed, in principle, to lead the way to EU membership, though it does not exclude it outright. The task facing the EU is to promote economic growth, stability and security. It is a prerequisite for the external surrounding of the EU to be a friendly, predictable and democratic environment.

[1] Apart from Eastern European countries, the invitations to join the ENP was issued to Algeria, Egypt, Israel, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia ...

The objectives of the ENP are to be met with the help of the bilateral relations between the EU and the countries mentioned in the document. The main emphasis in their framework is put on the political (including security) and economic reforms.

On 7 May 2009 a program was initiated under the name of the Eastern Partnership. This proposal from Poland, as supported by Sweden, aims to make the EU's Eastern policy more dynamic. The program is expected to facilitate mutual contacts between the EU and Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. An important element of it is a multi-dimensional deepening of the relationship at the political, economic and social level. The program is intended to allow citizens of those countries direct contacts with the EU by visa facilitation. Eastern European countries will receive increased financial assistance, trade preferences, and will have a chance to participate in other projects prepared by the EU. The program provides for the implementation of tasks, among others to promote democratic principles, stability and energy security.

## 4 BILATERAL COOPERATION

Bilateral cooperation takes place mostly on the basis of cooperation agreements. They define and clarify the EU's relationship with the countries of Eastern Europe. The provisions contained in the agreements in relation to specific countries cover the most important issues that affect them (6).

### 4.1 EU − Russia

Contacts between the EU and Russia have the form of regular and fairly frequent summits, meetings of high-level politicians, mainly involving President and then Prime Minister Putin. An important tool of the relationship is an agreement on strategic partnership signed by both parties. Russia is the EU's main partner in the East. Simultaneously, Russia's policy, focused on making lively contacts with the EU, is associated with the declared recognition of the EU's future role in global security. In addition, one of the major challenges associated with the laying of mutual relations is the issue of energy security. This follows, of course, from the ties of economies of many EU countries for energy supplies from Russia. A major problem in the meeting of mutual expectations is Russia's strong desire to influence the former republics, now sovereign states, as exemplified by the conflict in Georgia, among others.

### 4.2 EU − Ukraine

The EU has remarkably supported the democratic processes during Ukraine's Orange Revolution. Within the mutual contacts, crucial issues are raised as related to possible membership of Ukraine in the EU. It must also be clearly stated that the decision in this regard must be taken by Ukraine. A major problem with security is the issue, neglected by Ukraine, of the lack of readmission agreements with Eastern countries. The EU concerns about Ukraine are related to the problem of possible movement of certain threats through its territory, including organized crime, illegal immigration, etc.

### 4.3 EU – Moldova

The most significant challenge to security in relations between the EU and Moldova is the problem of Transnistria. Having this issue addressed is essential for security and stability in the region. This applies both to the EU, including Romania, and Ukraine. For this reason, relationships in the future will depend on success in solving the Transnistrian conflict.

### 4.4 EU − Georgia

The priority in relations between the EU and Georgia is the area of justice, freedom and security. This follows from the proposals submitted to Tbilisi in the framework of the ENP. The serious interest in Georgia on the part of the EU stems from the need to engage in solving security problems in the South Caucasus. Also, the candidacy of Georgia for NATO membership is taken more and more seriously. The serious interest in Georgia intensified in August 2008 due to the outbreak of the Russian-Georgian conflict. Therefore, it seems that in view of this situation, especially the attitude of Russia, the declarations of the independence of Abkhazia and South Ossetia, the EU should promote the democratic processes in Georgia more decisively.

### 4.5 EU − Belarus

The attitude of national authorities, blocking the official signing of a bilateral agreement, is not conducive to an active cooperation between the EU and Belarus. It is the only country in the region, which has not concluded a bilateral agreement with the EU. A democratic, stable Belarus would be certainly an interesting partner for the EU in many fields. Now, faced with serious internal problems affecting the EU's external policy, the EU is focused on supporting the opposition and independent media. The presidential elections of 2010, however, made clear once again the need for concrete actions against the policies of Minsk. An announcement of this was communicated in the EU's declarations relating to the limitation of contacts with the regime of Lukashenko.

## 5 CONCLUSIONS

Is it therefore possible to confirm the thesis of a significant, serious interest of the EU in issues of stability and security in Eastern Europe? It seems that the answer to this question may be affirmative. Surely one can (or rather should) encourage the EU to become even more active in this field. This is so, because not all developments are now satisfactory. Many difficult issues remain unresolved today. However, it is difficult to imagine that the EU could afford to neglect the relationships with the region, especially Russia and Ukraine. The recent elections in Belarus confirmed the need to support the democratization attempts. Stabilization of Georgia and Moldova will certainly contribute to improving regional security. For the EU, it is important in this context to build and support in the immediate vicinity a policy of predictability, stability and democratization in political, social, economic and cultural terms.

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# ON THE SHIFTING BALANCE OF COMMAND AND CONTROL: A TALE OF THE GENES AND XENOPHON

Zoltán JOBBÁGY

**Abstract:** Despite Clausewitz's warning that the deduction of effects from their causes in war is always difficult, focusing on causality has always been at the heart of strategic thinking. Similar to the endless combination of possible cause-and-effect relationships in war also the properties of gene mutation can result in an almost infinite field of variants. In order to comprehend this problem biologist Sewell Wright introduced the *theory of shifting balance*, which has commonly became known as the *fitness landscape*. In this article the author takes advantage of Wright's evolutionary theory and reinterprets command and control (C2). He proposes three options for C2 such as *Confidence and Competence*, *Coping and Co-evolution*, and *Creativity and Change*. In order to support his argument the author goes back in history two and a half millennia and refers to Xenophon's famous book, Anabasis. By concluding on the findnings he reflects this evolutionary approach to C2 on the background of the current technology orientation found in most Western armed forces.

**Keywords:** Causality, deduction, gene, mutation, biology, command, control.

## 1 CAUSALITY IN WAR

The British military historian and strategist B. H. Liddel Hart understood strategy simply as achieving an *effect*. According to him effects in war can only be achieved by a sound calculation and co-ordination in terms of ends and means.[1] Referring to effects in war reflects the human tendency to explain a complex phenomenon in a cause-and-effect framework. It rests on the assumption that war is composed of a network of causally describable processes and interactions. Some critiques warn that an explanation of this kind can only be true in one or at best in some of the underlying properties. As soon as the properties blur spatially and temporally, no disposition can deliver useful generalisation. We have to rethink in terms of correlations or co-variation rather than looking for causality.[2]

In book two, chapter five of *On War* Clausewitz addressed the problem of causality in war in detail. According to him hard facts are seldom fully known in wars; therefore the deduction of effects from their causes is always difficult. Effects in war cannot be traced back to a single cause, as several concurrent causes are normally at work. Consequently, it is not sufficient to trace effects back to their causes, but also the causes themselves must be assessed correctly. Investigating the relationship between cause and effect becomes easy only if they are closely linked. Unfortunately, in war everything is interconnected and effects produced influence all subsequent events, as for the final outcome every means available influence the ultimate outcome. When one tries to trace effects back to their causes, every step means that effects can also become causes for subsequent effects. Effects that appear correct at one level can become objectionable on a higher level and imply a new basis for judgement. This hierarchical chain indicates that the distance between cause and effect is proportionate to the number of other causes to be considered.[3]

The hierarchical and interrelated character of effects as explained by Clausewitz, together with their dual nature results that explaining war in terms of causality means facing endless possible combinations.

## 2 SHIFTING BALANCE OF GENES

When biologist Sewell Wright wanted to understand the properties of gene mutation he concluded that even a limited number of mutations can result in an almost infinite field of variants. In order to handle this problem he introduced the theory of *shifting balance*. which is a less rigorous and strict theory, but a more picturesque metaphor.[4] Wright constructed a graphic representation, which he understood as a short and non-mathematical approach to biological evolution resembling a certain similarity with a topographical map. Although he emphasised that references to geography are of secondary importance, the result was a map containing multiple peaks surrounded by circular contours. The map was defined by two axes representing the dimensions along which possible combinations could be arranged. Every combination had a certain value and by connecting the points of equal value a *landscape* containing contours of peaks and valleys arose.[5]

Wright assumed that evolutionary selection could carry the species to the top of the nearest peak, but could not cross valleys that separate the current peak from other, probably higher ones. However, should the species be able to cross valleys then it is not under the exclusive control of *natural selection*, but also of a certain *trial-and-error* mechanism. According to him an indefinitely large species that lives under constant environmental conditions and is exposed only to natural selection, can reach equilibrium by occupying a certain peak. The population either grows through an increase in

mutation rate or a decrease in mass selection, or it decreases through the opposite process. In both cases evolutionary selection alone does not seem to be sufficiently strong to push the species towards another and possibly higher peak.[6]

Wright also assumed that the environment is never static, but changes continuously. The *surface* of the landscape constantly deforms by depressing high places and elevating low ones. According to him, if a species is not extremely specialised and occupies a wide field on the landscape, by moving constantly it could find higher general regions. This trial-and-error mechanism can shuffle the species about by means of change without advance in adaptation. As a solution he proposed a large species to be subdivided into many local races that shift continually in a non-adaptive fashion on the landscape. Although this *exploratory process* could result in a decrease of *fitness* as an immediate effect, this way it would become possible that at least one local race finds a higher peak and pulls the entire species towards this better position. As Wright concluded a "subdivision of a species into local races provides the most effective mechanism for trial and error in the field of gene combinations."[7]

In other words, evolutionary adaptation involves differentiation in which the principal mechanism is essentially non-adaptive. In contemporary scientific language we can say that Wright regarded the species as a *complex adaptive system* that depend on the balance of certain factors controlled by a trial-and-error mechanism. In his attempt to see evolution as a *dynamic process* he regarded adaptation as a balance between *natural selection* and *random genetic drift* with each having a varying contribution to the survival and extinction of species over time and space. He proved that not only *adaptation*, but also *chance events* play an important role in biological evolution.[8]

## 3 NETWORK-CENTRIC APPROACH

Wright's theory applies to a phenomenon such as war in which outputs depend on several inputs, or as Clausewitz emphasised one effect can depend on several causes. Although Wright referred to the space of possible genetic combinations, the concept can be extended to model various complex problems ranging from combinatorial chemistry, physics, computer sciences and various social disciplines. It is also very valuable to discuss war in terms of cause-and-effect relationships. Clausewitz warned that no analysis can reveal the countless possibilities in which individual effects interact or provide useful information regarding their underlying mechanism.[9]

From a military point of view, Wright's idea of shifting balance resembles clear similarities with the basic attributes of *network-centric warfare* found in tary writings. Both stand for the re-focus from the sum of individuals to the network of possibilities they provide for, and the gains that can be exploited. Both re-focus from mostly isolated and homogenous actors to the various interdependencies smaller and more specified players stand for. Finally, both require the re-focus from linear events and processes to issues such as adaptation and *learning* under continuously changing conditions.[10]

Some critics regard the shifting balance theory as a crude metaphor that has *heuristic*, rather than *analytical* values. However, they cannot deny that Wright's idea is a fascinating approach towards visualising real-world problems by means of statistical features. Even critics acknowledge that despite objections, problems and limitations, a discussion of biological evolution based on the idea of fitness can be helpful. It can reveal insightful guidelines that may be generalisable to the intricate relations of causal mechanisms and the consequences they bear.[11] In sum, the *fitness landscape* is a beautiful idea that helps us think differently about causality in war. It depicts war as an *emergent* and *self-organising* process, and among ohers it can best contribute to a meaningful discussion regarding the issue of command and control in a dynamically changing environment such as war.

The suggested biological analogy and the idea of fitness make it possible to see war as a process, which is not always causally connected. Thus war is seen as a temporal sequence of aggregates rather than a linear process in which earlier events simply cause later ones.[12] Within this framework war can be conceptualised as a migratory process on an imaginary landscape that resembles topographical features. Consequently, the goal is to find and occupy regions that contain high peaks representing high value effects and deny the enemy doing the same. This organic understanding of war however, requires an *organic approach* to command and control.

## 4 COMMAND AND CONTROL OPTIONS

Addressing *constant change* is at the heart of Wright's shifting balance theory and is also a core finding in Clausewiz's epic volume. In fact, commanders at all levels world-wide face a constantly changing environment in which threats are frequent, variable and uncertain. In oder to cope with such challenges Wright suggested to avoid centralization. Some human organizations including letha terrorist groups have already recognised this.

They are loosely organized, even leaderless according to our understanding, and yet capable of inflicting casualties and damages world-wide.[13]

Centralisation on all levels has been for long time the main feature of any military. Apart from the benefits in terms of planning, organisation, resource allocation, etc., centralisation can be pretty expensive in many ways. It de-motivates subordinates to exercise initiative based on changing circumstances, and makes superiors disinterested in listening to subordinates carefully. Centralisation also means that independence, trust, rapidity in terms of decision-making and taking risk deliberately into account, are suppressed. In terms of command and control centralisation often stands for a top-down, mechanistic and linear approach resembling a monologue that does not take into account constantly changing situations in which commanders must deal with a thinking enemy who reacts and adapts to every move.[14]

In order to elaborate in detail on the consequences the shifting balance theory has for command and control we approach and discuss it from three different angles. Hence C2 offered as *confidence and competence*, *coping and co-evolution*, and *creativity and change*.

### 4.1 C2 as Confidence and Competence

In general we can say that the biggest consequence of centralisation in terms of command and control is twofold. The first is a formal separation between those who lead and those who are lead, which is expressed in a strict pyramid-like hierarchical design. The second comes as a result of the first, since it is supposed that those on the top are more important than those serving below. However, the shifting balance of command and control requires that much must be delegated to lower levels in order to detect, track and exploit emerging opportunities.

Conceptualising war as a search process in a landscape assumes that we see everything in terms of networks. Consequently, we must become a network ourselves, in which the emphasis shifts towards a horizontal focus. Power must be distributed in a lateral way in which each boundary, cluster, and node interacts as we engage with the enemy. It is impossible to control a complex adaptive system; therefore we must refocus from command and control in traditional terms and emphasis C2 as *confidence* and *competence*. This means that both superiors and subordinates must be able to work in an autonomous and asynchronous way in which boundaries are neither fixed nor controlled, but adapt to changing requirements. Consensus does not come as a result of a top-down monologue, but as a *stop-and-go* process that rests on trust and confidence. Both superiors and subordinates know that despite errors and blunders they make, everybody wants to achieve the right thing. Humans are willing to learn and change views in order to adapt to constantly changing circumstances.

Confidence and competence come out of a collective experience that helps exercise disaggregated and asynchronous procedures. Information can find its way to those who need it, even if they do not want to know it. Shifting balance stands for a constant change with often surprising opportunities that require rapid and immediate actions often carried out in novel ways. Armed forces have to move from a formal and vertical to a more informal and horizontal organisational structure. Only those can learn from their mistakes who have been allowed to make them.[15]

C2 as confidence and competence assumes that not only subordinates have the freedom to realise the superior's intent, but also the superior is ready to learn and adapt his intent to the battlefield realities that come as the result of a continuous give-and-take process with the enemy. This way it will be possible to exploit emerging opportunities nobody could have imagined in advance, but can serve well or even better than those, which were planned and formulated.

### 4.2 C2 as Coping and Co-evolution

The shifting balance of evolution exploits uncertainty in a novel way and calls for freedom and adaptability at all levels. C2 as *coping* and *co-evolution* requires only general statements to be stated in advance to start activities rather than a detailed plan. Thus only guidelines must be laid down in order to put the system into gear. As soon as the engagement with the enemy gains momentum, details that cannot be anticipated beforehand will emerge anyway. A good example for emergence and self-organisation was the 1967 Arab-Israeli war in which for the Israeli side "only the first [day] was planned in any detail; the rest was pure improvisation."[16]

Israel achieved one of its most stunning victories over its neighbours at a cost of roughly 680 soldiers killed, 2,600 wounded and 15 more becoming prisoners. In contrast, according to various estimates the numerically superior combined Arab forces suffered 21,000 casualties, a further 45,000 soldiers were wounded and 6,000 became prisoners. Confronted by a much larger coalition and facing a three-to-one imbalance of forces, Israel managed to win within six days. A successful *mix* of surprise, intelligence, guile, gamble, determination and courage backed by a maximum independence of subordinate commanders, mutual trust and

appreciation in the form of an *implicit brotherhood* throughout the ranks resulted in communication and comprehension, which are so necessary for flexibility in war.[17]

Israeli units were able both to self-organise and exploit emergent windows of opportunities despite the many blunders they made during the operations. They probably did not achieve what we would describe as desired effects, but were able to exploit those opportunities sufficiently enough to be victorious in the end of the day. C2 as coping and co-evolution reminds us that whatever the level of sophistication of the technology employed, it equally opens up and shuts down possibilities. It is as important to exploit advantages it offers as to understand the limitations it has. The very essence of coping and co-evolution means that we should always be ready to exploit vulnerable niches in order to turn initial disadvantage to our favour.

### 4.3 C2 as Creativity and Change

Conceptualising war as a complex adaptive system requires seeing command and control in terms of a *polarity* characterised by *stability* and *chaos* as end-poles. Even the shifting balance theory allows us for conducting command and control functions in a traditional top-down fashion resembling a monologue. The closer we are to the region of stability, the higher its value. However, we must equally take into account that as the dynamics of war unfold, things will shift towards the region of chaos. Consequently, command and control in traditional terms become increasingly vacuous. Approaches attempting to prioritise, centralise or distribute uncertainty cannot cope with all the conflicting requirements and constraints soldiers face.

The most important message of the biological metaphor is that victory in war requires the harnessing of everyone's capabilities and knowledge throughout the ranks. It is probably too far to state that if you order a soldier to do something, you have already failed as a leader, but we must acknowledge that people are in general ready and willing to work well, contribute their ideas and take responsibility. Success in war demands everyone's contribution to solve emerging challenges and crises. C2 as *creativity* and *change* indicates that self-managed and autonomous teams can come up with smarter solutions to problems and achieve a higher level of adaptability. The higher the risk, the more we need the commitment and intelligence of everybody. Creativity and change mean that people often get together in order to achieve more, but not less. This way they develop a shared understanding and behaviour to take required actions. Strategies developed this way are simpler and more localised. They require a constant search for solutions, which come as a result of intimate and local experience that can turn into system-wide coherence.[18]

Although these activities indicate that organisations must become able to tolerate a high level of messiness, they can provide for an atmosphere in which freedom and innovation are the driving forces for achieving sufficient local solutions. As the 1967 Arab-Israeli war showed, if people can develop trust for each other they also establish an atmosphere that is more inspiring and forgiving. Consequently, local responsiveness can turn into higher agility and better adaptability.

## 5 XENOPHON AND MARCH UP-COUNTRY

A good example for coping successfully with challenges in terms of C2 posed by constant change can be found in Xenophon's famous book *Anabasis*. It describes the march of a Greek expeditionary force of roughly 11,000 men fighting its way back from Asia Minor to Greece 2,500 years ago. Similar to the features of the fitness landscape, the ancient Greeks had to find home in a mostly unknown terrain guided only by local information that required constant adaptation to changing circumstances. They developed a trial-and-error approach in order to best exploit emerging opportunities.

### 5.1 Heading to the Black Sea

After the death of Cyrus who hired them, the Greeks found themselves trapped in a hostile environment. Surrounded by enemies with most of their generals and officers seized and killed, having no guides to show them the way, and facing unknown territory the Greeks managed to reach the Black Sea, mostly intact. According to Xenophon 8,600 men of the original 10,700 survived despite the difficulties they encountered, which means a total loss ratio of roughly 20 percent over a year. All of their actions reflected the shifting balance of command and control. As an example in book three Xenophon stated in the beginning of their long march that "let us not wait for others to come to us and summon us to the noblest deeds, but let us take the lead ourselves and arouse the rest to valour."[19]

During their march the Greeks routinely assembled to vote on proposal of their elected leaders, erected boards and councils to debate and discuss issues such as organisational modifications or suitable tactics. Having a flat-enough organizational design and a horizontal rather than

a vertical structure, the superiors always marched and fought alongside their subordinates. As Xenophon emphasised "it is right to expect that you should be superior to the common soldiers, that you should plan for them and toil for them whenever there be need."[20]

Whereas they achieved maximum physical flexibility by burning all their superfluous equipment out of need before the march, their command flexibility resulted from the ability to compensate for the want of leadership and discipline. However, what made them really lethal is expressed in the explicit encouragement of subordinates to come up with alternatives and suggestions at any time. Xenophon always welcomed bottom-up initiative by assuring subordinates that "if any other plan is thought better than mine, let anyone, even though he be a private soldier, feel free to present it; for the safety of all is the need of all."[21] This adaptability was enforced by an organisational design, which was regarded as a good-enough start only. Xenophon emphasised that "for the future, as we make trial of this formation we can adopt whatever course may seem from time to time to be best. If anyone sees better plan, let him present it."[22] As a result, when the Persian commander Mithradates seemed to be superior because of having mounted troops and slingers, the Greeks were able to offset his advantage within a night by establishing similarly equipped troops. They were also willing to use either superior enemy equipment such as Persian arrows, or to innovate and build new ones. If the marching formation they originally choose was not good enough, which became clear as soon as they started to cross rivers, they went over to an even less structured formation that further delegated responsibility down to junior commanders. Another good example for flexibility can be found in a dialogue between Cheirisophus, the senior commander of the Greek army and Xenophon. During a battle with a Persian army, the occupation of a mountain top was seen as crucial and Xenophon offered his commander that "[i]f you choose, then, stay in command of the army, and I will go: or, if you prefer, you make for the mountain top, and I will stay here." Cheirisophus replied by saying that "I leave it to you to choose which part you wish."[23]

Thus Xenophon led the Greek forces and when he was reminded by Soteridas, a common soldier, that he was riding on horse back while others had to conduct a forced march, he dismounted and continued to march on foot. On another occasion the generals collectively decided upon a proposition to cross a river. They concluded that although it was a clever alternative, its execution was rather impossible, which eventually led them first into the country of the Carduchians and then to Armenia.[24]

### 5.2 Arriving at the Black Sea

Information was allowed to flow directly upward in an unconstrained way as displayed by an example in book four. By fighting their way through the mountains, on one occasion the Greeks encountered a joint force of Armenians, Mardians and Chaldeans that appeared to be superior to them. They were forced to cross a deep and fast flowing river, which was seen as a difficult and dangerous undertaking. The situation came close to a disaster as the Greeks saw a river difficult to cross, enemy troops intended to obstruct their crossing and ready to fall upon their rear. However, by accident two young Greek soldiers discovered a save ford and since they knew that soldiers were allowed to go to Xenophon "whether he was breakfasting or dining, and that if he were asleep, they might awaken him and tell him whatever they might have to tell that concerned the war."[25]

They passed the information directly to their superior and this way the cornered and desperate Greeks were able to slide out of the hand of their enemies. Later in Western Armenia, they came under a heavy fall of snow that covered the bivouacked men. The next morning soldiers were reluctant to get up. In order to show example Xenophon was the first to get up and split wood. One by one soldiers got up and also started to split wood, build fires and anoint themselves. On another occasion when they entered the country of the Taochians they nearly run out of provisions and were forced to attack one of the strongholds that was built on a steep hill. Every time when the Greeks attacked they were repulsed by stones rolled down from an overhanging rock crushing the soldiers' ribs and legs. As a result Greek troops sought shelter in the cover of nearby trees. In order to solve the situation and motivate subordinates, the captains of the companies developed a scheme and led by example. In their run across the stronghold Agasias, Callimachus, Arystonimus and Eurylochus "thus contending … captured the stronghold, for once they had rushed in not a stone came down any more from above."[26]

Despite the unknown terrain and hostile countries they marched through, the Greeks could eventually reach the Black Sea. As described in book five they took counsel for themselves in which the generals and not the common soldiers underwent an inquiry with reference to their past performance, and in case misconduct was discovered, they had to pay a fine.[27] Needless to say that such a bottom-up evaluation of superiors by subordinates stands in sharp contrast with the current top-down one-way evaluation scheme of subordinates by superiors found in most armed forces. In other words, they conducted a thorough after action report in order to

enhance their effectiveness for the remaining part of their trip to Greece.

## 6 CONCLUSION

Wright's shifting balance theory and Xenophon's practice show that even informal command and control emphasising *emergent* and *self-organising* mechanisms can ease, but never eliminate the constantly changing nature of war. According to contemporary Western, especially American, military thinking the application of advanced technology can help reduce the fog of war, hence clarify cause-and-effect relationships. However, the shifting balance theory stands for clear limitation regarding such assumption. Causal relationships will never be completely knowable or perfectly detectable in war. Even if we are able to adapt in an excellent way as the ancient Greeks did, a given amount of trial-and-error can never be ruled out. Their recorded long march is the best example for the fact that in war we always deal with the likely rather than the true.

More information provided by technology might create more predictability, but the bigger its amount the greater the uncertainty, hence the unpredictability it contains. The shifting balance theory of evolution and war's friction remind us that both the formulation and achievement of desired effects mean putting on narrow blinders. In the last two decades we witnessed a steep increase in the performance of information technologies Western armed forces can field in order to support command and control functions. However, the tempo of operations and the demand for making split-second decisions has also grown. Still the weakest link in this process is the speed at which humans make decisions, and this has not changed much since the age of Xenophon. Another problem we have to accept is that despite the amount of available information, it is often "trivial in quality and overwhelming in quantity."[28]

Contemporary commanders are confronted with two sorts of uncertainty in terms of command and control. The first is due to the lack of accurate, useful and timely information, which has always been part of the business of war. The second is due to the overwhelming amount of information as advanced technologies can both collect and communicate nearly anything and everything.[29]

War as a complex adaptive system is mobile in which both the deployment and employment of forces frequently change. Official channels of command and control can brake down and superiors will often be unable to guide their subordinates who have to carry out actions with little time to assess and prepare. As the shifting balance of evolution and the ancient Greek example show, fleeting and unique military situations require a constant adaptation based on local information harnessing individual initiative and responsibility. Command and control must often be delegated to a local level in order to achieve effects that might not always be predictable, but are good-enough to become both effective and efficient at the end of the day.

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# MULTICULTURALISM IN THE MULTINATIONAL DIVISION CENTRAL-SOUTH INTERNATIONAL STABILITY OPERATIONS IN IRAQ (2003-2008)

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**Abstract:** In the report was presented the phenomenon of multiculturalisms occurring in the Multinational Division Centre-South in the Republic of Iraq in progress of activities of the Polish military contingent in years 2003-2008. The problem of the multiculturalism was introduced with reference to the national composition above-mentioned divisions, the environment of the local population with the regard of his influence on the cooperation within the framework of coalition forces and their relation with authorities and the local population in the area of the operating-responsibility. In the article were talked over also reasons of such juncture and the relation of themselves participants (soldiers) of the stabilization operation to this problem based on unique results of researches conducted by the author in the Republic of Iraq.

**Keywords:** Multiculturalism, social communication, Polish soldiers, international stabilization activity, local population, Iraq.

## 1 INTRODUCTION

Poland's commitment to an active participation in peace operations of the UN, NATO, OSCE and EU, resulted in the decades of Polish soldiers' task execution on various continents in multicultural environment. Therefore, besides a typical military training, an intercultural communication skills gain the great importance[1]. It must be stressed that "multiculturalism" is neither narrow nor explicit term[2]. According to Piotr Sztombka, multiculturalism, on the one hand, may be regarded as multitude and diversity of cultures in the following historical and modern co-existential dimension. On the other, it is ideology position stressing the right of various communities to different ways of life, and advocating a real equality of cultures[3]. Multiculturalism may also be perceived as diversity of cultures within one community, which unrepetitiveness and uniqueness should be treated with great tolerance.

With regard to preparation and conduct of international peace[4] and stability operations, the multiculturalism problem gains the specific importance. The inter-culture contacts and relations[5] that occur between the representatives of different cultures (within international contingents or in contacts with local population) may critically influence the effectiveness of stability tasks' execution and security in particular area of operation. Thus, the inter-culture communication competences of international contingents' personnel (especially officer's cadre)[6] are of no less importance in preparation process than typical military training[7]. In order to achieve that goal, multicultural education[8] should be important factor

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1 Intercultural communication takes place when a representative of one culture creates and passes information (clear and understandable), which is addressed to the representative of a different culture, see: A. Zaporowski, *Czy komunikacja międzykulturowa jest możliwa? Strategia kulturoznawcza*, Wyd. UAM, Poznan 2006, pp. 98-101; M. Zuber, *Komunikowanie międzykulturowe*, [in:] *Studia z teorii komunikowania masowego*, ed. B. Dobek-Ostrowska, Wroclaw 1999, p. 24.

2 The specialist literature describes multiculturalism, depending on different interpretation of the term, as transculturalism, multiculturalism or culture pluralism.

