C4ISR IN NAVY TRANSFORMATION: ROLE, JOINT RESEARCH AND ADVANCED TECHNOLOGY DEMONSTRATIONS

Velizar SHALAMANOV

Abstract: This article elaborates on an important aspect of Navy transformation – the role of C4ISR concept. It provides a comprehensive treatment of enabling the transformation C4ISR issues, such as the role and importance of network centricity and the joint research in general, the necessity for and the benefits of concept development and experimentation and advanced technology demonstrations, etc. The author shares his opinion on a topic that deserves special attention – that of the successful development and insertion of the C4ISR systems in the navy establishments. The role of the academia represented by the Center for National Security and Defense Research (CNSDR) in the Bulgarian Academy of Sciences (BAS) as a key element in Navy transformation is particularly emphasized.

Within the Framework of Reform Plan 2004, the Bulgarian Navy is close to finalizing its structural changes and downsizing process. The Navy may turn to be the first all-volunteers service. Experience gained from cooperation with NATO and NATO countries provides excellent opportunity to the Navy to lead in the integration process. There have already been steps for visible presence of Navy officers in the General Staff – the first deputy and then chief of J5, as well as the deputy of J3 are Navy officers. The Naval Academy is separate from the National Military University; it includes a department at the Defense and Staff College.

In addition to the process of integration in NATO and to the improvement of regional cooperation in the BLACKSEAFOR format, the Navy faces the challenge to improve and maintain close cooperation with border police, sea administration and many other governmental services, as well as with all maritime organizations.

New security risks, stemming from terrorism, proliferation and threat of weapons for mass destruction (WMD), organized crime and corruption, illegal drug, people and arms trafficking in the Black Sea area, demand attention. They pose the question of transforming the Navy as a second phase of the reform. Transformation is considered

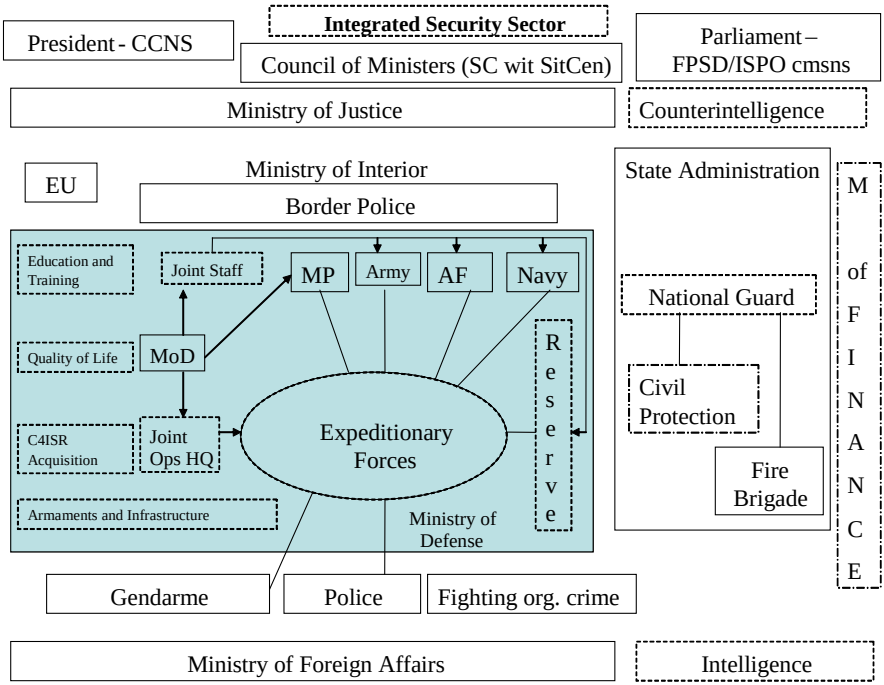

Figure 1: General Structure of an Integrated Security Sector in Bulgaria.

as a process of permanent and comprehensive (doctrines, organization, training, equipment, leadership, personnel, and infrastructure) changes, focused on building integrated capabilities for participation in an expanded spectrum of operations with particular stress on utilization of new technologies, which provide competitive advantages.

