JPRS-ELS-88-002
22 JANUARY 1988

FOREIGN
BROADCAST
INFORMATION
SERVICE

JPRS Report

Science & Technology

Europe & Latin America

JPRS-ELS-88-002
22 JANUARY 1988

SCIENCE & TECHNOLOGY
EUROPE & LATIN AMERICA

CONTENTS

/9987

RESEARCHERS INTERVIEWED ON ITALIAN ADVANCES

36980029 Milan INDUSTRIA OGGI in Italian Sep 87 p 85

[Interview with Rinaldo Piva, managing direstor of Ceramica Industriale Fer, by Luisella Acquati: "Italy Is Not a Bystander"]

[Excerpts] For a more detailed view of the Italian situation with respect to technical ceramics, INDUSTRIA OGGI interviewed Rinaldo Piva, the dynamic managing director of Ceramica Industriale Fer, which is based in Seregno, Milan, and which for many years has been conducting research in the field of new ceramics and has already succeeded in developing numerous prototypes.

[Question] What is Italy's present situation as regards new ceramics, and which applications appear to be the most viable?

[Answer] The distinctive performance characteristics these materials have exhibited have catalyzed the interest being shown by numerous industries, such as the automotive, the electronics, etc. At this time, we are still in the experimental stage; there are still many production problems to be resolved as regards both the ceramic powders themselves and the forming and sintering of parts.

Interest is centering increasingly on ceramic alloys, which undoubtedly have attained characteristic levels of performance unsuspected as of only a few years ago, rendering them suitable for the most diverse applications. Meanwhile, from a production standpoint, new machines are being designed and built for forming and sintering materials in a single operation, further improving the final characteristics of the products obtained. With hot isostatic pressing, pieces can be obtained that are truly uniform and are characterized by a high degree of toughness. Among the producers of these high-temperature/high-pressure presses, Europe's ASEA firm occupies a leading position. The most interesting applications of these materials have to do with internal combustion engines, whose thermodynamic efficiency is directly dependent on operating temperatures. These temperatures can be significantly raised, using the new ceramic alloys. The operators in the sector are already talking of the adiabatic engine of the near future with a 30- to 40-percent gain in fuel efficiency over present engines, and with the notable advantage of almost totally eliminating the polluting content of exhaust gases.

Numerous families of ceramics lend themselves advantageously to various applications in motors: They are products that can withstand sudden changes in temperature and that exhibit high resistance to flexure when heated. Silicon nitride, for example, has these properties and can be used to produce valves and valve guides; whereas, aluminum titanates can be used for exhaust gas ducts. Other ceramics, like partially stabilized zirconium oxide, exhibit good thermal insulation characteristics and good mechanical strength, and are therefore suited to the production of cylinder and piston parts.

Some of these parts are already being used in German and Japanese cars. Other applications of interest have to do with ceramic solid electrolytes, the use of which for solid-electrolyte fuel cells has been under study for some years now.

A concrete application, in which Fer is currently active and has been for several years now with commercial products, concerns the use of a new ceramic (fully stabilized zirconium oxide) as a sensing element in the production of oxygen analyzers.

This family of analyzers has been developed through studies carried out in their entirety by our company, ranging from the study and preparation of the powders to the production of the complete analyzer and to the problems of their installation and actual use in plants.

The potentialities of ceramic materials in the electrical and electronics industries are very high; but as regards production, two distinctive orientations must be considered. On the one hand, it is quite normal for firms producing components to design and manufacture in-house also the ceramic element they need (In the field of variators, changers and converters, for example, several firms operate in this manner). And on the other hand, Italy must cope with fierce competition from countries like South Korea, which, as regards alumina flats, markets very pure products at decidedly low prices. In Italy, there is a solidly-based production of alumina for mechanical uses (in gaskets for faucets, mixers and pumps), which is produced in massive quantities by a company that has recently been absorbed by a German firm.

Consideration is also being given to the use of ceramic solid electrolytes in sodium-sulfur electric batteries, which could be used to optimum advantage in vehicles called upon to circulate continuously in urban centers.

