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Economic Competitiveness

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EC: SPRINT Interuniversity Network Project Launched

92AN0064 Amsterdam COMPUTABLE in Dutch 1 Nov 91 p 1

[Text] Delft—The Technical University of Delft (TU) and five other European technical universities are to create a network among participating universities. The research proposal, which on the initiative of TU Delft was submitted to the European Commission within the framework of the SPRINT [Strategic Program for Innovation and Technology Transfer] program, has recently been approved. The EC is to contribute nearly 1 million Dutch guilders (ECU 0.85 million) to the project named UNITE (University Network for Intra-European Technology Exchange), spread over a period of three years. The remaining costs, nearly 1 million guilders (ECU 0.4 million), will be shared by the six partners.

The UNITE inter-university network will focus on the introduction of new technologies—such as environmental and information technologies—in industry. Over the next year, the universities will further develop their existing communications system, set up a number of pilot projects, and respond to industry's needs using available technologies.

In addition to the TU Delft, other universities participating in UNITE are the Westphalian Technical Institute of Aachen, the Belgian Dutch-speaking Catholic University of Leuven, the Belgian French-speaking Catholic University of Louvain-la-Neuve, the Imperial College of London, and the National School for Advanced Mining Engineering in Paris. These universities were already collaborating during the past two years in the so-called "Leuven network," which focused on student exchanges within the framework of the European Erasmus program.

EC Council Approves Four R&D Programs

92AN0067 Antwerp DE FINANCIEEL-EKONOMISCHE TIJD in Dutch 31 Oct 91 p 24

[Article: "EC Invests in Nuclear Research, Biotechnology, and Human Resources]

[Text] Luxembourg—This week in Luxembourg, EC science policy ministers gave their go-ahead for four specific research and development programs. Two of these programs concern nuclear research. In addition, an enormous budget—unprecedented in the EC—is being provided for biotechnology. Finally, human resources is also the subject of a special research program.

During the 1990-94 period, the EC will spend some 500 million ECUs on an R&D program on human resources and mobility.

On the one hand, the aim of the program is to promote training and mobility of researchers and, on the other hand, to develop a network interconnecting the various European research institutes. Through this program, a European system of research grants is to be established as well as a network for scientific and technical cooperation and a system of European research conferences.

The EC ministers allocated a ECU 162 million budget to a European biotechnology research program. Half of this is for the study of cell biology and organism research. ECU 64 million will be spent on in-depth research into the structure and behavior of molecules. Nearly ECU 20 million is to be used for specific research into the environmental effects of biotechnology.

The 12 EC member states also approved a research program on the safety of nuclear power stations. Most of the ECU 35 million budget will be used for research and evaluation of radioactive radiation and protection against its harmful effects.

Moreover, EC ministers were in favor of a continuation of the European nuclear fusion program. A subsidy of ECU 411 million will be used for the theoretical study of the so-called "next step," i.e., the next step in nuclear fusion following the completion of the European Joint European Torus (JET) trial project, as well as the actual continuation of JET until 31 December 1996.

The latter program, however, is being blocked by the Research Commission of the European Parliament, which demands guarantees that the next EC Framework Program for Research will provide an equivalent budget for study projects in the field of renewable energy sources.

On the occasion of the EC Council of Ministers, EC Commissioner for Science Policy Filippo Maria Pandolfi announced that the EC is prepared to meet its financial commitments to the Joint European Submicron Silicon Initiative (JESSI). However, the EC Commission is holding back its contribution until JESSI focuses more on semiconductors and less on microelectronics.

France: Research Ministry Industrial Research Incentives Outlined

92AN0083 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 7 Nov 91 p 6

[Article by Michel Heurteaux: "Industrial R&D: Increased Support and New Programs"]

[Text] France, which continues giving priority to its research budget, is also taking new initiatives in the area of major technology programs.

Research remains top priority and confirmation of this can be seen in the draft budget of the Ministry of Research and Technology—51.7 billion French francs [Fr] for 1992—with grants for major technology programs, subsidies, and investments on the increase. However, it is in industrial research in particular where government support seems most significant, with the

overall package increasing by 16 percent, out of which over 40 percent will go to small and medium-sized industries (SMI's). This effort will have to be continued through long-term policies and increasing subsidies, according to a joint communication by the Research and Industry Ministers presented to the Council of Ministers.

An evaluation of industrial research in France also shows that companies are increasingly aware of its importance and are allocating an increasing share of their investment expenditure to it. Two major trends emerge:

1) there is an increase in the volume of R&D work carried out in enterprises;

2) there is a strong concentration in research, with 2,650 companies carrying out regular R&D tasks and employing over one-third of all researchers.

Although SMI's account for a growing portion of national industry, providing 15 percent of work in R&D, they only benefit from 7 percent of government subsidies. Another fundamental fact emerging from this assessment is the privileged place held by the electronics sector. A survey commissioned by the Research Ministry, which is due to be made public at the end of the year, emphasizes the crucial significance of this industrial sector, where companies provided, for 1990 alone, 22.5 percent of the total expenditure in R&D, before aeronautics (18.4 percent) and the automobile industry (11.4 percent).

Accelerating the Innovation Process

Other than through direct subsidies, the government also wants to strengthen support mechanisms in an effort to consolidate the process of in-company innovation and research. Among the initiatives already taken are calls for proposals by the Ministry of Industry and Foreign Trade and the Ministry of Research aiming to accelerate the innovation process in enterprises. Other initiatives include technology grants, recruitment subsidies for researchers, and experimental tax allowances for R&D. This has experienced a growing success among SMI's, with Fr1.72 billion being allocated in 1990 to 6,600 companies with a turnover of less than Fr500 million.

Parallel to this deterministic drive in favor of SMI's, the authorities stress the importance they attach to the continuation of highly strategic industrial research programs, such as that on high-definition television (HDTV) or the future high-speed train (TGV), and an industrial program for Bull. The ministers of research and industry presented three new programs. Water quality and purification, the "Bioavenir" [biofuture] program, and road and vehicle safety. This last program, which will cost an estimated Fr650 million over the next five years, comes in addition to activities which have already been launched within the framework of the EUREKA project PROMETHEUS [Program for a European Traffic with Highest Efficiency and Unprecedented Safety] and the EC's DRIVE [Dedicated Road Infrastructure for Vehicles Safety in Europe] program. This is of interest to electronics industries.

The program in question will involve improving technical safety aspects of vehicles as well as everything concerning vehicle-road infrastructure communications systems. The greater part of the program will comprise technical developments relating in particular to dashboard computers and electronics. Research has been undertaken simultaneously in several directions: loss of vigilance detectors for drivers and hierarchical management of alarm systems; systems for active control of vehicle behavior and infrastructure links (braking, steering, etc.); continual monitoring of vehicle performance to alert the driver; and transfer of road signaling data to the vehicle.

French, Dutch Research Promotion Agencies Merge

92AN0097 Paris COURRIER ANVAR in French Nov-Dec 91 p 9

[Article: "The Netherlands Is Betting on Research"]

[Excerpts] On 6 November, ANVAR [National Agency for the Implemenation of Research] signed an agreement in Paris with its Dutch counterpart, StiPT [Organization for the Application of Technological Policy], in order to strengthen technological cooperation between the two countries. This is the result of a common desire to stimulate joint projects. [passage omitted]

The Netherlands is making major efforts in innovation: The share of its GNP that the country allocates to R&D is among the four largest in Europe! The current technology policy aims to stimulate small and medium-sized companies and to get young graduates "in the saddle." Five fields have been established as priority areas: biotechnology, materials, medical technologies, information technology, and environment. The national research organization is TNO [Netherlands Central Organization for Applied Scientific Research], ANVAR's partner in the Eurotech project which is financed by the EC's SPRINT [Strategic Program for Innovation and Technology Transfer] program. This Dutch cousin of the French National Center for Scientific Research (CNRS) employs over 5,000 people and has an annual budget of 600 million guilders (about 1,800 million French francs [Fr]).

The signing of an agreement between ANVAR and StiPT should facilitate the emergence of joint projects, in particular in the framework of the EUREKA program. StiPT was created in 1988 and is a department of the Ministry of Economic Affairs. Its activities are technological monitoring, development of new regulations, advice on and funding of projects for the creation of new products, services, or procedures. Its operating means consist of a budget of 300 million guilders in 1990 (about Fr900 million) and a network of 18 "innovation centers" which are attached to the chambers of commerce of the various regions and furnish information and contacts to companies.

Finally, StiPT has the task of establishing European links. In fact, it handles this task respectably: Major EUREKA

labeled projects were launched in 1990 under the chairmanship of the Netherlands, in particular in the fields of automobiles, computer science, or waste treatment.

Belgium: Inter-University Research Programs Launched

92AN0101 Antwerp DE FINANCIEEL-EKONOMISCHE TIJD in Dutch 7 Nov 91 p 3

[Article: "Council of Ministers Approves Interuniversity Research Programs"]

[Excerpt] (Tijd/Belga)—The Council of Ministers has approved two extensive multi-annual research programs for all Belgian universities. The case study was prepared by the previous Minister [of Scientific Policy] Hugo Schiltz and has now been submitted by his successor Wivina Demeester. This is the third phase (1992-96) of the Inter-University Attraction Poles (IUAP's) and the final stage of the long-term humanities program.

The amount provided for the third phase of the IUAP's is 2.046 billion Belgian francs (BFr). On the one hand, the first phase (1987-91) can continue and, on the other hand, the poles of the second phase (1991-95) will be strengthened.

The IUAP program aims to set up inter-university research networks through which research teams would be provided a fixed amount to spend. At the same time, it intends to improve cooperation between the teams and laboratories of various other universities.

The final stage of the social sciences research program takes up BFr169.3 million. This amount is intended to finance research programs dealing with: aging population; changes in the family structure; social disparity and bipolarity; and the reliability, effectiveness, and efficiency of public services and services for businesses. [passage omitted]

EC Approves Industrial Policy Document

92AN0118 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 21 Nov 91 p 3

[Article by Elisabeth Feder: "An Industrial Community Policy Becomes Possible"]

[Text] "18 November will be a cornerstone," said Dominique Strauss-Kahn, French minister for industry and foreign trade, after leaving the Brussels Council of Ministers on 18 November. When opening the Componic exhibition, he commented on the draft text concerning the future European industrial policy that had just been adopted. While emphasizing that "since it is written in Brussels slang, the text required deciphering." He developed the draft text ideas in three parts:

"Recognize the strategic character of electronics and microelectronics and encourage cooperation between companies; make available financial support to encourage cooperation in research (at the edge between research and production) as well as in precompetitive production; and, finally, fight for opening up other markets, for instance the Japanese market, and engage in true bilateral relations with Japan, and not only in multilateral relations as authorized by the GATT." The minister added that "the nature of cooperation between companies should be developed; it should not always be immediately profitable, competitiveness being evaluated in the long term." Therefore, "efforts should be made within the next two years, since they will determine the future of industrial Europe." In this context, the minister emphasized the role that governments will have to play, because "there is no chance to succeed if public intervention is not made available. It is necessary to find collective intervention modes." As for the Rome Treaty, industry was not properly taken into consideration, especially the industries of the future such as electronics. After the European industrial policy taboo was broken by German Commissionner Martin Bangemann almost a year ago, France presented a memorandum last June. According to the minister, this apparently "started the mechanism leading to the Council of 18 November. The Brussels meeting is a great success for the electronics industry and for France. The text adopted today marks a considerable step ahead that nevertheless needs implementing to build a European electronics industry."

Some EC member countries such as Germany, the UK, and the Netherlands were hostile to all interventionism before the meeting.

In the face of such reticence, and even if the text is not the June memorandum by a long shot, its adoption is that more satisfactory to the French minister as well as to his Italian and Belgian colleagues. The long discussions Mr. Strauss-Kahn had with his German colleague Juergen Moellemann during the days preceeding the Brussels meeting certainly restrained the debate.

Recalling the changes affecting industry as a whole with the introduction of electronics at all levels, Dominique Strauss-Kahn mentioned that, when the Maastricht conference has studied the revision of the Rome Treaty, it will feature a chapter on industry. He added: "I believe Europe to be a realistic idea if we manage to add a chapter to the Rome Treaty which would lead the way, not only to a political and monetary Europe, but also to an industrial Europe. It we don't, then we will fail to build Europe."

He also dampened enthusiasm by concluding that, at the present time, "a Community policy is made possible, but has not been decided on yet."

Germany: Max Planck Society's Financial Problems

92P60119 Berlin ING DIGEST in German Jan 92 p 18

[Text] For projects in the new FRG laender in 1992, the Max Planck Society had reported the need for 155.7 million German marks (DM): DM71.4 million for the establishment of temporary working groups and other projects, and DM85.4 million for the establishments which were suggested by the Science Council. However, only DM98.15 million were approved for the formation

of establishments in the new laender and eastern Berlin. This amount includes DM48.5 million for the establishments which the Science Council recommended. This amount corresponds to a sum of DM130,000 per planned job, which would include the financing of the initial apparatus and construction measures. According to Max Planck Society President, Professor Dr. Hans F. Zacher, "Considerable financial problems will certainly arise which will have to be settled by 1993 at the latest." The total allocations for the Max Planck Society will rise by only 5 percent in 1992. To cover the financial shortfall of DM16.8 million, cuts will have to be made everywhere, including a cut in DM6.1 million in personnel expenditures. This means that about 90 positions in the institutes in the old laender will be eliminated by 1992 at the latest.

EC to Boost Electronics, Information Industries

92AN0128 Antwerp DE FINANCIEEL-EKONOMISCHE TIJD in Dutch 19 Nov 91 p 7

[Article signed K.V.: "EC Twelve Take First Steps Toward Long-Term Industrial Policy: EC Recognizes Importance of Support for Electronics and Information Industries"]

[Text] Brussels—Yesterday, EC ministers for economic affairs approved a resolution that stresses the strategic importance of the electronics and information industries. The EC member states have agreed to make an effort to create a favorable European and international business climate for these sectors of industry.

The European electronics and information industries have an annual sales revenue of ECU 175 billion. This is approximately 5 percent of the Twelve's GNP. A survey of the sector, which was carried out by the EC Commission in March 1991, revealed that several key sectors of the electronics industry are lagging behind in the international marketplace. The EC's industry is, for example, underrepresented in semiconductors, peripheral equipment, and consumer electronics. This situation led to a European trade deficit of ECU 31 billion for information products in 1990. In comparison, in the same year Japan had a substantial trade surplus and the United States was able to reduce its deficit considerably. In the light of these findings the Twelve agreed to increase support for the sectors in question.

A joint resolution—the first of its kind according to the French Minister for Industry Dominique Strauss—urges fair international trade and more extensive cooperation within Europe. The resolution states that, in the first place, it is the companies themselves that are responsible for their competitiveness. However, it is necessary to develop key sectors in Europe which can compete internationally, "especially in a long-term perspective." This clause leaves the door open for aid to temporarily loss-making electronics industries, such as the French support to Bull.

The Twelve also want to encourage fair international competition. In order to obtain equal access to international markets, the Community should not only rely on the GATT [General Agreement on Tariffs and Trade] forum, but also on bilateral negotiations, for example with Japan. The resolution stresses the need for a high level of standardization and certification in the European electronics sector, wider cooperation in the field of research and training, and centralization of information on market access and distribution practices. Martin Bangemann, EC Commissioner for the internal market, praised the resolution as an example of how a modern industrial policy should be established. Indeed, it is remarkable that the classic debate between the supporters of state intervention and those of free trade was circumvented.

It is not yet clear whether the future treaty on the European political union will assign the EC any authority for industry. The Netherlands has watered down its original draft to a very general text whereas the UK is totally against the inclusion of a European industrial policy in the EC treaties. In the meantime, the EC Commission is investigating the possibility of establishing an industrial reconversion fund in the light of a general budgetary reform.

Pandolfi Calls for R&D Budget Increase

92AN0133 Rijswijk POLYTECHNISCH WEEKBLAD in Dutch 5 Dec 91 p 1

[Text] EC Commissioner F.M. Pandolfi would like to see the European Community make more funds available for science and technology. He said this at the annual ESPRIT [European Strategic Program for R&D in Information Technologies] conference in Brussels. In his opinion, the European R&D budget should account for approximately 6 percent of the EC Commission's total budget. At the moment it is about 3.4 percent.

According to Pandolfi, the EC Commission should reach this percentage within the foreseeable future, e.g., within the scope of the 1993-1997 Economic Program. This year, Brussels will have spent ECU 2.4 billion (5.6 billion Dutch guilders) on research programs. By 1996, however, Pandolfi would like to increase this budget to ECU 5.4 billion (12.5 billion guilders) in line with the proposed 6 percent target. According to Pandolfi, the 6 percent target for research and development is not new. The parties who drew up the European Act in 1985 had already agreed to an R&D share of 6 to 8 percent.

Contribution

The EC Commission is not capable nor willing to make the extra efforts on its own. Brussels is calling for substantial contributions from companies which are active in information technology. The major industrial companies—Bull, Olivetti, and Siemens/Nixdorf—are supporting Pandolfi with their plans for a European Software Institute. This should be an open software institute of a nonprofit nature, according to F. Lorentz, president of the board of directors at Bull.

In the case of new projects, the European Commission is emphasizing semiconductors, LCD [liquid crystal display] technology, and software. "European know-how is still falling short in these areas," says Pandolfi.

Despite the ESPRIT program, which began in 1984, the gap with Japan and the United States in the field of information technology still exists, says Prof. Dr. H. Weule, vice president for R&D at Daimler-Benz. "ESPRIT is too complex, fragmented, and in some cases the objectives are not clearly formulated." However, it is due to ESPRIT that European companies have indeed made efforts to better harmonize their research.

Weule believes that approved projects should be more in line with the strategies of European industry. In addition, project preparation and formulation should involve less red tape. Finally, ESPRIT research results should be used more rapidly in commercial products.

French Research Statistics Released

92AN0134 Paris SCIENCES ET AVENIR in French 13 Dec 91 p 8

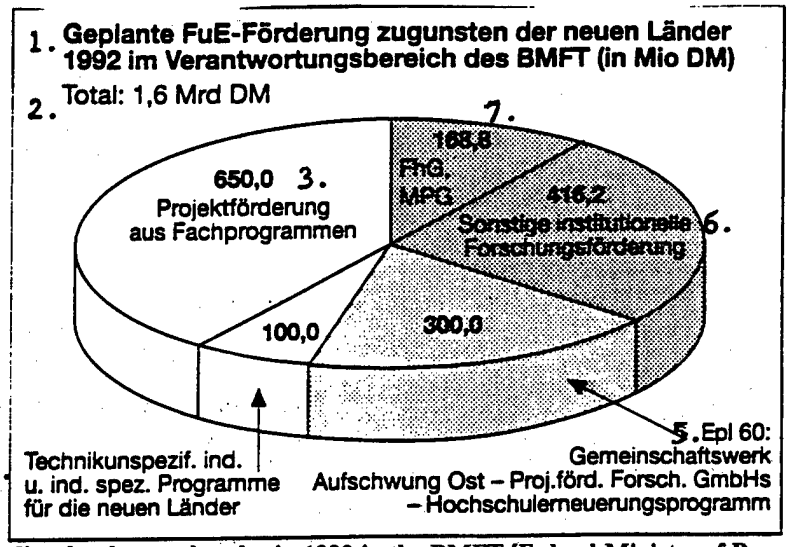
[Text] In France, the state finances 55 percent of the R&D, which represents 150 billion French francs (Fr) and 300,000 people. Researchers are between 40 and 55 years of age and constitute 55 percent of the total work force. Foreign students account for 40 percent of all dissertations produced by French universities. France generates 4.8 percent of the world's scientific publications, but its weak point is found in animal and plant biology. You will discover thousands of figures in the initial report of the Observatory of Science and Technology (OST), founded in 1990 at the behest of Minister of Research and Technology Hubert Curien. The ever-increasing importance of science in our society is escalating demand; the amounts at stake must be made profitable. But how can one measure the efficiency of the system? Numeric indices are needed, standardized on an international scale, giving detailed coverage of the whole domain. The OST report (Editions Economica, Fr300) meets this requirement and provides the quantitative base for discussions and for comments on French research policy.

Germany: 1992 R&D Budget for New Laender Summarized

92MI0142 Bonn BMFT JOURNAL in German Oct 91 p 1

[Text]

The quality and scope of research in Germany as a whole are being increased by expansion and reorganization in the new laender. For the first time, the BMFT budget for 1992 shows expenditure for institutional funding in the new laender. In accordance with the ministerial bill passed by the cabinet, the BMFT budget for 1992 amounts to DM9.252 billion. This means a 9.7 percent increase on the current budget 1991 projection of DM8.432 billion. In addition there are approximately DM300 million more for research in the new laender, which are earmarked for the higher education renovation program and industry-oriented research facilities from the joint "Upturn for the



1. Planned R&D funding for the new laender in 1992 in the BMFT [Federal Ministry of Research and Technology] sphere of responsibility (in millions of German marks [DM])

Key: 2. Total: DM1.6 billion 3. 650.0 Project funding from specialist programs 4. 100 Non-technology-specific indirect and indirect specific programs for the new laender 5. 300.0 Individual plan 60: Joint Upturn for the East campaign - Project Funding. Research Companies - Higher education renovation program 6. 416.2 Other institutional research funding 7. 168.8 Fraunhofer Society Max Planck Society

East" campaign under individual plan 60. The ministerial bill thus provides a total of DM9.552 billion research and technology in the whole of Germany in 1992 within the BMFT's jurisdiction.