Transformation is primarily an institutional change that aims at building integrated processes, organizations and systems to address modern threats of integrated character.

Transformation is not a routine process.[1] For example, in order to implement it, the United States established JFCOM and the Office of Force Transformation in OSD. In Prague, NATO decided to establish Allied Command Transformation (ACT), which was opened in Norfolk in the summer of 2003.

At the same time Allied Command Operations (ACO), as well as various operations commands were established to strengthen the operations dimension of the Alliance – it is not more a static structure, but a dynamic organization coping with constant changes that performs operations all over the world with expeditionary type forces.[2]

Taking into consideration these developments in NATO, the fact that the Black Sea shore of Bulgaria will be an external border of the EU, as well as that the Black Sea itself is a key area of cooperation with the neighbors of the EU, will place great emphasis on Navy modernization as part of the integrated security sector of Bulgaria, of NATO, EU, and US in particular.[3]

Integrated Security Sector

Operations and the modernization of the Bulgarian Navy in particular can not be analyzed without assessing the role and place of the naval forces in the bigger picture of an integrated security sector (Figure 1), with well established coordination.[4]

Abbreviations used in Figure 1:

AF	Air Force
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CCNS	Consultative Council for National Security
EU	European Union
FPSD	Foreign Policy, Security and Defense (Committee)
ISPO	Internal Security and Public Order (Committee)
MoD	Ministry of Defense
MP	Military Police
SC	Security Council
SitCen	Situation Center

According to the tendencies of development of the force structure in the Ministry of Defense (MoD) with common elements for the whole security sector as shown in Figure 2, the Navy has close relations with practically all the players in the security area. Capabilities development has to be coordinated with other players and is deeply influenced by the NATO and EU integration processes.[5]

It has to be pointed out that the structure of the integrated security sector and the force structure in MoD are fundamentally vitalized through a C4ISR infrastructure, providing network-centric capabilities for network centric operations. It means that the key element in building such a security sector and Navy in particular trough processes of transformation is to build a network-centric C2 system as depicted in Figure 3.

Modernization Part of the Transformation Process

Activating such a force structure requires very serious modernization / acquisition of platforms and C4ISR systems in addition to other elements of the transformation process. The implementation of the modernization part requires profound analysis

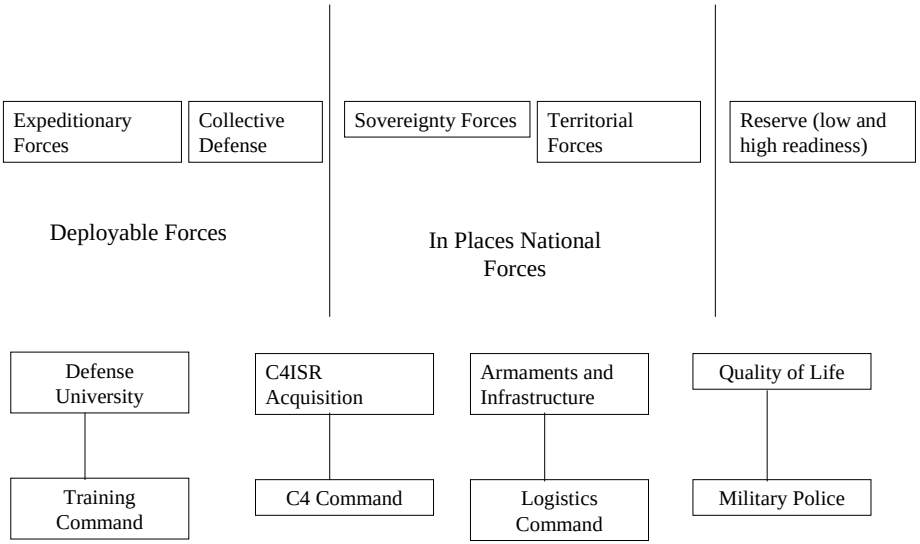

Figure 2: Force Structure in MoD with Common Elements for the Security Sector.

