PROSPECTS AND LIMITS OF TRANSATLANTIC ARMS COOPERATION IN EXTENDED AIR DEFENSE: THE CASE OF MEADS

Joachim Krause

The American Institute for Contemporary German Studies

The Johns Hopkins University

AICGS POLICY REPORT #2

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CONTENTS

FOREWORD

As we enter the second decade of the post-cold war period, the future of transatlantic defense cooperation appears increasingly uncertain.

Although the North Atlantic Treaty Organization is due to expand its ranks eastward, the role of the alliance in meeting the security challenges of a new century is unclear. Post 9/11 shifts in U.S. strategy and policy, a sustained and widening military capabilities gap between the United States and Europe, and the unwieldy size of a burgeoning NATO raise questions about the function of NATO in a fundamentally changed global geostrategic environment. The need for alliance interoperability—long touted by proponents of transatlantic armaments cooperation—is called into question as well by the United States' military preponderance and demonstrated ability to undertake military operations independently.

Yet, the history of transatlantic defense cooperation has never been easy. Throughout the cold war, both the United States and Europe embarked on a variety of cooperative defense projects, some of significant scale, others of relatively modest scope. Despite periodic success stories, the impediments to effective U.S.-European defense industrial cooperation have always been formidable. Efforts to pursue and sustain cooperative arms projects across the Atlantic nevertheless have persisted.

Despite the attendant complications, there are significant incentives to seek cooperative transatlantic armaments solutions. The need to sustain interoperability both within Europe and across the Atlantic continues to provide strong motivation for cooperative ventures. Additionally, the processes and pressures of globalization are creating an ever more integrated market for defense technologies. Budgetary pressures, particularly in Europe, create yet further incentives for developing and producing modern weapons systems in partnership, either with other European countries or with the United States.

The conflicting pressures attending transatlantic armaments cooperation are demonstrated clearly in the history of the "Medium Extended Air Defense System" (MEADS), which Dr. Joachim Krause skillfully chronicles in the following study. In this comprehensive analysis of the MEADS project, Krause offers a systematic assessment of the systems merits and futures, concluding that the system remains a "sound

and reasonable" cooperative alterative, though one with an uncertain future. Choices regarding MEADS and other cooperative ventures, Krause notes, will have important consequences for the ability of NATO or perhaps the European Union to undertake military operations appropriate to the threats of the "post-post-cold war world" and thus far-reaching implications for transatlantic relations more generally.

This report is part of the Institute's broader research program on the "Changing Agendas and New Challenges of German Foreign and Security Policy." We hope that this study will contribute to the continuing German and transatlantic discussion about defense and armaments cooperation across the Atlantic in the coming decades and in a changing world.

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October 2002

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INTRODUCTION

Transatlantic armaments cooperation has been a constant theme of western security policy for many decades. There have been, and still are, repeated initiatives aimed at getting the United States and the Europeans to work together on the definition, research, development, and production of modern weapons systems in order to save costs and enhance interoperability within the Atlantic Alliance. However, most of these initiatives have failed, and each time for the same reasons:

- First, these initiatives have had to contend with the philosophy, especially prevalent in the United States, of the national industrial base, i.e. the belief that national armed forces in their choice of equipment – and of critical weapons systems, in particular – ought to rely only on nationally produced goods, and never on foreign suppliers. This is particularly pronounced in the United States due to the many international commitments of the U.S. armed forces. Cooperative projects are, therefore, invariably subject to substantial pressure.
- Second, there are serious reservations in the United States when it comes to arms cooperative projects involving the transfer of sensitive technologies. Allies are not always trusted to safeguard such technologies in the same way the United States does.[1] This lack of trust reveals the asymmetry in size and capabilities of the U.S. defense industry, on the one hand, and those in the individual European states, on the other. The U.S. side has tended to be been more technologically advanced than its European counterparts, and it often has been difficult to demonstrate the mutual benefit of extensive cooperative projects.
- Third, the armaments market is a popular playing field for all kinds of protectionism. The arms market is one of the few sectoral markets exempted from worldwide trade liberalization (even within the EU). U.S. corporations have almost complete domination of the North American market, while also controlling a large part of the European market, and they frequently have been able to at least agree on denying their European competitors' access to the fiercely contested U.S. market. Through extensive lobbying, this has led to a strong protectionist attitude in Congress. Even European governments and parliaments have not been immune to protectionist

temptations, given the superiority of the U.S. arms industry. These tendencies have made transatlantic cooperative projects difficult.

- Fourth, transatlantic cooperative projects have always been susceptible to the influence of politics. In Congress, support for such projects has repeatedly been linked to demand for larger defense spending by the Allies,[2] while European states prefer to tie arms cooperation to other political issues (e.g. arms export controls on the part of Germany, demands for more transatlantic equality on the part of France, etc.).
- Fifth, international cooperative arms projects – be they transatlantic or intra-European – have always been associated with practical and organizational problems arising out of the need to harmonize different national concepts of security and to cooperate across national boundaries. Even with no serious impediments on the political or management side, arms projects can still be overloaded with too many requirements, with costs of cooperation so high as to outweigh potential savings.[3] Problems also frequently arise because of procedural differences when seeking political approval (particularly during the phase of parliamentary ratification).
- Sixth, a certain asymmetry in interests is noted. The Europeans have a much greater interest in ensuring savings through cooperative projects than does the United States. The primary purpose of cooperative projects is to share development and manufacturing costs in order to arrive at justifiable unit costs. In view of the limited national defense budgets in Europe, the need for cooperative projects is greater there than in the United States, where the defense budget is comparatively large and U.S. procurement orders often secure sufficiently large quantities for their investment.

Currently the most important transatlantic cooperative project in the armaments area, alongside the U.S.-British Joint Strike Fighter (JSF), is the MEADS program. MEADS is a project for the development and production of a Medium Extended Air Defense System, intended primarily to replace the Hawk anti-aircraft (surface-to-air) missile (SAM) systems of the 1960s. MEADS is to offer the capability to counter not just "conventional" targets of air defense – fighter planes and other military aircraft

– but also other aerodynamic objects such as cruise missiles, unmanned, air-breathing vehicles, and air-to-surface missiles, as well as medium-range tactical ballistic missiles. The MEADS program was agreed upon in 1995 as a quadrilateral project involving the United States, France, Germany, and Italy. Although France withdrew from the program a year later, the three other partners have continued to work on it ever since.

The project has made promising progress so far but also has come under repeated criticism in both the United States and in Europe and, as a result, has teetered on the verge of collapse. For some time it looked as if the problems were mainly in the United States, but since the end of 2000 the project has come under fire in Germany, where it is being called into question for completely different, often conflicting reasons and faces the threat of failure. The arguments of the Germans against continuing the MEADS project are the following:

- MEADS, just like other ground-based air defense systems, makes no sense militarily. In view of expected developments in air warfare, land-based air defense is superfluous. The future belongs to air power and its highly modern weapons.
- The technologies used in the MEADS project are outdated and cannot meet the changed demands of the early twenty-first century, although a need for a new air defense system exists.
- MEADS is too expensive; Germany cannot afford such a system.
- The project is just a pretext for the United States to sell its missile defense technology to the Europeans and, as such, will not be in a position to secure strategic defense for the Federal Republic of Germany.
- MEADS is harmful from the point of view of arms control.

The MEADS project could become a further example of failed transatlantic arms cooperation – with serious consequences for transatlantic relations and for the operational capability of the *Bundeswehr* during deployments outside Germany. Due to the way in which this issue is dealt with politically in Germany, this project, originally regarded as fail proof, is today at risk.

The purpose of this study is to contribute to a more nuanced and balanced assessment of this project and, above all, to address the future strategic

implications and weigh the arguments for and against the project. It will give a factual account of the MEADS project as it stands now, its history, and the technical parameters. It will put special emphasis on the project's strategic rationale. Do we need MEADS, and if this is the case, do we need it as a transatlantic endeavor, or are national or European alternatives more promising?

The approach taken is as follows: Part I describes the fairly checkered history of the MEADS project to date. Part II deals with the technical aspects and the likely financial implications of the project. Part III addresses the question of the strategic reasons for MEADS. This section also deals with the broader background of the current strategic debate (*Bundeswehr* reform, risk analyses, regional security, proliferation of weapons of mass destruction and missiles, issue of international political order, etc.), as well as translating the requirements into armed forces goals for NATO and the EU. Possible alternatives to MEADS are also discussed. In addition, Part III gives an assessment of MEADS from the point of view of transatlantic cooperation. Questions here include to what extent MEADS differs from earlier experiences, whether there have been positive developments, or how far the pessimistic expectations from previous transatlantic cooperative projects have been confirmed. Wherever possible, technical details and background information are explained in the appendices.

The study comes to the following conclusions:

The launch of the MEADS project as a U.S.-European cooperative project was sound and reasonable and will remain so. Strategic considerations, issues of Alliance policy, as well as economic considerations speak in favor of this project:

- In line with the proclaimed willingness of the German Red-Green coalition government to participate, even with military means, in international cooperative peace support operations, and in light of the *Bundeswehr* reform it has initiated, the government would be well advised to continue the MEADS project. If not, a gap would be created in the protection of German (and cooperating foreign) soldiers, which, under certain circumstances, can have major negative strategic implications.

- Pursuing the cooperative transatlantic MEADS project further also makes sense for the simple reason that it is extremely important, particularly in the area of air defense, that the same systems are used within the Alliance – nowhere else are systems interoperability and comparability as essential as in the field of extended air defense.
- There are no alternatives in the foreseeable future to continuing the MEADS project. A European option of joining the French-Italian FSAM project would be too expensive and time-consuming. Abandoning MEADS and purchasing PAC-3 alone would be risky, both strategically and for the purposes of alliance policy. The option of a homegrown German new-generation air defense system (LVSystNG) is political fiction and would be neither financially feasible nor politically defensible within the Alliance.

The success of MEADS is uncertain because the project is saddled with exactly those problems that have repeatedly hindered cooperative arms projects on both sides of the Atlantic. These include latent protectionism, the difficulties of designing common requirements for procurement plans and, once these are achieved, of fending them off against national reservations, and the considerable problems of integrating international cooperative arms projects into national procurement plans.

One special feature in the German case is the serious budgetary situation. The federal state's financial condition is unsettling and the defense budget is regarded as chronically underfunded. Despite former Defense Minister Scharping's assertions to the contrary, all experts – including the general inspector of the *Bundeswehr*, General Kujat – believe that the financing of the *Bundeswehr* reform is not guaranteed within the current budget limits and that considerably more funds would be needed for the procurement of new weapons systems. The heated debate of a year ago can be attributed to this desolate financial situation and the MEADS project could fall victim to this shortage. Although MEADS will not be cheap, rejecting the project for economic reasons would lead to a situation where both the Red-Green coalition's policy of participating in international peace support operations and *Bundeswehr* reform would be doomed to failure.

A withdrawal from MEADS would be a disaster from the perspective of the Alliance and would do serious harm to German security and defense policy.

Too much political capital has been invested, and for those in the federal government who want Germany to be a reliable and secure partner in international peace support operations, the consequences could be too negative in the end. This is not to argue that it would be futile to subject the technological and strategic fundamentals to a critical review, but that such an analysis ought to take place within the framework of MEADS and not with a view to some fictional new project whose contours are more than blurred and which in no way promises to be cheaper.

I. MEADS – A CHECKERED HISTORY

1. From integrated air defense to extended integrated air defense

The history of MEADS is replete with misunderstandings. One main misunderstanding is that MEADS is a system designed solely for missile defense. In fact, MEADS fits more conveniently into what is referred to as "extended air defense." What this means is that, above and beyond the traditional goal of combating enemy aircraft, the system is also intended to identify and counter ballistic missiles as well as other aerodynamic objects such as cruise missiles, unmanned aerial vehicles (UAVs), air-to-surface missiles, and even helicopters.

One particular feature of NATO air defense is that since the beginning of the 1960s it has been carried out for continental Europe under the joint responsibility of NATO. While the national air forces and armies are responsible for conducting air defense, the responsibility for command and control in peacetime and in times of war lies in the hands of NATO, which places extremely high demands on interoperability and on the integration of individual systems. During the cold war, air defense was the first – and possibly decisive – line of defense, as an attack by the Warsaw Pact would in all likelihood have begun with a major air attack, which would have had to be countered by defensive and offensive means.

Back then a central element in the integrated air defense was the densely layered air defense system of Hawk (medium-range) and Nike Hercules (long-range) missiles. The main burden of air defense for the upper tier (i.e. targets at an altitude and at a distance of more than six miles) lay on the Nike Hercules missile systems, whereas the Hawk system was used for the medium range (below six miles in altitude). Nike Hercules was introduced in the 1950s,

Hawk in the 1960s. In the lower-range band, various air defense systems (such as Roland and Gepard) were used. Besides that, combat aircraft like the Phantom were also assigned to help secure air superiority in NATO airspace and were thus as much an integral part of air defense as AWACS planes and the other elements of the battle management system. In addition, there was a strong air-based counteroffensive element, designed to disrupt Warsaw Pact troops in their advance and to establish air superiority as far eastward as possible. In the context of overall modernization efforts, mixed deployment zones (so-called clusters) were introduced for anti-aircraft missiles. In the late 1980s, NATO's air defense was organized along the conflict line, as shown in Appendix 1.

Since the time of the cold war, NATO's traditional air defense was designed exclusively to defend against aircraft. At the time, the main priority was to be prepared for a major attack by the Warsaw Pact, which would begin with a massive air strike.[4] The main parameters, therefore, were the size and quality of the Western systems and space coverage. Already in the early 1980s, however, there was talk about the need for an extended air defense.