In the field of heat exchangers, new ceramics could provide a high level of energy recovery, but production still presents numerous problems.

[Question] How are these powders produced and who are the major producers?

[Answer] Today, these powders are being produced using new processes that have completely altered the problems of forming and sintering. Materials are available with grain finenesses and flowability that were beyond imagination until a few years ago (a few hundred m^2/gram). They are produced, for example, by coprecipitation of solutions, which yields not only extreme fineness of grain but also perfect mixing of the components, with obvious advantages from the standpoint of uniformity of the ceramic obtained.

The major producers marketing excellent products at reasonable prices are the Japanese. The United States and Europe also have optimum products at decidedly higher prices. It appears that the Italian chemical industries are only now beginning to consider this sector. In my opinion, it is essential that there be an alliance between chemical firms for the production of the powders, and ceramics firms for the forming, sintering and characterizing of the manufactured product.

Marriages of this type have already taken place and the results are beginning to show. The powder production sector is a key sector, and the Italian chemical industries seem to be starting to move.

[Question] What are the present production and manufacturing costs?

[Answer] I can't furnish you exact figures: The cost of powders, depending on their characteristics and on quantities, ranges from a few tens of thousands of lire per kilogram to several hundred thousands of lire per kilogram. As for manufactured products, their geometry, the materials used, and their final characteristics can vary their cost by several orders of magnitude.

[Question] Which enterprises are taking a direct interest in these products?

[Answer] Aside from Fiat, which is undoubtedly proceeding with tests insofar as motors are concerned, other experimentation is being done by the research laboratories and by us; we, in fact, have for some time now been working on some prototypes. IMEC is without doubt interested in advanced ceramic materials. Its acquisition by the Germans, who are leaders in the sector, will probably yield surprises. The firms operating in the automotive spark plugs sector, Marelli and Spica, already possess a basic forming and sintering technology, but it is hard to know their levels of research. Montedison recently formed an ad hoc company that has all the prerequisites for doing some eminent work in the sector.

[Question] What levels has research in this sector reached in Europe, and particularly in Italy?

[Answer] Presently, Europe finds itself in a subordinate position with respect to Japan and the United States, mainly owing to our competitive nationalisms, which prevent us from launching joint programs. Fortunately, the EEC, lending expression to the current ferment, has taken steps, equipping laboratories specifically to test the characteristics of these new ceramics and encourage research. The particular tests and analyses the European operators will be conducting will provide indications as to the validity of the experimentation being done and will be a priceless source of information and data for future work.

In Italy, ENEA, CNR and the universities already have, or will shortly have launched, research programs in these new materials. In my view, we need to be able to merge our country's existing forces and capabilities (which are valid and highly qualified) towards ends that will represent concrete advantages to our operators interested in these products. The fact is that megaprojects often create distrust among the various participants, particularly where small- and medium-sized firms are involved. In the CNR's targeted project, which is to be launched during the initial months of 1988, new ceramics occupy the top position, and I believe that if the project is pursued with resolution, we can develop valid indications as to the future of these products in our country.

[Question] Does this mean then that within the near future we can expect to see our traditional ceramics factories converted into new ceramics industries?

[Answer] I think this will be very difficult. First of all, because our ceramics manufacturers are conservative and not inclined to resolve problems that are not directly connected with their own sphere of activity. Secondly, producing these new materials is completely different from making tiles. Furthermore, present uses, still in the testing stage, are limited, and the conversion of a product line results advantageous only when it can be approached in terms of high volume.

Clearly, the ferment that has occurred recently has already galvanized the big industries into action, particularly the chemical industries (Hoechst's acquisition of Rosenthal Technich Ag and Feldmuhle's acquisition of IMEC have not been random events), but projections at this time are difficult indeed.

On the other hand, it is of fundamental importance to create a network of cooperation that will facilitate an exchange of information and data between those who have been working for years on these materials and those who are desirous of producing new products for a developing industry. The speed with which new products are being created and developed is high, and requirements are changing every day. Simply stated, "the world of new ceramics" is just beginning.

