THE REVOLUTION IN MILITARY AFFAIRS AND SUSTAINABLE DEVELOPMENT

General Professor Teodor FRUNZETI, PhD [*]

Abstract: *Associating war with the idea of destruction made it to be considered completely incompatible with the concept of sustainable development. However, the military innovations (technologies, operational concepts, organizational adaptation) can be regarded as vectors not only of destruction, but also of evolution. This paper addresses the relationship between the concepts of Revolution in Military Affairs and sustainable development, the emphasis being placed on the content and dynamics in the contemporary period, marked by major changes in the socio-economic of changes that include the dramatic development of telecommunications, computers and technology.*

Keywords: *Revolution in Military Affairs, Technical and military revolution, development of military systems, operational and organizational innovations, sustainable development, security.*

The analysis of the phenomenon called Revolution in Military Affairs (RMA) must start from the premise that mankind is in a period of rapid economic and social changes including dramatic development of telecommunications, informatics, computers and biotechnology.

Given the fact that society transforms itself and a new civilization challenges the old one, the armed forces are compelled to make changes at every level simultaneously, from technology and culture to organization, strategy, tactics, doctrine, training and logistics. This is, in fact, the

[*] General Professor Teodor Frunzeti, PhD (tfrunzeti@unap.ro), member of the Academy of Romanian Scientists, Chairman of the Military Sciences Section, Commandant (Rector) of „Carol I" National Defence University.

definition of Revolution in Military Affairs[1] given by Alvin and Heidi Toffler in 1993 in their book: *War and Anti-war: survival at the dawn of the 21st century*.

1. Fundamentals of the current RMA

Along with the RMA we can bring into question the concept of *military revolution*. One can talk about a military revolution when the application of new technologies into a significant number of military systems is interwoven with innovative operational concepts and organizational adaptation, fundamentally altering the character and conduct of conflict and causing a dramatic increase in potential combat and effectiveness of the armed forces[2].

This definition is given in 1994 by Andrew Krepinevich, president of the Center for Strategic and Budgetary Assessment, one of the leading U.S. think-tanks. Krepinevich's definition leads to the idea that such a revolution can have profound consequences on the regional and global military balance. The past military revolutions, as the invention of gunpowder, induced changes in both the nature of military competition between states and the method of warfare. Thus the rules were modified, says the U.S. expert, leading in many cases to the devaluation of the former dominant elements of military power, the military organizations that have not adapted to changes in the competitive environment quickly went into decline. A year later, in 1995, Clifford Rogers proposed linking the theoretical framework of the military revolution with the theory of punctual equilibrium taken from biology, thus concluding that short episodes of rapid military innovation are followed by longer periods of relative stagnation[3].

The distinction between military revolution and the Revolution in Military Affairs is explained by the American historians MacGregor Knox and Williamson Murray, in 2001, in their book *The Dynamics of Military*

[1] Alvin şi Heidi TOFFLER, *War and Anti-War: Survival at the Dawn of the 21st Century*, Little Brown, Boston, 1993, p. 32.
[2] Andrew F. KREPINEVICH, „Cavalry to Computer: The Pattern of Military Revolutions", în *The National Interest*, 1994, pp. 30-42, URL: http://web.clas.ufl.edu/users/ zselden/Course%20 Readings/Krepinevitch.pdf.
[3] Clifford J. ROGERS, „The Military Revolutions in History and Historiography", în *The military Revolution Debate. Readings on the Military Transformation of Early Modern Europe*, C.J. ROGERS (coord.), Westview Press, Colorado, 1995, p. 6.

Revolution, 1300-2050: while the military revolution transforms society and states and also military institutions, the RMA is a complex mix of tactical, organizational, doctrinal and technological innovations, by means of which a new conceptual approach to the war or its specialized subdomain is implemented[4]. RMA is different from regular innovations in that it represents a giant leap in terms of military effectiveness. While conducting the RMA, military organizations face fundamental changes in the political, social and military landscape and are forced to innovate, adapt to or foresee revolutionary changes. RMA requires correlating the complex elements of social, political, organizational and technological changes with new conceptual approach to the war.