The modernization of air defense in the medium and upper layers began with the introduction of the U.S. Patriot missile system in the 1980s, aimed primarily at replacing the Nike Hercules missiles. In addition, the Hawk batteries were due for replacement, and consideration was given to a successor medium-range system in several countries. In Europe, between 1979 and 1981, the German, French and British defense ministries produced a joint study on the design of a future medium-range air missile defense system, which concluded that such a system, encompassing a multi-mode radar as well as missile guidance through phased-array radars (for optimum missile tracking) was necessary.[5]

On the basis of this study, in the mid-1980s, France and Italy began to develop a whole "family" of guided missiles for medium-range air defense (*famille sol air future*, FSAF).[6] Germany, which had originally played a big part in shaping the study, pulled out of this planning stage in 1982, giving initial priority to the development of the Eurofighter. It was not until 1987 that the German government agreed on a requirement for a tactical air defense system (*Taktisches Luftverteidigungssystem,* TLVS), which drew from the concepts of the 1981 study while at the same time, (and against the background of the

Reagan administration's call for a missile defense capability as part of the Strategic Defense Initiative, SDI), was also to have a capability to defend against tactical ballistic missiles. A design for such a system was also developed in the United States in the late 1980s (CorpsSAM), a system that closely paralleled the German TLVS design.

The issue of missile defense capability was already a point of contention in the late 1980s. There were increasing calls in the United States for new anti-aircraft and missile defense systems also capable of countering tactical missiles,[7] and although the German defense minister at the time, Manfred Wörner, supported this goal, the French government was skeptical and concentrated its efforts on the FSAF systems, which only provided for an enhanced defense capability against aircraft, cruise missiles, air-to-surface missiles, anti-ship missiles, and unmanned aircraft.

The 1991 Gulf War and the use of Iraqi missiles against the United States and its allies spurred growing U.S. interest in air defense systems that could defend against missiles, particularly through the use of hit-to-kill technology derived from the SDI program. A series of projects were launched in 1991 aimed at enhancing the modest missile defense capability of the PAC-2 systems, laying the foundation for a more comprehensive air defense strategy. By 1995 the Clinton administration introduced three categories of programs to enhance missile defense capability with differing priorities:[8]

- There were to be programs which – based on the experience of the Gulf War – would facilitate *short-term improvements* in the missile defense capability of existing systems like PAC-2. These included programs designed to enhance the probability of target detection and the accuracy of the weapons as well as improving the capability to distinguish between warheads and fragments of splintered missiles. The most important program was the PAC-2 Quick Response Program (QRP), which, among other things, provided for improvements in the radar system and the seeker, as well as for new developments in the direction of a multi-mode tracking mechanism for the PAC-2 guided missile.
- There were also to be *core programs* for a future U.S. missile defense, to which high priority was attached. These included the Patriot Advanced Capability-3 project (PAC-3), the Theater High Altitude Air Defense

System (THAAD), and the Navy Theater Wide Area Defense project (AEGIS/Standard Missile Block IVA).

- In addition, *future programs* were to be introduced, but with a lower-priority rating and aimed at the medium term. These were intended to either incorporate new technologies, such as the Airborne Laser (ABL) system, or replace existing systems or even systems that are just being introduced (such as the CorpsSam program, which was designed to secure for the U.S. Army and Marine Corps a flexible form of defense at the corps level).

2. The early stages of the MEADS project

As regards the group of future oriented programs, there was significant overlap between the American ideas of creating an air defense system with missile defense at the corps level (CorpsSam) and the German concept for a tactical air defense system (TLVS). This was also due to the fact that U.S. and German firms had already been working together during the initiation phase for the development of an air defense concept. It therefore came as no surprise when, in 1994, the Clinton administration invited the German government to take part in a cooperative project in this area. This venture had the potential of saving money on both sides and set a good example of transatlantic cooperation.

Driven above all by then Under Secretary of Defense for Acquisitions and Technology John Deutch, the offer to the German government also had two political goals. On the one hand, the Pentagon wanted to send a signal proving the willingness of the Clinton administration to expand transatlantic arms cooperation. Proper attention was paid on selecting an armaments sector that did not figure prominently among the central procurement projects in order to reduce the likelihood of stirring up protectionist forces. On the other hand, the U.S. administration wanted to prevent German-French cooperation in this area because of worries in the Pentagon about the German government getting too involved in France's plans, which emphasized more the European and less the transatlantic dimension of defense policy.

After some hesitation, the German government agreed to participate and asked, with one eye on France, that the program be multilateralized. Indeed, France and Italy agreed to join the program. Both countries had already been collaborating since the mid-1980s on the development of a successor to the

Hawk system under the FSAF programs. On the German side, the then Under Secretary of Defense, Jörg Schönbohm, was strongly supportive of this project, which was to mark a fresh start for transatlantic arms cooperation. The German government, as well as the two other European partners, were operating on the assumption that certain principles would have to be observed, including:

- the existence of adequate joint operational requirements for the system;
- agreement that the cooperative program would have to begin in the definition phase and lead through to joint procurement;
- guaranteed funding over many years;
- equal, balanced partnership without dominance;
- solid and competitive transatlantic industrial structures;
- unhindered technology transfer in both directions; and
- a fair division of labor.

Having agreed in late 1994 that their work should be governed by these principles and that the envisioned project of a medium-range air defense system was best suited for a successful transatlantic project, in February 1995 all four governments involved signed a Statement of Intent on the joint development and production of a Medium Extended Air Defense System (MEADS).[9]

3. The formative stages of the MEADS project

The following year, key agreements for the start of the program were reached and laid down in a Memorandum of Understanding (MOU).[10] This document was signed on May 28, 1996 on the European side by Germany and Italy only, France having already withdrawn. The MOU provided for a competitive Project Definition and Validation (PD/V) phase, followed by a Design and Development (D&D) phase. The research and development costs were to be borne by the U.S., German, and Italian governments according to a specific formula: the United States would pay 60 percent of the total, Germany 25 percent, and Italy the remaining 15 percent.[11] The idea was to create a completely new system, which – while building on preceding models – would consist of a new guided missile, a significantly improved multi-mode radar relative to the Patriot, and smaller launchers that would be easily transportable. The project was to be completed in 2007,

when the production phase was scheduled to begin – provided the project met all expectations.

France had withdrawn from the program because the defense ministry's six-year plan (*loi de programmation*) did not provide any funding for it, and, probably because there were doubts about the seriousness of the United States about the idea of an equal partnership. The American offer to collaborate on MEADS was interpreted as an attempt to keep the Europeans from taking part in the further development of the FSAF programs running under French guidance (SAMP-T and SAMP-N).[12] Moreover, Paris did not see any acute need for missile defense, but, rather, saw a need to cover traditional air threats from aircraft and from cruise missiles, especially at sea. The French government was critical about the whole concept of missile defense and, for political reasons, did not want to acknowledge the existence of a threat to its territory from North Africa.

4. U.S. criticism of MEADS

Political developments in the United States soon confirmed French sketicism about the project. After the November 1994 congressional elections in which the Republicans gained a majority in both Houses and were making plans to launch an ambitious legislative program (Contract with America), the conditions for the MEADS program deteriorated. The new majority wanted to force the Democratic administration under President Clinton to launch a national missile defense system. Clinton rejected these calls, citing international obligations (ABM Treaty) and the reduced threat level, and pointed to the need to improve missile defense capabilities in the tactical and theater areas. The resulting row was not without consequences for the MEADS program. In spring 1996, shortly before the conclusion of the above mentioned MOU, the Republicans had tried to punish the Clinton administration for its stance by canceling funds for MEADS, but then had to retreat. The MEADS project, still in its infancy, remained a favored issue of contention. Moreover, the Clinton administration was slow in implementing the MEADS agreements. For example, for a long time, the necessary funds were left out of the Pentagon's medium-term budget. In October 1996, however, the Clinton administration finally succeeded in getting the MEADS project at least started.

The Memorandum of Understanding of May 28, 1996 stipulated that an independent NATO agency was to be formed for the Project Definition and Validation Phase: the NATO MEADS Management Agency (NAMEADSMA). This body began work the same year in Huntsville, Alabama. In fall 1996, it commissioned two different consortia (MEADS International Inc. and MEADS Inc.) to submit competitive designs. One consortium (MEADS International, also called "Team B") was comprised of Lockheed Martin on the U.S. side and DASA/LFK, Siemens, and Alenia on the European side. The other consortium (MEADS Inc., or "Team A") consisted of Hughes and Raytheon (U.S.) and the same three European companies, but organized in teams that were strictly separated from their colleagues in "Team B." Neither of the two teams was to have any contact with colleagues on the other team; the two sides were separated by a so-called Chinese wall.[13]

Both teams were given about two years to submit their design studies and development bids. During this phase, the anticipated strong resistance to the project emerged, particularly in Congress, bringing the project to the verge of collapse. In addition to the dispute over the priorities of missile defense policy (national defense system versus theater missile defense systems), Congress was now arguing directly against MEADS. The allegation was that apart from the program to modernize the Patriot (PAC-3) no further program was necessary in this area. MEADS, thus ran the argument, had only been launched to do the Europeans a favor, and it was superfluous and expensive. Besides, it was argued that the Europeans did not appreciate America's generosity. The fact that this opinion took such a strong hold in Congress was evidently also due in part to the efforts of lobbyists working for U.S. firms involved in missile defense projects outside of MEADS.

Under these circumstances, the Clinton administration tried to stay the course, but given the heated political situation surrounding the impeachment case against the president, it became increasingly more difficult to strike reasonable compromises. When the two teams submitted their design proposals and development bids in October 1998, the entire financial basis of the project was threatened with collapse due to congressional interventions. Despite support for the project at the political level (in particular from Defense Secretary William Perry, Under Secretary John Deutch, and his successor, Paul Kaminski), implementation of the MEADS project in the Pentagon remained

deficient. After it emerged that the MEADS project had not been included in the multi-year budget planning in October 1998, the appropriations committees in both Houses cancelled all MEADS funding for fiscal year 1999.

The discontent over this development was substantial on the European side. It was further heightened by the fact that the negotiations on the technology transfer promised by the Clinton administration had failed to get off the ground. For several more months, the project languished in the doldrums while being additionally hampered by a lengthy legal row over the modalities of the selection procedure. During this time, the Clinton administration tried to keep the project above water and secure its funding with an emergency program.

In May 1999, when NAMEADSMA announced that it had selected the MEADS International Inc. consortium (with Lockheed Martin as the U.S. partner) for its design,[14] the problems at the political level were coming to a head. In August 1999, the House Appropriations Committee accused the Clinton Administration of having illegally spent money on the MEADS project and blocked forthwith all funds intended for MEADS for the coming fiscal year. The Italian and German governments subsequently threatened to withdraw from the project unless the Americans finally complied with the agreements of February 1995 and May 1996. The French government, for its part, saw its skepticism confirmed.[15] Massive political intervention on the part of the Europeans was needed until the Clinton administration addressed the deficiencies in its argumentations and the contradictions in its policy. Only then were serious negotiations with Congress on the MEADS project initiated, resulting in the corresponding funds being allocated to the Defense Department's medium-term budget planning (Program Objective Memorandum) and subsequently submitted to Congress for approval.

Not until October 1999, however, did the Clinton administration reach a compromise with Congress about the continuation of MEADS based on a new financial plan. This compromise addressed fundamental points of criticism, yet at the same time it secured funding over a longer period of seven years. Part of the compromise was that from now on, the United States would no longer pursue the development of a new guided missile under the MEADS project but would, by continuing the project, fall back on the mostly publicly funded PAC-3 missile. In addition, the U.S. share of the costs was to be reduced and that of the Europeans increased. In return, Congress agreed to

approve the $721 million requested by the Pentagon for further work on developing MEADS until 2007.[16] The introduction of a three-year phase, not planned originally, to assess and reduce technological and hence financial risks (Risk-Reduction Effort, RRE) was part of this compromise.

The European partners were initially dissatisfied with this development, but having no other option, they ultimately agreed to the compromise. Demanding funds from the U.S. Congress for the joint development of a new missile was difficult at a time when Congress was simultaneously gathering public funds to develop a missile with similar properties for comparable, though not identical, purposes. Since then, MEADS has been presented in the United States as a project being pursued jointly with the Germans and Italians to complement and subsequently replace the PAC-3 toward the end of the decade.

At the trilateral talks between the United States, Germany, and Italy, the partners agreed that the development of a MEADS guided missile should not be pursued for the time being and that efforts should be limited to integrating the PAC-3 missile, developing the multi-mode radar and guidance systems, and reducing the size of the launchers and of other peripheral equipment. In addition, the U.S. share of the development funding was lowered from 60 to 55 percent, while the German share rose from 25 to 28 percent and the Italian share from 15 to 17 percent. A Transition Effort phase was agreed upon among the three governments in November 1999 in order to incorporate these changes into the plan selected in May 1999. This phase ended in early 2000, resulting in a redesign of the project, the details of which are presented in more detail in Part II. Finally, on May 11, 2000, a timetable was agreed upon with the Clinton administration for the technology transfer from the United States to Europe (Time Phased Release Plan). Thus, the central demand for technology transfer was finally fulfilled, although the industry judged the provisions contained therein to be adequate. The task now would be to agree on the start of the RRE phase within the framework of a corresponding MOU.

5. MEADS under criticism in Germany

Unfortunately the May 11 agreement coincided in Germany with the debate on the reform of the *Bundeswehr*. On May 23, 2000 the Weizsäcker Commission, tasked with developing recommendations for reforming the *Bundeswehr*, submitted its report. Two position papers were released shortly

thereafter, one written by the Inspector General of the German armed forces opposing the report, and another written by the defense minister adding to it. On June 6, 2000, the cabinet resolved the main elements of the *Bundeswehr* reform, which meant that the MEADS project, too, was again subject to review. The German side now postponed the planned signing of the MOU on the RRE phase, citing the reform debate and the fact that work was still ongoing on the *Bundeswehr*'s material and equipment plan, which was to translate the reform into procurement requirements, as the main reasons for this decision.

