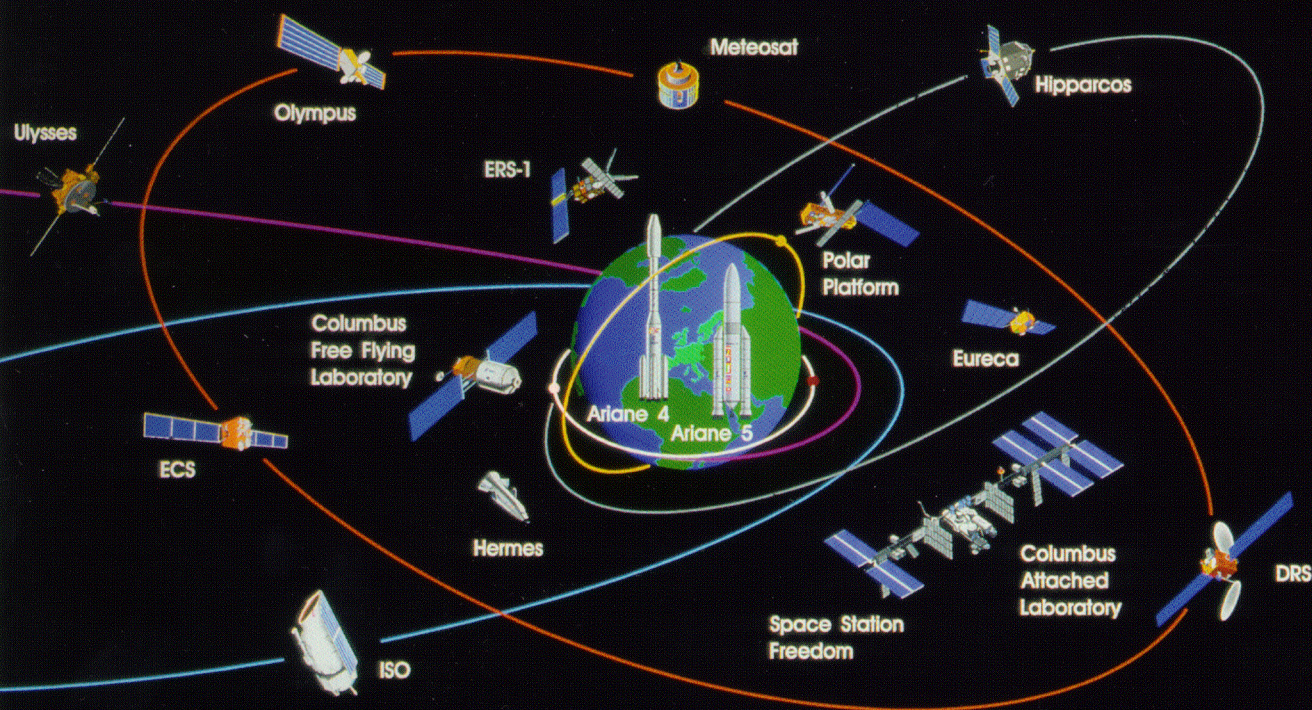


The Origins of the Federal Republic of Germany's Space Policy 1959-1965 — European and National Dimensions

by Peter Fischer



The ESA History Study Reports are preliminary reports of studies carried out within the framework of an ESA contract. As such they will form the basis of a comprehensive study of European Space activities covering the period 1959-87. The authors would welcome comments and criticism which should be sent to them at the appropriate address below.

The opinions and comments expressed and the conclusions reached are those of the authors, and do not necessarily reflect the policy of the Agency.

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Introduction

Like atomic energy, space flight ("Raumfahrt") had a negative image in West German public opinion throughout the fifties. Due to historical reasons both technologies were almost exclusively identified with war and mass destruction. Presumed to be decisive for the outcome of World War II the German Reich had undertaken a big effort in the development of nuclear as

¹ This account is based primarily on national archival sources, deposited in the Federal Republic's state archives in Koblenz (Federal Archive) and Bonn (Political Archive, Foreign Ministry), hereafter abbreviated BA and PA-AA, and on a collection of documents of the Federal Ministry of Defence, deposited in the archive of the Nuclear History Programme (NHP) in Bonn. Some use has also been made of material in Foreign Office files in the (UK) Public Record Office (PRO-FO), London, which has been collected by J. Krige. The paper at the same time benefits substantially from the most recent research on German space policy by Weyer (1990) and Trischler (1992) as well as on European space policy by Krige (1992/93), Russo (1992) and De Maria (1993) presented in this series. See also De Maria and Krige (1993).

well as rocket technology.² While the nuclear project, after a first period of intensive activities, had already begun to suffer from insufficient governmental support in 1942, the German rocket project was successful in developing several ballistic missiles of which the so-called V-2 was the most efficient.³ Contrary to their colleagues in the nuclear project, German rocketeers managed to attract a great deal of attention from the leaders of the Nazi regime. As with the Manhattan Project in the United States, the Peenemünde Project in Germany became the first example of a new and modern form of organizing a big research and development project based upon an unprecedented close interaction between the state, science, and industry.

Although neither the American atomic bombs dropped on Hiroshima and Nagasaki nor the heavy German rocket fire against London turned out to be decisive for the outcome of World War II, both technologies were immediately seen as power technologies influencing significantly the shaping of post-war international relations.⁴ Consequently, after the unconditional surrender of the Third Reich, any German activity in the field of nuclear and rocket technologies was totally restricted by the Allied Powers.

After ten years, with the termination of the occupation regime, these limitations were partly abolished. With the coming into force of the Paris Treaties in May 1955 the Federal Republic was free to become active in the development of nuclear and space technology for civil purposes. The construction on German territory of nuclear weapons as well as of guided missiles with a range greater than 70 km was still, however, strictly forbidden.⁵

While the Federal government almost immediately made extensive use of the restored right to engage in the development of nuclear energy — as early as October 1955 a special Ministry for Atomic Affairs was established —, it demonstratively refrained at first from doing the same with respect to space technology. The reason for this different policy was very simple. With the American Atoms for Peace Programme in late 1953 and the United Nations Conference on Atomic Energy in Geneva in August 1955, an international effort to develop nuclear energy for civil use was already well under way. In addition to that, the Federal

² For the German nuclear efforts during World War II see Walker (1987).

³ See Dornberger (1992), Greschner (1987), pp. 255-266 and Ruppe (1980), pp. 56-59.

⁴ See Freedman (1981).

⁵ See Fischer (1993b).

government, before deciding to launch a national nuclear energy programme, had deliberately joined an initiative of several European countries aiming at the creation of a supranational European Atomic Energy Community (EURATOM). Although facing considerable internal opposition against this political decision, Federal Chancellor Adenauer had regarded this integration necessary to overcome any suspicion abroad of the Federal Republic's sincere intentions not to embark on a dangerous course concerning its emerging national nuclear policy.⁶

For West Germany's re-entry into the field of space a comparable external initiative for international cooperation was required. Although throughout the fifties internal pressure had been growing for a revival of national space research, it was only at the beginning of the sixties that the Federal government took the appropriate political decisions. After the Federal Republic in 1960 had been officially approached to join other West European countries in developing space technology for civil purposes, the Federal government, under the pressure of the ongoing diplomatic negotiations, almost immediately decided not only to become active member of the emerging European Space Research Organization (ESRO) and the European Launcher Development Organization (ELDO). It also very quickly created the organizational and institutional infrastructure that was required both for successful participation in the international organizations and for an immediate start of an ambitious national space programme.

Evidently, this instant reaction was only possible because of the already existing national structures in the field of space research.⁷ Firstly, there were numerous so-called space societies, like the "Gesellschaft für Weltraumforschung e.V. (GfW)" or the "Arbeitsgemeinschaft für Raketentechnik e.V. (AFRA)". These were composed mainly of scientists and technicians from the Peenemünde Project. Organized in incorporated societies and therefore not conflicting with Allied restrictions, they had been partly reestablished or partly newly founded shortly after the end of World War II. Being active in the organization of scientific symposiums and in making propaganda for a peaceful image of space research, their members considered themselves to be in a forced temporary retirement.

Secondly, there were existing space research institutes like the "Forschungsinstitut für Physik der Strahlenantriebe (FPS)". Founded in July 1954 on the initiative of the GfW,

⁶ *Ibid.*

⁷ For this section see Trischler (1992) and Weyer (1990).

the FPS under its first director Eugen Sänger, soon succeeded in creating a team of space specialists. Working mainly on commission for the United States in the field of armaments production, the FPS had such illustrious firms among its members as BMW, Bölkow, Messerschmitt, Porsche, accompanied by General Electric, Fiat, and Contraves.

Thirdly, like Eugen Sänger, a considerable number of German space specialists, who had been constrained to work for one of the four victorious powers after the defeat of the Third Reich, were keen to come back into the Federal Republic in the second half of the fifties, hoping that space research and development could be continued also at home.⁸

Finally, long before the Federal government took its first decisions, several activities in the field of space research and development had been sponsored by the German Defence Ministry. Contrary to his unsuccessful predecessor, Franz Josef Strauß, Minister of Defence since October 1956 paid great attention to the development of modern technologies, insisting that an effective German defence contribution was absolutely conditional upon the integration of the most modern, i.e. nuclear, weapons including the necessary delivery means. In accordance with his demand for an equal standing within the NATO Alliance, he immediately started to push for a German participation in the production of these weapons.⁹

It was however not only the immediate utility for armaments production which led Strauß to become so immensely active in setting up national scientific as well as industrial capacities committed to the development of so-called modern, like nuclear, aviation or missile, technologies. Despite his often martial public rhetoric, Strauß was deeply convinced that the nature of international conflicts in the age of nuclear stalemate had changed substantially. With the decrease of the probability of an open conflict between the two super powers, it was first of all the industrial and technological capacity of the Western countries that had become the decisive factor in the conflict with the communist block. Moreover, according to Strauß' analysis, the industrial competitiveness of a country as well as its international political weight was going to become increasingly dependent upon the national ability to master the new technologies.

⁸ The forced emigration of German rocket specialists after 1945 and their contribution to the national space programmes in the United States, Great Britain, France and the Soviet Union is described in Greschner (1987), pp. 266-276. With the remarkable exception of the German emigrants to the United States, most of them returned to Germany during the fifties and the early sixties.

⁹ See Fischer (1991) and (1993a).

It was therefore hardly surprising that, when in 1960 the first interministerial meetings on a West German engagement in the field of space research were called, it was Strauß who came up with the most elaborate ideas. The story which this paper is going to tell starts however at another point. It begins with a short recapitulation of the diverse initiatives in the late fifties encouraging countries to participate in the international development of space technology for civil purposes.

1 European cooperation in space: early initiatives

It was not before the year 1957 that space research for civil purposes became the object of several international initiatives. The prelude was the so-called International Geophysical Year (IGY) which ran from July 1957 to December 1958. It encouraged countries for the first time to start scientific research in space using rockets and satellites. Ironically, it was the Soviet Union's contribution to the IGY which got things really going. In early October 1957 the USSR were successful in launching *Sputnik-1*, the first satellite, into space.¹⁰

In the Western World this public demonstration of superior Soviet technology caused a severe shock. For the first time in cold war history the USSR, often described as backward, had beaten the United States in the development of high technology. It was not only that the USSR deserved the credit for having opened the space age. They had also demonstrated their capacity to launch intercontinental ballistic missiles, being from then on in a position to attack American territory from home bases very rapidly.

The reaction to this "technological gap" was multifarious. In the armaments race between the two super powers, attention in the late fifties shifted from competition for the development of the most effective nuclear bombs to the development of the most efficient delivery means, as well as to satellites. Attaining the lead in the space race however required more than just a reinforcement of space research and development for military purposes only. What was also necessary was the immediate build-up of an integrated scientific and industrial infrastructure which could serve for the development of space technology for civil purposes. To coordinate this effort on the national and international level, the United States established in early October 1958 its civil national space agency (NASA).¹¹

¹⁰ See Krige (1993c), pp. 2-4.

¹¹ See Kries (1987), pp. 299-304.

At the same time, the North Atlantic Treaty Organization (NATO) was also concerned with the question of how to pool scientific and industrial resources for the space race. For this purpose, the NATO heads of governments conference in December 1957 established a scientific committee which immediately set up a "Groupe Consultatif sur la Recherche Spatiale".¹² It was recommended that European member countries, as soon as possible, should conclude bilateral agreements with the United States to use American launcher capacities for satellite experiments. Going further, it was even suggested that NATO should sponsor a European NASA to cooperate with the American NASA.¹³

The United Nations was another body which launched an initiative in late 1959 to encourage international cooperation in space research. Responding to the "open skies" proposal of President Eisenhower, the UN General Assembly established a "Committee on the Peaceful Uses of Outer Space" (COPUOS), charged to organize an international space conference similar to the International Atomic Energy Conference in Geneva in August 1955, that had taken place under the UN auspices. Since however the "Atoms for Peace" propaganda, to a great extent, had been designed as an ideological cover for the nuclear armaments race,¹⁴ there were not a few who were from the beginning suspicious about a "Space for Peace" campaign.¹⁵

The encouragement of scientific research in space, induced mainly by political and military interests, did not meet with unanimous approval, especially in the international scientific community. It was one of their most illustrious spokesmen, the Italian physicist Eduardo Amaldi, who pointed out very clearly that scientists should have the power to shape a space programme free not only from military pressures, but also from any bureaucratic and political "interference" by NATO member states' governments. In an important document, entitled "Space Research in Europe", and drafted in late April 1959 after extensive discussions with Pierre Auger, the President of the Comité des Recherches Spatiales in France, Amaldi spelled out in detail his idea for a "European Space Research Organization". This organization, modelled on CERN, "should have no other purpose than research and

¹² For documentation of this important conference see FRUS (1955-1957) IV, pp. 218-260.

¹³ See Krige (1992a), pp. 6-7.

¹⁴ For a detailed reconstruction of the ideological objectives of the Atoms for Peace programme see Eckert (1987).

¹⁵ See McDougall (1985), p. 184.

should, therefore, be independent of any kind of military organization and free from any Official Secrets Acts".¹⁶

The Amaldi memo soon became the major point of reference for the first discussions within the European scientific community. Circulated to senior science administrators in Belgium, France, Germany, Italy, and the Netherlands, it received extremely positive reactions. In the Federal Republic, the addressee was Alexander Hocker, civil servant in the Federal Ministry for Atomic Affairs, who had been, together with Heisenberg, the German representative to the CERN negotiations in 1951.¹⁷ Hocker himself circulated the memo to several scientists. In one of the replies, besides a positive reaction to the whole initiative, it was already mentioned that scientific and technical space development had to be separated carefully. Furthermore, it was regarded as essential that the interest of German industry in space be awakened.¹⁸

In a subsequent statement, Amaldi stressed again that the new organization should be devoted to strictly scientific and peaceful activities and suggested that a small group of five or six people from interested European countries should to be set up "as soon as possible" to study a more detailed scheme.¹⁹

A first chance to present his initiative to a wider scientific audience came in January 1960 when a major meeting of the international Committee on Space Research (COSPAR) was held in Nice. Founded at the general assembly of the International Council of Scientific Unions, immediately after the end of the International Geophysical Year, this purely scientific organization had the task of coordinating and promoting the development of space research on behalf of the world scientific community. With Alfred Ehmert and Julius Bartels, two distinguished German scientists had also become members of COSPAR. The fact that both had had no contact with the Peenemünde Project was of great importance. German

¹⁶ See Krige (1992a), pp. 4-7.

¹⁷ See Hermann *et al* (1987).

