STUDIES ON MILITARY R&D AND WEAPONS DEVELOPMENT

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The material which follows comprises the major portion of a book-length study prepared in 1984 for the Ministry of Foreign Affairs of Sweden. It was written as a background study for a report that was to have been released by the Office of the United Nations Secretary-General in 1984 or 1985 on "Military Research and Development". However, that report was never released because of disagreements, which are explained below, between the US and the Soviet members of an empanelled UN experts group. All the material included here is presented as it was originally written in 1984. It has not been updated or revised in any way.

The study of some 450 pages includes an Introduction on the role of scientific research in weapon development, four case studies, and a concluding summary chapter, which introduces arms-control issues.

The four case studies are:

1. The History of the Development of United States Anti-Satellite Weapons Systems (ASAT);
2. Weather Modification: The Evolution of an R&D Program into a Weapon System
3. The Origins of Multiple Independent Re-entry Vehicles (MIRVs) for ICBMs and SLBMs
4. Research and Development in (C)BW: "Basic" versus "Applied" Research, "Civil" versus "Military," and "Offensive" versus "Defensive"

<u>The Introductory Chapter: The Relation of Scientific Research to Weapons Development – Text and Extensive Tables</u>

The purpose of the opening chapter is to explain exactly what Military R&D is and how it works.

Weapon development, and the basic and applied R&D on which it is based, is not an autonomous process. It is a cultivated, organized, goal-oriented, purposeful process managed by government agencies. Particularly in the area of weapons development and procurement decisions, there seems to be extremely little, if any, "technological imperative." Military R&D – the activity and the knowledge and technological products that it produces – are a result of prior government decisions and expenditures whose purpose it was to produce that knowledge and those technological products. Military R&D was therefore not the *cause* of the arms competition between the US and the USSR, or any other "arms race." Neither can its product, the weapon systems, divorced from the decisions to develop and procure them, be properly understood as a

cause. They were produced by an enormous enterprise consciously established by political decision to produce them. The extensive tables that accompany the opening chapter demonstrate the scope and functioning of that enterprise. The resulting weapons are neither an accident nor a mistake – in the sense that no one asked for them. The weapon capabilities produced by the R&D process may drastically exacerbate the political climate, and they may do so in a step function if the weapon developed is dangerous enough. But the decision to procure the system is always a political one, and the R&D that produced the weapon was mandated in the first place by either political or military officials.

Basic and applied scientific research has contributed to producing every piece of military hardware that exists. Whether it is an ICBM or an aircraft, or any other weapon or piece of support equipment, every system and subsystem that one can enumerate is the product of a concerted research effort: the metal alloys, the fuels, the radar, the micro-electronics, the guidance equipment, the sensors, the satellites, the countermeasures, the (knowledge of) aerodynamic, geodetic, climatic effects, and so on. The knowledge and the products do not appear in a random environment or in a policy and management vacuum. Military R&D is guided and directed: questions are put, particular materials, effects, performance capabilities are sought, and research funding is allocated accordingly.

It is the purpose of the opening chapter and the accompanying tables to demonstrate this. The tables are organized into five groups as follows:

Group I: What one is looking for in military R&D; the capabilities and applications – and some indications of the process.

Group II: Where does one look; the funding of research in the basic sciences (the subsequent phases of "D.T. & E" of R&D are not dealt with here).

Group III: How does one organize the search; the "in-house" laboratories of the US military services are used by way of example (although at the time of writing less than one-third of US military R&D expenditure was allocated to these institutions and nearly two –thirds was expended by contracting to private industry.)

Group IV: How does the process work: examples of nine weapon-development histories of US weapon systems are given, as well as some examples of parallels in US and USSR weapon development.

Group V: What is the result: the weapons. Because the four case studies and the greater part of all the tables in Groups I – IV are derived from United States examples, the examples of final weapons systems were given by those of the USSR. The essentials of the R&D process, if not of its management structures, must be basically the same; the laws of nature and the methods of science make that a certainty.