Then, in October and November 2000, to the surprise of the U.S. and Italian partners, the German defense ministry expressed fundamental doubts about the MEADS project. These doubts were accompanied by a demand that, rather than continuing the MEADS project, a joint capability analysis and a technology evaluation should be carried out to take account of the new circumstances. According to a *Jane's Defence Weekly* report, the following points were raised, above all by Under Secretary of Defense Walter Stützle:

- The MEADS approach was based on requirements that were no longer valid given the threat situation; a new threat analysis was needed;
- The large number of possible threats probably could not be dealt with by one weapons system, such as MEADS, alone; it might make more sense to introduce an integrated system of specialized weapons;
- The air campaign against Yugoslavia in spring 1999 had shown that air defense systems operating with radars are always more vulnerable, and should therefore not be used as the basis for modern air defense;
- The costs of the high-performance PAC-3 missiles were too high, thus making it logical to pursue other options.[17]

The concern was that the technologies being used in the development of a missile defense system were too elaborate and too expensive and that there were no sufficient considerations about cost-effective, alternative technologies. The U.S. Department of Defense, while showing understanding for some of the technical arguments (reflecting as they did the U.S. wish for more cost-effective options), responded frostily to the implicit challenge to the project and pressured the German government to adhere to the agreed conditions and sign the MOU on the initiation of the RRE phase. Shortly afterwards, in

December 2000, German defense minister Rudolf Scharping assured his U.S. counterpart, William Cohen, that Germany stood firmly behind the continuation of the MEADS program and that it intended to sign the memorandum as soon as possible.[18] It was, however, another six months before Germany added its signature to the document.

The German government had gone from being a promoter of transatlantic arms cooperation to being a skeptic, turning the previous constellation on its head. Another reason behind the skepticism may have been parallel U.S.-German disagreements over the purchase of PAC-3 air defense systems by the *Bundeswehr*. The Americans wanted conditions attached to the supply of the missiles that the Germans regarded as unfair. This, in turn, negatively impacted on the assessment of the MEADS project without the conditions being objectively justified.

Finally, in June 2001, and only after considerable pressure by the Pentagon and threats that the project might be completed without German participation, Germany added its signature to the MOU, including a side letter[19] demand, followed by the *Bundestag's* approval for the start of the Risk-Reduction Effort.[20] The road up to that point had been extremely difficult politically and had ended in compromises that would impair the further progress of the project and, above all, make it more expensive.

As was stated earlier, the dynamics of spoiling armaments cooperation projects often repeat themselves. Just as in the United States, each new uncertainty on the part of the German government triggered unease among parliamentary groups and led to new complications for the cooperative project. In May 2001, SPD Member of Parliament Vera Wohlleben called for the withdrawal from MEADS on the grounds that Germany could not afford to participate in the MEADS research and development program, stating that it would be better to buy the U.S. end product, provided the U.S. armed forces bought a German defense product in return (e.g. the Howitzer 2000 tank).[21] SPD Member of Parliament Volker Kröning also demanded withdrawal from MEADS, citing the partners' lack of enthusiasm for the project. In addition, he said, the technology of MEADS was hardly better than that of PAC-3, and the kinds of threats that the PAC-3 could not neutralize could be easily countered by the Eurofighter.[22]

The two arguments were neither consistent with each other, nor did they reflect the reservations of the German defense ministry. Yet, they attest to the

risks involved when an international arms cooperation project, long supported by the government, is called into question by that very government. The arguments unleashed a political dynamic that could only be brought back under control with great difficulty. In addition, further challenges to the project emerged from within the coalition parties – some taking a general anti-armaments stance, others arguing from a U.S.-critical perspective.

Altogether, another full year had been lost, which will be reflected in increased overall project costs and thus a higher final price. The approval given by the German government was not without a certain amount of ambivalence, which could give rise to future disputes. The German government now avoids using the term MEADS, speaking instead of a "new-generation air defense system" (*Luftverteidigungssystem Neuer Generation*, LVSystNG), the characteristics of which match those of MEADS almost exactly. The government now refers to the RRE phase as a contribution to the development and procurement of an LVSystNG, claiming that after the end of the three years there can be a decision on the selection of a LVSystNG, which could mean a decision against MEADS. This decision would have to be based on a report to be submitted by the German defense ministry. The German government is operating on the assumption that the technology transfer agreed to with the United States in the context of this project could, under certain circumstances, be used to develop and procure a German-made new-generation air defense system.[23]

6. Risks and prospects for MEADS

Such a policy is not without its risks, for it is hardly imaginable – and, above all, barely affordable – for Germany, after the risk reduction phase, to embark on a completely new tactical air defense system, one possibly developed and produced by Germany alone. In principle, MEADS is nothing more than a name for a joint U.S.-German-Italian project that, given the changed strategic environment and new technologies, aims at developing the option of a significantly enhanced and affordable tactical air defense system. If the German government were to announce in 2004—after an eight-year-long joint project phase which it had supported and for which it shared the responsibility—that it was withdrawing from the project because the latter did not reflect the strategically relevant parameters or the relevant technologies, its credibility would be severely undermined for all comparable cooperative

projects. If critical arguments are to be raised, this should only be done within MEADS with the risk reduction phase as the appropriate framework. It is similarly unthinkable that the United States would accept a technology transfer that, after the completion and rejection of the MEADS project, would be used to create an independent, rival German system.

Although the option of an independent German air defense system is rather improbable, the policy of keeping all options open is already leading to further delays, since the preparations necessary for the introduction of the Design and Development Phase (D&D) have to be made a year before the end of the RRE phase (industry bids must be presented well in advance). Given the current situation, however, the possibility of this happening seems highly unlikely.

Meanwhile, the RRE phase is underway. It will last three years and, provided all three sides decide to stick to the project, there will be a transition to the D&D phase, which is expected to run through 2010. Only then – and assuming the absence of further obstacles – will decisions be made about concrete procurement plans. Current indications suggest that the RRE phase will focus on the following questions:

- Beyond the PAC-3 missile, to what extent are there more cost-effective options to combat helicopters and cruise missiles?[24]
- How can the partners ensure that the planned highly mobile, air-transportable, multi-mode radar for MEADS will not become too expensive?[25]
- How can a cost-effective version of the battle management system be produced?[26]
- What alternative technologies offer options for reducing costs?

The signing of the memorandum in June 2001 did not resolve the argument over the continuation of the program. There are still those in the German defense ministry and among the coalition parties who consider MEADS too expensive and superfluous and, instead, support the continuation of the upgrade program for the PAC-3 system. The German government – as indicated by its use of the word LVSystNG rather than MEADS – is distancing itself from the program, stressing its reluctance to commit itself to the time period after the end of the RRE phase.

7. Summary

In a nutshell, the history of MEADS so far can be seen as an example of how transatlantic armaments cooperation is difficult to the point of being almost impossible, but that given enough strong political will, such projects remain feasible. The emergence of political resistance to any kind of cooperative project is inevitable. Such resistance is driven by protectionist interests, internal political power struggles, or a generally critical attitude toward armaments and will prevail whenever – as in the case of the *Bundeswehr* – the overall funding of the defense budget is uncertain. Indeed, as all experts now agree, the funding of the *Bundeswehr* reform as planned by the current German government is not secured. Thus, the temptation is strong to respond to any sign of weakness in a cooperative project by calling the whole effort into question.

Indeed, the tight budgetary situation is probably the real reason why MEADS is under such criticism today. A few figures will highlight the extent of the current financial crisis. In 1990, the size of the *Bundeswehr*'s budget allocated for procurement and research and development (the investment part of the budget) was around DM 18.5 billion. By 2001, it had dropped to DM 11.2 billion, thus setting aside barely DM 6.9 billion (Euro 3.5 billion) annually for actual procurement spending. For a decade the *Bundeswehr* has had to accept drastic spending cuts, which are now affecting its core tasks. Many experts put the *Bundeswehr*'s procurement deficit at DM 50 billion (approximately Euro 25 billion). Despite a budget hike in October 2001 following the events of September 11, the *Bundeswehr* reform initiated by former Defense Minister Rudolf Scharping will not be sufficient to allow the funding of the armaments projects highlighted in the equipment and materials plan of April 2001. Some estimates put the annual shortfall at well over Euro 2 billion.[27] MEADS, therefore, has to compete with a large number of equally important projects. If the budget crisis persists, there is a major risk that financial considerations will be given priority over strategic needs, jeopardizing the entire policy of the German government, which has come out in support of a stronger role in foreign policy as well as military policy.

Aside from these purely political and financial problems, however, the experience with MEADS also shows that from a European (and above all German) perspective it is advisable not to raise expectations too high. More than ten years of neglecting critical technologies in the defense area have meant

that, especially in Germany, more and more gaps are becoming apparent despite the presence of what is generally a highly developed industry. While the provisions of the agreement on the MEADS project fall considerably short of European expectations, on both the industry and policy sides, the possibility of sharing in further U.S. developments in the field of land-based missile defense technology should be welcomed. Yet, developments in the political process also demonstrate the difficulty of shielding defense ministries' plans against the interference of other policy areas.

II. WHAT SHOULD MEADS LOOK LIKE?

A technical definition of MEADS has grown out of the work on the definition and validation (PD/V) phase and the subsequent transition effort phase. This is the result of trilateral efforts to harmonize the corresponding national perspectives and requirements and, after screening the relevant technological options, to develop a corresponding design that can be translated into specific technical requirements. So far, the three partners seem to have found it easier to agree on the requirements than on the question of technological feasibility and the costs involved. In fact, the practicability and affordability of the planned multi-mode radar with 360-degree coverage present the greatest uncertainties and will be the main focus of the Risk Reduction Effort. If an effective solution is found at a justifiable cost, the project could prove to be on the right track.

1. The technical parameters of MEADS

According to the technical parameters negotiated in the context of the definition phase and during the transition phase, the project is intended to develop and produce a medium-range air defense system that is to provide improved target acquisition and the ability to counter threats with a higher mobility relative to PAC-3. MEADS is intended to provide a lower-tier defense against both aerodynamic and tactical ballistic missiles with a high probability of kill, even against the presence of electronic countermeasures. It will have autonomous hit-to-kill capability against ballistic missiles and cruise missiles and will be able, through an extremely agile guide missile, to counter aircraft and other aerodynamic objects. MEADS is designed to facilitate 360-degree defense coverage and, within an expanded architecture, be capable of

integration into larger air defense systems. It is thus intended not merely as a replacement for PAC-3 but as an independent, central component of extended air defense.

The most important components of MEADS include:[28]

- A highly advanced multi-mode radar for target tracking and missile guidance, based upon an active homing, phased array radar with several antennas. Unlike the PAC-3 radar, it is intended to provide 360-degree coverage.
- A modern battle management system (BMC^4I) using the latest information and communications technology, capable of tracking and countering several missiles as part of an integrated communications systems made up of variously dispersed, flexibly configurable elements.
- The PAC-3 guided missile (or later versions), having not only advanced hit-to-kill capability in engaging tactical ballistic missiles but also the capability to counter aircraft.
- A much smaller launcher relative to PAC-3 that is transportable on trucks. Each launcher will be equipped with more than twice the number of interceptor missiles compared to PAC-3.
- MEADS is intended to have higher mobility relative to PAC-3, and it is designed to be transportable on C-130/C141 aircraft (PAC-3 does not fit onto aircraft of this type); the number of systems transportable on C-17s will increase from 12 (PAC-3) to 32 (MEADS).
- The number of operating personnel will be reduced by around half relative to PAC-3, and running costs are projected to be well below 50 percent of those of PAC-3.

The exact definition, in particular the interoperability among the different components, is to be established during the RRE phase. Likewise, key components of the system will be evaluated for cost-reduction options. The greatest uncertainty at present concerns the multi-mode radar with its planned 360-degree coverage. Here lie the greatest technological risks.

2. The costs of the MEADS project

In the past, there has been much speculation about the cost of MEADS. In some cases, very high figures have been mentioned. A study published by the government-owned think tank, Stiftung Wissenschaft und Politik, arrived at a price of $30 billion to cover U.S., German and Italian requirements.[29] This figure is far too high. The figure of DM 15 to 20 billion (Euro 8-10 billion) for *Bundeswehr* procurement costs cited in the study also appears too high. This estimate is based on the assumption that all twenty-four Hawk batteries in Germany will be replaced with fully equipped MEADS batteries (with approximately 3,000 missiles). However, in light of the changed threat situation and the completely altered conditions for extended air defense – and, not least, in view of the improved performance features of MEADS in comparison with Hawk and PAC-3 – such figures are too high. According to industry estimates, the total procurement costs for the *Bundeswehr*, based on smaller unit numbers, could be around Euro 5 to 6 billion (spread over a period of several years).

For the time being, however, all of these are only rough estimates; more precise estimates need to be assembled during the RRE phase. Currently, all cost estimates should be viewed with great caution. As long as drastic cost increases can be avoided, a MEADS program costing the *Bundeswehr* Euro 5 to 6 billion over several years ought to be politically acceptable, provided that the general financial conditions for the implementation of the *Bundeswehr* reform are in place. At this price, the *Bundeswehr* could not afford a comparable national program – even if the latter were technologically less demanding.

III. REASONS FOR AND AGAINST MEADS

The debate in Germany about the rationale for MEADS began in 2000 with the publication of two studies during that year: a fifty-page study published by the Stiftung Wissenschaft und Politik in March 2000,[30] and a shorter study by the Peace Research Institute Frankfurt (PRIF), published in fall 2000.[31]

Both studies conclude that continuing the MEADS project would be wrong – but for completely different reasons. The SWP study argues that (1) the proposed MEADS project would not be able to devise a strategic defense for the Federal Republic of Germany; and that (2) on a tactical level, given expected changes in air warfare, MEADS makes no sense. In addition, it was

(3) too expensive and (4) was used by the United States as a pretext to sell its missile defense technology to the Europeans. The HSFK study addresses the issue from an angle that is fundamentally critical toward armaments. For the most part, it raises only questions; ultimately, however, it leans in favor of ending the project. It concludes with the cryptic statement that a "thorough discussion of the problems outlined here … [could] very well suggest a withdrawal from this project."

What follows is an attempt at a strategic evaluation of the MEADS project. The central question is: does the *Bundeswehr* need something like MEADS, and should Germany participate in such a multilateral venture? These largely general questions can be divided into the following specific issues:

1. Does MEADS fit into the German armed forces' modernization and reequipment efforts, whose implementation is to occur in the coming years within the framework of the *Bundeswehr* reform of 2000? This question cannot merely be answered in view of current *Bundeswehr* plans. What needs to stand at the center of analysis is the critical assessment of strategic transformations and of the reform processes undertaken by other, comparable armed forces. More specifically, the question is about the direction in which the German armed forces are moving in terms of tasks and structures, and the importance attached to a system like MEADS in the establishment of an extended air defense within the Alliance framework. Special attention should be paid to the decisions that have already been made within the Atlantic Alliance and the Common European Security and Defense Policy (CESDP).