¹⁸ See Trischler (1993), document 123: Letter P. Meyer to A. Hocker, 10 July 1959 (BA, B 138/3451).

¹⁹ Cited by Krige (1992a), p. 5.

participation in COSPAR was the very first step towards officially reintegrating German space specialists into the international scientific community.²⁰

The Amaldi memo, officially published the month before, was discussed extensively at the above mentioned first General Assembly of COSPAR in Nice. In a series of subsequent informal meetings, the proposal to set up a European Space Research Organization quickly assumed a more concrete shape. These meetings, taking place between February and June 1960 in Paris and London, have already been extensively discussed in a previous report in this series, so we can confine our description to a very short summary of the results.²¹

First, in the course of these meetings, the circle of scientists around Amaldi and Auger who promoted European cooperation in space research was steadily enlarged. Most important was the early participation of Sir Harrie Massey, the chairman of the British National Committee for Space Research. The United Kingdom was the country with by far the most advanced national space programme in Western Europe.

Second, the French-Italian initiative to establish a European Space Research Organization dedicated to purely scientific research was accompanied by a British initiative to use its *Blue Streak* ballistic rocket as the first stage of a joint European satellite launcher.

Third, a resolution, entitled "Draft Agreement Creating a Preparatory Commission for European Collaboration in the Field of Space Research", which had been prepared by Auger, was adopted in late June 1960. Furthermore, the scientists decided to present this resolution to their national governments. For this purpose a study group, called the GEERS (Groupe d'Etude Européen pour la Collaboration dans le Domaine des Recherches Spatiales), was created, to prepare the programme and budget for interested governments. Auger was nominated as executive secretary of this study group, while Sir Harrie Massey was nominated its chairman.

2 *First reactions in the Federal Republic of Germany*

These meetings of the group of scientists were attended by Julius Bartels and Alfred Ehmert, the two German representatives to COSPAR. While they had followed the discussions of

²⁰ See Weyer (1990), p. 254.

²¹ For this section see Krige (1992a), pp. 10-22.

their colleagues with great interest, they had hardly been in a position to take an active part. For one thing a comprehensive picture of the interests in space research within the German scientific community itself was lacking.²² More important, there had been hardly any communication with the Federal Authorities about the desirability of an official resumption of German activities in space research, which had been interrupted since 1945 and which still suffered from the bad Peenemünde image. To lift this ban a political decision at the highest level was required.

It was Julius Bartels, the spokesman of the emerging German scientific space community, who, early in June 1960, took a first initiative. In a circular letter addressed to the Foreign Ministry, the Ministries of Transport and for Atomic Affairs, as well as to the president of the "Deutsche Forschungsgemeinschaft" (DFG) and the chairman of the "Deutsche Gesellschaft für Raketentechnik und Raumfahrt" (DGRR), he described the ongoing discussions for initiating European cooperation in space research.²³ Soon thereafter the Federal government was officially approached to comment upon the draft resolution of the group of European scientists, and the Foreign Ministry, in early June, called a first interdepartmental meeting. Due to the federal political system, and to the still rudimentary state of German activities in this field, governmental responsibility for space research and for astronautics was split between various departments. While, for example, the Federal Ministry of Transport had since the early fifties been concerned with space travel, the Federal Ministry of the Interior had been charged with authority to coordinate the whole complex of space activities at the cabinet level.

At the interdepartmental meeting in the Foreign Ministry, the various initiatives for international space cooperation were discussed in great detail.²⁴ It was generally agreed that, for political reasons, a joint European effort in the field of space research was most welcome. It was however felt that a final governmental decision about the possibilities and the actual size of German participation in a European organization for space research required a previous clarification of the technical requirements as well as a detailed survey of the actual state of scientific space activities in the Federal Republic. The members of the meeting therefore decided to ask the Deutsche Forschungsgemeinschaft (DFG) to draft a

²² For a detailed account of this early period, see the interview with R. Lüst (22 April 1993).

²³ See Weyer (1990), p. 271.

²⁴ Trischler (1993), document 125: *Record of the interdepartmental meeting in the Foreign Ministry on 7 July 1960* (BA, B 138/3451, 12 July 1960).

comprehensive study report. On the basis of this study report, to be delivered by October 1960, and for internal use only, the Foreign Ministry would then be able to draft a concrete proposal for the Federal Cabinet.

Although the discussion was still pretty vague at this first meeting, the representatives of the various departments did raise some fundamental objections against one of the envisaged activities of the proposed European space research organization, i.e. the use of the British *Blue Streak* rocket as a European satellite launcher. It was explicitly stated, "that the proposed European space cooperation should really serve the common interest of all the participants and that it should, therefore, not confine itself to a multilateral financing of a single national project, simply because its national financing causes difficulties (e.g. *Blue Streak!*)"²⁵

This explicit critique triggered a long and most controversial debate during the subsequent negotiations.²⁶ Originally developed as Britain's first intermediate ballistic missile, the British government, in mid-April 1960, had felt itself compelled to cancel *Blue Streak*'s development as a military weapon. *Blue Streak* was a liquid fuelled rocket, and was made obsolete for military purposes by the solid-propellant *Polaris* and *Minuteman*, which could be launched much more quickly. The military, in using *Blue Streak* as a launcher for nuclear warheads, was therefore confronted with two equally uncomfortable risks: the risk to start a nuclear war, by launching the missile too rapidly, or the risk of having the deterrent destroyed before it had left its launch pad because of a delay in the launching decision. For various reasons, e.g. national prestige, the enormous sums of money already invested (*Blue Streak* had already cost from \$180 to \$250 million), and, perhaps most important, the demand of the British military to maintain the already existing infrastructure including the technicians trained in the skills of rocketry,²⁷ the British government had however decided not to cancel the whole project, but to convert *Blue Streak* into a civilian satellite launcher to be developed in a European framework.

The first, although still unofficial, attempt in this direction was made by British scientists at the meeting of the group of European space scientists in late April 1960, as

²⁵ *Ibid.*

²⁶ This entire section is based on Krige (1993b).

²⁷ See PRO, PREM 11/3098, record of a conversation between Macmillan, the British Prime Minister, and Sir S. Zuckerman, 5 July 1960.

mentioned above. It was, however, only at the beginning of September that the British government itself became explicit on the proposed new scheme of cooperation. In a formal inquiry addressed to nine European countries including the Federal Republic, the question was officially raised whether there was an interest in the creation of an organization for the development of space launchers on the basis of the *Blue Streak* rocket.²⁸

The various political and financial constraints motivating the British government to launch suddenly a far-reaching initiative for European space cooperation could hardly be concealed from their potential partners. Scientists in particular, for whom a launcher was essentially a means to put a scientific experiment into orbit, received the British initiative with undisguised scepticism.²⁹ Most of them were convinced that *Blue Streak*, even recycled and used as the first stage of a satellite launcher, was technologically obsolete and too costly. Above all, however, the British proposal was mostly disapproved of because of its political character. While the Amaldi-Auger initiative for the establishment of a European space research organization had been purely motivated by scientific needs, the development of a European satellite launcher on the basis of *Blue Streak* was from the very beginning intertwined with national political, military and economic interests. It was also feared that the latter project would absorb most of the money that the participating countries were able to make available for the envisaged European organization.

3 *The DFG study report*

As requested, the study report of the Deutsche Forschungsgemeinschaft (DFG) was completed at the end of September 1960.³⁰ Drafted in the form of a memorandum, it offered the first comprehensive survey of the actual situation as well as the future perspectives for space research in the Federal Republic and Europe.

²⁸ Reference to the official request of the British government from 2 September 1960 is made in a joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs of 7 March 1962 (AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62).

²⁹ According to R. Lüst (interview, 22 April 1993), British space scientists at the international meetings in London and Paris told their colleagues that the *Blue Streak* initiative was "old hat".

³⁰ BA, B 106/17801, "Memorandum der Deutschen Forschungsgemeinschaft. Die Weltraumforschung in der Bundesrepublik Deutschland. Lage — Ausbaumöglichkeiten — Internationale Zusammenarbeit", Part 1 and 2, October 1960.

German participation in European space cooperation was recommended without any reservation. Although the report gave no concrete definition of the form and the size of this cooperation, it strictly refused, for financial as well as for political and psychological reasons, any German participation in the construction of heavy satellite launchers. As to the future national space activities, the report strongly recommended the early start of a German scientific space research programme and proposed the establishment of a national steering commission.

The recommendations which we have described call for two comments. Firstly, there was the important fact that the DFG, the traditional autonomous organization of German academic science and not, for example, the "Deutsche Gesellschaft für Flugwissenschaften" (DGF), which was the central organization of the more technically oriented big research institutes, had been charged to draft the study report. The strong accentuation of the classical space sciences in contrast to applied research in space technology was therefore preprogrammed.

Secondly, from the perspective of the DFG, an extensive German engagement in the development of space technology, including the costly construction of heavy launchers, was for reasons of organizational self-interest most unwelcome. It involved the real danger of losing again some part of its central authority in the distribution of public research funds, as had happened already to the DFG with another so-called future technology. In the case of atomic energy, scientific control over research activities had been replaced by political control executed by the newly established Federal Ministry for Atomic Affairs.³¹ In the case of space research, the DFG was not willing to lose again.

The reaction of the Federal government to the study report of the DFG was therefore not uniform.³² While most of the recommendations — i.e. the desirability and feasibility of German participation in the proposed European space cooperation, as well as the necessity of a national space research programme — were generally appreciated, the total refusal of a German engagement in the field of rocket research and development was not shared by the

³¹ For a reconstruction of the political decisions that led to the establishment of the Federal Ministry for Atomic Affairs see Fischer (1993b).

³² See AA-PA, B 30, IB1, Vol. 376, No. 202-81.21/2702/60, cabinet paper, drafted by the Foreign Ministry, 10 November 1960.

main departments.³³ The Foreign Ministry, for example, made no secret of its positive attitude towards the British initiative. The Ministries of Defence and of Transport, for their part, although raising fundamental objections against *Blue Streak* as a European satellite launcher, were not in principle against a German engagement in the field of rocket research. Both departments insisted strongly, however, on the need for bilateral cooperation with the United States.

At a cabinet meeting in late November 1960, the first that ever seriously discussed the matter of space research, the Federal government did not even try to formulate a coherent position with respect to the British initiative.³⁴ Rather it decided that, for the time being, the Federal government should take a receptive attitude without excluding the possibility of incorporating rocket research into the European space organization. Time was short. The Federal government had just received an official invitation from the Swiss government to participate in an international space conference that was going to take place only a week later in Meyrin and where all matters related to the establishment of European space research organization, including the British initiative, were going to be discussed.³⁵ The German Federal Government decided to attend this conference and to nominate Julius Bartels and Günther Bock as official scientific delegates.³⁶ With the latter, director of the "Institut für Luftfahrttechnik" at the Technical University of Darmstadt and president of the powerful "Wissenschaftliche Gesellschaft für Luftfahrt" (WGL), an official representative of German aeronautics was going to enter the stage. As it soon turned out, it was the big aeronautics research institutes and societies, accompanied by the national aviation industries, who were going to become the driving forces in German space engagement.

4 *The German Federal Government's first reaction to the British Blue Streak initiative*

³³ See BA, B 106/17801, 15 November 1960, record of the interdepartmental meeting in the Foreign Ministry on 31 October 1960.

³⁴ See BA, B 106/17801, 6 December 1960, report of the minutes of the 130th cabinet meeting on 23 November 1960.

³⁵ See AA-PA, B 30, IB1, Vol. 376, No. 125/60, note of the Swiss Embassy to the Foreign Ministry in Bonn, 27 October 1960.

³⁶ Apart from Bartels and Bock, two civil servants of the Foreign Ministry (Thierfelder and Meyer-Lohse) were nominated as German representatives to the Meyrin conference. See AA-PA, B 30, IB1, Vol. 376, No. 202-81.21/2781/60, internal note of the Foreign Ministry, 14.11.1960.

The intergovernmental conference in Meyrin, which took place from 28 November to 1 December 1960, and which was attended by delegations from 11 European countries, concluded with two important results.

First, the conference agreed on the so-called "Meyrin Agreement" which established the "European Commission for Space Research" (COPERS).³⁷ In this agreement the signatory states expressed their official interest "in studying the possibilities of European collaboration in research in space science and space technology" and assigned COPERS the task of drafting a scientific programme and an institutional setting for the envisaged European Space Research Organization (ESRO).³⁸ The only participating country which did not sign the agreement was the Federal Republic. The reason for this was however purely administrative.³⁹ Since the government had been unable to settle the German financial contribution to COPERS in the Federal budget before the conference, the Federal Republic signed the agreement on 27 February 1961, a delay of some three months.⁴⁰

Second, although the Meyrin Agreement had officially assigned COPERS the task of examining all proposals for a future space programme, including the use of *Blue Streak* as a European satellite launcher, the proceedings of the conference demonstrated clearly that at this stage there was no country, except perhaps France, that was willing to actively support the British initiative.⁴¹ These two governments soon agreed to organize a separate conference with the object of studying the proposal for a European satellite launcher based on *Blue Streak* as a first stage, a French second stage and a third stage made in Europe. This fundamental decision was preceded by intensive diplomatic consultations with the French. The British, in return for their willingness to modify the original design of the satellite launcher, which foresaw a UK rocket (*Black Knight*) as the second stage, had received French

³⁷ Text of the COPERS agreement (CIRS/1/Rev.7) from 1 December 1960 in AA-PA, B 30, IB1, Vol. 376.

³⁸ See Russo (1992), pp. 5-6.

³⁹ See AA-PA, B 30, IB1, Vol. 376, No. 202-81.21/60, report (No. 347) of the head of the German delegation (Thierfelder) to the Foreign Ministry about the conclusion of the 4-days negotiations in Meyrin.

⁴⁰ See "Europäische Organisation für Weltraumforschung. Die Mitarbeit der Bundesrepublik Deutschland", *Bulletin* No. 75, 18 April 1962, p. 634.

⁴¹ See joint cabinet paper of the Foreign Ministry and the Ministry for Atomic Affairs from 7 March 1962 (AA-PA, B 30, IB1, Vol. 309, No. 202- 81.21-575/62).

approval for a joint organization of the launcher conference.⁴² The path towards two separate European space organizations, one for space research (ESRO) and one for launcher development (ELDO) was traced out.

The launcher conference was finally scheduled for the end of January in Strasbourg. To inform potential partners in advance about the details of the Anglo-French heavy launcher project, but also to talk directly to the responsible ministers and officials, the British Minister of Aviation, Peter Thorneycroft, made a round-trip of several European capitals in early January. On 11 January 1961, Thorneycroft came to Bonn.⁴³ While the responses of the Ministers of Foreign Affairs and of Economics, von Brentano and Erhard, were most encouraging — the former explicitly promised to "do his utmost to ensure that Germany was suitably represented at the Strasbourg conference"⁴⁴ — the replies of two other members of the German Cabinet, Seehofer (Transport) and Strauß (Defence) were entirely negative.

Seehofer told Thorneycroft quite frankly, "that he was doubtful whether Europe could ever match up to American rockets and that the main German interest was in satellites rather than in the means of launching them. The Germans before they committed themselves to the Anglo-French plans would need to establish whether the rocket was worthwhile at all".⁴⁵ As to his own preference, he left no doubt that "serious thought should be given to whether it might not be preferable to use American rockets".⁴⁶ Strauß, for his part, made it perfectly clear to the British visitor that the Federal Republic's engagement in space flight would only be on the basis of cooperation with the United States.⁴⁷

The contrasting reactions of the German ministers deserve some explanation. As to the positive responses of von Brentano and Erhard, primary political considerations were decisive. Both ministers had always been in favour of a wider concept of European political

⁴² See Krige (1993b), pp. 12-18.