3 SZTOMBKA, P.: *Socjologia,* Wyd. Znak, Krakow 2005, p. 255.

4 It must be emphasized that there is no universal definition of „peace (mission) operation". In this paper, that term is understood as: preventing, reducing, calming and ending armed operations between countries or within countries with the assistance of third party peaceful intervention, organized and directed by an international organization, with participation of military, law enforcement and civilian personnel, in order to restore and keep peace, W. E. Gilman, D. E. Herold, *Peacekeeping Challenges to Euro-Atlantic Security,* NATO Defence College, Rome 1994, p. 21; *Słownik terminów z zakresu bezpieczeństwa narodowego*, Warszawa 2002, p. 92.

5 A culture contact may be considered as establishing an interaction and social relations between communities (their representatives) living in the different cultural circles, P. Sztombka, op. cit., p. 254.

6 See: KOZERAWSKI, D. S.: *Rola i zadania oficerów Wojska Polskiego w międzynarodowych operacjach pokojowych i stabilizacyjnych w latach 1953-2007*, [in:] *Oficerowie grup dyspozycyjnych. Socjologiczna analiza procesu bezpieczeństwa narodowego*, ed. T. Kolodziejczyk, D. S. Kozerawski, J. Maciejewski, Wyd. Uniwersytetu Wroclawskiego, Wroclaw 2008, pp. 69 and next.

7 See: KOZERAWSKI, D. S.: *Rola komunikowania się żołnierzy sił pokojowych ze stronami konfliktu zbrojnego*, Zeszyty Naukowe Wyzszej Szkoly Oficerskiej im. T. Kosciuszki „Poglady i doswiadczenia", Special edition, Wroclaw 1997, pp. 161-164.

8 See: MELOSIK, Z.: *Teoria i praktyka edukacji wielokulturowej*, Krakow 2007, pp. 11 and next.

during the formation of international forces personnel from uniformed groups[9].

The Polish soldiers' participation in international peace process dates back to mid-20th century, when, after the end of combat in Korean War in 1953, a group of Polish officers was dispatched to work within the Neutral Nations Supervisory Commission (NNSC) in Korea[10]. One year later, in April 1954, Polish representatives entered the International Commission of Control and Supervision (ICCS) that was created to resolve the armed conflict encompassing territories of Cambodia, Laos, and Vietnam[11]. The next mission of Polish military personnel was within the International Military Observer Team in Nigeria (OTN) (until March 1970).

The first case of participation of compact Polish military contingent (PMC) in international peace operation is connected with formation of Polish Special Military Unit (PSMU) for service in international peace forces UNEF II in the Middle East[12]. Following U.N. operations with Polish units' participation were UNDOF (since 1974) on the Golan Heights[13] and UNIFIL in Lebanon (since 1992)[14]. An operation that functioned in different socio-culture environment was UNTAG in Namibia in 1989-1990, and was conducted with Polish military contingent as a part of them[15].

After system transformation in Poland in 1989, Polish soldiers participated in international military operations (peace and coalition) in Persian Gulf (1991), former Yugoslavia (1992-1995), Cambodia (1992-1993), Haiti (1994-1995), and Bosnia and Herzegovina (since 1995).

It is worth to stress that characteristic for Polish soldiers' participation in such activities (since 1953) was the necessity to operate within multinational and multicultural environment on Asian, European, and African continents.

Poland's accession to NATO (12 March 1999) that was proceeded with its cooperation with alliance's members and other countries within the framework of "Partnership for Peace" program (since 1994), has formalized and broadened a spectrum of Polish military personnel cooperation while operating within multinational and multicultural environments. A confirmation of that was Polish military contingents' participation in peace and stability operations in Albania (1999), Kosovo (since 1999) and Afghanistan (since 2002)[16].

The Republic of Poland joining the European Union (2004) was an important factor that initiated an increase of Poland's involvement in operations

[9] The term "uniformed group" is not unambiguous, it may be understood as specific social group, because of its structure and hierarchic organization (within one group, the smaller subgroups compose the larger) that makes its availability, which is defined as a mutual relation of subordination and superiority of social entities. The „uniformed groups" are subordinated to superior actor, which, with regard to the largest of them – armed forces, is state, or, in some instances, international organizations, see: Z. Morawski, *Prawne determinanty pozycji, roli i statusu warstw dyspozycyjnych społeczeństwa Polski na przykładzie trzech organizacji formalnych*, Wyd. Uniwersytetu Wroclawskiego, Wroclaw 2005, p. 22; Z. Zagórski, *Społeczeństwo transformacyjne. Klasy i warstwy Polski postkomunistycznej*, Wyd. Uniwersytetu Wroclawskiego, Wroclaw 1997, p. 25.

[10] The ceasefire agreements supervision was entrusted to international commission that consisted of: Czechoslovakia, Poland, Switzerland, and Sweden. The commission worked in twenty four-person stationary and mobile inspection groups, which were located in seaports, airports and railway stations of both former warring countries' territories, and also patrolled the demilitarized zone. Therefore, multicultural contacts happed with different frequency every day. In February 1995, Polish personnel were pulled-out from Korea as a consequence of withdrawal of permission to stay on its territory by North Korean authorities. It is estimated that within the Commission worked 1065 members of Polish civil-military personnel (including 796 regular soldiers), F. Gągor, K. Paszkowski, *Międzynarodowe operacje pokojowe w doktrynie obronnej RP*, Torun 1999, pp. 147-148.

[11] For the purpose of supervision of armistice agreement proceedings created two separate commissions, which operated in Cambodia until 1969; Laos until 1975; Vietnam until 1972. The commission with similar tasks was, created under the Paris Agreement in January 1973, the International Commission of Control and Supervision in South Vietnam that operated until 1975. In all of commissions in Indochina have participated 1948 Polish representatives (including 1391 regular soldiers), F. Gągor, K. Paszkowski, op. cit., pp. 148-149.

[12] UNEF II – *Second United Nations Emergency Force* – the U. N. intervention forces, which were the continuation of UNEF I that operated in 1956-1967.

[13] UNDOF – *United Nations Disengagement Observer Force*.

[14] UNIFIL – *United Nations Interim Force in Lebanon*.

[15] UNTAG – *United Nations Transition Assistance Group*.

[16] See: KOZERAWSKI, D. S.: *Zaangażowanie Polski w międzynarodowe operacje pokojowe na Bałkanach w XX wieku a bezpieczeństwo militarne państwa*, [in:] *Polityka bezpieczeństwa Polski w XX i na początku XXI wielu (wybrane problemy)*, ed. T. Panecki, Wyd. Akademii im. J. Długosza, Czestochowa 2008, pp. 159-170; *Działania wojenne, pokojowe i stabilizacyjne prowadzone w warunkach szczególnych w XX i XXI wieku. Konflikty – doświadczenia - bezpieczeństwo*, ed. D. S. Kozerawski, Torun 2007, pp. 17 and next; *Operacje pokojowe i antyterrorystyczne w procesie utrzymania bezpieczeństwa międzynarodowego w latach 1948-2004*, ed. D. S. Kozerawski, Torun 2006, pp. 110 and next.

conducted by this institution in Bosnia and Herzegovina (2004), Congo[17] (2006), and Chad (2007-2009).

The vast majority of above mentioned international operations with Polish soldiers' participation was conducted under auspices of the U.N., OSCE, NATO or EU, and therefore, their activities were legitimized by these international organizations.

## 2 CONTENT

The military operation conducted by U.S.-led multinational coalition in 2003, should be considered as specific. As it was mentioned before, there are still no clear reasons for strike on Iraq, because the alleged possession of weapons of mass destruction (WMD) by this country was not proved until the present day. It seems that lack of support from the U.N. and NATO (especially Germany and France) forced Washington administration to look for ad hoc allies in Europe and beyond. A creation of multinational and, at the same time, multicultural coalition allowed for internationalization of conflict, as well as dispersion of responsibility for combat operations in Iraq after toppling Saddam Hussein's dictatorship on larger number of international relations' actors. It must be stressed that the reasons to create this coalition, the role of the United States, and operation environment – territory of Iraq – determined most of that operation's aspects connected with broadly understood multiculturalism[18].

With regard to coalition operation in Iraq, the multicultural issue (including, connected with it, intercultural communication) may be viewed in various aspects closely related to the following relations:

- Coalition forces (Command and other three divisions) – Multinational Division Central-South (MND CS)[19];
- Coalition forces – Iraq neighboring countries (Turkey, Iran, Kuwait, Saudi Arabia, Jordan, Syria);
- Countries' national contingents – Polish command of Multinational Division Central-South and 2500 personnel of Polish Military Contingent;
- Multinational Division Central-South (commanded by Poles) – Iraqi authorities, Iraqi Security Forces, local leaders (secular – sheiks, religious – imams), local population;
- Multinational Division Central-South (commanded by Poles) – rebel fighters (local and foreign).

One of the most involved countries in the coalition operation in Iraq was Poland, which was acknowledged by entrusting Poland with responsibility for one of four zones that Americans divided conquered, by them and British forces, territory of that country. Assuming the responsibility for Central-South zone and commanding Multinational Division Central-South, which, at the beginning, consisted of soldiers and contingents from 25 different countries, posed a great organizational challenge, and, at the same time, a precedent in history of the Polish Armed Forces. The series of problems had arisen at the phase of multinational division formation. Thanks to an intensive activity of Polish officers' group led by General Andrzej Tyszkiewicz, it was possible to invite a large group of countries representing not only different nationalities, but also different cultures, for cooperation within already mentioned coalition forces division. The MND CS consisted of soldiers from such countries as: Bulgaria, Denmark, Dominican Republic, Philippines, Georgia, Spain, Netherlands, Honduras, Lithuania, Latvia, Kazakhstan, South Korea, Mongolia, Nicaragua, Poland, Romania, Salvador, Slovakia, the United States, Thailand, Ukraine, Hungary, Italy, and Great Britain[20]. The main mission of the MND CS was to conduct stability operation in order to provide stable and safe conditions for development of existing administration, regional stability promotion, and elimination of terrorist threat.

Political reasons and changes of situation in region had caused the serious transformation of both tasks and character of the operation, in which Polish Military Contingent participated. It is worth to stress that an implementation of Western-style "democracy" – under the coalition forces strength's pressure – was met with part of Iraqi population' disapproval. It was manifested in different ways –

[17] See: KOZERAWSKI, D. S.: *Kontyngent Wojska Polskiego w międzynarodowej operacji pokojowej Unii Europejskiej w demokratycznej republice Konga w 2006 r. jako forma zaangażowania Polski w ponadnarodowy system bezpieczeństwa*, [in:] *NATO w dobie transformacji. Siły zbrojne w transatlantyckim systemie bezpieczeństwa początku XXI wieku*, ed. K. Kubiak, P. Mickiewicz, Wyd. „Adam Marszałek", Torun 2008, pp. 148 and next.

[18] KOZERAWSKI, D. S.: *Międzynarodowe działania stabilizacyjne w świetle doświadczeń X zmiany PKW Irak w 2008 roku*, Warszawa 2010, pp. 36 and next.

[19] MND CS – Multinational Division Central-South.

[20] TYSZKIEWICZ, A.: *Operacje stabilizacyjne na podstawie doświadczeń polskiej Dywizji Wielonarodowej w Iraku*, Dom Wydawniczy „Bellona", Warszawa 2005, pp. 125-150; E. Przeniosło, *Formowanie dywizji międzynarodowej*, „Przegląd Wojsk Lądowych" (PWL), Special Edition, Warszawa 2003, pp. 27-31.

from armed anti-coalition activities[21], through supporting (logistically and spiritually) rebel movements, to passive resistance against foreign forces seizing (in the opinion of local opposition movements – occupying) territory of Iraq. During the first years of operation, the level of multicultural communication between coalition soldiers and authorities and local communities' representatives, despite initial confidence of the latter, was far from satisfying. The main reason of that situation should be considered an insufficient level of cultural awareness education of civil and military personnel of international forces' contingents.

An important factor that impacted effectiveness of international forces' task execution were so-called national procedures, which applied to soldiers of particular contingents of MND CS, and which, in many instances, hindered realization of stability tasks within Central-South coalition forces' area of responsibility in Iraq.

An example were Spanish Rules of Engagement (ROE), which, unlike the similar documents of other MND CS contingents, did not specified procedures regarding the use of force against military (paramilitary)[22] forces, thus, could limit or even prevent from joint task execution.[23]

It should be acknowledged that, in the opinion of a group of Polish commanders, multinational character of commanded by Poles MND CS created the following serious obstacles during the process of task execution:[24]

- national limitations (i.e. participation in offensive operations prohibition);
- dual chain of command (MND CS command and national decision-making center of particular country – contractor);
- differences of mandate and mission;
- language barriers;
- differences in organizational structures, equipment and weaponry;
- changes of MND CS composition;
- variety of traditions and customs.

A serious problem, in both operational and socio-cultural (affecting soldiers' morale) aspect, was constant process of withdrawal of consecutive countries from Iraqi operation, which also applied to commanded by Poles Multinational Division Central-South. From the initial 25 countries that dispatched their contingents in the first rotation (2003) to MND CS, in the last – tenth – rotation (2008) remained only nine.

It is important to mention that within MND CS, aside from European nation's personnel representing Western culture, soldiers from Kazakhstan, Mongolia, Nicaragua, Honduras, Philippines, and South Korea were executing their tasks.

An essential element that positively affected Polish soldiers' (mainly officers) communication with representatives of other nations were English and Russian language skills (bilingualism), which allowed them to communicate with both NATO officers and those originating from Russian language zone (e.g. Armenia, Kazakhstan, Mongolia, Ukraine). This bilingualism of the majority of Polish officer's cadre was a rarity among entire coalition forces (the remaining zones were commanded by Americans and British) and facilitated communication in multicultural environment of the division commanded by Poles (both during working hours and unofficial meetings).

An interesting are the opinions of 10th rotation of PMC soldiers in Iraq regarding the assessment of their cooperation with representatives of other coalition countries. The survey was conducted in two groups, among commanding cadre of MND CS and among soldiers from task forces (TF), in the nine month of operation[25]. The results of the survey are presented on the graph below.

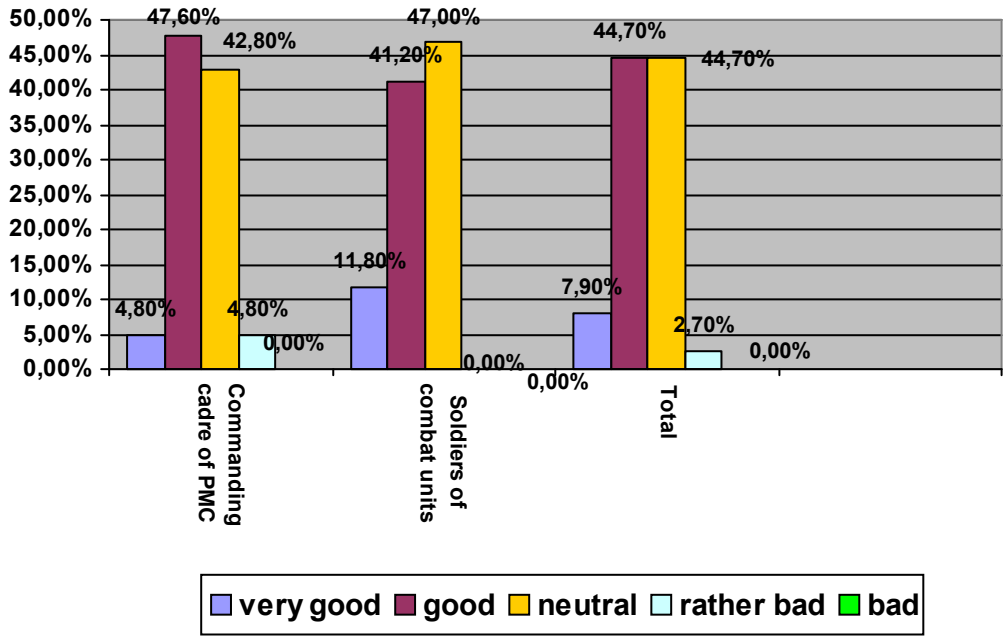
[21] See: OGRODNIK, J.: *Działania partyzanckie sił koalicyjnych w Republice Iraku w latach 2003-2006*, [in:] *Działania wojenne, pokojowe i stabilizacyjne prowadzone w warunkach szczególnych w XX i XXI wieku. Konflikty – doświadczenia - bezpieczeństwo*, ed. D. S. Kozerawski, Wyd. „Adam Marszałek", Torun 2007, pp. 250-268.

[22] TYSZKIEWICZ, A.: op. cit., Appendix 4.

[23] Spanish contingent's soldiers were permitted to use "a minimal lethal force against hostile attacks", however, because of the high level of threat during tasks execution within MND CS area of responsibility, the "minimal force" could not be sufficient to provide the security for own forces (Force Protection), or to support coalition forces. That problem was important because Spain dispatched nearly 1120 soldiers to MND CS, and its officers took responsibility for commanding one of Brigade Combat Teams (BCT).

[24] KOZERAWSKI, D. S.: *Problem edukacji wielokulturowej w aspekcie realizacji zadań podczas międzynarodowej operacji koalicyjnej w Iraku (2003-2008)*, [in:] *Andragogika a grupy dyspozycyjne społeczeństwa*, ed. W. Horyn, J. Maciejewski, Wyd. Uniwersytetu Wrocławskiego, Wrocław 2010, pp. 39-40.

[25] It is important to mention that all previous rotations (I-IX) had lasted six months.




Source: based on author's own research[26].

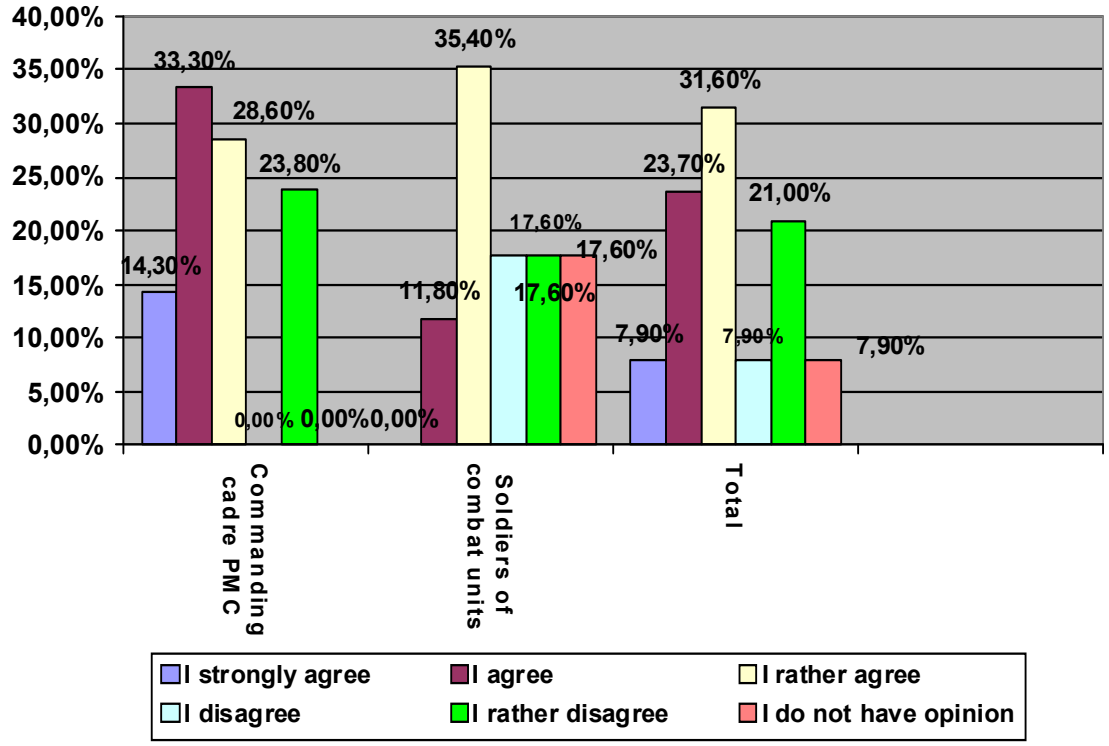
Fig. 1 Opinions of soldiers of 10th PMC in Iraq rotation, regarding an assessment of cooperation with other coalition nations' representatives

Base on the data presented on the chart above, it is possible to state that positive assessment values are similar in both commanding cadre and soldiers' groups (approx. 53%). Whereas negative and neutral high percentages of the opinions regarding above mentioned cooperation (approx. 47%) are interesting. Explaining their opinions, the respondents mentioned such reasons as lack of language skills (mainly English language) and character of the position they manned (lack of contact with foreigners). One of the serious limitations was relative low knowledge about history, tradition, and customs of nations that were part of coalition forces and the multinational division commanded by Polish officers. It seems that including and broadening cultural awareness matters to process of PMC preparation for next international operations may positively influence the level of cooperation between allies and coalition members.

Another important issue was a multicultural communication between PMC soldiers and local population and authorities representatives. The chart below presents, in graphical manner, opinions of Polish military personnel regarding time dedicated to history, religion, customs, and other cultural issues of Iraq during the process of preparation of Polish military contingent for the operation. It is important to emphasize that the survey was conducted in the ninth month of stability tasks execution in MND CS area of operation[27], which, because respondents experience, further increase the value of the results.

[26] The survey was conducted in August and September 2008, in the MND CS area of responsibility in Al Quadisiyah province (coalition forces bases: Ad Diwanijah and Al. Kut).

[27] It should be highlighted that PMC soldiers' participation in coalition operation on the territory of the Republic of Iraq, because of its characteristic, and dangers for health and life, was formally recognized as operations in the war zone.




Source: based on author's own research [28].

Fig. 2 Opinions of 10th rotation of PMC soldiers regarding the sufficient amount of time dedicated to multiculturalism matters during preparatory training for mission in Iraq

Based on analysis of this chart, it is evident that approximately 32% of respondents positively assessed their multicultural education preparation for the mission. The positive opinions ("I rather agree"), but with some reservations answered approximately 31% of respondents. Almost third part of trainees (approx. 29%) decided that the training was not sufficient, and approximately 8% did not have opinion on that matter. It should be emphasized that a part of respondents participated previously in Iraqi operation, therefore the number of undecided or having negative attitudes toward multicultural education during preparation for the mission may be curious (total – approx. 37%). Despite the fact that the results are not representing whole situation throughout entire operation, they are indicating the necessity for improving multicultural education (both in terms of quality and quantity) during the process of preparatory training, as well as during international stability and peace operations.

## 3 CONCLUSION

In such training, it is worth to remember that better multicultural education might allow better cooperation among international coalitions and with representatives of local population (administration, tribal leadership, religious leaders); improvement of Polish Military Contingents and coalition (allied) personnel security; more effective tasks execution and projects realization in support of local communities.

Above mentioned potential benefits might be result of, broader than currently, multicultural education of PMC personnel in country and in the area of operation. Although, it should be remembered that the better cultural awareness not necessary must change the perception of coalition forces by local population, especially if the forces do not have broad legitimization from international organizations – like the situation with coalition operation in Iraq.

Multicultural relations of Iraqis (Shiites constituted the majority in Polish area of responsibility – mostly content because of toppling Saddam Husain regime) with MND CS personnel were regarded by the former in terms of potential personal profits or culture threats.

The words of Ryszard Kapuscinski are worth considering in the context of Polish soldiers' participation in coalition operations similar, in character, to stability mission in Iraq: *"...Let's give the thought, whether, living among various cultures, civilizations, and religions, we want to search for*

[28] The survey was conducted in August and September 2008, in the MND CS area of responsibility in Al Quadisiyah province (coalition forces bases: Ad Diwanijah and Al. Kut).

*the worst things in other cultures to strengthen our stereotypes, or we rather want to look for common grounds. Our world is on the crossroads. Certain tendency seems to be unavoidable – we will all live in the multicultural world"* [29].

It should be stressed that we already live in multicultural world, and the key condition in a search of chances for cooperation with other cultures seems to be a respect for their diversity with widely understood tolerance. Thus, one of the most important factors that could allow achieving these goals is, beyond any doubts, multicultural education on every level of education and training of international military contingents' personnel.

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# MODELS OF FORMING/ DEVELOPING THE INTERCULTURAL COMMUNICATION COMPETENCE. MODELS RELEVANT TO THE ROMANIAN MILITARY HIGHER EDUCATION

Adrian LESENCIUC, Cosmina DRĂGHICI, Daniela NAGY

**Abstract:** Forming the relational dimension of Romanian military personnel and not only of participants in international missions, represents a requirement for developing *l'esprit de corps* (fundamental characteristic of their professional profile), lay at the foundation of forming and strengthening convictions, contributes to shaping/reshaping military staff personality, its adaptation to various acting situations (including intercultural environments) and to the accomplishment of complex missions. Starting from these considerations, we found it useful to review the models of forming/ developing the intercultural communication competence, for a future formative design where the directions of developing the communication competence become evident. Byram`s model inspired an adequate model of forming, the military system of education being easy to expand to the prefigured dimensions (knowledge, skills, attitude, education). This step must be continued with life-long training courses, respectively adequate selection and training of military personnel for international missions, together with position requirements and the development of cultural frame.

**Keywords:** Communication competence, intercultural communication competence, models of forming/ developing the intercultural communication.

## 1 INTRODUCTION

The concept of *intercultural communication competence* continues and develops according to *the interpersonal communication competence*. The intercultural perspective does not presuppose a communication limitation to the intercultural context of its production. In other words, intercultural communication may be regarded as a particular case of intercultural communication, but the terms of defining the application particularities depend on the context of communicative performance.

Once the intercultural field of communication competence has been delimited from that of interpersonal communication, within the dynamics of communicative relations, some researchers have proposed interpretative models. A first synthesis of these models was accomplished in 2002 by Manuela Guilherme [1]. Brian Spitzberg and Gabrielle Changnon [2], in a dynamic approach of the "intercultural communication" field and of the adequate conceptual apparatus have proposed the analysis of a set of compositional theoretical models, for co-orientation, development and adaption and of causal processes. Such processes lay the basis for shaping models of outlining/ developing the intercultural communication competence. Further on, Spitzberg and Changnon join the models of forming/developing the intercultural communication competence and name them development models that "retain a dominant role for the time dimension of intercultural interaction, specifying stages of progression or maturity through which competence is hypothesized to evolve" [3]. Within this category they distinguish: the King – Baxter model or the Bennett model. Apart from these, Howard Hamilton et al.[4] or Ting-Toomey [5] models are worth mentioning, as they contain features common with the models of outlining/ developing the intercultural communication competence: attitudes, knowledge, skills, and also models that describe methods of achieving the Arasaratnam [6] and Deardorff [7] communication competence. The former aims at reaching the competence in a double manner, starting from the cultural empathy (both directly and indirectly, at the same time with the interaction development and a change in the global attitude, which influences the motivation of interacting proficiently). The latter refers to a pyramidal projection of the interaction, starting from attitudes, knowledge, understanding and skills and proceeding with fixing the internal and external objectives. In Romania, a similar synthesis was mentioned by Aura Codreanu [8] in 2009.

## 2 THE SEELYE MODEL

Author of various studies dedicated to teaching strategies of outlining/developing the intercultural communication competence, H. Ned Seelye structures, beginning with 1984, a model based on Goal-Oriented End-of-Course Performance Objectives that is initially structured on seven [9], and later on, ten objectives that related to the ways of generating the student's interest, proving therelevance of social variables, the exploration of the connotations/reactions to the target culture, thenderstanding of the situational variables and of the conventions which model the human behavior,the understanding of the use of behaviorist

options permitted by society, the development of skills for structuring the information about the target culture and the evaluation of the culture generalization in terms of evidence, which sustains this generalization. Seelye`s model, presented in the paper *Teaching Culture. Strategies for Intercultural Communication* [10], may be applied by a set of tests (initial and final ones) reflecting the degree in which the change of attitudes has been achieved. The model proposes a middle way in outlining the intercultural communication competence: *(...) Seelye`s model stands half-way between foreign language/culture education that frequently relies on the acquisition of cultural content or on functional language activities and on professional training on intercultural communication that often rests on intercultural generalizations and stereotypes"*.

## 3 THE DAMEN MODEL

Louise L. Damen contributed to the acknowledgment of culture in foreign languages learning, by publishing the paper "*Culture Learning: The Fifth Dimension in the Language Classroom*" in 1987. Damen focuses on the necessity of projecting the behaviour of cultural self-consciousness, empathy, awareness and acceptance of diversity, tolerance, lack of ethnocentrism as requirements of a critical pedagogy. Cultural self-consciousness or the understanding of own cultural behavior and thinking lays the foundation for cultural consciousness and perception of other cultures' models. The trans-cultural consciousness represents the next step and it implies "*a continuum process of acculturation into bi- or multiculturalism, which is problematic if we take into consideration theories that emphasize group differentiation or other possibilities of intercultural cohabitation"*[11].

The model mentions a reorganization of the linguistic skills structure in listening, speaking, reading, writing and intercultural communication. Thus, a special attention should be granted to intercultural communication when learning a foreign language since "*instances of intercultural communication are more likely to result in miscommunication than in meaningful communication*" [12]. The model is perceived at the synthetic level and appeals to the dynamic approach to developing the communication competence, according to Rohrlich analysis:

## 4 THE ROBINSON MODEL

The model, mentioned in 1988, is inherently used within the process of foreign culture acquisition seen as an extension into the own culture.