Even though the first RMA was identified in the 14th century, long after the invention of the bow [5], regarding the dynamics, five waves of RMA can be identified with starting point in the 70s and 80s, when the Soviet specialists initiated the development of this concept[6]. The first wave, called *the Soviet military technical revolution wave*, is based on the scientific work undertaken by Marshal Nikolai V. Ogarkov, Chief of Staff of the USSR, who assumes that advanced technologies such as high-precision guided munitions correlated with improved sensors, open the way for more destructive forms of conflict and diminish the role of nuclear weapons in the war of the future. In this approach, on the battlefield of the future, new weapon technologies and information systems could be used allowing for almost simultaneous engagement of the full range of target distance, accuracy, lethality and speed greater than hitherto. The Soviets predicted the dramatic redefinition of the linear concepts of war by an increased importance given to space systems, unmanned systems and automated detection and engagement integrated into a network of networks.[7]

---

[4] James CARAFANO, „The Evolution of Revolution", în *H-Diplo*, Humanities and Social Sciences Online, august 2002, URL: http://www.h-net.org/reviews/showrev.php?id=6627.

[5] Williamson MURRAY, „Thinking about Revolutions in Military Affairs", în *Joint Force Quarterly*, Summer 1997, URL: http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA354177.

[6] According to Steven METZ and James KIEVIT (*Strategy and the Revolution in Military Affairs: from Theory to Policy*, Strategic Studies Institute, USA, 1997), the RMA theory is based on the writings of the Soviet thinkers in the 70s and 80s, particularly those of Marshal Nikolai V. Ogarkov who analyzes the revolutionary potential of new military technologies using the phrase "military technical revolution".

[7] Michael RASKA, „The «Five Waves» of RMA Theory, Processes, and Debate" în *Pointer, Journal of Singapore Armed Forces*, vol. 36, nr. 3-4, 2011, pp. 1-11, URL: http://www.mindef.gov.sg/content/

In Romania's scientific life, even from the 60s, we have discussed about the impact of scientific and technological revolution on the military, various authors emphasizing the link between the development of military technology and the social and political development[8]. Also, those concepts appear in the doctrinal documents of the Romanian Army in the 70s. In this context is defined the notion of *revolution in military technology*, along with the military-technical revolution, as being those radical changes, qualitative in the technical combat equipment, in the troops' organizational structure, in the methods of conducting war and conducting combat actions characteristic to the armed forces of all countries[9].

The second wave of the RMA begins in the 90s, last for about five years and its major concepts are *military revolution* and the *revolution in military affairs*. Analyzing the Soviet concept of military technical revolution, the U.S. experts concluded that while technological change is necessary, it is not a sufficient factor to trigger a significant change in the military or to ensure military success, so they proposed the concept of RMA that implies the existence of four key factors: technological change, development of military systems, operational innovations and organizational innovations.[10] This wave is characterized by the need of defining the RMA and the role it plays throughout history. The same issues are raised in theoretical debates and during the third wave of the RMA, thought to be characterized by a strong enthusiasm vis-à-vis the emergence of new technologies. During the five years (1995-2000), new concepts were developed in the RMA theory, as the one proposed by Admiral William Owens – system of systems. In his view, the system is at the heart of RMA systems and is built on the basis of information gathered and joint elements

imindef/publications/pointer/journals/2011/v36n34/feature1/_jcr_content/imindefPars/0003/file.res/1.%2001-12%20Five%20Waves%20Of%20RMA%20Theory%20R4.pdf.

[8] See the collection of the "Problems of military art" magazine in the 70s and 80s, published under the auspices of the General Staff of the Ministry of National Defense.