⁴³ See the record of Thorneycroft's talks on *Blue Streak* with German ministers presented to the Cabinet's Official Committee on Blue Streak, PRO, CAB 134/1428, document B.S.(0)(61)4, 23 January 1961.

⁴⁴ *Ibid.*

⁴⁵ *Ibid.*

⁴⁶ *Ibid.*

⁴⁷ See Trischler (1992), p. 401.

and economic cooperation which included the United Kingdom. In the German Cabinet, the federalist Minister of Foreign Affairs and the neo-liberal Minister of Economics who, since the late fifties, was considered to be the most promising candidate to succeed Adenauer in the chancellor's office, strongly advocated an early British entry into the European Communities.⁴⁸ They welcomed the British initiative for European cooperation in the field of launcher development as an opportunity to strengthen the linkages of the United Kingdom with the Continent as such, and also as a possible first step towards an enlargement of the EEC.

An explanation for the harsh reaction of Seehofer is easily found if we look at the very close relationship that the Ministry of Transport had established with one of the most important German space scientists, Eugen Sänger.⁴⁹ Since 1952 Sänger had acted as an official scientific advisor to this ministry and in 1954 he had become the director of the "Forschungsinstitut für Physik der Strahlantriebe" (FPS), which was in very close contact with the "Deutsche Gesellschaft für Raketentechnik und Raumfahrt" (DGRR). In sharp opposition to most of his colleagues, Sänger rejected the so-called conventional concept of ballistic space technology (like *Blue Streak*), which he described as primitive, uneconomical and technically outdated. Instead, he favoured an alternative concept of space travel, based on the development of space shuttles which could be recycled. In 1942 Sänger had already presented a detailed description of the construction of such a space shuttle. Evidently, the decision to follow the first or the second concept required the development of totally different rocket engines. Therefore, the assessment of the British initiative implied a very fundamental internal decision as to whether the FPS and the DGRR, or rather other big research institutes like the "Deutsche Versuchsanstalt für Luftfahrt" (DVL), were to be charged with the Federal Republic's re-entry into space technology development.

The Federal Ministry of Transport adopted Sänger's ideas almost unreservedly. In the internal debate about the final settlement of ministerial responsibility for astronautics it was only his alternative concept of space travel that justified the claim of this ministry. Consequently, when the British officially came up with their initiative, it immediately asked

⁴⁸ See Schwarz (1983), pp. 122-123.

⁴⁹ This section is based on Weyer (1990), pp. 95-101 and Trischler (1992), p. 455.

Sänger to give an expert opinion. Needless to say, this expert opinion, officially delivered in early February 1961, was entirely negative.⁵⁰

By far the most complicated matter with respect to the split in the Federal government on *Blue Streak* was the reaction of the Minister of Defence, Franz Josef Strauß. A sufficient analysis of the complex motives that were behind his uncompromising rejection of the Anglo-French initiative would require its own paper. More importantly, archive-based historical research on the Federal Republic's security policy after 1958 is still at a very early stage. Therefore, we have to confine our description to a few basic points.

More than anyone else in the Federal Cabinet, Strauß was interested in and also familiar with the technological details of rocket development. In sharp contrast to his unsuccessful predecessor Theodor Blank, his concept of German rearmament had been guided by a pronounced respect for modern weapons development. He was deeply convinced that the German defence contribution had to be adjusted to the requirements of the new nuclear strategy.⁵¹ Following the American New Look policy, manpower had to be substituted by technology. After having been appointed in late 1956 as the Federal Republic's second Defence Minister, Strauß therefore almost immediately decided to cut down the promised German defence contribution from 500,000 to a 360,000 man army. This spectacular decision was accompanied by a vigorous demand for the equipment of the NATO forces, including the Federal Republic, with the most modern weapons. There were basically two ways to acquire these new weapons, remembering that the Federal Republic in 1955 had voluntarily refused the right to produce nuclear warheads as well as missile carriers beyond the range of 70 km on its own territory. The first was their acquisition via the United States. The second was the production of modern weapons in cooperation with, and on the territory of, other European NATO allies.

Making no secret of his far reaching nuclear ambitions Strauß, sometimes in full, sometimes in only fragmented, consultation with Chancellor Adenauer decided initially to follow both options in parallel. While at several NATO Council meetings he continuously claimed the urgent need for a policy of nuclear sharing between the United States and their allies, in 1957 he had already concluded a first Franco-German armaments agreement. This so-called Coulomb Bechar Agreement formed the basis for a spectacular initiative in late

⁵⁰ See Trischler (1992), p. 415.

⁵¹ See Fischer (1993a), pp. 281-284.

1957, when the Federal Republic, France and Italy decided to start a secret project on the joint production of modern weapons.⁵² The action programme of this so-called FIG Project was formalized in several trilateral agreements, which foresaw not only the joint production of nuclear warheads, but also the joint development of intermediate range ballistic missiles (IRBM).⁵³ In the annex of the first of these agreements, signed on 28 November 1957, cooperation was explicitly envisaged "sur les engins sol/sol à moyenne portée (1500 km), et ceux ayant une portée de riposte à l'échelle européenne, soit environ, 3000 km".⁵⁴

In another agreement in spring 1958 the establishment of a joint Franco-German Institute for Ballistic Research in St. Louis (ISL) was decided. The FIG Project did not however last very long. After some months of intensive negotiations it precipitously collapsed with the end of the Fourth Republic. It was de Gaulle who, in July 1960, immediately after he had returned to office, tore the agreements to pieces, stating pompously "la capacité atomique [...] ne se partage pas!"⁵⁵

This humiliating experience created in Strauß a long standing suspicion about French reliability.⁵⁶ In direct reaction to the decision of de Gaulle, he decided to reshape the Federal Republic's armaments procurement policy by shifting emphasis from German-French to German-American cooperation. The acquisition of French Mirage aircraft for example, which had already been more or less agreed and which accounted for a total value of 1500 million DM, was immediately cancelled by the German Ministry of Defence and shortly afterwards replaced by an American weapons system, i.e. the Starfighter (F104).⁵⁷ A first contract with

⁵² See Fischer (1992a).

⁵³ In a conversation between French ambassador de Crouy-Chanel and German ambassador Blankenhorn on 13 November 1957, the idea of a Franco-German production of IRBMs on the basis of US licences was discussed. For a record of this conversation see BA, NL 351 (Blankenhorn), No. 80, pp. 55-57.

⁵⁴ Barbier (1990), p. 100.

⁵⁵ *Ibid.*, p. 113.

⁵⁶ See Strauß (1989), pp. 315-319.

⁵⁷ Despite this clamorous decision, German French cooperation however continued to play a major role in the Federal Republic's armament procurement policy. Eager to revive the FIG agreements in some way or other, Strauß, as a gesture of conciliation to the cancelled Mirage order, in late November 1958 proposed a couple of armaments projects to French Foreign Minister Couve de Murville including the joint production of the American Starfighter under licence. While for obvious reasons the latter proposal was totally rejected by the French, several

the United States, officially signed early in 1959, provided for the supply of 96 multi-purpose tactical aircraft ready for use as well as the production under licence of 210 additional fighters in the Federal Republic. This provision in the contract was most important since it offered the German aircraft industry the excellent opportunity "to familiarize themselves with the highest standards and latest methods, thereby attaining a productive capacity of a standard that bears comparison with that of any other nation".⁵⁸

Although the American Starfighter was a modern weapons system capable of carrying nuclear bombs, the emphasis in the international armaments race in the late fifties had already significantly shifted to the development of missiles as the most effective delivery means for nuclear weapons. In mid-April 1958 the NATO defence ministers at a meeting in Paris had adopted the basic document MC-70, which provided for the immediate equipment of NATO divisions with various surface-to-surface as well as surface-to-air short-range ballistic missiles of American production.⁵⁹ Shortly before the end of 1959 the Supreme Allied Commander in Europe (SACEUR) added to this catalogue his urgent claim for the development and rapid installation of a new generation of highly mobile IRBMs in some of the NATO countries ("Norstad Plan").⁶⁰ In a subsequent conversation with Strauß he supported the production under licence and the assembly of these weapons in Europe.⁶¹ Codified in the document MC-96, the request by SACEUR was officially adopted by the NATO Council shortly afterwards. MC-96 provided for no less than 655 IRBMs for the European war theatre. They were to be based on land as well as on sea.

The German Defence Minister, with the Starfighter example in mind, was immediately attracted by the idea of concluding a comparable big licence agreement with the

other proposals, particularly in the field of short range guided missiles, soon took concrete shape. In December 1960 a permanent commission composed of the general staffs of both countries was even established and charged with the task of coordinating research and development in the field of cooperation. For a record of the above mentioned meeting between Strauß and Couve de Murville on 19 November 1960 see BA, NL 351 (Blankenhorn), No. 94, pp. 21-29. For a detailed description of German-French armaments cooperation see Bittner (1986).

⁵⁸ Dornier (1967), p. 183.

⁵⁹ See Tuschhoff (1990).

⁶⁰ NIIP-A, document 38: internal note of the Defence Ministry, 31 October 1959. See also Schwartz (1983), pp. 75-81.

⁶¹ For the record of this conversation between Strauß and Norstad which took place on 22 November 1959 see NHP-A, document 39.

United States, an agreement that could also improve almost instantaneously Germany's potential capacities in the development and production of space technology of the highest standard. Two weeks before the British government officially cancelled *Blue Streak* as a military weapon, Strauß approached his French counterpart Messmer about the possibility of a joint proceeding with respect to the licence production of American IRBMs.⁶² It was against the backcloth of these developments, and here we take up again the lost thread of our story, that Strauß was so heavily opposed to the Anglo-French initiative. It was his firm conviction that the proposed European framework of cooperation was as wrong as the outdated technology of the *Blue Streak* rocket on which the development of the heavy launcher was going to be based. To put Germany's entry in the field of space technology for military as well as civilian purposes on the right track from the start, the push had to come from the production of superior United States rockets under licence.

5 *Coordination of German space policy: the Interministerial Committee for Space Research*

Chaired by the British Minister of Aviation, the jointly called Anglo-French conference was duly held in Strasbourg from 30 January to 2 February 1961.⁶³ It was attended by official delegations from 11 European countries. Because of the internal dissent within the German Cabinet on the Anglo-French initiative, but also because of the still unsettled ministerial responsibility for space research and technology, the Federal government was only represented by a small delegation of high-ranking civil servants from various departments. Left without any official instructions to take an active part in the conference, they merely served as observers.

After three days of intense deliberations, the main conclusions reached at the conference were summarized in an Anglo-French memorandum.⁶⁴ It included a first draft of

⁶² For a record of this meeting that took place in Paris on 28 March 1960 see NHP-A, document 43. In a dossier of the Defence Ministry (22 March 1960) attached to this document (see *ibid.*), it was explicitly stated that work in the field of electronics could be taken up only in cooperation with the United States and that an effort should be made to interest the French in the joint production of the *Starfighter* (F 104), the *Hawk* (solid fuel surface-to-air missile, 30 km range) and possibly the *Polaris* (solid fuel IRBM).

⁶³ See "Straßburger Konferenz für europäische Weltraumforschung. Informatorische Gespräche über die Entwicklung von Satelliten-Trägerraketen", *Bulletin* No. 29, 10 February 1961, p. 259.

⁶⁴ This section is based on Krige (1993b), pp. 19-23.

the initial programme of the envisaged organization, should it be set up, being "to study, plan, develop and manufacture a rocket system using *Blue Streak* as the first stage and a French rocket as the second stage. The development of the third stage", the memorandum went on, would "be carried out on the Continent".⁶⁵ In addition to that, the proposed programme also provided for the planning and construction of a first series of test satellites. As for the difficult question of sharing the costs of the initial programme, the delegations, because of the exploratory character of this first meeting, had abstained from fixing concrete figures. It was however generally agreed that it would be essentially up to the "big four" (i.e. the United Kingdom, France, Germany and Italy) to carry the budget of the envisaged organization to a large extent.

Two weeks after the Strasbourg conference the Federal government, in two identical notes from the British and the French governments, was officially asked to comment upon the proposed initiative. In an annex attached to these notes the basic principles for the new organization were spelled out in detail.⁶⁶

Confronted with the growing external pressure to formulate an official and coherent German space policy, the Federal government, in the meantime, had adopted an important organizational decision. Suspending for the time being the most complicated decision on a final settlement of ministerial responsibility for space research and technology the Cabinet, at its meeting on 25 January 1961, adopted an important organizational proposal made by Strauß.⁶⁷ It decided to set up an Interministerial Committee for Space Research as an interim solution to the clashes of competence between the various departments. Chaired by the Federal Minister of the Interior, and composed of all ministries that were concerned with space research and technology, this committee was officially charged with the task of coordinating the related activities of the various departments, of examining the organizational and legal conditions for the national development of space research and, in particular, of formulating a coherent governmental position on the proposed initiatives for international space cooperation.

⁶⁵ *Ibid.*, p. 19.

⁶⁶ The British and French notes of 14 February 1961 plus the annex are discussed in a joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs from 7 March 1962 (AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62) .

⁶⁷ See BA, B 106/17801, 1 February 1961, report of the minutes of the 137th cabinet meeting on 25 January 1960.

At the first meeting of the Interministerial Committee on 22 February 1961, a detailed discussion of the Anglo-French initiative was at the top of the agenda.⁶⁸ Although a clear majority of the departments concerned recommended that Germany refuse the proposed cooperative project based on *Blue Streak*, the committee decided to suspend for the time being a final decision on this matter. Instead, it was agreed to establish an expert commission, charged with the task of recommending whether, and under which conditions, the Anglo-French proposal could be accepted, specifying in particular the scientific, technical and economic arguments.

The unwillingness of the Interministerial Committee simply to reject the Anglo-French initiative calls for two comments. Firstly, the committee was vested with only limited authority. Its function was merely coordinative, so that a majority vote did not count. Secondly, formally to commit the Interministerial Committee to a negative vote was politically highly delicate, since it was not a secret to the members of the committee that the Federal Chancellor himself was promoting Germany's participation in European space cooperation. Deeply concerned about the international situation in the early sixties — the change in the American administration, the most unwelcome French request for a NATO tripartite directorate⁶⁹ comprising the three western victory powers, the ongoing dispute about nuclear cooperation within the Atlantic Alliance, and not least the dangerous escalation of the Berlin crisis — Adenauer had for some time been actively looking for new ways to strengthen the unity of European countries.⁷⁰ In a conversation with MacMillan on 23 February 1961 he therefore followed with great attention the British Prime Minister's explanations concerning the political advantages of the proposed cooperation on heavy launcher development, confessing "that he was behind their view in principle with all his heart" and that "Europe must play its part".⁷¹

⁶⁸ The results of this meeting are discussed in an internal note of the Ministry of the Interior from 23 February 1961 (BA, B 106/17801). See also Weyer (1990), pp. 276-277.

⁶⁹ For Adenauer's deep concern about de Gaulle's proposal to establish a NATO directorate, to be composed of the three Western victory powers, see Schwarz (1983), pp. 102-103 and Gnesotto (1986), p. 10.

⁷⁰ See BA, NL 351 (Blankenhorn), No. 101, pp. 31-35, record of a conversation between Adenauer and J. Monnet in Cadenabbia, 11-13 June 1960.

⁷¹ Cited by Krige (1993b), p. 23.