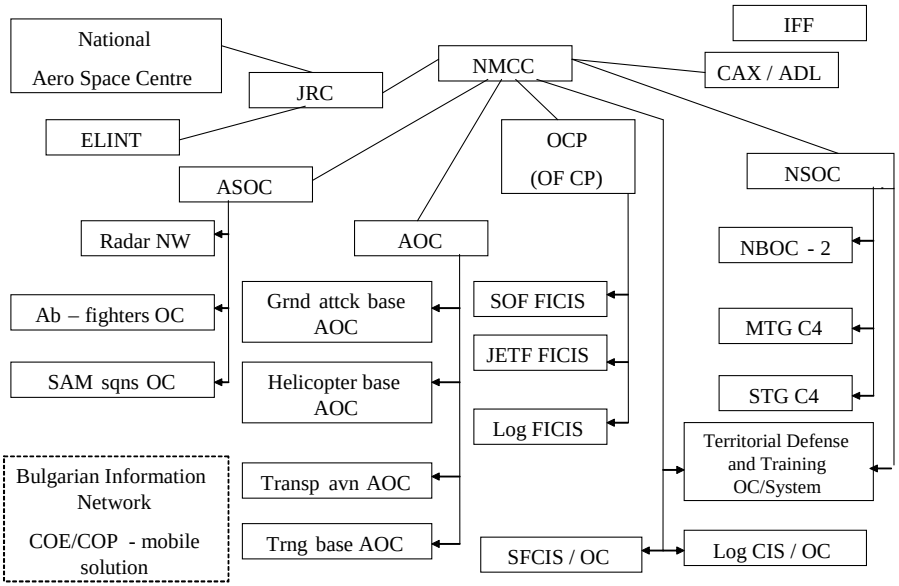

Figure 3: Target Network-Centric C2 System.

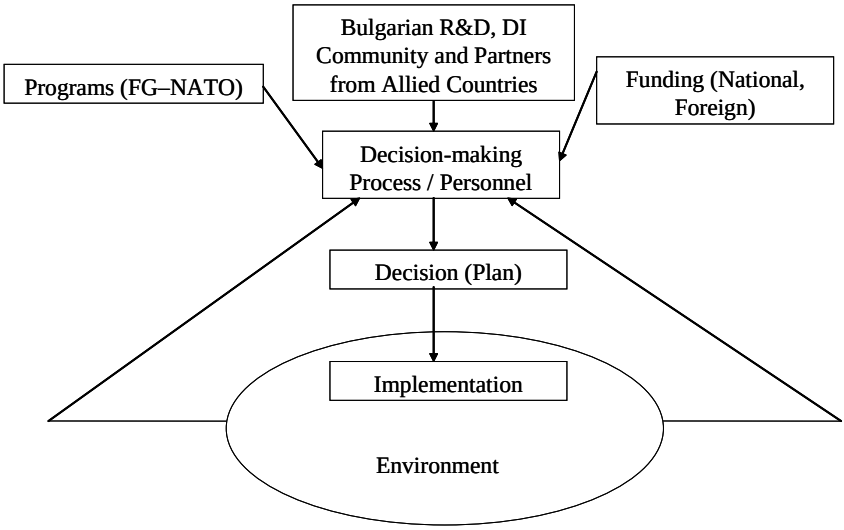

Figure 4: Analysis Scheme for Modernization Part of the Transformation Process.

and the establishment of comprehensive planning, programming, budgeting and acquisition processes.[6] An analysis scheme for the modernization part of the transformation process is proposed in Figure 4.

These efforts are supported by the Bulgarian R&D and defense industry (DI) community in cooperation with the relevant bodies from the allied countries.[7] In Bulgaria, practically, there is an established list of private DI companies such as: VMZ, Arsenal, Arcus, SAMEL-90, Armitech, Electron Progress, Cherno More, Bitova Electronika, Opticoelectron and others (related to the development of C4ISR systems).

State-owned arm of the community is represented by the Defense and Staff College and its Advanced Defense Research Institute and Interoperability Faculty, the *Bulgarian Academy of Sciences* with its *Center for National Security and Defense Research* (CNSDR), the *Space Research Institute* (SRI), the *Institute of Metal Sciences* (IMS), *TEREM SHC*, KINTEX and many others.