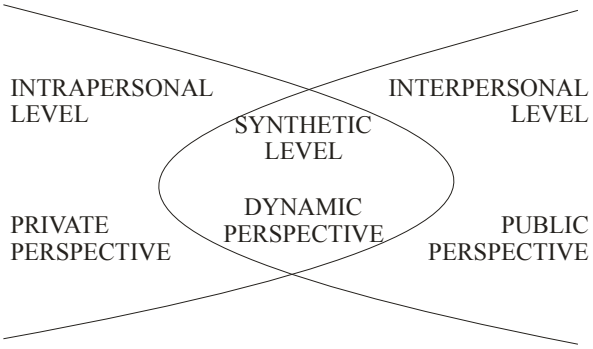


Fig. 1 The analysis levels for approaching the intercultural communication competence

The process does not involve a functional mchanism of a cumulative type, but it is more likely based on a homogenous synthesis between elements of the own culture and those of the other's, filtered through the value systems of the native culture. Trans-cultural understanding, useful when promoting positive intercultural interactions, may be reached by the "versatile culture": "*We will need to replace traditional views of culture as knowledge with views of culture acquisition as the development of cultural versatility*" [13], which also includes the perceptual versatility. Consequently, the achievement of the perceptive consistency becomes a necessity, and its difficulty is given by the cultural interference between the native culture and the other one. In order to overcome this drawback, Robinson suggests three strategies, as follows:

- actively looking for similarities as an initial point of departure;
- searching for empathy/similarity through analogy (a search for the similarity beneath the difference);
- using ethnography [14].

Their result is the deletion of cognitive errors concerning the extraction of differences and their exploitation in order to identify cultural similarities, that is, an immersion into the new culture by means of the own culture.

## 5 THE BENNET MODEL

In 1993, Milton Bennet proposed a model for improving the intercultural communication competence, necessary in the development of cultural sensitivity: Developmental Model of Intercultural Sensitivity (DMIS). The DMIS model, later on developed, implies going through several phases in experimenting the difference and the development of this sensitivity, within two relevant stages: ethnocentrism and ethno relativism.

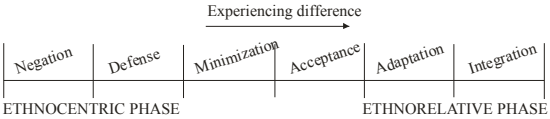


Fig. 2 M.J. Bennett's DMIS Model

Changing the set of standards, from personal (the native culture) to contextual standards of intercultural communication presupposes going through the negation, defense and minimization phases (into the ethnocentric phase), respectively, the acceptance, adaptation and integration phases (into the ethnocentric phase). Negation represents a conscious phase of rejection, it presupposes hostility towards diversity. Defense aims at an over-evaluation of the native culture as compared to the other cultures. The minimization phase (or passing over the ethnocentric phase) is characterized by the reduction of differences between cultures and by the identification of similarities (the affiliation to humankind, religion etc.). Acceptance presupposes respecting the cultural differences. Adaptation is related to the development of the ability of transcending into another referential cultural medium and the use of alternative cultural interpretations. Integration aims at including some other culture values into the native axiological system, and implicitly, acquiring an intercultural or multicultural identity, in addition to the national/ethnic background. The integration phase takes the form of "constructive marginality" variant, contacts with other cultural marginals and the refusal of assimilation by the core being often accomplished, thus allowing the engagement into the "contextual evaluation".

## 6 THE KRAMSCH MODEL

The Kramsch Model, proposed for the first time in 1993, brings into discussion three intercultural traditions: Critical Approach, Pragmatics and Hermeneutics, namely the orientation towards the others` understanding, towards the communicational practices that makes one understood and also towards self-understanding. This approach to foreign languages learning derives from the need of understanding the native speakers, an adequate communication with them and also a self-understanding of the process [16]. The threefold understanding is achievable by appealing to the practical language use by discourse, and not by a *single-voiced discourse* method, orienting the transmitter towards self, but by a double-voiced discourse, aiming both at self-orientation and orientation towards others. Language use, viewed as a culture engine, assures the outlining of a new perspective within the intercultural communication besides the communicating cultures. The new perspective, achievable within the frame of a "critical pedagogy" is vaster than the native culture's (C1) or than the target culture's (C2), fact that leads to four main directions in the projection of new language/culture learning:

- establishing a `sphere of interculturality;
- teaching culture as an interpersonal process;
- teaching culture as difference;
- crossing disciplinary boundaries [17].

In such a vast process, namely, the development of intercultural communication competence from the Kramsch model' s perspective, the events and facts are perceived within a kaleidoscope of reflections that lead to the configuration of a hermeneutical scale for interpersonal interactions, as follows:

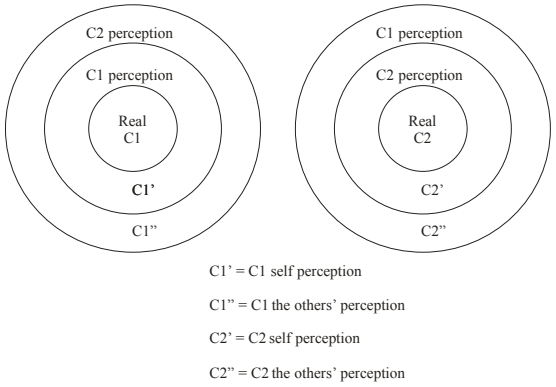


Fig. 3 The Cultural Reality and the Cultural Perceptions according to the Kramsch Model [18]

According to this approach it is necessary to follow specific steps for achieving trans-cultural understanding:

*"1. Reconstruct the context of production and reception of the text within the foreign culture (C2, C2`).*

*2. Construct with the foreign learners their own context of reception, i.e. find an equivalent phenomenon in C1 and construct that C1 phenomenon with its own network of meanings (C1, C1`).*

*3. Examine the way in which C1` and C2 contexts in part determine C1" and C2", i.e. the way each culture views the other.*

*4. Lay the ground for a dialogue that could lead to change."*[19].

## 7 THE BRISLIN-YOSHIDA MODEL

Richard Brislin and Tomoko Yoshida forward a four-steps pattern in 1994 [20]. They started from Knight's interpretative models (1991), based on

continuous knowledge, attitude, skills, and those of Sue's, Bernier's, Durran's, Feinberg's *et.al.* (1982). Their model was built on continuous awareness, knowledge and skills and consists of: (1) awareness; (2) knowledge; (3) emotions (including attitudes); (4) skills (regarding visible behavior). The awareness phase aims at identifying the native culture/other cultures values. Knowledge refers to gathering the necessary notions related to the culture/cultures contacted in order to eliminate possible misunderstandings and also to manage communication in case misunderstandings appear. Emotions refer to one's ability of mastering them. Intercultural skills aim at the behavior adaptation to the interactional context. The Brislin-Yoshida pattern is strictly focused on the psychological aspects of forming the intercultural communication competence (completely neglecting the linguistic aspects) and suggests a deeper awareness of the proper cultural values and of the cultural values of the other cultures. It also stresses the necessity of psychic comfort within the frame of pluri-, trans- or intercultural, the importance of mastering emotions and personal control in case of intercultural experience.

## 8 THE PENNYCOOK MODEL

In 1994, Alastair Pennycook proposed a model for outlining/developing the intercultural communication competence starting from the cultural and political implications of spreading the English language worldwide, a model that contributed to a post-colonial world with regard to the intercultural competence. Once the language holds the meaning of *locus* for "the political struggle" to impose the system of values, and cultural politics are viewed as *"struggle over different meanings"*[21], the acquisition of a new language (English, in this respect) gets new valences. In such a context, school should be perceived as a cultural and political arena and not a location in which an information corpus is transferred from teacher to pupil/student. The teacher must engage politically in order to contribute to the forming of intercultural communication competence whereas curricula have to be designed on interest topics, socially relevant for students. Teachers, seen as *"transformative intellectuals"*, represent the engine for the Pennycook model that promotes a set of approaches within the generous area of "critical pedagogy". Although the model does not render a prescriptive list of phases in acquiring the intercultural communication competence, *"Pennycook develops the potential for a critical pedagogy to the full since he links theconcept of `voice` to `agency` by empowering students/speakers of English as a global language into subjects who perform their own representations and by understanding a critical pedagogy of English as cultural politics"* [22].

## 9 THE BYRAM MODEL

Starting from the idea that the intercultural communication process needs the development of interpretation skills, establishing relations between cultures, that is, discovery and interaction, Michael Byram proposes in 1997 a model of acquisition, together with the necessary attitudes and knowledge, outside the institutionalized educational frame. The implication of the formative frame and of the teaching staff needs the insertion of the teaching process into a curricular/educational philosophy. Given the situation in which the teaching staff tend to promote autonomy and create teaching-learning methods in this respect, Byram imposes a new direction in outlining/developing the intercultural communication competence: *"I shall argue for the integration of teaching for intercultural communication within a philosophy of political education (Doye, 1993; Medle, 1987), and the development of learners` critical cultural awareness, with respect to their own country and others (Byram, 1997)"*[23]. Furthermore, Byram develops a model of outlining/developing the intercultural communication competence initially focused on four factors (outside the institutionalized educational frame), later on based on five factors (see *Figure no.4*).

According to Byram model, knowledge (*savoirs*) represents the result of socializing affecting identity and refers to the acknowledgement of social groups and their cultures (of proper groups and also of the Other – usually a "relational" knowledge), of interaction processes at individual and society levels. The drawback of this type of knowledge is related to the dominance of a certain type of culture and national identity acquired within an educational process whereas the national identity is acquired differently by individuals within the socializing process.

Interpretative skills (*savoir comprendre*), as well as discovery and/or interaction (*savoir apprendre/faire*) skills are useful for the conscious application of knowledge accessible by formal education, respectively by overtaking specific malfunctions of the interpretative activity regarding the other. Attitudes (*savoir etre*), conditioned by knowledge, skills and education, can not be regarded as simple cause-effect relations, but as part of a dynamic whole, necessary for acting in intercultural communication. More than that, attitudes condition the success of intercultural relations and, lest they should be characterized as simple stereotypes or

| | | |
|---|---|---|
| | SKILLS<br>of interperting and establishing connections<br>*savoir comprendre* | |
| KNOWLEDGE<br>self-knowledge and of others; of social and individual interaction<br>*savoirs* | EDUCATION<br>political education; critical cultural education<br>*savoir s'engager* | ATTITUDES<br>self-relativity; appreciation of others<br>*savoir etre* |
| | SKILLS<br>of discovering and/or of interaction<br>*savoir apprendre/faire* | |

Fig. 4 Factors that determine the outlining / developing of intercultural communication competence [24]

prejudices, they should not be just positive or presuppose willingness, but " *attitudes of curiosity and openness, of readiness to suspend disbeliefs and judgement with respect to others` meanings, beliefs and behaviors"*. Education (*savoir s`engager*), acquired in the sense of political education (*politische Bildung*), for the purpose of forming the subjects` critical cultural consciousness, presupposes the existence of some cognitive, evaluative and actionable directions/orientations, necessary for the obtaining the intercultural communication competence.

## 10 THE HAJEK-GILES MODEL

Christopher Hajek and Howard Giles proposed in 2003 the PMICC model (*The Process Model of Intercultural Communication Competence*), applicable in distinct contexts. The intercultural communication depends, from the two researchers` point of view, on the type of interacting entities, on the state of cognitive preparedness and on the cultural orientation. If the intercultural interaction may be long or short-termed, hence resulting the interacting entities type, the cognitive state of preparedness influences the ability/ inclination towards the communion with the group characteristics and presupposes self-supervision in terms of openness to change, activation of the sense of presence, appeal to awareness and situational consciousness. The cultural orientation refers to the community ideology in terms of cultural dimensions submitted to study by Hofstede. The three characteristics influence the learning and the conscious and unconscious development of the new culture. "*In other words, the model predicts that a person entering an intercultural encounter with an openness to change, a sense of presence, or enhanced mindfulness will be better prepared to learn, comprehend, or understand the influence of ingroup or outgroup history, politics, laws, customs, and language because these influence subsequent communicative processes and outcomes. Similarly, individuals will be better prepared to tolerate and appreciate characteristics of the outgroup"* [25]. Apparently a model of the acculturation process, Hajek and Giles` PMICC model brings into discussion the outlining/developing of intercultural communication process within an intercultural frame, not by appealing to the institutionalized educational system, but by activating the latent potentialities of the individual that is found in the situation of managing his own communicational resources. Practically, the variable combination taken into consideration leads to a consideration of the communication management, seen as *"the maintenance of optimal levels of individuation versus stereotypic expectations in one's perceptions of particular outgroup members, and maintaining this balance may regulate risk for miscommunication and intergroup prejudice"* [26]. So, the PMICC model does not imply the integration in construct of specific abilities, of layout, and nor does it exist an evaluation of the model validity, but it facilitates new research in the field, and, especially, its implementation within a institutionalized formative frame [27].

## 11 THE KING-BAXTER MAGOLDA MODEL

Patricia King and Marcia B. Baxter Magolda proposed in 2005 a model aiming at the development of intercultural maturity, seen as the final point in the process of outlining/developing the intercultural communication competence. Starting from Robert Kegan`s model (1994) of human development, that presupposed the engagement into building the meanings in order to render sense to the proper life course. King and Baxter-Magolda introduce a multidimensional frame which allows the description of intercultural maturity by explaining the frame dimensions, the connections with theories/models and that illustrates the levels of development. Intercultural maturity is multidimensional and consists of *"a range of attributes, including understanding (the cognitive dimension), sensitivity to others (the interpersonal dimension), and a sense of oneself that enables one to listen to and learn from others (the intrapersonal dimension)"* [28]. A structure based on levels of development overlaps the three-dimension structure, as follows:

Tab. 1 The Cultural Maturity Model, adapted by Spitzberg and Changnon [29]

| The Initial Level of Development | The Intermediary Level of Development | The Mature Level of Development |
|---|---|---|
| **Cognitive Dimension**:<br>- Definite knowledge;<br>- Naivety regarding cultural practices;<br>- Resistance to cognitive challenges. | **Cognitive Dimension**:<br>- The development of the awareness capacity and perspectives acceptance;<br>- Transition from authoritative knowledge to autonomous knowledge. | **Cognitive Dimension**:<br>- The ability to change perspectives;<br>- The use of multiple cultural frames. |
| **Intrapersonal Dimension:**<br>- Unconsciousness of the intersection of social roles (race, category, etc.)<br>- Lack of cultural consciousness;<br>- Outward defined beliefs;<br>- Differences viewed as threats. | **Intrapersonal Dimension:**<br>- The development of identities distinct from external perceptions;<br>- Pressure between internal and external stimulus;<br>- The reconnaissance of the legitimacy of other cultures. | **Intrapersonal Dimension:**<br>- The ability of creating an inner self;<br>- The challenge of own perspectives upon social identities (category, race);<br>- self- identity integration. |
| **Interpersonal Dimension:**<br>- Identity, dependant on those alike;<br>- Distinct experiences considered mistaken ones;<br>- Unawareness of cultural systems and norms;<br>- Egocentric perspective on social issues. | **Interpersonal Dimension:**<br>- The consent of the interaction with divergent ones;<br>- The exploration of the way in which social systems affect norms and group relations. | **Interpersonal Dimension:**<br>- The ability of engaging distinct interdependent relationships;<br>- Solid relations in appreciating differences;<br>- The understanding of the intersection of social systems and practices.<br>- The agreement to work for the others` rights. |

## 12 THE ADAPTATION OF MODELS OF FORMING/DEVELOPING THE INTERCULTURAL COMMUNICATION TO THE ROMANIAN MILITARY SYSTEM

Regarding the Romanian military education, the reshaping of competences and spreading the relational construct prefigured at the intercultural dimension are brought into discussion. Normally, this reconfiguration does not aim at the relocation of funds or massive restructuring of a system already subjected to adaptations, rehabilitations and lining to standards (regarding not only its educational side, but also the military one), but at a reshaping of competences according to comprehension investment and to the reconfiguration of the requests, submitted to a present and/or future prefigured reality. But, as long as the entire Romanian higher education is configured according to Hainaut's matrix [30]: to *know for the sake of knowing, of doing and of being,* it is obvious that the simplest way is that of following the step and of development in the same respect. Therefore, a valid way of forming the intercultural communication competence within the military higher education is the one proposed by Byram. Byram model, previously discussed, together with the other models of intercultural communication system starts from the idea of projecting this competence on three dimensions: cognitive, affective and psychomotor, alongside with the implementation of a new educational philosophy. Hence, the projecting frame remains unchanged whereas the approach changes. Therefore, Byram model is focused on knowledge, attitudes and skills – in d`Hainaut's perspective – but this perspective is modified, that is, skills aim at the interpretation and discovery/interaction, meaning that, in a cumulative manner, a fifth factor – the proper system of education – contributes to a configuration of the competition.

Based on this concept, the military higher education can be extended to prefigured dimensions:

- self knowledge and knowledge of the other, knowledge of the interaction, individual and social knowledge (savoirs), by sets of transmitted content within the educational act;
- skills of interpretation and establishing connections (savoir comprendre) by comparative analysis of transmitted knowledge;
- skills of discovering and/or interaction (savoir apprendre/faire), by applying the content correctly and by going beyond the classical interpretative frame;
- attitudes resulted from the relativization of the self and the re- evaluation of the other (savoir etre), by effective performance within an intercultural environment and by evaluating the prefigured skills and knowledge;

political education and cultural awareness (savoir s`engager), by effective engagement into relations with the other for self awareness, for cognitive, evaluative and act orientation, realized by mingling of cognitive, affective and psychomotor objectives, reached during the previous phases. Political education together with the critical cultural consciousness do not impose confining within the limits of an extreme patriotism, or its dilution, but the engagement into a relation with The Other, only in terms of respect for the national and the humanity values.

Within the military environment, the openness to alterity by projecting and forming the intercultural communication competence must not be seen as an alternative to patriotism and nationalism, or as an openness to poor cosmopolitanism or as a rejection of national culture in the detriment of civilization values that exclude the first ones. Patriotism and nationalism, if they imply love and the identification with a state/homeland, that is, a nation, that appeals to political consciousness, respectively to cultural consciousness of a nation-state existence, should not presuppose restrictive, exclusive or even aggressive forms. In its essence, patriotism offers the strong motivation for acting morally (Alasdair MacIntyre) [31], which presupposes the transcendence of any barriers towards the other one, the promotion of human rights irrespective of ethnicity, religion, race or type and the tolerance manifestation as a fundamental value of intercultural relations.

The openness to intercultural forming and development of intercultural communication competence answer very important and critical issues regarding present actionable steps of the Romanian military staff. Participation in peace keeping missions raises problems related to the Romanian military relations with the country, the accomplishment of the mission for the country and to the use of its action for the country they represent.

Intercultural education represents a way of forming in the sense of providing answers, at the other perceptive level, regarding the way in which the Romanian soldiers can cope, constrained by the oath of faith to the country, by the globalist challenges they are subjected to. The intercultural education also provides answers to unhealthy and non-attractive forms of cosmopolitanism, such as the aggressive universe, a cosmopolite strategy of destroying local cultures and institutions. Furthermore it creates a global political and cultural system, such as the hegemonic globalization, or a version in which a single country creates a united world, by subordinating other countries to the proper jurisdiction [32].

In the military environment, the intercultural education and, implicitly, forming the intercultural communication competence (which has attitudes and intercultural components at its basis) is shaped in the spirit of moderate patriotism characterized by interdiction of harming any one, no matter the person, special duties to the own country (but positive one - assistance, support for everybody), increased interest towards the own country and authentic interest, but, most important for the other, moral constraints in accomplishing the national goals and obligations, not only towards the own country but also towards the other ones through their citizens [33]. Thus, exaggerations of the obligations only for the own country are abandoned, with no constraints in reaching the targets, specific to extreme patriotism, or those regarding interests with no constraints in reaching the cosmopolite targets specific to extreme cosmopolitanism.

## 4 CONCLUSIONS

The application of a forming model of intercultural communication should not be made by ignoring other models. Thus, even if the Byram`s model is the most adequate to the Romanian environment, due to the projection of the finalities, at least of the military system of education, according to d`Hainaut, we may consider as viable in applying an adaptive model to the military theater of operations (during the training period for the peace-keeping mission) the objectives from Seelye`s model, the knowledge of the host culture and the application of the steps from Brislin-Yoshida, or the prefiguration of the maximum level of cultural maturity from the King-Baxter Magolda model. Also, to adequate the cognitive content regarding the host culture, Robinson's model or Bennett's model is useful and applicable within the theater of operations.

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# CREATION OF NEC AS PART OF THE PROCESS TO IMPROVE THE QUALITY OF COMMAND AND CONTROL SYSTEM

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**Abstract:** It is important to understand the reasons which are behind the creation of Network Enabled Capability (NEC) as well it is important to know what were the historical reasons which led the decision makers to begin to look at the use of modern information technologies in the development of the command and control system (C2 system). This article is providing the view on the similar concept in the US Army named Network Centric Warfare (NCW) which is considered as one of the responses to the application of the intensively developing information technologies in the command and control system while seeking the better effectiveness and quality of C2 system. The article is as well attempting to explain the basics of NATO transformation and its impacts on the application of modern technologies to the Armed Forces.

**Keywords:** NEC, NCW, information age, effectiveness, EBAO, force capabilities.

The significant milestone which critically influenced the creation of NEC (Network Enabled Capability) were conclusions of analysis and experiences from allied joint operations in Persian Gulf in 1991. At that period of time combat units conducted combat activities without any link in between them and the mutual information exchange was rather complicated. This was caused by the fact that units were using various incompatible and independent communication and information networks either within or among the forces. Such gap or shortfall, if you will, was decreasing and hampering the effective use of available combat potential of forces. It is possible to state that this was one of the reasons which made the military society to focus its thoughts towards the direction to enhance effectiveness of military activities in operations right through the way of improving the quality of command and control (C2) systems as well as the capability of improving the quality of interoperability in multinational operations. The importance of building up the capability which is using the power of networks in order to enhance the effectiveness of operations was risen up by the USA concept of Network Centric Warfare [1](NCW). The concept is one of the answers or even can be considered as the reaction to the Information Age. In other words it was an answer that was provided to the question how could military better and more effectively respond to a crisis by using available technologies, primarily informatics, for military purposes.

The founding idea of NCW is the collection of information from the battlefield for further analysis, collation and dissemination of Intelligence in order to enhance and speed up the decision making process as well as improvements of situational awareness throughout the force. It is appropriate to state that NCW is a premise for achieving the superiority in the effective use of available weapon systems through the enhanced and swift dissemination of information, Intelligence and situational picture to each carefully identified place on the battlefield. The sensors mounted on various platforms are the front line sources of information which are gained for further use within the C2 system.

In the Alliance member states, like USA, is the concept of NCW considered as the one of the key conditions for the transformation of the Armed Forces to the Information Age. It is assessed as the new way of thinking about:

- How to achieve the assigned end state with the higher effectiveness,
- How to better organize C2 posts and to better interconnect them mutually,
- How to improve the support throughout all participating systems.

The principal change in approaching and handling the security environment was the terrorist attack on 11 September 2011. The reaction to this tragic incident was the creation of a new NATO Strategic Vision which is, till nowadays, serving as a tool to counter the new security threats supported by such important new element like Effect Based Approach to Operations (EBAO). This new vision is bringing up to the light new possibilities as well as challenges for C2 systems and their integration to new conditions of the cooperation on the field of security within NATO, EU a PfP (Partnership for Peace).

The Prague summit in 2002 pointed out that NCW is going to be the key strategy for the 21st century. Some European Alliance member states have been, since then, building up the capability of conducting the operation enabled by the network. The use of different name NATO Network Enabled Capability (NNEC) instead of NCW is having only a symbolic meaning. However, it is fair to state that it seems that European allies are not having the same level of ambitions like USA and it is appearing that they are not willing to dedicate same amount of

[1] NEC is a concept which is less ambitious then NCW.

fiscal resources in order to develop comparably wide networked architecture like the USA within their NCW. The Europe is seeking for a cheaper solution. It intends to use the contemporary used technologies, organizational capacities as well as capabilities of personnel which are currently available or that are being either created or shaped to the requirements of the networked warfare.

Currently the Armed Forces can not rely on the transition speed of gained data, their timely oriented accuracy and the uninterrupted current of data's provided by surveillance and reconnaissance means (ISR-Intelligence, Surveillance and Reconnaissance). This is caused primarily by the gaps in interoperability and the absence of the appropriate amount of long range ISR means. Quite visible is subsequently a gap between the USA and the rest of NATO in the military campaign in Afghanistan. The war against terrorism indicates that NNEC could quite broadly contribute to the Information superiority. The utilisation of full NEC capabilities is directing us to new approaches of conducting the operations which are much more respecting the achieved effects of each single military activity. Here we talk about EBAO. The explanation of this term should include full integration of all means and capabilities of the Alliance, either military or non-military ones, for the conduct of a military campaign which is seeking to swiftly achieve the strategic goals.

The main and driving principles which are effecting all conducted capability changes in the NATO's transformation process are three fundamental goals that are leading to implementation of EBAO and in parallel five areas of principal transformation tasks.

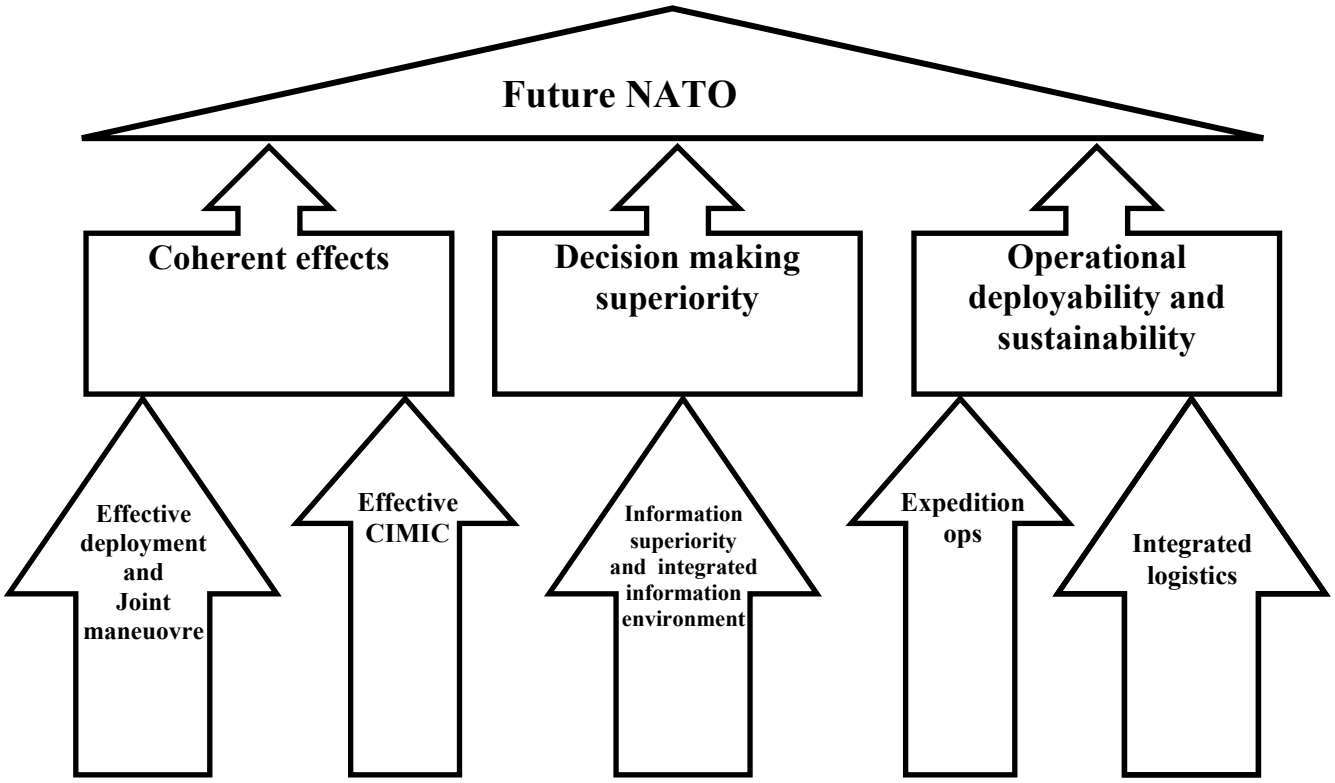


Fig. 1 NATO Transformation

The first attempts of the Czech Republic to implement the NEC platform could be backtracked to 2004. In this year the Czech Armed Forces officially adopted this issue. This was followed by the creation of the national Armed Forces NEC concept, subsequently endorsed by the Minister of Defence. This document was the first one which was clarifying the basic principles of this capability and it provided an answer to doubts why NEC should receive appropriate attention. Next activities led to the creation of the Intent of Department of Defence on building NEC in the Czech Armed Forces and finally followed by the creation of the Strategy of NEC in the Czech Armed forces. All this documents

were attempting to explain in details what, when and how NEC capability should be built up and achieved.

