

Science, Technology, Transformation in NATO Framework: Introductory remarks from NATO Science Committee HSD Advisory Panel¹

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NATO and Science. The NATO Science Programme was founded in 1958, with the establishment of the NATO Science Committee, following the recommendations of a Committee on Non-Military Cooperation in NATO. The report of that Committee of "Three Wise Men" - Foreign Ministers Lange (Norway), Martino (Italy) and Pearson (Canada) - asserted that progress in the fields of science and technology can be decisive in determining the security of nations and their position in world affairs, and stated that science and technology were areas of special importance to the Atlantic community.

The Science Committee immediately recognized that the training of young scientists and engineers was of paramount importance and introduced a group of support mechanisms, some of which applied today - Advanced Study Institutes, Collaborative Research Grants and Science Fellowships. Further mechanisms have been added and sometimes deleted over the years. The predominant characteristics of the Programme have continued to be an emphasis on cooperation and catalyst for high scientific quality, and a capacity for rapid response to new developments.

In a new departure late in 2003, the Science Programme underwent further transformation in line with the Alliance initiatives for countering new threats, and the Programme now concentrates its support on the collaboration on security-related topics of Defence Against Terrorism or Countering Other Threats to Security and/or Partner-countries priorities. To reflect this fundamental change a new name was selected for the programme, which became known as the NATO Programme for *Security Through Science* .

Overall policy guidance for the NATO Programme for Security Through Science is provided by the NATO Science Committee, which is composed of representatives of each NATO member country. The Science Committee normally meets three times a year. One of the meetings is in EAPC format, when the 26 NATO-country representatives are joined by colleagues representing 20 Partner countries. The Science Committee also meets twice a year in the format of the NATO-Russia Council (NRC), for a discussion of the concerns of the 27 countries in the scientific area.

The Science Committee is assisted in its work of assessing and selecting applications for support by Advisory Panels whose members are selected by the Committee from among the international scientific community. Associate members from Partner countries and Mediterranean Dialogue countries also serve on the Advisory Panels. Panel members put their professional expertise at the disposal of the Committee, and this direct involvement of the scientific community has been invaluable in arriving at and maintaining the high scientific standard of the Programme.

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The new name reflects more closely the aims and purposes of the revised programme. Support is now offered only for collaboration on security-related Priority Research Topics, which follow the new directions and objectives of the Alliance, and/or in Partner-country priority topics. The Priority Research Topics are in the following areas:

1. Defence Against Terrorism
2. Countering Other Threats to Security
3. Partner-Country Priorities

This applies not only to the traditional collaborative support mechanisms of Collaborative Linkage Grants, Expert Visits, Advanced Study Institutes and Advanced Research Workshops, as well as the new Reintegration Grant, introduced in March 2004, but also to Science for Peace projects. Mediterranean Dialogue countries will now for the first time be eligible for support under Science for Peace.

A feature of the new programme is a step away from bringing scientists together primarily to foster partnerships and build a new extended scientific community, which was an imperative of the 1990s. In a world changed by the terrorist attacks of 11 September 2001, the programme will now bring scientists together to work on solving problems associated with challenging new security issues of concern to NATO, Partner and Mediterranean Dialogue countries.

2004 also saw the establishment of four new Advisory Panels replacing the former Panel structure, and the selection by the Science Committee of a new set of national experts for the Panels. The new Panels are oriented towards security issues. One of them, the Human and Societal Dynamics (HSD) Panel, is specifically tasked to address security aspects of the 'soft sciences'. This is a completely new direction for the Science Committee, but one which is essential for understanding the roots of terrorism and other significant threats to our societies.

HSD Panel supports interdisciplinary research projects on topics related to understanding, anticipating, preventing and countering new and emerging threats to security. Its mandate includes studies on the impact of terrorism on society; effective defense against terrorism; the assessment and management of risk; new challenges for global security; defense and security sector governance issues; topics in the management of security-related science and technology policy / management; security related political science and international relations. This new area was included to stimulate interdisciplinary research directed at understanding / building capacity to understand complex dynamics within and among human and social systems, and their environment, related to security in modern world. The key aspect is scientific breakthroughs that could help NATO, nations and organizations to manage and adapt to change in security field.

The traditional Science Fellowships programme was terminated in 2004 and was replaced by a new mechanism: the Reintegration Grant. Reintegration Grants offer opportunities for Partner scientists already working or studying in NATO countries to return to their home country to conduct research with NATO support. This approach helps reduce the 'brain drain,' cited as a significant problem by many Partner countries.