The main opponents, like the Ministers of Defence and of Transport, but also the Minister of Finance were however not willing to accept an early surrender. The ongoing struggle within the German Cabinet became most evident in a somewhat double-bind message that was produced in response to the British and French notes of mid-February. On 23 March 1961 the Federal government officially informed the British government about its willingness in principle to take an active part in the construction of a heavy satellite launcher, suggesting however at the same time the start of expert discussions on whether the proposed European organization should construct a launcher based on *Blue Streak* or an American launcher under licence.⁷² The appropriate decision had been adopted at a meeting of the German Cabinet the day before, where the proposal of the Interministerial Committee to establish an expert commission had also met with unanimous approval.⁷³

For obvious reasons the latter alternative was totally unacceptable for the British, since they had launched their initiative primarily to prevent the cancellation of the already existing *Blue Streak* rocket, and not to embark on any form of European cooperation. In an internal UK cabinet statement it was therefore stated very clearly, that the British "under no circumstances" would "contemplate participating in a consortium to build American launchers under licence, nor in a second Strasbourg conference to discuss such a project".⁷⁴ Increasingly uneasy about the ongoing delays in the realization of the *Blue Streak* project

⁷² In a joint cabinet paper, drafted by the Foreign Ministry and the Ministry of the Interior and dated 22 June 1961 (AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-1234/61), reference is made to a message from 23 March 1961 to S. Lloyd, British Chancellor of the Exchequer, who at that time was on a visit in the Federal Republic. As has been strongly confirmed by several interviewees (Mayer, 27 April 1993, Bölkow and Koelle, 12 July 1993), the idea to build American satellite launchers under licence, pushed forward mainly by the parliamentary budget commission, was never considered to be a realistic alternative to the *Blue Streak* project within the German space community. As early as 23 February 1961 the German embassy in Washington informed the Foreign Ministry in Bonn, that NASA would be totally uninterested in any sort of international cooperation in the development of rocket technology (AA-PA, B 30, IB1, Vol. 181, No. Wi 202-81.21-2173/61). Several months later, a representative of the US embassy in Bonn officially denied any possibility of concluding such a licence agreement (AA-PA, B 30, IB1, Vol. 181, No. 202-81.21, internal note of the Foreign Ministry, 10 August 1961).

⁷³ The results of the 143rd meeting of the Federal Cabinet are discussed in a joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs from 7 March 1962 (AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62).

⁷⁴ See PRO, CAB 134/1428, p. 17-18, document B.S.61: record of the 3rd meeting of the UK Cabinet ministerial committee on *Blue Streak*.

being caused by the Federal Republic, the British government however agreed to the proposed expert talks, suggesting that French specialists should also take part.⁷⁵

6 *Reversing the opinion: the first report of the Bock-Commission*

By establishing a mixed composition of experts commission, headed by Prof. Günther Bock, the president of the "Wissenschaftliche Gesellschaft für Luftfahrt" (WGL),⁷⁶ the Federal government made it clear from the start that something more than just another version of the DFG report, i.e. a merely scientific examination of the Anglo-French proposal, was expected. In addition to academic space scientists and technical experts, several directors of big research institutes as well as representatives of the aviation and electronics industries, and a financial expert, were also selected.⁷⁷

Since the beginning of the sixties Germany's aviation industry, as well as the big research institutes specialized in aeronautics and astronautics, had become increasingly interested in international space activities, speculating that an official German participation on the international level would also help overcome the several internal and external reservations against the launching of a proper national space programme.⁷⁸ As a result of the growing structural problems in the aviation sector in the early sixties, both industry and highly specialized research institutes could only count on a permanent utilization of their capacities if their field of activities was enlarged by the inclusion of space technology. In contrast to academic space scientists, their interests were particularly focused on launcher development. It was now mainly up to their representatives to produce the desired expert opinion on the Anglo-French initiative.

⁷⁵ See AA-PA, B 30, IB1, Vol. 309, UK aide-memoire to the German Foreign Ministry, 4 April 1961.

⁷⁶ As one of the German delegates to the Meyrin conference, Bock had already spoken on 30 November 1960 to representatives from the British Ministry of Aviation about *Blue Streak*. For a report on this conversation which took place at CERN in Meyrin see AA-PA, B 30, IB1, Vol. 376.

⁷⁷ Except for Prof. G. Bock, the members of the expert commission were L. Bölkow (Bölkow-GmbH), Prof. A. Ehmert (MPAe), E. Hölzler, P. Kotowski (Telefunken), O. Lutz (DFL), W.J. Petters (Feldmühle Nobel AG), W. Pilz (FPS), A.-W. Quick (DVL), Prof. E. Sängler (FPS), K. Schneider (SEP) and K. Steimel (SEL AG).

⁷⁸ See Weyer (1990), pp. 236-239.

The meeting with British and French space specialists, organized in the form of an expert hearing, took place in late April 1961.⁷⁹ Headed by high-ranking officials, both delegations were extremely well prepared. The "technical proposals" of February 1961 had been revised, and the allocation of costs had been made much more transparent. In addition to this, the British handed over a document, headed "Technological Stimulus of Satellite Launcher Development and Space Research", in which the expected technological spin-offs of the proposed project had been spelt out in great detail.⁸⁰ Although visibly impressed by the amount of data and well designed arguments put forward, the German expert commission, that had been accompanied by a couple of civil servants from the various ministerial departments, abstained from giving an official reply to the proposed project at once. However, immediately afterwards they began to draft the requested expert report for the Federal government.

* * *

Compared to the very difficult process of reaching an agreement on the creation of a European Launcher Development Organization (ELDO), the parallel discussions on the establishment of a European Space Research Organization (ESRO) proceeded without substantial problems. During 1961 Auger's team of scientists began canvassing the European scientific community. At the first meeting of the COPERS on 13 and 14 March in Paris, it had been decided to create two working groups charged with the task of defining the scientific programme and necessary infrastructural facilities for the envisaged organization, of drawing up its budget, and of preparing a convention for signature by those member state governments who wished to join it.⁸¹

The Federal Republic was represented on both working groups. Alexander Hocker, a senior bureaucrat from the Federal Ministry for Atomic Affairs, was appointed as chairman of the LAFWG (Legal, Administrative and Financial Working Group), and Reimar Lüst from the Max-Planck-Institut für Physik und Astrophysik near Munich was selected as

⁷⁹ The results of this expert meeting which took place on 28 April 1961, are discussed in a joint cabinet paper drafted by the Foreign Ministry and the Ministry for Atomic Affairs and dated 7 March 1962 (AA-PA: B 30, IB1, Vol. 309, No. 202-81.21-575/62). See also "Deutsche Beteiligung am Bau eines Raumfahrtträgers", *Bulletin* No. 76, 19 April 1962, p. 651.

⁸⁰ See Trischler (1992), p. 417.

⁸¹ See Krige (1993a), pp. 2-3.

coordinating secretary of the STWG (Scientific and Technical Working Group). Lüst in particular played a very active role in the deliberations of his working group. Together with his British colleague Freddy Lines he was soon charged with the important task of drafting the first scientific satellite programme for ESRO.⁸²

The result was a "Blue Book" of some 400 experiments which required 440 sounding rockets and 34 satellites spread over eight years. To assemble the experiments and mount them on rockets, the establishment of an internationally staffed technical centre was seen as desirable, as was the creation of tracking stations, ranges, launching sites, and a data centre. Initial costs for the first eight years of the satellite programme were estimated at 733.5 MFF.⁸³

Since the preparatory work with respect to the establishment of ESRO went on without any controversial internal discussion in the Federal Republic, and since these activities have been already described in great detail in previous reports in this series,⁸⁴ we shall now devote most attention to the results of the expert opinion on the Anglo-French launcher initiative.

* * *

The eagerly expected recommendations of the Bock commission were finally presented on 22 May 1961.⁸⁵ Based on unanimous approval by the commission, the expert report strongly pleaded for a German participation in the construction of a European satellite launcher. Referring in great detail to the various objections that had been raised internally against the project, the report gave several reasons in favour of its positive assessment:

- (1) compared to the then existing American satellite launchers the proposed project, based on *Blue Streak*, could not be considered outdated;

⁸² This section is based on Russo (1992), pp. 16-18.

⁸³ See *ibid.*, p. 18 and Hochmuth (1974), p. 60.

⁸⁴ See Russo (1992) and Krige (1993a).

⁸⁵ For a detailed account of the recommendations of the Bock commission see AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-1234/61: joint cabinet paper, drafted by the Foreign Ministry and the Ministry of the Interior, 22 June 1961.

- (2) it seemed doubtful whether the United States would be prepared to give a European consortium a direct share in the development of American launchers or to grant a European organization the licence to build their launchers;
- (3) considering the already advanced stage of the work, the proposed project offered the opportunity to start immediately with the training of a consortium of European working groups interested in the development of satellite launchers;
- (4) space technology was a productive challenge for German research and industry which would improve the general level of science and technology in the Federal Republic;
- (5) the Federal Republic, in case of non-participation in the European space projects, would risk the danger of a brain drain as well as a substantial loss of competitiveness in the most advanced sectors of its industry;
- (6) the actual scientific and technical cooperation in the proposed organization would be a concrete contribution to the integration of Europe.

Obviously not all of these reasons were specific to Germany's participation in the heavy launcher project. Rather they amounted to a strong plea for a German engagement in space research and development. The report indeed left no doubt about the fact that the most important question at issue was primarily not the first but the second one. The Anglo-French initiative, therefore, had been evaluated and, as we shall see below reshaped with respect to the possible benefits it was expected to produce for the desired German come-back in space research and technology.

The report named four basic conditions for the recommended participation in the proposed European organization. Firstly, the proposed initial programme, i.e. the construction of a heavy satellite launcher based on *Blue Streak*, should be considered as being only the first step in European cooperation on space technology. It should therefore be guaranteed that the new organization would initiate studies on possible new and more advanced projects from its inception. Secondly, German science and industry had to be given an adequate share in the realization of the first project. This should be guaranteed by:

- a) substantial participation (project groups in the Federal Republic) in the development of the third stage, including the manufacture of essential parts of the third stage;⁸⁶

⁸⁶ In a subsequent statement by the head of the German expert commission the construction of the third stage was described as being particularly attractive since it would require completely new technological developments involving the latest state of the art. See BA, B 106/17803, report of G. Bock to the 7th meeting of the Parliamentary Committee on Atomic Energy on 23 May 1962.

- b) development of assembly groups for the first and the second stage as well as for the satellite;
- c) manufacturing of assembly groups for the first and the second stage, as far as these assembly groups had been already developed in Great Britain or France;
- d) active collaboration in foreign, particularly British and French, working groups.

Thirdly, the newly established European organization as well as the Federal Republic should execute their work in close contact with the United States. As an additional condition, the expert group explicitly demanded that the Federal Republic, in order to become an equal partner in the European organization, should urgently start with national space projects.

What the German expert report essentially intended was, first, to redimension the Anglo-French initiative, considered only as the prelude to a long-term European cooperation on advanced space technology. Second, it wanted to use the *Blue Streak* project instrumentally as a study project for German space research and industry. Third, it wanted to prevent any commitment to exclusively European space cooperation. Finally, it aimed to use German participation in the European launcher project as a "booster" for starting a national space programme.

It therefore emerged very clearly that German interest in the proposed scheme of European space cooperation was based on much more than just the classical foreign policy considerations that had been forcefully put forward by the Federal Chancellor and the Foreign Ministry. As a matter of fact it perfectly suited both the interests of German industry and big research institutes, who wanted to be quickly present again in a field of high technology development that had been inaccessible since the end of World War II. The lost political legitimacy of German space activities could be restored only by accepting the roundabout "European" road. Only by concrete participation in the collaborative effort to construct a European satellite launcher on the basis of already developed elements could the Federal Republic expect to catch up the existing backlog of space technology development as rapidly as possible.⁸⁷

⁸⁷ See "Experten wünschen Raumfahrtprogramm für Europa", press article (*Frankfurter Rundschau*, 13 July 1961) about the conference "Space Technology and Europe" (Konstanz, 8-11 May 1961). See also Weyer (1990), pp. 288-289.

7 *The decision to join ELDO and ESRO*

On the basis of the expert report the Federal Cabinet, at its meeting on 28.6.1961, formally agreed to German participation in the European launcher organization.⁸⁸ It was also agreed that the Federal Republic should simultaneously prepare for a national space programme. While these decisions met with almost unanimous approval, it was the Minister of Finance who raised some fundamental objections to the incalculable financial commitments. A provisional cost account, presented at this meeting, had specified a sum of 67 million DM as being required for national space activities in the following year. Together with the German financial contributions to ESRO (25 million DM) and ELDO (30 million DM), the estimate for 1962 amounted to a total of 107 million DM.⁸⁹ These figures, however, were still very uncertain and it needed no foresight to assume that over the years the real costs would most likely be very much higher. For obvious reasons this conflict was not to be resolved at the described cabinet meeting. The issue was, however, soon on the agenda again, when the parliamentary budget commission was to take its decisions on the allocation of the 1962 federal budget.

Immediately after the cabinet meeting Adenauer informed MacMillan in a letter about the positive outcome of the internal deliberations, expressing explicitly his hope that the establishment of the new organization would "secure for European science and technology a proper place in the field of space travel and space research".⁹⁰ In two diplomatic notes sent to the British and the French Embassies in the beginning of July, the Foreign Ministry gave a full account of the conditions for German participation in the proposed organization, quoting almost directly from the internal expert report.⁹¹ There was however

⁸⁸ See "Europäische und deutsche Weltraumforschung. Internationale und innerstaatliche Aufgabenstellung — Organisatorische Probleme", *Bulletin* No. 126, 12 July 1961, pp. 1225-1226. In another public statement the Federal government explicitly stressed that the European heavy satellite launcher should be considered as an apparatus used for exclusively civilian purposes and as such excepted from the definition of long-range missiles and guided weapons, whose production by the Federal Republic had been prohibited by the Paris Treaties ("Weltraumforschung", *Bulletin* No. 124, 8 July 1961, pp. 1203-1204).

⁸⁹ See AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-1234/61: joint cabinet paper drafted by the Foreign Ministry and the Ministry of the Interior, 22 June 1961.

⁹⁰ PRO, PREM 11/3515: letter Adenauer to Macmillan, 29 June 1961.

⁹¹ See Trischler (1993), document 129: answering note of the German Foreign Ministry to the French Embassy, 3 July 1961 (BA, B 138/2938).

one condition that had been added: it was claimed that the Anglo-French proposals for the new organization presented at the Strasbourg conference could still be modified.

The decision of the German Federal Government was received with great satisfaction and relief in London and Paris. The final measures to establish the European launcher development organization were now to be taken. The British government therefore decided to send out invitations for a governmental conference in London, scheduled for the end of October 1961. In anticipation of this conference, designed to reach a final agreement on the establishment of ELDO, a revised British draft of the contractual arrangements was circulated among the participating countries. In addition, the Federal government was explicitly asked to present as soon as possible a detailed feasibility study on the claimed development and construction of the third stage in the Federal Republic, and to allow British and French experts to inspect the technical and industrial infrastructures to be used for the execution of the work.⁹²

In consequence of its decision to join ELDO, but also because of the forthcoming parliamentary elections, scheduled for September 1961, it was desirable that the Federal Government adopt the timetable set up by the British. This was however impossible to meet, due to complexity of the measures and decisions which had to be taken.

8 *The reorganization of governmental responsibilities for space affairs*

There was first of all the unresolved problem of ministerial responsibility for space research and technology that had to be settled before the Federal Republic was officially going to join ELDO. Any decision with respect to this difficult question had however to be postponed until after the parliamentary elections. Although these elections again resulted in an impressive victory for the coalition of the Christian Democratic and the Liberal Party, the subsequent internal negotiations about the formation of the new government turned out to be extremely difficult. Within both parties it was widely felt that a change in the chancellor's office was most desirable. As a result a compromise was reached confirming Konrad Adenauer in office for half of the legislation period, to be followed by another candidate during 1963.⁹³

⁹² See AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62, joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs, 7 March 1962.