2. If this question can be answered in the affirmative, the next question is, what are the alternatives to MEADS, and what comparative advantages and disadvantages can be anticipated at the present time? Basically, the focus of analysis here ought to be on those systems that can perform similar functions (PAC-3, SAMP-T), as well as on possible unconventional alternatives.

3. As long as the procurement of MEADS makes strategic sense, to what extent is the structure of a transatlantic multilateral project the best way forward? Might it not be better to pursue an independent German initiative or a European proposal? Or would it be more honest to purchase, right from the start, a U.S. "off-the-shelf" product?

4. Finally, another aspect to examine would be whether procuring MEADS would result in problems of a more general political nature, such as incompatibility with existing arms control agreements.

1. MEADS and the reform of the *Bundeswehr* in the context of the Alliance

a) The general political-strategic framework

The question of the compatibility of MEADS with the procurement strategy of the *Bundeswehr* can only be answered in the context of the Alliance strategic concept and in the context of the plans of the EU to set up a crisis reaction force for so-called Petersberg missions. The *Bundeswehr* was never meant to play an independent role as a tool of government defense policy. That was true already during the cold war conflict and has remained so since reunification in 1990. There is a broad consensus in Germany today that going-it-alone in security and, above all, in defense policy, is not an option. Given the highly integrated air defense within the Alliance, in existence since the 1960s, any armaments project in this area has to be assessed very specifically in terms of compatibility within the Alliance.

In view of the armed forces' reform and the setting of procurement priorities, the *Bundeswehr* must take its lead from developments within NATO and the EU and from any specifications laid out within the framework of these institutions – a process in which Germany is, obviously, also involved. This framework can be outlined as follows:

- The definition of security risks;
- The associated definition of tasks for the armed forces;
- The related essential features of military reform;
- The implicit requirements for procurement policy; and
- The financial and material scope within which related decisions are to be made.

As far as the definition of security risks is concerned, this can only reflect what has already been discussed and set out in numerous documents within NATO, the EU/WEU, and even the OSCE and the United Nations in recent years – namely, that a threat, in the sense of a direct, overarching threat

to the security and survival of Alliance territory, no longer exists, but that large numbers of risks remain, all of which can be described as potential threats.

Within NATO two fundamentally different kinds of risks are assumed: those leading to a massive military threat against the members of the Alliance along the lines of a reemergence of a Russian threat; and those developing either out of the instability of societies or through the occurrence of smaller and medium-scale regional conflict situations that might develop into indirect or medium-term threats. Such threats may not necessarily be military in nature. Some of these risks may evolve into direct threats to individual Alliance members (for example, Turkey) while others may require the use of peace support operations.

These latter kinds of risks have recently increased in relevance, not least as a result of Iraq's invasion of Kuwait, the wars in the Balkans and the Caucasus, and the terrorist attacks against the United States. In the Western world at least, there is a broad, evolving consensus on the need to be prepared for these new, usually internal, conflicts and to act upon them while they are still at an early stage through diplomatic and, if necessary, military and peace support operations.[32] Although this is rarely stated explicitly, what lies behind this consensus is the fear that such conflicts may grow into real threats if they are not dealt with in time:

- Wars and hegemonic policies in the Persian/Arabian Gulf region, on the Arabian Peninsula, and in the Middle East in general could turn into threats to western energy security and contribute to serious worldwide political shifts impairing the security of the western world.
- Conflicts in the Balkans or eastern Europe have the potential to weaken the economic, social, and political development of the region, with indirect consequences that could grow into threats to western societies and states (refugee flows, organized crime, importation of violence, and the willingness to use violence within western societies).
- Unresolved regional problems and conflicts, particularly those where there is a total breakdown of accepted barriers to law and order, which have the potential to contribute to a general erosion of international order and bring about the kind of collapse of structures of international order that preceded World War I and World War II.

Within NATO, particular attention is paid to the interaction of such crises with the proliferation of weapons of mass destruction and of missile weapons/ technologies. These weapons have been a major threat since the early 1990s because of the collapse of the Soviet Union and the continuing precarious situation of Russia's military-industrial complex.[33] The combination of the spread of nuclear and missile weapons heightens our sense of the existing risks as well as the creation of new ones to the western world:

- The proliferation of weapons of mass destruction and missiles increases the risk of western intervention forces becoming exposed to unacceptable dangers during crisis management operations, thus undermining the concept of international order.
- The proliferation of weapons of mass destruction (and missiles) can lead to direct threats to European and North American states from problematic actors.
- It can also contribute to a situation where a ruthless and reckless actor upsets the regional balance in a strategically important region – a situation that, in the case of the Persian Gulf, could have catastrophic consequences. However, the proliferation of weapons of mass destruction and missiles might also turn previously stable regions into unstable ones (such as the Asia-Pacific region or South and Central Asia).[34] The number of states possessing or aspiring to acquire weapons of mass destruction and missiles is increasing (see Appendix 2).

In sum, the security of the Euro-Atlantic region is seen today primarily within a larger context; thus, a reasonable approach ought to embrace not only preventive diplomacy (particularly structural prevention) and mediation, but also intervention. Such responses must also be based on international legitimation and should renounce go-it-alone operations.[35] In the last ten years, this approach has evolved with NATO as the main transatlantic cooperation and coordination mechanism and with the EU assuming an increasingly self-assured role. NATO's Strategic Concept of 1999 states:

> The maintenance of the security and stability of the Euro-Atlantic area is of key importance. An important aim of the Alliance and its forces is to keep risks at a distance by dealing

> with potential crises at an early stage. In the event of crises that jeopardize Euro-Atlantic stability and could affect the security of Alliance members, the Alliance's military forces may be called upon to conduct crisis response operations. They may also be called upon to contribute to the preservation of international peace and security by conducting operations in support of other international organizations, complementing and reinforcing political actions within a broad approach to security.[36]

b) New missions for the armed forces

On the basis of such risk assessment and the related preparedness for a policy of prevention, crisis management, and peacemaking, both NATO and the EU/WEU have redefined their tasks as well as the role and task assignment of the armed forces. NATO outlined this in its 1999 Strategic Concept in the context of three security tasks for the armed forces:

1. *"The maintenance of an adequate military capability and clear preparedness to act collectively in the common defence."* On the one hand, this has to do with the ability to be prepared, within a reasonable amount of time, for a possible reemergence of a military threat to alliance partners at the periphery (such as Russia). On the other hand, it has to do with new threats to the alliance area at the periphery, such as threats to Turkey from Iraq or Iran, or missile threats. As exemplified by the terrorist attacks against the United States on September 11, 2001 and the subsequent invocation of Article V of the Washington Treaty by the North Atlantic Council, NATO is capable of responding to even unforeseeable kinds of attacks against member states.
2. *Crisis management,* which means that the Alliance stands ready "case-by-case and by consensus ... to contribute to effective conflict prevention and to engage actively in crisis management, including crisis response operations." Herewith is NATO intended as the military arm of an international cooperative diplomacy aimed at stability and the maintenance of order. This was practiced several times in the former Yugoslavia, most recently in Macedonia.
3. *Partnership,* which means that NATO promotes "wide-ranging partnership, cooperation, and dialogue with other countries in the Euro-Atlantic area with

the aim of increasing transparency, mutual confidence and the capacity for joint action with the Alliance." Strategies of partnership are not pursued simply to familiarize other states with the workings of NATO. Rather, the principal aim is to use cooperative security as an instrument to prevent the renationalization of defense policies in the pursuit of inner stability in the mostly former communist states, still undergoing significant transformations. NATO enlargement too should be perceived in this context.

NATO, however, is not alone in defining today's tasks for the *Bundeswehr*; the European Union is also contributing to a redefinition of European security and defense policy. Over the last several years, the EU summits of Cologne, Helsinki, Feira, Nice, Gothenburg and Laeken have laid the foundation for the EU, through a corps-sized rapid reaction force, to conduct so-called Petersberg tasks (peacekeeping force deployments, evacuation missions, military enforcement of embargos, as well as peace enforcement measures) either in cooperation with the United States or alone. The EU's military missions explicitly assume that NATO will retain the principal responsibility for defense.

Since NATO considers both allied defense and conflict management as part of its mission, the tasks and equipment of the armed forces also must be correspondingly broader, with almost dual applicability. "Military capabilities effective under the full range of foreseeable circumstances," according to the 1999 Strategic Concept, "are also the basis of the Alliance's ability to contribute to conflict prevention and crisis management through non-Article V crisis response operations."

Thus NATO countries – and this applies largely to most EU states – must define, as far as possible, procurement choices, command structures, and doctrines to fit both tasks: defense and crisis intervention. Indeed, over the past years, the preparation for missions aimed at crisis intervention (peace support operations) has assumed a more central role than the task of traditional defense. Peace support operations involve greater challenges for today's defense policy planning, mainly because the possibility of a reawakened Russian threat seems to have receded. In the words of the Strategic Concept: "These missions can be highly demanding and can place a premium on the same political and military qualities, such as cohesion, multinational training, and extensive prior planning, that would be essential in an Article V situation. Accordingly,

while they may pose special requirements, they will be handled through a common set of Alliance structures and procedures."[37]

The following five types of peace support operations are thereby distinguished within NATO:

- Conflict prevention operations;
- Peacemaking;
- Peacekeeping;
- Peace enforcement operations; and
- Consolidated operations.[38]

The consequences of this development for western armed forces and their equipment can presently be observed in several countries. Armed forces everywhere are undergoing reforms that share among themselves certain common traits:[39]

1. Armed forces are increasingly moving in the direction of light and mobile intervention forces, making them suitable as instruments for preventive diplomacy or for decisive conflict management.
2. This new role of the armed forces is taking place less within the traditional national context, but increasingly as part of cooperative international actions.
3. As armed forces grow smaller and more mobile, equipment and structures change as well. In most countries, this has resulted in the phasing out of military conscription.
4. Land forces are losing in relative importance to air forces and partly also to the Marines, while growing emphasis is placed on standoff weapons and means of electronic warfare.
5. The self-sufficiency of armed forces is seen as less central today as was the case during the planning phases for an East-West conflict.
6. In most cases, military budgets are shrinking.
7. The image of the armed forces and of soldiers in society is undergoing a change; soldiers are seen less as defenders and more as "armed diplomats" in mediating international conflicts.

c) The new role of extended air defense

What are the implications of these developments for the extensive air defense and for the relationship between defensive means (anti-aircraft missiles) and offensive means (combat aircraft, special forces) in the context of air defense? First of all, it means that the traditional central role of air defense (consisting of offensive and defensive elements) as NATO's first line of defense against a massive attack of the Warsaw pact is no longer valid. Secondly, it means that with regard to traditional allied defense and intervening armed forces, the role and the mission of extended air defense must be redefined. Its primary purpose must be to deal with opponents who are acquiring increasingly modern means of air warfare (including electronic warfare), as well tactical missiles and weapons of mass destruction.

In this context, since the early 1990s NATO has taken steps toward redefining air defense in the direction of an "extended integrated air defense."[40] In November 2000, agreement was reached on a NATO Integrated Extended Air Defence System (NATINEADS) that is based on four pillars:

- Battle Management, Command, Control and Communications, Computers, and Intelligence (BMC^4I);
- Active defense;
- Passive defense; and
- Conventional counterforce.

The envisaged BMC^4I aims at securing accurate and timely command-relevant information needed for extended air defense. This primarily means the establishment of air and space reconnaissance systems ranging from low altitude aircraft and drones to the exoatmospheric space, which allow for simultaneous early warning and target acquisition, the integration of various sensors, and complex communications management.[41]

Active air defense involves protection against aerodynamic systems (aircraft, ballistic missiles, unmanned aerial vehicles, remotely piloted vehicles, radar combating missiles), as well as air-to-surface/sea missiles, ballistic missiles (the latter mainly as carriers of weapons of mass destruction). A distinction is thereby made between threats having a range of up to 600 miles and threats with a range between 1200 miles and 1800 miles. The former includes risks that might occur mainly in the context of allied defense and of

crisis management operations and that could happen in the near future. By contrast, the latter threats would qualify as strategic threats to Europe that would emerge only in a few years.[42]

In considering medium extended air defense, the *Bundeswehr* proceeds from the assumption that such defense must not be composed solely of a BMC[4]I capability but also must include aircraft (combat aircraft for air defense) and land-based air defense systems. The latter are seen as inevitable because, relative to combat aircraft (whose advantage is their high flexibility and mobility) they are seen as more cost-effective.[43]

With regard to future land-based air defense systems for countering aerodynamic and ballistic targets at medium altitudes, such systems can be assumed to have, for the most part, technically and functionally identical elements or capabilities. Thus, acquiring multifunctional systems would be recommendable. With regard to defense against longer-range missile threats, other architectures are required.[44] In early 2001, NATO assigned two competing consortia the task of developing such needed architectural designs and demonstrating their potential for technical development.[45]

Thus, an active extended air defense at medium altitudes must contain not only combat aircraft but also mobile, land-based air defense systems such as PAC-3 or MEADS. In its planning, the German Air Force takes for granted that the acquisition of MEADS (or of some new-generation air defense system) will be a key element in future extended air defense. In the event of German troops operating in out-of-area theaters, the combined efforts of such systems will be essential in order to protect against aerodynamic objects or ballistics missiles. Although total protection against incoming missiles is not considered to be feasible, point defenses with increasing footprints are being seen as practical results.[46]

Passive air defense is concerned with the physical protection of objects against the effects of enemy air attacks through hard point defense or through ABC-protection.