German Minister Recommends EC Communications, Information Technology Program Changes

92MI0205 Bonn BMFT JOURNAL in German Dec 91 p 15

[Text] In the light of the key role played by information and communications technology in business competitiveness and the increasing amount of EC resources going into R&D projects, the federal research minister has sent the EC Commission a 10-point memorandum on EC information and communications technology research funding. It underlines the importance of European research policy as a complement to national research and technology policy. But there are also points of criticism. In particular, the growing splintering of the subject-matter of EC funding programs needs to be countered. It is essential that the European ESPRIT [European Strategic Program for Research and Development in Information Technologies], RACE [Research and Development in Advanced Communication Technologies in Europe], and Telematics R&D funding programs should in the future be focused more on key strategic issues. In practice this could be achieved by integrating EUREKA [European Research Coordination Agency], initiatives such as JESSI [Joint European Submicron Silicon Initiative] more fully into Community funding than hitherto. For the JESSI research program this means in concrete terms that the Commission ought to contribute 25 percent to the program's funding instead of the present 8 percent.

Another of the memorandum's proposals is designed to make it easier for small and medium-sized enterprises to gain access to European funding programs. As far as the general strategy is concerned, the Federal Research Minister agrees with the EC Commission that the measures required to increase the information technology industry's competitiveness primarily constitute a challenge to the initiative and responsibility of the firms themselves. Economic, education, trade, and fiscal policy are also required in addition to research policy to create favorable conditions for the development of these firms.

First Eastern German Max Planck Institute Takes Shape

92MI0210 Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German 18 Dec 91 pp 16-17

[Text] The senate of the Max Planck Society [MPG] resolved at its 21 November 1991 meeting to found an institute of colloid and interface research. The institute will become operative under provisional management on 1 January 1992. Initially, its staff will work from the former GDR Academy of Sciences institutes (in Berlin-Adlershof, Teltow-Seehof, and Freiberg). The future location of the institute will be decided next year. On 22 November, the senate of the Max Planck Society endorsed two recommended appointments for the first Max Planck institute in the new federal leander, the Halle-based institute on which it had decided on 6 June. As of 1 January 1992, Professor Ulrich M. Goesele of Duke University in Durham, North Carolina, and Professor Juergen Kirschner, of the Free University of Berlin, will be appointed both as the directors of the institute's two experimental departments and as members of its managing board. The present director of the institute in Halle, Professor Johannes Heydenreich, will retain his management responsibilities. The institute's future name will be the Max Planck Institute of Microstructure Physics. The name defines the institute's terms of reference: it will focus on research into solid-state systems so small that their properties are essentially determined by interfaces.

The Max Planck Society's senate also resolved on 22 November to set up 14 additional fixed-term Max Planck Society teams at universities in the new federal leander. These teams, which will join the 15 being created, are as follows:

- MPG "Cell Division Regulation and Gene Substitution" team at the Humboldt University in Berlin;
- MPG "Modulation of Growth Factor Signal Transmission" team at the University of Jena;
- MPG "Pharmacological Hemostaseology" team at the University of Jena;
- MPG "X-ray Diffraction in Laminar Stratified Systems" team at the Humboldt University in Berlin;
- MPG "Theory of Complex and Correlated Electron Systems" team at the Technical University of Dresden;
- MPG "Error-Tolerant Computing" team at the University of Potsdam;
- MPG "Algebraic Geometry and Number Theory" team at the Humboldt University in Berlin;
- MPG "Partial Differential Equations and Complex Analysis" team at the University of Potsdam;
- MPG "Nonlinear Dynamics (in Astrophysics)" team at the University of Potsdam;
- MPG "X-ray Optics" team at the University of Jena;
- MPG "Time-Resolved Spectroscopy" team at the University of Leipzig;
- MPG "Complex Catalysis" team at the University of Rostock;
- MPG "Asymmetric Catalysis" team at the University of Rostock;

- MPG "Synthesis, Structure, and Properties of Liquid Crystal Systems" team at the University of Halle-Wittenberg.

These 29 teams, plus the Garching-based Max Planck Institute of Plasma Physics branch at the Humboldt University, make 30 Max Planck Society centers at universities in the new federal laender. They provide an additional research capacity with, according to present planning, a total of 300 permanent employees, 160 of whom will be scientists.

The Max Planck Society plans to set up additional institutes and project teams in the new laender next year. Seven projects are currently being assessed. The Max Planck Society will be able to employ a permanent staff of 825 in these research institutes in 1992. The Max Planck Society will also provide resources from its budget for an additional 230 guest scientists, postdoctoral and postgraduate students, and scientific and student assistants.

Funding for Contract Research in Eastern Germany Announced

92MI0230 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 8 Jan 92 p 5

[Text] The EC Commission has now approved a Federal Ministry of Research and Technology (BMFT) scheme to fund research and development contracts carried out by R&D establishments and firms engaging in R&D in the laender (Contract Research and Development West-East, AWO). Universities, non-university research establishments, and juridically independent enterprises offering research and development services can obtain 40 percent or 35 percent grants if they undertake R&D contracts for firms based outside the new laender or East Berlin.

The lower rate of funding applies to firms with more than 250 employees or with income in excess of ECU20 million. Contracts qualifying for funding may be placed with [as published] firms in the old laender or even outside Germany.

This program, which will run until the end of 1993, is designed to make it easier to gear the research and development capacities of the new laender to firms' market requirements and contribute to the establishment of genuine joint research and development projects with firms with market experience.

Around 2.1 million German marks [DM] have been earmarked for 1991 and over DM50 million for the period up to the end of 1993.

Applications and enquiries can be sent to the Berlin office of the Federation of Industrial Research Associations (AIF).

Sweden: Research Policy Called Short-Sighted

92WS0275A Stockholm SVENSKA DAGBLADET in Swedish 12 Jan 92 p 3

[Article by Ulf af Trolle, professor of business economics: "High-Tech Research in Danger"—first paragraph is SVENSKA DAGBLADET introduction]

[Text] It is ridiculous to allow profitability considerations to determine research activity, according to Ulf af Trolle.

Sweden's share of world trade exports of high-tech products is shrinking steadily. One of the reasons is that we do not put enough emphasis on high-tech education and research. According to views I have expressed in a variety of contexts this is related to the deleterious planning system we have followed with regard to academic instruction. It is well-known that we have tried to adjust the scale of higher education and research to perceived needs, which automatically leads to a relative reduction because previously perceived needs disappear and are replaced by new ones that could not be foreseen.

In contrast to this ridiculous method the Japanese have stressed bringing out all the technical talent they can find in young people and developing it to the utmost in the confident assurance that the "surplus" of people with an elite education will continually create new industrial development areas and thus jobs.

There is nothing miraculous about the steady Japanese advance in the 1980's compared with the Swedish decline. Here, as in so many other areas, we have sent the wrong signals and are now seeing the results. The ratio of people with training in advanced technology has been shockingly low in Swedish industry compared with the situation in competitive countries.

If a country is to have a chance to develop in technically advanced areas—a vital necessity for Sweden's welfare—a massive concentration on education and research far exceeding the current visible need is the only feasible course. Unfortunately there is no way to calculate the profitability of research in advance. However there are disagreeable ways of registering the effect of insufficient research and development afterwards.

Development Neglected

For a business troubleshooter it is a tragic routine duty to note that the decay of firms in crisis is almost always connected with neglected development. When things start going badly for a company the simplest move is to cut development costs. The negative effect is invisible in the short term. It is all the more evident in the long term.

It is quite understandable that people take this kind of short-term view in a crisis-plagued firm that is facing the threat of imminent annihilation. The opportunities to reduce costs quickly are limited and research and development costs can be relatively large in view of the margins they are dealing with. At times necessity outweighs all other considerations.

However it is inexplicable when the same approach is used in a national economic context. A country, even in wartime, has entirely different opportunities for bridging revenue gaps through loans and the amounts involved are also relatively negligible. The difference between the cost of a mediocre education and research activity in a country and one of the highest quality—such as the Japanese model—is only around 1 percent of GNP.

At this time Sweden is discussing saving money by introducing a two-day waiting period for health insurance benefits, an idea that involves the risk of strikes. But the amount we are talking about here would be enough to double all the funding for what we now call high-technology education and research in this country. It is inexplicable that people are willing to jeopardize our future welfare for such a small sum.

Stress Aeronautics!

These general reflections were occasioned by an interesting report entitled "Aviation Research and Technology" (SOU [Swedish Government Report] 1991:53). It is a solidly prepared report from the Defense Ministry and a majority of the ponderous statements from bodies to which it was submitted for comment have been favorable.

It can be difficult to decide which areas of advanced technology a small country like Sweden should concentrate on after squandering so many opportunities in the very core of advanced technology, information technology. But aeronautics is an area of the greatest importance, in my opinion. This applies not only to the Swedish defense system following the experiences provided by the Gulf War, but also to technical development as a whole, primarily of course for companies that are directly concerned, like Saab and Volvo, but in principle for all technically-oriented industries.

This is an area that is very suitable for a small country because it offers big possibilities for niche efforts and in addition there is probably no other technical area where the spinoff effect of new discoveries is so great. Aeronautics stretches its tentacles into virtually all technical areas, always on the highest technical level. Think, for example, of strength technology and material development. In the United States new examples of such spinoff effects constantly appear.

Shocking Reading

Against this background it is shocking to read the following in the report:

"For its especially high-tech activity the aircraft industry needs access to well-educated technicians and information from a large number of subject areas that are represented at technical colleges. Therefore it is dependent to a large extent on the country's total technical education and research. The specific field of aeronautics is represented only at the Stockholm Institute of Technology. According to a study recently conducted at KTH [Stockholm Royal Institute of Technology] the production of civil engineers with training in aeronautics is clearly inadequate and research training in the area is virtually nonexistent."

The author then goes into the research that is carried out at the independent National Aeronautical Research Institute, FFA, and writes:

"The FFA has a state appropriation of around 10 million kronor a year and is otherwise financed by paid commission work. In the current budget year these involve a total of around 120 million kronor. About two-thirds of the commissions come from the defense system with the FMV [Defense Materiel Administration] as the client."

(Both quotations are from page 9, but the line of thought is expanded elsewhere in the report.)

Reason for Report

What was the reason behind the report? Was it that there is a shortage of education and research at the technical colleges? Or that such insignificant amounts are invested in this key area of high-tech research? Even if the state commissions are counted as part of the investment it does not add up to the amount of money it will take to keep the Inland Railway, a politically important venture, operating for a year.

Not at all! The reason for the report was that this activity is expected to derive less money from commission work and will thus show a loss. It must be adjusted to fit the smaller framework. It would take too long to go into the profit and loss arguments presented in the report here.

This is the first time in my active life that I have seen such a concept applied to research activity. It should suffice to note that the author of the report had a clear directive to view the assignment in this way and that the goal was an adjustment to the lower limits, i.e. cutbacks. On this basis Goran Franzen of the FOA [National Defense Research Institute] has done an excellent job.

Off Base

But this point of departure is way off base, although it is in line with our past doctrine of contraction. This is not just a question of how much we should invest in air defense, it is also a question of how much we should concentrate on high-tech research within one of the areas, aeronautics, where we have had—and should still have—outstanding qualifications.

Therefore the right question is how much we need to invest in aeronautical research to give us a chance to keep up and how the activity should be organized to produce the best results within this framework. Of course vitally important high-tech research must also be carried out efficiently, for example by concentrating our resources in the most profitable areas and by buying services where they are cheapest. But these are side issues.

We now have a government that clearly stated its intention of breaking with the old planning model which restricted education and research. It would therefore be logical to give the author of the report a revised assignment with instructions to examine his own report and its questions from an entirely new point of view. Efficiency and profitability would not be evaluated within the framework of the appropriations the FFA has now or can expect to get automatically but on the basis of the results the research could provide for the country's economic development if it is handled well.

It is this efficiency we must now put foremost and thus pay special attention to the spinoff effects. And naturally also the risks we would otherwise run by stifling technical research that is vital for our future welfare.

Education and Research

I have expressed the view in the public debate that in a small country like Sweden we must concentrate basic research in the universities and technical colleges instead of consigning it to special research institutions—as they do in France, for example. When research is assigned to academic educational institutions we obtain an automatic link between research and education at all levels that would otherwise be hard to maintain.

This would avoid the kind of gaps Franzen describes at the Stockholm Institute of Technology. But the main thing is that the most efficient dissemination of research results to other students is obtained when it occurs in the same hallways.

Thus, it seems to me that the natural solution would be to set the FFA up as an institutional section at the Stockholm Institute of Technology and at the same time restrict certain activities with directly commercial possibilities to special companies. That is where things like the big wind tunnel, whose services we can theoretically sell abroad if we are competitive, belong.

Among other things this means that the transfer of large investments would occur at realistic prices. Incorporating the FFA in the Institute of Technology will lead to some problems of a formal nature, for example segments of aeronautical research must be classified for defense reasons. But there are solutions to such problems.

Another problem involves the formal academic qualifications of top personnel, but this is a transitional problem that affects only a small number of people. In general the academic qualifications at the FFA are in a high class.

But the most important thing is to make sure that enough funds are provided to give research a real chance. Are there no politicians who are prepared to turn this issue, so essential to Sweden's technical future, into an Inland Railway?

Germany's BMFT Loan Program to Benefit Microelectronics, Materials and Biotechnologies

92WS0281A Duesseldorf VDI NACHRICHTEN in German 13 Dec 91 p 1

[Text] Bonn, 13 Dec—Bonn wants to lend a helping hand to small business in the field of high technology. Beginning in 1992, the BMFT [Federal Ministry for Research and Technology] will provide low-interest loans for investment in new technologies by small and midsize businesses (KMU's) with an annual sales level of up to 50 million German marks [DM]. A loan program to this effect has just been signed by Minister Dr. Heinz Riesenhuber of BMFT and the Reconstruction Loan Corporation (KFW). The program, with total funding of DM2 billion, is available with 100 percent disbursement at a fixed interest rate of 7.5 percent. A company can apply for up to DM3 million.

No more than 80 percent of an R&D project can be financed with the small business loan (with a term of up to two years). Besides personnel, computer costs, and material costs, the funding can also be applied to 60 percent of the investments necessary during the R&D phase. Effective immediately, applications can be submitted to any borrower's bank. The application deadline is 31 December 1997.

Allowances are made for the special conditions in the new Bundeslaender in that the exemption from liability for borrower's banks has been increased to 75 percent there in the event of repayment difficulties (old Bundeslaender: 50 percent). With this "unbureaucratic and strongly market-oriented research stimulus," Riesenhuber said, the risk remains with the company, unlike with subsidies. The loan program should increase the competitiveness of KMU companies and help ensure "technology leaps" in the areas of microelectronics and engineering, as well as in materials and biotechnologies.

France: Thomson, CEA-Industrie to Form New Industrial Combine

92WS0288A Paris AFP SCIENCES in French 19 Dec 91 pp 1, 2

[Text] Paris—Meeting with the Council of Ministers on 18 December, Prime Minister Edith Cresson mapped out the forming of an international-scale industrial combine in the leading-edge technology sectors: The civil nuclear, the consumer electronics, and the electronic components sectors. This combination is to take the form of a company, to be named Thomson-CEA-Industrie, encompassing the civil nuclear and electronics activities of the CEA-Industrie [Atomic Energy Commission's industrial capital shares holding company—see box at end of this article] and Thomson S.A. groups.

Once formed, the new company will control the entire gamut of the public sector's electronic components design and manufacturing activities. This is particularly so in the case of semiconductor activities, thus providing SGS-Thompson's French participation with a legitimate link to Thomson-CEA-Industrie's industrial activities, while maintaining its capital and substantial technical linkups with Thomson-CSF. Thomson Consumer Electronics will be controlled by the new company.

And thus formed, the state will be the major stockholder of Thomson-CEA-Industrie, and the Atomic Energy Commission a substantial shareholder in order to optimize cooperation between the research activities under its control and the new company's industrial activities. Thomson-CEA-Industrie will be the major stockholder of COGEMA [General Nuclear Materials Company] and the stockholder of record of Framatome [Franco-American Nuclear Construction Company]. Its aim will be to develop this strategic sector and maintain France's world primacy in the nuclear domain.

These guidelines are to be implemented during the first half of 1992, within a framework of strict observance of employees' rights and in accordance with the evaluation procedures in effect under existing laws.

[Box p 1]

The Thomson Group

As of the end of 1990, the Thomson public-sector electronics group as a whole was employing more than 105,000 people, and had a consolidated revenue of 75,2 billion francs[Fr].

These results were very contrasting, however, depending on type of activity. Thomson-CSF, a subsidiary company specializing in electronics for professional and military use, and employing more than 46,000 people, posted a profit of Fr2.2 billion on a revenue of Fr37 billion.

Thomson Consumer Electronics, with 51,600 employees as of the end of 1990, posted losses of Fr2.7 billion, on a revenue of 33 billion.

And SGS-Thomson, an electronic components subsidiary, controlled in equal parts by Thomson-CSF and IRI/Finmeccanica [(Italian) Institute for the Reconstruction of Industry/Mechanical Engineering Finance Corporation], the Italian state-owned holding company, posted a loss of $96 million (more than Fr500 million) in 1990 on a revenue of $1.3 billion. It employed 21,000 people.

CEA-Industrie

Since 1983, CEA-Industrie has been the holding company for all the industrial participations of the CEA [Atomic Energy Commission], the public sector agency that exercises supreme control over the French nuclear sector. Its activities are still tightly linked to atomic energy.

Of the Fr29.7 billion in revenue earned last year by CEA-Industrie, Fr26 billion (or 88 percent), came from the nuclear sector: Fuel manufacturing with 100 percent state-owned COGEMA [General Nuclear Materials Company], and construction of power plants, mainly with 36 percent state-owned Framatome [Franco-American Nuclear Construction Company].

Buttressed by its burgeoning treasury, and to soften the impact the decline in nuclear power plant capital investment programs has had on its profits, the group has recently diversified its production in high-technology sectors.

In particular, through Framatome, CEA-Industrie has a presence in the connector engineering and production sector (manufacturing of complex connectors) and in heavy industry. It also controls CISI [International Data Processing Services Company], one of the leading French SSII's [data processing services and engineering firms], whose revenue last year totaled Fr1.4 billion. And CEA-Industrie's latest major diversification move is into the medical electronics sector.

Despite the economic slowdown, CEA-Industrie posted a net profit last year of Fr1.7 billion, amounting to 5.6 percent of its revenue. During the first half of 1991, however, the group posted a loss of Fr659 million stemming from its dispute with Iran over the Eurodif plant.

France: CEA, University Create Joint Laboratory

92WS0288B Paris AFP SCIENCES in French 19 Dec 91 p 3

[Text] Paris—The Atomic Energy Commission [CEA] and the New Evry-Val-d'Essonne University have signed an agreement, according to a 17 December CEA announcement, calling for the creation of a joint research laboratory: The Ile-de-France Mechanics Research Center [CEMIF].

Initially, in the absence of facilities of its own, the CEMIF will use the CEA's installations at Saclay. It will have a joint scientific board and a joint board of directors, and could employ some 50 doctoral students at the ABD [All-But-Dissertation] level, beginning in 1992, according to statements by officials of the CEA's educational and research units, during a press conference.

The CEMIF will be headed by Mr. Rene Gibert, a member of the CEA's Nuclear Reactors Directorate, and will have as its objective the conduct of research in several disciplines in the field of mechanics, such as mechanics modeling, dynamics, and the mechanics and thermal aspects of fluids.

The creation of this laboratory is the first undertaking of its type, according to Mr. Yves Chelet, head of the INSTN [National Institute of Nuclear Science and Engineering], and, said Mr. Chelet, it identifies with "a policy aimed at encouraging scientists to forge ties with the universities."

The INSTN occupies CEA premises and is itself an institute of higher learning under the aegis of the National Education Ministry. It offers a total of 19 programs of study at the PhD level, and two engineering diplomas: Nuclear Engineering, and Robotics and Production Engineering. In 1991, it had over 700 students.

JESSI Budget, Program Cutbacks Announced

92WS0288C Paris AFP SCIENCES in French
19 Dec 91 p 13

[Text] Munich—The JESSI [Joint European Submicron Silicon Initiative] European research program will be rechanneling its outlays into several specific lines of research, thus reducing its expenses, according to an 11 December announcement by the program's management.

JESSI's budget for the coming year will be over 400 million ECUs, but under the 460 million of preceding years. The program is funded to the extent of 50 percent by interested enterprises and research centers, 40 percent by interested governments, and 10 percent by the European Commission.

JESSI has indicated that emphasis will be placed on research in the areas of HDTV [high-definition TV], digital audio broadcasting, wide-band (ISDN [Integrated-Services Digital Network]) data transmission, cellular mobile telephony, and automobile safety electronics. In a press release, the organization reports on its two years in existence, citing the fact that 3,000 scientists are at work on over 70 JESSI projects involving 120 enterprises.

JESSI's management also indicates that the agreement signed with its American counterpart SEMATECH [Semiconductor Manufacturing Technology] in September—see AFP SCIENCES No. 788, of 26 September 1991, p 20—has given new impetus to its work and will open the way to further advances toward standardization.

European Materials, Biology Laboratories Created

92WS0299A Paris AFP SCIENCES in French
02 Jan 92, p 1

[Unsigned article: "European Science on the March"]

[Text] Paris—Following the creation and official establishment of the European Association for Research in Astronomy at Cambridge (see AFP SCIENCES, No 800 19 Dec 91 p 11), other European laboratories are planning to regroup or to provide for joint activities by teams from several countries to build the Europe of Science, after Maastricht. In this way, the various European countries could share human and material resources and the discoveries of science to the benefit of more ambitious undertakings. Two of these laboratories are scheduled to be created at Perpignan as of 14 January.

SIMAP (Science and Engineering of Materials and Processes) will be established in the context of the Odeillo Institute of Science and Engineering of Materials and Processes, the Montpellier Laboratory of the Physical Chemistry of Materials, and the Barcelona Institute of Materials Sciences. Its objective is to promote research on controlling the properties of ceramic films of type SiC, AIN, Si3N4, of supraconducting ceramics, and films of the "diamond" type, and of membranes.