⁹³ See Schwarz (1991), pp. 689-699.

It was therefore not before the end of the year that the chancellor's office came up with a concrete proposal redefining the responsibilities for space research and technology within the federal cabinet. In a note dated 24 November 1961 all ministers were asked to comment upon the suggestion that the Ministry for Atomic Affairs should be charged with the overall responsibility ("Federführung") for space research and technology as well as with the chairmanship of the Interministerial Committee.⁹⁴

As one might expect, this proposal was heavily criticized by all those departments which were going to lose a role in these sectors. The Ministry of the Interior, particularly affected by this new settlement, raised fundamental objections because of the implicit tendency towards establishing a Federal Ministry of Science and Research.⁹⁵ The Ministry of Economics, responsible also for the aviation industry, raised objections of principle against the intended special political and administrative treatment of the emerging space industry that had to be integrated into the system of a free market economy.⁹⁶

The proposal also met the opposition of the Ministry of Defence which, in fundamental contrast to Erhard, insisted exactly on the opposite, i.e. the need for the state to play an active role in the development of key technologies. For Strauß the proposed reorganization of responsibilities was simply not sufficient to provide for an effective German space policy. In his reply to the chancellor's office he therefore favoured an integral solution, charging the Ministry for Atomic Affairs with full responsibility for the entire civilian aerospace sector.⁹⁷ Compared to the impressive institutional arrangements that had been set up in the United States or in France, this was still something of a second best solution, since it did not easily provide for an integrated development of space technology to be transferred between the civilian and the military sectors. Because of his responsibility for the

⁹⁴ BA, B 106/17801, circular letter of the Federal Chancellery (Globke) to the Federal Ministers, 24 November 1961.

⁹⁵ BA, B 106/17801, internal note of the Ministry of the Interior, 18 January 1962.

⁹⁶ See Trischler (1993) document 130: internal note of the Ministry of Economics, 25 September 1961 (BA, B 102/36136).

⁹⁷ BA, B 106/17801, letter Strauß to the Federal Chancellery, 25 January 1962.

development of military aerospace technology, he could however count on having substantial influence on the decisions of the Ministry for Atomic Affairs.⁹⁸

Unaffected by these critical objections and without any further consultation of the cabinet, Federal Chancellor Adenauer, on 29 January 1962, officially decided to put his original proposal into effect.⁹⁹ Several reasons account for this determination. Firstly, the Federal government's emerging space policy could be kept at a low profile. Ongoing reservations in public opinion about Germany's reentry into the field of rocket development could thus be assuaged.

Secondly, establishing a central governmental authority for space affairs, vested for the time being with only coordinative powers, helped avoid an open constitutional conflict about state competences in the field of science and research.¹⁰⁰ An immediate solution had to be found for dealing with the international negotiations, and for guaranteeing that the Federal government did not enter the two European space organizations without having settled governmental responsibility.

Finally, a clear step towards a future central administration of science and technology in the Federal Republic had been taken. As it turned out, it took only some months before the Ministry for Atomic Affairs was officially transformed into a Federal Ministry of Scientific Research.¹⁰¹ Adenauer's decision therefore has to be seen as a prudent compromise, demonstrating again his impressive capacity to hammer out the most pragmatic solutions to the most complex problems.

The urgent need to establish a central authority responsible for space was also felt outside government after the official decision to join ELDO. As a first step the top organizations of Germany's aviation industry and big research institutes, the "Bundesverband der Deutschen Luftfahrtindustrie" (BDLI) and the "Deutsche Gesellschaft für

⁹⁸ In the year 1962 the Defence Ministry had a share of 28,7% (= 410,3 million DM) of the total Federal research budget compared to 18,1% (= 258,6 million DM) of the Ministry for Atomic/Scientific Research. See Weyer (1990), p. 365.

⁹⁹ BA, B 102/36136, letter Adenauer to the Federal Ministers, 29 January 1962. See also "Neuabgrenzung der Geschäftsbereiche der Bundesministerien. Erlaß des Bundeskanzlers", *Bulletin* No. 25, 6 February 1962, p. 211.

¹⁰⁰ See Stamm (1981), p. 231.

¹⁰¹ *Ibid.*, p. 320.

Flugwissenschaften" (DGL), decided on 13 July 1961 to establish the "Kommission für Raumfahrttechnik" (KfR), designed to coordinate the space activities of research and industry.¹⁰²

Both interest groups were very concerned that, via the new European space organizations, national financial resources would be channelled to their foreign competitors, and that not enough money would be left to conduct a proper national space programme. The emerging German space industry, in particular, saw the participation in ELDO and ESRO clearly as a means to an end. The development of space technology required long-term, high risk investments which individual firms were unwilling to undertake without being given adequate guarantees by the state.¹⁰³ The political interest of joining the two European space organizations was first of all welcomed because it promised to lock the Federal government into a long-term commitment to fund the development of space technology on the European as well as on the national level.

Things could, however, only work out this way if two basic conditions were fulfilled. First, the "return coefficient", i.e. the relation between Germany's financial contributions to the organizations and the value of the industrial contracts placed by the organizations in the Federal Republic, was not to be below unity. Second, the amount of public money spent for the execution of an efficient national space programme had to be considerably higher than the financial contributions to the European organizations. Among the German space community it was widely agreed that the ratio had to be at least 2:1.¹⁰⁴

Evidently, both conditions were interdependent, since without an advanced national space programme it was almost impossible to achieve return coefficients of unity.

The primary task which the newly created KfR was charged with was, therefore, to draft as soon as possible a 4-year national space programme. It was to list all projects appropriate for a rapid build-up of the technological know-how needed to guarantee German

¹⁰² BA, B 106/17802, 28 August 1961, record of the first meeting of the KfR in Düsseldorf on 21 August 1961.

¹⁰³ This section is based on Krige (1993d).

¹⁰⁴ See for example Mayer (1967), p. 49.

scientific and industrial competitiveness in space.¹⁰⁵ An early coordination of the ideas of industry and of research institutes seemed all the more desirable since individual firms like "Bölkow GmbH" had already started to present some very concrete proposals to the state authorities.¹⁰⁶ The ability of social interest groups to agree on collective interests and to formulate common goals was however very limited. Individual firms as well as big research institutes acted first of all as individual competitors in complex action systems that were not primarily determined by national interests, but by the pursuit of profit and scientific progress.

9 Execution of the work on the third stage: the second report of the Bock commission

As soon as the decision of the Federal government to join ELDO had been taken, a tug-of-war for the development and execution of the third stage started. To put an end to this wrangling, the Interministerial Committee at its meeting on 11 August 1961 decided to reconvene the expert commission under the chairmanship of Günther Bock.¹⁰⁷ Charged with the task of drafting the feasibility study, the commission was asked to examine the technical and financial requirements for the construction of the third stage, and to inspect carefully the potential research institutes and industrial facilities in the Federal Republic. Granted the almost complete lack of concrete experience and know-how in running space projects in Germany this highly difficult task, however, needed some time. From 11 September 1961 to 10 February 1962 the expert commission held seven sessions, along with several meetings with foreign experts, particularly from Great Britain and France, before the work was concluded.¹⁰⁸

To accomplish its task the commission immediately invited two industrial groups, the "Entwicklungsring Nord AG" (ERNO) and the "Bölkow GmbH", to work out design

¹⁰⁵ See BA, B 106/17802, record of the first joint discussion of German industry about a 4-year space programme in Munich, 16 August 1961.

¹⁰⁶ BA, B 106/17801, letter Bölkow to the Ministry of the Interior with an enclosure "Raumfahrtforschung: Vorschläge für ein gezieltes, weitausblickendes Forschungs- und Entwicklungsprogramm", 7 July 1961.

¹⁰⁷ See Trischler (1992), pp. 420-421.

¹⁰⁸ See Weyer (1990), p. 291.

proposals for the third stage, to be presented no later than mid-January.¹⁰⁹ The two groups were not however equally prepared for this difficult task. ERNO AG, a consortium of three individual firms in the German aviation industry, Focke-Wulf, Weserflug and Hamburger Flugzeugbau that had been formed in 1961 with the explicit task of coordinating activities in the emerging space sector,¹¹⁰ had to start almost from scratch. Bölkow GmbH could already profit from some concrete experience in the development of military rocket technology.¹¹¹ Before anyone else Ludwig Bölkow had recognized the need for space programmes in the Federal Republic, believing that in the late fifties the main emphasis in the field of development with an eye on the future had shifted from civil and military technology to space technology. As early as 1959/60 he had drafted his ideas and suggestions for concentrated space programmes and had submitted them to the ministries. It was also Bölkow who in the Bock Commission first articulated the demand to develop the third stage of the heavy satellite launcher in the Federal Republic.

The diverse professional backgrounds of the two industrial groups also found its expression in the totally different design proposals they first presented in December 1961 to the Bock Commission. While the layout of that made by ERNO AG was based on the use of a conventional, middle-energy propulsion system, Bölkow GmbH proposed the development of a modern high-energy third stage including the use of more powerful propellants, such as liquid hydrogen or fluorine. They argued that, considering the limited efficiency of the first two stages, only the use of an extremely powerful third stage could guarantee a payload capacity sufficient for launching future heavy satellites and space laboratories into orbit. "Everything else", Bölkow stated emphatically, quoting from a letter to him by Wernher von Braun, "would be outdated, before development was completed".¹¹²

The idea of compensating for the technical limitations of the already well advanced first and second stages, by a highly modern third stage to be developed by the Federal Republic, was indeed challenging. It did not, however, win the approval of the Bock Commission, who feared that it would miss the time schedule that had been set up for the

¹⁰⁹ The following section is based on an interview with Ludwig Bölkow and Dietrich E. Koelle in Ottobrunn (12 July 1993).

¹¹⁰ See Trischler (1992), p. 421.

¹¹¹ See Bittner (1986), pp. 121-126.

¹¹² Cited by Koelle (1993).

start of the first complete three stage heavy satellite launcher (July 1965). The commission therefore decided to favour, at least for the time being, the resort to proven propellant technology, explicitly expressing, however, the urgent need for parallel studies in the field of the proposed advanced propellant technologies.¹¹³ This division reflected at the same time the earlier recommendation of the Bock Commission — the necessity for the new European organization to start immediately with the study of advanced programmes and the hope that it would be German firms that would be charged with this task, so enabling them to establish a lead in the field of advanced propulsion systems. In response to this decision, Bölkow GmbH presented shortly afterwards a second design proposal based on the use of middle-energy propellants, as did the ERNO AG with respect to a high-energy third stage.

The complete feasibility study of the Bock Commission, entailing design proposals by both ERNO AG and Bölkow GmbH, was officially presented on 15 February 1962.¹¹⁴ Its most important result was the proof "that German science, engineering and industry would be in a position to develop and to manufacture the third stage, as well as to take charge of other tasks in the whole project".¹¹⁵ As already mentioned above, the commission clearly favoured the development of a middle-energy third stage, without however giving preference to either of the two design proposals. Instead, the Federal government was recommended to charge both industrial groups with the task of figuring out and jointly realizing the best of the two technical solutions. As to the concrete execution of the work, it recommended enlarging the already existing rocket engine test facilities in Trauen and Lampoldshausen. The first were to be used by ERNO AG, the second by Bölkow GmbH. With the sum of 97 million DM plus 16 million DM for necessary investments, the commission also gave a first cost estimate of the development of the third stage.¹¹⁶ It soon turned out that this figure was much too low. In

¹¹³ See the very detailed report of G. Bock to the 7th meeting of the Parliamentary Committee on Atomic Energy on 23 May 1962 (BA, B 106/17803). At a meeting with British and French experts on 19/20 September 1961, the Bock commission had already been strongly advised to give preference to the conventional design proposal. For a record of this meeting see BA, B 138/2498, 22 September 1961.

¹¹⁴ AA-PA, B 30, IB1, Vol. 309, "Projektstudien über die dritte Stufe der Europäischen Träger- rakete, durchgeführt im Auftrag des interministeriellen Ausschusses für Weltraumforschung der Bundesrepublik Deutschland", January 1962.

¹¹⁵ AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62, joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs, 7 March 1962.

¹¹⁶ BA, B 106/17803, report of G. Bock to the 7th meeting of the Parliamentary Committee on Atomic Energy on 23 May 1962.

the end the real costs mounted to a total of 500 million DM,¹¹⁷ 4.5 times more than the initial estimate.

10 The Lancaster House conference and the signature of the ELDO and ESRO conventions

In the meantime governmental negotiations on the establishment of ELDO had made further progress. From 30 October to 3 November 1961, on the invitation of the British government, an official conference of the potential member states had taken place at Lancaster House in London.¹¹⁸ Apart from the abovementioned internal problems in the Federal Republic, i.e. the settlement of governmental responsibilities for space affairs and the completion of the feasibility study on the third stage, there were however several other reasons that prevented a final agreement on the convention. There was first the question of Italian membership. Notwithstanding heavy diplomatic pressure and considerable concessions concerning Italian collaboration in the construction of the satellite launcher, the Italian delegation was unwilling to enter into formal commitments at this conference.

Then there was the German demand for an enlargement of the organization's activities, including the study of advanced launcher technologies right from the start. Although it was agreed that £2 million be set aside in the initial programme for a two-year study on future possibilities, the conference failed to arrive at binding commitments on members' participation in this additional activity.

Another problem that remained unresolved was the free exchange of information. According to German law design and patent rights belonged to the inventor. The request of the German delegation to restrict information exchange was however heavily opposed by the other delegations, particularly the British.

Finally, there were the financial problems. A compromise was reached regarding a ceiling of expenditure. It was agreed that should the £70 million total budget be exceeded, the member states would discuss among themselves how to deal with the excess. However, the conference was unable to agree on the very difficult question of how to share the shortfall should Italy decide definitely not to join.

¹¹⁷ See Koelle (1993).

¹¹⁸ This section is based on Krige (1993b), pp. 28-32.

The Lancaster House conference concluded with the decision to continue negotiations at the level of expert meetings.¹¹⁹ For this purpose a so-called Preparatory Group was established. It was charged with the double task of drafting the final text of the ELDO convention and of carrying out the planning needed to permit the organization to proceed with its work quickly and economically when it was set up.¹²⁰ The deliberations of this Preparatory Group, which first met on 11 December 1961, dragged on for a couple of weeks until in mid-February 1962 the work on the draft of the ELDO convention was successfully concluded.

In the Federal Republic, the results of the preceding negotiations were discussed at a cabinet meeting on 14 March 1962.¹²¹ It was pointed out with particular satisfaction that all four conditions for the Federal government's participation in ELDO had essentially been pushed through. First, ELDO's programme had been extended. Although the convention only foresaw an obligatory participation of all member states in the initial programme, the desirability of starting immediately with studies on advanced launcher technologies was generally confirmed. Second, the Federal Republic's claim for leadership with respect to the development and the construction of the third stage had been accepted. Third, a close cooperation between the new organization and the United States was envisaged. Fourth, several provisions of the convention, particularly those that regulated patent rights, the exchange of information and the protection of secrecy, had been at least partly changed to meet German proposals. At this cabinet meeting, agreement was also reached on Germany's financial contribution. The decision of Italy to become a member of ELDO was received with great relief. According to the final regulations, and on condition that Austria, Norway, Spain, Switzerland, Sweden and Denmark would not join the organization, the Federal Republic's share of the common budget (£70 million) amounted to 22,01 %, i.e. 170 million DM spread over five years.