The element of the *conventional counteroffensive* involves the use of air combat forces for the suppression of enemy attack forces, such as positioned missiles, command posts, etc. – that is, air defense as forward defense. NATO states are currently the best equipped for this, since, owing mostly to superior U.S. capabilities, they can establish almost complete dominance in this area.

d) The relative importance of land-based air defense

The above arguments raise the general question about the role of land-based air defense relative to airborne forces (combat aircraft as well as combat forces to counter force). Most likely, interventions can be expected to occur under conditions of western air superiority. This, at least, has been the experience in all of NATO's past military operations in the former Yugoslavia as well as of the international troops that liberated Kuwait in 1991. For the most part, this development is the result of the overwhelming air superiority that the United States is able to project nearly everywhere around the globe, a superiority that is complemented by western European forces. Alone, however, the EU states would be in no position to take effective action should they resolve to undertake an operation without the United States (which, presently, is still rather unlikely, although not excluded as a future option).

And so the question arises, why not do away completely with air-launched anti-missiles as part of the extended and integrated air defense and instead rely on one's own superior air combat forces to suppress enemy air forces? This thesis was put forward in the aforementioned SWP study, with the following arguments:

> In these conflicts [i.e. the war in Bosnia-Herzegovina and the intervention in Kosovo] it was not air defense of home territory that was critical to the operation, but from the very beginning of the conflict, air superiority over the enemy's territory was vital; once this was achieved, it automatically resulted in the protection of home airspace, for whose defense special forward-deployed forces were no longer needed."[47]

Apart from the fact that in the case of EU-only operations air superiority is by no means guaranteed, such arguments are hardly conclusive. They overlook essential factors characteristic of such peace support operations. In the case of international interventions, the question is not so much protecting home airspace but keeping intact the operating capability of allied troops. What are required are flexible systems and overlapping capabilities (also of defensive and offensive means in the context of extended air defense). In particular, experiences from previous operations show that, Western air superiority notwithstanding , the enemy could use mobile missiles or unconventional means

of air attack to impair the intervening forces, which could erode or topple political support for the intervention. Ballistic missiles in particular, but also unmanned air vehicles as well as cruise missiles, are well suited for such missions. They are elements of what we call today asymmetric warfare, and – as shown by the September 11 attacks on New York and Washington, D.C. – these can cover a wide spectrum of possible forms of attack.

As was true already in the days of the V-2 during World War II, ballistic missiles are the weapons used by those who have lost air supremacy and henceforth do everything in their power to upset the resolve of their opponent. In such cases, the destructiveness of these weapons frequently has been of lesser relevance. The destructive power of V-2 attacks was far less than that of fighter-bombers, but the psychological impact was always important: short early warning times (in some cases, none) and the impossibility of defense. To be sure, neither the V-2 attacks of the *Wehrmacht* in World War II nor the missile attacks of Saddam Hussein during the Gulf War were decisive, but they in no small measure contributed to a sense of insecurity and could, under other circumstances, have been strategically relevant. There will always be, in comparable situations, incentives for states of concern in different regions to consider and carry out such options.

The potential for adversaries to possess weapons of mass destruction with which to charge their missiles becomes even more relevant under crisis scenarios. Thus, for the *Bundeswehr*, acting in international troop contingents for crisis management or crisis resolution, there is no other choice but to invest in missile defense systems in order to cope with such types of asymmetric threats. Otherwise, the dispatch of German troops to numerous crisis regions could not be justified.

A counterargument to this – as is presented in the SWP study – is that even missile threats or threats from cruise missiles and unmanned vehicles can be better intercepted through air combat forces. The experience of the Gulf War, however, has shown that this is not a realistic option. During Operation Desert Storm U.S. F-15, F-111, and A-10 combat aircraft tried desperately to annihilate Iraqi Scud launchers. About 1,500 sorties against Scud batteries were flown, but not a single launcher was destroyed. Such problems and predicaments, as they have become clear, will not be resolved in the foreseeable

future,[48] even though improvements in the ability of combat aircraft to intercept and attack targets are expected.[49]

An additional objection to the argument outlined in the SWP study is of a rather general nature and has to do with the scope of the relevant timeframe. After all, the *Bundeswehr* wants to commit itself, through MEADS, to a system that over the next twenty to thirty years will represent the core of a land-based, medium-range air defense. Even if we accept the argument of the SWP study, we must still ask whether it is safe to exclude the possibility that over the next thirty years certain situations may arise whereby the West will not be able to establish sufficient air superiority. In the face of the dramatic political-strategic changes that we have experienced during the past fifteen years, there is almost nothing that we can safely exclude. Thus, we have to assume that situations might arise where ground-based missile defense will be necessary, or that foregoing such an option will carry an intolerable risk.

In view of the next three decades, no responsible military planner or politician will be able to exclude the possibility that there is a need for a ground-based missile defense. The latter no longer holds as central a significance as it did during the period of the cold war—and there is certainly no need for such great numbers anymore—but we cannot do without such systems, especially when facing the probability of growing numbers of short and medium-range missiles in regions that are a potential field of activity for NATO or EU-led interventions.

A further argument against a ground-based missile defense component within extended air defense is that it constitutes only terminal defense and, thus, would provide only limited protection. Terminal defense, it is argued, is more expensive and less capable than boost phase defense.[50] It would offer no protection against biological and chemical weapons, not even against radioactive fallout of fired missiles armed with nuclear warheads. It would be better to invest in boost-phase defense against missiles, particularly the airborne laser (ABL) system. This argument, however, fails to consider that in the case of the relatively short-range missiles, which are the present focus (100 miles up to 600 miles), the cited fallouts will occur even when the missiles are engaged at an early phase. In addition, the length of the boost phase of short and medium-range missiles is much shorter, so that the time available for destroying a missile during its boost phase will be extremely short. Besides,

ABL technology has been tested far less than the hit-to-kill technology on which MEADS relies, and it is certainly not cheaper.

Thus the question of whether MEADS is suitable to the impending modernization and reequipping of the *Bundeswehr* can be answered only in the positive. What the *Bundeswehr* needs is a system that,

- under circumstances of a major conventional (but increasingly unlikely) conflict, allows for air defense against attacking aircraft, cruise missiles, and unmanned vehicles; and
- particularly in different multinational scenarios of intervention, offers options for defense against primarily "asymmetric" air threats (i.e. mainly against missiles tipped with conventional or unconventional warheads, but also against cruise missiles) and, at the same time, is also capable of organizing air defense against an adversary outfitted with strong offensive air forces.

Under most conceivable scenarios, future air threats will be small in comparison to what could have been expected under cold war conditions. Thus, limited procurement of missile defense systems in the context of extended air defense should be envisaged. Yet, the emergence of new air threats can never be excluded. Based on these considerations, the federal government has drawn a detailed list of military requirements a new-generation air defense system must fulfill:[51]

- the capability to provide wide coverage to intercept and engage aerodynamic objects and ballistic missiles within a 360-degree effective zone;
- an enlarged footprint (space protected) against tactical missiles;
- an integrated architecture with deliberate system redundancy – including overlapping tasks of different air defense systems – that is immune to individual systems failures;
- less vulnerability against electronic counter-measures;
- the capability to identify and track counter ballistic missiles, cruise missiles, unmanned aerial vehicles, and aircraft with limited radar reflecting surface;

- maximum interoperability for the purposes of target detection, target identification, and target destruction – this is especially important in the case of allied operations.

On the whole, the current parameters of the MEADS project correspond exactly to these requirements. This conclusion remains valid even after allowing for the questions raised in the SWP study with regard to probable battlefields. The SWP study rightly states that under presently foreseeable scenarios of multinational interventions air-launched adversary threats are less significant. It does, however, conclude that all ground-based air defense systems will be made redundant. The belief that in the next thirty years, and under all conceivable scenarios, combat air forces would be sufficient to counter enemy air threats – including those of an asymmetrical nature – is far too optimistic.

2. Alternatives to MEADS

Even after recognizing that the *Bundeswehr* and allied forces need a ground-based air defense system such as MEADS, there is still the question of whether one might be better off with existing systems or with comparable systems currently under development or production in other countries. As matters stand at present, only three systems can be considered: the U.S. PAC-3 system ; the French-Italian project SAMP-T (*Sol-Aire-Moyenn Portée, Terrestre*); and, theoretically, the latest Russian air defense systems S 300 and S 400. Other air defense or missile defense systems have parameters that do not meet the specifications defined above, such as the Israeli Arrow 2 missile defense system or the U.S. Theater High Altitude Air Defense System (THAAD). Both systems are mainly missile defense systems and are supposed to operate in other layers.

a) MEADS and Patriot

The Patriot system was introduced in the early 1980s in the United States and in the late 1980s in Germany, the Netherlands, and a few non-European armed forces. It replaced the Nike-Hercules surface-to-air missiles. At the time of its launch, the Patriot system demonstrated a significantly greater capability than Nike-Hercules. The first Patriot guided missile had a high-explosive fragmentation warhead that detonated as soon as it had approached the target, but it lacked the capability to defend against missiles. An improved

version (Patriot Advanced Capability [PAC]-2*)* introduced in 1991 had some limited missile defense capability based on analogous radar and missile technology as well as advanced software. It could, for example, provide limited defense against Scud missiles.

During the 1991 Gulf War, the PAC-2 system faced its first test when it was employed against Iraqi Scud attacks, but its efficiency was still limited. It did not directly defeat the incoming missiles but, rather, damaged them or diverted them from their course. In addition, it had difficulty differentiating between the warhead and other components of the missile falling off in mid-air.[52]

In order to make up for the shortcomings of PAC-2 during the Gulf War, a short-term program was introduced in the wake of the war that aimed at quadrupling the protected area (up to about 120 square miles) relative to PAC-2 and extending the intercepting range by 40 percent (PAC-2/QRP). Basically, the radar was modified and an automatic guidance system was incorporated. This improved PAC-2 was introduced in 1994.

Since then, U.S. efforts have concentrated on further developing the Patriot systems into a comprehensive lower-tier missile defense weapon. These efforts operate under the project name of PAC-3. Essentially, PAC-3 is a three-stage program. During the first phase (*Configuration I*), a new type of guided missile (Guidance Enhancement Missile – GEM) that allowed for enhanced guidance during the flight was introduced. In addition, several system components were improved, particularly in the area of command and control and in the tracking of missiles, such as a bigger and faster fire control computer and a more capable pulse Doppler radar. By the end of 1995, Patriot batteries with this PAC-3 system had already been introduced. During the second phase (*Configuration II*), further modifications were undertaken in the areas of sensors and guidance techniques, such as a target identification and discrimination system as well as GPS extension for better target synchronization. This phase was concluded in 1998.

The focus so far has been on the development of a new PAC-3 guided missile, which is smaller than PAC-2 and GEM and based mainly on the effects of kinetic energy (*hit-to-kill technology*) (*Configuration III*). In addition, further improvements on the radar have been carried out, and interoperability with other system components of extended air defense (particularly of upper-

tier and longer-range missile defense) has been broadened. Third-generation PAC-3 systems are also intended to be remote-controlled (up to eighteen miles), permitting a greater footprint size. Most fundamental was the extension of the identification and discrimination system for incoming missiles.[53] The PAC-3 system has been in the testing phase since 2000 and has had some successful tests, but it is not yet ready for deployment.[54]

The United States will continue to improve upon the capability of the PAC-3 system, particularly with regard to the radar. The MEADS project is thereby seen as a follow-up project to the PAC-3. By relying on important system components of the PAC-3 (mainly the guided missile), the United States seeks to cooperate with the Europeans on enhancing several elements of the system, including its mobility and radar coverage.

For this reason, the question of replacing MEADS with the latest PAC-3 system is somewhat odd. The German Air Force, which since the latter half of the 1980s has used the Patriot system for air defense, intends to procure PAC-3 systems along with the Netherlands in order to improve extended air defense and to allow for the establishment of a core common air defense with a lower-tier missile defense capability. Foregoing MEADS and relying solely on PAC-3 would mean excluding oneself from the future development of tactical missile defense in the field of extended air defense. Given the fact that the missile threat spectrum will become broader and technologically more demanding (especially with regard to the size and the speed of ballistic missiles, as well as to the technology of decoys), it seems hardly justifiable to stop further modernization at the PAC-3 level.

Since June 2001 the German government has, however, followed just such an option by announcing that it would go for either PAC-3 or MEADS, but not both together. Consequently, the so-called second advanced capability adjustment to the Patriot system (i.e. the fielding of the PAC-3 system) has been put on ice for the moment. This decision appears strange at first, but it shows the extent to which the severe financial conditions surrounding the *Bundeswehr* reform are forcing political decision-makers into more or less evasive action.

b) MEADS in comparison to SAMP-T

Another candidate would be the French-Italian co-production SAMP-T. In this case, unlike with PAC-3, a situation of competition exists, and

it could even be argued that for Germany, as a proponent of European integration, participation in this consortium would be wiser than further pursuing MEADS. However, technical and financial aspects, as well as political questions, militate against such an option.

AMP-T is a project belonging to the family of air defense systems known under the acronym FSAF (*famille sol air future*) that France and Italy have jointly pursued since the late 1980s. The original goal of these efforts was the development of defense systems for the Navy, Army, and Air Force aimed primarily at countering aircraft and tactical aerodynamic missiles (cruise missiles, UAVs, and unmanned aircraft as well as air-launched missiles). The family concept was intended to facilitate the development of joint components (multi-mode radar, guidance systems, launchers, main parts of the guided missile, and missile darts), making them cheaper and more versatile.

The guided missile of FSAF is the Aster missile, which is to be offered in two versions (Aster 15 und Aster 30). Aster 15 has a range of up to eighteen miles, Aster 30 of up to forty-three miles. Aster 15 can operate at altitudes of up to six miles, Aster 30 of up to twelve miles. The missiles are made up of two elements: the booster, whose size differs between Aster 15 and Aster 30; and the dart, which is equal in both systems and whose peculiarity lies in its exceptionally high agility. The dart consists of an approximately 33-lb heavy explosive device intended to destroy aircraft, cruise missiles, unmanned aircraft, but also air-launched missiles.