[9] This definition was presented by Valter Roman in 1960 at the Scientific Session at the Polytechnic Institute in Bucharest in his paper with the title "The scientific-technical revolution and military technical revolution", published in the Bulletin of the Polytechnic Institute of Bucharest, tome XXII, fascicle 2, 1961 and resumed in the volume *Military phenomenon in the history of our society*, Military Publishing House, 1980, pp. 248-261.

[10] James BLAKER, *Understanding the Revolution in Military Affairs: A Guide to Amercia's 21st Century Defense*, Progressive Policy Institute, Washington DC, 1997, p. 5 apud Michael RASKA, *op. cit.*, 2011, p. 4.

and provides the integration of platforms and of existing components, especially the C4I (command, control, computers, communications and information) with the ISR (intelligence, surveillance and reconnaissance) in a coherent interoperable way, which, in fact, was achieved in the years that followed. In Owen's opinion, the armed forces, especially the American ones, should accelerate RMA by establishing new priorities regarding new priorities in the allocation of resources and the adoption of technological, organizational, structural and doctrinal changes[11].

In the fourth wave, between 2000 and 2005, discussions were focused on the feasibility, accessibility and timeliness of revolutions in military affairs. Moreover, the Bush administration applied the ideas and concepts related to RMA in formulating the policy on defence transformation – *Military Transformation: A Strategic Approach*[12]. The USA lead this RMA wave as they did with the other two. A more complex and comprehensive approach of RMA was shaped, supported by Donald Rumsfeld, the Secretary of Defence in 2002: „...a revolution in military affairs covers more than building new high-tech weapons, although this is certainly part of it. RMA refers to new ways of thinking and new ways of fighting"[13]. RMA and the transformation of the U.S. military were focused on two interrelated operational concepts – network centric warfare and effects-based operations – based on the idea of translating the information superiority and multi-mission capabilities at both strategic and operational levels.[14]

Finally, the fifth wave of the RMA is underway and, since 2005, the effectiveness of such an approach has been called into question. The main problem faced by the U.S. military was the realization of this vision in a credible and effective set of capabilities, strategies and organizations[15]. In fact, the transformation of defence was undermined by the changes and operational needs arising in conflicts in Afghanistan and Iraq that turned into long campaigns of counter-insurgency, where the U.S. military faced a

[11] Ibidem, p. 6.
[12] U.S. Department of Defense, *Military Transformation: A Strategic Approach*, SUA, 2003, URL: http://www.iwar.org.uk/rma/resources/transformation/military-transformation-a-strategic-approach.pdf.
[13] Ibidem, p. 9.
[14] Michael RASKA, *op. cit.*, 2011, p. 7.
[15] Richard BITZINGER, *Transforming the US Military: Implications for the Asia-Pacific*, Australian Strategic Policy Institute, 2006, p. 12, apud Michael RASKA, *op. cit.*, 2011, p. 8.

wide range of political and socio-economic hybrid challenges of a non-linear conflict for which it was not prepared[16].

In modern society, science and technology are dominant factors, but with possible antagonistic effects: science and technology both can lead to the evolution of humanity or its destruction. Furthermore, the distinction between military and non-military activities is becoming increasingly blurred: for example, in the USA and the UK, the military is considered to have large and disproportionate influences on science and technology[17].

A 2005 study of think-tank Scientists for Global Responsibility, on military involvement in science and technology, highlighted the important role that the military plays in commercial partnerships in the UK supported by the government. Furthermore, it is concluded that, in developed countries, the military supports the development of new technologies, such as nanotechnology, particularly in the U.S.[18]. The same study states that the current military thinking is based mostly on the idea of achieving security through military superiority and gives little importance to the comprehensive and multidimensional approach of security.