¹¹⁹ See AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-4228/61, Foreign Ministry note to the UK embassy, 24 November 1961.

¹²⁰ See AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62, joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs, 7 March 1962.

¹²¹ See AA-PA, B 30, IB1, Vol. 309, No. 202-81.21-575/62, joint cabinet paper, drafted by the Foreign Ministry and the Ministry for Atomic Affairs, 7 March 1962.

Two weeks later, on 29 March 1962, the German Federal Government officially signed the ELDO convention.¹²² It took another month before the convention was finally signed by all participating countries, i.e. Great Britain, France, Italy, the Federal Republic of Germany, Belgium, the Netherlands and Italy. Only two months later, in mid June 1962, the Federal government together with eight other West European governments (Denmark signed in December) also signed the ESRO convention.¹²³ Although both organizations were given a similar institutional structure, i.e. a council and an integrated transnational agency to which suitable responsibilities and authority were allocated, the differences were profound and were to have a far-reaching and, with respect to ELDO, an almost disastrous effect.

While ESRO was specifically authorized to enter into contracts, acquire fixed and movable assets, and institute legal proceedings, the ELDO secretariat was authorized to place contracts only "in agreement with the Government of the State in the territory of which the work is to be carried out".¹²⁴ More than that, the ELDO convention explicitly stated that design, development, and construction would have to "be carried out under the leadership of the authorities and organizations [...] of the respective governments".¹²⁵ The predictable consequence was that national bureaucracies retained control, and that ELDO was never allowed to develop a technical capability similar to ESRO's.

There were however other striking differences between the two European space organizations. ESRO's purely scientific eight-year programme had been well defined and the means to carry out this programme were concretely spelled out in the convention:¹²⁶

- (1) Firing of 400 sounding rockets at 65 per year by the third year;
- (2) Successful launching of two fully instrumented small satellites annually from the fourth year of existence;
- (3) Successful launching of two major space probes annually during and after the sixth year.

¹²² See "Deutsche Beteiligung am Bau eines Raumfahrtträgers. Europäische Organisation für die Entwicklung und den Bau von Raumfahrzeugen", *Bulletin* No. 76, 19 April 1962, p. 651.

¹²³ See "Europäische Organisation für Weltraumforschung. Unterzeichnung eines Vertragswerks durch den Deutschen Botschafter in Paris", *Bulletin* No. 109, 16 Juni 1962, p. 946.

¹²⁴ Cited by Hochmuth (1974), p. 61.

¹²⁵ *Ibid.*, p. 66.

¹²⁶ See Russo (1992).

To carry out this programme the ESRO convention explicitly provided for the establishment of several international facilities, of which the most important, ESTEC (European Space Technology Center) was located in the Netherlands, while the Federal Republic got the data center (ESDAC).

By contrast, ELDO's organization lacked any concrete definition of its real purpose. The participating countries wanted to develop a heavy space launcher but gave little thought to what they were going to launch or for what purpose. The ESRO convention did not even provide for any commitment concerning a preferential use of the ELDO launcher for their programmes. By rejecting any obligatory commitments other than the initial five-year programme, the fate of the organization was made dependent on a successful recycling of the already somewhat outdated British *Blue Streak* rocket. The fragility of the ELDO organization soon became obvious when the United States in 1964 successfully launched a first satellite into a geostationary orbit (36.000 km), an altitude that was far beyond the range of the projected three-stage ELDO rocket.¹²⁷ The subsequent severe crises and the final failure of the organization were therefore to a large degree a consequence of the initial institutional decisions.

11 Institutional build-up of the Federal Republic's space policy

The Ministry for Atomic Affairs, charged with the central handling for space research and technology, set out to prepare the bills for the necessary ratification of the ELDO and ESRO conventions.¹²⁸ Its other urgent task was to establish an effective steering system to design and to execute the Federal Republic's future space policy. In the ministry itself a department for space had to be created. Because of the shortage of civil servants who were already versed in the difficult matter of space in the Federal Republic, the ministry had to recruit the few specialists of those ministries that had actively participated in the preparatory stage. After consultation with Franz Josef Strauß, Max Mayer, a civil servant in the Ministry of Defence, was appointed in June 1962 as director of the new space department.¹²⁹ Mayer, an engineer

¹²⁷ See Koelle (1993).

¹²⁸ After official approval by the German Parliament on 6 December 1963, the ratification of the two conventions was concluded late in 1963. See "Europäische Raumfahrt-Abkommen ratifiziert", *Bulletin* No. 220, 13 December 1963, p. 1963.

¹²⁹ See BA, B 138/2475, letter Strauß to Balke, 27 July 1962.

specialized in rocket propulsion and a former member of the Peenemünde group, had been responsible for the development and equipment of the German forces with guided missiles since 1956. His new function also served the interests of the Ministry of Defence which could look forward to a very close cooperation with the new department.¹³⁰ Other civil servants, mostly lawyers, came from the Ministries of the Interior (W. Brado) and of Finance (H. Schramm). Within the space department, the first was made responsible for ESRO, the second for ELDO.

Since a sufficient inhouse expertise was lacking, another urgent task for the Ministry for Atomic Affairs was to create an advisory commission. Modelled basically on the German Atomic Commission, an example of already existing and successfully operating institution, early in September 1962 the ministry decided to set up a German Commission for Space Research.¹³¹ It was headed by the minister himself, and leading scientists, engineers, industrialists, delegates from other ministerial departments as well as the chairman of the "Kommission für Raumfahrttechnik" and the vice-chairman of the German federation of trade unions were appointed members of this commission.¹³² This impressive composition clearly revealed that, beyond the creation of an ordinary advisory committee, concerted action for the development of space technology in the Federal Republic was intended. At its first meeting on 6 September 1962 the commission immediately created four subgroups, as provided for by its constitution, and a special working group for the recruitment of junior space specialists.

At the meeting of the Interministerial Committee in late February 1962, chaired for the first time by the Ministry for Atomic Affairs, undersecretary Cartellieri defined the activities of his ministry somewhat euphemistically as being confined to the formulation of Germany's space policy.¹³³ The creation of a separate supervisory authority was therefore required for the control and administration of space efforts in industry. For this purpose, the "Gesellschaft für Weltraumforschung mbH" (GfW) was established on 23 August 1962.¹³⁴

¹³⁰ *Ibid.*

¹³¹ See "Deutsche Kommission für Weltraumforschung. Gründungsversammlung in Bad Godesberg", *Bulletin* No. 167, 8 September 1962, p. 1420.

¹³² For the composition of this commission see *ibid.*

¹³³ See Trischler (1992), pp. 412-413.

¹³⁴ See "Gesellschaft für Weltraumforschung gegründet", *Bulletin* No. 157, 25 August 1962, p. 1338. See also Trischler (1992), pp. 412-415.

Organized as a not-for-profit corporation,¹³⁵ the task of the GfW was to supervise and administer the ESRO, ELDO and national endeavours. The GfW had to serve as the national project holder organization for ELDO, whose convention stated that contracts to national industrial firms had to be placed "in agreement with the Government of the State in the territory of which the work is to be carried out".

Being designed as the executive body of the ministry, the GfW suffered however from the very start from a couple of substantial difficulties which led to the complete failure of the organization during the late sixties. Not only did the GfW fail to recruit competent personnel. Even though set up as a not-for-profit organization, it also failed to escape the rigidity of the federal budgetary law, which limited its scope of action severely. What is more, the GfW lacked a positive image, being blamed by the public for being dominated by the interests of private industry, whereas industrialists complained about exactly the opposite, i.e. its monitoring function.¹³⁶ The failure of the GfW to effectively execute its tasks contributed significantly to the difficulties of the German contribution to ELDO. Neither on the European nor on the national level was it possible to have a central and professional project management for the construction of the third stage.

The Ministry for Atomic Affairs had more success in its efforts to pave the way for a reorganization of the German space research institutes. This was considered to be particularly urgent since the budget commission of the German Parliament had made any increase of the research budget dependent on an effective coordination and centralization of the respective activities in the Federal Republic. These, as a consequence of the allied restrictions after World War II, had been split between diverse and often competing single institutes and scientific societies.¹³⁷ The aim, therefore, was the creation of a single and unified organization for all non-university research institutes working in the field of space research and technology.

Facing strong and determined resistance from the established organizations, the ministry profited from a big public scandal, the so-called "Egypt-crisis", to launch its first

¹³⁵ The state was the managing partner of the GfW, with a capital share of 19.000 DM, joined by Fritz Rudolf, the chairman of the KFR, with a capital share of 1.000 DM.

¹³⁶ See interview with L. Bölkow and D.E. Koelle (12 July 1993).

¹³⁷ See Trischler (1992), pp. 463-464.

initiative in this direction.¹³⁸ In late 1961 it had become publicly known that three leading scientists of the "Forschungsinstitut für Physik der Strahlantriebe e.V." (FPS), i.e. Prof. E. Sänger (director), W. Pilz and Prof. Goerke together with the managing director of the FPS (Krug) had since autumn 1960 been actively engaged in the development of a rocket for Egypt. Both Sänger and Pilz had participated before in the construction of the French *Véronique*, and it was exactly this rocket that they had taken as a model.

Heavily embarrassed because of the negative effects on the German-French but also on German-Israeli relationships, the Federal government immediately suspended all public financing of the FPS and later demanded the dismissal of all four top specialists.¹³⁹ As a result of this scandal the FPS shortly afterwards lost its autonomy. In April 1962 it was incorporated into the "Deutsche Versuchsanstalt für Luftfahrt e.V." (DVL).¹⁴⁰ For the DVL, specialized in aeronautics research, the integration of the FPS meant a re-orientation of its research priorities and a strengthening of its claim to become the institutional nucleus of all extra-university activities in the field of aeronautics and space research. The path to the formation of a unified and central research organization was however still long and it took until 1967 for the "Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt e.V.", a fusion of all individual research institutes and societies, to be successfully established.¹⁴¹

Even more difficult was the process of concentration of the German aerospace industry, equally strongly sought by the Federal government and the budget commission of parliament (see Table I). The development of advanced technology required long-term state investments which had to be concentrated and not split between competing national industries. The events following the recommendation of the Bock-Commission, namely to ask two separate and competing industrial groups to develop jointly the third stage of the ELDO rocket, clearly demonstrated the need for such a measure.

There was first the problem of spending public money for building-up of two complete technical infrastructures, i.e. the propulsion test facilities in Trauen, to be exclusively used by ERNO AG, and in Lampoldshausen, to be used by Bölkow GmbH. The

¹³⁸ See BA, B 106/17803, internal note of the Ministry of the Interior, 17 November 1961.

¹³⁹ *Ibid.*

¹⁴⁰ See Trischler (1992), pp. 454-456.

¹⁴¹ *Ibid.*, pp. 472-499.

state also had to finance the construction of a third propulsion test facility at the site of Bölkow GmbH in Ottobrunn, designed for military development projects. For obvious reasons the Ministry of Finance protested heavily against this unwarranted spread of public money.¹⁴²

The second problem was to coordinate the efforts of two competing industrial groups. As has been mentioned above, the GfW lacked from the start any adequate steering capacity. The transformation of the Ministry for Atomic Affairs into the new Ministry of Scientific Research in December 1962 did not compensate for this lack of political control.¹⁴³ The appropriate decision, accompanied by a change of minister, was taken after a severe governmental crisis ("Spiegel affair").¹⁴⁴ Confirming the recommendation of the Bock Commission, the newly appointed Minister of Scientific Research arranged for the establishment of a working pool, the "Arbeitsgemeinschaft Satellitenträger" (ASAT) to be formed by ERNO AG and Bölkow GmbH. It was to serve as the legal contract holder (see Table II).

Involuntarily pieced together, neither firm was, however, willing to build up an organizational infrastructure which guaranteed an effective project management, at least on the industrial level. Instead, after having received officially a partial contract by the ministry to officially begin with the development of the third stage in late April 1963,¹⁴⁵ and after having agreed to realize the Bölkow design proposal for a middle-energy third stage, the execution of the work, divided on a 50% basis, took place in the following years with hardly any communication between the firms.¹⁴⁶ Bölkow GmbH took responsibility for the construction of the guiding engines, the electrohydraulic equipment, the flying attitude control system and the compressed gas container, whereas ERNO AG developed the

¹⁴² See Trischler (1993) document 138: Ministry of Finance letter to the Minister for Scientific Research, 1 April 1964.

¹⁴³ See Stamm (1981), pp. 244-247.

¹⁴⁴ See Schwarz (1991), pp. 769-810.

¹⁴⁵ See "Bundesrepublik baut 3. Stufe des europäischen Raumfahrzeugträgers. Abschluß eines Teilvertrags mit der Arbeitsgemeinschaft Satellitenträger in München", *Bulletin* No. 71, 23 April 1963, p. 626.

¹⁴⁶ See interview with L. Bölkow and D.E. Koelle (12 July 1993).

structure, the tanks, and the main rocket engine (see Table III).¹⁴⁷ The difficulties which the German third stage created when it was first mounted on the other two stages were therefore not surprising. To explain the failure of the German stage Ludwig Bölkow and Dietrich E. Koelle, one of his chief-engineers, retrospectively laid most blame on the initial non-decision by the Ministry of Scientific Research to charge two industrial groups concurrently, instead of commissioning one main industrial contractor.¹⁴⁸ The problems on the national level were however only a reflection of the problems in ELDO as a whole, where a central industrial management was equally lacking.¹⁴⁹

12 *The national space programme*

From the very beginning of the internal discussions about Germany's participation in the European space organizations, the formulation of a national space programme was increasingly demanded by industry, science and the state. Unlike the other two main financial contributors to ELDO and ESRO, Great Britain and France, the Federal Republic was going to enter the European space organizations without any ongoing national space programme. Such a programme was seen as a precondition for an effective cooperation on the European level.¹⁵⁰ Only by rapidly building up inhouse capabilities in space technology and the respective technological know-how, it was said, could the competitiveness of German research and industry be ensured. Only on the basis of a functioning national space programme could a fair return on the German financial contributions in the form of industrial contracts be expected.

In late April 1962, less than one month after the Federal government had signed the ELDO convention, a first detailed proposal was presented by the "Kommission für Raumfahrttechnik" (KfR).¹⁵¹ It has to be remembered that the KfR, established in August 1961, was a joint organization of German aerospace industry and research, i.e. the

¹⁴⁷ See Koelle (1993).

¹⁴⁸ See interview with L. Bölkow and D.E. Koelle (12 July 1993).

¹⁴⁹ See Hochmuth (1974), p. 76.

¹⁵⁰ See "Weltraumforschung und Raumflugtechnik. Das deutsche Programm — Ein nationaler und ein internationaler Teil", *Bulletin* No. 187, 9 October 1962, p. 1578.

¹⁵¹ See "Nationales Raumfahrtprogramm. Vorschläge der Kommission für Raumfahrttechnik für die nächsten vier Jahre", *Bulletin* No. 89, 15 May 1962, p. 760.

"Bundesverband der Deutschen Luftfahrtindustrie e.V." (BDLI) and the "Deutsche Gesellschaft für Flugwissenschaften e.V." (DGF). The so-called "4-Years Programme 'Space Technology' of German Research and Industry" was an impressive list of diverse space research and development projects, which was divided into two fairly unconnected sections: one drafted by the DGF and the other drafted by the BDLI. In the course of the internal preparations it had turned out to be impossible to reach agreement on a truly joint programme of German space research and industry.¹⁵²

Of particular interest was the latter which was split into three parts. Part I dealt with all those projects for which concrete proposals had already been worked out. In this section the development of a rocket engine based on a high-energy propellant, presented by Bölkow GmbH, was the most prominent project. As was explicitly stated by the Bock Commission, the construction of a modern propulsion system of this type was considered to be of high importance for the future development of the ELDO rocket, which might even combine stages 2 and 3 in one single high-energy upper stage.¹⁵³ It was thought desirable to start the development of this advanced technology as part of the national programme at first, since this would increase the Federal Republic's chance to win the corresponding ELDO contract later on.

