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English summary

1. This study has four aims: *first*, the new concept of preventive arms control will be developed; *second*, existing institutions, instruments and procedures will be described for the United States, the Netherlands and the Federal Republic of Germany with respect to the linkage between weapons innovation and civil research in areas that are sensitive for three arms control regimes (NPT, BWC, CWC); *third*, it will be argued whether and how military technology assessment could be introduced as an instrument of preventive arms control in the parliamentary system of the Federal Republic of Germany; and *fourth*, it will be discussed which international initiatives the Federal Republic of Germany should undertake with respect to preventive arms control in OSCE, NATO, WEU, the EU and the United Nations.

2. This study is organised in three parts: I. theoretical context (chapters 1 and 2); II. three empirical case studies on institutions, procedures and instruments regarding the weapons innovation process and arms control in the United States of America (chap. 3), the Netherlands (chap. 4) and the Federal Republic of Germany (chap. 5) and III. conclusions (chap. 6) and recommendations (chap. 7).

3. With the exception of preliminary conceptual proposals, at present neither in the political practice of the OSCE states nor in the transatlantic arms control discussions there exists any elaborated concept for the development of a preventive arms control policy. Chapter 1 attempts to contribute to such an effort. The present arms control behaviour of governments is dominated by the implementation of existing arms control treaties. At present, the area of weapons innovation is neither a topic of an operative arms control policy and of conceptual planning in the U.S., the Netherlands and the FRG, nor is the limitation of conventional arms exports. Both areas of compensation for declining defence procurement budgets have been a desideratum partly in research but primarily of existing policies.

Preventive arms control as the domestic component of an international cooperative arms control policy is to aim at political stability and crisis avoidance in the context of a cooperative and collective approach. This requires a rather intensive prior evaluation of all military research and technology concepts as well as of the civilian research procedures that are affected by existing arms control regimes based on these criteria:

- compatibility with existing arms control treaties and with the declared aims of the German Federal Government in ongoing arms control negotiations;
- compatibility with humanitarian considerations that its soldiers are not protected against special health risks;
- compatibility with the norms of humanitarian international law (e.g. with the two additional protocols to the Geneva Convention of 12 August 1949, relating to the protection of victims of international armed conflicts, and with the Convention on prohibitions or restrictions on the use of certain conventional weapons which may be deemed to be excessively injurious or to have indiscriminate effects of 1981);
- compatibility with international codes of conduct;

- cost reductions by an early cancellation of public funding for military and civilian research and development projects that may have adverse arms control consequences.

This requires an integration of procedures of self-control into the weapons innovation process, the results of which must be accessible for a detailed evaluation by the German Foreign Office, the Bundestag and its budget review by the German Federal Accounting Office. These procedures are to confront the policy-makers at an early stage with the few critical cases that should become an object of a military technology assessment which could thus become an instrument assisting in the decision-making process within Parliament.

Therefore, preventive arms control in the military sector has to address the institutions, instruments and procedures of the weapons innovation process and in the civilian sector the public funding in those gray areas that are sensitive with respect to arms control obligations and goals. However, a major precondition for such an integration of these conceptual ideas on preventive arms control is a review of the tight classification procedures that were enforced during the Cold War and a higher degree of transparency towards parliament, its citizens and the general public.

4. Technology assessment is generally understood as an effort to evaluate the social and political implications of technological developments. Technology assessment was developed as a reaction to technological determinism and the dangers of a technocracy. Initially, TA was a purely academic activity that primarily focused on the monitoring of consequences or of effects of technology for the society aiming at critical assessments, early warning systems and „counter-intelligence“ in the struggle against the technocracy. TA was based on the concepts and justifications of the neopositivist, rational-synoptic school in the area of policy analysis. Early TA-experts assumed that their critical results would be directly reflected in public decisions due to their scientific prestige. In this respect TA itself was a technocratic concept in Habermas' interpretation. In the 1970s, this school was replaced by a new approach that stressed applicable knowledge and that initially involved the clients and somewhat later other actors interested in technology in order to offer the problem definitions for TA and the inputs for the analysis. The following changes with respect to TA-approaches can be noted: originally there was an author-centred TA-type; somewhat later the client becomes more actively involved in the process of implementing a TA; and more recently several fora were created that involved the representatives of interest groups and most recently interactive TA approaches evolved.