In November 2006 the NATO summit in Riga in its resume declared the program of the development of NATO NEC as the key element of all phases of NATO's transformation and in parallel it set a requirement to the member states for the support to this development by implementing own individual nation's NEC capability. The fact that both the president of the Czech Republic and the Prime Minister signed the resume of Riga summit raises the importance of this document to a level of a significant commitment of the Czech Republic to NATO.[43] The implications are that the information collection, their analysis, collation and dissemination will be particularly important for foreseeing of conflicts, conflict prevention or if possible even cessation of a conflict. The paramount will be the ability to understand all aspects of the operational environment and keep up an active approach so as to solve a crisis in the very early stages. The key to the successful achievement of shortening the time between the outbreak of a crisis and the response to it by properly weighted option must be done through the improvement of all elements of the decision making process.

From a broader perspective it can be stated that NEC is describing a combination of strategies, modern tactics, ways, procedures and methods of organizing the work, which can be used by either partially or entirely networked forces for achieving the superiority over the enemy.

NEC will enable the forces to improve radically the quality of the command and control system, the decision making process and operational effectiveness. The use of the right forces in the right place will enhance the operational effectiveness. The ability to respond more swiftly and accurately will enable commanders to achieve the same goals with less force which in consequence will enhance the operational effectiveness of the Army of the Czech republic.[44]

The implementation the NEC concept is focused predominately on the way of thinking and responding of personnel and the secondary importance is wasted on the new advanced communication and information technologies. The critical element to achieve successfully the appropriate use of NEC capability powers are personnel and their behaviour within the networked environment.

The recent experiences of mature armies which use NEC capability at either more or less developed levels prove that the forces are gaining significant superiority over the enemy specifically by enhanced sharing of the information and the situational awareness. This knowledge is valid to all services as well as to all levels of C2 system. The foundation is created by communication and information technologies which are mutually interconnecting C2 nodes, sensors and weapon platforms to one network. The first priority task is to ensure the enhanced effectiveness of own forces and in parallel to achieve much more accurate effect on the enemy.

NEC concept can be understood as a tool which has the decisive impact on the operational capabilities of the force as well as it is a significant multiplier of the unit's combat power. It represent a capability to mutually interconnect C2 nodes, sensors and weapon platforms to one living network which will subsequently enable the Czech Armed Forces to achieve those capabilities that are necessary for the participation in NATO joint combined operations.

The driving idea is to set up such environment, conditions and capabilities of the Armed Forces which would enable the force to see the first and more then the enemy, to understand the situation better and quicker, to decide better and faster and to effect the enemy more decisively and swiftly. Those capabilities can be expressed in four principal ideas which characterise the substance of NEC:

1. **Information superiority.** It is based on the collection of any data available from all sensors present on the battlefield (ground, air, naval and special forces) and fusion of the analysed information throughout the network.
2. **Knowledge superiority.** It will enable all commanders and their staff the more effective understanding of all aspects of the battlefield. All of those who need to know will have an access to all available types of information which are being preserved in the network and thus they will have a possibility to turn such information into the key knowledge.
3. **Superiority in the decision making.** It is assumed that entire staff will be equipped with well developed tools for enhancing the decision making process which will automatically propose and constantly analyse all possible option for the use of forces.
4. **Operational superiority.** Own forces will have a greater and a more effective impact on the enemy. Immediate understanding of the highest commander's intent (*What*) and the end state (*Why*) will enable all subordinates to fulfil the assigned task with the better understanding, more independently and with the greater initiative.

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NEC concept has three mutually depending and overlapping dimensions. These three NEC dimensions are people, networks and information. Within **the networks dimension** it is important to understand that the heart of NEC is a network of networks which is distributing information. The effective information management as well as timely provision of information securely gathered from identified sensors will enable to achieve **the Information superiority** over the enemy which subsequently will provide **the superiority in decision making.**

The centre of gravity of **the Information dimension** is a better level and a higher quality of the used information to make decisions. It will be very important for the commanders and their staff to sort carefully out which information are relevant and which are not of any use as well as to find the way how to gain those usefull information. The foundation of **the Information dimension** is the ability to share information, knowledge and situational picture.

The centre of gravity of **the People dimension** is the enhanced education and the training of all military personnel which must be able to utilize knowledge, capabilities and experiences for the better development. People must learn to seek for, gain and share information from various numerous sources and then to use those information in the process of decision making. The biggest requirement will be to manage the effective tools for securing and protecting the information gathered in the NEC environment.[45]

In parallel, quite important will be to understand that technologies are just a toll. The way and the level to which we can manage this toll will depend on our ability to flexibly change the way we organise ourselves and the work, regardless the fact whether we are in a peace time or a crisis. It will be important to substitute a traditional schema of organisation by a networked one which will provide the better flexibility, wider relationships as well as it will enable to cooperate throughout the organisational boundaries. NEC is not only about technologies it will effect all aspects of conducting the operation.

**NEC basic principles are as follows:**

- robust and networked forces (enhanced information sharing);
- information sharing (enhanced quality of information and situational awareness);
- situational awareness sharing (enhanced cooperation and automated synchronisation of activities will enhance stability and speed up C2 process).

The application of these principles will significantly enhance the effectiveness of the use of the force in any type of an operation. NEC is having a great potential which will enable significant enhancement of the key operational capabilities of the Czech Armed Forces. However, the utilisation of this potential will depend on our capability to apply, most likely in several steps, new technological developments to military communication and information means and equipment as well as to C2, education and training processes.

## CONCLUSION

The enhancement and the higher effectiveness of C2 system is the necessary presumption to achieve the final goals and effects of an operation as well as to improve the planning for and the conduct of an operation. The latest experiences in the field of communication and information technologies are having an impact on C2 process and as well on C2 principles. It is followed with changes in education and training processes of personnel and hand in hand with changes in the mind set this will enable us to achieve to build NEC capability.

Based on the analyse of available knowledge sources, experiences and the evaluation of C2 is evident that the enhancement of the effectiveness of C2 must be carried out constantly focussing not only on modern technologies, but as well on people and the educational system. Therefore it is important to cooperate and share all gained experiences from current, either NATO or EU led operations, among the partners.

Another important step is to transform the C2 system in the appropriate synchronisation with changes being made in organisational structures of the Czech Armed Forces. One of the further phases of building NEC capability are necessary analysis of possible impacts of structural changes of the Czech Armed Forces and their subsequent harmonisation with C2 principles.

Last but not least, it will be important to pay attention to build "Reach Back" capability which represent a totally new approach how to achieve a situation when less participants within C2 system are physically deployed in the area of operation while the level of support to decision making process is enhanced by connecting broadly supportive staff from a distant, out of area and secure location.

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# THINKING ABOUT DECISIVE FACTORS OF THE ARMED FORCES DEVELOPMENT

Ján SPIŠÁK

**Abstract:** There exists a close connection between the security environment and relevant capabilities that the armed forces will have to demonstrate in future operations. Some thought of this article point on several decisive factors such global environment, threats and challenges that have had significant influence and impact on development of the armed forces. Between others there are security and operational environment with persisting asymmetry that in principle dictates the way of the training the armed forces need to follow to succeed in future operations. Nevertheless, primary role to cover all security challenges embodies in politicians, their comprehension of difficultness of current environment and taking optimal precautions for security policy of the state and society.

**Keywords:** Security policy, armed forces development, operational environment, asymmetry.

## 1 INTRODUCTION

Nations have struggled for years, facing present and future threats and challenges in the complex security environment. There are many determinant factors that emphasize need for the armed forces development to overcome such challenges.

When thinking about the armed forces development, one could have a few questions. What is the reason and why to execute this development? Is this development regular process to reach necessary capabilities for only nation´s internal interests and ambitions? Or is it a broader process to counter particular external challenges, influences and changes to secure higher values typical in human society? We can say yes, all answers are true. The armed forces development should be a process for ensuring broad objectives of security and defense policy in future specific environment. The basic goal of such policy is to reach a status when we will talk about security.

The term "security" means a desirable state of affairs where all risks are reduced to a minimum. These risks may arise from threats to the population, sovereignty and territorial integrity, the democratic establishment and the principles of the rule of law, internal order, property, environment, international security commitments and so fore. The nation´s security policy follows up such desired security status by preventing and eliminating threats and risks arising from these threats. This policy is implemented by means of diplomacy, defense, economy, internal security and public information policy.

It is obvious if any country, coalition or alliance wants to comply with its own ambitions in areas of interest and counter these threats, it must exploit all instruments of national power – diplomatic, economic, informational and military. Especially the last one must be capable and ready to response current and future threats and challenges in specific environment, in specific conditions. The NATO´s Comprehensive Political Guidance emphasized development of international security environment as having increasing impact on lives of citizens of the world. Accordingly, the NATO´s 2010 New Strategic Concept described the evolving security environment as complex and global, predisposed to change, with an unpredictable development.

The chronicles of military history teach us the importance of preparing for the future security challenges. It would be unrealistic to anticipate that the next decades of this century will avoid of conflict. Clausewitz, father of strategy, two hundred years ago observed that every age has been marked with its own kind of war. As in the past each of conflicts in the future will have its own distinctive feature, character, course and result.

## 2 SECURITY POLICY

The security policy of the state emanates from the security environment and has permanently been influenced due to changes emerging from this environment. Security environment could be simply defined as a place having impact on security policy of state. It is an area where interests and relations of others international participants are being realized and met.

Security policy then indicates possible ways to implement necessary conditions for state´s security. Principal factors that fundamentally influence content of security policy are security threats the state is facing or will be facing in the future. There are also security interests of vital or strategic importance and political-military ambitions which ensure such interests and eliminate risks. The political constitution and the international position, industrial growth, economic and level of technological maturity are other crucial determinants for defining state´s security policy, its characteristics and direction.

Level of security of state has been influenced by threats a measure of their risks, which is periodically evaluated. This level reflects the content and forms of execution of the security policy. The security

policy then determines a strategy how to follow security interests and consequently establishes necessary requirements for the armed forces development.

## 3 TRENDS OF SECURITY ENVIRONMENT DEVELOPMENT AND THE ROLE OF THE ARMED FORCES

Based on characteristics of current security environment, dynamic changes and study security dilemmas, we can observe significant trends that will determine security development. We can expect many security challenges as the new century witnesses continued political, economic, racial and religious tensions. In terms of military, the range of threats will extend from smaller, lower-technology opponents using more adaptive, asymmetric methods to larger, modernized forces able to engage deployed forces in more conventional, symmetrical ways. In some potential conflicts a combination of these types of threats could be especially problematic. We can anticipate the rise of regional nation-state actors. They will attempt to dominate their respective region of the world either by threat or use of military force and which, in some way, will undoubtedly challenge vital, strategic or other important interests.

The environment in which the armed forces will be committed might be effected by disruption of the flow of vital resources that threatens the natural systems that sustain life on Earth, overpopulation, urbanization, economic degradation mostly in unstable regions with growing problems of poor infrastructure and environment. These all aspects are real or possible threats that can be inter-related or combined and are likely to be the main risks and challenges in the future.

To cover these challenges the Armed forces will encounter a variety of conflicts in a number of different environments. The armed forces will have to contribute to effective conflict prevention and to engage actively in crisis management, including through non-Article 5 crisis response operations, stabilization operations and military support to post-conflict reconstruction efforts.

The armed forces will mostly have to be prepared to respond:

- Regional hegemony with asymmetric capabilities, such as weapons of mass destruction and missiles, designed to deny access to vital areas and resources.
- Global threats including terrorist groups, transnational criminal and drug organizations, warlords as well as so-called non-warfighting problems like environmental security issues, health and disease problems, illegal migrations and others.
- Problems in regions that require peacekeeping and stabilization, humanitarian assistance or national reconstruction.
- Inevitably, there is also resolution of domestic emergencies that exceed the capacity of other national or local officials to handle.
- Realizing such broad range of tasks, we need to answer several essential questions about the nature of the armed forces development and relevant capabilities.
- What do we need the armed forces must be able to do?
- What kind of the armed forces do we need to do it?
- How the armed forces will fulfill required tasks?
- What means and resources would be used for those purposes?
- And finally, can we afford this kind of the armed forces?

Considering these questions from a broad perspective, and answering them should be based on an assessment of security situation and should end in a clear statement of governments that advocate their vital and strategic interests, engagements and political-military ambitions. Through governmental procedures, decision makings and directives there is a road to initiation of further steps in organizing, financial arrangements, doctrine, training, and equipment of the armed forces needed to meet all possible commitments. Assumed missions have significant political, economic, humanitarian, cultural, and social impacts in society which, let us supposing, understands and supports the role and missions of the military. If yes, there is nothing to restrain the armed forces development. However, reality has been in many cases different.

## 4 THOUGHTS ABOUT GEOPOLITICS

Harvard political scientist Samuel Huntington in his book *The Clash of Civilization and the Remaking of World Order*, stated: “The principal conflicts of global politics will occur between nations and groups of different civilizations. The clash of civilizations will dominate global politics. The fault lines between civilizations will be the battle lines of the future.” As in the past, these geopolitical fault lines will continue to witness ethnic, religious, economic, and political confrontation. Let´s suppose it will be true.

We can suggest that the Informational Age will probably not change the perpetual characteristics of geopolitics. Geopolitical interactions based upon the

pursuit of international order, stability and the balance of power will continue to influence the vital, strategic, national and other interests of nations and/or coalitions. The nation-states will remain fundamentally the same. These states will be identifiable political entities limited by geographical parameters.

Competing states, contrary, will seek to gain dominance over their neighbors. Conflicts will occur as some nations redress historic grievances and try to recover from old wounds that have been stifled for hundreds of years. The spread of information also strengthen ethnic groups and contributes to cultural frictions within troubled regions. Some states may disintegrate into smaller, ethnically based units. This fragmentation will cause both interstate and intrastate conflicts in specific geopolitical and cultural fault lines, in the specific security environment.

## 5 OPERATIONAL ENVIRONMENT

Operational environment is usually defined as a composite of conditions, circumstances, and influences that affect the employment of military forces. It encompasses physical areas and factors (of the air, land, maritime, and space domains) and the information environment. There are the adversary, friendly, and neutral systems relevant to the specific operation. Operational environment is a place where all aspects of military capabilities transformed from state policy, modern technology, doctrinal and operational training will be applied.

There are numbers of critical factors that define the nature of the operational environments in which military activities may occur. These factors are so called "variable components", the exact nature of the conditions, circumstances, and influences that make up the operational environment will vary according to the particular situation. While there are almost infinite numbers of variables that can be used to describe the specific environment, there are twelve basic that tend to have the greatest impact on military operations. Those components are:

- Physical environment
- Nature and stability of the state
- Sociological demographics
- Regional and global relationships
- National will
- External organizations
- Infrastructure
- Military capabilities
- Technology
- Information
- Economics

Each part of this list is important and must provoke politicians and leaders to the thoughts abouthow to integrate these components through diplomacy, economics, technology and others areas to the development of versatile, dominant and full spectrum capability based military force. These components are interrelated and sometimes overlap. In different situations they will be more or less important, but they are all common to any operational environment.

The collective content of all components will define any operational environment the Armed forces could face, whether they are involved in stability and support operations, smaller-scale contingencies, or high intensity warfare. Studying Operational Environment will allow us to look at the major trends of its changes. We can identify the friction points and the root causes of war and what might be the general operating conditions for the armed forces anywhere on the globe.

## 6 ASYMMETRY IN THE OPERATIONAL ENVIRONMENT

The famous study of strategy and warfare "The Art of War", written by Sun Tzu, warned: "In battle one engages with the orthodox and gains victory through the unorthodox." The concept of asymmetric warfare is critical to understand the operational environment. Nations and non-state actors in various regions of the world generally see the NATO as a major dominating power, with large technological, economic, and material advantages and overwhelming military capability. Given this strategic assessment, potential opponents will seek to avoid this strength while exploiting perceived weaknesses.

We can see asymmetry as an ideological, cultural, technological, or military imbalance where a disparity in comparative strengths and weaknesses exists. In the context of the operational environment, asymmetry means an adaptive approach to avoid or counter dominant strength without attempting to oppose it directly, while seeking to exploit weaknesses. Consideration about question what do we need the armed forces must be able to do; we have to judge the potential enemies of the future. These will include warlords, tribal chiefs, insurgents, terrorists as well as cyber-bandits. These enemies might be sometimes children warriors with rich fighting experience and skill.

In this case, asymmetry will still be a significant determinant for development of the armed forces to face an opponent who will try avoiding open, force-on-force battles and relying on hit-and-run tactics, deception, camouflage, dispersion and the use of

guerilla warfare, and/or terrorism. Each kind of the environment will require a specific approach to succeed and reach desired objectives. Asymmetrywill stay a dominant characteristic of the armed conflict in specific operational environment.

## 7 MILITARY IMPLICATIONS FOR THE ARMED FORCES

We can ask what general implications for the Armed forces are. Following the broad approach to security defined in the NATO Strategic Concept, the armed forces will have to provide the fundamental military tasks to cover all challenges of developing security environment. Therefore the Armed Forces must adopt a holistic aimed approach (global, integrated, interdisciplinary), at developing highly synergic operational capabilities suitable for the carrying out all named missions.

There also exists a strong connection between the operational environment and the training of the forces. While most of security questions are matters of higher policy, training is the only one business of military professionals where development of the armed forces is highly visible. Warfighting in complex operational environment requires preparations of the armed forces in the similar environment and innovative training and education methods. It means allowing asymmetry to be a valid, legitimate partner in battle training, education, exercises, simulation and experimentation. Training and education must incorporate asymmetry from beginning as an inevitable fact of life. The goal of realistic operational environment conditions in the training is to produce an objective force of leaders, soldiers and units capable of rapidly adapting and optimizing capabilities to achieve mission objectives in a complex and evolving environment across the full spectrum of conflict.

Future set of missions will require trained forces that can be rapidly configured to their different typologies, mobile, sustainable in time, highly interoperable and flexible. If these capabilities, in combination with trained and high-tech equipped force meet the goal, it will enable NATO´s countries coalition to remain the world's dominant strategic power during the next decades of this Century.

There is a common understanding if any soldier in operation is come to have his boots on the ground there cannot be any shortcomings. His capabilities must be adequate conditions of specific operational environment. This fact should be alpha and omega at all stages of political and military hierarchy. Why? Not hard to answer it. Because of ensuring vital interests and security, because of political and military engagements and because of tasks the state policy wants to guarantee in specific operational environment. In this case the armed forces development from a broader perspective just followsconditions, circumstances, and influences that affect the employment of military forces. The more care from politicians the bigger probability the armed forces will succeed in future operational environment.

## 8 CONCLUSION

To precisely define all elements having influence on the armed forces development is necessary to assume nature, complexity and difficultness of the changing security environment. Just few were mentioned. There must be greater emphasize put on understanding of physical, economic, technological, informational and other domains of this environment and all consequences must be taken in consideration. Primary role embodies in politicians, their comprehension of difficultness of current environment and its impacts on the security policy of state. All implications of the armed forces development must be understood from a broad perspective. Nevertheless, it is changing global security environment, which determines the way the armed forces development must be directed to cover all present and future emerging challenges.

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# MODELING OF CHARPY TEST FOR STEEL C30E

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**Abstract:** In the paper it is presented an approach to simulate Charpy notch toughness test and estimation of toughness for steel C30E. A finite element program LS-DYNA was used to model the Charpy hammer together with specimen and power law material model for various temperatures. The material properties of the steel were determined by uniaxial pull test on standardized specimen and material model parameters were fit to the experimental results. The simulation results are compared to experimental results for accuracy.

**Keywords:** Notch toughness, Charpy test, failure mechanism, FEM.

## 1 INTRODUCTION

The aim of the paper is to experimentally determine the material properties of steel C30E from simple tension test and apply these in toughness simulation in LS-DYNA software. The numerical and experimental results should match. This is done in order to assess and verify the material properties so they can be later used in various other simulations, e.g. penetration test, stress analysis etc. It is known that the safety of soldiers manning the vehicle is important but also there is tendency to find construction materials with affordable cost. Therefore materials suitable to compose armor are examined not only from viewpoint of toughness and penetration resistance, but also from point of cost effectiveness. The examined steel C30E is low cost steel distributed in tempered state, i.e. heat treated for reduction of internal stress. In order to assess influence of heat treatment, specimens were made subjected to hardening conditions i.e. heated and sharply cooled to ambient temperature. Of course in the simulation have to be incorporated failure models to account for plastic as well as brittle fracture and results were compared to experiment.

## 2 MATERIAL PROPERTIES

In order to run simulation, the material properties of given materials have to be known. In this case the stress-strain curve was experimentally obtained using uni-axial tension test with given specimen made according to norm (Fig. 1) [1]. Two tests were then performed – with untreated specimen and with hardened specimen subjected to heat treatment. The graphs of the tests are in Fig. 2.

It can be noted that the test machine evaluates the force and displacement thus the stress-strain curve has to be calculated using well known formulas:

$$\sigma = \frac{F}{A_0}, \tag{1}$$

where $F$ is the pulling force and $A_0$ is the cross-section of the specimen and

$$\varepsilon = \frac{\Delta l}{l_0}, \tag{2}$$

where $\Delta l$ is displacement and $l_0$ is the initial length of the specimen.

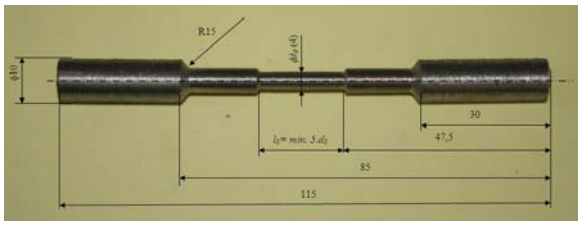



Fig. 1 Specimen for tension test

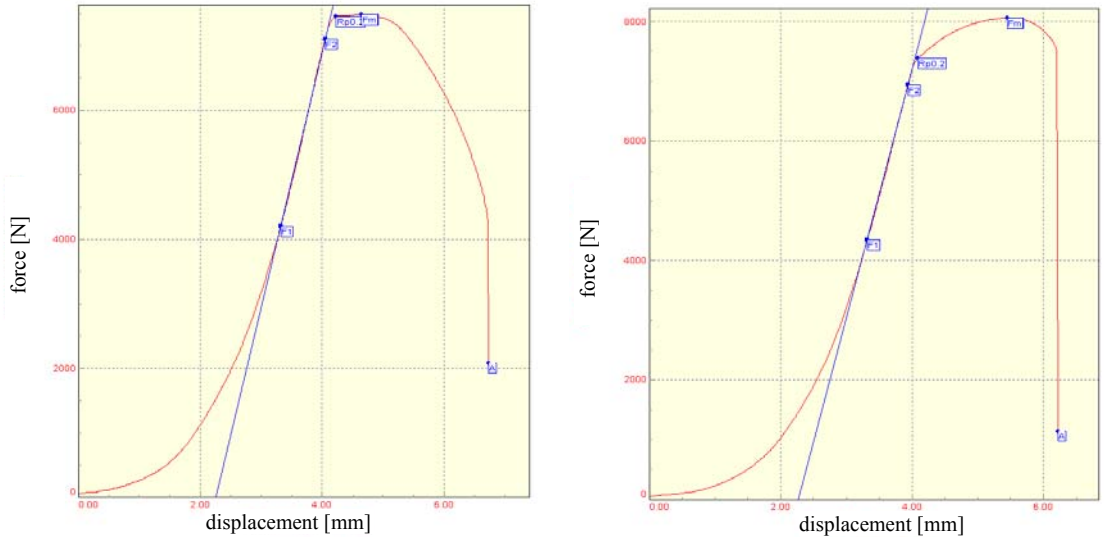
The stress-strain curve obtained this way was then used to determine the coefficients of the material model. The Johnson-Cook model is used for the purpose of plastic deformations:

$$\sigma = \left(A + B\varepsilon^N\right)\left(1 + C\ln\dot{\varepsilon}\right)\left(1 - T^M\right), \tag{3}$$

where A, B, C, N and M are unknown constants, ε is strain and the dot above strain represents strain rate. The unknown coefficients were found by fitting the J-C equation onto the experimental curve and are summarized in Tab. 1 for both the tempered and hardened steel.

## 3 THE MODEL AND RESULTS

The Charpy test model was readily available from previous research [2] with small changes required to break the specimen. The weight of the hammer was increased to 16.31 kg and the impact velocity is 4.95 $m.s^{-1}$, thus the kinetic energy of the hammer in the point of impact is approx. 200 J. To model the fracturing process in the specimen, failure options were specified in LS-DYNA.




*a) tempered* *b) hardened*

Fig. 2 Tension test results

Tab. 1 Steel properties

| Property | Tempered steel | Hardened steel |
|---|---|---|
| Density ρ [kg.mm$^{-3}$] | 7.85e-6 | 7.85e-6 |
| Shear modulus G [GPa] | 81.0 | 81.0 |
| Elastic modulus E [GPa] | 190 | 190 |
| Poisson ratio ν [-] | 0.3 | 0.3 |
| Bulk modulus K [GPa] | 170 | 170 |
| Yield stress A [GPa] | 0.83 | 0.864 |
| Hardening constant B [GPa] | 1.002 | 1.092 |
| Hardening exponent N [-] | 1.12 | 0.99 |
| Strain rate constant C [-] | 0.00541 | 0.005 |
| Thermal exponent M [-] | 0.87 | 0.87 |

The plastic failure is described by the effective plastic strain whereby if the given limit is reached, failure occurs and material fractures. The brittle fracture is described by the allowable force impulse and by the Tuler-Butcher criterion [3].

Set of 16 simulations was performed to state the failure criteria and energy needed for the specimen to break. The failure criteria are temperature dependent and thus a curve that approximates the experimental results can be drawn. The fracture energy and toughness for both specimens, the tempered as well as hardened specimen is in Table 2.

From the simulation the kinetic energy required to fracture the specimen was recorded for a set of fracture parameters. The results can be seen in Table 3 for tempered steel and in Table 4 for hardened steel.

The whole process from start to final fracture took 3 ms. Kinetic energy of the Charpy hammer is transformed into internal energy of the specimen including nucleation and propagation of the fracture.

Tab. 2 Steel toughness/fracture energy

| Steel temperature [°C] | Toughness [J.cm$^{-2}$] / Energy [J] | |
|---|---|---|
| | Tempered steel | Hardened steel |
| 20 | 158.75 / 127 | 118.75 / 95 |
| 10 | 113.125 / 90.5 | 118.75 / 95 |
| 0 | 102.5 / 82 | 112.5 / 90 |
| -10 | 94.125 / 75.3 | 100 / 80 |
| -15 | 72.5 / 58 | 95 / 76 |
| -25 | 62.5 / 50 | 88.75 / 71 |

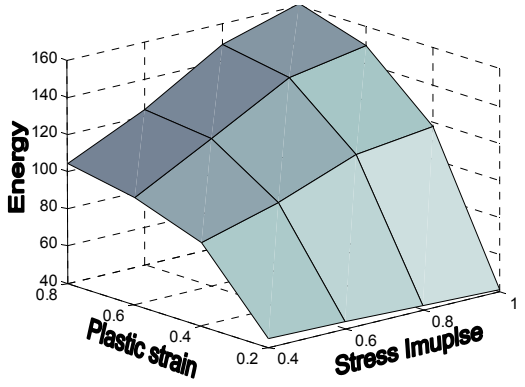
The failure properties are dependent on temperature and it can be seen that with decreasing temperature the energy required to break the specimen sharply drops. This is especially true for the tempered steel. Graphical representation of the fracture energy is in Fig. 3 for both steels. The hardened steel is more stable in environment with variable temperature while the tempered steel is very suitable for temperature above zero.