Another project mentioned under this section was the development of a retrievable sounding rocket. Because of the danger burnt-out sounding rockets of the traditional type created for occupied areas, there were very few places where scientific experiments with these instruments could actually be carried out.¹⁵⁴ Although given much less prominence, the development of research satellites was also defined as a possible national space project.

Part II of the KfR programme dealt with so-called long-term and futuristic space projects, mentioning in particular studies on the development of a space shuttle as well as a space platform. Part III finally covered a couple of proposals concerning the build-up of development and test facilities for German space industry, among which the construction of a space simulator was especially emphasized.

¹⁵² This section is based on Weyer (1990), pp. 303-315.

¹⁵³ BA, B 106/17803, report of G. Bock to the seventh meeting of the Parliamentary Committee on Atomic Energy on 23 May 1962.

¹⁵⁴ *Ibid.*

It was not so much a lack of interest as a lack of money that caused the rather reserved reactions to the KfR programme when it was presented to the Ministry of Scientific Research. Considering the very small budget the ministry had at its disposal to promote national space projects, the KfR programme, with a total cost estimate of 933.1 million DM,¹⁵⁵ was seen to be mere "wishful thinking", i.e. a rather inappropriate basis for internal planning.¹⁵⁶ In March 1962, the budget committee of the German parliament had cut down the 1962 space budget from the 60 million DM officially asked for by the Federal government to 35 million DM, of which only 10 million DM were available for national space projects.¹⁵⁷ Compared to the original requests of the Interministerial Committee (100 million DM) and the KfR (126 million DM), this sum did not leave much room for ambitious experiments, and it was clear from the start that the future national space programme would be primarily shaped by financial constraints.¹⁵⁸

Apart from its enormous size, another striking aspect of this first draft of a national space programme was its pronounced orientation towards rocket technology. It was the development of advanced rocket propulsion systems, to be used in the long run for the development of a space shuttle and a space platform, which the KfR had considered to be the most suitable project for Germany's re-entry into space. Evidently, with respect to history, it had been in this field where German space scientists and technicians had first gained international respect. Considering, however, that the Federal Republic was also going to become an active member of ESRO, its disregard for the stormy developments in the field of satellite technology was somewhat astonishing.

¹⁵⁵ This total figure was the sum of 747,6 million DM asked by the BDLI and 185,5 million DM asked by the DGF. See Weyer (1990), p. 304.

¹⁵⁶ Oral information by Max Mayer (interview, 27 April 1993).

¹⁵⁷ See Trischler (1992), p. 421. In the internal dispute about the 1962 space budget, the Ministry of the Interior strongly rejected the argument of the parliamentary budget commission, "that today satellite launchers could be bought from the United States or from other countries" and that any European effort in this field of research and development would be superfluous. See Trischler (1993) document 132: Ministry of the Interior letter to the Ministry for Atomic Affairs, 20 March 1962. In an internal note of the Ministry for Atomic Affairs (AA-PA, B 30, IB1, Vol. 309, No. 20-202-81.21/737/62, 22 March 1962) the Ministries of Defence and of Finance, still irritated at having been outvoted in the decision about German participation in ELDO, were heavily blamed for having pressured the members of the budget committee.

¹⁵⁸ The decision of the budget commission was heavily attacked in a public declaration by the directors of the German aeronautics research centres of 30 March 1962. See Trischler (1993), document 133.

It was only a few months before this one-sided orientation of future national space activities towards rocket technology was challenged by a clear-cut statement by three major representatives of German space research and industry. In November 1962 the directors of the DVL and the "Institut für Geophysik und Meteorologie, Universität Köln", Quick and Petzold, together with Ludwig Bölkow presented a joint memorandum, called "Satellites for German Space Research" which spelled out a detailed programme for satellite development in the Federal Republic.¹⁵⁹ The initiative to draft such a memorandum had basically come from a conversation with B. Goethert, a German scientist who worked for the US Air Force and who had drawn the attention of Quick and Bölkow to the emerging development of commercial satellites in the United States.¹⁶⁰

Without mentioning the KfR programme explicitly, the memorandum criticized the lack of concrete and feasible projects able to demonstrate an original German contribution to the conquest of space. Emphasizing the necessity for German space research and industry to become, as soon as possible, a competitive partner at the international level, it particularly demanded Germany's participation in the discussions already under way on the development of a European communications satellite. As to the German space programme, the memorandum proposed the construction of five different types of satellites within the following seven years. Dividing the work between industry and research institutes on a 60% to 40% basis, the total cost for carrying out this programme was estimated to be 100 million DM.

The satellite memorandum was particularly appreciated by the KfR which had been looking for a while for a new conceptual approach to overcome the deadlock in the discussions with the state authorities after the presentation of its own programme. On 1 February 1963 the KfR submitted a revised and much more structured "Research Programme 1963",¹⁶¹ which contained the following projects:

¹⁵⁹ BA, B 106/17803, 1 November 1962.

¹⁶⁰ Goethert was the technical director of the "Arnold Engineering Development Center" in Tullahoma. In October 1961, he had been appointed director of the "Institut für Weltraumforschung" founded by the DVL. Goethert carried out the duties of this office from the United States. See Weyer (1990), p. 174.

¹⁶¹ The revised KfR programme was also divided into a section by the DGF and a section by the BDLI. Again we discuss here only the latter. See Weyer, pp. 332-338.

- 621 sounding rockets
- 622 high energy propellants
- 623 space shuttle
- 624 non-chemical propellants
- 625 satellites
- test facilities

Project 625, the most innovative change in the revised KfR programme, was basically an adaptation of the satellite memorandum drafted by Bölkow, Quick and Petzold. Referring to the current financial constraints caused by the severe cuts in the 1962 space budget of the Ministry of Scientific Research and to the fact that the ratification of the ESRO convention was still far from complete, it was explicitly suggested that Germany's financial contribution to ESRO, allocated already in the 1962 (5 million DM) and 1963 annual budgets (22.4 million DM), should temporarily be used for the national satellite project.¹⁶² Compared to the 10 million DM allocated for the national space programme in the 1962 annual budget, this was a considerable amount of money which risked being lost. By proposing to finance at least initially the satellite project out of the national ESRO funds, and by considerably reducing and reshaping the financial requirements for the other projects (the development of a space platform for example had been cancelled completely), the KfR was able to present a much more moderate total cost estimate for 1963 (see Table IV).

The revised figures clearly revealed the growing pragmatism that had gained ground within German industry. Of all the suggested projects there were basically two which could be started immediately: 621 - sounding rockets and 625 - satellites. The others were described as study projects. With respect to the latter there was, however, still the launching problem. Although it was clear from the start that a proper German satellite programme would require close cooperation with the United States, i.e. using the American *Scout* and *ThorDelta* rockets, a bilateral agreement still had to be concluded. Considering the ambitious size of the envisaged satellite programme, providing *inter alia* for the development of a very advanced and prestigious heavy, multi-purpose satellite weighing 1,500 kg, such an agreement was anything but easy to reach. From the first talks with NASA late in summer 1963, it had already become very evident that the United States was pursuing a rigid policy of non-cooperation in all those cases where its lead in the development of advanced satellite technology or commercial interests were going to be challenged by its international

¹⁶² *Ibid.*, pp. 335-336.

partners.¹⁶³ Without the technical support of the United States, there was however no chance to go ahead with the envisaged national satellite programme.

One of the first tasks of the German commission for space research (DKfW), once commissioned by the ministry to draft an official national space programme on the basis of the proposals presented by German industry and research institutes, was to considerably reshape the ambitious satellite project. The members of the DKfW, after some controversial internal discussions, basically shared the growing view of German industry that the development of satellites should be considered as the key project to relaunch national space activities. To formulate a coherent and feasible project proposal, the DKfW established in September 1963 an "Ad Hoc Committee 'Satellites for German Space Research'" and appointed Prof. W. Quick, one of the authors of the satellite memorandum of November 1962, as chairman of this committee.¹⁶⁴

On the basis of the proposals of this ad hoc committee the DKfW presented on 1 April 1964 a completely revised proposal for the national satellite project.¹⁶⁵ Although the DKfW study still mentioned "Project 625 B", i.e. the heavy multi-purpose satellite, it focussed entirely on "Project 625 A" which was the code for the development of a light research satellite of 60-80 kg weight. By giving preference to a comparatively conventional satellite type it was hoped that the United States would reconsider its initial unwillingness to support technically the German satellite project, and that a fruitful bilateral cooperation, including the transfer of space technology, could be established. A possible alternative to this approach, i.e. the equipment of US satellites with German scientific instruments, was at the same time totally rejected, since it would have prevented German industry from getting in on satellite technology.

As for the need to start immediately on the development of this technology in the Federal Republic, the DKfW study referred explicitly to Germany's membership of ESRO, arguing that the existence of an ongoing national satellite programme before ESRO placed its contracts was indispensable to ensure German competitiveness and a "fair return" of its national financial contributions to this organization. In the long run this strategy turned out to be successful. To achieve a return coefficient of unity it took however until 1975, whereas

¹⁶³ *Ibid.*, p. 343.

¹⁶⁴ See Weyer (1990), p. 345.

¹⁶⁵ *Ibid.*, pp. 346-350.

throughout the sixties the flow back of German financial contributions to ESRO was below 37%.¹⁶⁶

The memorandum "Space Research in the Federal Republic of Germany", presented by the DKfW in May 1965, was a first draft of the entire national space programme.¹⁶⁷ Among all the projects mentioned in this draft programme, it was again the development of a national satellite which was given highest priority and to which in the following years more than half of the entire national space budget was allocated.¹⁶⁸ Already in late 1963, Bölkow GmbH had been commissioned to work out a design proposal for the German satellite, and it was under the leadership of this firm that a consortium of national aerospace industries, in close cooperation with the United States, went ahead with the construction of AZUR, as the first German satellite was now called.¹⁶⁹ At the same time neither the development of a high-energy rocket propellant system nor the development of advanced sounding rockets ever succeeded to go beyond the stage of mere planning.¹⁷⁰

When the AZUR satellite was successfully launched into orbit in 1969, the German space community was able to appeal to a turning point in the history of national space activities. At the end of the decade the amount of public money spent for the national space programme had for the first time exceeded the amount of money that was allocated to the European space programmes (see Table V). What is more, 25 years after the end of the calamitous Peenemünde project, German science and industry had successfully demonstrated its capacity and its determination to peacefully re-enter space.

¹⁶⁶ See Schwarz (1979), pp. 211-212.

¹⁶⁷ See Mayer (1967), p. 49.

¹⁶⁸ In a reply by the Ministry of Scientific Research to an earlier draft of this memorandum, the project of a German research satellite was described as being the most advanced and the most promising. See Trischler (1993), document 139: report of undersecretary Cartellieri at the DKfW meeting on 20 June 1964 (BA, B 138/3464).

¹⁶⁹ See Weyer (1990), pp. 349-351.

¹⁷⁰ See interview with L. Bölkow and D.E. Koelle (12 July 1993).

Concluding remarks

Space research had an impressive but at the same time shady political past in Germany. During World War II German space scientists were very successful in mastering rocket technology for the Nazi regime. Burdened with the Peenemünde project it was not before the end of the fifties, when the international development of space technology for civilian purposes took shape, that Germany's re-engagement in the field of space activities was considered to be politically justifiable.

A concrete opportunity to overcome any suspicion about the possibility of abusing this powerful technology was given in 1960, when two major initiatives for European space cooperation were launched: the establishment of a European organization for space research (ESRO) and the creation of a European organization for the development of a heavy satellite launcher (ELDO). While Germany's participation in the first organization was undisputed right from the start, it was only after a very controversial internal debate that domestic consent to the latter project was finally reached.

Several reasons accounted for this. The first regards the political character of ELDO. While the creation of ESRO was clearly an initiative of space scientists, i.e. a bottom-up approach, the primary impetus to form a European organization for the development of a heavy satellite launcher came from the top political level, i.e. a top-down approach. Designed as a means to recover large financial investments on a rocket technology the British were no longer able to develop for military purposes, the recycling of *Blue Streak* in a European framework was presented to the Federal government as an opportunity to strengthen the cohesion between Britain and the Continent. Attracted by the idea of promoting European integration in a crucial field of modern technology, Chancellor Adenauer, confronted with substantial opposition in his cabinet, asserted his authority to push the initiative through.

The second reason derives from the diversity of interests within the German space community. For German space scientists, as for their colleagues in the other European countries, a launcher was primarily a means to an end, i.e. to put a scientific instrument into orbit. Seen from this perspective, the extremely costly creation of an independent European launcher capacity did not make much sense since American satellite launchers were already available. For the emerging national space industry and the non-university aeronautic and astronautic institutes participation in ELDO was considered to be the only chance to immediately participate in the development of modern rocket technology. Neither the national

option, excluded for political reasons, nor other international options, particularly the originally suggested bilateral cooperation with the United States, were realistic and feasible alternatives. The USA categorically refused any sort of technology transfer in the field of rocket development. Taking these limitations into regard, and attracted especially by the third stage of the proposed European satellite launcher which would require a completely new development involving the latest state-of-the-art technology, both interest groups strongly favoured Germany's participation in ELDO. This, they hoped, would enable them to build up the respective technological know-how very rapidly.

From the very detailed expert studies they presented to the Federal government it became, however, equally evident that Germany's participation in the initial programme of ELDO would also serve to start an ambitious national space programme denied Germany since 1945, first by allied prohibitions and then, after 1955, by self-exercised political restraints. German membership in ESRO and ELDO had the advantage that the Federal government would be locked into a structure from which it was extremely difficult to withdraw. Since any successful participation in these international organizations depended on the rapid national build-up of technological know-how and a functioning industrial and scientific infrastructure, the commitment for the Federal government to promote a national space programme in parallel was an immediate consequence of the decision to join ESRO and ELDO. This assessment rapidly bore fruit and the Federal Republic soon became one of the major European space powers.