These changes with respect to TA approaches may be interpreted as a first step towards influencing the process of technology assessment itself instead of influencing the use of new technologies and of technical systems. By supporting the interaction among scientists, producers, clients, consumers and other representatives of interest groups, interactive technology assessment aims at the development of technologies and of technical artefacts and not how technologies and artefacts are to be developed.

If an expert in military technology assessment is invited to undertake an evaluation of a military technology then the MTA-expert acts in his capacity as a political adviser. In this respect, the MTA-expert could assume three roles of: a) a policy adviser as an *analyst*, b) a policy adviser as a *policy advocate* and c) a policy adviser as a *counsellor*.

5. In the United States of America, the end of the East-West conflict resulted in a significant decrease in military expenditures while spending on military research and development in relationship with procurement has significantly increased. As a reflection of its global hegemonial role numerous institutions participate in U.S. arms control decision-making while Congress in its own decision-making can rely on the advice of four support agencies: a) the General Accounting Office (GAO), b) the Congressional Budget Office (CBO), c) the Congressional Research Service, and d) the Office of Technology Assessment (OTA) which was closed down in October 1995. We reviewed the experience with two procedures at the

point of contact between weapons innovation and arms control: a) with the Arms Control Impact Statements (ACIS) and b) with the internal arms control implementation as part of the work of the division of acquisitions in the Office of the Secretary of Defense. We recognised as a major deficit that both procedures were unrelated to the routines of the weapons acquisition process (milestone process). While the instrument of military technology assessment has been developed in the United States by OTA, nevertheless, due to the lack of interest in the U.S. Congress, so far MTA was used as a tool of a preventive arms control policy.

6. While the U.S. annually spends about 500 times as much on military research and development as the Netherlands, nevertheless this NATO country has succeeded since 1984 - partly in reaction to the critical discussions in the 1980s - to implement an arms control assessment of new research and development as well as procurement projects as an integral part of its Defence Materiel Process. Furthermore several studies by INSTEAD (the Interdisciplinary Network on Studies on Technology Assessment in Defence in the Netherlands) on behalf of NOTA, the Dutch version of OTA (e.g. on the ATBM capability of the Patriot air defence missile) came pretty close to the goal of a MTA as an instrument of preventive arms control. However, due to the decreasing interest in the Dutch parliament these first attempts remained without any major political impact.

7. At present, the Federal Republic of Germany spends about one fortieth of the U.S. expenditure for military R&D. However, since German unification, a similar trend can be observed as the one for the U.S.: the relative portion of military R&D expenditure compared with procurement spending has increased significantly. In addition, civilian research spending in those gray areas affected by the Nonproliferation Treaty, the Biological Weapons Convention and the Chemical Weapons Convention must also be taken into account. In the German Ministry of Defence no reference could be found that new military R&D and procurement projects are presently being reviewed with respect to their arms control implications as an integral component of the Phased Armaments Programming System. In comparison with the United States, no formalised process of arms control impact analysis of technology development and weapons procurement as an integral part of required procedures for the implementation of arms control treaties exists. At present, an arms control evaluation of civilian research projects in areas that are sensitive to existing arms control regimes (e.g. the decision of the Federal Scientific Council (Wissenschaftsrat) on the planned research reactor FRM-II in Garching relying on highly enriched uranium) only takes place in reaction to specific requests from Parliament. However, it is no constituent element of a required internal interdepartmental review process. Both in the executive and in the legislative branches of government no interministerial or inter-committee procedures exist with respect to the arms control compatibility of new military and non-military research projects that are sensitive to arms control obligations. Presently, in the Federal Republic of Germany no scientific analyses exist on military (defence) technology assessment as an instrument of a preventive arms control policy concept. Furthermore, the independent scientific capability for conducting such an undertaking is rather limited.

8. In all three countries that were reviewed for this study at present no procedures exist that require an arms control impact analysis, comparable with the environmental impact statements, as an integral part of the phased weapons innovation and procurement processes, i.e. so far arms control considerations hardly play a major role in the weapons innovation process. In the United States, the arms control impact statements that were required by law from 1976 to 1993 were primarily an instrument used by the U.S. Congress to obtain information during the budget process. This law required that the defence and the energy departments had to make sensitive information on new weapons developments available to

the U.S. Arms Control and Disarmament Agency which forwarded this information with an interdepartmentally cleared analysis to the U.S. Congress.