2. The characteristics of current RMA

Considering the context described above, the premise of the current RMA analysis is that the pace, quality and its impact on military organizations and defense management processes vary across different geographic regions and strategic cultures. In this context, there are at least three factors that accelerate RMA dissemination. Firstly, it is about regional rivalries and persistent state of insecurity induced by the development of complex types of conflicts and threats of the twenty-first century, that expanded the national defense requirements, particularly the operational ones. Second, the economic growth in Asia is another factor that increases the ability to purchase the latest weapons systems, and also the force modernization programs in these countries. The third main factor that

[16] Keith SHIMKO, *The Iraq Wars and America's Military Revolution*, Cambridge University Press, New York, 2010, p. 203, apud Michael RASKA, *op. cit.*, 2011, p. 8.
[17] Götz NEUNECK şi Christian ALWARDT, *The Revolution in Military Affairs, its Driving Forces, Elements and Complexity*, IFAR Working Paper no. 13, mai 2008, p.3.
[18] Chris LANGLEY, *Soldiers in the Laboratory. Military Involvement in Science and Technology – and Some Alternatives*, Scientist for Global Responsibility, Oxford, 2005, p. 9, URL: http://www.sgr.org.uk/ArmsControl/Soldiers_in_Lab_Report.pdf.

accelerates the distribution of RMA is the globalization, consolidation and competition of weapons markets and defense industries globally that need to diversify their business interests through export strategy and innovation.[19]

The RMA analysis is generally centered on the U.S., paying less attention to its impact on different strategic situations and the implications it has on military modernization in the small states and emerging powers. Currently, there is, especially in the Asia-Pacific and the Middle East, a process of modernization of forces through the acquisition of advanced military systems and adaptation to the new concepts specific to the current RMA.

The current RMA is characterized by several factors that are specific to developed countries in the first two echelons of this revolution, the USA, Great Britain and France, such as structural changes taking place in the international system, the high level of investments in research and development of the military, the major progress in the sector of information and communication technology and, last but not least, the integration of tactics and force structure with technological development, training and simulation.

The structural changes taking place in the international system refer to the distribution of power among key international actors. Despite debates about the rise of "competitive partner," as the European Union, the Russian Federation, Japan, China, India etc., the United States still remains the most important world power both economically, technologically and militarily, and from the point of view of cultural penetration and effectiveness of democratic governance. The technological supremacy belongs indisputably to the U.S., EU – notably Britain and France – Canada and Japan and depends on the ability to change technologies radically and fast, on the power to determine the standards, the ability to integrate the latter, of markets, consumers, regulators and least developed countries in this regard. This technological supremacy is correlated with a high capacity to update the military doctrine to new technology, primarily for the U.S. and then the UK and France. Thus, the three states are considered key players in the current RMA.

[19] Richard BITZINGER, *Towards a Brave New Arms Industry?*, Oxford University Press, Oxford, 2003, apud apud Michael RASKA, *op. cit.*, 2011, p. 9.

The U.S. topped the charts worldwide in terms of military budgets and the use of high-tech, the defense spending hovering at around $ 700 billion[20]. An expanded military and industrial complex is financed with it and the Americans dominate the world in terms of military technology, aero-naval forces, firepower and smart tactical weapons, logistics support of operations, etc.[21] The U.S. status in the world in military-technical sphere is especially noticeable in NATO, where it is by far the largest contributor, with more than 20%, in both civilian and military budget and NATO Security Investment Program (NSIP) , while Britain, France and Germany together contribute with about 35% to each of these three categories of budgets[22]. In this context, the United States found necessary a rebalancing of NATO defense spending between U.S. and European partners and Canada. Thus, it was proposed the concept of Smart Defense by means of which is required the equitable sharing of costs of defense within NATO, especially in terms of defense capabilities involving considerable funding: anti-ballistic defense, surveillance and recognition, intelligence, maintenance and training, force training, effective engagement and force protection.

Regarding the EU, the European Defence Agency (EDA) is intended to be the main driver of the development of military capabilities and the promotion of research and technology in the field of defense. Thus, the EDA has adopted a capability-based approach and the concept of pooling and sharing which refers basically to the decision of several states to contribute materially and financially to the establishment or acquisition of a specific military equipment that subsequently can be used by several members[23].