The European Laboratory of Molecular and Cellular Vegetal Physiology will combine the Laboratory of Vegetal Molecular Physiology and Biology of the University of Perpignan, associated with the CNRS [National Center for Scientific Research], and the Barcelona Institute of Research and Development, Molecular Genetics Department. The study of genes that control the formation and germination of plants and the study of the problems of differentiation of the cellular cycle will be the major topics selected for the research work to be done there.

Finally, another European laboratory, devoted to the magnetism of surfaces and interfaces, will team up with the Strasbourg Institute of Materials Physics and Chemistry and Professor Kirschner's staff at the Physics Department of the Free University of Berlin. This laboratory will be set up later in the German capital.

Europe Studies "Clean" Electric Power Station

92WS0299B Paris AFP SCIENCES in French
02 Jan 92 p 19

[Unsigned article: "European Study for Clean Electric Power Generation Using Coal"]

[Text] Paris—In the context of the European Thermie Program, six European electric power companies—including EDF [French Electric Power Company], four Spanish companies, and one Portuguese company—will

jointly study the construction and experimental operation of a conventional, environmentally-safe thermoelectric power plant at the Puertollano site, in the south-central section of Spain, according to an EDF announcement on 27 December.

This 300-Mw demonstration facility will get its first financing installment to the tune of ECU15 million, granted by the Commission of European Communities. Set up in the vicinity of the Puertollano open-cut mine, it will comprise a combined-cycle plant, with the fuel for the gas turbine coming from the gasification of coal obtained from various sources.

According to EDF and its partners, the Spanish companies ENDESA [National Electric Power Enterprise, Inc.], Hidroelectrica Espanola, Sevillana de Electricidade, Hidroelectrica del Cantabrico, and the Electricidade de Portugal Company, the carbon dioxide emissions from the plant will be reduced by 20 percent, as compared to those from a conventional coal-fired plant. Its sulfur dioxide and nitrogen oxide emissions will be 40 and 11 times less, respectively, than the ceilings provided for in the Community Directive on Electric Power Plant Emissions.

Following a trial period, during which a broad range of coal types will be used, the plant will employ bituminous coal produced on site. "One can gauge the importance of this research effort to the environment," EDF emphasized, "if one realizes that coal today supplies close to half the world's electric power generation or that coal accounts for 76 percent of the world's known fossil energy resources."

France's L'Air Liquide Develops Waste Recycling Process

92WS0302B Paris L'USINE NOUVELLE in French 19 Dec 91 pp 64, 65

[Article by Dominique Commiot: "Waste Recycling: Chemistry Advancing to Pure Oxygen"]

[Text] On 6 December, at Billingham (Teesside), in the north of England, Jim Mole, ICI research engineer, and Philippe Queille, chief, Thermal Engineering Department, L'Air Liquide Research Center, will put the finishing touches on the patent application relating to chemical waste reprocessing by means of pure oxygen, which they want to file jointly worldwide.

The cooperation of these two men, sitting at a table in a construction site shack, speaks for itself. These patents mark the conclusion of successful cooperative effort, a real first—embarked upon in 1989—between the British chemical industry giant and the world's "Number One" outfit in industrial gases.

The process devised by the Briton and developed by the Frenchman enables ICI to save Fr400 million in the construction of a reprocessing unit that is being completed. It opens up some pretty marked prospects for L'Air Liquide.

Until now, the idea looked like "mission impossible." It involves the reprocessing of chemical waste by incineration, with pure oxygen being used as a combustion agent instead of air. The process offers several decisive advantages. Since the necessary gas volume is much smaller, the furnace can definitely be smaller. Hence, a rather considerable gain (40 percent) in the cost of the ICI unit that will reprocess the waste coming from the production of methyl methacrylate (MMA), an intermediate product in the manufacture of acrylic plastic substances that are found in paints, in toilet and bathroom equipment, and also in car bodies.

ICI is already producing 100,000 t per year at Teesside and a new unit, under construction just next to the reprocessing plant, will double the capacity within one year. As a sign of the times, out of Fr1.1 billion total investment by ICI, more than half (660 million) will be for the reprocessing unit only!

And here is the second advantage deriving from oxygen: it makes it possible to reduce the fuel consumption in the reprocessing furnace by one-third. Finally, the process is much cleaner. It considerably reduces the discharge of carbon dioxide, sulfur dioxide, and nitrogen oxide. And, since reprocessing is more efficient, ICI will, by catalytic conversion, recover 98 percent of the sulfuric acid contained in the waste from the production of MMA, in other words, 430,000 t of acid per year. Until now, the English chemical industry each year would dump into the North Sea close to 200,000 t of waste rich in ammonium sulfate and sulfuric acid from the production of MMA.

To achieve these results, it was necessary to control pure oxygen combustion which generates a flame temperature of up to 1,000 degrees higher than when air is used. Now, the more one raises the temperature, the more one increases the discharge of nitrogen oxides. And overheating entails the risk of attacking the refractory lining of the furnace.

To control the temperature, the smart thing to do is to make a fine adjustment of the shape of the flame and to properly arrange the distribution, in the furnace, of the injectors through which the liquid waste is introduced into the furnace. Until now, chemists had tried empirical approaches to these adjustments. But these attempts never yielded anything better than oxygen doping, such as in an American unit by Stauffer (Rhone-Poulenc Group) that employs a mixture with 40 percent pure oxygen.

Here, then, is the only solution: numerical simulation. The ICI researchers submitted the problem to different specialists. "L'Air Liquide was not among the first on our list," confided Jim Mole, "but their advances in the numerical simulation of complex thermal phenomena convinced us to work with them."

Philippe Queille and his team at the Loges-en-Josas laboratory (Yvelines) developed specific software to model the geometry and placement of the burners in the furnace—this being the critical point—and the speed with which the waste is injected. By combining these parameters with the temperature fields, the pressures, the tracking of the particles in the furnace by means of chemical kinetics programs, they were able to demonstrate—by pure simulation—the feasibility of a pure oxygen furnace. The software (40,000 lines of FORTRAN) required a whole week of calculation by a powerful Convex computer. A pilot unit, built at L'Air Liquide, then confirmed the numerical results. The ICI unit will become operational just two and a half years after the agreement was signed between the two partners.

This achievement opens up a new market for L'Air Liquide. "It is likely that the majority of sulfuric waste treatment units will switch to pure oxygen, either on the occasion of revamping, or for the construction of new units," thinks Claude Pivard, heavy industry marketing manager. And the process can be adapted to the reprocessing of many other kinds of chemical waste. Since the patents jointly held by ICI and the French group are locked in tight, L'Air Liquide will be in a good position to sell the inevitably associated big oxygen plants. The ICI unit will, as a matter of fact, consume 650 t of oxygen per day!

As the only drawback at Billingham, L'Air Liquide did not win the oxygen production market. It was not in the same league here with the British Gas, its big rival. We might as well say it. The world's "Number Two" outfit in industrial gases, very well established in the Teesside region, where ICI, one of its big clients, employs 11,000 workers in its three biggest facilities worldwide—was reduced to doing pipes at its existing oxygen production units. "Under these conditions, it is impossible to be competitive," it was explained at L'Air Liquide, which never managed to sell a single production unit in Great Britain. But all its bitterness is dissipated by the prospects opened up to it, elsewhere in the world, by the process perfected with ICI.

France: CNRS 1992 Budget Discussed

92WS0308 Paris AFP SCIENCES in French 9 Jan 92 pp 1-4

[Unattributed article: "The CNRS in 1992: A Budget of Nearly 11 Billion Francs [Fr]"]

[Text] Paris—With a budget of Fr10.978 billion for this year, the National Center for Scientific Research (CNRS) will be able to continue its modernization, to open itself to the outside, the universities, Europe and the world at large, and to fine-tune its efforts to help East European researchers, the CNRS general director, Mr. Francois Kourilsky, indicated on 9 January.

"The CNRS," he emphasized, "should be the last one to complain about its budget, considering the austerity enforced in other ministries. But we should not forget that some adjustment took place last year. Therefore, our budget growth was moderate. In 1992, a similar threat still hangs over us. We shall find out next month."

"People should know that our situation is becoming dangerous and is reaching the limits," Mr. Kourilsky went on. "The resources we can provide for laboratories to operate (around 18 percent) are inadequate and we have limited room to maneuver for the transfers and relocations that we intend to continue. But the CNRS cannot borrow like the CEA [Atomic Energy Commission]."

Actually, the largest French research organization (26,000 people) devotes 76 to 77 percent of its total budget (exclusive of taxes) to personnel expenditures, a Fr7.734 billion wage bill. It finds itself in a situation where, after a pause in the building of large facilities, it must resume their modernization, especially that of mainframes and data-processing networks. "We must change the profile of scientific computing, replace our obsolete vector computers. I have a dream for 1993: to see our laboratories and their European counterparts interconnected through distributed data-processing networks."

Mr. Kourilsky, who assessed his efforts since 1989 as relatively satisfactory, estimated that the CNRS and research in general can no longer remain aloof from society's concerns. "As I see it," he said, "there is a change in attitudes toward science. There is Europe, of course, but also the increasing integration of scientists into society. The CNRS must prepare for it or engage in it faster. It will not necessarily be a very simple thing. Research must increasingly be in the front line. The evolution of the CNRS must take place in this spirit."

Research on the environment will be the subject of a drastic recasting; it will be carried out in partnership with the National Center for Space Studies (CNES) and the French Institute for Research on the Exploitation of the Ocean (IFREMER).

In the field of human sciences, through an interdisciplinary program, the CNRS will increase its research on urban problems: suburbs, rural residents moving to cities, speculation, drugs, unemployment, integration, health services.

Mr. Kourilsky pointed out that the CNRS did not wait for "the government's roaring forties" to undertake its decentralization and the relocation of its laboratories. The 50 percent goal has been achieved. "We are now aiming to have 60 percent of the organization in the regions by the year 2000. All this is done quietly and smoothly, except that the Finance Ministry may reconsider some incentive measures."

Some 360 members of the administrative staff will thus be relocated in different regions, to bring the administration closer to the laboratories, which cannot all be managed according to the same criteria.

A forthcoming meeting of the Interministerial National Development Committee (CIAT)—tentatively scheduled for 23 January—should study the question of the

CNRS headquarters, which some would like to move away from Quai Anatole France, in the center of Paris.

Mr. Kourilsky announced that his organization will continue to negotiate a new contract with universities. "Many things do not work," he acknowledged. "The difference between an associated unit and a CNRS-owned laboratory has become blurred. We need to redefine, to straighten out certain situations. Links with higher education institutions must be amplified. We should create mixed units. All this will affect 8 to 10 percent of the personnel. A clear plan will be ready by June." As for researcher mobility between the CNRS and the universities, "rules have been written, adjustments have been made," Mr. Kourilsky indicated.

Finally, Mr. Kourilsky announced the creation of an "Orientalism Committee" in charge of "bringing to the CNRS general director's attention any developments in research on oriental languages, civilizations, and societies" from "Rabat to Hokkaido," on which 60 teams (420 people) are working "too often in coteries or around 'pharaohs'." Professor Robert Ilbert is currently writing a report on research concerning Mediterranean countries, which was requested by the research minister, Mr. Hubert Curien.

In this respect, the CNRS is contemplating the creation of three new research units during the next few years:

—an Institute for Studies on Turkey, Iran, and the Near East, in Strasbourg, in partnership with the College de France;

—a Far East Institute in Lyon, involved more particularly with China, Japan, and Korea, with support from the Lyon-II and Lyon-III Universities;

—and finally, in Aix-en-Provence, an Institute on Southeast Asia and the Pacific, supported by the Archives of Overseas France and in partnership with the Aix-Marseille-I University; this institute would be geared more particularly to the study of the Indochinese peninsula and the East Indies.

Far from being threatened with decline, Orientalism at the CNRS can look forward to new and ambitious prospects that many countries would envy, Mr. Kourilsky pointed out in substance, in answer to some concerns expressed in this respect.

1992 Breakdown of Resources by Scientific Departments

In Million Francs	Total Budget	Budget Exclusive of Wages
Physics and mathematics	1,058	258
Nuclear and particle physics	886	306
Engineering sciences	828	164
Sciences of the universe	968	261
Chemical sciences	1,340	292
Life sciences	2,063	414
Human and social sciences	1,216	132

[Box, p 4]

Creation of an Orientalism Committee

The CNRS has just created an Orientalism Committee to assist its general director.

The committee's mission is to monitor the consistency of the policy carried out in this field at a time when Orientalists are divided among several sections of the national committee.

The Orientalism Committee will advise the CNRS general director and the director of the Human and Social Sciences department in the preparation and harmonization of their efforts and initiatives.

Its main responsibilities will be:

—to bring to the CNRS general director's attention any developments in CNRS research on oriental languages, civilizations, and societies;

—to submit proposal to improve the organization of the teams working in this field;

—to help better coordinate the research on oriental languages, civilizations, and societies carried out by linguists, archeologists, historians, and social science researchers;

—to provide a standard of reference for the international scientific community.

The committee will not be directly involved in managing the research that concerns scientific departments.

The Orientalism Committee will consist of 18 members:

—three members by right, appointed respectively by the Ministry of Research and Technology, the Ministry of National Education, and the Ministry of Foreign Affairs;

—ten scientific personalities appointed by the CNRS general director;

—five members elected by the National Committee sections:

- one member from each of the following sections:
- man and the environment: evolution, interactions (31);
- ancient and medieval worlds (32);
- uniqueness of man and diversity of cultures (38);
- two members from the section: formation of the modern world (33).

Members will be elected or appointed for a four-year term, which may be renewable.

Status of Projects in EC Framework Program Reviewed

92WS0325A London INTERFACE EUROPE in English Nov-Dec 91 pp 13-19

[Article: "EC Research Programme News"]

[Text]

Thirteen Out of 15 Programmes Adopted

The Council of Ministers has now formally adopted four more of the specific EC R&D programmes outlined in the Third Framework Programme 1991-94. These are given in detail below. (Of the fifteen individual programmes outlined in this document, only three programmes have yet to be finally agreed—Controlled Thermonuclear Fusion, Measurement and Testing and Nuclear Fission Safety). In addition, two of these adopted programmes, "Non-Nuclear Energy" and "Agriculture and Agro-Industry," are now the subject of calls for proposals. Outlined below is the content of each of these adopted programmes, and the specific areas open to proposals are marked with two asterices, thus **.

Non-Nuclear Energy

1. Non-Nuclear Energy. This programme will run from 9 Sep 91 to 31 Dec 94. The total budget is 155.43 MECU. Its work will be coordinated with other programmes such as "Agriculture and Agro-Industry" and "Industrial and Materials Technology (BRITE/EURAM [Bright RADAR Indicator-Tower Equipment/European Research on Advanced Materials)". Research is divided into four areas, and all these areas are now open to calls for proposals. After each area outlined, ** denotes that these topics are open to tender.

Area I: *Analysis of Strategies and Modelling*

The aim of this area is to define energy R&D strategies and to analyse national or Community policies dealing with energy and the environment. The programme will expand the existing capacity to draw up energy forecasts and evaluate policies by introducing the new environment and internal market dimensions. It will develop new concepts not envisaged or inadequately covered by previous activities.

** Modelling will focus on the use of EC-wide models to analyse the different energy, environmental and related economic policies. The topics open for proposals are: (1) analysis of strategies; and (2) development of new methods.

Fossil Sources

Area II: *Minimum Emission Power Production From Fossil Sources*

Subject to the work already carried out in the JOULE programme, research aims at optimising energy production from fossil sources and reducing the adverse effects on the environment resulting from the widespread use of fossil fuels. Two main lines of activity are planned: (a) in the fields of advanced technologies for energy production; and (b) in removal and fixation of carbon dioxide, as well as work on combustion models.

** Research will look at the environmental aspects of fossil fuel conversion and combustion, especially the greenhouse gas emissions, and the basic research to improve exploration and exploitation of fossil fuel resources. The topic open to proposals are: (1) energy production from fossil fuels using advanced technologies; (2) reduction of emissions; (3) security of supply hydrocarbons; and (4) more effective and cleaner utilisation of hydrocarbons.

Alternatives

Area III: *Renewable Energy Resources*

The aim is to accelerate technological readiness and to prepare for early market integration of all the most promising technical options. Within a global systems approach, particular objectives are: to increase the conversion efficiency of solar, wind, mini-hydraulic, wave, tidal, biomass and geothermal systems; to decrease their costs; and to improve their attractiveness to developers, industry and consumers.

** Area IIIA: *Renewable Energy Sources.* The main emphasis is on solar photovoltaic, wind energy and biomass, but work will also look at the potential applications in rural areas and developing countries of using such renewable energies. Topics open for proposals are: (1) the solar house; (2) renewable power plants; (3) biomass; and (4) renewable energies for rural electricity, local fuel and water.

Geothermal

** Area IIIB: *Geothermal Energy and Deep Reservoir Geology.* Work will focus on "Hot Dry Rock" research. Some generic research in high and low enthalpy will be pursued. Deep reservoir geology will extend its scope and use more geophysical and geochemical techniques beside deep reflection seismics.

Conservation

Area 4: *Energy Utilisation and Conservation*

The general aim is to develop highly efficient and clean electrochemical energy conversion systems for electricity generation, cogeneration, hydrogen and methanol production, transport and industrial electrochemical reactors.

** In the sector of Fuel Cells, the development of new energy conversion is emphasised. Topics open for proposals are: (1) new options in energy conservation: fuel cells; (2) technologies for energy saving in industry and buildings; and (3) energy efficiency in transport including substitutes for conventional fields.

Call for Proposals

The budget is divided as follows (in MECU): Area 1: 9; Area 2: 36; Area 3: 57.43; and Area 4: 53. A further 1.57 MECU is allocated for the dissemination and exploitation of results programme. For full details see OJ L 257 of 14 Sep 91. The deadline for calls for proposals is 14 Feb 92. See OJ C 238 of 13 Sep 91. For more information: CEC, DG XII-E, Ref. Non-Nuclear Energy 'Calls', 75 rue Montoyer, B-1040 Brussels. Fax: Brussels 236 3024.

2. Biomedicine and Health. This programme will run from 9 Sep 91 to 31 Dec 94 with a budget of 131.61 MECU. Its work is divided into four research areas.

Area 1: *Development of Coordinated Research on Prevention, Care and Health Systems*

This area covers the harmonisation of methodologies and protocols in epidemiological, biological, clinical and technological research. The key targets will include: research on precompetitive drug-testing; the identification, risk prevention and early detection of dangerous substances and biological agents on human health; and the application and enhancement of biomedical technology to medical health care.

Major Health Problems

Area 2: *Major Health Problems and Diseases of Socio-Economic Impact*

Targeted diseases will be: *AIDS; cancer; cardiovascular disease; mental illness and neurological disease;* and *the aging process, age-related health problems and handicaps.*

Human Genome

Area 3: *Human Genome Analysis*

Work will cover the completion and integration of the genetic and physical maps; the genetic basis for biological functions; and the setting up a coordinating mechanism to sequence a portion of the genome of major biological interest (e.g., the portion coding for the human lymphocyte antigen system).

Emphasis will be placed on the well-being of patients, to ensure that advances in genetics enhance human health. Special attention will be given to the genetic component of multifactoral conditions such as Alzheimer's and in developing methods to improve therapies. The research will be linked with international organisations such as HUGO, the Human Genome Organisation, as well as with other EC programmes. Any ethical, social and legal aspects of this research will be approached with caution. No research modifying, or seeking to modify, the genetic constitution of human beings by alteration of germ cell or of any stage of embryo development which may make these alterations hereditary will be carried out under this programme.

Ethics

Area 4: *Research on Biomedical Ethics*

This will include legislation on bioethics and current ethics; the social impact of the programme (i.e., any technological risks); assessing bioethical aspects of other EC R&D programmes; and establishing a European "ethical observatory."

1.33 MECU is allocated to the scheme for dissemination and exploitation of results. The programme's budget of 131.67 MECU is divided as follows (in MECU): Area 1: 27.5; Area 2: 72 (25 of this for AIDS research); Area 3: 27.5; and Area 4: 4.67. For full details see OJ L 267 of 24 Sep 91.

BRITE EURAM II

3. Industrial and Materials Technologies. (This programme succeeds the current BRITE/EURAM, and will informally be called BRITE/EURAM II). Its budget is 666.3 MECU. Again, the programme will run from 9 Sep 91 to 31 Dec 91. Because of the nature of the programme, it will be linked with many other R&D programmes, e.g., environment, health, measurement and testing and BRITE.

Materials

Area 1: *Materials - Raw Materials*

The object is to improve the performance of materials *"at a cost which allows competitive industrial exploitation over a broad range of applications not restricted to a few high performance items."* The accent is on the innovative use of industrial minerals, dimension stone (marble, etc.), metals and materials, including their exploration, exploitation, recovery, transformation and production.

Raw Materials. The aim is to improve existing processes and the use of new and competitive technologies. Research will focus on developing more efficient methods for mining, process application and testing of technologies; integrated techniques and modelling for the exploration of mineral deposits and the exploitation and processing of minerals and rocks; and new and improved drilling technologies. Special attention will be given to prenormative occupational safety and the effect on the environment.

Recycling

Recycling. A major goal is to reinforce the scope and effectiveness of recycling technologies, while minimising the harmful effects to the environment. Research will consist of making a comprehensive analysis of the cycles from the raw material to recycling, taking account of

economic, energy and environmental problems. It will relate to industrial waste, including new technologies to exploit residues containing conventional as well as precious and strategic metals. Another aim will be to encourage technologies for the more efficient treatment of residues containing metals.

New and improved materials and their processing. Here the goals are developments in materials and processes in conventional mass commodity materials with enhanced properties and performance at a reasonable cost. Research will also address advanced structural materials for high performance systems, advanced functional materials, surface engineering and joining technology. The improvements of performance materials will be examined, together with the use of combinations of advanced materials with probable strategic industrial applications.

Design

Area 2: *Design and Manufacturing*

The aim is to improve the capability of industry to design and manufacture products which are at the same time of high quality, easy to maintain, highly competitive and environmentally and socially acceptable. This will be coordinated with the computer integrated manufacturing (CIM) element of the EC's IT [Integrated Technologies] R&D programme.