9399

SAGEM BUBBLE MEMORIES FOR SPACE APPLICATIONS DESCRIBED

3698A296 Toulouse LA LETTRE DU CNES in French 1 Jun 87 pp 7-8

[Article under the "R&D Techniques" rubric: "French Bubble Memories for Space Applications Qualified"]

[Excerpt] With military funding, SAGEM [Company for General Electricity and Mechanics Applications] has successfully developed 512-kbit memory chips that double the capacity of flatpacks. Each flatpack contains eight 512-kbit chips, i.e., 4 Mbits. Because of this significant increase in capacity, several space projects have chosen to use a magnetic bubble memory [MBM] recorder.

An identification and qualification model was developed that incorporating an 8-pack 32-Mbit page. The model was qualified at the start of 1986. Since then, flight models for Sigma and Eureca have been produced. Acceptance procedures for the Sigma flight model are planned for July 1987.

The SAGEM Space Bubble Memory Recorder

The basic features of this device are:

- modular capacity up to 256 Mbits in 32-Mbit increments,
- fully redundant internal architecture ensuring high reliability,
- four-channel simultaneous interface with 600-kbit/s exchange rate,
- random access per 8-kbit block,
- high integration density: 36 kg and 38 cubic decimeters for 256 Mbits.

Outlook

The advances achieved by SAGEM in the magnetic bubble memory field now make it possible to envisage doubling the capacity of multichip flatpacks from 4 to 8 Mbits by incorporating 1-Mbit chips. This operation, which will take place in 1988, will enable the MBM recorder to be still more efficient in terms of mass, volume, and recurrent costs for capacities of up to 512 kbits per 64-Mbit page. The first programs to benefit from this new development will be Vegetation and Vesta.

With the emergence of European manned lights, a new type of equipment will be developed--magnetic bubble memory cassette reader-recorders--that will allow interactive access by the crew to management systems aboard space vehicles. The following uses are planned:

- computer reloading,
- configuration of a workstation,
- storage of test data for return to earth,
- etc.

The two major users will be Hermes and Columbus.

Over the longer term, bubble memory technology offers broad prospects for development. Laboratories are testing 4-Mbit chips now and they will eventually be incorporated into hardware.

25050/12913

ARIANE V NEW TESTING FACILITIES DESCRIBED

3698A314 Paris L'USINE NOUVELLE in French 9 Jul 87 pp 34-35

[Article by Marc Chabreuil: "Exclusive: In the Heart of the Ariane V Test Bench";--first paragraph is L'USINE NOUVELLE introduction]

[Text] SEP and Serete reveal innovations of PF-52, the most sophisticated European space test Bench, to L'USINE NOUVELLE".

In the hills overlooking the town of Vernon, SEP [European Propulsion Company] engineers have begun to take over a facility which will be inaugurated with great fanfare next September: the PF-52. This barbarous abbreviation refers to "the most complex space test bench ever built in Europe," affirms Alfred Melle, the distinguished SEP chief. On 3,000 square meters, hundreds of meters of "clean" piping and more than a thousand moving parts (gates, valves...) transport diabolical liquids: more than 100 cubic meters of liquid oxygen and hydrogen. These highly explosive cryogenic fuels (as cold as -253 degrees Celsius) are stored at high pressure (400 bars) to feed equipment "no larger than a trash can but of strategic importance": the two turbopumps for Ariane V's Vulcain engine, which is 15 times more powerful than the present cryogenic third stage of the European launcher. These turbopumps are located on the other side of a 2-meter thick firewall capable of withstanding an explosion of 150 kg of TNT. The first test of the oxygen section will take place right after the end of the year.

Built under SEP as prime contractor of with the assistance of Serete, which provided overall engineering, this Fr 310-million installation is the result of cooperation among about 10 European firms. "Several of them developed completely new components for this project, affirms Hubert de Beaumont, project director at Serete--mainly in France (low-pressure cryogenics, piping, assembly, and integration), the FRG (high-pressure cryogenics), and Italy (cryogenic tanks, fittings, and flexible tubing).