The Case Studies

The first study, a history of the development of US anti-satellite systems, concerns more complex technological systems than are dealt with in the other studies. ASAT, and the related early programs which surrounded it, made far greater demands on coordinated research and was significantly more costly. The study also deals with the political determinants of the development of the system, and of direct US/USSR interactions and negotiations that affected the development process. The USSR's ASAT development program is also described up to 1984.

The second study is concerned with weather modification. The discovery of the phenomenon occurred during WWII, and its use as a weapon in war took place twenty years later during US military operations in Indochina in the 1960s and 1970s. The military use of weather modification probably came as a total surprise to the scientific, military and international political communities. The disclosure of its use also led almost immediately to negotiations for its control as a weapon of war. The focus of the study is on the question of control – or lack of control – in the development of weather modification from its discovery during WWII to its use in the Indochina theater of war.

The third study, The Origins of MIRV, seeks to isolate the reasons for which MIRVs were developed and to assess the degree for which "technological imperative" did or did not play a role.

The fourth study, on R&D primarily in the area of biological weapons, is an attempt to probe the relation of R&D to arms control and disarmament agreements and the problems of verification in conjunction with such agreements or of confidence assessments in the absence of verification. It is also a more or less unique attempt to deal with the problem of distinguishing between three pairs of opposed terms used to describe research: basic versus applied, civil versus military, offensive versus defensive. In addition, it was possible to examine a historical example of conversion of military R&D facilities in this study.

As indicated, the central focus of each of the studies is somewhat different, but all have – in addition to the involvement of military R&D questions – two important considerations in common:

- Arms control has had an impact on weapon-development processes in three of the cases (weather modification, BW and ASAT).

- Two are categorized as weapons of mass destruction or the equivalent (BW and weather modification) and at least in its earlier years, ASAT involved nuclear weapons, either in the ASAT and possibly in its presumptive target. MIRVs, of course, concern nuclear-weapons delivery systems.

These are therefore not typical conventional weapon systems.

None of these systems represent weapons basic to all military forces, such as tanks, planes, ships, and missiles, all of which involve successive generational replacement. The lessons that will be learned from these case studies can be expected to be unrepresentative of those that might obtain regarding the more "conventional" categories of weapons. The relations of R&D to the weapons development process, however, may not differ significantly, as demonstrated in the long opening chapter.

All of the case studies are very much, if not primarily, concerned with the development *process* of the weapon systems, and the decisions taken during that process. The case studies are not focused on the research per se (except in the study on BW); that is dealt with in the opening chapter.

Why this Study was Written

Every two or three years between the early 1960s and the 1980s, the Office of the United Nations Secretary-General released reports dealing with various aspects of arms control and disarmament. The subjects of these reports were suggested by individual UN Member States. The Office of the Secretary-General would select a panel of ten or twelve specialists from UN member states on opposite sides of the Cold War and from neutral states, these served as The Experts Group for the study. Representatives of the US and USSR were invariably included among the Expert Group members selected for these studies. However the Secretary-General would also appoint a small staff of two experts who were responsible for drafting the reports. Early in 1983, Sweden suggested that the Secretary-General issue a report on Military Research and Development. The proposal was approved by the UN on April 14, 1983.[1]

It was the responsibility of the country that had made the suggestion for the study to supply background materials for the Expert Group and for the drafters of the report. The Swedish Ministry of Foreign Affairs therefore commissioned ten studies as support for the

[1] UN Resolution 37/99J, April 14, 1983.

Experts Group. This study of ~450 pages was one of the ten, and was produced when I was a Visiting Research Associate at the Swedish Institute of International Affairs in Stockholm. The other nine studies were much smaller, ranging from five to 83 pages in length, and all were all prepared in 1984.[2]

The first draft report of 269 pages in length was prepared for the UN Group of Experts on Military R&D by February 13, 1984. The senior drafter was British, his deputy was from West Germany, and both were well known researchers. A second draft, much reduced to 163 pages, was ready by July 1, 1984. However, the Soviet member of the Experts Group would not agree to certain sections of the study, and due to the deadlock by December 1984 the mandate of the Expert Group had to be extended into 1985. In essence, the Soviet expert demanded further excisions which the US representative was not willing to accept. The information that the Soviet expert insisted be removed was all in the public domain, but referred to the USSR. It was not the only instance in those years of examples in an arms control context in which Soviet delegates demanded a "USSR–free" text of one or another report or study.[3] The Soviet and the