SME's

SME [small and medium-sized enterprises] involvement will be encouraged. Research will be directed to the application of advanced enabling disciplines such as physics and chemistry mechanics, optics, mathematical modeling and process engineering and their integration into new technological developments.

Design. Research will address the impact on product performance, the length of time needed for design, manufacturing and life-cycle costs; failure modes and defect analysis; design for the ease of manufacturing, quality control, maintenance, recycling or reuse; improved modeling/simulation and rapid prototyping techniques to support the engineering design process.

Manufacturing

Manufacturing. Research covers the use of efficient and cost-effective manufacturing processes and the integration of the design interface, quality control, maintenance of facilities and the working environment; adapting established CIM systems to meet industries' needs, especially SME's. Attention will be directed to flexible small-batch production technologies, as well as mass production technology. Research in chemical engineering will develop integrated approaches and could include process modelling, separation technology, molecular engineering, catalysis and surface science and technology and chemical sensors. There will also be fundamental research into mixing and stirring, and particle and powder technology.

Aeronautics

Area 3: *Aeronautics Research*

The objectives are to: (a) contribute to strengthening the technology base of the European aeronautical industry and the knowledge base which supports actions to minimise environmental impact and enhance the safety and efficiency of aircraft operations; and (b) promote cooperation between large high-tech companies and smaller companies, SME's and research institutions in the EC.

Research activities will be pursued in (a) *Environment Related Technologies;* (b) *Technologies of Aircraft Operation;* (c) *Aerodynamics and Aerothermodynamics;* (d) *Aeronautical Structures and Manufacturing Technologies;* (e) *Avionic System Technologies;* and (f) *Mechanical, Utility and Actuation Technologies.*

After allocating resources for the centralised scheme for the dissemination and exploitation of results and JRC [Joint Research Center] research, the programme budget of 633.3 MECU is divided (in MECU) as follows: Area 1: (1) Raw materials and recycling, 80 and (2) Materials, 228.8. Area 2: 301.5 and Area 3: 53. For full details see OJ L 269 of 25 Sep 91.

4. Agriculture and Agro-Industry. The budget for this programme, to run from September 1991 to the end of 1994 is 329.87 MECU. The programme is divided into four areas and these are now the subject for calls for proposals. As before, the topics open to tenders are marked by two asterices, thus **.

Agriculture

Area 1: *Primary Production in Agriculture, Forestry, Aquaculture and Fisheries*

Research in this area will look at ways of adapting primary production to the demands of the market. The aim will be to correct the imbalances and the diversification in agriculture, forestry, aquaculture and fisheries towards traditional and new products for food and non-food (including energy) use. Work will also look at improving socio-economic conditions in areas which are lagging behind in development and to remedies for physical and/or socio-economic aspects of desertification and deforestation. Examples include: erosion control, the effects of climate change on primary production, and prevention and control of forest fires.

** I.1 *Agricultural and horticultural production systems:* Topics open for proposals are: Conversion, diversification and extensification; Interaction between agriculture/horticulture and the environment; and Product quality.

** I.2 *Forestry:* Silviculture planning and management; Novel silviculture systems; and Interaction of silviculture and the environment.

** I.3 *Fisheries and aquaculture:* Improvement of assessment methods; Modeling; Fisheries and aquaculture development; and Scientific basis for regulations and their enforcement.

** I.4 *Rural and coastal development:* Description and classification; Analysis and prediction.

Inputs

Area 2. *Inputs to Agriculture, Forestry, Aquaculture and Fisheries*

Research will contribute to the competitiveness and viability of agriculture through reduced and more efficient use of inputs. Environmentally friendly and efficient inputs to crop production, stock farming, forestry, aquaculture and fisheries will be developed. Examples include: genetically improved strains of micro-organisms, plants, animals and fish; nutrients; pest and disease control; techniques for organic farming; and monitoring and control systems (hardware and software).

** II.1 *Inputs for crop production:* Nutrition and irrigation of crops; Pest, disease, weed and abiotic stress control; and Genetics and breeding.

** II.2 *Inputs to forestry.*

** II.3 *Inputs for animals:* Improved animal nutrition and feed; animal health and well-being; and Genetics and breeding.

** II.4 *Equipment and monitoring systems.*

** II.5 *Aquaculture:* Health of aquaculture stocks; New species; Interaction between aquaculture and the environment; Reproduction and larval rearing; and Improvement and conservation of the genetic basis of aquaculture.

** II.6 *Fishing techniques and equipment:* Fishing gear performance and its development.

Biological Raw Materials

Area 3: *Processing of Biological Raw Materials From Agriculture, Forestry, Aquaculture and Fisheries*

The aim is to provide, through precompetitive R&D, the basis for processes (including transport and storage) for new or improved, competitive products in food, non-food and energy (e.g., biomass) sectors. New and efficient separation, extraction and conversion processes will be developed (while being environmentally friendly). These will include new processing methods applying physical, mechanical, chemical and biological means. Examples are: non-solvent extraction, the application of biocatalysts in separation and processing, and aseptic packaging.

Emphasis will be put on innovative, efficient processes which: improve safety and maintain or increase the quality of the processed products, convert biomass into energy and other industrial uses, improve the utilisation of by-products, and reduce waste and pollution from processing activities or lead to bio-degradable products.

Processing

** III.1 *Food processing:* Food safety; Food quality; Nutritional wholesomeness of food products; Environmental impact of food processing; and Packaging, distribution and preservation.

** III.2 *Non-food processing:* Homogeneity and security of supply; First level of processing (separation, extraction and mechanical processing); Transformation and conversion through biological and combined processing; and Bioenergy.

End Use

Area 4: *End Use and Products*

The objective is to generate a better knowledge of the characteristics required in final products (food and non-food, including energy) based on biological materials. In relation to food, work will concentrate on: the interface between transformation, distribution and the consumer; the definition and satisfaction of nutritional needs of consumers; and on toxicology, hygiene and safety. Examples of R&D topics include: effects of processing; sensory/organoleptic characteristics of food; and "natural" food additives. Attention will be focused on the non-food area, to find new more environmentally friendly types of products. Examples include: bio-degradable materials, new composite products, biobased chemicals and pharmaceuticals and biocompatible polymers.

** IV.1 *Food quality and consumer aspects:* Consumer safety; Interaction between diet and health; Specialty of functional foods; Understanding of food properties; and Prenormative research.

** IV.2 *Non-food:* Assessment of market requirements; Bioenergy and prenormative research.

Non-Food Demonstration Food Projects. These projects should aim to demonstrate the technical reliability and economic viability of new products and/or technology. This should be proven on a small scale and involve the participation of both users and producers.

The total budget is divided as follows (figures in MECU): Area 1: 100; Area 2: 65; Area 3: 100 and Area 4: 64.67. For full details see OJ L 265 of 21 Sep 91. This is the first call for proposals. The total estimated cost is 138.6 MECU. The deadline for this first call for proposals is 31 Jan 92.

A second call for proposals will be published later. See OJ C 264 of 10 Oct 91. An information pack is available

from: CEC, 75 rue Montoyer, Ref. First Call for Proposals; Agriculture and Agro-industry including Fisheries, B-1049 Brussels. Fax: Brussels 236 4322.

Nuclear Fission

Nuclear Fission Safety. This programme is one of the three specific programmes yet to be formally adopted by the Council of Ministers. It is now the subject of an amended proposal.

The total budget for the amended programme is 32.67 MECU. An additional 6.2 MECU has been set aside for administration, etc., and 166 MECU will go to the Joint Research Centre's (JRC) contribution to the programme (the JRC's activities will be the subject of a separate proposal).

The programme itself will be divided into two areas: Area 1 covers *Radiation Protection* and Area 2 deals with *Reactor Safety.*

Radiation Protection

Area 1: *Radiation Protection*

The aim is to provide the knowledge for an objective assessment of the effects and risks of radiation, as well as the methods to optimise radiation protection. Research will be carried out:

—to define the extent of exposure and the ways in which radiation can occur from natural (including risks related to radon in homes), medical and industrial sources;

—to study the health consequences (including the treatment to over-exposure);

—and to assess the risks which radiation can pose both to man and his environment.

The knowledge gained from this research will be used to update the basic safety standards for health protection, and help evaluate the impact of long term choices in energy policy. The research will address three "themes," these are: (1) *Human exposure to radiation and radioactivity;* (2) *Consequences of radiation exposure to man: their assessment, prevention and treatment;* and (3) *Risks and management of radiation exposure.*

Reactor Safety

Area 2: *Reactor Safety*

The objective is to contribute to the definition of what will be needed to satisfy requirements from future generations of nuclear power plants. Work will be conducted under three main themes: (1) *Accident progression analysis;* (2) *Behaviour and qualification of the containment system and;* (3) *Accident management and control.*

The budget for these two areas is 37.67 MECU, which is divided as follows: Area 1: Radiation protection; 78-79 p.c. and Area 2: Reactor Safety: 21-22 p.c.

The cross-frontier research projects will be funded largely by shared-cost contracts. Not included in the main budget will be some *accompanying measures.* These will include: the organisation of seminars and workshops, etc.; advanced technology training programmes; and promotion of the exploitation results. For full details see OJ C 262 of 8 Oct 91.

ESPRIT Microwave Engineering Projects Reviewed

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[Article by Tom Brazil, University College, Dublin, Ireland, J. Mun, BNR Europe, Harlow, Essex, and A. Mbaye, CEC, DG XIII-ESPRIT, Brussels: "European Cooperative Research in Microwave Engineering Under the ESPRIT Programme"; first paragraph is MICROWAVE ENGINEERING EUROPE introduction]

[Text] ESPRIT is providing momentum, and money, for a European collaborative in microwave semiconductor devices and support technologies. Our three authors, with academic, industrial and Community perspectives, summarise past progress and future prospects.

The European microwave industry has undergone many changes in recent years: companies have been taken over, new names have appeared and old names disappeared. Away from the publicised boardroom dramas, a remarkable pattern of cooperation and collaboration between microwave research workers has been steadily increasing. This development is particularly apparent among those companies, research institutes and universities who are participating in the current round of research projects being funded under the European Community's ESPRIT programme (European Strategic Programme in Information Technology).

The ESPRIT II programme on Compound Semiconductors involves approximately 330 man-years of effort in Europe across six projects.

The purpose of this article is to describe some of the background to these developments, and to give a short account of the projects of direct interest to microwave engineers which are now underway as part of ESPRIT II, including a selection of the technological achievements to date. The discussion concentrates on projects based on compound semiconductor technology. The imminent launch of the next phase, ESPRIT III, will expand this further.

The European Community (EC) now supports a wide range of research initiatives in many technological sectors, under a unified administrative structure known as the Framework Programme. ESPRIT is one of the oldest, and still by far the largest, single research programme, directed towards the critical enabling technologies of computing, microelectronic and related fields. It was

launched in 1984 with a straightforward central objective: to ensure that Europe developed a sufficient technology base in these sectors to become and to remain competitive with the United States and Japan into the 1990's. Allied to this central thrust, were the twin aims of promoting industrial cooperation within Europe, and contributing to the development of international standards.

ESPRIT II Halfway Stage

At present, the second phase of ESPRIT is roughly at the half-way stage. The actual implementation of ESPRIT is carried out through shared-cost contracts, each involving a minimum of two industrial partners from different EC countries. Contracts are awarded as a result of an often fiercely-competitive proposal/evaluation stage, following the publication by the EC of a Call for Proposals which incorporates a detailed technical workplan. Projects are typically two to four years in duration, and range from large so-called Type A projects, to smaller Type B projects, together with a number of support actions under the Basic Research programme of ESPRIT. Usually, the Community contributes 50 percent of the costs of research, and the total EC budget for ESPRIT II is approximately 1600MECU.

Microwave-related research did not figure very prominently in the first phase of ESPRIT, since, perhaps inevitably, the greater part of the resources in microelectronics was devoted to Silicon-based digital electronics and related CAD [computer-aided design] activity. There was, however, one project addressing microwave CAD (mostly linear) which contributed to the development of a commercial software product currently marketed by Argumens GmbH of Germany, and there was also a substantial project on the technology of producing high-speed digital and signal conversion circuits based on compound semiconductors.

There are six projects on compound semiconductors under the current, second phase of ESPRIT, mainly directed towards analogue microwave applications. These projects involve approximately 330 man-years of effort between 1989 and 1993, and, with one exception, they all started in January 1990.

Overview of Projects

Each of the six compound semiconductor projects in ESPRIT II has a well-defined application pull. A project centred on advanced transistors, for example, is pulled by the need of these transistors for high-performance integrated circuits. A project centred on MMIC's [Monolithic Microwave Integrated Circuit] is pulled in its turn, by the need of these circuits for various system requirements. The projects can be examined from several angles. In what follows, we shall examine them by the frequency bands which they cover. This reflects, to some extent, the technology and devices being pursued by each project, although some are concerned with basic technologies of general interest, (for example, the development of non-toxic precursors). These projects can be regarded as horizontal technology initiatives which act to complement the more vertical projects which are driven by circuit and system requirements.

The projects are summarized in Table 1, which also includes the names of the participants. Exotic acronyms can be derived from the project titles, but how some acronyms are derived remains a mystery! Broadly speaking, the ESPRIT II programme on compound semiconductors is pivoted on two A-type projects each with over 100 man-years of effort, namely, COSMIC [Coherent Optical System of Modular Imaging Collectors] and AIMS [Advanced Imagery Manipulation System]. Although these projects also involve a substantial amount of horizontal activities in the areas of devices and technology, they are nevertheless very much systems-driven, where the target specifications and functionalities of the devices and circuits are defined from system studies. Between COSMIC and AIMS, the projects cover frequency bands between approximately 1 to 20GHz and 20 to 30GHz respectively.

Table 1. ESPRIT II for Compound Semiconductors, Prime Contractors Underlined

GaAs Monolithic Analogue Circuits for Microwave Communications Systems up to GHz	Siemens (Ge), Marconi (UK), Telettra (It and Sp), Telefonica (Sp), FORTH (Gr), Jansen (Ge), ArguMens (Ge), Univ. Madrid (Sp), Univ. Rome (It), PT Torino (It)
Advanced Integrated Millimeter-wave Sub-assemblies	Thomson (Fr), Daimier Benz (Ge), Alcatel Espace (Fr), Univ. Lille (Fr), Electronik Centralen (De)
Advanced in GaAs-based Devices for high-speed IC's	Marconi (UK), BNR-Europe (UK), Philips-LEP (Fr), Thomson (Fr), Picogiga (Fr), FORTH (Gr), Farran Tech, (Ir), Univ. Lille (Fr), Univ. Madrid (Sp)
Monolithic Integration Beyond 26.5 GHz	Univ. Glasgow (UK), Alcatel Espace (Fr), GaAs Code (UK), Univ. Cambridge (UK), Farran Tech. (Ir), NMRC (Ir)
Metal Organic Research for Semiconductor Epitaxy	Thomson (Fr), CNET (Fr), RSRE (UK), FORTH (Gr), Univ. Aachen (Ge), Univ. Stuttgart (Ge), Preussag (Ge), Riber (Fr), SMI (Fr), Univ. Padova (It)
Multi-wafer PLANET MOVPE Reactor	Philips-LEP (Fr), Aixtron (Ge), Polyflow (Be), Philips (Ne), Telefonica (Sp), Univ. Poly. Madrid (Sp)

These two A-type projects are complemented by two smaller B-type projects, MONOFAST and GIANTS. MONOFAST is concerned with technology and MMIC design techniques focused at 44GHz and GIANTS is concerned with the development of In GaAs based transistors where one of the aims is to demonstrate a low-noise amplifier MMIC at 60GHz. Another aim is to demonstrate optoelectronic integration on InP substrates.

The four application-led and device-led projects are further complemented by two material-orientated B-projects, MORSE and PLANET. MORSE is concerned with the development of non-toxic precursors and MOMBE growth and PLANET is concerned with the development of a multi-wafer MOVPE reactor capable of growing GaAs and InP based materials. The key areas covered by projects are summarized in Table 2, and a few technological highlights are described below.

Table 2: A Summary of the Key Areas Covered by Each Project

Navigation, mobile comm. DBS, point to multipoint optical trans.	**Short-hop link, satellite comm., ultra small sat, terminal**				
LNA, RFA/mixer, Trans imp. amp.	T/R switch, LNA, SSPA, mixer, VCO	LNA	Broadhand amp., LNA, O/E integ.		
MESFET HEMT	MESET HEMT PMHEMT HBT (GaInP)	MESET	PMHEMT HEMT (InP) (GaInP)	HEMT (GaInP) HBT	HEMT laser (GaAs) opt. wg. (InP)
MBE	MBE MOVPE	MBE	MBE MOVPE	MOMBE MOVPE	MOVPE
				Non-toxic precursors	
				MOMBE cracker cell	2" and 3 multi-wafer reactor
1 to 23 GHz	20 to 30 GHz	44 GHz	1 to 60 GHz		

Project 5018 - "COSMIC"

This project covers components for use between 1 and 20GHz. Within this frequency range, attention is focused on the L, X and Ka-bands. At L-band, one of the key interests is on high-gain over -60dB, transimpedance amplifiers for high-speed optical receiver applications. A sub-group in this project is investigating different circuit topologies but using essentially a well-established GaAs MESFET [Metal-Semiconductor Field-Effect Transistor] technology. This technology is also used for RF [Radio Frequency] amplifier/mixer MMIC's required for mobile communications and navigation.

At X-band, the interest is centred on components for DBS [Direct Broadcast Satellite]. Two approaches to MMIC's are being examined, one is based on a structured-array technology and another on a high-packing density technology. Both approaches use MESFET's, with 0.3μm/0.5μm gate length technology, and are aiming to integrate several DBS receiver functions, such as RFA [Radio Frequency Amplifier]/mixer/post-amp./IF [Intermediate Frequency] amp., etc., on a single chip. The low-noise front-end is provided by a HEMT [high electron mobility transistors] MMIC. Preliminary results for a two-stage LNA [Low-Noise Amplifier] using 0.4μm HEMT show 15dB gain and 1.8dB noise figure.

The main application at Ka-band is point-to-multipoint services. Use at 18 to 20 GHz demands technology improvements especially in submicron HEMT's and self-aligned techniques. The advantages of laser-assisted MBE [Molecular Beam Epitaxy] growth are also being investigated.

Project 5032 "AIMS"

AIMS, led by Thomson, addresses components up to sub-systems level for applications between 20 and 30GHz. System pulls are from short-hop land links and ultra-small aperture satellite terminals (USAT). A range of generic MMIC's are being developed covering transmit/receive (T/R) switches, low-noise amplifiers (LNA's), non-linear circuits, voltage controlled oscillators (VCO's) and solid state amplifiers (SSPA's). Apart from the T/R switch, which makes use of the well-established MESFET, all other circuits are based on the use of heterojunction transistors: HEMT, pseudomorphic HEMT (PHEMT), HBT.

FET's [fast, low-noise field effect transistors] have been developed to a very high level of performance, ready for application in integrated circuits. The performance achieved by 0.25μm gate length HEMT's include f_T of 55GHz, 0.65dB noise figure and 9.0dB gain at 18GHz. Corresponding figures for the PHEMT are 100GHz, 0.9dB and 11.0dB.

The project is also investigating the novel use of several variants of the HEMT and PHEMT for non-linear applications and for power generation. Multi-channel HEMT's with planar doping are being studied to tailor the transconductance profile to realise mixer operation either in the fundamental mode or in the doubler mode. Double-heterojunction PHEMT's with planar doping are being pursued for high-efficiency power transistors, and 0.25μm gate length devices have demonstrated 120mW output power at 1dB compression, with 10dB gain and 44 percent power-added efficiency at 18GHz.

HBT's are also being investigated for power transistor applications both with a novel GaInP/GaAs structure and with the conventional GaAlAs/GaAs. The larger

bandgap layer is expected to give better device performance and process control. The first GaInP/GaAs microwave HBT's have already been made, with f_T and f_{max} of 30 and 45GHz, respectively.

Project 5052 - "MONOFAST"

The overall aim of this project is to integrate unfamiliar technologies and new design tools into a proven methodology for high-frequency MMIC's. The close interaction between technology and design is aimed at minimising circuit sensitivity to device variations. A submicron MESFET based LNA MMIC at 44GHz is used as a technology driver.

Design starts from the FET physical parameters in terms of semiconductor material, gate length, recess depth, etc. From these physical specifications the electrical properties of the device can be predicted, enabling the amplifier to be designed. The sensitivity of the amplifier performance to the device parameters and thereby to the physical parameters can thus be analysed, and subsequent technology optimisation is focused on the control of these parameters. The work also involves the study of coplanar waveguides. This transmission medium is chosen for MMIC's at 44GHz and beyond, because it eliminates problems caused by via hole inductance.

At the technology level, it has been demonstrated that MBE growth can give the required control of epilayer thickness, and work is focused on the dry etching of the gate recess. In addition to conventional multi-layer e-beam lithography, the project is assessing the use of ion-beams and a combination of ion- and e-beam.

Project 2035 - "GIANTS"

This project has had a head start of one year compared to the other projects, i.e., January 1989 rather than January 1990. The project is led by Marconi, Caswell and the objective is to investigate novel FET's on GaAs and InP substrates which make use of an InGaAs channel layer. At the start of the project, these transistors were relatively immature and several device options were examined. However, the consortium is now concentrating on three devices and each device is being incorporated into integrated circuits.

One particular aspect of collaboration in this project is the role played by Picogiga. They have developed various MBE layer structures based on feedback from the device partners, and the device partners have in turn relied heavily on these materials for their activities.

Device results from this consortium include a 0.25μm gate-length PHEMT which has demonstrated 675 mS/mm transconductance, with an f_T of up to 130GHz, and is being used in a broadband amplifier MMIC up to 30GHz. A lattice-matched HEMT on InP has also exhibited over 770 mS/mm transconductance from 0.25μm gate length device with an f_T in the region of 90Ghz.