The projects under the FSAF program are developed and produced in the context of the Eurosam consortium, which consists of MBDA and Thales Air defence (originally Aerospatiale, Alenia, and Thomson-CSF). Four programs presently run under the FSAF umbrella :

- SAAM: this involves an air defense program for the Navy with a relatively short range (up to 18 miles), aimed primarily at countering missiles such as Exocet, which attack slightly above the sea level. The guided missile Aster 15 is being employed in this system.
- SAMP-N: this involves an air defense system for the Navy aimed against threats from aircraft and cruise missiles as well as other aerodynamic missiles at greater distances (up to 43 miles) and at higher altitudes, through the use of the guided missile Aster 30.

- SAMP-T: this is the land-based version of SAMP-N, to be used either by the Air Force or the Army;
- SAMP-T, Bloc 1: this is a project for the extension of SAMP-T in the direction of a limited missile defense capability against tactical ballistic missiles with a range of up to 370 miles. This project is not expected to enter any operational stage before 2003–2004.

The SAAM system was recently introduced on the French aircraft carrier *Charles de Gaulle,* and six other such systems are expected to be installed on Italian warships by 2003. Orders for the SAMP-T system stand at a total of twenty-nine for the French Air Force and Army and at fifteen systems for the Italian Army. Saudi Arabia has expressed interested in procuring several systems for its frigates of the La Fayette class in 2003.[55]

The FSAF program has the potential for furthering European cooperation. Since the mid-1990s, as part of a new consortium that includes British Aerospace, Eurosam has been cooperating with the UK on the development of a Principal Anti Air Missile System (PAAMS) to further develop the naval FSAF projects. In the context of PAAMS, French and Italian frigates of the Horizon class and British destroyers of the 45-class are to be equipped with a much improved air defense system that will facilitate even the protection of entire convoys. A corresponding three-party agreement on the development of PAAMS was signed in August 1999 for an amount of Euro 1.3 billion.[56] Hence PAAMS is on a good path toward becoming the main sea-based air defense system of the European navies.

The capability of the different FSAF and PAAMS projects for countering aerodynamic vehicles (aircraft, cruise missiles, unmanned aircraft, and air-launched missiles) is generally believed to be very high. So far, however, they have no missile defense capability. The reason is mainly political: France withdrew from the MEADS project in 1996, not least because it considered the U.S. assumptions about the threat from tactical ballistic missiles as exaggerated and because it wished to put more emphasis on naval threats from aerodynamic objects. Only in recent years, after new evidence about the proliferation of ballistic missiles came to light, has this attitude begun to change. As part of the SAMP-T/Bloc 1 project, an attempt is now being made to catch up with PAC-3 and MEADS in terms of missile defense capabilities. A

final decision as to whether France will continue in a follow-on Bloc 2 program, and therefore in a development aimed to parallel MEADS, will not be made before 2003, or even later. Current plans for the Bloc 2 program aim at developing a defense against tactical ballistic missiles with a range between 900 and 1200 miles, a specification that matches only part of the range of MEADS. This evidence clearly suggests that it makes no sense to abandon MEADS in order to join SAMP-T/Bloc 1 or Bloc 2.

Another reason why FSAF systems and projects present no real alternatives to MEADS is that the former are mainly intended for naval tasks (particularly the protection of large warships against aerodynamic missiles). Thus, they do not meet the requirements of a primarily land-based German component in international operations, which needs to be protected against all air threats (including ballistic missiles). Still, it would be possible, together with France, Italy, and possibly the UK, to carry out a SAMP-T/Bloc-2 project that would have the same specifications as MEADS. In the end, however, this would translate into greatly increased demands in terms of time and money. The 55 percent U.S. share in MEADS could not be funded in Europe. It would thus mean the withdrawal from an established project (MEADS), and from a partner who holds a significant technological lead in the areas of missile and extended air defense, to link up with a new partner who until recently had paid rather little attention to missile defense. It would also mean that all formerly acquired precursor systems (PAC-3) would be rendered worthless, and previously made outlays for the MEADS project would become null and void. The withdrawal from MEADS in favor of a Franco-German or European SAMP-T/Block 2 is thus not an option.

c) Other candidates

Another theoretical alternative to MEADS would be to purchase Russian anti-aircraft missiles (such as the S-300PMU or S-400) and to negotiate a favorable price. This option, while interesting at first glance, involves too many drawbacks.

First of all, the S-300PMU system does not conform to the *Bundeswehr*'s procurement requirements as outlined above. In its performance characteristics, this system shows similarities to the PAC-2 system. The guided missiles and the delivery systems are too large and inflexible to meet the criteria of high mobility. The missiles are typically 23 to 27 feet long (compared to 5.2 meters

for the PAC-3 guided missile), have a diameter of 1.6 feet (65 inches for the PAC-3 guided missile), and weigh between 1.5 and 2 tons (695 lb for the PAC-3). In addition, these weapons are mainly designed to counter aircraft, cruise missiles, and other aerodynamic MIRVs, not ballistic missiles at an altitude of 25,000 to 30,000 meters. Only the extended S-300PMU1 version has a limited missile defense capability.[57]

Too little is known about the successor S-400 model (SA-20 Triumf) to draw any concrete conclusions. Based on current information, this type is expected to come out in two versions: one with a large guided missile with specifications similar to those of the S-300PMU; and one with a distinctly smaller missile (9M96). The latter is also intended to be capable of countering tactical ballistic missiles because of its ability to reach altitudes of up to twenty miles and its exceptional mobility (flight maneuver with 20 g). In the final analysis, the S-400 missile seems aimed primarily at defeating aerodynamic objects and is, presumably, in many aspects inferior to comparable Western systems. The Aster 30 missile, for instance, clearly has a greater agility (up to 50 g, possibly even 62 g), and even the PAC-3 fares considerably better.

Even if the parameters of the Russian anti-aircraft systems were to improve, it remains doubtful whether this would justify terminating the MEADS project. The acquisition of Russian systems would not only contradict all declared goals of intra-alliance or European interoperability and compatibility (and thus appear inconsistent with the goals of the DCI and ESDP), but it would also suggest that Germany simply withdraw from the research and development area and renounce an established position within the area of transatlantic industrial cooperation. An alternative would be some barter trade with Russian business partners allowing for German industry participation in the development of technology and for cooperation on subsequent production. This suggests, however, that the MEADS project, initiated in 1996 with the United States and Italy, would be launched anew in concert with Russian partners. This idea makes no sense at all—neither politically nor financially, or even from the point of view of industrial policy—and it probably would produce the worst outcome at considerable cost. As a result, the "Russian option," too, is not an option with any real prospect for success.

3. Is transatlantic cooperation necessary?

If, from a strategic point of view, it is significant for the *Bundeswehr* to acquire an air defense system with the attributes of MEADS, one question remains: does this acquisition have to occur in the context of a transatlantic cooperative venture with the United States, or can this also take place within some European or national context, or some other combination thereof? The conditions under which the federal government signed the Memorandum on the launch of the Risk Reduction Phase in June 2001 suggest that the German government has reserved for itself the option of developing an independent, national new-generation air defense system (LVSystNG). Is this a realistic option or a political move aimed at placating or mollifying critics within the government's own ranks?

MEADS is currently the only significant transatlantic armaments project, and given the sobering experiences with similar projects in the past, the question of whether this remains a meaningful undertaking is justified. Europeans have become skeptical with regard to transatlantic cooperative ventures since the United States has not been sufficiently fair and open toward its partners. Too often has the willingness to cooperate been reversed in the course of a project; too often have the Pentagon and Congress clearly displayed protectionist behavior with regard to the acquisition of defense industrial goods. Technology transfers, too, have always been particularly difficult to resolve, and, when in doubt, the United States has given preference to national development and acquisition projects. Some observers also point to the fact that even in the United States, collaborative projects are judged critically, because they imply greater costs and hardly contribute to interoperability owing to the strict U.S. technology controls.[58]

Although most of these arguments are valid, MEADS might turn out to be different. The MEADS project came into existence precisely because of the determination of convinced Atlanticists on both sides to build on a good opportunity and launch a cooperative project with potential for future success. There are some significant reasons to suggest that it is worthwhile to further pursue the MEADS project within the transatlantic context:

- A technologically demanding project such as MEADS is so expensive that the Federal Republic would not be able to carry out the necessary research and development and procurement on its own. For that reason,

cooperation—especially with the United States as well as with other partners—is urgently needed to share the costs for research and development and to lower, to the extent possible, the unit costs of the end product through higher procurement numbers. High levels of procurement of missile defense systems nowadays can be achieved only within the context of collaborative projects, because in light of the changed threat situation, the quantities procured on a national basis are lower. This applies esecially to the current financial crisis of the German federal state and of the *Bundeswehr* in particular.

- Failing to modernize land-based missile defense systems would greatly hamper the *Bundeswehr*'s abilities to take part in international peace support operations. It could also potentially expose German soldiers to unnecessary risk. The result could be that for many engagement scenarios, the Western allies will choose to forgo altogether German participation or limit it to low-risk support functions. The harm thus incurred upon the political alliance would be enormous.
- MEADS is, however, also important for German and European industry because it offers an opportunity to catch up in critical areas of missile defense technology. Because of the massive interest of four consecutive administrations in missile defense, the lead enjoyed by U.S. firms in this area (e.g., in hit-to-kill technology) can hardly be offset any longer. Today the relevant question for European firms is to avoid losing track in important military technology areas and to make use of their existing competencies in such a fashion so as to be capable of cooperating in U.S. projects – be it as a subcontractor or a system partner. Transatlantic cooperation is, therefore, a necessity, not a luxury for German and European companies that want to produce defense goods in technologically demanding sectors. Medium-range missile defense belongs to those areas from which Germany can greatly benefit through cooperation on technology transfers. Moreover, it is an area in which Germany still has a lot to bring to the table in terms of technologies, thus permitting it to play a role beyond that of a pleading party.

The United States also should have an interest in continued cooperation, even though it could afford to finance such a system by itself. Paramount political considerations are mainly at play here. For

some years now, there has been concern in the United States that since the end of the cold war, the Europeans—and in this case especially the Germans—have been spending too little on defense, thus becoming increasingly less useful as allies. This is especially apparent in the declining numbers for defense procurement and for defense research and development, and nowhere in Europe is the rupture as dramatic as in Germany. This also means that the German defense industry has not been able to keep up in many critical areas of the so-called revolution in military affairs, because the respective demand on the part of the state was not there. Meanwhile, the fear of a permanent technological "gap" and its related consequences for the alliance is so great that there are voices in the United States demanding that more transatlantic cooperative projects be pursued with greater tolerance and willingness to allow technology transfers.[59]

The story of the MEADS project is a telling example of how, despite repeated clashes between the different currents in U.S. policy – the protectionists, on the one hand, the Atlanticists and the supporters for a balance between Europe and the United States on the other – the proponents of a transatlantic orientation can still maintain the upper hand. The strongest evidence for this is the agreement on technology transfer that was concluded in May 2000 and satisfied, to a large extent, the demands of the European partners.

Transatlantic cooperation need not contradict European armaments cooperation. On the contrary, the former should complement the latter, a view that the German government made clear at the time of the launch of the MEADS project. As could be shown above, there is at present no basis for an alternative European project for an air defense system of comparable design. The necessary technological capability is lacking in Europe, and, were it to be acquired, it could only be done in the context of a protracted and very costly catch-up process.

Beyond that, there are further reasons for continuing with MEADS. Above all, it has to do with maintaining interoperability with the United States in the area of extended air defense. There is hardly any area of cooperation in the Alliance where interoperability and comparability are as important as they are in extended air defense. If the MEADS project proves to be feasible and affordable, it has the potential of becoming the standard low and medium-range air defense system of the transatlantic alliance and the EU.

Moreover, a successful MEADS project would be a testament to the German-U.S.-Italian ability to carry out, even under difficult conditions, a common and more cost-effective project for all parties. Such an outcome can also have positive symbolic implications, similar to the joint U.S.-British Joint Strike Fighter (JSF) project.

4. MEADS and arms control

The final argument against MEADS involves the extent to which it conforms to arms control agreements. Most of the time, critics point to the presumed incompatibility between missile defense and the ABM Treaty of 1972. Yet, even the above-mentioned PRIF study concedes that MEADS in its current configuration does not violate the ABM Treaty of 1972. On the other hand—and similarly argued in the SWP study—an "attitudinal" incompatibility could ensue at the point when MEADS becomes part of a multi-tier missile defense system, also including elements of strategic missile defense barred from the ABM Treaty. Then, the argument goes, MEADS could become part of an arms race with Russia.[60] Such considerations are mistaken, however, because they attempt to place the idea of extended air defense within a context into which it does not fit. MEADS is primarily about the protection of ground troops in allied defense or – the most probable scenario – during international interventions.

In addition, assumptions about an arms race with Russia are unfounded. Moscow has neither the money nor the intention to pursue such an arms race. Rather, the Russian government seems intent on seeking the cooperation of the United States and Europe states on theater missile defense. Even on the question of national (global) missile defense, one would expect it to be more inclined toward some kind of compromise.[61] Even the December 2001 announcement by the Bush administration that it planned to withdraw from the ABM Treaty has changed nothing in this respect. The reaction of President Vladimir Putin made it clear that Russia does not approve of this move, but does not consider it a significant security problem.

IV. CONCLUSIONS

If we sum up the arguments, we reach the conclusion that the pursuit of the MEADS project as a U.S.-European cooperative project is and will remain sound and reasonable. Strategic considerations, issues of alliance policy, and economic considerations speak in favor of this project:

- In line with the proclaimed willingness of the German Red-Green coalition government to participate in international cooperative peace support operations even with military means, and in light of the *Bundeswehr* reform it has initiated, the government must continue to pursue projects such as MEADS. If it does not, a gap would be created in the protection of German (and cooperating foreign) soldiers, which under certain circumstances, can have major negative strategic implications.
- Pursuing the transatlantic MEADS project makes also sense for the simple reason that it is extremely important, specifically in the area of air defense, that the same systems are used within the alliance—nowhere else are systems interoperability and comparability as essential as in extended air defense.
- There are no alternatives in the foreseeable future to continuing the MEADS project. A European option akin to joining the French-Italian FSAM project would be too expensive and time-consuming. Abandoning MEADS and purchasing PAC-3 alone would be risky for strategic reasons and for the purposes of alliance policy. The option of an indigenous German new-generation air defense system (LVSystNG) is political fiction and would be neither financially feasible nor politically defensible within the alliance.