Tab. 3 Fracture energy[J] - tempered steel

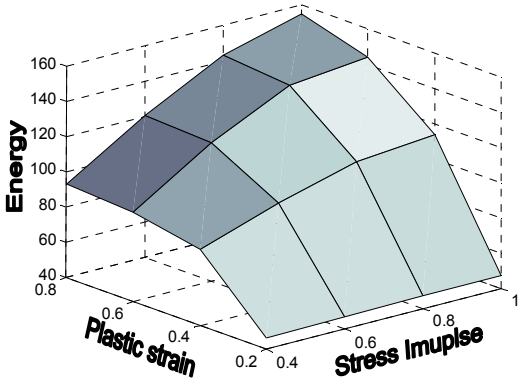
| | Stress impulse factor | | | |
|---|---|---|---|---|
| **Plastic strain** | 0.4 | 0.6 | 0.8 | 1.0 |
| 0.2 | 44.5 | 44.0 | 42.5 | 41.0 |
| 0.4 | 85.0 | 96.6 | 112.5 | 117.6 |
| 0.6 | 97.7 | 119.5 | 142.2 | 149.5 |
| 0.8 | 104.2 | 123.4 | 148.7 | 160.6 |

Tab. 4 Fracture energy[J] - hardened steel

| | Stress impulse factor | | | |
|---|---|---|---|---|
| **Plastic strain** | 0.4 | 0.6 | 0.8 | 1.0 |
| 0.2 | 46.8 | 47.0 | 47.5 | 47.5 |
| 0.4 | 83.0 | 98.0 | 110.1 | 113.6 |
| 0.6 | 91.0 | 118.6 | 139.6 | 144.2 |
| 0.8 | 93.5 | 120.4 | 143.3 | 155.1 |



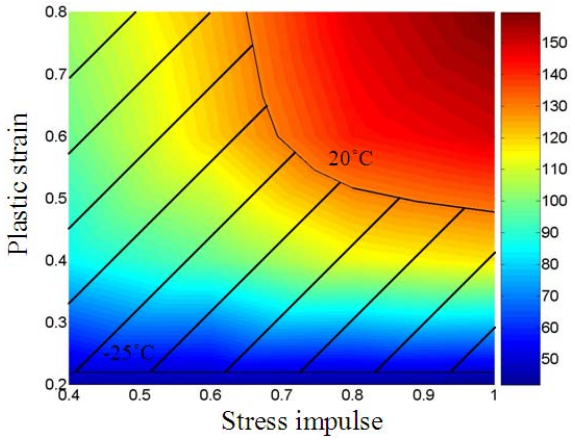

*a) tempered*



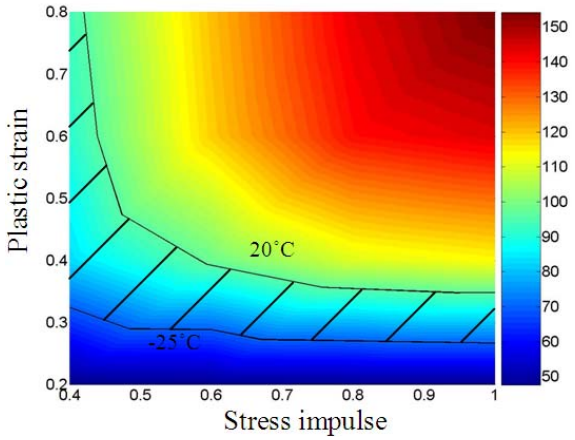

*b) hardened*

Fig. 3 Fracture energy

The failure mechanism in the hardened steel is influenced by the heat treatment because of which the plastic principle is subdued by the force impulse mechanism thus the specimen shows partly brittle fracture especially for lower temperatures. Set of suitable failure parameters is approximated from experimental results and forms curves which are isosurfaces for particular temperature and corresponding energy required to fracture (Fig. 4).




*a) tempered*




*b) hardened*

Fig. 4 Isocurves representing suitable parameters

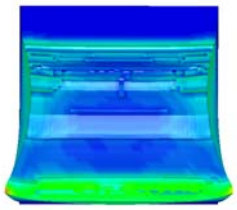
It can be seen that with lower temperature the plasticity is deteriorating and brittle fracture is prevalent. This can be seen with both steels but the tempered steel is very sensitive to temperature drop and the fracture energy is quite independent on the value of stress impulse thus the specimen breaks due to insufficient plastic flow in the material. Also the area for suitable parameters is very large indicating high dependence on temperature. The hardened steel is improved in the way that the sensitivity to temperature is less dominant and the plasticity is still good during low temperature despite the fact that the fracture energy is little lower compared to tempered steel for ambient room temperature.

The fracture surfaces are similar for both steels but it can be noted different plastic deformation due to afforementioned effects (Fig. 5 and 6). In the simulation the plastic deformation is not only visible from deformation of the specimen but also in Fig. 6 it is color coded where light shades of grey are maximal plastic strains and dark shades are minimal plastic strains.

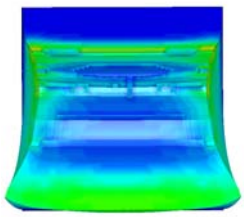
*a) tempered*

*b) hardened*

Fig. 5 Fracture surface - experiment



*a) tempered*



*b) hardened*

Fig. 6 Fracture surface - simulation

Thanks to the simulation the whole process of fracturing can be observed in various stages of fracture (Fig. 7). Experimentally this is hard to achieve because the process takes only a moment and expensive equipment is needed to capture it with good temporal resolution.

The plastic deformation can be seen in the figure as a darker shade. The fracture forms at the root of the notch firstly and at its center and gradually expands onto whole width of the specimen. The fracture then propagates further into the depth in a circular pattern, i.e. the material in the middle of the specimen fails but the material on the sides is still intact and deforms plastically. This pattern can be seen in Fig. 6 where the sides manifest high degree of plastic deformation and the middle area does not and the circular pattern is noticable especially for the hardened steel.

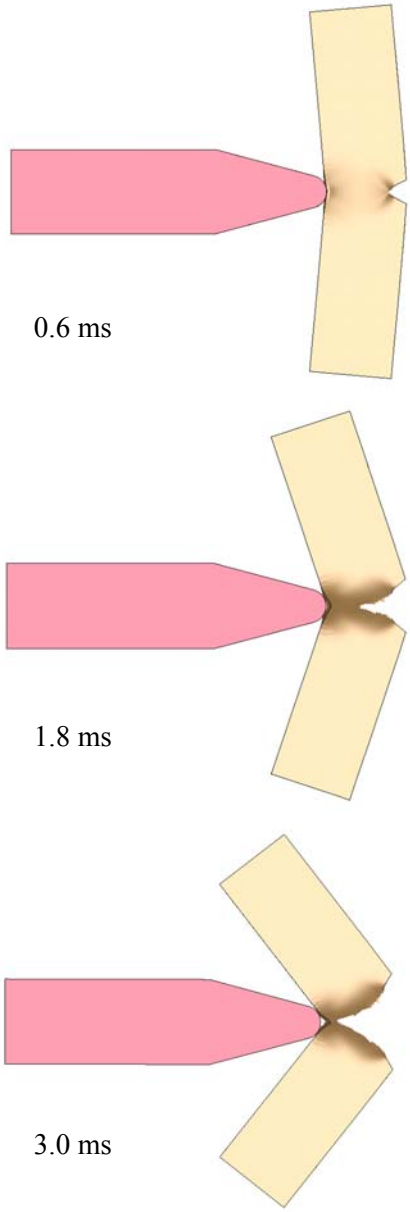



Fig. 7 Fracture propagation

## 5 CONCLUSION

In the paper a finite element software LS-DYNA was used to simulate behavior of steel C30E during Charpy toughness test. Two kind of specimens were used to determine the material parameters for this

steel and its influence to heat treatment. One specimen was tempered to reduce internal stresses and another specimen was hardened to further improve its hardness. Material model Johnson-Cook was used to model the steel in both heat treated states. The parameters were estimated from experimental simple tension pull test and fitted to correspond to the stress-strain curves obtained. The failure mechanism used incorporate so plastic failure as well as brittle fracture and combination of both resulted in desired results. It can be seen from the behavior of the material that the plasticity sharply drops with temperature for both heat treated steels but also the hardened steel maintains better plasticity during lower temperatures. This is especially seen on the fracture surface where larger deformation occur and from the simulation it is clear that also larger plastic strains are accumulated in this region.The simulation results are in good agreement with the experiment which was carried out on Charpy hammer tool thus it confirms the validity of simulation as a tool to be used in mechanical engineering to observe various processes and to help broaden the understanding of them.

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# GUNSHOT EFFECTS SIMULATION

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**Abstract:** In the paper it is presented an approach to simulate gunshot process and its unmasking effects together with means to suppress it. A finite element program LS-DYNA was used to model gun barrel with the bullet in the air environment. Arbitrary Lagrange-Euler (ALE) formulation is implemented to describe the behavior of gases from powder propellant.

**Keywords:** Muzzle device, suppressor, gunshot, FEM.

## 1 INTRODUCTION

In recent years more and more emphasis is given on stealth missions during combat. When one is not seen there can be no counterattack commenced on him. Thus for example a sniper after hit can retreat into safety without harm. This can be done by suppressing the gunshot effects which during normal conditions reveal position of the shooter. Two most important unmasking effects are audible and visual effect produced during gunshot. There are more components of both effects – the audible part is composed mostly by rapidly expanding propellant gases after the bullet left the barrel, if the bullet is supersonic, a sonic crack of the bullet can be heard. Next is noise from moving of the mechanical parts of the gun whether it is the impact of firing pin to the cartridge cap or impact of the breech on the rear of barrel or the ejecting cartridge case and loading mechanism of the gun. The visual part also referred to as muzzle flash is composed of muzzle glow, which is formed by hot propellant gases which are highly compressed. Primary flash which occurs after the bullet has exited the muzzle and is caused by these propellant gases exiting the muzzle behind the projectile. Intermediate flash which occurs at the time of shot ejection and persists until the chamber pressure drops. Secondary flash which is a result of ignition of combustible mixture of propellant gases enriched by atmospheric oxygen and the last component are sparks which are ejected together with the bullet and are formed by residual fragments of metallic components of brass and crystals of potassium salt (Fig. 1) [1].

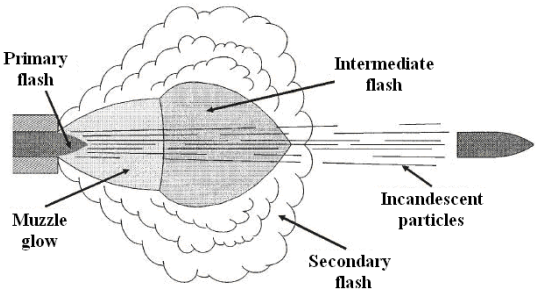


Fig. 1 Visual part of the gunshot effect

In the model presented there is not incorporated the visual part of the bullet shot which would require to model the burning process of the gun powder propellant displaying the stage of chemical reaction and also temperature of reacted gases [2]. It is therefore assumed that the propellant burns ideally and only reacted gases can be visualized. The attention is pointed on the audible part especially the pressure shock wave which is formed by the propellant gases after the bullet exits the muzzle and is also the only component which can be reduced by using suppressor device. Most suppressors can realistically reduce the noise of firing by 18 ÷ 32 dB depending on the device. Suppressors for subsonic cartridges can approach 40 dB of noise reduction.

## 2 THE MODEL AND RESULTS

The FEM software LS-DYNA was used to simulate the behavior during gunshot. The air and gunpowder propellant are modeled using Euler approach and the bullet is modeled using Lagrange approach. The barrel is modeled as a set of boundary conditions as we are not interested in its deformations yet. The whole model had to be modeled as quasi 3D because the Euler domains require very fine mesh in order to catch the pressure shock wave. In this manner one dimension is very small and the number of elements is affordable for ordinary computer to compute. The model represents an assault rifle with caliber 5.56 mm and can be seen in Fig. 2. The length of the barrel is 488 mm, weight of the projectile is 3.6 g and the propellant weight is 1.85 g. Whole model consists of 168,147 nodes and 83,100 finite elements.

The air environment has to be contained in sealed volume with appropriate boundary conditions so that the gas would not leak into void and is modeled using MAT_NULL keyword. For gases also the equation of state has to be defined. In this case the air was described by the EOS_LINEAR_POLYNOMIAL equation with all coefficients equal zero except C4 and C5 which were set to 0.4.

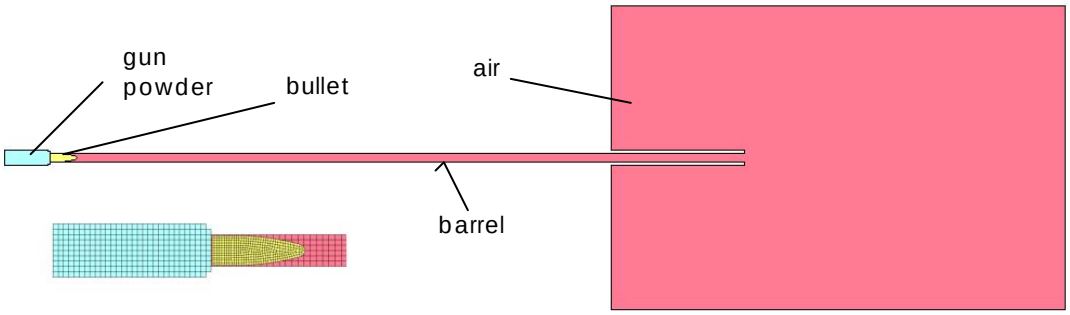


Fig. 2 Model with detail of gun chamber

Used properties for air can be seen in Table 1 with basic units set to kg, GPa, mm, ms, kN.

Tab. 1 Air properties

| Property | Value |
|---|---|
| Density | 1.205e-09 kg.mm$^{-3}$ |
| Dynamic Viscosity | 1.730e-11 GPa.ms |
| Internal Energy | 2.533e-04 GJ.kg$^{-1}$ |

The area of the air should be as large as possible to avoid reflection of shock waves from its boundaries and also unrestricted flow of the air in the volume. The main limit is of course the available memory of the computer where the requirements rise quadratically for quasi 3D model and cubically for full 3D model. Here the area of the air has dimensions 30 x 20 cm.

The properties of gun powder had to be experimentally determined from pressure curve in the barrel during shooting (Fig. 3).

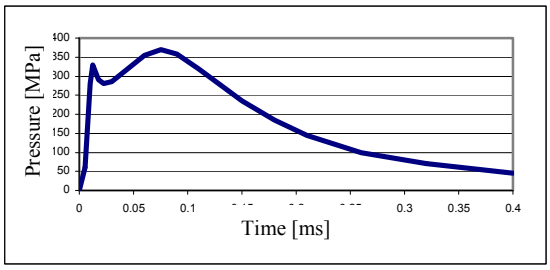


Fig. 3 Pressure in the gun chamber

The pressure sensor was uncovered after the bullet traveled approx. 10 mm so the beginning of the pressure curve is not captured and the first peak is formed due to the shock formed when the propellant gases filled the cavity in which the sensor was embedded. The bullet leaves the muzzle at the end of the curve at time 0.4 ms, the rest of the curve was clipped. Of course the real time from ignition of the propellant to the instant when the bullet leaves the muzzle is approx. 0.6 ms for the model, nonetheless we were not interested in the beginning phase but mainly in the phase where the propellant products are freely expanding as the bullet travels down the barrel.

The Jones-Wilkins-Lee equation of state for the gun powder was used which describes the pressure in the gas products relative to the expanded volume as follows:

$$p = A\left(1-\frac{\omega}{R_1 V}\right)e^{-R_1 V} + B\left(1-\frac{\omega}{R_2 V}\right)e^{-R_2 V} + \frac{\omega E}{V} \quad (1)$$

where A, B, $R_1$, $R_2$, ω are constants, E is internal energy per initial volume of gas products and V is relative volume of expanded gases. The five unknown coefficients had to be retrieved by numerical optimization to fit the pressure curve in Fig. 3. For this task a Matlab routine was programmed which utilized Monte-Carlo optimization algorithm for the five coefficients, which were in each optimization cycle substituted into equation (1) together with relative volume and internal energy and the result was compared with the measured pressure curve. The relative volume was calculated from known position of the bullet in the barrel dependent on time. The set of coefficients with smallest deviation from the measured pressure curve in terms of root mean square (RMS) was then chosen to be used in the simulation. Only the part from the peak pressure onwards was used as the beginning of the pressure build up is related to the burning of the gun powder and this is handled by different algorithm. An assumption has been made here, that the propellant burns ideally, that means, that all amount of the propellant in the cartridge is completely burned in the barrel.

Material model HIGH_EXPLOSIVE_BURN was used to describe the burning process. The used parameters for this material and also for the equation

of state are summarized in Table 2. The initial detonation was set to zero time and located at the point of action of the firing pin at the bottom of the cartridge chamber.

Tab. 2 Gun powder parameters

| Parameter | Value | Units |
|---|---|---|
| Density | 1.63e-6 | $kg.mm^{-3}$ |
| Burn velocity | 350 | $mm.ms^{-1}$ |
| C-J pressure | 0.3 | GPa |
| A | 0.1935 | GPa |
| B | 0.141 | GPa |
| R1 | 0.8 | - |
| R2 | 0.878 | - |
| Ω | 0.2641 | - |
| E | 0.11 | $GJ.kg^{-1}$ |

The bullet is the only part modeled in Lagrange coordinates and for simplicity it is assumed that the whole bullet is made of lead. There has to be coupling between the gases and the bullet and also between the bullet and the air. This has been done through the CONSTRAINED_LAGRANGE IN_SOLID keyword which was set to default parameters. The penalty function would be better in this case but unexpected instabilities occurred during the simulation such as the gas products violated the bullet boundaries and leaked through it thus unacceptable results arose.

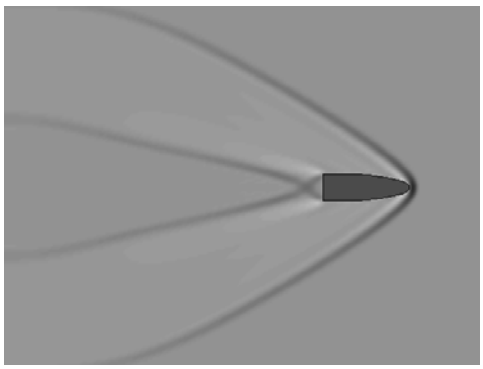

Fig. 4 Simulation in LS-DYNA

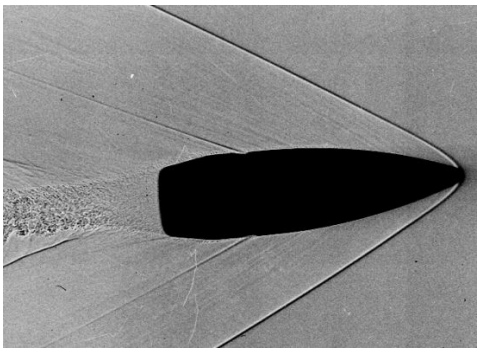

Fig. 5 Shadowgraph photo of bullet flight

With the penalty method very good results of bullet flight in the atmosphere have been done (Fig. 4) and compared to real-time shadowgraph photography as can be seen in Fig. 5 [3]. The accuracy and resolution is directly proportional to the density of the mesh grid and thus for 1 mm grid the results can be perceived as blurry or foggy. A very fine grid is required for the image of the simulation to be sharp and this in turn requires powerful computer rig.

Here in the paper we are interested in the noise which the gunshot makes with barrel without muzzle device and compared with the barrel with the muzzle device where the air flow can be visualized also. To make the comparison one needs to set parameters which will characterize the gunshot event and in this case it will be the acoustic pressure. The acoustic pressure is calculated according to RMS value of pressure of the event as follows:

$$dB = 20\log\frac{p}{p_{ref}}, \qquad (2)$$

where p is RMS value of the pressure curve and $p_{ref}$ is the audible limit of human ear with value $2x10^{-5}$ Pa.

In the Fig. 6 and 7 it can be seen the pressure gradient and density of propellant gases during simulation with the barrel without the muzzle device respectively. The simulation spans over 1 ms from the ignition of the propellant. The gases almost immediately leave the barrel after the bullet and form large pressure shock wave. The blast wave of first precursor created by the compressed air pushed in the front of the bullet and also formation of Mach disk due to supersonic flow of the propellant products can be clearly visible. From the contours of the propellant gas density it is evident that the bullet perfectly seals the bore and no leakage occurred until after the bullet left the muzzle. The propellant gas is then expanding and mixing with the air and forms a conical shape which later on when the outflowing gases lose momentum transforms into mushroom like shape. It is evident that even at the end of the simulation the density and thus pressure of the propellant gases in the barrel is still high and the gases are still pouring out of the barrel and contribute to the formation of the burned propellant cloud and muzzle flash. It is only pity that finite rate chemistry was not included into the model and the re-ignition of the propellant products upon exiting the muzzle and mixing with fresh air is neglected. Thus the shape and also temperature distribution of the muzzle flash might deviate from experimental results. Nonetheless it can be seen further that the deviations are not so significant. In future it is possible to improve the model by using the 'ignition and growth' material model for the propellant to simulate also the chemical reaction in the propellant products upon entering the atmosphere and their re-oxygenation.

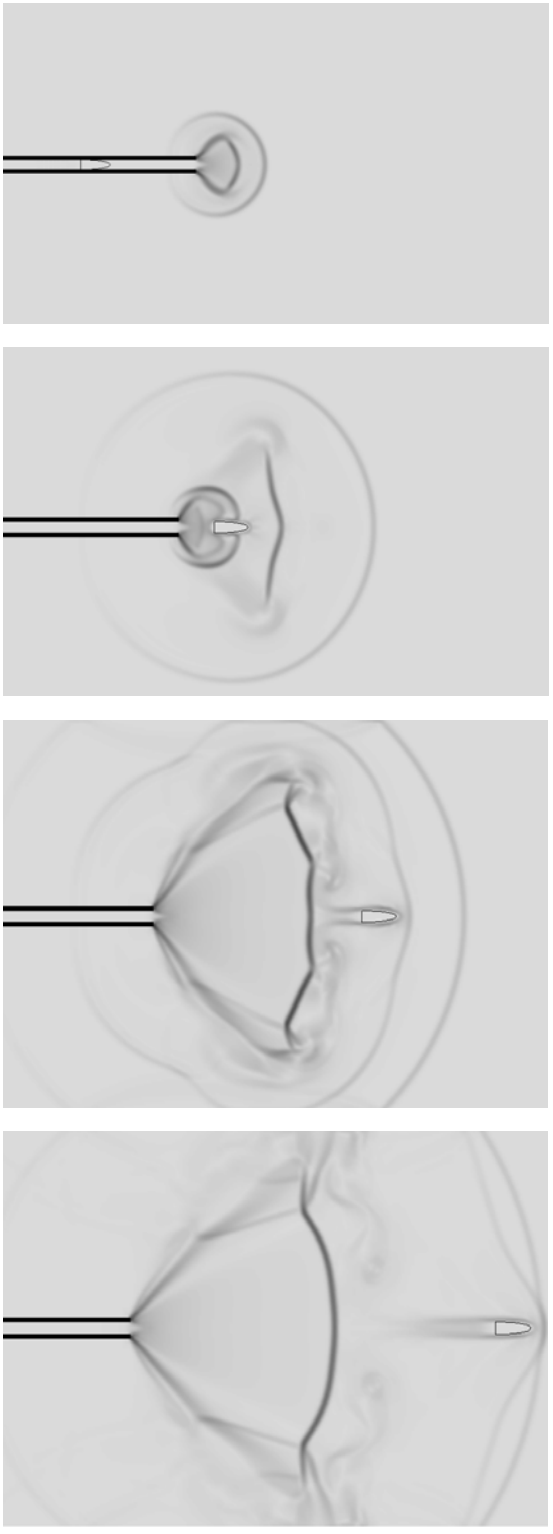

Fig. 6 Pressure gradient

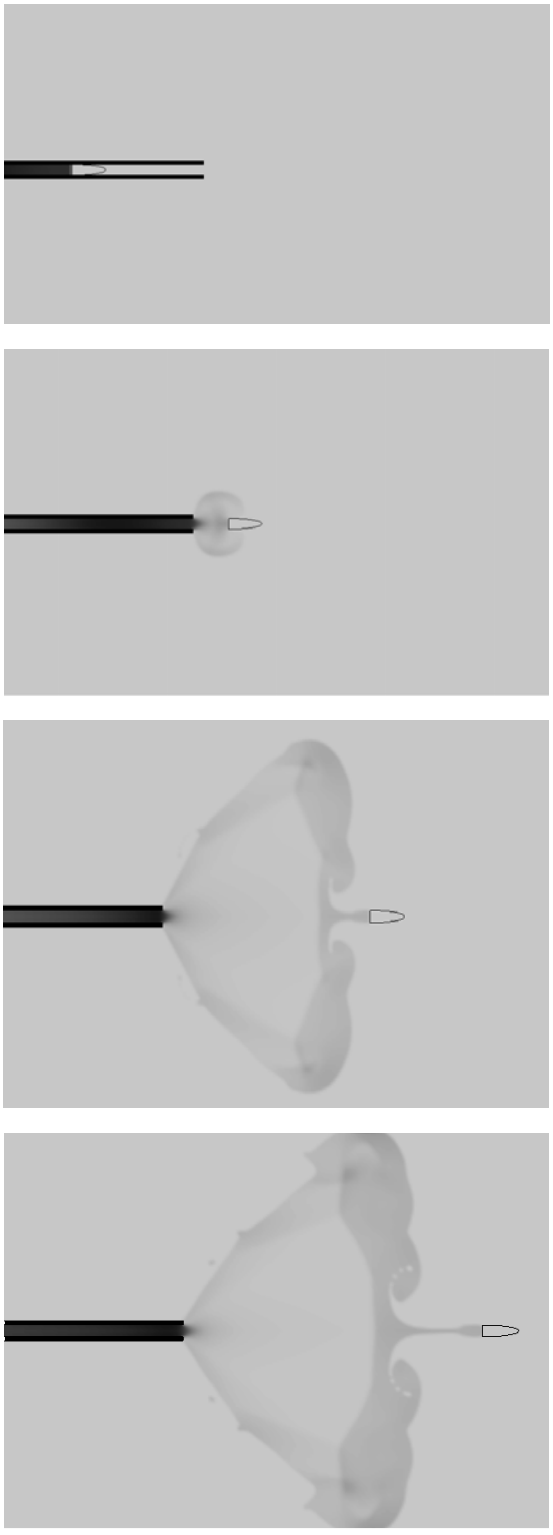

Fig. 7 Density of the propellant gas

The results in Fig. 6 can be compared to shadowgraph photography of an actual shooting from a 5.56 mm caliber rifle. We have had no sufficient equipment nor do we have expertise to do this but fortunately in the literature it can be found very good shots as can be seen in Fig. 8 [4].

Complementary to the density of the propellant gas it can be seen in Fig. 9 the density of the surrounding air in one moment. The similarity to the shadowgraph photography is evident. Due to the temperature dispersion it can be seen the wake in the flow of the surrounding air. It is hardly to

distinguish any boundaries between the propellant products and the air as the diffusion of the gases proceeds.

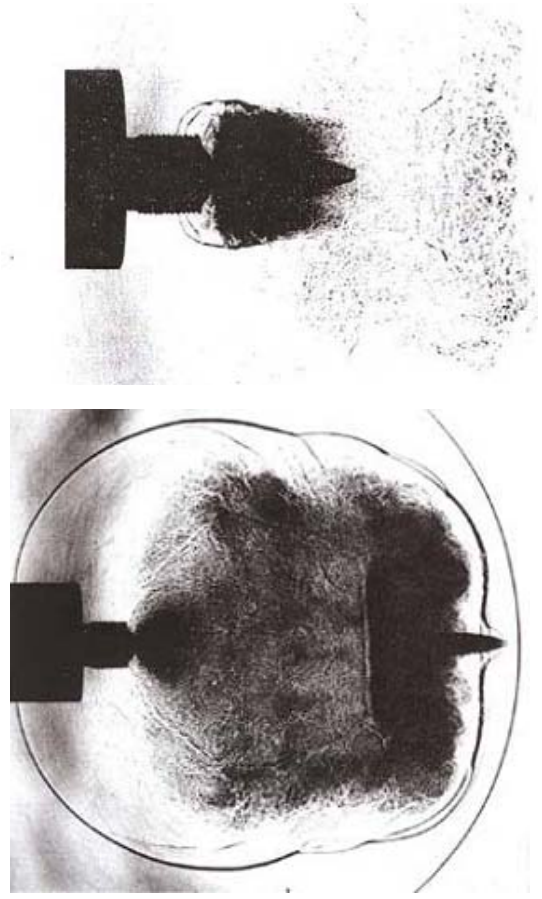

Fig. 8 Shadowgraph of a shot

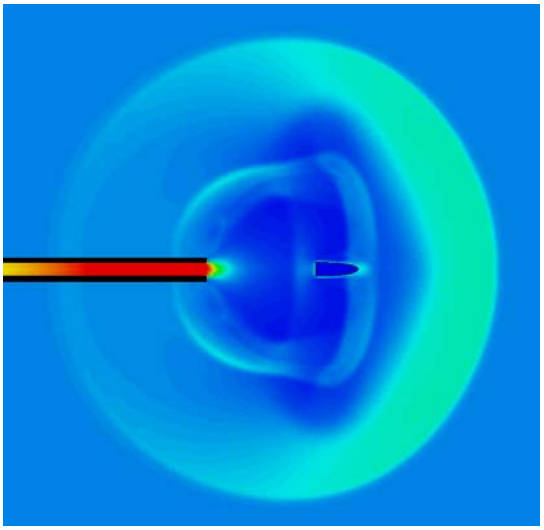

Fig. 9 Air density

The pressure of the blast is very similar in composition to the air density, as the density is a function of pressure and temperature (Fig. 10). The temperature of the flash can be seen in Fig. 11.