In 2004, a total of 387 grants were awarded to scientists in Partner and Mediterranean Dialogue countries to cooperate with NATO country scientists. These activities span a wide

range of topics and mechanisms, including more than **100 scientific conferences**. The Science for Peace (SfP) programme was very active in 2004, with **over 60 new projects** either approved or in a state of advanced planning. These 3-5 year projects involve teams of scientists from Partner and NATO countries focused on the application of science and technology to practical problems. **There are 139 SfP projects either ongoing or completed**, including topics such as explosives' detection; detection of dirty bombs; radioactive waste disposal in Turkmenistan; and dealing with radiological contamination. **Computer Networking** continued as an important element of programme activity during 2004. The **Virtual Silk Highway (VSH)** project, which brings Internet computer connectivity to the scientific and educational communities of the Caucasus and Central Asia, was extended to Afghanistan, with the installation of a ground station in Kabul. The VSH project is the largest Computer Networking project, but other smaller projects are also conducted to extend Internet access in many Partner countries

New initiatives were launched in 2004 to include a series of joint workshops with the Conference of National Armaments Directors (CNAD) supporting their activity on Defence against Terrorism. The NATO STS programme was also included in the Environment and Security (ENVSEC) initiative, along with OSCE, United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP).

Co-operation with the Mediterranean Dialogue countries continued to strengthen in 2004. A total of **230 events** had been held between 2000 and 2004 involving the participation of over **1,000 Mediterranean Dialogue scientists**. The impact of the STS Programme in the Partner countries was noted by the Secretary General in his fall 2004 visits to the countries of the Caucasus and Central Asia. He remarked that during their face-to-face meetings with him, nearly all of the Heads of State had underscored the importance of this NATO programme for their countries.

Research Partner Bulletin Board has been established to assist research scientists in finding collaborators. Scientists may EITHER make themselves known to the scientific community by posting details of their ongoing research projects or research interests, OR search for partners amongst those already posted.

A NATO Science Partnership Prize was launched in 2002, to be presented annually by the Secretary General of NATO. The purpose of the Prize is to recognize excellence in scientific collaboration between Partner/Mediterranean Dialogue and NATO country scientists in activities supported by the NATO Science Programme. The Prize consists of a cash award of €10,000 per recipient to be used to support research activity, as well as a special Medal and Certificate

Challenges of Modern Society and Science in NATO Context. The NATO Committee on the Challenges of Modern Society (CCMS) was created in 1969 by the North Atlantic Council with the initial aim of addressing problems affecting the environment of the nations and the quality of life of their peoples. As part of a section called 'Threats and Challenges', its activities have been expanded over the years to include Partner countries in the Euro-Atlantic Partnership Council (EAPC) and more recently adapted to take into account emerging issues to security. The member countries of the Euro-Atlantic Partnership Council are the 26 member countries of NATO, plus the 20 Partner countries. The North Atlantic Council in Ministerial Session has decided that CCMS activities should also include experts from Mediterranean Dialogue countries.

The Committee meets twice a year in plenary sessions and annually with Partner countries (EAPC format meeting). The Committee provides a unique forum for sharing knowledge and experience on technical, scientific and policy aspects of social and environmental matters in both the civilian and military sectors among NATO and EAPC Partner countries.

To provide the guidelines for future work, the following Key Objectives have now been identified:

- a. Reducing the environmental impact of military activities;
- b. Conducting regional studies including cross-border activities;
- c. Preventing conflicts in relation to scarcity of resources;
- d. Addressing emerging risks to the environment and society that could cause economic, cultural and political instability; and
- e. Addressing non-traditional threats to security.

These Key Objectives are not exclusive or restrictive. The primary criteria for initiating CCMS activities remain the interest of a sufficient number of nations to work collectively on topics related to challenges of modern society in line with the five key objectives, and their **willingness to commit resources**.

In creating the CCMS, the North Atlantic Council decided that the Committee would not itself engage in any research activities. Work is carried out on a decentralised basis, mainly through pilot studies (3/5 years) and short-term ad hoc projects (12/18 months), which are nationally funded. Activities also include the organization of workshops and the co-sponsoring of international conferences and seminars.

Directors of pilot studies and short-term projects are encouraged to use the CCMS web site as a working tool and in the dissemination process.

With the help of a small yearly budget, the CCMS is able to provide financial assistance (to cover transport expenses and/or daily allowances) to experts who have difficulty in obtaining the necessary funds to attend meetings of pilot studies, short term projects or workshops. The CCMS Study Visit Programme is open to experts from both NATO and Partner countries. Requests, which should be endorsed by the appropriate pilot study director and by the National CCMS Coordinator, are made to the CCMS Secretariat.