However, this instrument was completely detached from the phased milestone process and it did not have any direct repercussions on the weapons innovation and procurement process. So far, only the U.S. and the Netherlands acquired a limited experience with the instrument of military technology assessment, while in the Federal Republic of Germany, this TAB-project on control criteria on armaments can be seen as a first pre-stage that may lead to MTAs in potential follow-on projects. From this we conclude that evaluations from an arms control perspective should become a part of the formal decision making process. If the Members of Parliament are confronted with separate evaluations of the military, industrial and arms control aspects of a specific weapon or technology it remains unclear how these different aspects will be balanced. There are several solutions to this problem. According to a first solution the responsible Parliamentary body bases its decision on a range of different perspectives. It may even be better if several actors with different perspectives could present their views in a Parliamentary hearing. However, in order to avoid conflicts of interest, MTA analyses should only be carried out by authors and institutions that are completely detached from the Defence Ministry but who will be given full access to classified material. The authors of MTA-analyses, acting as counsellors, produce such analyses as part of an analytic process in which several policy perspectives are represented in order to do justice to the different perspectives. Even if the participants in such a process do not reach a final consensus, such an interactive MTA-process in which representatives of industry, technology experts, arms control specialists and military officers take part would nevertheless be helpful, especially if controversial aspects would lead to divergent political decisions.

9. The fifty detailed proposals of this study are aimed at integrating the concept of preventive arms control within the executive as guiding principles on the one hand into existing procedures of the weapons innovation process in the Ministry of Defence and on the other hand into the distribution of research funding by the Ministry of Education, Science, Research and Technology and other funding agencies, such as the German Research Society (DFG) or the Federal Scientific Council (Wissenschaftsrat). The proposed Arms Control Compatibility Assessments (ACCA) should then be evaluated by the disarmament division of the Foreign Office. However, the evaluation of projects in the area of nuclear physics, biology, genetic engineering, chemistry and pharmacology requires a competence that is usually not available in any foreign service. This competence could be acquired either by rotating scientists from research institutes and universities to the desk in the Foreign Office that would be responsible for these evaluations either for a few years, on an ad-hoc basis, or by contracting this task to a few highly qualified scientists. These Arms Control Evaluations (ACE) of the Foreign Office along with the Arms Control Compatibility Assessments of the Defence and Technology Ministries should then be forwarded to the Foreign Relations Committee as part of the annual disarmament report by February each year. This report should then be reviewed by an independent Arms Control Advisory Panel of the Subcommittee on Disarmament and Arms Control. In controversial cases the Subcommittee should request a military technology assessment through the Committee on Education, Science, Research and Technology and Technology Assessment. The resulting MTA should be reviewed a year later by all shareholders as part of an interactive MTA during a Parliamentary hearing.

10. Three groups of political initiatives for a preventive arms control policy in the international realm are being recommended in this study:

- *Arms Control Compatibility Assessments* - as well as the right of access of the Federal Accounting Office - should become a component of all Memoranda of Understanding pertaining to international military research, development and procurement projects.

- The *integration of the concept of preventive arms control* into the existing foreign, arms control and military consultative processes in NATO, the WEU, the CFSP and in the OSCE should be considered.
- Furthermore, *policy initiatives should be developed with the goal to introduce considerations of a preventive arms control concept as a confidence building measure* into existing international reporting mechanisms (e.g. BWC) and to create additional reporting requirements where they are presently missing (e.g. NPT-regime, CWC).

In Art. 2 of the Treaty on the Final Settlement With Respect to Germany, both German states prior to unification have stressed „that only peace will emanate from German soil“. Based on Germany's historical obligation, the Federal Republic of Germany should document its new responsibility by thinking ahead conceptually in the area of confidence building, arms control and disarmament as well as conflict avoidance and peace-building. One step in this direction could be the development of a concept of preventive arms control and the establishment of institutions, procedures and instruments both in the national and in the international realm for its realisation and implementation.