Project 5031 - "MORSE"

There are two goals in this project, which is led by Thomson. One goal is the development of new and less hazardous precursors and the verification of the quality of these precursors by MOVPE.

In parallel, the second goal is concerned with the development of MOMBE growth and the realisation of equipment improvements. GaAs HBT and HEMT are used as vehicles for assessing the epilayer quality from MOVPE and MOMBE respectively, in the case of the HEMT, a novel GaInP donor layer is used instead of the more conventional GaAlAs.

Project 5003 - "PLANET"

The objective of this project is to develop a high-throughput multi-wafer MOVPE reactor suitable for the growth of heterostructures for microelectronic and opto-electronic devices, such as GaAs lasers and InP waveguides.

The project is led by Philips-LEP and the initial reactor chamber optimisation is based on multiple 2" wafers, leading to multiple 3" wafers. The quality of the wafers are assessed by the fabrication of GaAs HEMT and PHEMT, and of GaAs-based lasers and optical waveguides on InP.

Conclusions and ESPRIT III

We have examined briefly the main objectives of the ESPRIT II projects on compound semiconductors and how they constitute a strong overall programme. Many results have been achieved by these projects, but space here has limited us to some of the highlights for this paper. It should be noted that a number of interesting related basic research actions are also supported under ESPRIT, mainly emphasising futuristic applications of "nanoelectronics," in which the quantum-mechanical behaviour of electrons is exploited in new ways.

The programme covers a wide range of very specialised technical areas which, collectively, make up the foundation of the III-V industry, and also have a great bearing on the modern microwave industry. It is difficult to envisage a single company with the resources to tackle all these areas. The synergy and the necessity of collaboration within the ESPRIT framework is therefore evident.

At the time of writing, the proposals submitted for support under ESPRIT III are about to be evaluated.

The Workplan for this Call for Proposals places strong emphasis on commercial exploitation of the research, and several topics related to microwave engineering feature prominently. These include power devices and MMIC's for microwave and mm-wave applications, and increased emphasis on CAD for non-linear and high-frequency compound microwave IC's. When these projects start in 1992, the pattern of microwave research collaboration in Europe will become even more widespread.

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CORPORATE ALLIANCES

SGS-Thomson, Philips Join Submicron CMOS Activities

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[Article by Francoise Grosvalet: "SGS-Thomson, Philips Join Forces for the CMOS [complementary metal-oxide semiconductor] of the Future"]

[Text] SGS-Thomson and Philips have just signed an agreement of principle to develop advanced submicron logical CMOS [complementary metal-oxide semiconductor] technologies. Seemingly impossible when the possibility of a Philips-Matsushita cooperation was rumored, the agreement is a symbol of what European industrial cooperation could ultimately become.

This symbol was recognized as such by Minister of Industry Dominique Strauss-Kahn in his opening speech last 18 November at Componic, the electronic components exhibition.

The minister regarded it as the inception of exemplary industrial cooperation. The agreement also shows that SGS-Thomson is not the only electronics center and that Philips is open to European cooperation. Even if the agreement is still only an R&D agreement, the minister admits that it is a good start.

The agreement of principle signed by Philips and SGS-Thomson last Monday involves the joint development of CMOS technologies with linewidths of 0.7 micron and smaller and the required design rules and libraries. The joint research will be carried out at Grenoble 92, the joint SGS-Thomson/CNET [National Center for Telecommunications Studies] R&D Center, located in Crolles, near Grenoble. Some 20 Philips engineers should join the SGS-Thomson and CNET specialists at that center, which is to be operational by mid 1992. The first jointly developed technology will be a 0.5-micron CMOS technology on 200-mm-diameter silicon wafers. This project should be completed by the end of 1993. The agreement also provides for Philips to use SGS-Thomson's pilot production line in Crolles for prototype manufacture and preproduction of circuits based on jointly developed technologies.

According to Heinz Hagmeister, president of Philips Semiconductors, the agreement is important in that it allows both partners to combine their submicron technological know-how and thus quickly introduce new improvements. According to Dominique Strauss-Kahn, the agreement is also consistent and non-overlapping with JESSI [Joint European Submicron Silicon Initiative]. For Pasquale Pistorio, CEO of the SGS-Thomson group, this cooperation is an important step toward creating a strong European semiconductor industry. Something that only SGS-Thomson seemed to desire so far.

Financial details of the agreement have not been disclosed, but it does not provide for Philips taking a shareholding in SGS-Thomson's capital.

Siemens Agrees to Enter Into European Chip Factory

92AN0138 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 5 Dec 91 pp 1, 9

[Article by Francoise Grosvalet and Elisabeth Feder in Germany: "Industrial Policy: Siemens Does an About-Face"]

[Text] Siemens is ready to establish a semiconductor manufacturing unit with SGS-Thomson and Philips if the EC agrees to subsidize it.

Who would have believed it! Siemens, the champion of liberalism which not long ago declared itself to be against any direct government intervention in the semiconductor industry at the investment level, is advocating the establishment of a European policy for the semiconductor industry. At least, one can interpret in that way a letter sent last October by the Siemens Board of Directors to Filippo-Maria Pandolfi, the European Commissioner responsible for new technologies. In that letter, whose existence and contents were just revealed by Reuter, Siemens declared itself ready to create a joint production unit in conjunction with the two other European semiconductor manufacturers, Philips and SGS-Thomson, on condition that the EC be willing to subsidize it.

This is a somewhat surprising proposal when one recalls that, when the same proposal was made by SGS-Thomson last October, "its partners" (read, Philips and Siemens) "had decided it was premature or inopportune to commit themselves to the idea." The German company is also prepared to share, for a fee, the 16-Mbit dynamic random access memory (DRAM) production know-how acquired through its agreement with IBM.

The terms of this letter have not been confirmed by Siemens, whose spokesman, Dr. Eberhard Posner, informed us that the letter mentioned by Reuter is "a routine letter exchanged between Karlheinz Kaske and F.M. Pandolfi within the context of a discussion on European electronics in response to proposals made by the latter."

The same spokesman reaffirmed Siemens' opposition to a straight merger of the three European companies, which would, in his opinion, be vetoed by the German Cartel Office. However, Siemens said that it is possible,

if "one considers the IBM-Siemens partnership as a core unit of whose know-how other Europeans can take advantage, in particular for logical circuits know-how."

Joint Production to Extend Corbeil-Based Operations

The agreement signed by IBM and Siemens last July indeed provides for the possibility of giving other European semiconductor manufacturers access to this technology. According to Siemens, one of the advantages of a new large-scale production unit of the joint operation with IBM at Corbeil could be continued. According to the official agreement, this operation would be limited to 600 200-mm silicon wafers per day. Bear in mind that two or three times this amount would be needed in order to be counted among the 16-Mbit giants by 1995-1997.

Siemens would indeed find a distinct advantage in the establishment of a jointly-operated silicon foundry, which would allow it to share the financial risks with others, while benefiting from a significant increase in production volume.

The cost of such a unit could reach approximately DM1 billion and, due to the prevailing conditions in the market for memories, result in a very rapid return on investment. Moreover, Siemens has not yet chosen the site for the 64-Mbit DRAM production plant and the company would be prepared "to contemplate a joint-production plant if Brussels were to agree with its vision of European electronics."

DASA, Jenoptik Carl Zeiss Form Opto-Electronics Firm for Space Research

Duesseldorf VDI NACHRICHTEN in German 06 Dec 91 p 18

[Text] Aerospace Company: Deutsche Aerospace AG in Munich and Jenoptik Carl Zeiss Jena GmbH have just set up a joint aerospace company in Thuringia, Jena-Optronik GmbH, with headquarters in Jena, which is intended to advance the expansion of aerospace activities in the new Bundeslaender. It is hoped in particular that the experiences of the Thuringian partner in the application of optics and electronics to space travel can be utilized. The company's future tasks include the construction of optic sensors and aerospace instruments, the erection of sensor systems for ground observation, and the marketing of data provided by these systems.

Aerospatiale in Nondestructive Testing Venture

92WS0284B Paris AIR & COSMOS in French 6-12 Jan 92 p 38—FOR OFFICIAL USE ONLY

[Article by J.B.: "Nondestructive Testing: Three Companies Create NDT Export"; first paragraph is AIR & COSMOS introduction]

[Text] Aerospatiale, Sogerma-Cocea, and Veritas are offering the services of their facilities and their teams to industries, airline companies, and government administrations.

On 17 December, the NDT Expert GIE [Economic Interest Group] officially saw the light of day. What do the initials NDT conceal? Merely the abbreviation for the English term: Nondestructive testing. The use of the English abbreviation demonstrates the intent of the GIE's three French partners to operate at the international level. Aerospatiale owns 51 percent, Sogerma-Socea 29 percent, and Veritas 20 percent, of the new company.

In taking on a juristic structure, NDT Expert is simply making official the cooperation the three companies have been providing in this domain for almost four years. NDT Expert will specialize in providing quick responses to its clients and making available to them specialized, competent teams, staffed to address and resolve the client's specific needs, and equipped with technical instrumentation available on the market. Besides on-site expertise by way of teams sent out expeditiously, NDT Expert provides training services to airline companies as well as time and motion and procedural studies. In the latter respect, Aerospatiale, itself a manufacturer of aeronautical equipment, makes available to NDT Expert the facilities of its Louis Bleriot Research Center, particularly in the field of studies on new procedures, and their evolution and interpretation. Sogerma-Socea, which specializes in modifications and heavy maintenance and repair of airframes, brings to the GIE the skills and know-how of operational teams geared to handle the trouble-shooting and repair needs of airline companies. The group's third partner, Veritas, provides its expertise to NDT Expert in the area of navigability of all types of aircraft, and in that of regulations and obligations vis-a-vis navigability authorities all over the world.

The demand for reliable, easy to interpret nondestructive testing, at a reasonable cost with respect to production costs, is growing. A symposium organized in Paris in December by the AAAF [Aeronautical and Astronautical Association of France] took stock of the research being done on NDT. Aside from the R&D aspects, operational ways and means were presented, together with real cases of use. Above and beyond "exotic" means such as Dassault's acoustic holography, Snecma's ultrasonic testing based on turnaround time, the shearographic method (measurement of deformations in a vacuum and under load) exhibited by the Laser Technology company, etc, the symposium endeavored to highlight the need to develop methods of interpretation of results, in the interest of enhancing ease of use.

Thomson-CEA Industrie Merger Criticized

92WS0294A Paris L'USINE NOUVELLE in French 02 Jan 92 pp 10, 11

[Article by Dominique Commiot: "Industrial Policy at an Impasse"; first paragraph is L'USINE NOUVELLE introduction]

[Text] The alliance between the consumer electronics firm and the nuclear company solves nothing. The first sector is barely keeping its head above water, while the second lacks any coherent strategy.

Edith Cresson resigned from the previous government in October, 1990 with the statement: "I think the political will to push forward an industrial policy is presently lacking." As acting prime minister for the last eight months, the decisions she has made on behalf of such a policy have been curious to say the least. To argue that the consumer electronics business of the Thomson group is closer to the nuclear industry than to defense electronics is dubious. Government authorities want an industrial policy. But without any clear definition of goals that are suited to the international economic context, the logic of their policy is anything but industrial.

On what is the government basing its policy? Thomson-CEA Industrie was created to counter deficits in whole segments of high-technology industries. France's trade balance is steadily worsening in computers and software, semiconductors, and consumer electronics. The situation is worrisome, and the desire to correct it is legitimate. Converging interests now make it possible to move things in that direction. Unfortunately, they are interests that have little to do with an industrial policy.

As proof, consider the four ingredients that helped put together the deal. The Thomson group's boss, Alain Gomez, has lost faith in consumer electronics. For lack of a clear and effective European policy to counter Japanese pressures, he no longer believes the Old World has a future in the industry. Gomez had been exerting pressure for several months to separate Thomson CSF's industrial electronics from Thomson Consumer Electronics's (TCE) products.

The second ingredient is Abel Farnoux, the 70-year-old former head of Videocolor (Thomson). Edith Cresson's special adviser has been dreaming of starting up an electronics subsidiary forever. He wrote a report on the topic for Pierre Mauroy's government back in 1982. Once admitted to the corridors of power, the prime minister's closest collaborator lost no time in getting his grand schemes underway again.

Although not short of arguments, Abel Farnoux needed an opportunity. He found it with the CEA, which is the third ingredient in the plan. Now that the nuclear program has shifted into a lower gear, the Atomic Energy Commission's staff of 20,000 is oversized and its organization ill-adapted. The fact that its big subsidiaries, Cogema and Framatome, are still under the control of their research centers is becoming absurd. The CEA has needed reforming for several years, but until now no one has had the political courage to undertake it.

The fourth ingredient is more traditional. The state shareholder has run out of money to finance the enormous needs of the national companies. TCE's hole amounted to 2.7 billion French francs [Fr] in 1990. Its high-definition television program should swallow up Fr9 billion, and recapitalizing the company should require another Fr6 billion. A response to the situation is urgently needed. But to avoid further deepening the budget deficit, the money had to be found elsewhere: in the overflowing coffers of CEA Industrie, for instance.

Bull will also make use of these slight-of-hand tricks, among others. The group lost Fr6.7 billion in 1990. Its deficit will undoubtedly exceed Fr3 billion in 1991, and it plans to invest Fr11 billion to develop a new computing architecture. In Bull's case, the government intends to dip into the surpluses of France Telecom, while simultaneously trying to persuade an American manufacturer to invest in the capital of the French computer maker. Hewlett-Packard and IBM are contenders, attracted not by the company's performances, but by its huge stock of installed equipment into which they can incorporate their own hardware should they become shareholders.

These moves have little to do with an industrial policy. Yet to hear the statements being made, such a policy does in fact exist. The trouble is, the government considers everything a priority: space, aeronautics, weapons, telecommunications, and computer science, in addition to nuclear power, microelectronics, HDTV, and on and on. By putting everything on the front burner, nothing really gets special attention.

The criteria for a true industrial policy should include protecting jobs, shoring up the trade balance, supporting technologies that will be widely incorporated and that are capable of bolstering the entire industrial fabric, and matching financial resources to policy goals. But the limitations of each of these objectives must be carefully measured.

When it comes to employment, the highly-automated production of television sets or electronic chips requires little manpower. Thomson produces 800,000 color televisions a year in its Angers factory with 1,500 workers. And 90 percent of its sets are manufactured offshore. This gives some indication how little support for these industries will pare the trade deficit.

Policymakers still need to establish clear priorities concerning widely used technologies. Scattered funding results in stalemates. France produces only 5 percent of the world's industrial wealth. It cannot do everything alone. Alliances—between firms for manufacturing and between states for market regulations and research—are essential. And the alliances must be formed first in Europe, which is certainly the most natural place for France to collaborate. Here, too, the advantages and dangers must be weighed. Sharing the risks of technological development can have negative effects. Certainly France's expenditures for public aeronautics research over the last 30 years have made Aerospatiale a great international group. But its German partner in Airbus Industries, MBB, has also acquired the capability to build jumbo jets, at less expense.

Finally, the state must use its power to regulate markets to entrench the competitiveness of national companies. State markets, standards, patents, the regulation of competition, and import quotas are all means to this end.

The principal danger of any industrial policy is the threat of technocracy. Nuclear power, the Ariane rocket, and Airbus demonstrate that, when it comes to business in protected markets, industrial policies lead to success. But when it comes to reaching millions of customers, on world markets open to the most savage competition, the know-how of CEOs counts much more than decrees.

Alcatel Components Subsidiaries to Merge

92WS0302A Paris L'USINE NOUVELLE in French 19 Dec 91 p 38

[Article by Jean-Pierre Jolivet: "Alcatel Cable Regrouping Distribution"]

[Text] The market is becoming concentrated. Electric power distribution dropped 10 percent this year.

Alcatel Cable is doing some house-cleaning in its electronic components distribution activities. As of January, its Dimacel and CGE Composants affiliates will merge to give rise to Dimacel Composants. This outfit employs 220 workers (including 130 commercial types) and will weigh in at Fr450 million, pushing its way to the front-runner in this field, right after the SONEPAR Group. "We had to take up our positions quickly in a market that is in the midst of a process of concentration,: said Michel Chapuis by way of explanation. He is an Alcatel Cable manager in charge of electronic distribution and logistics.

In regrouping its electronic distribution setup, Alcatel Cable will make good use of the complementary features of its two affiliates: passive components with CGE Composants, active and passive components with Dimacel. The former handles big customers and the latter is well established on the small and medium requirements market. This combined effort will enable Dimacel Composants to move into the lead among a potential 20,000 customers.

That is nothing to sneeze at. The new Alcatel Cable affiliate must face a market shaken up by the slowdown in semiconductor sales. Electronic distribution dropped 10 percent this year. Other threats are emerging on the horizon. Eurocomponents International, whose European focus as a distributor has gotten a big buildup, has just come to life. America's Avnet is getting ready to retake FHTec Composants (Fr430 million), which holds 13 percent of the French electronic component distribution market.

This situation made Dimacel Composants' managers firm up their positions. Today, the Group no longer hesitates to divest itself of its unprofitable activities.

CORPORATE STRATEGIES

Philips Streamlining Operations in France

Components Activities

92AN0043A Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 24 Oct 91 p 7

[Article by Didier Girault: "Philips Spins Off Evreux and Brive-la-Gaillarde Plants"]

[Text] Continuing a corporate reorganization begun in September 1990, Philips Components has decided to spin-off two unprofitable activities.

As a result of the "Centurion" streamlining program begun by Jan Timmer's headquarters, Philips Components France has decided to spin off its money-losing operations: photomultipliers and night-vision tubes at Brive-la-Gaillarde, as well as printed circuits at Evreux (ferrites and hybrids will retain their Philips Components label). Thus, as of 1 January 1992, the Brive-la-Gaillarde site (annual sales figure of 150 million French francs [Fr] and 350 employees) will take the name Philips Photonique; the printed circuits operations at Evreux (Fr400 million and 650 employees) will be renamed Philips Printed Circuits.

Forestalling any attempt to regard these spin-offs as a preliminary step toward a possible sale, Alain Le Corvec, general director of Philips Components France, nonetheless affirms: "If there were to be grave difficulties in printed circuits, which has not been the case for Evreux, it is certain that in the medium and/or long term we would take the steps necessary for the site to be profitable again and not become a millstone around the neck of the group."

The decision for the spin-offs was made by the operations executives. In the opinion of Alain Le Corvec, even if the printed circuit business were to take off again (through the increased use of double-sided and multilayer structures in the future), the existence of overcapacity (with equipment manufacturers/users, as well as in Scotland and Italy) seriously tempers the optimism which otherwise might be shown. Practically, for Evreux a review of the product range will be required. For Brive-la-Gaillarde, it will be necessary to resolve the problem caused by the "ups and downs" of the market for night-vision tubes destined for a "depressed" military sector. Finally, filing for bankruptcy or putting the subsidiaries up for sale cannot be ruled out.

These decisions were made at a time when semiconductor manufacturers were swearing by partnerships with large equipment manufacturers. Thus, they concentrated on mass production and tried to shed atypical cells incorporated over the years, which are too application-specific.

At the Caen plant, for example, Philips sold the solar panel production unit, now called Photowatt, to its

management; chip mounting for the production of memory boards passed into the hands of TRT [Radioelectric and Telephone Telecommunications Company].

More Tranquillity in Semiconductors

Philips seems more relaxed than at this time last year, when it announced the discontinuance of its SRAM [static random access memory] project. Speculation, then, about an arrangement with Matsushita was rampant. Today, having improved profitability, being sustained by its "downstream" divisions (lighting, communications systems, and consumer products), and being aware of the importance of components for the future, the semiconductor sector admits that it no longer has a gun to its head.

And if negotiations with Matsushita do continue, they are no longer in the same spirit. According to Alain Le Corvec, "there is no longer the impetus of September 1990." The company has always opposed merging the three largest European semiconductor manufacturers into one single entity because "the merger of the three majors would produce a creature carrying less weight than NEC, but endowed with three times as many industrial sites and R&D centers than the Japanese," observed Alain Le Corvec, who nonetheless said that he is prepared to "take part in well-defined projects," such as liquid-crystal displays, for which discussions are under way with the French Thomson and the British General Electric Company (GEC).

Two Types of Agreements

Philips is soliciting two types of agreements: the "pseudo-vertical" partnership agreements and the technology agreements. "One should not exclude the possibility of there being agreements which would not be capital investments," Alain Le Corvec said. Partnerships provide security: "Equipment manufacturers are the depositories of experience. The more contacts with each other, the better that would be for semiconductor manufacturers," explained Le Corvec. Also, the volume effect works in favor of such agreements.

[Box]

Critical Size by Product Segment

Rather than the theory of critical size, Alain Le Corvec defends the concept of "critical size by product segment." Thus, the general director of Philips Components estimates that for color tubes, the critical size is approximately 2 million units per year. He added: "The 5 percent rule applies to each product segment; and it is better to have 3 to 4 percent with well-defined components than 5 percent with a large range of products."

Semiconductors

92AN0043B Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 24 Oct 91 p 7

[Article by Didier Girault: "Philips Transfers Its CMOS [complementary metal-oxide semiconductor] and BiCMOS [bipolar-CMOS] Technologies to Caen"]

[Text] Yesterday, the bastion of bipolar technology, the Caen-based plant of Philips Semiconductors, is adapting the complementary metal-oxide semiconductor (CMOS) technology developed in Zurich and the bipolar-CMOS (BiCMOS) technology developed in Santa Clara to analog technology.

Integrated circuits should consume less and less power, operate at increasingly higher speeds, and integrate more and more functions in order to meet the demands of telecommunications, microcomputer technology, and the consumer market, given the current tendency toward portable or miniaturized equipment. In order to meet these requirements, Philips Components is starting up two new technological processes—CMOS and BiCMOS—at the Caen plant.