In April 1995, the Committee on the Challenges of Modern Society approved the establishment of an Environmental Clearing House System (ECHS) through an electronic bulletin board. ECHS is intended to be used as a forum for environmental information for multiple users and as an electronic gateway to other on-line environmental databases. The purpose of the ECHS is to provide a tool for multiple CCMS pilot studies and participating nations to acquire, organize, retrieve, and disseminate environmental information of common interest. Users are able to post information on the ECHS for sharing with other individuals or user groups, access and retrieve information posted by others, as well as access other Internet data files beyond the domain of the NATO/CCMS Environmental Clearing House System. The system is accessible by any Internet subscriber for consultation. Only users with proper authorization are allowed to provide or modify data base information. The ECHS does not support classified, restricted, or otherwise

sensitive data. This Clearing House for Environmental Technical Information is established on the World Wide Web and can be accessed at URL <http://www.nato.int/ccms/>.

Since April 1995, the Committee on the Challenges of Modern Society has had its own web site (<http://www.nato.int/ccms/>). This web site was developed to function as a "clearing house" for environmental affairs concerning the NATO community. It is a tool for the multiple CCMS pilot studies and participating nations to acquire, organize, retrieve and disseminate environmental information of common interest. It provides access to environmental data, reports and studies.

NATO and Technology Management. The accord establishing the North Atlantic Treaty Organization (NATO) in 1949 provided the framework for the greatest international mechanism ever in defense science and technology. From its earliest days, NATO involvement in science and technology has sought to build cooperation and promote security and stability. Today, the central element of the NATO defense science and technology program is the Research and Technology Organization (RTO), which provides the best basis for collaboration among the most technologically advanced countries in the world. Through this body, alliance nations plan and execute activities that cover the full spectrum of technologies vital to current and future security.

RTO and its two predecessors, the Advisory Group for Aerospace Research and Development and the Defense Research Group, have a history of fostering long-term relationships among senior executives, scientists, and engineers; sharing information and research; and enhancing military capabilities. There is no international activity that rivals RTO in scope, magnitude, or potential. RTO can continue to build on these successes by emphasizing longevity of its highly qualified members, prioritizing areas of opportunity, integrating the seven newest NATO invitees, and building a closer relationship with Russia.

Formed in 1998 by the merger of AGARD and DRG, the Research and Technology Organization is the primary NATO organization for defense science and technology. RTO reports to both CNAD and the Military Committee; it has both a board and technical panels; and it blends the research and technical missions of its predecessors. RTO promotes and conducts cooperative research and information exchange, develops and maintains a long-term NATO research and technology strategy, and provides advice to all NATO elements on research and technology issues. In pursuit of this mission, RTO operates at three levels: the Research and Technology Board, technical panels, and technical teams. A Research and Technology Agency provides staff support to RTO

The *Research and Technology Board (RTB)* constitutes the highest authority in RTO. It is the policy body tasked by the North Atlantic Council through the Conference of National Armaments Directors and the Military Committee to serve as the single integrating body within NATO for the direction and/or coordination of defense research and technology. RTB consists of up to three members per NATO nation. The members are chosen nationally and may be representatives of government, academia, or industry, although the majority of members come from the government. Board members are typically senior science and technology executives at a deputy under secretary, deputy assistant secretary, or deputy administrator level. RTB elects a chairman for a 3-year term from nominations submitted by the nations.

Technical panels are composed of senior-level technical experts appointed by member nations. The panels have considerable autonomy and are charged with initiating, planning, and managing technical activities, subject to RTB approval, within their areas of responsibility. Each technical panel consists of up to three national members from each NATO nation. These members are nationally chosen and the majority are government representatives. In addition, members-at-large, who may be required for a specific technical expertise, may also be appointed based on a panel request or recommendation. The total membership of a panel is limited to 60, however. National panel members typically have been government senior executive personnel with extensive science and technology responsibility and authority. Panel members-at-large most often have been internationally recognized experts of high technical stature from government, academia, or industry.

Technical teams are formed by the technical panels to perform specific tasks, which include organizing and hosting symposia, expert meetings, workshops, lecture series, technical courses, and other activities. Technical team activities have clearly defined products and are limited in scope as well as duration, with 3 years being the maximum term a team may be in existence unless specifically extended by the board. Panel or board members appoint technical team members. Any significant change in activities or team membership requires board approval. At any given time, dozens of technical teams exist. Each team typically has multiple representatives from the nations coming from a variety of backgrounds and experience levels.