Both Smart Defense and Pooling and Sharing are considered to be components of the current RMA but, although there are projects in both cases, we have to go beyond the conceptual phase and implementation in national policies, strategies and doctrines of some concrete elements. For

[20] The International Institute for Strategic Studies, *The Military Balance 2013*, Routledge, London, 2013, pp. 49-85.
[21] Teodor FRUNZETI, Sebastian OPRESCU, *The world of great powers (2011-2013)*, Top Form Press, Bucharest, 2013, pp. 11-41.
[22] NATO, *Paying for NATO*, URL: http://www.nato.int/cps/en/natolive/topics_67655.htm.
[23] Cristina BOGZEANU, „The NATO-EU relationship in terms of Smart Defense şi Pooling and Sharing concepts", in *Strategic Impact* no. 3/2012, pp. 34-41.

instance, with NATO, the new approach aims at the following capabilities that underlie the new RMA: land, maritime and air surveillance (the equipments necessary to the Air-Land NATO System have already been purchased through a multinational contract including Bulgaria, Check Republic, Estonia, Germany, Italy, Latvia, Lithuania, Luxemburg, Norway, Romania, Slovakia and the USA); AWACS – Airborne Warning and Control System; counteracting the improvised explosive devices (in 2011, 13 NATO member states decided to acquire technologies to counteract this type of devices); the anti-missile shield (initiated by the USA with the contribution of Holland and Germany and with the permission of Turkey, Spain, Poland and Romania to host its elements on their national territories); defence against cyber attacks; command and control systems etc. The EU also proposes under the aegis of Pooling and Sharing a number of projects, such as air refueling, maritime surveillance capabilities, intelligence, surveillance and reconnaissance, future military satellite communications, smart munitions and naval logistics.

The focus of the current RMA is the exploitation of innovations specific to information age such as increasingly miniaturized personal computers, real time video and data communications, social networks without borders, encryption technologies and data fusion, improved radar systems, etc. The main challenge for policymakers is to implement these technological elements in military and political concepts. This is true even for so-called leader of the current RMA, namely the U.S. – the current status of the RMA in the U.S. military seems to be unclear, although there are certain identifiable elements, such as C4ISR, guided ammunitions, new weapon operating principles (laser, microwave, non-lethal weapons), new types of sensors, stealth technology, missile defense, space war, etc.[24]

In this context, there are opinions that the revolution is actually an evolution, the contents of the current RMA allows forecasting the emergence of a new (r) evolution in military affairs in four key sectors:

[24] Gary CHAPMAN, „An Introduction in the Revolution in Military Affairs", în *XV Amaldi Conference on Problems in Global Security*, Helsinki, 2003, URL: http://www.lincei.it/rapporti/amaldi/papers/XV-Chapman.pdf.

counter intervention systems, remote weapon systems, energy weapons and last but not least, cyber warfare[25].

3. Revolution in Military Affairs and Sustainable Development

War is rightly associated with the idea of destruction, loss, being in this instance fully incompatible with the concept of sustainable development, its destructive effects having repercussions on natural capital, and also on the man-made one, resulting in considerable economic losses in association with lack of water, food, medicines, and the destruction of infrastructure.

The image of the former Yugoslav Republic after the wars that led to its collapse or the Kuwaiti oil fields set ablaze by military forces during the withdrawal from Iraq in January 1991 are good examples in this respect.

As an application of new technologies in military systems while developing new operational concepts and organizational adaptations designed to fundamentally change the nature and the conduct of the conflict, RMA seems to be, at first glance, completely incompatible with the idea of sustainable development. The latter designates a vision according to which development must be sustainable and not just economically, but also socially and environmentally. A central point of the meaning of the concept of sustainable development is the need to meet the needs of the present without compromising the need of future generations to meet their own needs[26].