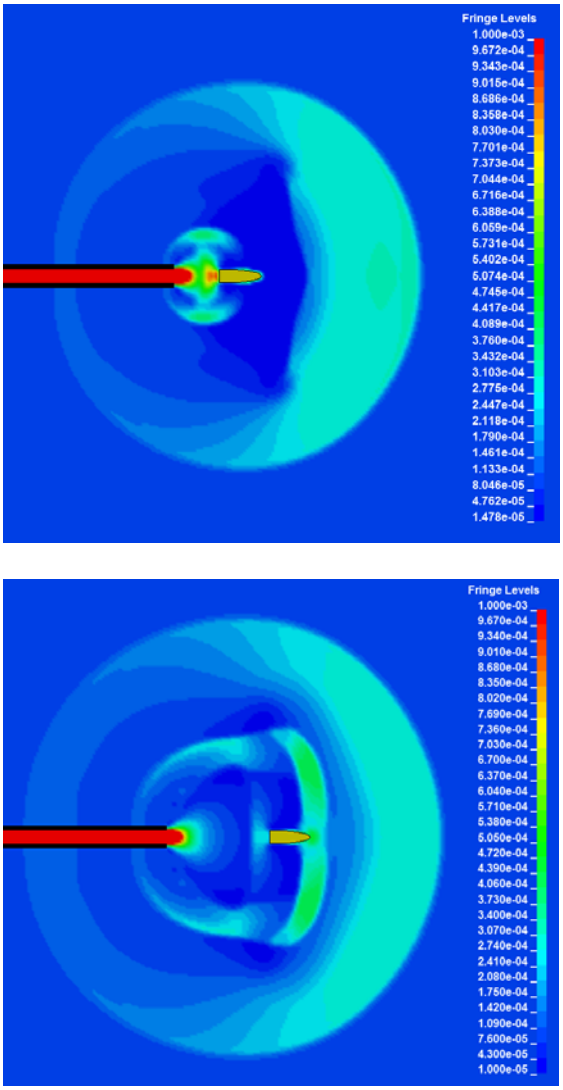





Fig. 10 Pressure

The temperature field is very smooth and transitory. The heat is generated whenever the gases are compressed in addition to the heat generated by burning of the propellant. Thus also the air in front of the bullet is gaining temperature but this is negligible. It can be seen from the figure that the temperature rapidly drops as the propellant gases expand and the heat is quickly dispersed in the surrounding air. In addition to the mixing of the gases with the air, the radiation also helps to spread the heat. The shape of the thermal field is more or less conical and it is of course given by the shape of the burned propellant products. Here the surrounding air is assumed static without any perturbations due to the wind and therefore the thermal figure is symmetric and the heat is distributed uniformly along the barrel until the bullet exits the muzzle and the temperature of the gases in the barrel starts to drop in the direction from the muzzle towards the breech.

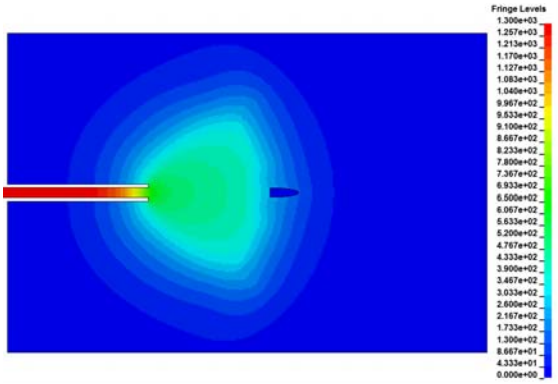


Fig. 11 Temperature

Here it is necessary to note that it was not possible experimentally to support these results because the thermal camera owned by the department has no high speed capability. Instead of thermal images a high speed footage of muzzle flash in low light conditions was done (Fig. 12).

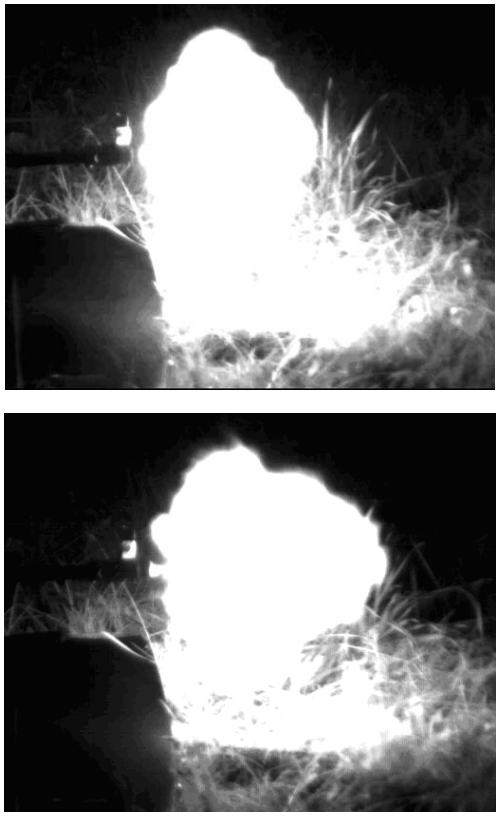

Fig. 12 Muzzle flash

Even though the temperature distribution of the flash is not evident from the footage, it is clearly seen that the flash is formed in shape of conical cloud and later on elongates in the direction of the shot. In the simulation only the first millisecond ofthe event is captured and similar results to the experiment can be expected after the first millisecond. This is indicated also by the velocity field in Fig. 13.

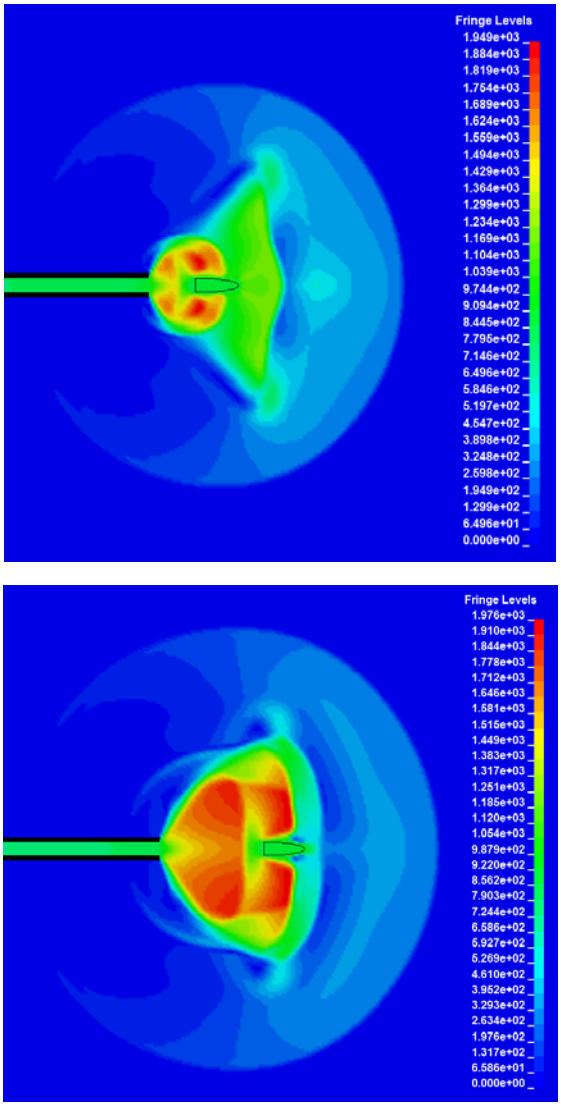


Fig. 13 Velocity

As the propellant gases flow out of the barrel a disc is formed where the velocities of the flow are supersonic, i.e. Mach disc. The momentum of the gas diminishes quickly but the flow of the gas out of the barrel is not finished even at the end of simulation and fresh momentum is added in the direction of the shot. The disc elongates and tends to form shape similar to experimental results in Fig. 12.

In Fig. 14 and 15 is the same simulation with the suppressor. The gases here expand into the expansion chambers thus their pressure is reduced and also they are mixed with the air in the suppressor while some vortexes are formed in turbulent flow. The situation here is diametrically different. The simulation spans also for 1 ms and it can be seen that the powder gas products are released slower from the suppressor as at the end of the simulation majority is concentrated in the expansion chamber. This is reflected also in the pressure shock wave which is much shallower even

though its duration is longer. This means that the audible effect of the shot is suppressed as the acoustic pressure is lower.

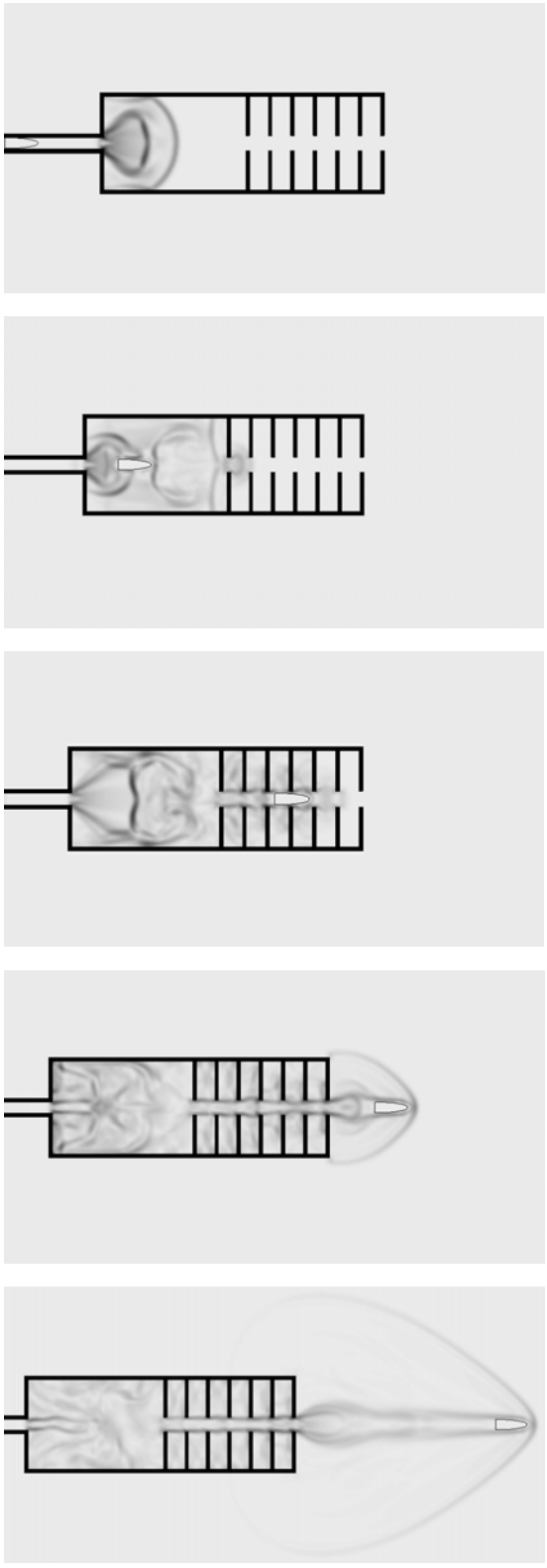

Fig. 14 Pressure gradient

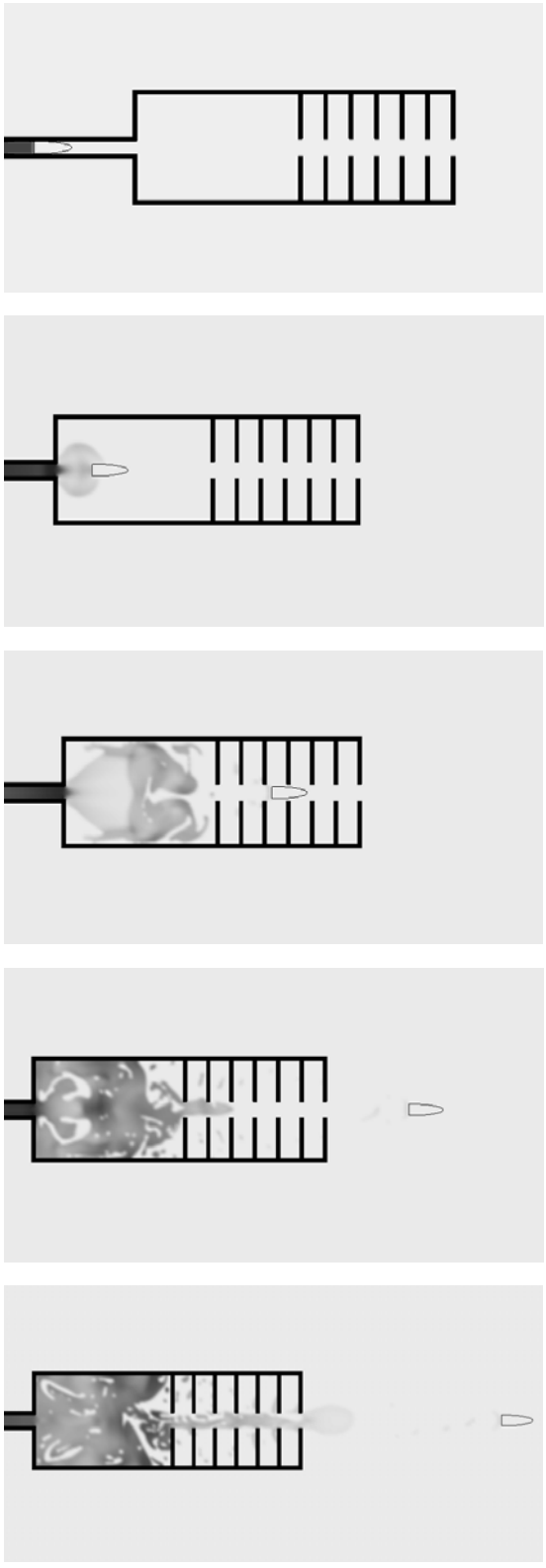

Fig. 15 Density of propellant gas

In Fig. 16 and 17 graph of pressure-time dependence is shown for bare barrel without muzzle device and barrel with suppressor. The pressure near the muzzle was reduced from 3.4 MPa to 0.7 MPa

and the acoustic pressure was suppressed by 13 dB even for this simple suppressor

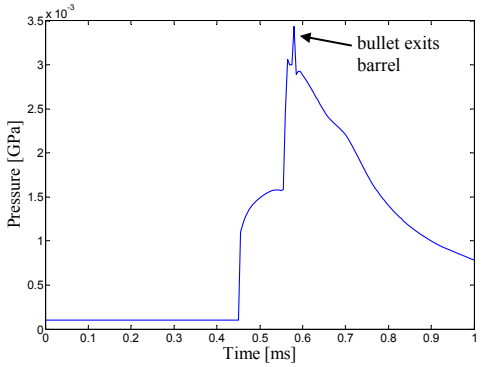


Fig. 16 Pressure near muzzle without suppressor

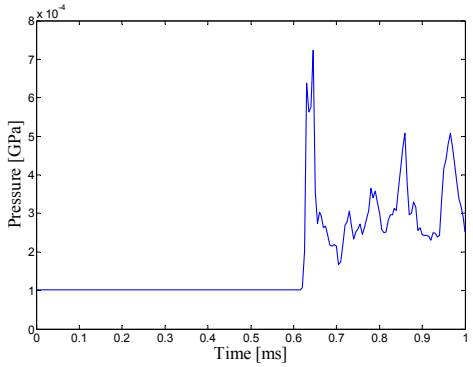


Fig. 17 Pressure near muzzle with suppressor

It can clearly be seen the building pressure in the precursor wave in Fig. 16. Afterwards the bullet exits muzzle and the propellant products are unleashed from the barrel under high pressure. This is indicated by the peak in the graph. From then on the pressure continuously drops until the atmospheric pressure is established. The duration of this balancing act is obviously longer than 1 ms and from extrapolation it ought to be somewhere between 3 to 5 ms assuming marginal affinity to atmospheric pressure.

The situation with suppressor is harder to interpret. Obviously the atmospheric pressure in the beginning is followed by pressure of exiting gases after the bullet exits the suppressor. The precursor wave is scattered by the suppressor and is not visible in the graph. It is evident that even though the pressure is lower, it is not decaying as quickly and smoothly as in the case of bare barrel. The pressure waves are scattered by the expansion chambers and the gases are being gradually released from the suppressor. The pressure characteristic is oscillating but it can be found a moving average curve which suggests that the pressure is not yet dropping but is more or less flat. The downward trend can not be established and thus it is impossible to predict the duration of the balancing act. In the case of suppressor much longer simulation time would be needed to capture the whole event.

The geometry and the dimensions of the expansion chambers play important role in directing the flow, creating vortexes and dissipating the energy of the propellant gases mixed with air thus slowing them down which results in reduced audible effect of the gun shot.

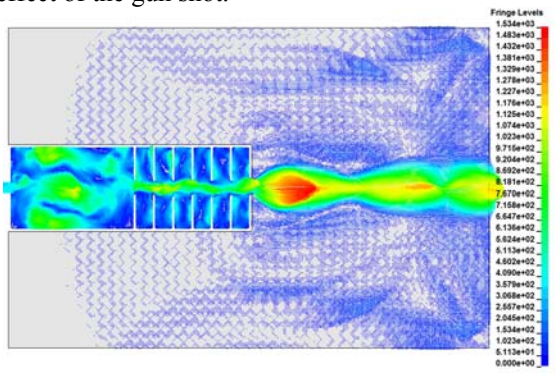


Fig. 18 Velocity field of the flowing gas

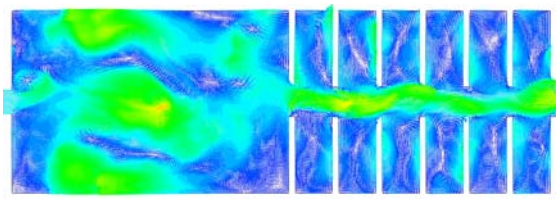

Fig. 19 Detail of the gas flow in the suppressor

Using the LS-DYNA software the flow can be visualized and studied to achieve better results in efficiency of muzzle devices. This is documented in Fig. 18 and 19 where the velocity vector field in the suppressor is shown. On the other hand it can be expected that the suppressor and partly also the barrel will be heated quicker as the hot propellant gases are retained for longer time by the suppressor (Fig. 20).

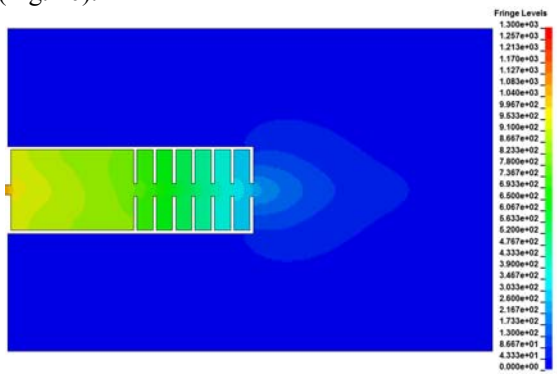


Fig. 20 Temperature field

For axisymmetric muzzle devices the 2D study is fully sufficient as the resulting pressure and velocity fields ought to be also axisymmetric. For devices

with general geometry the 3D simulation provides best results but powerful computer is required to handle such problems. Very fine mesh is required especially to model the turbulent flow inside the expansion chambers.

## 5 CONCLUSION

In the paper a finite element software LS-DYNA was used to simulate behavior of gunshot effects with and without suppressor. The ALE formulation was used to couple the propellant gases and air with the bullet thus resulting in fluid-structure coupled simulation with turbulent flow and viscous effects. The material properties of powder propellant were determined from experimental measurements of pressure in barrel during shot. The simulation involves ignition of powder propellant, its burning and formation of shock wave front and expansion of propellant gases. It can be seen that using simulation better understanding of various processes during gunshot can be achieved. Especially using the suppressor uncovers the turbulent flow and formation of vortexes and also the flow of propellant gasses in the expansion chambers. The efficiency of the suppressor seems to lie in slower release of the propellant gases thus the pressure wave is reduced and also the combustible mixture has more time to completely react with ambient oxygen and cool down. From this point of view the efficiency of the suppressor is directly proportional to its size and also to its ability to create as much eddy currents as possible to act as a capacitor with slower release of accumulated energy. The simulation can be used to improve the design of existing muzzle devices or develop new design and optimize its parameters to improve efficiency of its functioning.

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# ASPECTS REGARDING THE ROLE OF AIR FORCE IN COMBATING GLOBAL TERRORISM

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**Abstract:** Global terrorism poses a growing threat to the international community. The political, economic, and informational instruments of power play primary roles in addressing and eliminating the root causes behind asymmetric extreme risk events, but the military instrument will prevent some attacks and retaliate for others.

Air force (AF) is one of the primary components of the military instrument in the battle against terrorism and contributes to current counterterrorist (CT) capabilities by providing global mobility for special operations forces, air superiority to protect those forces, and precision strike capability to target terrorist infrastructures. It also provides intelligence critical to deterring, preempting, and answering terrorist attacks, and provides psychological operations support to help erode terrorist will and popular support.

The traditional role of AF in combating terrorism in different steps of application is presented. The analysis of possible future improvements in AF is essential to enhance the CT capability effectiveness.

**Keywords:** Global terrorism, Air Force (AF), counterterrorist (CT) capabilities.

## 1 TERRORISM - A NEW CHALLENGE

Although terrorism has occurred long before the air force, the terrorist phenomenon is growing, promoting the fundamental problems of timeliness list. This new terrorism, the result of historical evolution, closely related to the evolution of society as a whole, is itself a process with global implications difficult to prevent and manage. Failure to ensure a response to terrorist actions will likely be interpreted as a sign of weakness and may lead to new and more spectacular terrorist attacks.

Unfortunately, terrorists are advantaged in this fight, especially when their targets are in a free and democratic society. Using the appropriate documents for international travel, terrorists can move freely in open societies and can choose the time, place and target their attacks. They claim that they are at war, but does not respect the laws of armed conflict and have no care to non-combatants.

Similarly, the same conclusions can be drawn in the case of countries that sponsor or coordinate the terrorism. These countries use the terrorism as a "strategic weapon likely to replace the conventional war."

We witness the transformations of conceptual and action, diversification and sophistication of methods of action of terrorists, including the use of the newest weapons and technology. Addressing the issues raised by contemporary terrorist phenomenon involving multiple approaches, including the military which still holds an important role.

From this perspective, linking the AF, particularly the aviation with the phenomenon has two aspects. On the one hand, the terrorism uses the aviation in its own interest as a way of asymmetrical preparation and on the other hand, air forces are engaged / involved in preventing and combating terrorism.

Dealing with the terrorism has become a priority on the agenda of state and collective security. Actions in this context bear the characteristics of a conflict atypical, unconventional. Countering the terrorist phenomenon proves difficult and complex, take place at all levels - local, regional and global - involving actions and operational-tactical level but a strategic temporal and spatial extent, the aviation contributes greatly to this feature of the battle.

Given the AF major features- action in the air environment, relative independence from the infrastructure ready on the earth surface, ubiquity - they will continue to play an important role in any counterterrorist operation (CT). The contribution of this category of forces has become particularly important, sometimes critical to the success of CT operations, and it is expressed in two ways: the supporting role such as collecting information or mobility, and the operational role those facilities such as terrorist strike.

Below we address some specific aspects of the air force participation in the fight against international terrorism. Starting from the analysis of such events, we present some aspects regarding the AF missions and the mode of actions.

## 2 AF'S MISSIONS IN COMBATING TERRORISM

They can be grouped into six categories: Air Transport, Air Superiority, Air Attack, Intelligence, Surveillance, and Reconnaissance (ISR), and Psychological Operations.

*Air Transport*

For CT forces to be effective, it is vital for them to respond to terrorist incidents, and the AF to ensure the transport capacity needed for successful

CT operations. This includes the strategic AF to ensure global mobility by moving the CT personnel, equipment, and weapons everywhere in the world. Also, insertion and extraction of special operations forces (SOF) is provided by aircraft or helicopters.

*Air Superiority*

Although terrorist groups do not have their own AF, air superiority has occasionally been a factor in counterterrorism actions. Probably the most notable was the intercept of an Egyptian civil airliner by US Navy F-14/Tomcat fighters on 11 October 1985. The aircraft was carrying four Palestinian terrorists (plus their leader, Abu Abbas) who had hijacked the cruise ship Achille Lauro on 7 October and subsequently killed Leon Klinghoffer, a 69-year-old. The terrorists had surrendered to Palestinian Liberation Organization officials in Port Said, Egypt, and been granted safe passage to Tunisia by the Egyptian Government. The airliner was destined for Tunisia, but was intercepted by four F-14s from the aircraft carrier Saratoga and forced to divert to Sigonella, Sicily, where the terrorists were to be taken into American custody.

Some analysts equate the US Navy shootdown of two Libyan fighters over the Gulf of Sidra on 19 August 1981 as a CT response. Although the action was not a direct response to a specific terrorist incident, continued sponsorship of terrorist activities by Muammar Qaddafi and the Libyan government has certainly been a motivation for making this decision.

Air superiority may also be used to protect CT forces engaged in a mission by providing them air defense from a state-sponsor's air forces. Air superiority coverage may be overhead or on-call, reacting only if something goes wrong with the operation or to cover extraction of forces.

*Air Attack*

Probably the most visible CT airpower role is air attacks against terrorism-associated facilities. These strikes can be conducted by fixed-or rotary-wing aircraft or by cruise missiles. An example of the former is Operation Eldorado Canyon, the 14 April 1986 air strikes against Libya in response for the 5th April bombing of the La Belle discotheque in West Berlin in which an American serviceman and a Turkish woman were killed and over 150 people were wounded. An example of the latter is the Tomahawk cruise missile strike against the Iraqi Intelligence Service headquarters in June 1993 in response to the uncovered plot to assassinate former President Bush.

CT strikes can be preemptive or reactive in nature, and involve important considerations. While abstaining from argument about the legality of apreemptive strike, other considerations include the need for meticulous targeting to avoid collateral damage and furnishing sufficient evidence to justify the strike to the international community. Strikes in reaction to a terrorist attack can be conducted to punish the perpetrators or sponsors and to send a message that such action will not go unpunished. However, retaliatory strikes must not be conducted purely for revenge, but should be motivated by clearly defined goals and objectives.

*Intelligence, Surveillance, and Reconnaissance*

Probably the most important contribution of AF to CT is providing intelligence for planning and execution of operations and monitoring of terrorist associated facilities. CT planning and operations require timely, responsive, and accurate intelligence to succeed, and much of this intelligence gathering can be performed by manned or unmanned aerial vehicles, or overhead national assets (satellites). Although human intelligence (HUMINT) is the most important intelligence discipline for providing information on terrorist organization and intent, imagery intelligence (IMINT) and signals intelligence (SIGINT) from air and space platforms also provide valuable information for analysis, planning, and execution. Further, space communication platforms also provide the means for rapidly and securely disseminating this information.

*Psychological Operations*

Psychological operations (PSYOP) can be used to deter or disrupt planned terrorist actions, and to erode their base of support within the local or general population. AF can play an effective role in these areas by deterring state-sponsors of terrorism through physical presence or shows of force. If there is concern a state may sponsor or direct terrorist attacks against a high level meeting of political leaders or a highly visible international event such as the Olympic Games (as North Korea implied with veiled threats against the 1988 Summer Olympics in Seoul) AF can be overtly deployed within striking distance of the sponsoring state as a visible reminder of the consequences for a hostile act.

Manned or unmanned aerial vehicles can also deliver PSYOP leaflets or conduct PSYOP radio or television broadcasts. These can be directed at the terrorists themselves as a warning of the consequences for their intended actions or the local or general population to erode the support base for terrorists and their cause. PSYOP can be used to counter terrorist propaganda, explain a recent CT terrorist strike or operation in the area, and explain care taken to avoid civilian casualties and collateral damage in such a strike. Aircraft overflights can also be used as a form of PSYOP. For example, the mere overflight of Manila by USAF F-4/Phantom fighters was instrumental in thwarting a coup attempt against

the Corazon Aquino government in the Philippines in December 1989. Of course the possible benefits of PSYOP in a re-hostilities phase must be weighed against the tradeoff of compromising knowledge of terrorist locations or plans.

AF also provides other support to CT operations. Aircraft can provide logistics support through resupply and provision of CT ground forces in the field. Fighter aircraft and bombers can provide overhead or on-call fire support to CT hostage rescue attempts or equipment recovery missions. They can also conduct diversionary operations to focus attention away from the area CT forces are conducting or planning to conduct a mission.

To aid planners, a matrix is provided below to graphically illustrate when traditional air forces roles are normally employed in CT situations. The timeline extends from the entire pre- to post-terrorist attackperiod.

## 3 AF TARGETING A TERRORIST ORGANIZATION

The effective way to employ AF against any targeted complex system is associated to a better understanding of architecture of the system and the identification of its centers of gravity.

We believe that in this case can be used as a model for analysis of systems, the known "model of the five circles". Summary of the model results from the assessment that each system (state, military or criminal organization, business, or even a human being), and hence the terrorist structure, it is organized around the same way: "… There is a leader or leadership entity controlling the organization. There are certain system essentials required by the organization to function or exist, and these essentials are moved through a supporting infrastructure. The organization has a population enabling it to function, and it has fielded forces to defend it from attack." This hierarchical relationship can be plotted in a chart consisting of five concentric circles.

The five components- leadership, essential elements, infrastructure, population, fielded forces - are ranked and placed concentrically from the center to the periphery, with their constituent features and functional-actionable. In addition to the interdependence of entities represented by each circle diagram illustrates their relative importance to the central element - leadership.