Funding is a critical factor and it could be divided into funding from national and foreign sources. National sources include: MoD's Investment Budget; MoD's R&D Budget; NATO Integration Program - MoD Share; Special "Mission Funds;" and Special "Mission Loans." Foreign funds come from FMF, IMET, EIPC, EDA and other related programs of the US, as well as similar programs from other countries.

Special "Mission related funds" for joint operations and training, NSIP and the other NATO programs as well as the EU–border control and Civil Protection funds could be added to the foreign funding opportunities.

The process of decision making and program management in MoD is a factor with very high importance for the overall success of the modernization process. Figure 5 represents the current structure of the decision making process, but there is a room for improvement.

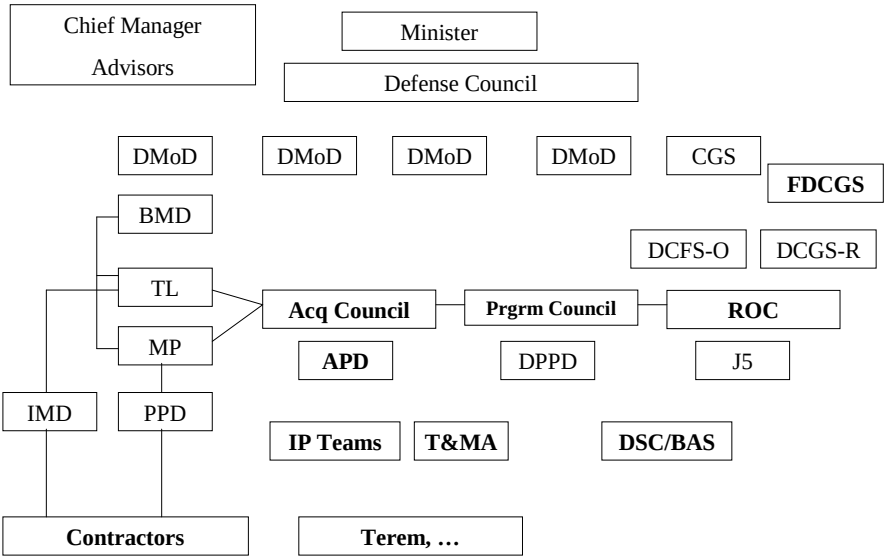

Figure 5: Decision-making at MoD.

The process of modernization has to generate a set of programs with the new focus of transformation – the network-centric warfare implications to integrate the existing elements into a new system through modern information networks. Analysis is required to provide interoperability and security in open coalition environment. In such a "coalition environment" the role of proxy servers is a key for providing integrated operational picture. Analysis of the target network C2 system compared to the current situation attempts to identify the missing elements and to start their acquisition (development, procurement).

Naturally, C4ISR projects are important, but only if there are platforms and weapons capable to engage precisely the targets. Currently there is a list of projects for Navy

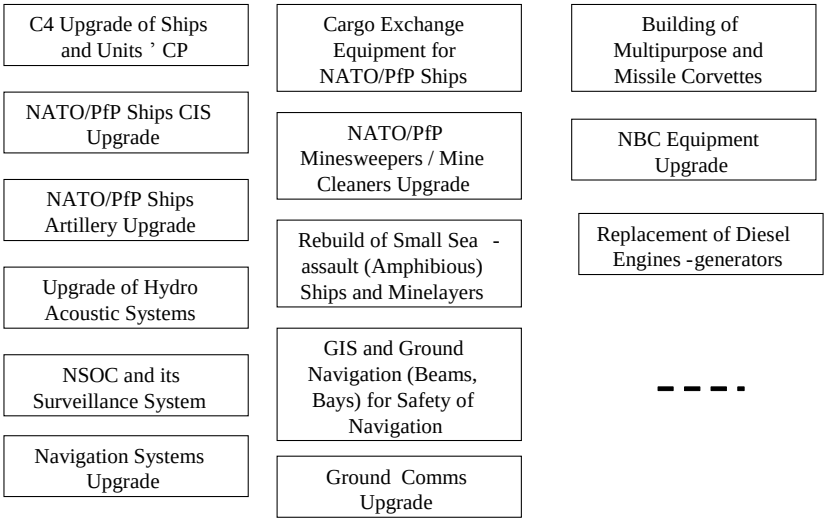

Figure 6: Navy Transformation through Modernization Programs.

modernization, represented in Figure 6, but the question is: are they really focused on the main stream of transformation.