[2] I was able to present a much larger work because portions of it had already been written. As early as 1970, for the Tenth Pugwash Symposium on the "Impact of New Technologies in the Arms Race," I had prepared a group of tables titled Information re Control of Military Research and Development. In the same year, 1970, an early draft of the CBW R&D case study was presented at the Tenth International Microbiology Congress in Mexico City (Milton Leitenberg, "Research and Development in Chemical and Biological Warfare," Background Paper for the Tenth International Microbiology Congress, Mexico City, August 7-14, 1970). Between 1970 and 1976, I published several relevant papers (Milton Leitenberg, "World Armaments: The World's Arms Race," *Encyclopedia della Scienza e della tecnica*, 1970, pp. 208-223; Milton Leitenberg, "The Classic Scientific Ethic and Strategic Weapon Development," *Impact of Science on Society*, 21:2 (May 1971): 123-136; Milton Leitenberg, "International Level of Funding for Military Research and Development," UNESCO, International Symposium on Targets for Scientific and Technological Development for the United Nations Second Development Decade, Baden/Vienna, May 23-25, 1972; Milton Leitenberg, "The Dynamics of Military Technology Today," *International Social Science Journal*, 25:4 (Fall 1973): 336-357; and "The Conversion Potential of Military Research and Development Expenditures," *Bulletin of Peace Proposals* 5:1 (1974): 73-87. [The paper was also reprinted in a German book in 1974.]) The case study on Weather Modification was published in 1976 in a Pugwash volume as well as in a US Senate Hearing (Milton Leitenberg, "Problems of Environmental Warfare: Weather and Climate Modification, the Evolution of an R&D Program into a Weapon System," *Proceedings of the 25th Pugwash Conference on Science and World Affairs*, January 1976, pp. 459-472; Reprinted an *Prohibiting Hostile Use of Environmental Modification Techniques*, Committee on Foreign Relations, US Senate, 1976, pp. 34-44). The case study dealing with the history of the US ASAT program, had initially been written in 1978-1979 while I was at Cornell University and only needed to be updated. It was later published in Germany in a volume of my selected studies (Milton Leitenberg, *Rüstung und Sicherheitspolitik*, Baden-Baden: Nomos Verlag, 1987).

[3] A notorious example was a special issue of the *UNESCO Courier* [23:10 (November 1970), pp. 4-15], which featured a summary of the second *SIPRI Yearbook of World Armaments and Disarmament, 1969-70*. The *UNESCO Courier* was published in five languages, including Russian, under an agreement whereby the translated editions were forbidden to make any alterations whatsoever in the published text. The SIPRI Yearbook summary was essentially a review of the global "arms race." The *UNESCO Courier* article appeared under the name of Philip Noel-Baker, a holder of the Nobel Peace Prize and the Lenin Peace Prize. Nevertheless, for the Russian translation, Soviet officials excised every reference to the USSR, even complimentary ones. In one table, which had included financial data for the USSR, the line

US expert each held fast to their positions, and therefore agreement under the UN conditions of absolute consensus was never reached, and the study was never publicly released.

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was removed, but the remaining sums were left intact, making it readily obvious that an excision had been made from the original.

A second example was a background paper prepared by the author for a UNESCO Symposium on The Media and Disarmament, held in Nairobi, Kenya, in April 1983. The background paper was titled "Problems of the Reliability of Armament and Security Information," and included a section which discussed the routine misreporting of Soviet military expenditure by Soviet officials. The Soviet delegate to the UNESCO meeting demanded that the background paper be withdrawn, or, under UN consensus, the USSR would not allow the meeting to be convened. It took a day of negotiations before the Yugoslav delegation (which of course was favorable to the content of the background paper) fashioned a compromise under which the UNESCO meeting could proceed. The designation of "background paper" was removed.