The idea of „sustainable development" has been one of the EU concerns ever since 2001 when it established a strategy in this respect[27], being renewed in 2006 following a review process; the result was the Review of the EU Sustainable Development Strategy– Renewed Strategy[28].

---

[25] Antonio MISSIROLI (coord.), *Enabling the Future – European military capabilities 2013-2025: challenges and avenues*, EU Institute for Security Studies, Paris, 2013, pp. 21-25.

[26] Alexandra SARCINSCHI, "International security between the reality of economic crisis and the desideratum of sustainable development", in *Power balance and security environment*, vol. I, XI Annual Scientific Session with International Participation, "Carol I" NDU Press, Bucharest, 2011, pp. 37-52.

[27] Commission of the European Communities, *Communication from the Commission, A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development*, Brussels, 15.05.2001, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2001:0264:FIN:EN:PDF.

[28] Council of the European Union, *Review of the EU Sustainable Development Strategy (EU SDS) – Renewed Strategy*, 09 June 2006, http://register.consilium.europa.eu/pdf/en/06/st10/st10117.en06.pdf.

The overall objective set is to identify and take actions to enable the EU to favor the continuous improvement of quality of life of not only the present generation but also the future ones by creating sustainable communities able to manage and use resources efficiently, to achieve ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion[29].

All this requires, however, a stable security. Prosperity, high quality of life, use of resources, protection of the environment are goals that cannot be achieved only at peace. Security is an essential condition in order to talk about sustainable development. And, as we have shown in previous chapters, RMA not only improves the technique of war, but changes the nature and way of fighting it, being the name given to the process of adapting the military organization to new risks and threats to peace, closely related to the dynamics of the latter.

Moreover, in a world of globalization, the risks and threats do not respect borders, the commitment to maintaining regional and international security is an act of responsibility for any international player's security, which transpires both in the EU Sustainable Development Strategy and in that of similar documents issued in Romania[30]. Thus, Chapter 7, Foreign and Security Policy; guidelines and specific contributions of Romania to EU Foreign and Joint Security and European Security and Defence Policy in relation to the requirements of sustainable development, states that the foreign policy of Romania will focus around the following priority objectives: a) Creating a predictable and stable security environment in Romania, according to the national interest, b) contribution to the sustainable development of Romania, c) Shaping and promoting Romania's profile within the EU d) promotion and protection of Romanian values worldwide e) Increase Romania's contribution on the international scene[31]. Achieving these objectives is, however, closely related to connecting Romania to the main trends in the military, including the RMA. The development tools needed to guarantee the security is a sine qua non for sustainable development.

[29] Ibidem, p. 3.
[30] Government of Romania, Ministry of Environment and Sustainable Development, National Strategy for Romania's Sustainable Development. Horizons *2013-2020-2030*, Bucharest, 2008.
[31] Ibidem, pp. 143-148.

In fact, in NATO, there is a research program called The Science for Peace and Security Program[32], intended to contribute to the strategic objectives of the Alliance both through projects directly supporting NATO operations and addressing the defense against terrorism, cyber defense, environmental protection, protection against CBRN agents, the protection of energy infrastructure, identifying renewable energy use in the military etc.

In addition, two recent initiatives taken in defense planning in NATO and the EU, "Smart Defense" and "Pooling and Sharing" imply more efficient expenditures for military equipment necessary to ensure security on the principle of "more for less".

Also, we should not underestimate the RMA contribution to the economic dimension of the idea of sustainable development. Thus, one of the four key objectives set by the EU Strategy is to promote a prosperous economy, innovative, knowledge-based, competitive and based on the principle of protecting the environment, providing high standards of living and EU numerous and well-paid jobs[33].