For all important programs, and especially for the C4ISR ones, the spiral lifecycle approach using evolutionary prototyping is a key approach, particularly when the objective of transformation is to manage change and maintain deployability of forces for different operations.[8] Such a challenge requires intensive use of concept development and experimentation (CDE) approach with a set of advanced technology demonstrations (ATD). The main message to Bulgaria delivered from the experience of leading nations in transformation is: "Architecture approach, Standardization, Evolutionary prototyping."

Central Transformation Instrument: Concept Development and Experimentation

Concept development is a critical creative process enabled by advanced research methods, typical for academic institutions. This process includes: assessment of the situation based on well developed framework of questions and development of the needed system architecture as a model. On the basis of this experimental parametric model (an empty model), a set of options has to be developed and carefully assessed with formal and often informal methods, with the intention to compare different op-

tions. Selection of the solution(s) for further assessment and improvement through experimentation is an expertise -based process with a need to integrate the assessment and choice of many different experts and to develop a selection matrix for the final solution.

The processes of transformation plan formulation and risk assessment are performed during all steps of concept development in order to check the achievability of the solution, how realistic and in what time frame it is. Such a process could lead to a really smart procurement.[9]

Experimentation with the concept is more oriented towards applied research as a whole, but recursively it could include CDE for some of the building blocks of the larger concept under experimentation. Selection (or development if not available) of the building blocks is, therefore, an important requirement for the experiment. Advanced technology demonstrations (ATD) could help in assessing and selecting the required elements for concept implementation. After the assessment of the elements, the challenge to face is the integration of the building blocks in the process of prototyping and testing of the whole system.

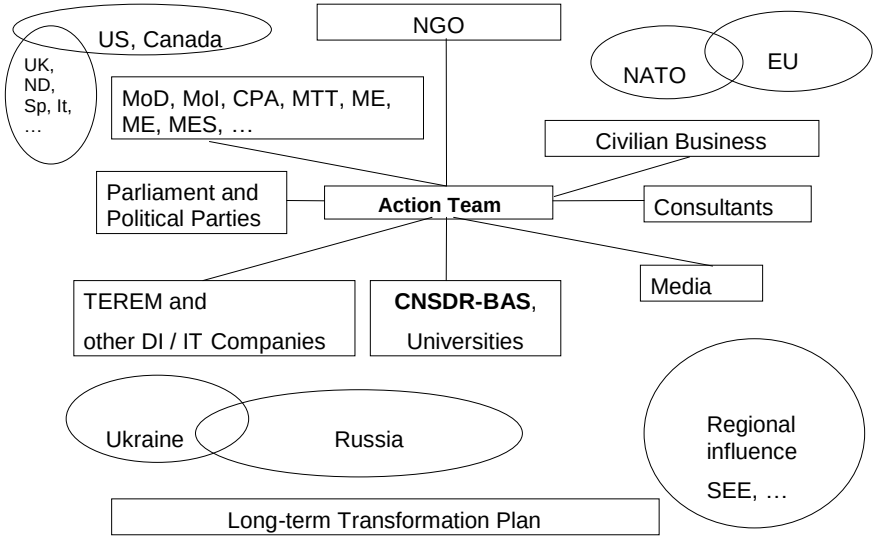

Figure 7: Environment for Implementation of Transformation: Network Centric Knowledge Based Approach / Strategy.

Advanced technology demonstrations are important area where the research community meets business people with real products; these products and solutions need to be improved and adapted to the operational and technical concept required by the transformation task.

ATD requires identification of the key building blocks and plan for basic or applied research in prototyping system elements. Testing, assessment, documentation and certification of the system elements are a long process before the final integration of the system.

The network-centric and the knowledge-based approaches, as well as a strategy for implementation of CDE/ATD in the process of Navy transformation are illustrated in Figure 7.

