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PRESENT CHALLENGES OF RESEARCH AND TECHNOLOGY POLITICS

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16. Abstract

This short article deals with the present situation in regard to research and technology in the Federal Republic of Germany. It points out how important it is to ensure rapid transfer of scientific know-how from the laboratory to the manufacturing process.

In that aviation and space flight will continue to be in a leadership position, it is these areas that the government should support to a maximum extent possible.

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PRESENT CHALLENGES OF RESEARCH AND TECHNOLOGY POLITICS*

I. Andreas v. Bulow**

The overall economic situation of the Federal Republic of /3*** Germany is now at a critical stage. We have to deal with threats, which are entirely new because of their national and international relationships. They also have substantial effect on the research and technology politics.

Our everincreasing energy bill, our present performance balance deficits, worldwide uncertainties in international currency, high general inflation rates, reduction in the growth and high unemployment all have seriously affected our economy.

At the same time, new technologies are developing very rapidly. New international markets are developing based on long-term research and development, and the economies of the next twenty years will be based on them.

In spite of numerous difficulties in several countries, the Americans and the Japanese have introduced a new era which is very much based on technology. This already has an effect on Europe. The innovation capacity and creativity of the economy and the population has to be confronted with these new problems, if we want to participate and be leaders in this new development of industrial countries.

The important question for research and technology is how to accelerate and effectively structure the development, considering that funds are being reduced.

FAST TRANSFER OF SCIENTIFIC KNOW-HOW.

The rapid transfer of scientific know-how from the laboratory to the manufacturing process of industry will be very

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* Report on the yearly main meeting 1981 in Stuttgart. DFVLR (German Research and Test Facilities for Aviation and Space Flight). 35 March, 1982.

** Federal Research Minister for Research and Technology, Bonn.

*** Numbers in margin denote foreign pagination.

important for our economic future. We have to debate the correct and effective strategy. This requires a critical analysis of our potential. This does not mean a basic revision of our present policy, but it means that our forces and and capacities have to be concentrated. We require a great deal of patience and a close coordination between our research activity and the economic development in our country. From the example given to us by the Japanese, we have to learn. The Japanese over the last fifteen years have developed new products and entire branches with a concentrated development and technology policy, which was supported by the government and industry. In the near future, their economy will benefit from this. We are referring to microelectronics, data processing, communications technology, machine construction, the automobile industry, steel production and other branches which are still growing. They are now heavily involved in the energy sector.

The Japanese have shown us how a close coordination of the research and technology policy and the general economic development leads to success.

Common discussions and consensus of the government and business about the role and importance of research, technology and economic development are required in order to formulate a reasonable national strategy.

GOVERNMENT SUPPORT PROGRAMS ARE REQUIRED.

In our country the technological level is too low. The conversion of new technologies and scientific knowledge into practice by industry requires too much time. Also the administration of this requires too much time.

The government research and technology politics has to address these critical questions. The support programs of my ministry are tailored to a rational modernization strategy. I would like to mention the following:

- Energy Technologies
- Electronics, Manufacturing Technologies
- Microelectronics and Communication Technologies, which extend from the development of modern satellites up to the introduction of glass fiber optics
- Raw Material and Material Technologies
- Technologies for Humanization of Occupational Life and Improvement of the Environment, as well as Aviation and Space Flight.

In addition, we have basic research, as well as research for protecting our resources and maintaining our natural life environment. The question about the chances and risks of technologies in an endangered environment has to be discussed.

This is a demanding program. In 1982 we spent 6.5 billion DM for this, and this fraction of government money was too small. Internationally, the development of the economy and technology is being substantially supported by governments, especially in the area of future technologies.

It would be unreasonable to assume that the market forces have caused the price shifts in the energy sector, or the fast development of new technologies such as microelectronics, laser technology, software systems in data processing, image technology and other technologies for most of our competitors in the world markets. Instead, this was supported by many governments, which have developed many new technologies. Unfortunately, these technologies did not start in our country over the last ten years. It would be difficult to find a laser technician, whose development work has not been supported by public research and development contracts. It is difficult to find a leading American research group in the area of data processing, which was not substantially - directly or indirectly - supported by public funds. No one should overlook the fact that public funds in the U.S.A.

have established enormous personnel capacities within the framework of weapons research and development, as well as in the area of aviation and space flight. The American economy has also /4
greatly benefitted from this in the civilian area. This is why I do not believe in a restriction of government support to basic research and indirect tax aids.