L'Air Liquide, for its part, developed double-skin vacuum piping (to prevent thermal exchange) 10 inches in diameter, although 2 inches had never been exceeded. Welding being banned for the sake of easy disassembly and maintenance, Sefilac designed special joints which are absolutely leakproof at the flanges. Likewise, Sereg, supervised by L'Air Liquide, manufactured a butterfly valve 10 inches in diameter, a record in view of the operating pressures and temperatures. (A Swiss company had unsuccessfully attempted this.)

The Italian company Hydro-Sapiens provided another achievement by supplying double-sheathed flexible tubing of the same diameter. The German company Messer Griesheim manufactured the cylindrical part of a 12-cubic-meter tank containing liquid hydrogen at 400 bars, a part impossible to make by forging. So Messer opted for the multilayer technique (two ring cylinder halfs composed of several 30- to 40-mm thick layers).

Although less spectacular, the Labinal group's special filters are nevertheless essential. Mounted in series, they trap all particles over 10 microns in diameter. "A function of capital importance; constant concern for cleanliness has guided the construction of this installation, which is made almost entirely of stainless steel," assures Guy Moussayon, a quality control engineer with Serete. Turbopumps, like clockworks, are particularly sensitive to any pollution (the test cell is moreover kept at superpressure), as sad experience has shown in other installations, particularly at Kourou. Each PF-52 element was scoured, degreased, tested with a "white cloth," passivated, and dried in nitrogen before being conditioned. Equally Draconian precautions are taken on the site. Mounted in clean areas (and swept by nitrogen), the assemblies have been tested to be sure they are leakproof in a vacuum or in helium (spectrometry) and for cleanliness (particle count) before being sealed and delivered to SEP.

As a result of this costly (7 percent of research and 15 to 30 percent of construction costs) but effective quality control, no modification or recleaning of components was necessary during the assembly of this installation. A host of inspectors followed the progress of work by all contractors all over Europe. In addition, an independent quality-control team of three supervised the whole process, taking nuclear industry specifications as a model. "Specifications were simplified for the studies but reinforced for execution," explains Guy Moussayon.

Development of this prototype, largely designed by CAD (Assigraph for flow schemas and Computervision 3D for the test model of a part of the bench), laid the ground work for future development: Other facilities will be built in France and Germany for testing the different components of the Vulcain engine. This has not kept Serete from handling this project "in industrial fashion" by taking into consideration not only competitiveness and operating profitability (minimum loss of propellants but deadlines as well. "Despite multiple modifications of Vulcain--two PF-52 pilot studies were necessary--the project is less than 6 months behind schedule. Above all, a cost-control method has kept the cost of the test bench 7 to 8 percent below estimates, which has earned us a SEP bonus," explains Francis Berton, director of Serete's advanced technology department.

This result augurs well for development of the PF-50, also at Vernon, and testing of the complete engine (the building site will be opened next October and it will take about 30 months to complete). Most importantly, it enables Serete to bid optimistically for construction of the Ariane V launching pad at Kourou. Initial consultations will take place in the months to come.

[Box, p 35]

Up to 800 Bars and 200 Kg/Second

SEP engineers will use the PF-52 to test the oxygen or hydrogen turbopumps, or both at the same time, at a maximum rate of two tests per week. To do so, the test bench must generate two feed modes for each propellant:

- Pressure of 3 bars (storage at 12 bars in a tank pressurized for 200 bars) and high flow rates (250 kg/second of hydrogen and 42 kg/second of oxygen) to simulate the flow of propellants from the rocket tanks to the turbopumps. They will leave the pumps at 150 bars;

- Pressure of 120 bars (storage at 400 bars in tanks pressurized for 800 bars) and low flow rates (6.5 kg/second of hydrogen and 6 kg/second of oxygen) to feed the hot-gas generator which drives the turbopumps.

25046/12913

INNOVATIVE TECHNOLOGIES OF TDF-1 SATELLITE OVERVIEWED

3698A311 Paris L'USINE NOUVELLE in French 16 Jul 87 p 9

[Article by Marc Chabreuil: "Satellites: The Battle of the Generations"]

[Text] At Aeorspatiale at Cannes, the largest satellite ever built in Europe is waiting for Ariane's return to space. TDF-1, like its German twin TVSAT-1, is in fact a 6.4-m high device spanning more than 19m with its solar panels deployed. A total of 2 metric tons of electronics, composite materials, photovoltaic cells...representing a Fr 1.7-billion investment to broadcast...four television channels.