MEADS continues to have a good chance of becoming a successful example of transatlantic arms cooperation, precisely because it is not a system vital to the future of the Alliance. Extended air defense nowadays is an important element of allied defense and of the ability to intervene; without it, allied defense and most interventions would be untenable.

Yet the success of MEADS is uncertain because the project is saddled with exactly those problems that have repeatedly hindered cooperative arms projects on both sides of the Atlantic. These include: the more or less latent protectionism of the United States; the difficulties of designing common

requirements for procurement plans and, once these are achieved, of fending them off against national reservations; and the considerable problems of integrating international cooperative arms projects into national procurement plans. In addition, such projects are always burdened with other issues, such as quarrels and petty jealousies surrounding Alliance policy, as well as generally critical attitudes against arms production, which are particularly prominent in German politics.

One special feature in the German case is the serious budgetary situation. The federal government's financial condition is unsettling, and the defense budget is chronically underfunded. Despite former Defense Minister Scharping's assertions to the contrary, all experts – including the General Inspector of the *Bundeswehr*, General Kujat – take for granted that funding of the *Bundeswehr* reform is not guaranteed within the current budget limits and that considerably more funds would be needed, especially for the procurement of new weapons systems. The heated debate of a year ago can be attributed to this desolate financial situation. The MEADS project could fall victim to this stringent economic constraint.

Whether the MEADS project will survive another three years of renewed testing is open to question. Under the current political and, above all, budgetary conditions, anything is possible. A withdrawal from MEADS would be a disaster from the perspective of the alliance and would do serious harm to German security and defense policy. Too much political capital has been invested, and, in the end, for those who want Germany to be a reliable and secure partner in international peace support operations, the consequences could be extremely negative. At any rate, it is possible – and even necessary – to subject the technological and strategic fundamentals of the project to critical analysis. Such a review, however, ought to take place within the framework of MEADS and not with a view to some fictional new project whose contours are at best blurred and which in no way promises to be cheaper.

ENDNOTES

[1] See General Accounting Office, *No Easy Choice - NATO Collaboration and the US Arms Export Control Issue* (Washington, D.C.: Government Printing Office, January 1981).

[2] Andreas Fürst, *Der US Kongreß und die amerikanische NATO-Politik 1948-1989* (Sinzheim: pro Universitate Verlag, 1996), p. 136 ff.

[3] For an overview of the problems in armaments cooperation in general, see Wilfried Karl, ed., *Rüstungskooperation und Technologiepolitik als Problem der westeuropäischen Integration* (Opladen: Leske und Budrich, 1994); Pierre de Vestel, "The Prospects for Defense Industrial Cooperation in an enlarged European Union," in Franco Algieri, ed., *Managing Security in Europe* (Gütersloh: Bertelsmann Stiftung, 1996), pp. 133–157; Holger H. Mey, "Europäische Rüstungszusammenarbeit," *Europäische Sicherheit*, Vol. 45, No. 7 (July 1995), pp. 28–30; Christian Muguet, "Die militärisch-industrielle Zusammenarbeit, die deutsch-französische Kooperation und die europäische Verteidigung," in Centre d'Information et de Recherche sur l'Allemagne Contemporaine [CIRAC], *Handeln für Europa* (Opladen: Leske und Budrich, 1995), pp. 94–111; Shannon M.L. Hurley, "Arms for the Alliance: Armaments Cooperation in NATO," *Comparative Strategy*, Vol. 7, No. 4 (1988), pp. 377–398; Keith Hartley, *NATO Arms Co-operation: A Study in Economics and Politics* (London: Allen & Unwinn, 1983); R. G. Matthews, "The 'Nuts and Bolts' of Industrial Cooperation in Armaments Manufacture," *RUSI Journal*, Vol. 126, No. 3 (September 1981), pp. 41–45; David Greenwood, "Allied Cooperation in Armaments Development, Production, and Support: a European View," in: Kenneth A. Myers, ed., *NATO - The Next Thirty Years* (Boulder, CO: Westview, 1980), pp. 317–334; Dan Smith, "Trans-Atlantic Cooperation and Conflict in Military Technology: A Case Study of International Technology Politics," in: Dieter Ernst, ed., *The New International Division of Labour, Technology and Underdevelopment* (Frankfurt/M.: Campus, 1980), pp. 173–196; Robert W. Dean, *The Future of Collaborative Weapons Acquisition* (Santa Monica, CA: RAND, 1978); Keith Hartley, "NATO, Standardisation and Nationalism: An Economist's View," *RUSI Journal*, Vol. 123, No. 9 (1978), pp. 57–60.

[4] See Peter Vigor, *Soviet Blitzkrieg Theory* (New York: St. Martin's Press, 1983); Phillip A. Petersen and John G. Hines, *The Conventional Offensive in Soviet Theater Strategy*," *Orbis*, Vol. 27, No. 3 (Autumn 1983), pp. 695–639; John G. Hines, Phillip A. Petersen, and Notra Trulock, "Soviet Military Theory from 1945 to 2000: Implications for NATO," *The Washington Quarterly*, Vol. 9, No. 4 (Autumn 1986), pp. 117–137. See also Lothar Rühl, "Die Vorwärtsverteidigung der NVA und der sowjetischen Streitkräfte in Deutschland bis 1990," *Österreichische Militärische Zeitschrift*, Vol. 29, No. 6 (November/December 1991), pp. 501–508.

[5] This system was to include a two-mode seeker, the first mode for directing the missile toward the target, the second for close tracking and countering attacking objects, assisted by highly advanced command and control technology.

[6] See the contribution of Eurosam President Zalonis titled "Industrial Co-operation in Limited Anti-Missile Defence" at the symposium of the WEU Parliamentary

Assembly of April 1993 on the issue "Current State of Industrial Studies on Anti-Missile Systems in Europe." It can be accessed on the Internet: http://www.fas.org/spp/starwars/program/europe/weu_93.

[7] These calls were brought up in the context of the concept of Counter Air 90 and were also discussed in NATO. See Richard DeLauer, "Emerging Technologies and their Impact on the Conventional Deterrent," in Andrew Pierre, ed., *The Conventional Defense of Europe: New Technologies and New Strategies* (New York: Council on Foreign Relations, 1986), pp. 40–70.

[8] Data are from U.S. Department of Defense, Ballistic Missile Defense Organization (BMDO), *1995 Report to the Congress on Ballistic Missile Defense*, Washington, D.C., September 1995; Lieutenant-General Malcolm R. O'Neill, Director BMDO, Statement Before the Subcommittee on Defense, United States Senate, Committee on Appropriations, June 27, 1995; David A. Flughum, "USAF Aims Laser at Antimissile Role," *Aviation Week and Space Technology*, August 14, 1995, pp. 24–25. See also David A. Flughum, "Army Pushes Missiles for UAV Use," *Aviation Week and Space Technology*, August 28, 1995, as well as William B. Scott, "Kinetic-Kill Boost Phase Interceptor Regains Favor," *Aviation Week and Space Technology*, March 4, 1996, pp. 22–23; Holger H. May, Karl P. Sasse, Karl-Heinz Allgaier, '*Counterproliferation': Die Bedeutung einer Raketenabwehr für Europa* (Frankfurt a.M./Bonn: Report Verlag, 1994), pp. 83–119; Keith Payne et al., *Proliferation, Potential TMD Roles, Demarcation and ABM Treaty Compatibility* (Washington, D.C.: National Institute for Public Policy, September 1994), pp. 19–24.

[9] Gerhard Schulze, "MEADS: Ein neues Flugkörper-Waffensystem für die Luftverteidigung," *Wehrtechnik*, Vol. 27, No. 6 (June 1995), pp. 16–17. On expected contributions by the German industry, see Wolfgang Erlewein and Wolf Krüger, "MEADS: Erfahrungen und mögliche Beiträge der deutschen Industrie," *Wehrtechnik*, Vol. 27, No. 6 (June 1995), pp. 18–21.

[10] "MEADS Memorandum of Understanding Signed," News Release, Office of Assistant Secretary of Defense (Public Affairs), Washington, D.C., May 31, 1996 (http://www.defenselink.mil).

[11] The original work share was to be 50 percent U.S., 20 percent German, 20 percent French, and 10 percent Italian.

[12] Jean Dupont, "Europe Wary of U.S. Aims in Joint Defence Programme," *Interavia* 1 (January/February 1996), p. 43.

[13] Dieter Pfab, "MEADS: Das Luftverteidigungssystem für den Beginn des 21. Jahrhunderts," *Wehrtechnik*, Vol. 29, No. 8–9 (September 1997), pp. 51–54.

[14] U.S. Department of Defense, Memorandum for Correspondents, No. 076-M of May 19, 1999 (http://www.defenselink.mil).

[15] Greg Seigle, "U.S. Spending Row Puts MEADS in Jeopardy," *Jane's Defence Weekly*, August 25, 1999, p. 3.

[16] See Greg Seigle, "U.S. Congress U-Turn on MEADS," *Jane's Defence Weekly*, October 13, 1999, p. 4.

[17] Bryan Bender, "Germany Scraps MEADS for New Air-defence Approach," *Jane's Defence Weekly*, Vol. 34, No. 23 (December 6, 2000), p. 3.

[18] Michael Sirak, "Germany Agrees to MEADS Risk," *Jane's Defence Weekly*, Vol. 34, No. 24 (December 13, 2000), p. 6.

[19] According to the side letter, there was to be an assessment about the integration of further critical technologies into the MEADS project, especially those that contributed to the increased survivability of the radar, the interoperability of guidance systems, and the versatility of the seeker. In addition, efforts were to be made to integrate elements from other systems into the project. Finally, more cost-effective alternatives to the Patriot PAC-3 missiles were to be sought.

[20] The parliamentary budget committee approved DM145.5 million for the three-year RRE phase, of which DM35.1 million were to be used for 2001. With regard to the concluding report at the end of the RRE phase, the budget committee also demands an assessment by the Federal Ministry of Defense highlighting the advantages of MEADS relative to other systems (PAC-KWA 2; AMRAAM, ASTER). The final decision on the procurement of MEADS is to follow at a later point.

[21] "SPD zieht bei Bundeswehr die Notbremse," *Die Welt*, May 22, 2001.

[22] Volker Kröning, "Die Luftwaffe von morgen: Qualität statt Quantität," Internet: http://www.bundestag.de/me/mdbhome/kroenvo0/luftwaff.htm.

[23] On the federal government's position, see its response of August 10, 2001 to *Bundestag* members' request about plans for a tactical air defense system (TLVS/MEADS). (Antwort der Bundesregierung auf die Kleine Anfrage der Abgeordnete Jürgen Koppelin, Günther Friedrich Nolting, Dr. Wolfgang Gerhardt und der Fraktion der F.D.P. [Drucksache 14/6517] zu Planungen zu einem taktischen Luftverteidigungssystem [TLVS/MEADS], Deutscher Bundestag, Drucksache 14/6802.) Before the budget committee in early May 2001, the government had also stated that the extension of the Definition phase did not include the obligation to continue cooperation beyond the present negotiations, and that in case of the program's discontinuation all needed information gained by then (including technical details pertaining to the Time Phased Released Plan) could without any constraints be used for the purposes of developing and procuring a "new-generation air defense system."

[24] Michael Sirak, "U.S. Army to Study Low-Cost Cruise Missile Defence Interceptor," *Jane's Defence Weekly*, Vol. 35, No. 5 (January 31, 2001), p. 3.

[25] Christopher F. Foss, "Lockheed Martin Wins MEADS Radar Contracts," *Jane's Defence Weekly*, Vol. 36, No. 7 (August 15, 2001), p. 4.

[26] Karl Heinz Allgaier, "Erweiterte Luftverteidigung, Sachstand und Ausblick zur Flugkörper-Abwehr," *Soldat und Technik* 4 (April 2001), pp. 22–28.

[27] See *Redefining German Security: Prospects for Bundeswehr Reform*, Report of the American Institute for Contemporary German Studies Study Group on Security (Washington D.C.: AICGS, 2001), pp. 29 ff.

[28] Horst Binder, "MEADS: Ein Erfolgsmodell für die transatlantische Kooperation," *Soldat und Technik* 11 (November 2001), pp. pp. 40–43.

[29] Hartwich Hagena, Herman Hagena, and Niklas von Witzendorff, *Eine Raketenabwehr für Europa? Probleme und Erfahrungen mit den Systemen von MEADS und PAC-3*, SWP-AP 3122 (Ebenhausen: Stiftung Wissenschaft und Politik, March 2000) pp. 44 ff.

[30] Hartwich Hagena, Herman Hagena, and Niklas von Witzendorff, *Eine Raketenabwehr für Europa? Probleme und Erfahrungen mit den Systemen von MEADS und PAC-3*, SWP-AP 3122 (Ebenhausen: Stiftung Wissenschaft und Politik, March 2000); Unpublished manuscript, 300–400 copies of which were distributed to political decision-makers. The authors are not employed by SWP, and prepared the study externally.

[31] Bernd W. Kubbig (with Tobias Kahler), *Problematische Kooperation im Dreieck: Das trilaterale Raketenabwehrprogramm MEADS*, HSFK Bulletin No. 18, Frankfurt/M, Fall 2000 (www.hfsk.de/abm/bulletin/ kubbka.htm).

[32] Lori Fisler Damrosch, ed., *Enforcing Restraint. Collective Intervention in International Conflicts* (New York: Council on Foreign Relations, 1995); Lawrence Freedman, ed., *Intervention in Military Conflicts in Europe* (Oxford: Blackwell, 1994); Richard N. Haas, *Intervention: The Use of American Military Force in the Post-Cold-War World* (Washington, D.C: Carnegie Endowment for International Peace, 1994); Anthonia Tanca, *Foreign Armed Intervention in Internal Conflict* (Dordrecht: Nijhoff, 1993); Martin Ortega, *Military Intervention and the European Union*, Chaillot Paper 45 (Paris: WEU Institute, March 2001).