If we do not reach a common strategy for development by government, the economy and the research facilities, we will not be able to compete internationally.

A few numbers will clarify this. The Federal Republic of Germany has substantially increased its research expenditures over the last ten years. At the present time, the government and the economy together are expending about 35 billion DM per year. This corresponds to about 2.3% of the gross national product. This puts us in a leading position among the industrialized countries.

CRITICAL EXPORT SITUATION OF GERMAN TECHNOLOGY.

At the same time, the export of high technology goods has been stagnating for many years, for about 25% of our transportation volume. In contrast to this, since the middle of the sixties the imported fraction of these goods has been doubling, and today amounts to about 10%. The trade balance with the U.S.A. and Japan of the Federal Republic of Germany has continuously deteriorated for high technology products.

I have the impression that, in spite of the large increases in research and technology expenditures, we will not be able to increase our exports. We have to ask ourselves whether the ratio of effort and rewards is still acceptable.

APPLICATION-ORIENTED RESEARCH AND TECHNOLOGY SUPPORT.

This is why the government has to get more involved in the application kind of research and technology support.

In spite of the large general reductions, I have made sure that the main points of our research and technology policy will

result in the greatest possible contribution to the long-term modernization of our economy. For 1982 we plan substantial increases in funds of research and technology work compared with 1981, in the areas of electronics, optical communications, information processing and software technology, bio-technology as well as manufacturing technology.

It is also important to make available future-oriented technologies to the greatest number of affected industrial concerns. The research and technology policy has to improve technology transfer. Therefore I have planned that in 1982 the expenditures for innovation advisory services, external contracted research and the collaboration with other countries in the area of research and technology will increase at a faster rate.

Concentration of funds does not mean that we are limiting funds in all areas, but instead we are considering expansions in several research areas.

Before concluding my general remarks, I would like to mention two things about basic research. In the Federal Republic of Germany basic research is being substantially supported. About 30% of the funds of the Federal Ministry for Research and Technology (BMFT) are being used there.

Nevertheless, I was not able to support the basic research and development facilities in the same manner, above and beyond the normal growth rate. Some centers have had to make sacrifices, and there has been a reorientation in some fields. I have decided to guarantee reliable support from the government to research facilities and basic research, and they will not be subjected to the fluctuations of the budget. There are a number of persons who do not believe that this support is sufficient, and also believe that the administration is deficient in this area.

I do not believe the fact that financial expenditures for basic research are responsible for the lack of peak results

in this sector. We also have to discuss administrative controls, the freedom and creativity of basic research scientists. I believe that the administrative conditions will have to be oriented according to the requirements of effective research, and not vice versa. I require the support of the West German states for this.

Overall I believe that we have a system of organization of basic research and large scale research, which we do not have to be ashamed of. I would like to mention the collaboration between scientific universities, government support and industry, as well as support of third entities. I would welcome a greater financial support of the economy to basic research.

Large scale research facilities also have a similar positive total balance sheet. Large scale research facilities amount to one fourth of the BMFT budget. I hope very much that it will be possible for you to retain flexibility with respect to their requirements. This is also required because we will make greater use of the large scale research facilities for our modernization strategy.

I believe that the German research and test facility for aerodynamics in space flight will do very well in this area.

RESTRUCTURING OF THE DFVLR.

The DFVLR in the 70's was made up of a large number of research and test facilities, and has always been flexible.

Out of the 42 independent institutes in 1973, 28 were dissolved within five years or were structured into 26 new institutes and facilities by combination and transfer. Unfortunately, there were consequences in this for the workers. Due to new rules and displacements of programs and projects, 805 workers (about 40%) had to be transferred to new areas or even had to move.