For every CDE project an action team is needed to integrate the capabilities and efforts of all other players. In the network, the other critical element (really connected with unique capabilities) is the academic world; in Figure 6 the role of the academia is played by the Center for National Security and Defense Research (CNSDR) in the Bulgarian Academy of Sciences (BAS).

Center for National Security and Defense Research as a Key Element in Navy Transformation

The Center for National Security and Defense Research was established in the Bulgarian Academy of Sciences with the principal objective to provide the necessary information, coordination and support to the BAS' units and individual scientists who take part in research activities in the area of national security and defense, in order to enable them to get deeply involved in the applied tasks faced by the Bulgarian Armed Forces, Ministry of Defense, the Ministry of Interior and other security and emergency management agencies in the processes of modernization and rearmament as part of transformation.

The organization and structure of the center and its environment prove the value of network and knowledge-based approaches. It is a typical enabler body as presented in Figure 8.

Functional areas, covered by CNSDR are:

- National security and defense strategies, security sector reform;
- Army, Air Force and Navy modernization;
- Civil Protection modernization;
- C4ISR infrastructure modernization;
- Logistics modernization;

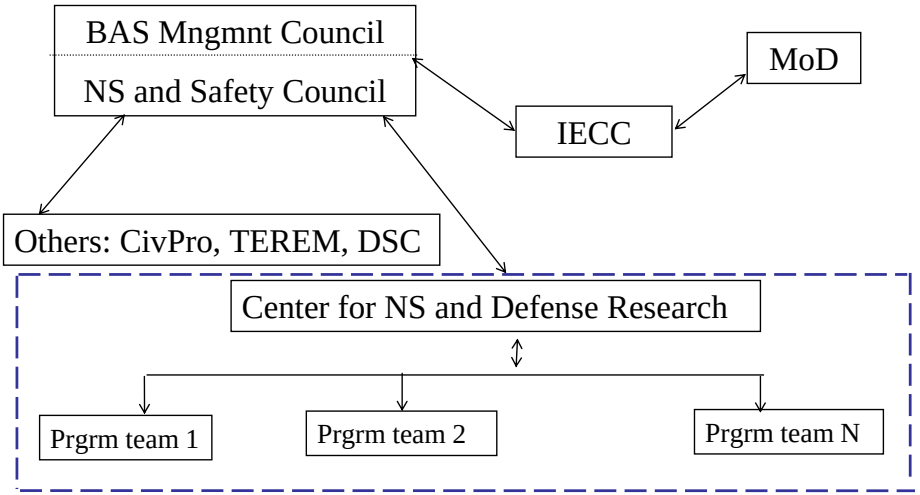

Figure 8: CNSDR Environment of Functioning as R&D Enabler in the Network of Bodies.

- Defense industry, R&D transformation;
- NATO and EU cooperation.

Forms of activity for the CNSDR are:

- Studies;
- Basic and applied research;
- Advanced technology demonstrations;
- Concept development and experimentation;
- Conferences, seminars, workshops and training courses;
- Consulting;
- Management services.

Principal projects of CNSDR currently are:

- White Paper on Defense;
- RAPIDS;
- Modernization Plan and PG/FG analysis;
- TEREM Transformation Plan;
- Civil Protection Early Warning System;
- HEMUS conference, CITMO conference.

Over 40 projects in specific areas ranging from information systems and C4 architecture development to specialized air reconnaissance modules have been developed since 2001.

International cooperation is one of the most important dimensions of CNSDR's activities. Main partners of the center are:

- NATO SC (Assistant Secretary General - Public Diplomacy);
- RTO;
- NC3A;
- TNO Defence Research;
- US ONR Global;
- USEUCOM Science Dimension;
- PfP Consortium … and in future ACT, Center for Technology and NS Policy in NDU.

CNSDR-BAS is established to solve the above-mentioned problems in cooperation with all involved institutions using a sound methodology and world class expert teams with deep national understanding of the problems. The upcoming HEMUS 2004 defense exhibition and conference in Plovdiv is an excellent opportunity to find good solutions for accepted force proposals from NATO and urgent requirements of deployed units through joint ATD, prepared by MoD-BAS-business teams.