The preliminary analysis of terrorist structures is based on the five circles model (Tab 1). All terrorist organizations have a governing entity, individual or group, but the way the concrete execution of leadership is diverse: from individual arrived spontaneously, often ad hoc, leading the group, the leaders confirmed over time, coming from the religious political or military, sometimes with important public positions, heterogeneous groups of empirical work, the fairs organized command structure. Of particular importance is the leadership within a state that sponsors international terrorism or coordinates.

As essential elements can be identified C2 systems to transmit the decisions and directives of their leaders, networks/systems financing and logistical and material, including weapons, non-lethal means, identification and travel documents, and information for planning and executing attacks. Special emphasis is placed on advertising and media involvement because without public attention the terror is insignificant ignored.

Infrastructure is needed to transport terrorists, weapons and ammunition, equipment and other means of terrorism, and in some cases even for the hostages. They use various ways, including public transport system, but in some cases preferred means of transport that provide security and concealing their actions.

Training camps are required for indoctrination and training of members in the use of specific procedures and tactics of terrorism and use of weapons and ammunition supplied. In addition, the shelters are needed to plan and prepare attacks, or simply to protect terrorists.

The circle designated for population contains the elements of support, domestic or foreign, which allow operation of a terrorist organization. Internally, the organization has instructors, weapons manufacturers, engineers, financiers, etc.

Externally, there are family members who do not participate actively in the group activities, but can provide basic needs (food and shelter) for the survival of terrorists. For groups motivated by religious ideals, their adherents, even if not active participants in terrorist activities can provide financial support, moral and ideological. Also, there is an element in the population to which we refer to as "anti-people". This item is not actively involved in supporting terrorist group, but also supports the objectives and goals, and tolerates the presence of terrorist and their action's methods.

The outer circle is the forces available to the terrorist organization formed in cells or units. From the perspective of combating terrorism, we think, given the number and dispersal, they are the least effective element and the most difficult employee. Except for the temporary prevention of terrorist operations, striking terror forces and media is often the most unproductive option if not provided by the capture or annihilation of an entire organization.

Tab. 1 International terrorist organization structures

| LEADERSHIP | SYSTEM ESSENTIALS | INFRASTRUCTURE | POPULATION | FIELDED FORCES |
|---|---|---|---|---|
| Terorist leaders<br><br>Overt political arm<br><br>Overt military/ paramilitary arm<br><br>Religious leaders<br><br>Media leaders<br><br>State Sponsor | Commands and control<br><br>Weapons development/ procurement<br><br>Financial network<br><br>Supply network<br><br>Documentation<br><br>Intelligence | Transportation network<br><br>Training camps<br><br>Safe areas/safe havens | Support<br>- Family<br>- Co-religionists<br>-"Anti-population"<br><br>Trainers<br><br>Engineers<br><br>Financiers | Terrorist cells/ units |

The model of five circles helps to understanding the functioning of terrorist organizations and, in this way, the identification and prioritization of objectives / targets to which they will operate. This is representing an important element in planning military CT operations.

## 4 CONCLUSIONS

Volatile nature of the complex and deeply subjective motivational factors, and action features grouped under the abstract concept of "terrorism" has led many to conclude that this concept can not give a satisfactory definition, but the phenomenon exists and must be fought with military means.

AF reflects the use of innovative technologies, efficient in CT operations.

Current conflicts have taken on new features by becoming unusual physiognomy, where laws and principles of war/conflict are no longer found at all. Therefore it's necessary an appropriate approach, consistent with current conceptual and technical resources but also political, strategic and existing security.

Missions and mode of action of the AF is reviewing and determine, as a consequence, conceptual changes, organizational and technical. Thus, given the fact that terrorists often locate their headquarters or offices in areas heavily populated inside homes, schools, hospitals or religious buildings or cultural significance, it is necessary to improve the means of striking air strikes in order to increase accuracy and effects. Also, the need for secret missions and the increased danger of terrorists who are present in areas determined using UAS.

There is however an effective response to terrorism - a strategy of integrating all instruments of power to combat terrorists and their sponsors.

As a component of military power, the AF already contributes to this goal by providing global mobility of counterterrorist forces, air superiority to protect their actions, and precision attack against the terrorist infrastructure. AF provides critical information to stop, prevent or respond to terrorist attacks and psychological operations can support counterterrorist operations and can influence the will to eroding popular support. Developing means to enhance the effectiveness of air operations, planners of CT operations will provide options for decision making in the fight against terrorism.

However, because of many of the most fanatical terrorists, military force will not change unfortunately their commitment to the organization and cause. As counterterrorism measures aimed at stopping a terrorist attack, military action can prevent temporary or delay a terrorist action, or it may be terrorists to seek easier targets to tackle or find a more effective weapon category. Military force may also cause future attacks with retaliation or revenge character.

Ultimately, if a state sponsor of terrorist activity triggers a form of war against another state, the effective use of military power tools can lead to a cessation of its activities. If this action continues to escalate to war, he will remain below the level of terrorist violence that requires a counter-response. An effective employment of the AF will help to lower the threat of terrorism.

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# KEY PRIORITIES FOR PUBLIC POLICY FOR THE ENVIRONMENTAL SECURITY IN THE ARMED FORCES OF UKRAINE

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**Abstract:** The main priorities of state policy of the Armed Forces of Ukraine in the field of environmental protection. Established that the environmental safety of Ukraine is not possible without the improvements of the organizational, legal, socio-political and economic mechanisms for environmental management, which should be based on modern methods of information and industrial technologies. It is shown that great attention should be given to training in the field of environmental safety for the stabilization of the ecological situation in Ukraine.

**Keywords:** Ecology, environmental security, the Armed Forces of Ukraine, the peacekeeping mission, environmental education.

## 1 INTRODUCTION

Currently, Ukraine attaches great importance to environmental safety of the country. In accordance with the Law of Ukraine "About Environmental Protection" The following requirements apply to the factors affecting the environment: a) environmental requirements for disposition, design, construction, reconstruction, enactment and operation of enterprises, installations and other facilities (Article 51); b) to protect the environment by using pesticides, fertilizers, petroleum and petroleum products, toxic chemicals or other substances (Article 52), c) to protect the environment from uncontrolled and harmful biological effects (Article 53); d) to protect the environment from the acoustic, electromagnetic, ionizing, and other harmful effects of physical factors and of radioactive pollution (Article 54), e) protect the environment from pollution by waste (Article 55); e) the environmental safety requirements on vehicles (Article 56); g) the requirements of ecological safety in the research, implementation of discoveries, inventions, using new equipment, imported equipment, technology and systems (Article 57); h) the environmental safety requirements for military, defense facilities and military activities (Article 58); i) environmental requirements for the placement and development of human settlements (Article 59) [1].

## 2 KEY PRIORITIES FOR PUBLIC POLICY FOR THE ENVIRONMENTAL SAFETY OF UKRAINE

Environmental protection, primarily provides protection from the negative impact of anthropogenic and natural factors and should ensure its security and livelihoods. Therefore, the main goal of environmental security is to protect the entire natural environment of the country.

However, due to lack of financial resources, development of legislative management system. to do it is quite difficult.

Therefore, the decision of the Verkhovna Rada of Ukraine on March 5, 1998 № 188/98-VR "The Principles of State Policy of Ukraine for the Environment, Natural Resource and Environmental Safety" identified priority areas for environmental safety, that must be resolved in the near future. Namely:

1. Environmental security in the energy and the nuclear industry;
2. Ensuring environmental safety during the handling of radioactive waste;
3. Develop a set of technologies, methodologies and technical tools to assess environmental safety of cars in their operation;
4. Achieving environmental safety in the handling of waste;
5. Achieving a stable and secure environmental safety of military activity and the conversion of military-industrial complex;
6. Development of scientific and methodological bases of regulation and planning of technogenic and ecological safety within a unified state system of prevention of accidents, disasters and emergencies;
7. Development of environmental requirements for rational use, protection and recovery of mineral resources in the new economic conditions;
8. Identify priorities for research in the use of natural resources, environmental protection, environmental security.

For the development of priority sectors one must attract the experts on environmental safety, scientists and specialists of scientific schools, scientists of the European Union, public and private organizations, administrations, etc. At the present stage of political and social development of Ukraine the following should be done:

- reorganize the relevant government bodies to improve the legal and economic system of ecological security;
- ensure the interaction of public authorities, local government and business entities to ensure environmental safety;

- improve the legislative and regulatory framework with respect to the conservation and restoration of natural resources and environmental security;
- improve the system of ecological monitoring of the implementation of environmental legislation;
- develop and implement financial and economic mechanisms to ensure environmental programs;
- develop and implement a system of environmental insurance, environmental monitoring and environmental audits;
- develop and implement a system of regional standards for the evaluation of boundary-acceptable change of environment [2,3].

## 3 POLICY OF ARMED FORCES OF UKRAINE IN THE FIELD OF ENVIRONMENTAL SAFETY DURING THE INTERNATIONAL MILITARY OPERATIONS OF THE PEACEKEEPING CONTINGENT

Ukrainian armed forces are actively participating in international projects on environmental protection during peacekeeping operations. Participation in these projects is of great importance for Ukraine and the countries which it collaborates with. Such international cooperation is carried out within the framework of the Partnership for Peace program and is accompanied by international conventions and treaties [3-5]. Done much work on information exchange, training in the environmental safety of the armed forces, the organization of environmental monitoring and restoration of the environment on military installations Also of great importance is given to improving the regulatory framework and research support.

The policy of the Armed Forces of Ukraine in the field of environmental protection while participating in peacekeeping missions aimed at adhering to the relevant provisions of environmental legislation of Ukraine in the framework of the local environmental legislation [4,5].

Environmental objectives and activities of the Armed Forces are designed specifically for each international transaction and subject to the following regulations:

- existing national and international environmental laws and legal documents;
- ukrainian environmental and legislative acts in this area;
- regulations, standards and guidelines on environmental safety, developed by organizations and countries who led the mission during peacekeeping operations.

In accordance with local conditions, developed programs to protect the environment of the local area of hostilities. These programs include the following provisions:

- the organization of environmental protection activities of the military contingent in the locality;
- responsibility, competence and environmental monitoring of the environment in the area of deployment of military unit;
- environmental education for specific conditions;
- existing environmental laws and regulations;
- specific rules and regulations when using the fuel, waste, residues of heavy metals near shooting ranges;
- instructions in case of environmental emergencies;
- instructions on closing military base since the end of the peacekeeping situation; instructions on sampling, decontamination areas, cleaning and processing of liquid and solid wastes.

Commanders and military experts, environmentalists, members of the peacekeeping mission is responsible for environmental protection and ecological safety of a particular locality. Provide training and monitor compliance with environmental regulations. Therefore, for environmental safety in a particular region forces comply with international standards of NATO, namely the policy framework and adhere to the doctrine of NATO in the field of environmental protection, planning, environmental protection during special operations, system of training of troops for the protection of the environment during peacekeeping missions. At the same time to environmental management is a system of measures, approved by the officers and brought to the personnel as approved conservation plan [3,4].

It should be noted [3] that Ukraine receives the necessary assistance in the field of environmental protection at military installations from the government and the armed forces of nations such as USA, Canada, Sweden and Denmark. Problems of ecological safety is extremely relevant to most developed countries, as they are relevant for Ukraine. Therefore, in this context, the Ukrainian government pays great attention to solving the environmental problems facing the Armed Forces during that period It should be noted that the solution to these challenges will require not only a great human cost, but also financial, material, technical and scientific effort that at the present stage of development of Ukraine it cannot afford.

Ecological safety of Ukraine is impossible without improvement of the organizational, legal, socio-political and economic mechanisms for environmental management, which should be based on modern methods of information and industrial

technologies. The main priorities of the international system of ecological security are:

- prevention of technological and environmental disasters;
- cooperation in the field of information and environmental security;
- the policy of providing technical and environmental assistance to States in need in the framework of collective environmental security;
- assessment of real environmental threats and damages after the environmental and technological emergencies and disasters;
- development of programs of environmental protection of the civilian population.

Currently, the priority problems of organization of ecological safety in the Armed Forces of Ukraine are:

- organization of environmental monitoring system in the Armed Forces of Ukraine;
- improvement of methodical and regulatory framework;
- carrying out environmental certification of military units, as well as environmentally hazardous sites;
- provision of modern equipment, new technology and software;
- disposal of radioactive waste, ammunition, weapons, military equipment and property;
- improvement of sanitation facilities;
- assessment of the ecological state of the closed silo launchers;
- creation of control points monitoring devices exhaust gases of military equipment;
- training of specialists in the field of environmental security [6,7].

Ukraine's entry into the international community provides the solution of socio-economic problems, namely the solution of environmental problems in market conditions. Ukraine should learn from the experience and recommendations of the European powers, if possible, to receive specific financial, technical and advisory assistance for the improvement of environmental safety.

## 4 KEY PRIORITIES FOR ENVIRONMENTAL EDUCATION IN THE ARMED FORCES OF UKRAINE

Commander of the Armed Forces of Ukraine is responsible for the environmentally safe operation of the troops. Specialists have been trained in this field should help in solving the problems of environmental security. To experts and officers, coordinating sphere of ecology could effectively follow the policy goals of the Armed Forces of Ukraine in the field of environmental protection and maintain a high level of knowledge in the field of environmental law, they need to give an opportunity for professional development.

Chiefs of ecological security of military units must develop annual plans on the issues of training and educating personnel on the environmental safety and provides for the study of the subject "Environmental security of armed forces", adoption of practical and methodological lessons with the officers and warrant officers with respect to preventing contamination of territories of military units, the expansion of the visible environmental campaigning, awareness-raising educational work on forming in troops and their families, respect for nature [3,6,].

In order to improve environmental education at all levels of military and civilian personnel should receive basic training in the field of environmental protection. In addition, employees who hold relevant positions require special training, which is necessary for the successful execution of their duties.

The purpose of training - awareness of the influence of military activities on the environment and acquire knowledge on how to reduce and prevent this effect.

In the training content includes the following sections.

1. Causes of environmental problems and principles of application methods to remedy them.
2. The policy of the Armed Forces of Ukraine in the field of environmental protection.
3. Local objectives and means to improve the state of the environment.
4. Environmental standards for emissions of hazardous substances and wastes.
5. The influence of the military units on the environment.

Ecological knowledge in the initial stage of military training aimed at understanding the basic causes of environmental problems, policies of the Armed Forces of Ukraine in the field of environmental protection and environmental standards developed by the military unit, where one serves. Learning content consists of the following sections: 1) the causes of environmental problems and methods for their removal, 2) the policy of the Armed Forces of Ukraine in the field of environmental protection, and 3) methods of improving the environment; 4) environmental regulations on emissions of harmful substances; 5) the influence of his military unit on ecology.

With the passage of a special environmental training the learning process includes the impact of its own military activities on the environment and to minimize this effect. The training program is carried

out in accordance with a training package that will be issued at the central level . Environmental education should be organized by military unit commander, in which soldiers are serving.

Environmental education in military educational institutions is an integral part of various levels of training officers and environmental policy must meet the educational goals of each institution. Training includes an initial training program to prepare future military officers and enlisted man, tactical and training programs for staff officers [3,7].

The initial training program to train future officers and NCO include:

- awareness of environmental issues and principles for their elimination;
- understanding the basics of effective environmental management;
- an opportunity to provide basic training on the ecology of troops in the initial stage of military training;
- understanding the need for respect for the environment during the planning and conduct of large-scale military exercises.

Tactical program includes:

- understanding the procedures for granting permits and the accompanying conditions, programs, inspect and report on the state of the environment;
- awareness of the principles of management of military activities with respect to the environment;
- acquaintance with the principles of organization of environmental activities at the local level;
- familiarity with the terms of the inspection in the Armed Forces of Ukraine;
- possibility to implement the principles of respect for nature in planning and conducting large-scale military exercises.

The training program for staff officers includes:

- knowledge of environmental legislation;
- awareness of the environmental activities of the Armed Forces of Ukraine;
- awareness of the environmental activities of the armed forces of other countries;
- awareness of environmental education in the Armed Forces of Ukraine;
- knowledge of the requirements for environmental management;
- possibility to implement the principles of respect for nature in planning and conducting large-scale military exercises.

It should be noted that environmental education is carried out by the commanders of military units and training centers. First of all, the course covers topics that include information on the procedure for obtaining permits and the responsibility of commanders of military units within the system of environmental management. Commanders have special responsibilities in the management of daily activities and need to be aware of their responsibilities under environmental legislation. They also need to know about procedures for obtaining permits, conditions, programs, inspection and reporting on environmental performance and results. Able to manage and implement environmental management in the life activities of careful attitude to nature [3,8].

Great importance for increasing the level of environmental training is informative personnel (staff). All staff should receive information regarding changes in environmental legislation, promotion of environmental protection, discovery and introduction of environment, which affect the activities of military units.

Information should be provided during the briefings for commanders of military units during the international conferences and seminars regarding the results achieved, new rules and improvements, new scientific developments and implementations, that relate to environmental performance of the state These activities are carried out under its own control the daily operations of environmental measures [3,5,8].

## 5 CONCLUSION

Ukraine's entry into the international community provides the solution of socio-economic problems, namely the solution of environmental problems in market conditions. Ukraine should learn from the experience and recommendations of the European powers, if possible, to receive specific financial, technical and advisory assistance for the improvement of environmental safety.

Respect for the natural environment should be an integral part of peacekeeping missions, which is one of the most important conditions for solving problems of national security.

In conclusion, we note the following.

1. The environment security, primarily provides protection of a man from the negative impact of anthropogenic and natural factors and should ensure its security and livelihoods.
2. The main goal of environmental security is to protect the entire natural environment of the country.
3. For the development of priority sectors to attract the experts on environmental safety, scientists and specialists of scientific schools, scientists of the European Union, public and private organizations.

4. Reorganize the relevant government bodies to improve the legal and economic system of ecological security, and improve the legislative and regulatory framework with respect to the conservation and restoration of natural resources and environmental safety.
5. Improve the system of ecological monitoring of the implementation of environmental legislation, design and implement economic instruments of financial support of environmental programs, to develop and implement a system of environmental insurance, environmental monitoring and environmental audits.
6. The primary problems of organization of ecological safety in the Armed Forces of Ukraine is to organize the environmental monitoring system in the Armed Forces of Ukraine, improvement of methodological and legal framework, conducting environmental certification of military units, as well as environmentally hazardous sites.
7. In order to improve environmental education at all levels, the military and civilian personnel should receive basic training in the field of environmental protection.

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[6] *Law of Ukraine "On environmental protection"*. Resolution of the Verkhovna Rada of Ukraine of 06.25.1991, № 1264-IV.
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# ON CHINA'S INTERNATIONAL AND REGIONAL STATUS

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**Abstract:** In International Relations' area, states have different statuses depending on their economic, military, diplomatic, political and cultural power. Nowadays, emergent states, inclusively China, claim a new international status as a consequence of the changes which have taken place during the last decades in their economic, military and political development. A high international status implies assuming multiple responsibilities in all the areas on regional and international levels. As it has become the second world economic power in 2010, China considers that its regional and international status has to be acknowledged as a great power.

**Keywords:** Power criteria; impact; International Relations; economic power; military power; international status.

## 1 PRELIMINARY CONSIDERATIONS

International relations' dynamics, which are preponderantly antagonistic, determine states to permanently change their foreign politics, to adapt it to the regional and international political environment conditions. All the state actors tend to promote and defend their interests using their power or the advantages of being included in a political-military alliance (NATO, for instance) or in other type organizations (the EU, for example). In other words, the power of a state or non-state actor which activates within the international relations' field reflects its status.

In our opinion, states may have: a) a very high international status which corresponds to their recognition as super-powers; b) a high status, which corresponds to their recognition as great powers; c) a common status, when they don't have a significant power. State's status level directly influences the way in which its national interests are achieved.

Power emerges as an integrator concept which is realized on a range of well-known dimensions: economic power, political power, military power etc. In fact, states adapt their behavior, by the instrumental components of their national interest, in order to integrate, to maintain or to strengthen their position within the international system. Additionally, as they are subjected to the pressures of interdependence, of centralization and de-centralization, of the competition with the other actors of the international system, states adapt their behavior in order to achieve their interests which, presently, aren't limited anymore to maintaining security and order, and encompass a wider variety of problems, many of them having an economical nature. The value and functional matrix of this system implies the enlargement of state reason (raison d'état) in order to encompass other states' reasons, each participant having to recognize the limits imposed by the system to their behavior[1].

Bearing in mind that, in international relations, any economic decision has a political dimension and economy represents, as it is well known, an ascendant dimension of national interest, it isn't likely for the global market to overcome its fundamentally economical status and to become a form of organization of the political community.

Nowadays, the balance of power at international level has overcome the unipolarity which characterized the world order after the '90s by the emergence, on the world political chessboard, of new state and non-state actors which tend to become great regional or international powers. Among these, there is also China which, during the last years, has known profound transformations at all the levels but, especially, at the economic one due to its continuous and strong growth.

## 2 SOME OBSTACLES OF CHINA'S ASSERTION AS A GLOBAL POWER

Although there is a tendency to look upon China as a great power considering its economic growth and resources, when analyzing its place on the world stage one shall also take into consideration a range of obstacles.

China has an important economic, military and political potential, but it isn't enough to be considered a great power[2]. According to the quoted source, among the obstacles which China has to face in its efforts to become a great regional and global power, there are also the following:

- Resources and economic growth. China has important human resources – more than 1,300,000,000 people, which equals to an abundant work force and a gigantic market. It also has considerable natural resources which represent an advantage for its economy. Nonetheless, the latter are not enough for supporting the ampleness and the rhythm of its economic evolution.

[1] VINCENT, J.: Real politik and World Community, 1982, p. 77. In Iver B. Neumann and Ole Weaver, *The future of international relations*, p. 54.

[2] *La Chine : Superpuissance stratégiques du 3ème millénaire*? Available at: http://luciomontemayor.centerblog.net/6315 467-les-puissances-militaires, pp. 2-4.

- Military capacities. China has one of the most significant military potential from Eastern Asia, especially in regard to the number of its manpower. But, it hasn't capacity of force projection.

- Politics and diplomatic openness. As a permanent member in the UN Security Council, China has the veto right and is able to assert itself on the international political scene. Except its diplomatic and demographic importance, China's potential regarding its natural resources is immense but still below the US if the population number is considered. Thus, every reason to consider China a great power has its reverse.

On the external level, China is facing a range of strategic difficulties such as:

- The rivalries with its neighbors. Since 1998, China seems to have begun a regional politics of re-conquering some territories. This attitude isn't looked askance at by its neighbors who refuse any Chinese hegemony. Such tensions occurred in the relations with India, Bhutan, Vietnam, Taiwan, North Korea.

- Economic obstacles. Although China has high economic growth rates, it still has difficulties in asserting itself in front of the "tigers" from the neighborhood due to its limits and obstacles encountered.

At the same time, China also has some strategic and military limits, among which we shall mention the following: the insufficient quantity of the conventional means to deliver nuclear warheads to the target; on strategic level, China doesn't have a projection force comparable with the US one; the freedom of action of its naval forces is also narrow.

As a consequence, due to its strategic and military limits, due to the economic obstacles and to its neighbors' lack of trust, China doesn't have yet the possibility to compete with the US at a global level as far as their international status is concerned.

Nonetheless, China's development is very complex. It has been in expansion both in the social and economic areas. China is developing its economy and its social organization and is approaching the global average although it keeps its status as a developing country. Until the '80s, China had developed pursuing the communist model, then it has transcended slowly and progressively towards the capitalist model.

Additionally, one shall also take into account the fact that, presently, China is a state changing at an amazing speed with a high influence on the whole world. Thus, it is worth noting the fact that the events in China are not relevant only for the Chinese but also for all the people in the world. Evolutions taking place within the Chinese society – as instance, the parity Yuan-Dollar or the Yuan-Euro one or the decrease of the unemployment rate – affect directly world's economic relations and the examples from the economic, political or cultural field may turn out to be numerous.

Plus, the unusually rapid change of China may be seen not only in the macro-economic indicators (which are, thanks to the international statistic, at everybody's disposal), but also empirically by just observing the Chinese cities and provinces[3]. For example, at Beijing, the architectural diversity is already overwhelming. It is already known the fact that, in Europe, Berlin benefited by an urban reconstruction on the basis of international support and according to a new philosophy (oriented to the individual and democratic agreement) and, consequently, it offers today the most interesting modern architectural landscape on the European continent. Due to its diversity and innovative character, Beijing follows the same way on an incomparably greater area (we shall not omit the fact that in China's capital are living approximately 20 million people).

## 3 CHINA – WORLD ECONOMIC POWER

China has outrun the United States of America, in 2010, asserting itself as the greatest world economy, considering the purchase power, accordingly to Peterson Institute for International Economy in Washington[4]. In accordance with the quoted source, in 2009, the Chinese economy was evaluated at 14.8 trillion dollars and the US one at 14.8 trillion dollars when the life costs are taken into account. Within the last ten years, China's economy has grown with an average rate of 10.3% every year, six times faster than the US economy. Nevertheless, China's GDP/inhabitant which reflects the quality of life has grown from 7,518$ to 11,047$, accordingly to the assessment of the International Monetary Fund, and, in the US, the GDP/inhabitant is 4.3 times higher as compared with China. In table no. 1, there are presented the main indicators of China's economic development[5].

[3] *China ca mare putere (I).* Available at:, http://www.ziuadecj.ro/ editorial/china-ca-mare-putere-i--3600.html.

[4] *China a devenit cea mai mare economie mondiala, după puterea de cumpărare.* Available at: http://www.ziare.com/ economie/ crestere-economica/china-a-devenit-cea-mai-mare-economie-mondiala-dupa-puterea-de-cumparare-1068705.

[5] *China – 2011. Available at:* http://www.theodora. com/wfbcurre nt/china/.

Tab. 1 The main indicators of China's economic growth

| Indicators | Value |
|---|---|
| GDP | 5,745 billion $ (2009) |
| GDP growth | 10.3% (2010) |
| GDP/inhabitant | 7,400$ (2010) |
| Inflation | 5% (2010) |
| Active population | 819.5 billion (2010) |
| Unemployment rate | 4% |
| Export | 1,506 billion $ (2010) |
| Import | 1,307 billion $ |
| The main clients | US (14%), Hong Kong (15.1%), Japan (8.4%), South Korea (4.6%), Germany (4%) |
| The main providers | Japan (14%), South Korea (10.9%), Taiwan (10.5%), US (7.3%), Germany (4.7%) (2007) |
| Public debt | 17.5% from the GDP (2010) |
| Foreign debt | 406.6 billion $ (December 2010) |
| Public expenses | 634.6 billion $ (2007) |
| Trade glut | 2,400 billion $ (end of 2009) |

These data confirm the fact that China has taken firmly on the economic growth, discharged of a range of previous political and ideological restrictions. By this significant growth, China becomes a great regional power and asserts itself as one of the future global powers which will play an important role in the economic area, influencing considerably the global and globalized economy.

## 4 CHINA – A RELEVANT MILITARY POWER

China is permanently, systematically and relatively transparently preoccupied by the "building" of modern national armed forces similar in almost all the aspects to the Western ones. In this regard, the Chinese government took actions and continues to take actions especially in national security and defence in the following directions:

- ***The relatively constant growth of the defence budget***. China's military budget has constantly progressed for several years. Within the last four years, it doubled and grew from 25 to 57 billion dollars[6]. The budget for 2006, which reached 35 billion dollars, corresponded to a fifteenth of the US military budget and to 1.36 % of China's GDP[7]. In 2007, in the view of modernization, the government grew the budget to 1.78% in order to reach 45 billion dollars[8]. At those times, it was the second world military budget, 600 billion dollars less than the US military budget[9]. In 2010, China's military budget was almost 57 billion euros, meaning half of the defence expenses in 2009[10]. The analysis of the military budget growths reveals the fact that they are assigned as follows: military equipment, expenses on the formation and re-valorization of military pays. Because People's Liberation Army is behind the Western armed forces, it is necessary to improve the level of militaries' training and to buy high-technology equipments. Then, in 2006, as a consequence of the mentioned plan which provided the equipment of the Chinese armed forces with its own new generation high technology weapons, it was natural for its budget to grown in the following years. This growth constituted a source of anxiety for the US as far as the regional military balances are concerned[11]. China's official military budget will reach, in 2011, 90 billion $[12]. As a comparison, accordingly to the quoted source, US military budget is six times higher than the Chinese one, being expected to reach 553 billion dollars in 2012. The growth of the military expenses for national defence derives from a triple necessity[13]: personnel costs, militaries' social protection, the reconstruction of the systems of weapons and the improvement of its mechanisms. As China decided the reduction of its armed forces' man power, it has to provide the costs necessary to the social inclusion of the dismissed, on the one hand, and for improving its troops' training, on the other hand.

- ***The doctrinaire reform***. Since the '90s, Chinese armed forces engaged into a doctrinaire reform which marked the progressive disappearance

[6] "*L'émergence pacifique" de la Chine dans le monde*, http://www.senat.fr/rap/r05-400/r05-400.html.