In the same time period, the DFVLR gave up 12 programs (41%) out of 29 programs and defined 5 new main points. Also 26 new programs were formed. Out of the 96 projects of 1975, only 47 are

still being worked on in 1981. There have been 70 new projects. After this dynamic restructuring, the DFVLR has not stood still for consolidation. /5

Instead, priorities have been reevaluated by the management, considering the most recent savings measures, and in the personnel area as well. Cancellations are also being considered. A number of recommendations were discussed during the main yearly meeting and in the committees. I know that budgetary reductions and our 7.5% project (reduction in force) have caused a great deal of unrest among our workers. I understand this. I am very thankful to the management of DFVLR and the managers of the large research facilities that they have been able to deal with these savings.

AVIATION AND SPACE FLIGHT WILL CONTINUE TO BE IN A LEADERSHIP POSITION.

The DFVLR has been dominated by aviation and space flight, and these have developed over the last few decades to some of the most important pacing technologies. This is still true today. The DFVLR is our most extensive large research facility in addition to the nuclear power plant facilities at Juelich and Karlsruhe. We do not have to be ashamed of our aviation and space flight activities in many sectors, compared with international facilities.

In the past, space flight technology has been an instrument for increasing the general competitiveness of our industry. During the present phase of structural displacements among the highly industrialized countries, this has contributed to the development of new products and methods over the entire industrial structure.

The world space program, which we are continuing, is aligned to widespread support of basic research and results in many innovations for our economy.

We have to clarify the long-term perspectives in aviation and space flight. Many points of view exist here. I hope that the

DFVLR can be more closely associated with the aerodynamics and space flight programs of the Federal Government and that they will participate in the preparation and execution of projects, in close collaboration with public contractors, science and industry.

I would like to mention the use of space flight technology and laboratory use of space conditions as one major point, especially zero gravity conditions. The application areas of communications, navigation and earth observation are especially important for scientific innovation. Space flight technology has given us new possibilities for this.

In the conventional sectors of aviation and space flight, much remains to be done. As you know, we cannot work alone and have to increase cooperation within Europe. I believe that this is especially true for the scientific programs of the ESA within the framework of international collaboration. We require the agreement of other ESA partners for this. I would also like to mention the Spacelab Application Program. One pacing item of Spacelab development is the consequent exploitation of this system. I am very happy that the DFVLR is active with their substantial funds. I am in the process of preparing an additional applications program for the ESA.

The observation of the earth will remain a long-term important point of the ESA program. The first step for this is a satellite, with which the required basic research can be performed.

In the area of satellite communications, the emphasis is on German-French collaboration in the area of communication satellites. Both of our governments in September, 1981 signed an additional agreement about the technical-industrial collaboration for the marketing and export of these communication satellites. It is also important to transfer this technology into the user and service areas, when the experimental work is successful. I believe that

this is one of my tasks, and it is a justification for our financial expenditure. The realization and market conversion has to be performed by others.

Just like before, we have to deal with transportation means for our payloads. In addition to the continuation of the Spacelab, the ESA is participating in the development of space platforms, which will be launched with the space shuttle. Finally, improvements to the launch vehicle Ariane are possible.

Unfortunately, the dual nature of the European space effort will be continued in the projects Spacelab and Ariane.

The DFVLR has established an important link to energy research. I would like to recall the planning and execution of the "Small Power System" project which, in September, 1981, led to the official start-up of two solar power plants in the Spanish Almeria area. This followed directly from propulsion research for aviation and space flight. Combustion technologies in aviation, solar cell technologies in space flight were used for this. The DFVLR is increasing its role in the area of non-nuclear energy research, especially the use of regenerative energy sources and has started with a cooperation with industry and universities, especially the University of Stuttgart.

These types of cooperation have to be intensified. I am attempting to accelerate the technology transfer.

FINANCIAL STIMULUS DURING TECHNOLOGY TRANSFER.

Within the framework of our research on technology transfer, any research facility can retain one third of the funds received from its transfer. The DFVLR should make greater use of this possibility of engineering research facilities for external contracting. This offers a good chance for all sizes of enterprises, to improve their innovation and marketing talents by using the large research facilities. One important result of contractual research is that the industry will pay part of the costs, and

is happy to do this, so that public funds are saved somewhat.

Whenever financial and conceptual ideas are associated, there is a basis for efficient research activity with a high success quota. All of us must exploit this possibility. I would like to conclude this and I hope I was able to discuss some of the challenges as well as some of the solution possibilities for active research and technology policy.