RMA has a significant contribution to competitiveness in terms of military technology and equipment, and an increase in fostering relations between state and non-state actors, between public and private institutions. A first illustration of this is found in the meaning and implications of the "smart defense" and "pooling and sharing" initiatives whose implementation requires a multi-sectoral approach, based on cooperation in the military and the defense industry. Moreover, a key component of the two initiatives in the area of defense planning is research and development, due to the need to identify extensive and comprehensive solutions to be useful in managing long term sustainable crisis. Efforts have been concentrated to identify solutions for the acquisition and development of necessary military equipment.

Another illustration of this type of RMA contribution to sustainable development lies in the transfer of technology from the military to the civilian field and vice versa. Thus, on the one hand, there is a wide range of

[32] *The Science for Peace and Security Programme*, http://www.nato.int/cps/en/SID-F6BC341A-1359075D/natolive/top ics_85373.htm?.

[33] Council of the European Union, *Review of the EU Sustainable Development Strategy (EU SDS) – Renewed Strategy*, 09 June 2006, http://register.consilium.europa.eu/pdf/en/06/st10/st10117.en06.pdf, p. 4.

technologies that appeared first in the military and are now widely used in the civilian field, with beneficial effects in terms of environmental protection, economy of resources (internet, the use of nuclear energy, the use of satellites, laser technology). The considerable number of such techniques is due to the fact that research investments were initially made in the military field and then entered the civilian field because the military field was essential to ensure security in previous periods, however its beneficial nature in the civilian field, in achieving sustainable development indicators cannot be denied.

"War is the ultimate attack on sustainability"[34], but not RMA. As previously mentioned, this process doesn't define only the refining methods to wage war and developing the military. RMA and connecting actors to specific trends of each period equal enhancing the ability to guarantee the primary, fundamental condition of sustainable development – security. In addition, developments in technical and military technology involve and run in parallel with research and development, whose concrete results have contributed over time to ensure supremacy not only on the battlefield but also in improving the quality of life in general. RMA requires a continuous effort to improve the performance of the military institutions and helps maintain competitive, innovative and knowledge-based performance economies.

Conclusions

In the last decade, the development of military equipment and technology underlying RMA has accelerated, this emerging revolution is closely linked to changes taking place in human society, especially informational and technological ones. Military capabilities are changing due to the main trends of development of different areas: awareness and connectivity, coverage and durability, precision and miniaturization, speed and undetectability, automation and simulation. In this context, most experts agree that the only technological innovation is insufficient to trigger a genuine revolution in military affairs, being necessary a reevaluation of doctrines and operational concepts.

[34] Chris LANGLEY, *Op. Cit.*, p. 9.

Thus, we believe that the main problem of the current RMA seems to be linking new technologies to doctrinal sphere in a functional long-term system, where the boundaries between these two components have a high degree of flexibility and allow the existence of reciprocal links between them. For the states of the first two echelons of RMA, there are already considerable efforts to update military doctrine based on new technologies, but this process is a major consumer of financial resources and research and not all state actors afford to run it especially in the current economic difficulties. We can say that no country in NATO, EU and/or outside them is able to develop and produce isolated technologies and weapon systems necessary to a potential future war fought with smaller more lethal forces and with major cyber and space components. We also believe that it is extremely difficult, even impossible, for every country, even the most developed ones to keep pace with the current RMA and for this reason the only solution lies in the technical, technological, industrial and military cooperation of these – a developing trend within NATO and the EU.

BIBLIOGRAPHY

Bogzeanu, Cristina, *Relaţia dintre NATO şi UE din perspectiva implicaţiilor conceptelor Smart Defence şi Pooling and Sharing,* in *Strategic Impact* nr. 3/2012.

Carafano, James, *The Evolution of Revolution,* in *H-Diplo*, Humanities and Social Sciences Online, august 2002, URL: http://www.h-net.org/reviews/showrev.php?id=6627.

Chapman, Gary, *An Introduction in the Revolution in Military Affairs*, in *XV Amaldi Conference on Problems in Global Security*, Helsinki, 2003, URL: http://www.lincei.it/rapporti/amaldi/ papers/XV-Chapman.pdf.