The 1-micron, low-voltage (1.5 to 6 V), large-scale-integration CMOS technology, named SACMOS [Self Aligned CMOS], has been transferred from the Zurich unit to Caen. It will be test-implemented in telecommunications and consumer products, according to Caen plant representatives, with a view to assuming mass production by the end of 1992.

Fr600 Million Invested From 1986 to 1990

The 1-micron, high-speed 13-GHz transitional frequency, quality BiCMOS (QUBIC) technology should be fully operational in early 1994. The version of QUBIC technology which will be utilized at Caen is a modification of that of Signetics (Santa Clara, California). It will be tested in high-speed logic circuits of the Futurebus+ type, for which Philips has teamed up with Texas Instruments. According to experts at Caen, these technologies have the advantage of being produced rather easily. Since 1986, 125-mm-diameter silicon wafers are used at Caen for their manufacture. This required an investment of 600 million French francs [Fr] over the 1986-90 period. So far the division has specialized in high-power and hyperfrequency bipolar circuits. Its favorite, "the jewel of 0.5- to 5-GHz technologies utilized on-site," in the opinion of division chief Jean-Pierre Regner, is to date the subnanosecond laterally oxide-insulated (SUBILO-N) process, a fully-tested process which was given a "face lift" in 1985-86 to give it analog capability.

SUBILO-N is used for the development of hyperfrequency (1 to 4 GHz) silicon transistors intended to operate in class C pulsed mode and in class A, A/B, and B continuous-wave (CW) mode with 1 W to 700 W in output power. These components supply the replacement market for radar tubes in the L-band (1.2 to 1.4 GHz) and S-band (approximately 3 GHz), the airborne

systems market (960/1215 MHz anticollision radar), and satellite telecommunications systems (radiolocation), a field in rapid expansion. In fact, Philips Components controls 9 percent of the global market for transistors operating at frequencies above 1 Ghz (estimated at $80 million) and 20 percent of the European market.

The SUBILO-N process is also used for the production of high-speed bipolar integrated circuits for the television, telephone, and mobile communications industries (Caen is the center responsible for mobile phone products), and for driver control/command systems (hard disks). In 1991, this activity alone should represent Fr525 million in sales revenues, showing a 10 percent annual growth (for overall plant revenues of Fr800 million per year). Sales for this sector have been made principally in Europe (60 percent). Officials at Caen hope to expand their Asian market share (30 percent at present) and, above all, that in the United States (10 percent). As for research, as of now it is concerned with developing new packages aimed at reducing on-card dimensions.

Siemens R&D Policy Analyzed

92AN0111 Zellik TECHNIVISIE in Dutch 20 Nov 91 p 11

[Text] Last 21 October, Siemens Belgium organized a workshop in Brussels about its R&D policy, under the motto: "Siemens Interaction With Academic Research."

This workshop was designed to elicit reactions from the scientific community with regard to possible forms of cooperation. In addition to joint projects with the Flemish Free University of Brussels (VUB) (development of copper electrolytes for the production of printed circuits), with the francophone Free University of Brussels (ULB) (development of digital relays), and with the Interuniversity Microelectronics Center (IMEC) (cooperation in the field of microelectronics), several high-technology research projects of Siemens' central R&D department in Munich and Erlangen were presented. Prof. Dr. H.G. Danielmeyer, head of the central R&D department, discussed the new role of science and industry within the context of technological evolution as well as Siemens' attitude toward this changing situation.

A Race to Keep Up

Science and industrial R&D have become a multibillion dollar business. Both the state and private companies are investing vast amounts in the development of new technologies. R&D expenditure is increasing year after year. Siemens' R&D effort also increased from DM3.3 billion in 1981 to more than DM7.0 billion in 1991, i.e., an increase of 10 percent per year.

Despite EC efforts to invest considerable amounts of money in a policy intended to boost crossborder cooperation in the field of research and development, Europe's competitive position in important technological fields seems to weaken. Europe's future welfare depends, to a large extent, on its advanced industry. The cost of rapid, expensive technological changes can only be recovered if the company concerned is able to acquire and hold on to the largest or second largest market share.

In order to reach the top, it is necessary to cooperate in the area of R&D with partners both in America and in the Far East. Present high-technology developments, for instance the development of a 64-Mbit DRAM [dynamic random-access memory] (a cooperative project involving Siemens and IBM), are unaffordable for a single company. Total independence is no longer possible not even in large and wealthy countries. However, a company should not run the risk of becoming dependent on others for its own key technology. With "strategic alliances" in the area of R&D, the art consists in balancing the risk of becoming independent against a fair cost- and effort-sharing scheme.

Focusing on Future Market Positions

Siemens has an R&D staff of 43,000 persons (compared to 41,000 during the fiscal year 1988-89), including 9,800 outside Germany. Most of them are working in the distributed R&D groups which are part of the divisions; 1,400 researchers are working within the central R&D departments located in Munich and Erlangen (Germany) and in Princeton, New Jersey.

The task of this central R&D department, which receives some 7 percent of the overall R&D budget (roughly DM460 million in 1990), consists in providing product divisions with up-to-date technological know-how needed to stay in business in the future.

As in most large companies, Siemens' R&D activity is market-driven. Siemens therefore defines "core technologies" for its central research. These technologies are selected for their strategic value for the company. They should eventually form the basis for substantial improvements in terms of added value and corporate profits; generally speaking, they should support the product development activities of the different divisions and ensure potential long-term growth.

Siemens aims at establishing a cost-efficient relationship between its central R&D projects and the results of its product divisions. To this effect, it has implemented an in-house assessment procedure to determine the core technologies which are essential for the company and to update them in terms of technology push and market pull, as detected by the divisions. At present, this set of core technologies includes some 20 technologies, subdivided into five, interrelated, main categories: materials processes and methods, components, software, networks, and systems.

These core technologies account for roughly 95 percent of the 300 different fields covered by the subsidiaries' R&D efforts. From the present (fiscal) year onward, Siemens' central R&D activity has been reorganized in line with these main categories.

The updating of the core technologies is the responsibility of the R&D committee, in which each division is represented by one person, i.e., the division chief. This steering committee is subdivided into working groups. One of them, the Innovation and Technology group, is making an interdisciplinary study to determine which new products can be made using existing technologies and which existing products can be adapted to other applications. This multidisciplinary cross-pollination should give a large industrial company such as Siemens an edge on companies which do not have this product range and which do not (cannot) apply such cross-pollination. The members of the working groups who come from the divisions are best qualified to transfer the central R&D department's technology to the subsidiaries.

External Cooperation

In order to successfully continue to function as the technological driving force within the company, the central R&D department closely cooperates with external technology and research sources, especially with universities and research centers. Siemens' central R&D department spends roughly 10 percent of its annual budget on cooperation with external partners.

In this regard, participation in national and European public programs is very important and generates 3 percent of Siemens' R&D income. For certain research projects, however, bilateral agreements are concluded with very carefully selected partners. At present, the central R&D department is involved in some 500 active contracts with external scientific partners from all over the world. In addition, there are agreements with more than 150 universities and technical institutes throughout the world. Finally, more than 200 researchers from Siemens' R&D department are simultaneously working as lecturers or associate professors at university training centers.

Cooperation with academic research centers, however, is not considered a substitute for internal competence build-up in the field of science and engineering. Quite the contrary, efficient R&D cooperation requires a well-balanced exchange of ideas and knowledge. Siemens is therefore looking for partnerships in those fields in which the company itself is doing very intensive research. Siemens' core technologies serve as a guideline. As industrial partner in cooperative R&D projects, Siemens has a vast competence to offer. However, it demands the same commitment and efficiency from the university partners as it does from its own research activities.

Research at Siemens Belgium

Within the Siemens group in Belgium, R&D expenditure rose to 3,300 million Belgian francs [BFr] in 1990. R&D occurs at two major centers in Flanders—in Ghent (switching laboratory) and in Oostkamp (production techniques, components, testing software, security techniques, etc.)—and at Siemens-Nixdorf plants in Brussels, Liege, and Namur. ATEA [Antwerp Telephone and Electrical Works] is also carrying out R&D in the field of exchanges, more specifically in the field of optics for telecommunications and software.

The central laboratory for production techniques in Oostkamp conducts the R&D for all Siemens companies throughout the world. It is also working on the improvement of processes for galvanic copper separation, especially for through-connections. The technique for the through-connection of rigid printed circuitboards is now under control and for the through-connection of thin flexible intermediate layers, an adequate horizontal feed-through installation is being developed. In addition, a basic research project is being conducted with a view to optimizing both the copper plating baths and the control on the effect of additives. Recycling methods are being developed for heavy metals (copper, nickel, lead, tin) and precious metals, in order to obtain a waste-free electroplating shop, which is environmentally safe and limits operating costs.

Another important activity, in addition to the laser marking of products, is the development of a SIL [Semiconductor Injector LASER] technology, which involves the manufacture of injection molded parts with integrated conductors. For this purpose, a three-dimensional plastic substrate is metallized using galvanic processes; the pattern in the metallic layer is applied using a laser. This metallization can serve as an electromagnetic shielding and/or for heat dissipation. It is an assembly-saving structure (the package serves as printed circuitboard) which can be further miniaturized. It is an ingenious combination of CAD [computer-aided design], plastic injection molding, surface treatment, and laser patterning.

Finally, Siemens is also involved in software development: It develops, on the one hand, tools (CAE [computer-aided engineering] system Sigraph-Design) and, on the other hand, information systems (interactive graphic process optimization for the Electromechanic Components division). A number of products is also under development, including low-frequency connectors with integrated capacitance filters, connectors for the automotive industry, high-frequency connectors, and miniaturized switches and keys for surface mounting (SMD).

In Ghent, software is being developed for private switchboards (PABX [private automatic branch exchange] "HICOM-200") and public telecommunications systems (subscriber services, call charging, and a database for the interconnection software for EWDSD [Electronic Digital Switching System] public exchanges).

Saab, Ericsson Merge Space Activities

92AN0115 Zellik INDUSTRIE in Dutch Dec 91 pp 27-28

[Text] In order to consolidate their competitive position in the growing European market for space equipment, Saab-Scania and Ericsson will be merging their know-how effective 1 January 1992. The new Swedish company, to be called Saab Ericsson Space, will be established in Gothenburg and will employ 360 people. The initial revenue is estimated at 300 million kronor ($46 million). Saab-Scania owns 60 percent of the company's shares, whereas Ericsson has a 40 percent interest. Saab's space department is the biggest supplier of space computers in Europe. It supplied, for instance, the board computers for the Ariane 4 and 5. At present, it is also developing the computers for the Hermes space shuttle and for the Columbus spacelab and is working on the observation satellites Spot-4 and ERS-2.

Ericsson is specialized in communications systems which make use of microwave technology and antennae. It will, for instance, supply this sort of equipment for the ERS-2 satellite. The formation of Saab Ericsson Space is considered as a first step toward closer cooperation between Swedish companies which are engaged in space technology. Volvo Flygmotor and the state company Swedish Space Corporation, which is in charge of the Esrange space research center, will also be involved in the cooperation program. During the last 10 years, Sweden carried out two important projects: the scientific satellite Viking (1986) and the telecommunications satellite Tele-X.

SGS-Thomson Seeks Customer Shareholders

92AN0123 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 28 Nov 91 pp 14-15

[Interview of Thomson-CSF CEO Henri Starck, by Jean-Pierre Della Mussia: "SGS-Thomson To Federate European Semiconductor Industry"]

[Text] Henri Starck, CEO of Thomson-CSF and vice president of the supervisory board, representing SGS-Thomson's French stockholders in this capacity, explains why this company is opening up its capital to customers.

ELECTRONIQUE INTERNATIONAL HEBDO [EIH]: You are opening up SGS-Thomson's capital to its customers. Why?

Starck: Before answering this question, we had better examine the overall semiconductor landscape and its development. The industrial landscape in semiconductors seems to me to present two major features: On the one hand, we note that production is increasingly being concentrated in the hands of a few big players in this field, essentially Japanese; on the other hand, these same big players are semiconductor branches of very large integrated groups operating simultaneously in several sectors of electronics: information technology, consumer goods, and telecommunications. The semiconductor activities in these large integrated groups, whose electronics sales vastly exceed $10 billion, represent $3 billion to $4 billion, i.e., between 15 and 30 percent of total sales. These groups have invested heavily in semiconductors because they have sensed that these are the prime movers of progress in equipment and that possession of this key to progress gives them a competitive advantage over their competitors.

Conversely, they constitute outlets for their semiconductors, which currently represent 30 to 40 percent of their production capacity. They thus have a greater stability to go through periods of crisis, as well as a financial base enabling them to invest continuously in R&D and production facilities, without cyclical jolts. The concentration movement is very profound since the market share of these big players in semiconductors has steadily increased by 5 percent annually, or 60 percent in 10 years. The first three groups in this field together already hold 24 percent of the world market, with approximately 8 percent for each.

In every new generation—they succeed each other every three years—investment thresholds in R&D and production facilities increase by more than 50 percent, and this movement is going to continue. We must anticipate that the three world leaders alone will control 30 percent of the market within five years and 40 percent within 10 years. In geographic terms, these data mean that Japanese industry, which already has 55 percent of the world market, will have 80 percent in 10 years.

EIH: What is the result of this for groups other than the large integrated ones?

Starck: We must distinguish between groups whose emphasis is on semiconductors and groups with marginal semiconductor activities. In any case, these groups operate only in one or two of the four fields: information technology, consumer goods, telecommunications, and semiconductors. Until now, concentration has been to the detriment of companies whose principal activity is in semiconductors. During the past 10 years, these have lost the market shares gained by the big players, with widely varying situations ranging from market share retention for some to disappearance for others. There is no reason why the movement should not continue.

The situation is different for electronic equipment industries with no semiconductor activity or only a little activity covering only a small portion of their strategic requirements. These industries acquire a large share of their semiconductors from the large integrated groups, which are their own competitors in information technology equipment, consumer goods, and telecommunications. This already worrying situation will rapidly become critical if nothing is done about it.

Indeed, the pace of innovation depends more and more on semiconductors. Can the industries I mentioned allow themselves to depend on their own competitors for

their innovations? Can they become increasingly dependent on them as concentration in semiconductors advances? As for the large groups that will have the key to semiconductors, will they not increasingly exploit their ceaselessly growing competitive advantage?

EIH: To stop this trend, you propose a federation around SGS-Thomson?

Starck: I am convinced that the tightening of links with SGS-Thomson is an appropriate way for users to maintain their independence.

The range of SGS-Thomson products and technologies covers a very significant share of electronic equipment makers' requirements. The establishment of partnerships—or the strengthening of existing links—with SGS-Thomson will offer them a solution to ensure that their strategic needs for semiconductors are covered. Such links can be established at several levels: development of products and technologies adapted to their requirements; joint products research; the making available of design rules; reservation of production capacity; priority or exclusive supplies, whereby the buyer guarantees a part of its purchases. If the equipment manufacturer himself has semiconductor activities, the partnership can be at the level of transfers of know-how or of activity.

The acquisition of a significant interest in SGS-Thomson is the closest form of partnership. It enables the partner to influence SGS-Thomson policy, the continuity of this policy, and the durability of the links thus strengthened. Such acquisitions of interest would establish concrete relationships between equipment manufacturers and a components producer, modeled after those which exist within large integrated groups, and it would give the partnership the capacity for innovation, the stability, and the dynamism that the integrated groups were able to create.

However that may be, there is no question of a uniform formula. The type of relations which SGS-Thomson can establish will depend on the partner considered, on the technologies and products involved, on whether the partner has semiconductor activities of its own, on the partner's supply and investment policy, and on its awareness of the danger emanating from the large integrated groups.

EIH: Up to what level could a "partner" enter into SGS-Thomson's capital, and how many partners could optimally be involved?

Starck: There is neither an ideal number nor a magic formula. The main thing is that the partnership should function. If I told you that I hope for the presence of five to seven stockholders coming in with 10 to 20 percent of the capital each, that would already be too Cartesian an approach.

We have already begun such discussions. But do not ask me where we hope to get with some company or other. Such projects must always satisfy the interests of both parties; the discussions are therefore arduous, and the best diplomacy is secret diplomacy. We can talk advisedly about an agreement only when it has been concluded. A fortiori, is it not vain and untimely to talk about it when conversations have not even begun?

EIH: Can you be a close partner with two competing companies, in information technology for example?

Starck: The problem is one of solidarity between them. In my opinion, they can have privileged links with the same semiconductor supplier, but it is up to them to form this opinion. You must distinguish between stockholders' relations and commercial relations. A semiconductor company cannot live without ethics: If a customer requests confidentiality, we respect it. I can tell you that we already have several cases of partnership with companies operating in the same field. To my knowledge, the fact that Thorn EMI took a 10 percent stake in SGS-Thomson's capital has not made the latter lose a single customer. I hope that the big electronic equipment producers will enter into SGS-Thomson's capital at a level reflecting the influence they wish to have. But we must be pragmatic.

EIH: What capital outlay does it represent to acquire a 5 percent stake in SGS-Thomson's capital?

Starck: Approximately $50 million. The company's consolidated net situation is actually $460 million. A contribution to the capital would be welcome because it would make it possible to reduce a debt that currently amounts to $900 million. A $500 million increase in capital, for example, would make it possible to reduce indebtedness to $400 million and accordingly the indebtedness/capital ratio to less than 50 percent. It would be a return to normalcy. But we are not up against the wall and our proposals of partnership are not solely aimed at a short-term financial operation.

EIH: Are you also looking for partners in the United States?

Starck: We consider Europe a priority, but the United States is not excluded. We have not made overtures to that effect.

EIH: In what respect is SGS-Thomson a better partner in semiconductors than others?

Starck: Let us first note that SGS-Thomson did not lose market shares at the time of its creation in 1987, nor since. This is a fairly rare situation for a Western company; it certainly highlights the complement between SGS and Thomson-Semiconductors at the time of its creation, and, above all, the quality of its management.

I will not go back over the company's progress. You emphasized it yourself recently. The operating result will be positive in 1992, and we have every reason to think that the authorities and the EC will continue to support our R&D efforts.

EIH: Where do your relations with Philips and Siemens stand?

Starck: Projects for closer relations have been studied. Our partners considered, at least in the short term, that it was too early to commit themselves. Contacts are being continued with Siemens for sector-based cooperation. As far as Philips is concerned, the memorandum of understanding concluded a few days ago clearly illustrates both the strategic nature of the subject and the diversity of possible agreements. The work done with Philips will fit in with the continuity of the studies already begun in Grenoble by SGS-Thomson, together with the CNET [National Center for Telecommunications Studies], and LETI [Electronics and Information Technology Laboratory].

Germany: Jenoptik Announces Medium-Term Investment Strategy

92MI0219 Bonn DIE WELT in German 15 Jan 92 p 14

[Text] "1991 was the year of total chaos; 1992 will be the year of new structures." Following the confusion of recent months, Lothar Spaeth now finds himself in a position to outline the course that Jenoptik GmbH of Jena will take in the future. The chairman of the three-strong board defines the company, which is wholly owned by the Land of Thuringia, as a technology holding company which will increasingly take on regional development functions.

The holding company covers 14 individual firms so far, a total which is intended to rise to 30. Its operational business consists of the optoelectronics, systems engineering, and precision manufacturing divisions, which employ a workforce of 1,050, and are scheduled to receive 18 million German marks [DM] in investments during 1992. Within the next 12 months Spaeth expects profits totaling DM100 million, commenting, "this is a large sum in view of our high research costs."

This sum includes the company's share of revenues from joint ventures with such prestigious partners as Sandoz AG of Basel, Rheinmetall AG of Duesseldorf, and German Aerospace (DASA) of Munich. In addition to these joint ventures, Spaeth also sees good medium-term prospects for a newly established eastern trading company. Moreover no other company in eastern Europe has such an extensive network, or expertise comparable with that of Jenoptik. For this reason, initial losses were built into the calculations so that the existing structures could be maintained.

The holding company still has 650 other employees, 50 percent of whom are engaged on winding up the former Zeiss factories, a process in which a significant proportion of regional development is involved. Spaeth has ambitious plans in this connection: "We have launched a DM250 million building investment program to cover the next four years. Jena will be a major construction site."

The next two years will see the main thrust of the quarter-billion mark program, which is hoped to attract private investment on a similar scale. A sum of DM125 million has been earmarked just for redeveloping the main factory in the center of the university city. The northern factory of the formal optics combine will be completely demolished, making way for a congress center [Saalepark]. Elsewhere, private investment is to fund the creation of an office and business center costing DM180 million.

Jenoptik will continue to run at a loss for the foreseeable future. Losses in 1991 exceeded DM600 million, with triple-digit millions again budgeted for this year. As Spaeth stresses: "It was important to press the Trust Agency for adequate capital resources. Our forecasts are that we shall not break even until 1995."

Thomson Consumer Electronics Future Discussed

92WS0294B Paris L'USINE NOUVELLE in French 02 Jan 92 pp 12-14

[Article by Dominique Commiot and Jean-Pierre Jolivet: "Consumer Electronics: The Slim Chances of France's Survivor"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Thomson Consumer Electronics is losing money, lots of money. Asian competition is steamrolling its profit margins. HDTV (high-definition television) will not save it.

There is reason to fear the worst for the future of Thomson Consumer Electronics (TCE). Its merger with CEA Industrie does not solve the underlying problems of the world's fourth-largest consumer electronics group. And the failure of Europe's strategy for high-definition television jeopardizes Thomson's tenuous plan to resist the crushing domination of Japan.

TCE, along with Philips and Nokia, is the last surviving Western company in the market. American, German, and British firms are all dead or have been absorbed. TCE's survival is a miracle that was orchestrated first and foremost by a great CEO, Paul Richard. Richard put the group together after Thomson-Houston merged with Hotchkiss-Brandt in 1966; he engineered its rapprochement with CSF (General Radio Company) in 1968. The attention that government authorities have showered on television ever since de Gaulle made the miracle possible. The Secam standard and import quotas kept the Japanese threats, which were directed first at the United States when color television arrived, at bay.