[7] TURBANSKA, A.: *L'état actuel de la puissance militaire chinoise.* Available at: http://perspective.usherbrooke.ca/bilan/servlet/BMAnalyse?codeAnalyse=750, p. 1.

[8] *Pékin augmente son budget militaire de près de 18% », RFI, 4 mars 2008*, http://www.rfi.fr/actufr/articles/099/article_63503.asp.

[9] *Le budget militaire chinois en question », Radio 86, 27 mars 2007*, http://www.radio86.fr/decouvrir-et-apprendre/geopo, apud Agata Turbanska, L'état actuel de la puissance militaire chinoise, http://perspective.usherbrooke.ca/bilan/servlet/BMAnalyse?codeAnalyse=750.

[10] *Hausse limitée du budget militaire chinois.* Available at: http://www.latribune.fr/actualites/economie/international/20100304trib000483877/hausse-limitee-du-budget-militaire-chinois.html.

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[13] *Chine - Un budget militaire qui gonfle à vue d'œil.* Available at : http://www.chine-informations.com/actualite/chine-un-budget-militaire-qui-gonfle-a-vue-il_3225.html.

of its mass armed forces. The objectives of this process were the diminution of the man power armed forces' professionalization and investments in high technological weaponry. Nowadays, China has begun producing modern weapons and has the most developed industrial-military complex. Within this area, China collaborates with Russia, Ukraine, France and Israel and realized armament programs with Pakistan. Chinese armed forces aren't anymore an immense mass of static defenders of the empire's territory, but a modern force capable of striking remote targets. For this purpose, Beijing undertakes a series of activities on the following dimensions: equipping its armed forces with last generation weapons in order to catch up with the technological level of the Western countries; improving the military logistics (transportation, communications, command); improving armed forces' personnel's training in accordance with the equipment with high technological combat means. In 2009, 14.9 % of the military budget growth was calculated for the improvement of Chinese soldiers' life conditions[14], for space militarization (cyber-war, anti-satellite weapons), for the change of national military strategy. Moreover, there are also taken actions in the following directions: the organizational modernization of the armed forces; the reform of the Chinese armed forces' budgeting system in order to make the arming program more coherent and continuous; Western standards in fight technique which will be included in Chinese armed forces' equipment.

- ***China's aspiration to become a world power on all levels***. In spite of being an economic giant, China will not be for long behind its American competitor from the military point of view[15]. Indeed, US military power continues to be a major argument of its world supremacy and China's capacity to entangle it emerges from the assertion of its own power. But, China seems to have opted for a strategy of avoiding a military conflict with the US, concomitantly with the modernization of its armed forces.

- ***China develops its capacities for asymmetric war***. This would permit China, in case of a conflict with the US, to counter the American armed forces superiorly equipped, by exploiting their vulnerabilities, especially, their dependency on communication systems. Among the targeted devices, there are the blinding lasers, anti-satellite missiles, electro-magnetic weapons and attacks on the information networks. Their reason to be consists in neutralizing the adversary's communication in a crucial moment, making it incapable to act and allowing inferior technological armed forces to re-establish the equilibrium. The voluntary destruction, on 11th of January 2007, by China of one of its worn-off weather satellites with a ballistic missile seemed to be a warning[16]. At the same time, military and civil information networks represent other vectors of asymmetric warfare and of the future battle field which will be taken into account by China. It doesn't conceal its ambition in the area of cyber-war and created a specialized structure in this purpose, a structure that can be also found within the American armed forces. Finally, in the area of economic and information war, the information pirates and the financial speculators integrate as key actors in the future warfare. China is interested in this type of weapons not only from a tactical point of view, but also as a deterrence factor at a strategic level. Such weapons regard the possible adversaries' financial systems and armed forces.

- ***The increasingly large involvement in foreign mission under UN mandate***. Nowadays, China overruns France, an important contributor to UN peace missions. Since 2009, it has participated at fight operations against the piracy in Aden Gulf[17]. China is the first trade power, the first oil and raw material importer, having interests in all the continents. China is likely to become a great military power, capable of intervening beyond its borders and of influencing significantly the global strategic balances.

- ***Defining perspicuously the objectives to be reached in the military area.*** China modernizes and develops its armed forces in order to reach some objectives. The first one consists in deterring the other powers to attack it. The second one is to form sufficiently strong armed forces so as to be able to intervene in the neighbor countries as the need arises. The third objective is the necessity to be able to fight separatism and the fourth one is the fact that China aspires at having a stronger arsenal than the US. This is a strong instrument of pressure on America, especially in the issue of Taiwan, which has remained a source of tension. Additionally, the fact that China has entered the club of the space weapon possessors is appreciated as an inexorable

[14] Arnaud de La Grange, *Washington s'inquiète de la puissance militaire chinoise. Available at :* http://www.lefigaro.fr/internation al/2009/03/27/01003-20090327ARTFIG 00013-washington-s-inquiete-de-la-puissance-milita ire-chinoise-.php, p. 1.

[15] *La Chine face à la puissance militaire américaine, une réponse asymétrique.* Available at : http://www.infoguerre.fr/matrices-strategiques/la-chine-face-a-la-puissance-militaire-americaine-une-reponse-asymetrique/, p. 1.

[16] Ibidem.

[17] NIQUET, V.: *Chine: les ambitions de la puissance militaire.* Available at: http://www.alternatives-internationales.fr/chine--les-ambitions-de-la-puissance-militaire_fr_art_1067_52456.html.

step towards space militarization[18]. The US, various European countries and, probably, India and Japan already have the ability to make such tests at their turn. The Chinese space success occurs in the full North-Korean nuclear crisis and may suppor t the consideration according to which Japan should also develop its defence space technology.

China asserted that its military modernization program has only defensive purposes. However, one shall also take into account that the existence of a Chinese soft power will necessarily evolve, by an integrated development, towards a hard power, usually of a military nature[19]. A Pentagon Report of 2009 appreciated that the Chinese military could threaten the regional equilibrium[20]. Moreover, some analysts reckon that China is a potential military threat and its armed forces' modernization which is under process constitutes for the US a reason to worry[21]. According to the quoted source, it seems that China develops missiles capable of reaching numerous places in the world, inclusively beyond the Pacific Ocean's shores.

In our opinion, China is a great military power as it has great man power, high defence budgets, high technology fight means, preoccupations in developing anti-satellite weapons etc., but its status has to be acknowledged by the other military powers. Accordingly to a military powers' table, China is on the fourth place[22].

## 5 CONCLUSIONS

As a conclusion, even if the international scientific community hasn't reached to a consensus yet regarding China's status on the world scene, this state represents, in our opinion, a great regional power and has a clear potential to become a great world power considering the transformations taking place in the worlds order – the end of the unipolarity and the emergence of a multipolar world order, where China will play a significant role. Thus, China is an emergen global power which nobody can ignore when referring to the international politics, economics or security. Continuing its development and consolidating its soft power seem to be the main challenges for China.

China seems to be unaffected by the economic and financial crisis which shattered seriously the economies of the other world states. On the contrary, it has become the second world economic power in 2010 after Japan confirmed that it has lost its status after 42 years[23].

Because of its economic development, China has great financial resources to continue the process of economic growth and of conquering the world market. It is possible that soon China would accomplish its aspiration to become a significant regional and international actor, capable of assuming multiple and diverse roles, inclusively in security and world stability.

China is mostly surrounded by hostile states or US debtors. As China accedes to the first place in world economy, it will also have to become a significant military power in order to deter the US to contest this status[24], on the one hand, and to cope successfully with the security challenges, on the other.

For a few years, China's role on the international scene has grown. It becomes an increasingly important actor. Its central place in the world economy allowed China to reach this international status. At the same time, the modernization of its armed forces on all the dimensions – *human* (professionalization and reducing the man power), *equipment* (last generation armament), *organizational* – will allow China to aspire at the status of great military power.

Nevertheless, China is not and will be not recognized a great power just because of the high number of inhabitants (more than a billion people) or of its area or of its military power and technologies. Undoubtedly, all these matter. But China is and will be recognized as a great power also because of the culture which is promoted and which places it as a landmark of the current humanity history.

By its economic development at high and constant speed, China will trigger positive effects on its population, for its regional and international status, but not for world economic, for its neighbors and its economic partners. Its huge resource needs –

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[18] Ibidem, p. 2.

[19] LIEBERMANN*, A. : La Chine devient-elle vraiment une puissance militaire ?* Available at : http://les-yeux-du-monde.fr/2011/01/14/la-chine-devient-elle-vraiment-une-puissance-militaire/,p. 1.

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[24] *La Chine doit s'efforcer de devenir la première puissance militaire et économique mondiale.* Available at: http://www.chineinde.info/blog,la-chine-doit-s-efforcer-de-devenir-la-premiere-puissance-militaire-et-economique-mondiale,218274.html.

raw materials, energy and so on – as well as its currency reserve may trigger unwanted consequences for the global economy or if some states' national economy. Hence, in future, there may emerge tensions and even conflict with some state or non-state actors.

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[3] *China ca mare putere (I).* Available at: http://www.ziuadecj.ro/editorial/china-ca-mare-putere-i--3600.html.

[4] *China a devenit cea mai mare economie mondiala, după puterea de cumpărare.* Available at: http://www.ziare.com/economie/crestere-economica/china-a-devenit-cea-mai-mare-economie-mondiala-dupa-puterea-de-cumparare-1068705.

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# NATO IS SIXTY YEARS OLD

György SZTERNÁK

**Abstract:** In connection with the sixtieth anniversary of the foundation of NATO several remarkable articles and study papers have been published both by Hungarians and foreign experts. The objective of these works is to introduce the structure of the Alliance and its political and military activities in the past sixty years and the actions taken by NATO for strengthening European security. The present study paper is aimed at making an effort to present the political, economic, and military circumstances after the Second World War.

**Keywords:** Second World War, Truman Doctrine, Marshall Plan, Soviet Union, Berlin crisis.

On 8th May 1945 hundreds of thousands of people were marching in the streets to celebrate the victory over fascism and the thank God for their survival.

The victorious powers of the Second World War – the United States, Great Britain, France, and the Soviet Union – discussed the military and political issues related to the settlement of problems at conferences held during the war (Tehran, Moscow, Yalta, and Potsdam). However, the previous harmony broke up at the Potsdam Conference and conflicting interests arouse between the negotiating parties, which was further increased by the announcement of the United States about the successful American nuclear test on the second day of the Conference.

By the end of World War II the European economy had suffered tremendous losses. The productive capacities of the countries were destroyed by bombing raids and military operations and the losses suffered by the grownup population able to work were huge in nearly every country.

The circumstances in Europe, particularly in Germany are clearly described by Willy Brandt, depicting destruction: "bomb craters, hills of debris and rubbles, fields of ruins everywhere. One can hardly imagine there used to be houses here. Yes, in this no-man's land there were people living. Their life was a permanent struggle for a handful of potatoes, a piece of bread.[1]" In other words that time real threat for the future of the continent was posed by collapsed economies, poverty, and in some regions famine, further complicated by the problems of territories under military occupation and their unresolved political and legal status.

As Winston Churchill puts it: "the terrible destruction of Europe with all its past glory and the destruction of the huge parts of Asia blind our eyes.[2]"

After the Second World War the dream did not come true and the victory of the Allied Powers over fascism was not followed by an international system based on the cooperation and consensus between the Great Powers. Although in 1945 the United Nations Organisation (UN) was established with an objective to serve such an international system the ideas concerning different political, ideological and social structures laid the ground for the establishment of the bipolar world order. After the Second World War both the US and the Soviet Union intended to build some kind of a collective defence system on the basis of their own security ideas. According to analysts the main cause of Cold War confrontation was that western countries saw European security as a type of collective and cooperative structure, while the Soviet Union aimed at minimising potential threats of a war.

The simplest way to do so in the opinion of Soviet political and military leaders was to expand the influence of the Soviet Union over Europe and if possible over the entire world. Military power and gaining control over occupied territories comprised a fundamental prerequisite in Soviet military thinking. Stalin was convinced that the Red Army would be welcomed in Eastern Europe, liberated by the Soviet Union. Formally he accepted the democratic world order proclaimed on 12th August 1941, based on the Atlantic Charter, but in practice he did not abide by it. His relations towards western democracies remained suspicious and distrustful after the Second World War.[3] This distrust and suspicion can be the

[1] VALKI, L. (ed.): *A NATO* [NATO] Corvina Kiadó, Budapest 1999. p. 12.

[2] Winston S. Churchill: *A második világháború* [The Second World War] Volumes I-II. Európa Könyvkiadó Budapest 1999. p. 687.

[3] GADDIS, J. L.: *Most már tudjuk*. A hidegháború történetének újraértékelése. [We Now Know: Rethinking Cold War History] Európa Könyvkiadó, Budapest, 2001.
The Atlantic Charter: A Joint Statement by President Franklin D. Roosevelt and Prime Minister Winston Churchill on 12th August 1941.
The President of the United States of America and the Prime Minister, Mr. Churchill, representing His Majesty's Government in the United Kingdom, being met together, deem it right to make known certain common principles in the national policies of their respective countries on which they base their hopes for a better future for the world.

cause why the Soviet Union did not fully demobilise the Red Army and convert war production after the end of the war. Gaddis writes that the West was ideologically as opposed to the Soviet Union as it was opposed to the West. In his opinion the victors only destroyed fascism but not tyranny at the end of the war as that time nearly all of Europe was scared of Stalin's dictatorship. The image of capitalism did not change in the mind of the Soviet leader or of anyone in his environment as they declared war against the entire capitalist world and even negotiations with western powers were regarded as a type of struggling them. As soon as a few months after the war it was already clear that the western part of the continent would be based on the principles of voluntary principle and democracy while in the Soviet-occupied territories dictatorship and all its elements would be dominant. This ideological division determined the entire further development of Europe.

While the Soviet Union forced the introduction of Soviet-type plan economy based on single-party system the USA made political self-determination and the significance of economic relations the centrepiece of its great-power ambitions. In the American strives to superpower status imperial traditions and objectives did not play any role, the author claims. Nevertheless, the USA also wished to increase its influence in the post-war world and it had all the necessary tools for implementing the Wilson principles of self-determination, free market, and collective security. It must be acknowledged to this fact that the western countries, including the USA, significantly reduced the strength of their armed forces. Moreover, the western countries hoped that the Soviet Union remained their ally similarly to its wartime status. However, in just a few months after the war they became adversaries both in the political and military senses of the word. In the occupied territories the Soviet Union used all its means and forces to bring communist players and their parties to power, cut its relations to western countries, and blocked the occupied territories from the western world.

We wish to repeat: in spite of the complex political and military situation in Europe the real threat was posed by the damage, tremendous level of destruction, poverty, and the difficult economic situation of countries. At the same time the majority of European politicians recognised that there should be some deterring tool (organisation) in order to prevent another war in the continent. They also recognised that Stalin-led Soviet Union presented a threat to Western Europe both in political (ideological) and military sense.

In the book of professor Valki there is a reference to the fact that the European countries were unable to independently resolve the listed problems and needed the assistance of the USA in the original sense of the word. After a two-year-long post-war uncertainty a turning point came both in the western and the eastern parts of the continent. In the east the Soviet Union solidified its influence in the occupied territories. As a response to that the USA proclaimed the Truman Doctrine, the Marshall Plan, and declared the principle of the containment of the Soviet Union.

On the basis of the Truman Doctrine the USA intended to halt the further Soviet advance in the continent at any price.[4] In March 1947 President Truman said in the Congress: "the United States of America must pursue a policy which helps the free nations in their fight to be able to defend themselves against an armed minority and foreign pressure wishing to subjugate their country." – quoted by Professor Valki. On the basis of this doctrine the Soviet Union realised that the main objective of the USA is to prevent an expansion from the east and that America took over the historic role of Great Britain in the world.

In order to recover the European economy and re-launch production the USA proclaimed the Mashall Plan.[5] The plan is linked to American Secretary of State George C. Marshall and its official name was European Recovery Program. The Plan was proclaimed in June 1947 and it lasted until 1952. The program was funded by the USA, however, the participating nations had to make a joint plan for their economic cooperation. In his latest book, NATO in 1948, Lawrence Kaplan writes: the key of the American attitude to Western Europe rooted in the logic of Marshall Plan, that is first time in human history Western Europe had to demonstrate its capability of jointly acting and

[4] The Truman's Principle: the program of Harry S. Truman (1884–1972), the President of the United States, submitted to the Congress on 12th March 1947. The program requested urgent economic, financial, and military assistance for the governments of European countries – Greece and Turkey – threatened by external and internal Communist forces. The declaration and approval of the Truman's Principle indicated the increasing conflict between the previously allied United States and the Soviet Union, and actively contributed to the emergence of a divided world. http://www.zmne.hu/tanszekek/kvt/digitgy/20011/hadtud/ballo.html 2009-03-18

[5] The Marshall Plan was named for American Secretary of State George C. Marshall, its official name was European Recovery Program. The Plan was declared in June 1947 and lasted until 1952. The entire program cost USD 13.3 billion. http://www.playhold.hu/www.ckke.hu/index_1020402230.php 2009-03-18

responding in unity.[6] In other words, cooperation and joint planning comprised the most significant element of the Marshall Plan apart from the assistance to European countries. The Soviet Union and the countries liberated by the Red Army were separately mentioned in the document, what is more, Hungary was not only invited to the preparation meeting but it was requested to participate in the elaboration of the Plan itself.[7]

The principle of the containment of the Soviet Union, which comprised the basis of the Truman Doctrine, comes from George F. Kennan[8], who was the head of American embassy in Moscow. In his analysis nicknamed "Long Telegram" he outlined the real motivations of the Soviet politics and the possible American approach, that is "the neurotic aspect of the Kremlin to the world issues is based on the traditional and instinctive uncertainty of the Russians". Consequently, the Soviet Empire " is insensitive to the logic of reason and is very sensitive to the logic of force"[9]

The analysis by Kennan is nearly by word repered a previous opinion of Winston Churchill, related to the Soviet Union: the expansionism of the Soviet Union comprises a threat to the entire European continent and not just to its eastern part. The USA and its allies must pursue a policy which contains this policy without inducing another war.

A few months later on 5th March 1946 Winston Churchill delivered his Fulton speech translated into nearly all languages since that time. The phrase "Iron Curtain" is mentioned in this speech first time. It is my duty, however, to place before you certain facts about the present position in Europe. I am convinced that you do not want me not to present these facts the way I see them. From Stettin in the Baltic to Trieste in the Adriatic an iron curtain has descended across the Continent. Behind that line lie all the capitals of the ancient states of Central and Eastern Europe. Warsaw, Berlin, Prague, Vienna, Budapest, Belgrade, Bucharest and Sofia; all these famous cities and the populations around them lie inwhat I must call the Soviet sphere, and all are subject, in one form or another, not only to Soviet influence but to a very high and in some cases increasing measure of control from Moscow.[10]

The statements in the Fulton Speech was also justified by the Berlin crisis in 1948 when the Soviet Union and the political leaders of the German territories under Soviet occupation proclaimed that they would not allow the representatives of the other three victorious powers to enter the city then took Berlin under blockade in order to force the western allies to withdraw from West Berlin thus allowing the entire city to be taken under communist influence.

The western countries' response to the Soviet proclamation was an air bridge and the successful supply of the city was organised through an airlift between June 1948 and May 1949. The population of West Berlin was provided with food, fuel, and other goods of primary importance through this air-bridge. At the peak of the 324-day-long operation commanded by General Clay, some 13 thousand tons of goods were transported into the city daily involving the takeoff and landing of thousands of aircraft. The importance of the air-bridge and the supply of the city was articulated in the most precise way by General Clay, the commander of the

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[6] Lawrence S. KAPLAN, L. S.: *NATO 1948: The Birth of the Transatlantic Alliance*, Roman and Littlefield, New York, 2007.

[7] In his speech at Harvard University on 5th June 1947 American Secretary of State George Marshall declared that the United States is ready to take part in the implementation of the program aimed at assisting European countries destroyed during World War 2. „Our policy – Secretary of State Marshall said – is not aimed against any countries or doctrines but at starvation, poverty, despair, and chaos. Its objective is to foster the establishment of political and social circumstances which allow the existence of free institutions. I am convinced that assistance should not be provided case-by-case basis at the time of crises. The assistance from our government should foster the resolution of the situation and not just its easing. It would be neither correct no efficient from the Government of the USA – he continued – to elaborate a program for the economic rebuilding of Europe on its own. This is a job for the Europeans. I think the initiative should come from Europe. The task of our country is to provide a friendly assistance to the elaboration of the European program then to support the program to the necessary extent.*"*
Szűcs, László–Vida, István: A Marshall-terv és Magyarország. A Minisztertanács 1947. július 10-i ülése. [The Marshall Plan and Hungary. The meeting of the Council of Ministers on 10th July 1947.] http://www.tankonyvtar.hu/historia-1999-03/historia-1999-03-081013-7 2009-03-18

[8] KENNAN, G. F.: (1904-2005), a former Head of the Planning Department of the State Department outlined the principle of the containment of the Soviet Union in his *Long Telegram*, sent from Moscow in 1946 and in his famous article *The Sources of Soviet Conduct* published in July 1947.
Efstathios T. Fakiolas: Kennan's Long Telegram and NSC-68: a Comparative Theoretical Analysis. East European Quarterly, Vol. XXXI. Issue 4. January 1998. pp. 415–433.

[9] KENNAN, G. F.: Long Telegram. in: Dennis Merrill - Thomas G. Paterson: Major *Problems in American Foreign Relations.* Volume II: Since 1914. (5. Edition) Boston: Houghton Mifflin Company, 2000. pp. 210-212.

[10] CHURCHILL, W. S.: *A második világháború I-II kötet.* [The Second World War Vol. 1-2] Európa Könyvkiadó Budapest 1999. Volume 1 pp. 408-417.

American sector of Berlin: "If Berlin falls, Western Europe will be the next. If our intention is to defend Europe from communism we have to stay firm???."[11]

By the end of 1948 Eastern and Western Europe were divided by ideological and political front lines whose integrity was carefully guarded by both sides. Eastern Europe got under Soviet influence and was closed from the western half of the continent.

The events of the Berlin crisis had a serious influence on both the American and Western European political leadership and public. Western Europe was forced to realise that from military aspect it was weaker than the sovun and it was less organised than the Eastern European region in the field of ideology. The solution was seen in the establishing of the Western Union – later renamed Western European Union – by signing the Brussels Agreement by Great Britain, France, and the Benelux States in 1948. This step played an important role in the establishment of common defence. The significance of the USA in the Euro-Atlantic integration in shaping??? became clear also due to the events in 1948. Facing the seriousness of the consequences of the Berlin crisis the majority of hard-line isolationist senators turned into supporters of the organisation of a north Atlantic alliance. At the same time the majority of Western European states, scared by the Berlin blockade, turned to the USA for security guarantees. So this is clear that from the end of World War 2 to the establishment of the North Atlantic Alliance the former allied powers, America and the Western World and the sovun became enemies.

Both the March 1948 secret negotiations between the British and the Americans in the Pentagon and the direct??? preparatory negotiations were conducted in complete secrecy???. However, it should be mentioned here that Donald Maclean was a member of the British delegation, who was one of the friends and a member of the intelligence network of famous Soviet spymaster Kim Philby, and he escaped to the sovun after his activities were disclosed in 1951. That is why it may not be an accident??? that Polish daily paper Zycie Warszawy published an article on the North Atlantic Alliance and the related British-American plans as early as on 4th April 1948. All this indicates that the sovun received firsthand information and intelligence from the alliance in shaping??? and the negotiations. However, Moscow was unable to halt the process or have any influence on the events.[12] It was the Vandenberg Resolution No. 239 approved on 11th June 1948 that lifted??? the last obstacle to the establishment of NATO, stating that the direct participation of the USA in the military and political bloc is acceptable moreover it is necessary.[13]

Thus in 1949 the North Atlantic Treaty Organisation[14] could be established with the involvement of 12 countries on both sides of the Atlantic Ocean. Its primary objective was to prevent the expansion of Soviet influence to further countries in Europe similar to that in the Eastern European region;[15] to keep at bay the sovun aiming??? at world hegemony; and also to prevent the breaking??? out of a terrible third World War. It was also to ensure a future commitment of the USA towards the European security, to keep Germany on a leash??? in military aspects??? that is as the first Secretary General of NATO Lord Ismay said: to keep the Russians out, the Americans in, and the Germans down.

In other words the events of the Berlin crisis managed to convince the politicians of western countries about the necessity to have an alliance as the crisis was still on when the signing ceremony was conducted. After the treaty became legally

[11] The events began in March 1948, when Stalin declared the bolckade of Berlin, which also meant the termination of the settlement dividing the city into four (American, British, French, and Soviet) occupation zones.
VALKI, L. (Ed.): *A NATO [NATO] Corvina Kiadó*, Budapest 1999. pp. 15-16.

[12] Dérer, Miklós: A *NATO születése*. [The Birth of NATO] Available at: http://www.rubicon.hu/index.php?page=kincstar&id=10 2009-04-21
The Cambridge Five, or in some sources the Cambridge Four, is a name used for a Soviet spy network which operated in Great-Britain. Its members were the following persons: Kim Philby 1912–1988, codename: „Stanley"; Donald Duart Maclean 1913–1983, codename „Homer"; Guy Burgess 1911–1963, codename „Hicks" and Anthony Blunt 1907–1983, codename „Johnson." http://hu.wikipedia.org/wiki/Cambridge-i_%C3%96t%C3%B6k 2009-04-21

[13] Available at: http://www.nato.int/docu/basictxt/b480611a.htm, 23 April 2009.

[14] On 17th March 1948 the Brussels Treaty was concluded by the Benelux-countries, the United Kingdom, and France, with the joint defence against a Soviet aggression as its main objective. The Treaty also identified economic, social, and cultural cooperation, and the field of self defence. The signing parties of the Brussels Treaty soon began urging the establishment of the Euro-Atlantic military cooperation too.

[15] In December 1940 it was Trygve Lie, the Minister of Foreign Affairs of the Norwegian Government in exile, who first suggested the establishment of an Atlantic security alliance covering the entire North-Atlantic region. However, there was no legal ground for making the USA a member of a military alliance in peacetime, against its foreign policy traditions. This issue was resolved by the Vandenberg-resolution, through which the Republican majority of the Senate gave the Democrat Government full powers in launching the negotiations.

binding ??? it became clearthat the alliance was established to provide defence against the Soviet threat perceived as a direct and imminent dangerand to prevent a potential aggression. The signatory parties were aware of the fact that the public a few years after the sufferings caused by the war would not have tolerated any offensive agreement??? In any of the signatory states.

The close military and political cooperation between NATO partners was also of fundamental significance because it established equilibrium among western states moreover it served to territorial defence and through this national interests as it is doubtless that no Western European country would have been able to defend itself against the sovun and its Eastern European allies. After the establishment of the Alliance in 1949 NATO worked out its first strategic concept which can be regarded as the second most important document as it has the fundamental principles of further strategies. The 1950s were dominated by the strategic concept of "massive retaliation" emphasising a defence based on deterrence: in the case of an attack NATO would have been ready to deploy nuclear weapons. The development of the doctrine was based on the worries that the European powers would not have been able to prevent a Soviet aggression with the use of their conventional weapon systems therefore conventional weapons would not have been sufficient for defending the West. Therefore the potential deployment of nuclear forces was seen as the remedy for the imbalance between the two blocs. Fortunately no nuclear forces have been deployed ever since.

In conclusion one of the authors who will turn sixty this year seems reasonable to make two remarks having reread the original text of the treaty at the sixtieth anniversary.

Firstly, Article 2 of the Treaty reformulates and confirms the Marshall Plan: *"The Parties will contribute toward the further development of peaceful and friendly international relations by strengthening their free institutions, by bringing about a better understanding of the principles upon which these institutions are founded, and by promoting conditions of stability and well-being. They will seek to eliminate conflict in theirinternational economic policies and will encourage economic collaboration between any or all of them."* This Article was a very important factor in the economically collapsed Europe because it provided the population of the signatory states: the opportunity of an economic development.

Secondly, Article 10 of the Treaty proves that the Alliance did not intend to exclude any of the countries of the continent: *"The Parties may, by unanimous agreement, invite any other European State in a position to further the principles of this Treaty and to contribute to the security of the North Atlantic area to accede to this Treaty. Any State so invited may become a Party to the Treaty by depositing its instrument of accession with the Government of the United States of America. The Government of the United States of America will inform each of the Parties of the deposit of each such instrument of accession."* This basic principle has applied for sixty years because as many as sixteen states have already joined the founding member states. However, the question put??? by Rob de Wijk is still current???: "can an alliance be efficient in the field of deterrence and defence with member states neglecting each others' interests, having political or economic conflicts, or being suspicious to each other"[16] This is a crucial question NATO has to answer even after sixty years from its foundation.

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[16] Rob de WIJK: *A NATO az ezredforduló küszöbén*: Küzdelem a konszenzusért, [NATO at the Turn of the Millennium: Struggle for Consensus] Debrecen: Hajja, 1998, p. 15.

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