Commission of the European Communities, *Communication from the Commission, A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development*, Brussels, 15.05.2001, http://eur-lex.europa.eu/LexUriServ/ LexUriServ.do?uri =COM:2001:0264:FIN:EN:PDF.

Council of the European Union, *Review of the EU Sustainable Development Strategy (EU SDS) – Renewed Strategy*, 09 June 2006, http://register.consilium.europa.eu/pdf/en/06/st10/ st10117.en06.pdf.

Frunzeti, Teodor; OPRESCU, Sebastian, *Lumea marilor puteri (2011-2013)*, Editura Top Form, Bucureşti, 2013.

Guvernul României, Ministerul Mediului şi Dezvoltării Durabile, *Strategia Naţională pentru Dezvoltare Durabilă a României. Orizonturi 2013-2020-2030*, Bucureşti, 2008.

Krepinevich, Andrew F., „Cavalry to Computer: The Pattern of Military Revolutions", in *The National Interest*, 1994, URL: http://web.clas.ufl.edu/users/zselden/Course%20 Readings/Krepinevitch.pdf.

Langley, Chris, *Soldiers in the Laboratory. Military Involvement in Science and Technology – and Some Alternatives*, Scientist for Global Responsibility, Oxford, 2005, URL: http://www. sgr.org.uk/ArmsControl/Soldiers_in_Lab_Report. pdf.

Metz, Steven and KIEVIT, James, *Strategy and the Revolution in Military Affairs: from Theory to Policy*, Strategic Studies Institute, USA, 1997.

Missiroli, Antonio (coord.), *Enabling the Future – European military capabilities 2013-2025: challenges and avenues*, EU Institute for Security Studies, Paris, 2013.

Murray, Williamson, „Thinking about Revolution in Military Affairs", în *Joint Force Quarterly*, Summer 1997, URL: http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA354177.

NATO, *Paying for NATO*, URL: http://www.nato.int/cps/en/natolive/ topics_67655.htm.

NATO, *The Science for Peace and Security Programme*, http://www.nato.int/cps/en/SID-F6BC341A-1359075D/ natolive/top ics_85373.htm?.

Neuneck, Götz şi ALWARDT, Christian, *The Revolution in Military Affairs, its Driving Forces, Elements and Complexity*, IFAR Working Paper no. 13, mai 2008.

Raska, Michael, „The «Five Waves» of RMA Theory, Processes, and Debate" în *Pointer, Journal of Singapore Armed Forces*, vol. 36, nr. 3-4, 2011, URL: http://www.mindef.gov.sg/content/imindef/publications/pointer/journals/2011/v36n3-4/feature1/_jcr_content/iminde fPars/0003/file.res/1.%2001-12%20Five%20Waves%20Of%20RMA%20Theory%20R4.pdf

Rogers, Clifford J., *The Military Revolutions in History and Historiography,* în *The military Revolution Debate. Readings on the Military Transformation of Early Modern Europe*, C.J. ROGERS (coord.), Westview Press, Colorado, 1995.

Sarcinschi, Alexandra, „Securitatea internaţională între realitatea crizei economice şi dezideratul dezvoltării durabile", în *Echilibrul de putere şi mediul de securitate*, vol. I, a XI-a Sesiune anuală de comunicări ştiinţifice cu participare internaţională, Editura Universităţii Naţionale de Apărare „Carol I", Bucureşti, 2011.

The International Institute for Strategic Studies, *The Military Balance 2013*, Routledge, London, 2013.

Toffler, Alvin şi Heidi, *War and Anti-War: Survival at the Dawn of the 21st Century*, Little Brown, Boston, 1993.

U.S. Department of Defense, *Military Transformation: A Strategic Approach*, SUA, 2003, URL: http://www.iwar.org.uk/rma/resources/transformation/military-transformation-a-strategic-approach.pdf.