The *Research and Technology Agency (RTA)* provides RTO staff support. The multinational RTA staff numbers approximately 50 people. It consists of formal NATO positions and a larger number of positions that member nations voluntarily provide in an ad hoc manner. The assigned personnel may be civilian or military and either technical or administrative. RTA is led by a director selected by RTB and subject to approval by CNAD and the Military Committee in consultation with the Secretary General. The director is a full-time NATO employee.

Science and Transformation on National Level. The Center for Technology and National Security Policy was set up as an example in US in June 2001 as part of the National Defense University with the aim to study the implications of technological innovation for U.S. national security policy and military planning. The center combines scientific and technical assessments with analyses of current strategic and defense policy issues. Its major initial areas of focus include: (1) technologies and concepts that encourage and/or enable the transformation of the Armed Forces, (2) developments by defense laboratories, (3) investments in research, development, and acquisition and improvements to their processes, (4) relationships among the Department of Defense, the industrial and academic sector, and (5) social science techniques that enhance the detection and prevention of conflict. The staff is led by two senior analysts who will hold the Roosevelt Chair of National Security Policy and the Edison Chair of Science and Technology and who can call on the expertise of the university community and colleagues at institutions nationwide. The papers published in the *Defense Horizons* series present key research and analysis conducted by the center and its associate members.

The Centre for Transformation of the Bundeswehr was established in Germany, in Netherlands TNO – Defense, Safety and Security is an organization to support MoD and MoI in adopting new concepts.

The Bulgarian Academy of Sciences (BAS) is the largest national research center of Bulgaria, incorporating 67 research institutes and laboratories. It is one of the leading national institutions in the field of fundamental and applied research and technology development, including research and development for the needs of the country's security and defense.

Taking into account the exceptionally important role of national security and recognizing the importance of the preparation for NATO membership as one of the main national priorities, the Bulgarian Academy of Sciences looks for effective mechanisms to carry out national security and defense research and to support Bulgarian integration in NATO and EU.

The Framework Agreement between the Ministry of Defense (MoD) and the Bulgarian Academy of Sciences, signed in December 1999, proved to be an important driver for activating and intensifying interdepartmental collaboration in the field of research and technology applicable to Bulgarian national security and defense. In 2000 alone, on a competitive basis, project teams from the Bulgarian Academy of Sciences successfully accomplished twenty two research projects contracted by the Ministry of Defense. In addition to the continuing defense-related basic research, in 2001 scientific-engineering teams from the Academy, under contracts with the MoD, developed system- and technical requirements for modernization of the fighter aviation of the Bulgarian Air Force, designed the communications sub-system of the new Air Sovereignty System, developed and tested new materials, armor and mines, designed and implemented prototypes of systems for advanced distance learning, etc.

The Bulgarian Academy of Sciences provides for the main participation in implementing bilateral and multinational Research & Technology cooperation programs of the Bulgarian Ministry of Defense, mainly with NATO organizations and NATO member countries.

By taking into account the successful cooperation, on December 28, 2001, the Minister of Defense and the President of the Bulgarian Academy of Sciences renewed the Framework Agreement for another five years.

In its capacity as a national research institution that concentrates the basic research potential of Bulgaria, the Bulgarian Academy of Sciences has taken up the task of scientific support for formulation and implementation of national security and defense policy and planning. To this end, the Executive Board (EB) of BAS established the **“Center for National Security and Defense Research” (CNSDR)** as an organizational coordinating unit to the EB of BAS.

The principal objective of CNSDR is to provide the necessary information, coordination and support to 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 Bulgarian Armed Forces, Ministry of Defense, the Ministry of Interior, Civil Protection Agency and other security and emergency management agencies in the processes of modernization and rearmament. A set of framework agreements were signed with defense company TEREM (largest overhaul, maintenance and military equipment modernization company with several branches for Land Forces, Air Force and Navy), with Defense Staff College, Academy of Ministry of Interior and with State Agency for Civil Protection. The last agreement was supported with the establishment of the National science coordination council for

protection of population and infrastructure to support permanent government commission in this field.