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Table I

Concentration of German aerospace industry after 1945

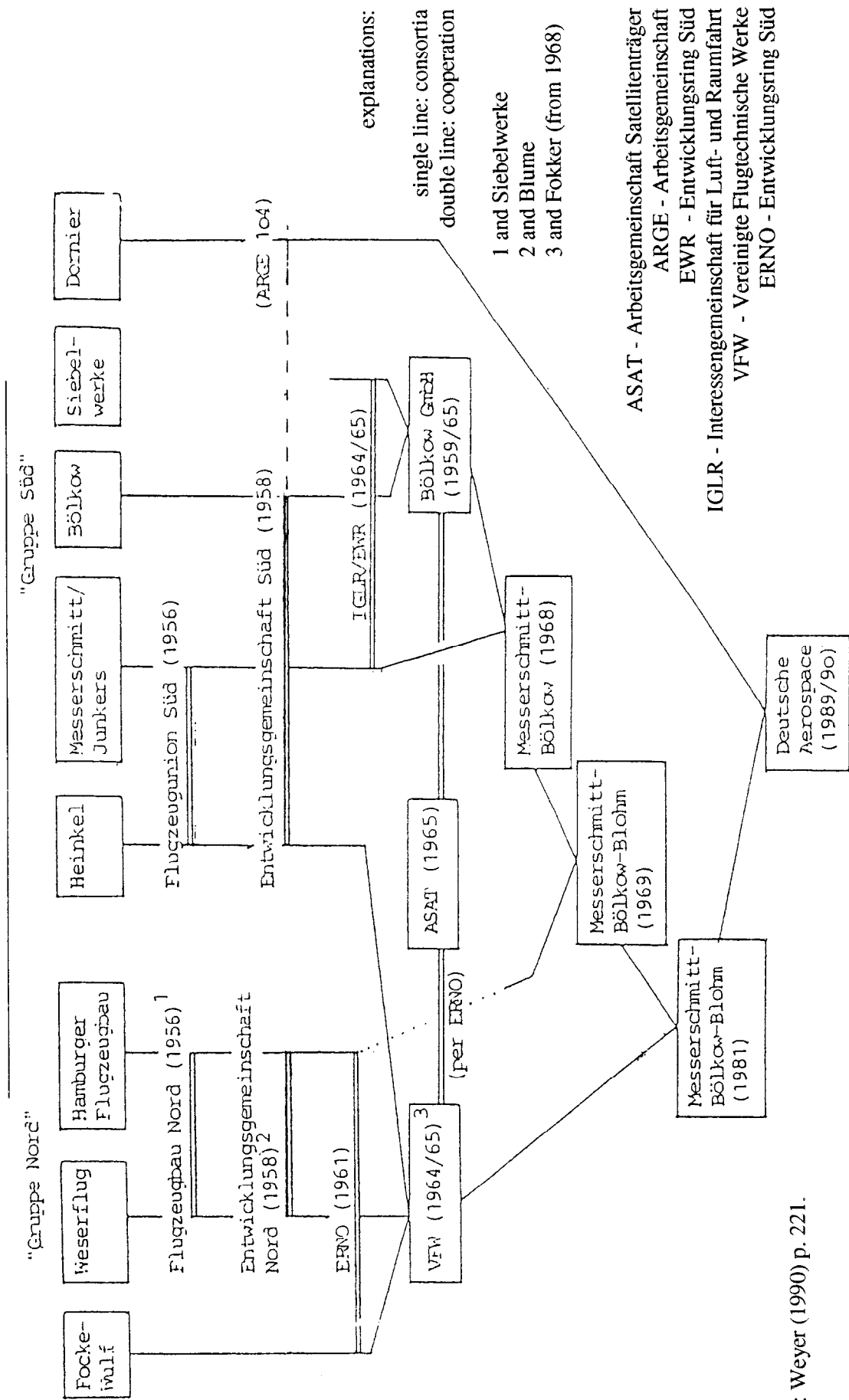
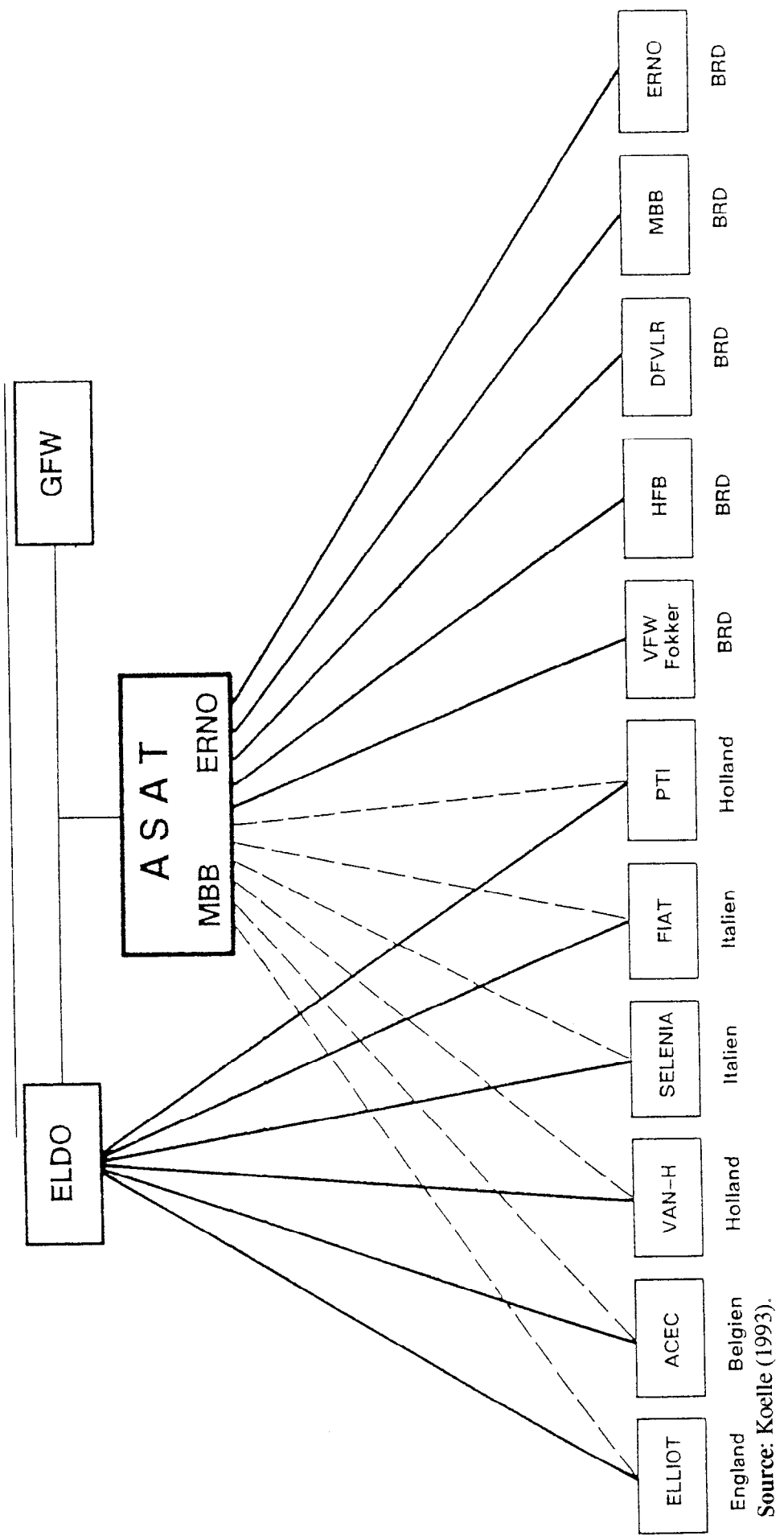


Table II

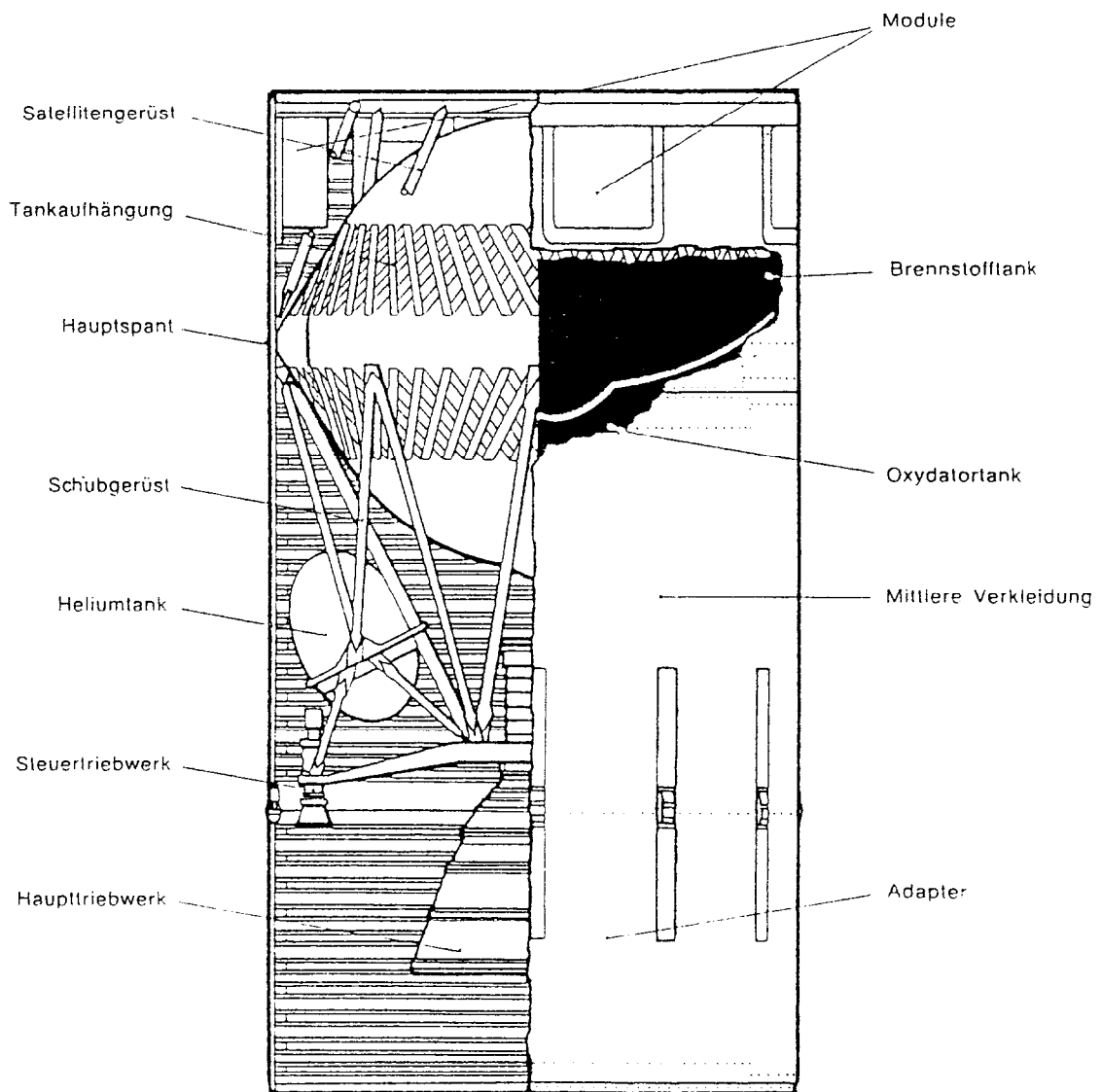
Organizational scheme for the development of the third stage (multiparallel contracts)¹



¹ Apart from the subcontractors of ASAT there were several sub-contracts for the third stage directly placed by ELDO.
Source: Koelle (1993).

Table III

The technical concept of the third stage resulting from a compromise of the design proposals presented by Bölkow (propellant system) and ERNO (structural concept)



Daten der III. Stufe:

Brennstoff:	50% Hydrazin N_2H_4	
	50% Unsymmetrisches Dimethylhydrazin $N_2H_2(CH_3)_2$	
Oxydator:	Stickstofftetroxyd N_2O_4	
Mischungsverhältnis:		$r = 1.5$
Spezif. Vakuumschub (Haupttriebwerk):		$F = 2300 \text{ kp}$
Nom. spezif. Vakuum-Impuls (Haupttriebwerk):		$I_{vac} = 294 \text{ sec}$
Spezif. Vakuumschub (Steuertriebwerk):		$F = 50 \text{ kp bzw. } 30 \text{ kp}$
Nom. spezif. Vakuum-Impuls (Steuertriebwerk):		$I_{vac} = 284 \text{ sec}$
Durchmesser der III. Stufe		ca. $D = 200 \text{ cm}$
Gesamtlänge der III. Stufe mit Adapter		ca. $L = 381 \text{ cm}$
Gesamtmasse der III. Stufe mit Treibstoffen, aber ohne Adapter und ohne Satellit:		$m = 3300 \text{ kg}$

Source: Koelle (1993).

Table IV

Comparison of the KfR programmes of 1962 and 1963 for the planning year 1963
(only BDLI section)

projects	KfR 1962		KfR 1963	
	million DM	share %	million DM	share%
621	6,6	10,1	10,0	27,1
622	8,0	12,2	3,8	10,3
623	22,8	34,9	9,4	25,5
624	-	-	5,2	14,1
platform	9,0	13,8	-	-
facilities	19,0	29,1	3,6	9,8
625	0,2	0,3	4,9	13,3
total sum	65,6		36,9	

Source: Weyer (1990), p. 338.

Table V

Allocation of the Federal space budget to the national and to the international programmes
(planning figures in million DM)

year	total	national	share %	international	share %
1962	35,1	10,1	28,8	25,0	71,2
1963	101,1	42,2	41,7	58,9	58,3
1964	144,9	52,9	36,5	92,0	63,5
1965	149,4	70,2	47,0	79,2	53,0
1966	228,0	88,6	38,9	139,4	61,1
1967	290,8	136,9	47,1	153,9	52,9
1968	321,4	159,3	49,6	162,1	50,4
1969	351,1	205,9	58,6	145,2	41,4

Source: Weyer (1990), p. 363.

Abbreviations

AVA	Aerodynamische Versuchsanstalt e.V., Göttingen
AFRA	Arbeitsgemeinschaft für Raketentechnik, Bremen
AGARD	Advisory Group for Aeronautical Research and Development (NATO)
ASAT	Arbeitsgemeinschaft Satellitenträger, München
BDLI	Bundesverband der Deutschen Luftfahrtindustrie e.V., Düsseldorf
CERN	Conseil Européenne pour la Recherche Nucléaire
CNES	Conseil Nationale d'Études Spatiales
CETS	Conférence Européenne des Télécommunications par Satellites
COPERS	Comité Préparatoire pour la Recherche Spatiale
COSPAR	Committee on Space Research
DAFRA	Deutsche Arbeitsgemeinschaft für Raketentechnik e.V., Bremen
DFG	Deutsche Forschungsgemeinschaft
DFL	Deutsche Forschungsanstalt für Luft(-und Raum)fahrt
DFS	Deutsche Forschungsanstalt für Segelflug e.V., München-Riem
DFVLR	Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt
DGF	Deutsche Gesellschaft für Flugwissenschaften e.V.
DGLR	Deutsche Gesellschaft für Luft- und Raumfahrt
DGRR	Deutsche Gesellschaft für Raketentechnik und Raumfahrt e.V.
DKfW	Deutsche Kommission für Weltraumforschung
DLR	Deutsche Forschungsanstalt für Luft- und Raumfahrt e.V.
DRG	Deutsche Raketengesellschaft e.V., Bremen
DVL	Deutsche Versuchsanstalt für Luft(- und Raum)fahrt e.V.
ELDO	European Launcher Development Organization
ERNO	Entwicklungsring Nord GmbH
ESA	European Space Agency
ESRO	European Space Research Organization
EURATOM	European Atomic Energy Community
EWR	Entwicklungsring Süd GmbH
FPS	Forschungsinstitut für Physik der Strahlantriebe e.V., Stuttgart
GfW(1948)	Gesellschaft für Weltraumforschung e.V., Stuttgart
GfW(1962)	Gesellschaft für Weltraumforschung mbH, Bad Godesberg
IAF	International Astronautic Federation
IMA	Interministerieller Ausschuß
IGY	International Geophysical Year
IRBM	Intermediate Range Ballistic Missile
ISL	Deutsch-Französisches Forschungsinstitut St. Louis
KfR	Kommission für Raumfahrttechnik
MBB	Messerschmitt-Bölkow-Blohm GmbH
MPAe	Max-Planck-Institut für Aeronomie, Lindau/Harz
MPG	Max-Planck-Gesellschaft
MPI	Max-Planck-Institut
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
SEP	Société Européenne de Propulsion
SEL	Standard Elektrik Lorenz AG
VfR	Verein für Raumschiffahrt

VLF Verein für Luftfahrtforschung
WGL(R) Wissenschaftliche Gesellschaft für Luft(- und Raum)fahrt, Köln

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