Conclusions

For the Bulgarian Navy the year 2004 is crucial in transformation efforts. Currently AF has its MiG-29, ASOC, Pilatus and probably soon Mi-24/Mi-17 modernization projects; Army is moving forward with the different FICIS projects and upcoming Daimler Chrysler vehicles program; the Navy is waiting to receive its corvette and NSOC projects. There are many other smaller, but crucial for the force proposals and deployment objectives, which need serious R&D for CDE and ATD, performed by joint teams.

Progress in the field of modernization is very much dependent on the long-term vision, developed in cooperation with academic community and preparation of realistic, scalable and flexible to different contingencies programs as a tool for management of change.

Navy has additional difficulty, connected with the distance of the Navy HQ in Varna from MoD and GS in Sofia. On the other side, cooperation with CNSDR-BAS will give another Sofia-based pillar of Navy modernization process.

Initial steps could be supported through even larger team efforts, where in addition to Navy and their academic / business partners (as well as the NGO partner as is AFCEA – Varna chapter), other key players could be added – NATO, US and other allies.

Joint action plan for CDE and ATD financed through the R&D budget of Navy, as well as using FMF and other programs, could shape seriously the transformation process and on a very realistic basis.

Notes:

[1] Hans Binnendijk, ed., *Transforming America's Military* (Washington: NDU, Center for Technology and NS Policy, 2002).

[2] *NATO Response Force – NATO's Expeditionary Capability*, Briefing to the Ministerial Summit (Colorado Springs, CO, October 2003), available at <www.nato.int/docu/comm/2003/10-colorado/briefing02.pdf> (25 March 2004).

[3] Velizar Shalamanov, "Perspectives for Cooperation in Defense and Security," *International Relations* 4 (2003): 53-62 (in Bulgarian).

[4] Velizar Shalamanov, "Civil-Military and Interagency Cooperation in the Security Sector in Bulgaria," in *Security Sector Reform – Does It Work? Problems of Civil-Military and Interagency Cooperation in the Security Sector*, ed. Philipp Fluri and Velizar Shalamanov (Sofia: Procon, 2003), 79-114.

[5] Todor Tagarev, "Developing Defence Capabilities in the Process of NATO Integration – Allied, National Planning and Specialisation" (paper presented at the International Workshop "Strategic Defence Review – Economic Dimensions," Ribaritza, Bulgaria, 29-30 May 2003).

[6] Todor Tagarev, "Prerequisites and Approaches to Force Modernization in a Transition Period," *Information & Security. An International Journal* 6 (2001): 30-52, <www.isn.ethz.ch/onlinepubli/publihouse/infosecurity/volume_6/f4/f4_index.htm> (12 February 2004).

[7] Todor Tagarev, "From Downsizing to Modernising Defence in C&E Europe: Opportunities for SME's," in *Defense Related SME's: Analysis and Description of Current Conditions*, ed. Fernando Duarte Carvalho, NATO Science Series, Series V, vol. 43 (Amsterdam: ISO Press, 2004), 137 - 147.

[8] Velizar Shalamanov, "C4ISR Program Management in the Security Sector Transformation: Key Area of Defense" (paper presented at the International Workshop "Strategic Defence Review – Economic Dimensions," Ribaritza, Bulgaria, 29-30 May 2003).

[9] *The Acquisition Handbook: A Guide to Smart Procurement*, Edition 4 (London: Ministry of Defence of the United Kingdom, 2002).

VELIZAR SHALAMANOV is advisor to the President of the Bulgarian Academy of Sciences on security and defense issues and Chairman of "George C. Marshall"-Bulgaria. Being former Deputy Minister of Defense (defense policy and planning, November 1998 – July 2001), he serves as advisor to the Parliamentarian Committee on Foreign Policy, Defense and Security. Dr. Shalamanov holds the title of Associate Professor (Automated information processing systems) and has more than 150 publications in the areas of CIS architecture and development, information warfare, decision support, national and regional security policy, defense planning and reengineering. Dr. Shalamanov is member and co-founder of the AFCEA-Sofia Chapter and the Business Executives for National Security – Bulgaria. He serves on the International Advisory Board of DCAF. *E_mail:* Shalamanov@GCMarshall.bg.