Consumer electronics has been a mainstay of industrial policy for over 30 years. The results have been mixed. Witness Minister of Industry Paul Dreyfus's cancellation of the tape recorder agreement with JVC (Matsushita) in 1981, the sorry failure of the "tricolor's" mini-stereo system marketed that same year, or the German Cartel Office's nixing of the takeover of Grundig in 1982. But when Thomson purchased RCA—the company that

invented color television—from General Electric in 1987, it gained international heft. It took the name Thomson Consumer Electronics at that time.

Today only 5,000 of the company's total workforce of 51,000 work on the French mainland. This compares to 2,700 at Sony France. TCE's sales doubled overnight when it acquired RCA. It had a turnover of Fr33 million in 1990, 11 percent of which it earned in France. And the group is now the top-ranking television vendor in the United States, with a market share of 20 percent. TCE makes eight million television sets and nine million picture tubes a year. It operates 40 factories worldwide, including six in France. The group ranks first in the United States and second in Europe for video equipment (tape recorders and camcorders). While Thomson had no color television set to offer in 1976, it now holds 11 percent of that world market.

Although the picture appears to be a glowing one, it is full of clouds. TCE is losing money, lots of money. It racked up Fr2.7 billion in losses in 1990, Fr1.8 billion for restructuring costs. The company's debt totals Fr10 billion, and its financial costs absorb 4.2 percent of its sales.

Competition from Japan and the four Asian dragons have flattened TCE's profitability. Thomson officials say that, under Japanese pressure, prices have dropped 12 percent yearly since 1985 in real francs. And the dollar's fall (15 percent in 1990) does not help the French-franc accounts of a company that does half of its business in North America.

The drop in prices follows the frenetic pace of Japanese innovations. "You dreamed it, Sony has brought it to life." The slogan of the top international company, which is 2.5 times bigger than TCE, perfectly reflects the ability of Japanese firms to translate technological advances into inventive products. They do it through religious and organized attention to the marketplace. At Matsushita Company, for instance, engineers from the research and development department work weekends at retailers in order to stay in touch with customers.

Consumer electronics innovations are very shortlived, often surviving less than three years. To make money on such "jet products," companies need an extremely efficient system of production. The system must be able to set up a sequence of operations very swiftly, and shift just as swiftly from one product to another. "The first year," explains a consultant, "we manufacture 400,000 units of a new product; the second year 8 million. And the following year we shift to another model." The system emphasizes a worldwide sales organization, which is the only kind capable of absorbing the huge volumes the companies produce. And it is backed by a highly focused policy of brand names. Sony has one brand, while Matsushita has two worldwide, JVC and Panasonic. Furthermore, the Japanese domestic market, which makes up 30 percent of the total world market, is practically inaccessible to foreign competitors.

How can TCE hold out? To varying degrees, Thomson lacks the Japanese ace cards. Unlike Philips, TCE does not have an innovative culture capable of rivaling those of the Japanese firms. That is its first structural handicap. The Eindhoven giant produced cassette tape recorders and compact discs. Now it is preparing the wave of the future with DCC audiodigital cassettes, or interactive compact discs, which combine a stereo system, microcomputer, and videodisc in one device.

Thomson, in contrast, has always been a follower. The company was formed in 1893 to exploit the patents of two American physicists, Elihu Thomson and Edwin Houston. This corporate culture of deliberate technological lag, combined with a powerful distribution network, succeeded well for the group in the 70s, when Paul Richard was at the helm. Now, however, it is compromising its future.

TCE is not initiating any of the new products that are responsible for the dynamism of the consumer electronics industry. It is inactive on the fringes, where new products (camcorders, portable tape recorders, etc.) are born. TCE began marketing its compact Saba camcorders in October, 1990, two years after Sony's Handycam came out.

The group is too highly concentrated in television, which accounts for 53 percent of its business, compared to 16 percent for Sony. As it happens, sales of television sets are declining in the United States and are stagnant in Europe. And even in the TV market, which should be its strong suit, Thomson is losing market shares, notably under the pressure of small-screen Asian manufacturers.

All these are unmistakable signs that TCE's manufacturing and sales organization is inefficient. The merger with RCA is proving especially difficult to digest. Four years later, the group's international restructuring is still far from complete. TCE has closed down four factories in Europe and opened two in Thailand and Indonesia. But staff cutbacks are still pending everywhere in the world except in France, where the company has already restructured. It will not reach its goal of saving Fr800 million annually for another two years. And TCE's new boss—Bernard Isautier, a 49-year-old graduate of Paris University X-Paris School of Mines—put his finger on the firm's marketing and sales inadequacies as soon as he took over 18 months ago. "My priority," he said, "will be to transform TCE into a market-driven company." The first step will involve rationalizing the overabundance of European brandnames, which include Thomson, Brandt, Teleavia, Saba, Nordmende, Telefunken, and Ferguson.

To counter these frailties, Alain Gomez attempted a poker play: Betting everything on high-definition television to beat the Japanese at their own innovation game. The long-term prize would include the chance to totally replace the world's stock of sets. These hopes have nearly been dashed by the European misunderstanding. Last 19 December, the EC telecommunications ministers backed away from immediately imposing the D2MAC standard

on satellite television broadcasters. Mandatory use of the standard has been postponed until 1995.

But Europe's whole strategy depended on the interim D2MAC standard. It was hoped that the D2MAC would immediately create a market for sets that would then be adapted for HDTV. Like Philips and Nokia, TCE was counting on implementation of the standard starting in 1992, when TDF1's and TDF2's live television satellites began operating commercially. The satellites were to inundate French and European households with better-quality pictures. This is far from being the case: The satellites, half of whose repeaters have failed, are drifting in the cosmos, while programs taped in D2MAC are scarce.

Meanwhile, Japan's NHK is broadcasting eight hours of high-definition programs a day. And between now and 1995, Japanese manufacturers will have the time to propose competitively-priced equipment based on the D2MAC standard. That is if they do not acquire the patents, when the Europeans are already selling them. The 16/9 Space System sets that TCE has been selling since March of 1991 for Fr30,000 will gather dust on the shelves. Yet HDTV has already swallowed up Fr2.8 billion in research and development costs and Fr1 billion in industrial investments.

TCE is no better positioned on the American HDTV front. The television of the future may just hoist local industry back into the saddle. General Instruments and the Zenith-ATT team are pressing the Federal Communication Commission (FCC) to opt for an entirely digital high-definition television in 1993. The digital technological leap makes it possible to transmit more information in a narrow bandwidth. Moreover, it relegates both the Europeans and the Japanese to the status of challengers. True, TCE and the David Sarnoff Center (RCA's ex-laboratory where color television was invented) are working on this technology in collaboration with Philips and the NBC station. But with two irons in the fire, Thomson is scattering its research and development expenditures (Fr1.8 billion, or 2.5 times less than Sony).

Furthermore, Japan's mastery of integrated circuits casts a shadow over non-Japanese HDTV ambitions. High-definition sets will contain over Fr1,000 worth of semiconductors (of which 70 percent will be memories), compared to a maximum of Fr250 today. It is hard to take up the gauntlet of HDTV while hoping to keep purchasing "sensitive components" from Toshiba, NEC, Hitachi, or Matsushita! Stresses a TCE engineer: "The Japanese have already stopped delivering the most recent components we need to manufacture our new tape recorders."

Much remains to be done to achieve technological independence. The challenges range from developing image-compression algorithms, to devising signal processors, digital memories, liquid-crystal display systems for very large TV pictures, and CCD sensors (for portable cameras). The Europeans, who have focused on the standards battle rather than on market expectations and upstream technology, are losing the game.

Technologically, industrially, and commercially, incorporating Thomson Consumer Electronics into CEA Industrie solves nothing. The group may gain access to the financial resources it needs to survive. And TCE's needs are colossal: Fr9 billion over five years for research into HDTV, which it is developing with Philips, plus Fr6 billion over three years for vitally needed recapitalization.

For now, a far-fetched notion sums up the industrial plan behind the merger. "The nuclear industry is closer to consumer electronics than industrial electronics is," asserts Abel Farnoux, Edith Cresson's special advisor. This is pure political rhetoric. Actually, the nuclear industry involves a solid technological base and a handful of customers. Televisions and camcorders depend essentially on millions of customers, and thus on marketing and sales. It is an entirely different ballgame, wholly unfamiliar to Jean Syrota, the 55-year-old X-Mines graduate who will take over the reins of CEA Industrie while remaining president of Cogema. And while the new structures are being set up and the merger is being digested, the Japanese will be able to corner the quarry.

French Chips Under One Banner

If there is an industrial synergy to be found in the CEA Industrie/Thomson Consumer Electronics/SGS-Thomson merger concocted by Edith Cresson's advisors, the only likely place is the manufacture of components. The centerpiece of the edifice—which recreates, although no one admits it, the electronics subsidiary dear to Abel Farnoux's heart—is LETI (Laboratory for Electronics and Data-Processing Technology). The CEA's microelectronics laboratory employs 835 people, 45 percent of whom are engineers and 43 percent technicians. It has an annual budget of Fr630 million.

LETI's potential is especially keen in CMOS (complementary metal-oxide semiconductors) circuits, in which the laboratory was a forerunner back in 1963. Moreover, the CEA laboratory is working with SGS-Thomson to develop submicronic technologies. The Franco-Italian chip manufacturer awards over Fr100 million in research and development contracts annually to LETI, virtually making it one of SGS-Thomson's research laboratories.

LETI is also helping to develop the next generation of semiconductors within GRESSI, which is the consortium created with the Grenoble Norbert Segard Center of CNET (National Technical Studies Center). Semiconductor technology must master 0.35- and 0.25-micron etching by 1995. The task has been coupled with the Grenoble 92 program, which teams CNET and SGS-Thomson and aims to perfect the industrialization of 1-micron chips.

Another LETI strong suit of interest to Thomson Consumer Electronics is display techniques. Thomson is especially interested in flat screens, and the promising technology of cathode screens featuring 2-mm thick microdots.

Of course, Thomson Consumer Electronics has presently opted for the liquid crystal technology that it bought from General Electric. It has even invested Fr100 million, in collaboration with the group's military branch, in a new, exclusively liquid-crystal factory at Voreppes-Moirans, near Grenoble.

Given the difficulty of developing large screens, however, LETI's technology could be the alternative to liquid crystals.

All these synergies argue in favor of merging LETI with Thomson-CEA Industrie. There is one limitation, however: Over a third of LETI's contracts are defense related.

Sales, Production Plans of Deutsche Airbus

92WS0323A Duesseldorf HANDELSBLATT in German 31 Jan-1 Feb 92 p 23

[Article by Lutz Beukert: "Producer Sees No Fault in the Design"]

[Text] HANDELSBLATT, Thursday, 30 January 1992 HAMBURG—Helmut Mehdorn has identified a change in the aircraft construction trend. "We will be delivering more aircraft again this year than we will be selling," the chairman of Deutsche Airbus GmbH, Hamburg, forecast in a conversations with Handelsblatt.

Mehdorn refers to the fact that in the current year Airbus will deliver about 160 aircraft, while only 130 new orders were taken in the same period. The high number of aircraft (952 as of the end of January) previously contracted for will be further reduced.

In the light of developments in the airline companies, the production plan up to 1994 will now be subject to monthly checks. Presently, the plan calls for a monthly production of 10 A 320/321, four A 310/300, and up to six A 330/340 aircraft. The current monthly production rate in Hamburg is 15.5 units. The tempo is anticipated to pick up, Mehdorn reports.

The trend to deliver more and sell less set in last year. The airlines are confronted by a decreasing number of passengers due, on the one hand, to the Gulf War and, on the other, to increased taxes, personnel and fuel costs. All of these difficulties are compounded further because of sharper competition. For Airbus, the prevailing market situation resulted in 163 aircraft being delivered last year, while only 101 new aircraft orders could be entered in the books.

Still, Mehdorn is proud of what was accomplished in 1991. The company was able to offset the unexpected drop-off in contracts through new customers. Included here, among others, are the 12 aircraft produced for Trans European Airways, but which the company did not buy.

Now including the three MBB and Dornier plants in Laupheim, Speyer, and Neuaubing near Munich, which have belonged to Deutsche Airbus since mid 1991, the company should have a turnover of about DM5.4 billion in the current business year, as against DM4.3 billion in 1990. The profit in 1991 is on the order of about DM400 million, as against a loss of DM376 million in 1990. Consequently, the loss carried forward from previous years of DM1.7 billion has been able to be reduced. The Airbus chairman is very satisfied with how the three production sites in south Germany, which previously had not been oriented to the Airbus line, have been integrated in the Airbus family. The south Germany plants clearly understand that Deutsche Airbus constitutes a unified group. Mehdorn elaborates: "When it goes well for us, it goes well for all ten production sites with their 23,000 employees. If it goes bad for us, it goes bad for everyone. We do not have separate north and south German plants."

Mehdorn confirms the fact that to effect the south's absorption into Airbus, a yearly production volume of 700,000 man-hours was shifted out of the north German and into south German plants. Moreover, an additional 100,000 man-hours could be added from foreign production sources or which, owing to the previous domestic lack of capacity had to be produced elsewhere.

The program for the construction of the A 321 is currently running full speed ahead in Hamburg. The first fuselage and wing-parts are to be assembled in June. The first flight of the small Airbus, for which 140 orders from ten companies now exist, is scheduled for mid March 1993.

The A 320's streak of bad luck—including the recent crash near Strassburg—obviously worries Mehdorn. Of the 251 aircraft delivered, three have been lost. Two the three losses could be attributed to human error. The Strassbourg incident also points in that direction. Mehdorn can detect no fault in the design of the aircraft. His confidence is buoyed by the fact that to date no airline has withdrawn its order for the aircraft. However, the official report of the investigation has not yet appeared.

EAST-WEST RELATIONS

Siemens, Czech Skoda Form Joint Skoda Transportation

92MI0191 Bonn DIE WELT in German 21 Dec 91 p 8

[Text] Siemens AG of Berlin and Munich has scored a twofold success with the Pilsen-based Skoda company. Just a few weeks after the south German electronics giant announced its power engineering joint venture with Czechoslovakia's largest manufacturer of engineering

plants and machinery, they have followed with a joint transport engineering venture.

Next year, Siemens' transport engineering division and Skoda's transport division plan to establish the joint venture company "Skoda Transportation," in which Siemens will have a 51 percent majority holding. The intention is to "involve" the companies that make up Siemens transport engineering group: Krauss-Maffei Transport Engineering GmbH of Kiel and Essen, and the freight car builder Dueway AGH, of Krefeid, with Krauss-Maffei and Krupp acquiring parts of Siemens' shareholding.

Siemens' second success with Skoda places the German company unambiguously up with the front-runners among the world's major transport engineering suppliers: Siemens will soon be in third place behind its main competitors, GEC-Alsthom and ABB, each of which has worldwide sales of around 3 billion German marks [DM] in this sector. The Munich company's transport engineering division currently has sales of around DM2.5 billion, though Skoda's transport sector will add business worth at least another DM250 million.

The new Siemens/Skoda joint venture's business is estimated at around $100 million. Skoda gave the fact that Siemens had made "the most financially attractive offer" as one of the reasons for accepting its bid, though the German company's open-minded attitude to technology transfer was also a decisive factor. A spokesperson for Siemens stated that the company's acquisition of Skoda's locomotive sector was designed to "increase its involvement in existing eastern European markets." There were also plans for a rapid expansion of Skoda's subway train construction business.

ABB, Siemens' fellow bidder for Skoda, was not forthcoming: "We made a good, economically viable offer, beyond which we could not go," said spokesman Magne Roehe at the company's Zurich head office. He declined to comment on rumors that, as Siemens and ABB had frequently been partners in corsortia, most recently in developing the ICE [Intercity Express], ABB still had access to Skoda and the eastern European market through the "back door."

Volkswagen Bratislava Begins Operation

92MI0192 Bonn DIE WELT in German
23 Dec 91 p 10

[Text] The first two Volkswagen Passats to leave the Bratislava assembly line on Saturday are regarded by the Wolfsburg automobile group and the government of the Slovak Republic as the start of a partnership that will bring benefits to both sides. Less than a year ago, it still remained uncertain whether VW would even get a chance with truck manufacturer BAZ [Bratislava Automobile Works]; however, a revised bid by VW led to resumption of talks and eventually to the establishment of the "Volkswagen Bratislava Spol, s.r.o." in May, 1991.

Assembly of Passats in Bratislava, initially conceived as a training phase that will not be extended to CKD [completely knocked down] production with an annual output of 30,000 cars until 1993, accounts for only part of the total project, however. Alongside construction of the assembly lines, VW is setting up a gearbox factory intended to produce 1,400 units a day, or in other words, 350,000 complete gearboxes per year from early 1994; VW Bratislava will then be "the most modern gearbox factory in the world," said VW board chairman Carl H. Hahn, on Saturday. He added that work would start as early as summer 1993, with an output of 600 gearboxes and clutch housings a day; these components would be fully absorbed by the group and supplied to the VW factories in Wolfsburg, Moselle, Brussels, and Mexico, and to its Spanish subsidiary SEAT. Bratislava would thus become an important source of foreign currency for the country.

VW holds 80 percent of the company's present share capital of 60 million German marks [DM], BAZ having a 20 percent holding, though the Slovak company has also made investments in kind. Further capital investments of DM140 million in 1992 and 1993 will bring VW's stake up to 94 percent of the share capital. Investment in vehicle and gearbox production will rise to around DM860 million by 1995. By the time it achieves its planned production levels, the company will have 1,500 employees, 700 in the automobile works and 800 in the gearbox factory.

While he was in Bratislava, Hahn indicated that VW's involvement in Slovakia had originally had "quite differnt purposes" from vehicle manufacture: VW's revised strategy would however also provide potential capacity for the anticipated expansion of the automobile market in eastern Europe, for which Bratislava's favorable geographic position made the city "the right strategic location."

The new Passat is currently being produced only in Emden and Brussels; the previous model is still being built in small quantities in China and Brazil. During the year now ending [1991], domestic production of Passats increased by 40,000 to over 388,000 cars, almost one in every two of which was a non-basic model. Forecasts of demand suggest a doubling of car sales to 1.8 million units in the former COMECON countries (excluding the Soviet Union) by 1995. The vehicles assembled in Bratislava will initially be sold in western Europe and Czechoslovakia and subsequently in the other eastern European countries. Expansion of production capacity to 150,000 cars is considered conceivable if demand rises accordingly.

Siemens Awarded Major Slovak Electricity Corporation Contract

92MI0214 Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN
18 Dec 91 pp 25-26

[Text] The power generation division (KWU) of Siemens AG, in Berlin and Munich, will supply Siemens' process

control systems for blocks 3 and 4 of the Mochovce nuclear power station now in construction. Siemens/KWU had been awarded a similar contract for blocks 1 and 2 of the same plant a year ago. All four units, all equipped with pressurized water reactors of Soviet design (model WWER-440/V213), have an output of 440 megawatts. They are due to start commercial operation between 1993 and 1996. Siemens was awarded both contracts by the Slovak electricity board, SEP in Bratislava. Siemens/KWU will perform this new contract in close cooperation with Czechoslovakian suppliers and, engineering and assembly firms.

Process control is, so to speak, the reactor's "nervous system," it includes the power station's automation systems and governs the metrological monitoring devices and plant control systems during normal operation and in the event of failures. It is essential to the safety of a power station.

Eight nuclear power plant blocks (Bohunice 1-4, Dukovany 1-4), each with an output of 440 megawatts, are in operation in Czechoslovakia. Four units on the same scale are in construction in Mochovce, while two 1,000-megawatt blocks are being built in Temelin. Since the early 80s, Siemens/KWU has supplied various components for the 440-megawatt plants, mainly monitoring systems and maintenance and inspection equipment.

Siemens AG also cooperates with Czechoslovakia in a joint power generation venture with Skoda Plzen and Skoda Prague. The three companies signed a framework agreement in Plzen on 25 November 1991. Skoda's negotiating team had availed itself of the consulting services provided by Consultant KPMG [Klynveld Peat Marwick Goerdeler] and International Finance Corporation (IFC), an associate company of the World Bank. The agreement is still awaiting approval by the government of the Czech Republic. This joint venture will supply fossil-fuel powered plants and nuclear power stations, hydroelectric generators, and modern environmental protection systems for power stations and waste disposal plants. In all these sectors, the joint venture will provide a full range of services, from design to planning and turnkey delivery, from marketing to servicing. Siemens/KWU's share in the new venture, provisionally named "Skoda Energy," will be 67 percent, while Skoda will hold a 33 percent share. Part of Siemens' share is expected to be taken over by Paris-based French reactor producer Framatome S.A., which has been working with Siemens/KWU on reactor development since 1989.

Mr. Ladislav Novotny and Mr. Ivan Vlasa, the general directors of, respectively, Skoda Plzen and Skoda Prague, express the same conviction: "Skoda Plzen and Skoda Prague have both chosen Siemens as their strategic partner in the development of their energy business because Siemens, together with Framatome in the nuclear station sector, offers the best prospects for developing power station business at the international level: business divisions with worldwide competitiveness, advanced technology, and outstanding product know-how. This joint venture will help us bring our power stations in northern Bohemia up to the requisite environmental protection standards and to solve other pressing environmental problems facing our country."

Hungary: Siemens Telefongyar Kft. Joint Venture Established

92WS0271A Budapest MAGYAR ELEKTRONIKA in Hungarian Nov 91 pp 6, 7

[Interview with Gabor Beke-Martos and Gunther Janak by Bela Laczko: "The Siemens Telefongyar Kft."]

[Text] Since June of last year our readers could have been following in the columns of our journal the activities of Siemens in connection with the Hungarian telephone system. We also reported that Siemens—with the Telefongyar [Telephone Factory], picked out as its Hungarian partner—has prepared grand plans not only for the manufacture of EWSD exchanges but also for modernization of the entire factory. After a long series of discussions with the Property Agency, a new mixed enterprise was formed on 1 September. Dr Gabor Beke-Martos, director general, and Gunther Janak, technical director, briefed us on the creation of the new enterprise and their developmental plans.