Principal tasks of CNSDR are:

- To provide duly and accurately the necessary information from the users in different branches of security sector to scientific and research teams of BAS.
- To provide information for the NATO Research and Technology Organization (RTO) and to commence work on the adaptation of feasible research areas in the units of BAS involved.
- To support the establishment of goal-oriented teams and to coordinate their work on significant and important projects related to the modernization of the security sector.
- To set up and coordinate bilateral cooperation and cooperation with international organizations operating in the field of research and technology for national security and defense.
- To prepare and maintain a national database for the competence of research units, teams and scientists in corresponding scientific fields of priority for the national security and defense.
- To organize and carry out national and international scientific events on the problems of research and technology to the interest of defense.

The development of Civil Security System is a good example of the transformation effort. It is a process which requires the implementation of a specific methodology and the key is the interdisciplinary character of the issue. The experience of CNSDR-BAS in many similar projects – from White Paper on Defence through transformation of the largest defense company TEREM to the White Paper on Civil Security - has resulted in the idea to form a Center of Excellence in Security Sector Transformation (CoE in SST). The center could consist of :

1. Communication and Information Infrastructure (CII)
2. Working Groups (WG)
3. Knowledge Infrastructure (KI)
4. Expert Network (EN)

CII includes a central hub with servers and work stations linked to the Internet and distributed virtual network of workstations of the WG members. **WG** operate in the following areas: WG1 - Security Policy and Strategies; WG2- Integrated Security Sector Architecture and Change Management; WG3 - New technologies in security and defense.

KI consists of: Theoretical models in the security and security sector areas; Computer (software) models; Literature and selected publications; Accomplished projects in CoE; Produced papers. The KI is managed in a set of matrixes to establish cross reference between problems and methods to support their resolution in order easy to form strategies (networks) of steps for decision making process in resolving any security / SST problem.

One of the key elements of the CoE is the **Expert Network built around** participation in conferences, editorial boards, NATO SC panels, PfP Consortium, DCAF, CESS, and other international security related organizations and programs. Of course EN is an extension to the WG and KI themselves. One of the key elements of the EN/KI is the capability to deliver knowledge through different courses, including in ADL/CAX environment.

The development of such support for decision making and implementation of security sector transformation has proved critical especially for problems of building of architecture for network based capabilities in the area of civil security.

This is the focus of the current NATO Science for Peace Project SFP-981149 for building new capabilities in Decision Making Support for the Bulgarian Security Sector **“Operations Research Support to Force and Operations Planning in the New Security Environment”**. The project aims to provide timely and effective scientific support, drawing on existing and developing novel operations research methods and models, in order to meet current and anticipated needs of end users from defence establishments, ministries of interior, and civil protection agencies both in decision making process / change management and support of computer assisted exercises. In addition, project results will be incorporated in the curricula of Bulgaria’s Defence and Staff College and the Academy of the Ministry of the Interior.

Through this project Bulgaria will establish a Centre of Excellence in Operations Research (OR), which will be attracting promising young scientists, conducting cutting-edge research on force and security-sector transformation and network-enabled operations, and facilitating the integration within NATO’s OR community. The project networks the supplementary capabilities of several academic and research organisations from Bulgaria (the C4I Department of Institute of Parallel Processing, the C4ISR Laboratory of the Space Research Institute and the Operations Research Department of the Institute of Mathematics and Informatics – all of them from the Bulgarian Academy of Sciences, supported by many other institutes, and the Defence and Force Management Department of the Rakovsky Defence and Staff College), from Germany (Niemeyer Operations Analyses) and The Netherlands (the Operations Research and Business Management Division at TNO Defence, Security and Safety).

The best way to achieve comprehensive understanding of security and to plan the transformation of security institutions in an integrated security sector is through a multidisciplinary joint / multinational studies. The architectural approach has proved the best tool in the theory and practice of computer networks – hence, such instrument is needed for change management in the area of security and security sector. The presented project is one practical implementation of this idea to be tested further in real environment by supporting the implementation of just approved Crisis Management Law.

CNSDR has been established in order to support MoD and further security sector modernization in the process of NATO integration and it is now prepared to facilitate the participation of Bulgarian teams in the 7th Framework program of EU in the area of security, as well as to look for opportunities of collaborative research programs in security area on bilateral basis.

A further development of the security sector transformation and modernization system in Bulgaria will more and more require science and technology involvement. A closer cooperation between the National Science Fund (supporting civil and fundamental science) and CNSDR (coordinating mostly applied research required by security sector institutions with deeper integration within NATO and EU science and technology organizations) opens opportunities for Bulgarian scientists, first, better to contribute to national goals, and, at the same time, to be better integrated in international projects.

The current seminar has given an excellent opportunity to discuss issues of science policy, science programs/projects management, cooperation between different funding / planning / management institutions and establishment of effective performance measurement system for accountability of science and technology spending.