[33] Graham T. Allison, Owen R. Coté Jr., Richard A. Falkenrath, and Steven E. Miller, ed., *Avoiding Nuclear Anarchy: Containing the Threat of Loose Russian Nuclear Weapons and Fissile Material* (Cambridge, MA: Harvard University Press, 1996).

[34] Joachim Krause, *Strukturwandel der Nichtverbreitungspolitik* (München: Oldenbourg, 1998), pp. 119 ff.

[35] Joachim Krause, "Kooperative Sicherheit: Strategische Ziele und Interessen," in Karl Kaiser and Joachim Krause, eds., *Deutschlands Neue Außenpolitik; Band 3: Interessen und Strategien* (München: Oldenbourg, 1996), pp. 77–96.

[36] *The Alliance's Strategic Concept*, Meeting of the North Atlantic Council, Washington, D.C., April 24, 1999.

[37] *The Alliance's Strategic Concept*, op. cit.

[38] NATO Document MC 327 ("NATO Military Planning for Peace Support Operations"); quoted in Hans Joachim Schubert, "Mehr Raum, weniger Zeit und Kräfte; Operative Führung vor dem Hintergrund vielfältiger Einsatzoptionen für Luftverteidigungskräfte," *Truppenpraxis/Wehrausbildung*, Vol. 43, No. 6 (June 1999), pp. 408–413 (410).

[39] *Redefining German Security, Prospects for Bundeswehr Reform*, a.a.O., S. 16 - 17.

[40] Jörg Peter Köpke and Jörg Dronia, "Die Luftverteidigung im Wandel zur erweiterten Luftverteidigung," *Wehrtechnik*, Vol. 30, No. 2 (May 1998), pp. 17–20.

[41] See the federal government's report on the concept of future air defense, submitted in late January 2001 to the defense committee of the German *Bundestag*. (Internet: http://www.geopowers.com/Konzepte/vtd_zept/DCI/ survive/survive.html.)

[42] See also Karl-Heinz Allgaier, *Erweiterte Luftverteidigung*, op. cit.

[43] Ferdinand Mertes and Rüdiger Knappe, "Die Flugabwehrraketenkräfte der Luftwaffe heute und morgen," *Wehrtechnik*, Vol. 30, No. 2 (May 1998), pp. 21–23.

See also Karsten W. Fromm, "Boden-Luft-Abwehrsysteme gewinnen an Bedeutung," *Europäische Sicherheit*, Vol. 49, No. 7 (July 2000), pp. 20–21.

[44] *Bericht der Bundesregierung zum Konzept der künftigen Luftverteidigung*, op. cit.

[45] Luke Hill, "TMD: NATO Starts the Countdown," *Jane's Defence Weekly*, Vol. 35, No. 1 (January 3, 2001), pp. 24–27.

[46] *Bericht der Bundesregierung zum Konzept der künftigen Luftverteidigung*, op. cit.

[47] *Hagenah* et al., op. cit., p. 34.

[48] Eliot A. Cohen and Thomas A. Keaney, *Gulf War Air Power Survey: Summary Report*, Washington, D.C., 1993, pp. 83–90.

[49] Gen. Ronald R. Fogleman (Chief of Staff, US Air Force), *The Air Force Role in Theater Ballistic Missile Defense*, http://www.af.mil/news/ speech/current/ The_Air_Force_Role_in_Theat.html. See also Richard Mesic, "Extended-Counterforce-Options for Coping with Tactical Ballistic Missiles," in Paul K. Davis, ed., *New Challenges for Defense Planning: Rethinking How Much is Enough* (Santa Monica, CA: RAND, 1994), pp. 515–541, especially pp. 538 ff.

[50] See *Hagenah* et al., op. cit., p. 35.

[51] *Antwort der Bundesregierung auf die Kleine Anfrage*, op. cit.; see also, "Reform der Luftwaffe – Konzentration auf unmittelbare Einsatzaufgaben, Interview mit dem Inspekteur der Luftwaffe, Generalleutnant Gerhard Back," *Europäische Sicherheit*, Vol. 50, No. 6 (June 2001), pp. 14-19 (18 f.).

[52] See *Dan Morgan* and *George Ladner*, "Scud - Damage Suggests Needs Refinements; U.S. Missiles Sometimes Fail Warheads in Midair Interceptions," *The Washington Post*, February 21, 1991; *David Hughes*, "Success of Patriot System Shapes Debate on Future Antimissile Weapon," *Aviation Week and Space Technology*, April 22, 1991, pp. 90–91.

[53] See U.S. Department of Defense, Fact Sheet "Patriot Advanced Capability –3," Fact Sheet 203-00-11, November 2000; http://www.defenselink.mil. See also Federation of American Scientists, Factsheet on "Patriot PAC-3 Missile," http://www.fas.org/spp/ starwars/program/dote99/99patriot.htm.

[54] A successful test took place in April 2001, following another successful test in July 2000. Nevertheless, not all system components have yet been tested.

[55] Data according to Eurosam (www.eurosam.com/products/customers.htm).

[56] See Mark Bromley, *European Missile Defence: New Emphasis, New Roles*, Paper No. 36 (London: BASIC, May 2001).

[57] Data taken from the web site of the Federation of American Scientists (FAS), www.fas.org/nuke/guide/russia/airdef/.

[58] See Kubbig, *Problematische Kooperation im Dreieck*, op. cit., p. 8, and the reference made to the report by the Government Accounting Office (GAO).

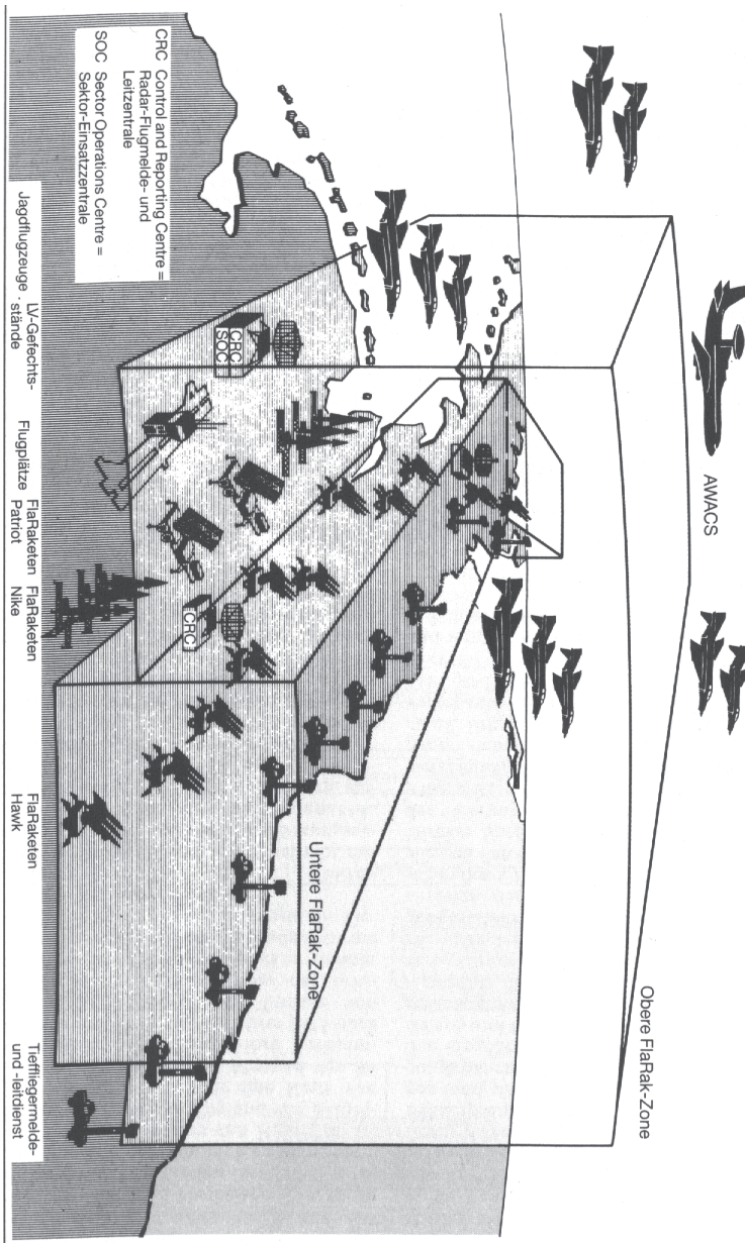
[59] See David C. Gompert, Richard L. Kugler und Martin C. Libicki, *Mind the Gap. Promoting a Transatlantic Revolution in Military Affairs* (Washington, D.C.: National Defense University Press, 1999).

[60] Kubbig, *Problematische Kooperation im Dreieck*, op. cit., p. 9.

[61] See Hannes Adomeit, *Putin und die Raketenabwehr. Moskaus Haltung zu NMD im Kontext der russisch-amerikanischen Beziehungen* (S 29) (Berlin: Stiftung Wissenschaft und Politik, September 2001); and Klaus Arnhold, *Russlands Vorschlag zur nicht-strategischen Raketenabwehr für Europa* (S 28/01) (Berlin: Stiftung Wissenschaft und Politik, September 2001).

VI. APPENDICES

1. NATO's air defense in Central Europe in the 1980s



Source: Federal Ministry of Defense, *Weißbuch 1985* (Bonn, 1985), p. 207

2. States possessing or aspiring to acquire weapons of mass destruction and missiles (not including the U.S., Russia, China, France, and the UK)

Country	A-Weapons	B-Weapons	C-Weapons	Technology
Libya	no	R&D, attempt to acquire production facilities	yes, production halted	Scud technology
Egypt	no	R&D until 1980	yes, production discontinued	Scud technology
Saudi Arabia	no	no	no	CSS-2
Syria	no	R&D	yes	Scud-C from North Korea; production facility being built
Iraq	no, possible attempts at recovering past capabilities	yes, but remnants of previous stocks unresolved	yes, previous stocks destroyed, further stocks likely	continuation of different programs (Scud and more)
Iran	R&D probably	presumably	yes	Shahab-2 (300 miles) Shahab-3 (800 miles) Shahab-4 (1240 miles) under development
Pakistan	yes	R&D assumed	amounts in laboratory	M-11 (220 miles) Shaheen (430 miles) Ghauri (800 miles) under development, tested
India	yes	R&D assumed	yes	Prithvi (155 miles) Agni (930-1240 miles)
North Korea	R&D, possibly reactor fuel used for a few explosive devices	probably	yes	Scud-C (310 miles) Nodong (180 miles) Taepodong (up to 1600 miles) under development
Israel	yes	presumably	yes	Jericho 1 (310 miles) Jericho 2 (930 miles)

Source: Joachim Krause, *Strukturwandel der Nichtverbreitungspolitik* (München, 1998); published data of BND.

3. Timeline and development phases of MEADS

1979–1981	joint study by Germany, UK, and France on future medium-range air defense system
1982	Germany withdraws from trilateral cooperation
Mar. 1983	U.S. President Reagan announces SDI
1985	France and Italy begin FSAF cooperation
1987	German government passes tactical requirement for air defense (TLVS)
1991	in the Gulf War, Iraqi missiles are used against targets in Saudi Arabia, Qatar, and Israel; U.S. is badly prepared, small defense capability of PAC-2 system
1994	Clinton administration proposes cooperation on medium-range missile defense system to German federal government
Nov. 1994	in congressional elections in the U.S., the Republicans win in both Houses and pressure the Clinton administration to develop a national missile defense system
Feb. 1995	Statement of Intent on the joint development and production of a Medium Extended Air Defense Systems (MEADS) signed between the U.S., Germany, France, and Italy
May 1996	MOU between U.S., Germany, and Italy on the implementation of the MEADS program
summer 1996	Project Definition and Validation (PD/V) phase begins
fall 1996	NAMEADSMA assigns two transatlantic consortia to design plans for MEADS
October 1998	consortia submit proposals; at the same time, U.S. Congress withdraws funds intended for MEADS
May 1999	NAMEADSMA accepts the proposal of MEADS International
October 1999	compromise between Clinton administration and the U.S. Congress; project to be continued in limited form; additional RRE negotiated
Nov. 1999	the three participating governments negotiate a Transition Effort phase until the beginning of 2000 as well as a partial redesign of the project
May 2000	timeline for technology transfer negotiated (Time Phased Release Plan)
June 2000	German federal government lays out basic elements of the *Bundeswehr* reform

October 2000	German Ministry of Defense raises doubts about continuation of MEADS
Nov. 2000	U.S. signs MOU for Risk-Reduction Effort (RRE) phase
Dec. 2000	Defense Minister Scharping reassures U.S. colleagues that his government will soon sign MOU on RRE
June 2001	Germany signs MOU on RRE (including a "sideletter")
June 2001	beginning of RRE phase
summer 2004	end of RRE phase; beginning of D&D phase
2007 or 2008	presentation of a prototype; national decisions on procurement
as of 2010	possible start of production

4. List of abbreviations

ABL	Airborne Laser
ABM Treaty	Anti-Ballistic Missile Treaty
ACCS	Air Command and Control System
ATBM	Anti-Theater Ballistic Missile
BMC^4I	Battle Management, Command, Control, Computers, Communication and Intelligence
D&D	Design and Development
FSAF	Famille sol air future
GEM	Guidance Enhancement Missile
HSFK	Hessische Stiftung für Friedens- und Konfliktforschung
JSF	Joint Strike Fighter
LVSystNG	Luftverteidigungssystem Neuer Generation
MIRV	Multiple Independently targeted Reentry Vehicle
MOU	Memorandum of Understanding
NAMEADSMA	NATO MEADS Management Agency
NATINEADS	NATO Integrated Extended Air Defence System
PAAMS	Principal Anti Air Missile Systems
PAC-3	Patriot Advanced Capability-3
PD/V	Project Definition and Validation
QRP	PAC-2 Quick Response Program
R&D	Research and Development
RRE	Risk-Reduction Effort
SAM	surface-to-air missile
SAMP-T	Sol-Aire-Moyenne Portée, Terrestre
SDI	Strategic Defense Initiative
SWP	Stiftung Wissenschaft und Politik
THAAD	Theater High Altitude Air Defense System
TLVS	Taktisches Luftverteidigungssystem
UAV	Unmanned Aerial Vehicle

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