Gabor Beke-Martos: Siemens Telefongyar Kft. [Siemens Telephone Factory Ltd.] was formed officially on 1 September 1991. The majority share is that of Siemens, a smaller share is that of the Hungarian state, represented by the Property Agency. The Siemens share is also a composite one—Siemens Austria provided the majority of the base capital but Siemens Magyarorszag Kft. [Siemens Hungary Ltd.] is also a capital partner. (Siemens Magyarorszag Kft. is a 100 percent Siemens interest.)

The intent of Siemens was always straightforward—to strive for majority ownership—and the Property Agency accepted this. In the course of the discussions the concrete division of shares developed to the full satisfaction of both sides. The founding of the enterprise actually consists of two parts—an augmentation of the base capital of the existing Telefongyar, which Siemens provided, and purchase of a part of the state property. This means, ultimately, that all the earlier property of the Telefongyar, its full value and its burdens, is transferred to the new enterprise.

MAGYAR ELEKTRONIKA: I must ask a question. Is it now a subsidiary belonging to Siemens Austria, or should this deal be viewed differently?

Gunther Janak: Siemens Austria signed a contract with the Munich center of Siemens that it would figure in this enterprise as a partner. The responsibility and task of Siemens Austria—beyond the fact that it participates in this enterprise with its capital—is to support the creation of a Siemens type enterprise. This means both organizational and technical tasks. All the functions of a Siemens

undertaking must be built up here; this is a complete vertical structure from development through manufacture to marketing and service.

They already have experience in Austria in connection with building this vertical structure, the situation was similar there when they adopted EWSD manufacture. We are bringing this experience into Hungary.

In the first phase the tasks are primarily organizational. The structure to be built is the usual Siemens organization; it will include manufacture, marketing and a central and a decentralized economic guidance organization. The basic rule is that a technical expert and an economic expert work together on every theme. Siemens Austria will bring significant forces from its own expert staff into the Telefongyar; in the short and medium term they will provide guidance in the chief functions. In the long term they will be withdrawn and give their places to trained Hungarian colleagues who will carry on the business of an enterprise built up on the Siemens model. But we must also note that there are also two experts from the Munich center who will act here for a shorter time.

MAGYAR ELEKTRONIKA: Can we learn something about the makeup of the leadership?

Gabor Beke-Martos: The leadership consists of four people. Peter Hetenyi is responsible for marketing, he is one of the directors of Siemens Magyarorszag Kft.; Mr. Gunther Janak is technical leader, from Siemens Austria; Dr. Harald Wasserburger provides the economic leadership; and I take care of coordination and the legal, personnel and information tasks, as director general of the enterprise. Someone from the Telefongyar works with every foreign colleague, providing local information for execution of the tasks.

Gunther Janak: The chief task in my area, development, for example, is to convert the well trained Hungarian developmental engineers to a different methodology. The same is true of production; there is need for new technologies and new leadership methods if this is to be a Siemens enterprise. And we can also say this of the economic leadership, here also they must convert to an accounting system on the Siemens model.

MAGYAR ELEKTRONIKA: I am very happy that there will be development here also. I would like to hear Mr. Janak speak in a little more detail about this, as leader of this area.

Gunther Janak: One of the essential elements of the developmental structure is that a group had to be created to adapt the EWSD system to Hungarian conditions. Installation of the first exchange, which Siemens is installing in Gyor, was done by the Munich center. More exchanges must be installed in Hungary this year, and they must be installed by a Siemens Telefongyar team. Accordingly a three man staff is already working on these tasks in Vienna.

Later we will establish at the Telefongyar a complete software development team, with the appropriate infrastructure (a large central computer and workstations for the developers). People from Siemens Telefongyar Kft. will take over significant developmental jobs as requirements increase on the user side and as new versions of EWSD require this. According to the plan Siemens Telefongyar will assume so-called system responsibility beginning in 1993. Naturally this means all user services.

The other developmental branch is transmission technology. The Telefongyar has a past and a present in this branch. Existing orders must be satisfied with the products of the Telefongyar but later we want to adapt Siemens products here also. Developmental tasks will derive from this as well. We are also trying to get development contracts from Siemens Munich.

In addition to the two main developmental areas—which are basically product oriented—we would like to create what is essentially a software house within the enterprise. This will deal with all data processing tasks whether they are communications engineering or general data processing problems. There is such a software house in Austria too, which works with 2,200 people and is the largest of its type in Europe. We want to develop something similar to this in Budapest. In the beginning we would like to get contract assignments from the Austrian software house but later it would be good to survey and satisfy the needs of the Hungarian market. Now we have begun with 15 people and the medium term goal is 100 people.

MAGYAR ELEKTRONIKA: Permit me one more question! On the way in I saw the Dunatel table. Does this firm still exist?

Gunther Janak: My personal opinion is that Siemens will liquidate this firm and since it was created by Siemens Munich they will be the ones to do it. At the same time it is important that the authorizations which this firm received be transferred to Siemens Telefongyar Kft. Legal continuity is important here.

MAGYAR ELEKTRONIKA: Gentlemen, I wish you much strength and good health for your work!

France's EDF to Install Environment Monitor in CIS

92WS0298C Paris AFP SCIENCES in French 12 Dec 91 p 22

[Text] Paris—Electricity of France (EDF) has just signed a contract for 15 million French francs [Fr] to set up an environmental-monitoring network in Belorussia.

It signed the contract with the Russian Ecological Research Institute Oural-Energo-Tchermet. The Russian and Belorussian authorities agreed to assign the Institute the task of devising a system to monitor the radiation in their environments following the Chernobyl accident.

Sofratome, which is the joint subsidiary of EDF and the Atomic Energy Commission (CEA), will execute the contract.

EUROPE-ASIA RELATIONS

Japanese Firms to be Granted D2-MAC Licenses

92AN0042 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 24 Oct 91 p 6

[Article by Michel Heurteaux: "D2-MAC: Europe Opens Its Doors to Japan"]

[Text] Japanese firms are signing licensing agreements to produce D2-MAC television sets. Have the Europeans let the cat in with the pigeons?

Not so long ago, some people within European business circles pondered over the necessity of D2-MAC as an interim standard to achieve high-definition television (HDTV) by 1995. This technological choice has just been validated by the Japanese themselves, since it appears that they have already negotiated several licensing agreements with European manufacturers. Yet unconfirmed by the parties involved, these agreements were supposedly concluded within the framework of the "MAC Paquet" economic interest group (EIG), which, besides Thomson and Philips, includes France Telecom, Telediffusion de France, BBC, and British National Transcommunication Ltd. They will authorize Japanese manufacturers to build TV sets using D2-MAC technology.

According to the information at hand, license fees have been set for three different cases: ECU3.6 per TV set if the licensee is a group of European origin; ECU5.7 for foreign firms with European-based production plants; and ECU8 for manufacturers outside the EC. Income from these licensing agreements will be collected directly by the MAC Paquet EIG and distributed in equal shares among its members. With the market surge expected for the TV of the future, these royalties could become a regular gold mine for the European audiovisual equipment manufacturers and could partly pay off their R&D costs.

Even if such agreements are worthy in that they reinforce the standard itself, are they not a potential menace for the European audiovisual industry in the longer term? Knowing that the Japanese have already acquired PAL licenses and that the latest agreements will enable them to make inroads in the D2-MAC market, the question is a serious one. Far from wanting to counter the Europeans in terms of standards, it seems that the Japanese seek to exploit all existing standards, as exemplified by Sony during its "Sony World" exhibition in Paris, where they presented a 16/9-format multistandard prototype working equally on the PAL-Secam, NTSC, and D2-MAC standards. It seems that the true battle, as seen by the large Japanese groups, will not be fought on the technological ground—the Japanese MUSE standard against HD-MAC—but rather on the commercial ground.

European Technology Can Really Be Exported

Meanwhile, the CGT [General Labor Confederation] union at Thomson has voiced strong warnings regarding the group's strategy, stating that "the tendency is growing stronger and stronger, after having succeeded in imposing the D2-MAC standard with the help of the public authorities, to relinquish all or part of hardware production to Asian manufacturers against sizeable royalty profits."

The management takes a much more serene look at the real consequences of such agreements, especially the commercial ones. There is no particular concern about large-scale competition from license-built products since Japanese manufacturing costs are practically equal to those in Europe. Another positive aspect of the matter, according to Thomson, is that European technology would be able to demonstrate that it really can be exported.

Japan: Sharp Director on European Penetration Strategy

92AN0093 Nanterre LA LETTRE DE L'INTELLIGENCE ARTIFICIELLE in French Nov 91 pp 16-18

[Interview with Yukata Wada, Sharp's Senior Executive Director for International Affairs, published in MAINICHI SHIMBUN of 3 September 1991: "Sharp: Initial Step of Japanese Artificial Intelligence (AI) Laboratories in Europe"]

[Text] Sharp, a worldwide manufacturer of consumer electronics and office equipment and also known for the quality of its liquid crystal display developments, is one of those Japanese companies with worldwide operations based on a strategy of internationalization. Last year Sharp established "Sharp Laboratories of Europe" in the UK, which focus on research and development in the fields of artificial intelligence and optoelectronic technologies. In artificial intelligence, they work in particular on natural language and automatic translation. Thus, Sharp is one of the Japanese pioneers in R&D decentralization. According to Yukata Wada, the company's executive director for international affairs, commercial blocs now are counterproductive because they are inevitably exclusive. While insisting that Sharp has a lot to contribute to the various countries of the world, he also would like to see foreign companies contribute to the development of Japan.

Question: What is your view on the integration of the European market?

Wada: The formation of an integrated market in the European Community in 1992 will constitute an achievement without precedent, not only for the

member states, but also for the neighboring countries, which will also feel the consequences. This common market will stimulate economic activity in Europe and will be beneficial to the world economy.

Question: What is Sharp's current position in Europe?

Wada: Strengthening its activities in the regions or countries in which Sharp is already established is one of the company's basic principles. The reason for it is the same, whether in Japan, Europe, or in the United States. We want to be able to plan, design, manufacture, sell, and offer after-sales service in the areas where we have the largest number of customers. If we can do this, we will be able to offer our customers products and services that will satisfy them. To this end, we commit ourselves to the countries in which we have activities and try to gain a strong foothold on these markets. First we established sales offices in Europe. Now we also have four plants there. The first was set up in Wales in 1986 and was called Sharp UK. We started by manufacturing video recorders and electric ovens there, and then photocopiers and compact disc players, among other things. In 1986, we also created a television set manufacturing plant in Barcelona, Spain. Two years ago we started manufacturing digital television sets there, and this plant has now become our main development center for this product. It has been a big commercial success in Europe. It should be noted that development of digital television in Barcelona is not only meant for Japan, but for the entire world.

We are also in the process of building a new plant on the same site, which will become operational in April 1992. In another European plant which was created in 1988, we manufacture office equipment, fax machines, and photocopiers. At about the same time, we created "Sharp Precision Manufacturing" in Wales for the manufacture of precision molds. This plant was established in line with our policy of local industrial context. This means that we procure parts, components, and materials locally. Finally we set up a laboratory in Oxford to strengthen our policy of offering the best possible products to our customers. After having found a product that is suited for a market, after having designed, manufactured, sold it, and offered after-sales service for it, what was there left to do? We created this laboratory to capitalize on the research and development possibilities of the European market. The reason for the creation of this laboratory is, in fact, twofold. First of all, we hope to be able to develop products which are, or can be, manufactured in Europe in the plants currently at our disposal. Second, we want to conduct research in the fields of artificial intelligence, optoelectronics, and mobile telecommunications, in the hope that the discoveries will benefit Sharp throughout the world. Organizationally, Sharp has quite a range of functions which could be represented vertically. In Europe we try to transplant and bolster these functions horizontally. Having done this, it is not our intention to pile up more and more functions at the top, but rather to mix them and become a part of the local environment.

Question: How long will it take for this philosophy to become well implanted?

Wada: We believe that there are several fields in which we are comparable with our colleagues of Japanese industry, but our basic aim is to follow a policy of internationalization. We are thus in the process of reaching for this goal in certain geographical areas. Twenty years ago, everything was made in Japan—development, design, manufacture, sales, everything—and then exported to the world. When we created production sites abroad and manufactured products that were suited for the local markets, this was considered a form of global approach. Today, however, we do not consider the simple manufacture of products in a plant to be a global approach. On the contrary, we think that a real policy of internationalization consists in the vertical integration of development, design, manufacture, research and development, sales, after-sales service, and corporate image building. This process will be complete when we achieve vertical integration and horizontal development. From this angle, I think that, in order to be global, you also have to be local.

Question: Was there an urgent need that pushed Sharp to develop its organization in this manner?

Wada: I do not know whether one can say that it was necessary, but the needs of our customers pushed us in this direction. Another aspect to be taken into account is that our company had arrived at a point of development which made it possible for us to go on with these changes.

Twenty years ago, even if there had been a need for creating an integrated worldwide network of subsidiaries working locally, we could not have done it. We did not have the capacity for it. Step by step, we have become a stronger company and our products can now be found everywhere. Our products have thus gained broader recognition, and we have been able to make improvements to them as needed to satisfy our customers. We also believe that, by becoming an integral part of our local markets, we can make a better contribution to the economy and to society. We have gained the trust and support of governments in the regions in Europe where we are. Before creating the Oxford Research and Development Laboratory, we passed the idea on to the European Commission, which encouraged us a lot in our plans. Similar support has been given to us by the UK Minister of Commerce.

Question: It seems that the establishment of an R&D center in Oxford gives you a head start over your competitors?

Wada: Yes, it appears that we are the first to create such a research and development center. In fact, we discovered that a Science Park was being built in Oxford at the very moment when we were looking for a site for the possible building of the laboratory. But we were not looking only in Europe. I believe that there is a lot of exceptional and exciting research going on in Europe,

and this constitutes a good opportunity for us if we can take advantage of it. We also believe that we ourselves can make a major contribution. This combination should yield good results.

Question: The European economies have experienced a very low growth rate this year. Has this affected Sharp's results in Europe?

Wada: It is certain that the British economy is in a recession and that the burden of eastern Germany and eastern Europe is felt everywhere. Although we consider it as temporary, it certainly has had an influence on our sales. However, our organizational structure enables us not to suffer too much from this. For instance, 60 percent of Sharp products sold in the United Kingdom were manufactured there. Some products were also manufactured in a third country. For all of Europe, Japan supplies only about 40 percent of the products. For example, electric ovens are shipped from the United States.

Question: Now that so many Japanese companies of your sector are in Europe, is there a big difference between your work methods in Japan and in Europe?

Wada: We have several European competitors in electronics, such as Thomson, Siemens, Philips, and Olivetti. Whereas in Japan we only have Japanese competitors, in Europe our main competitors are European. We compete against them while cooperating with them.

Question: Will it be necessary to cooperate with competitors or create joint ventures in order to be able to survive on the market?

Wada: At this time, we have a working relationship with Electrolux and we offer them our distribution network in Japan for their products. In addition, we jointly develop products. Sharp also has a cooperation agreement with Philips. Furthermore, we are in the process of discussing possible cooperation agreements with other firms. I think that companies will become more integrated in the long run. The importance of electronics in our current society cannot be denied. The electronics companies today are so large that they can cover all aspects of the industry. Research and development plays an important role in this context. In the future, every company will reinforce its strong points while taking advantage of the technical advances of its competitors. Of course, we will also share our knowledge. It is clear that survival will be our mutual interest, and I think that we will help one another to make it.

NEC's Supercomputer Market Strategy in Europe Presented

92WS0325D Edam SUPERCOMPUTER EUROPEAN WATCH in English Nov 91 pp 4-6

[Article: "NEC Supercomputers in Europe"]

[Text] A couple of months after the announcement of the new SX-3 series of supercomputers in April 1989, NEC Corporation of Japan started to organize its sales and marketing for this product in Europe. Today, at the end of 1991, there are sales offices in Switzerland, France, Germany and The Netherlands. Other areas in Europe, like the Scandinavian countries, the United Kingdom, Spain and Italy are covered on a "project by project" basis through one of the established sales offices.

On October 15, 1991, Vic Oppermann, NEC Benelux became responsible for the overall coordination of sales activities for the SX-3 in Europe.

In these past two years of operation, the following European orders have been received:

University of Cologne, Germany - SX-3/11

National Aerospace Laboratory, The Netherlands - SX-3/12 (This NLR system will be upgraded to a - SX-322 in December 1991)

Center of High Speed Computation, Switzerland - SX-3/22

These orders are for supercomputers in the range of 700 Mflop/s to 11 Gflop/s in peak performance and working under Super-Ux, NEC's extension of Unix System V.

Worldwide, NEC has sold 50 supercomputers as of today—17 SX-3 models, six of which were sold outside of Japan. When the SX-3 was launched, NEC said they planned—not a commitment, but a hope—to sell 20 machines in Europe and 20 in America. That means another 17 in Europe in the coming years.

Market Strategy

Focus is placed on market segments which are best suited to the position which the SX-3 today occupies in the range of supercomputers available on the market. The need for the highest performance available and the ease-of-use through Unix based access, supported by automated vectorizing tools, is sought by NEC in areas like aerospace, automotive, meteorology, university research and heavy construction industries.

To support the European customers and marketing offices, NEC has established a European Supercomputer Support Center in Cologne, Germany, under the management of Akihiro Iwaya. This organization, which consists today of 10 analysts, give support in the area of application porting, benchmarks and a wide variety of necessary presales activities. Under an agreement with NLR in The Netherlands their system is available for benchmarks and demonstration purposes. It is also used for application porting activities.

Future

NEC's strategy is to manufacture and market into the top end of the supercomputer market; it is committed to deliver at any one moment in time the system with the

highest performance available. Today, the SX-3 is regarded as such, with a peak performance of 5.5 Gflop/s per processor. The four processor SX-3/44 yields a speed of 22 Gflop/s.

Performance enhancements to the current SX-3 series are to be expected in the near future, and further down the road, NEC plans for the successor product of the SX-3 with a fivefold performance boost to over 100 Gflop/s peak performance.

Oppermann thinks that, for this class of systems, the name "supercomputers" is hardly appropriate in view of the various less-performing systems which are marketed under the same name. "What about 'gigacomputer'?" he asks rhetorically. He also foresees a "teracomputer": towards the end of the decade NEC plans for the TTT with 1 Teraflop/s speed, 1 Terabyte of memory and 1 Terabit/s I/O.

NEC is spending over ECU3 billion per year on corporate research and development. One of their target areas is massively parallel system architectures on which NEC researchers started to work five to six years ago. For example, in designing the SX-3 much simulation work was carried out on a 64 processor parallel system. NEC targets in this area for a 300 Gflop/s system with more than 256 processors within a couple of years. In April this year NEC announced the successful development of a 200 Mflop/s vector processor on a single board of 17 x 17 cm.

The SX-3 Series

NEC's SX-3 series can be configured with up to four tightly coupled arithmetic processors. The SX-3 series utilizes parallel pipeline processing on each processor and multitasking for multiprocessor systems. From the single processor entry model to the maximum configuration, the SX-3 series meets a wide range of performance needs. Combining up to four processors in several multiprocessor configurations, the SX-3 series offers speeds of up to 22 Gflop/s.

A vector unit consists of one, two, or four sets of vector pipelines. Each vector pipeline set consists of two add/shift and two multiply/logical functional pipelines. Each of the functional pipelines can be operating simultaneously: thus, each arithmetic processor in an SX-3 series configuration can execute up to 16 floating-point operations per machine cycle, or a maximum of 5.5 Gflop/s per arithmetic processor.

The basis for the speed operations of the SX-3 series ("the heart of a supercomputer" as NEC calls it) is the 2.9 nsecond cycle time achieved through the use of high-speed VLSI [very large scale integration] and high-density packaging technology.

The arithmetic processor employs RISC [Reduced Instruction Set Computer] architecture to improve performance through simplified instructions. There are 128 scalar registers in the scalar unit. Through the use of the registers and the instruction recording features of Fortran or C compilers, the scalar units constituting a scalar pipeline are fully utilized, thus ensuring high scalar performance.

The main memory supports an up to 1,024-way interlace function assuring ultra high-speed data supply. The main memory can be configured to a maximum of 2 Gbyte.

An extended memory unit of up to 16 Gbyte, can operate as an input/output device with significantly higher performance than a magnetic disk by virtue of a maximum transfer rate of 2.75 Gbyte/s.

Thyssen, Itoh to Enter German Satellite Communications Market

92WS0325K Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 23 Dec 91 pp 3-4

[Article: "C. Itoh/Thyssen To Enter Germany's Satellite Communications Market"]

[Text] C. Itoh & Co. of Japan and Thyssen AG, the German steel and machinery conglomerate, are to establish a joint-venture company in Duesseldorf to provide leased line services via satellite.

The venture, to be called Space Line Communications Service, will be capitalised at DM8 million, with Thyssen holding 67 percent and C. Itoh and C. Itoh Deutschland GmbH owning the remaining 33 percent.

Beginning in July 1992, Space Line Communications Service will provide leased line voice, data and graphic transmission services via the Copernicus communications satellites. Initially, the service will be available only to the Thyssen group, but once established, the company will offer the same services to other customers.

C. Itoh cites eastern Germany as a particularly promising market for satellite communications because it will take more than five years for the Deutsche Bundespost Telekom to establish an ISDN [Integrated Services Digital Network] in the area. Last year, the German government liberalised leased line services via satellite in an effort to compensate for the lack of a strong telecommunications infrastructure in eastern Germany.

C. Itoh has accumulated experience in satellite communications by working with Japan Communications Satellite Co., Japan's only communications satellite firm, in which it is a major shareholder.

A fourth advanced Copernicus communications satellite which will be capable of covering eastern Europe is scheduled to be launched next year.