This is precisely the sledgehammer argument of the opponents of this French-German program. Admittedly, satellites half as heavy such as Telecom-1B (Matra) or Astra (Luxembourg) can broadcast 6 and 16 channels. The rent for one channel is then five times cheaper. This calls for comparison. These so-called "light" satellites require receiving antennas 1 m (or more) in diameter costing approximately Fr 20,000 to install. TDF-1 only requires a 50-cm molded plastic parabolic antenna (Fr 6,000, decoder included) that can be mounted on any windowsill. This is space television anybody can afford, true direct broadcasting!

What is the secret of TDF-1? Its broadcasting power (230 watts per channel compared to 20 to 50 watts in conventional telecommunications satellites) and, consequently, a "strong" signal at ground level requiring only modest receiving facilities. To achieve this result, the members of Eurosatellite (Aerospatiale, MBB §Messerschmitt-Boelkow-Blohm], Alcatel Espace, AEG-Telefunken, and ETCA [Space Technology and Design Studies]) had to perform some technological miracles. They first had to make traveling-wave tubes--the famous TWT's--of almost 250 watts.

Acting separately, AEG and Alcatel (formerly Thomson Espace) looked into the problem. the Germans played it safe and adopted conventional technology. The French gambled on high-tech (brazed helix, collector made of pyrolitic graphite...), saving 3 kg in weight and producing 50 dB in gains and a 50-percent improvement in output. However, these electron tubes regularly failed. Despite modifications requested by CNES [National Center for Space Studies], TDF-1 had to be equipped with four more reliable German TWT's and with one Alcatel tube for the spare channel (TDF-2 will carry three components from each of the two manufacturers).

Such on-board broadcasting power produces two consequences. First, it requires a completely new heat dissipation system. Aerospatiale has decided to evacuate the calories through a 120-m heat duct network rounded out by a whole range of thermal protecters (superinsulation, optical solar reflectors, special paints...). The second consequence is the need for a solar generator capable of supplying 3,360 watts. A rigid-type generator, it is composed of a carbon-fiber frame which contains 43,200 AEG solar cells, glued to a flexible substrate of kapton and carbon-fiber fabric.

Another innovation is that TDF-1's antennas will be directed with a precision unequalled in telecommunications (0.005 degree). For this purpose, Aerospatiale has developed SOFA (fine antenna orientation system). This is a 7.1-kg flexible structure placed between the satellite's body and the antenna reflector. Controlled electronically, SOFA cancels angular distortions coming from the satellite.

Most unexpectedly, the TDF-1, considered the most sophisticated of telecommunications satellites, uses 100-percent European technology dating from the late 1970's (the program adopted in 1979 was to have led to the launching of satellites in early 1984). This 4-year delay has considerable consequences. Today, it is possible to make antennas whose beams virtually follow a country's borders, which permits broadcasting power to be limited. In contrast, (TDF-1 crosses into the territories of seven neighboring countries--which presents the advantage of enlarging its audience.) Likewise, over the past 8 years, receiving antenna sensitivity was multiplied by a factor of 5, with the same consequences.

The dispute between advocates of light satellites, led by the Directorate General for Telecommunications (DGT), and heavy satellites, spearheaded by Telediffusion de France (TDF), is more intense than ever. But whatever its future in direct broadcasting, the TDF/TVSAT program is targeting a promising market. It has already generated export sales: 150-watt TWT's ordered by the Japanese and a Fr 650-million Scandinavian Tele-X satellite in production.

The program has also produced a line of heavy platforms called Spacebus 300 for which there is considerable world demand. If Eurosatellite wins contracts from Intelsat, Eutelsat, Scandinavian (Tele-Y), etc., it will be due to TDF and TVSAT.

25046/12913

FRANCE'S AEROSPATIALE RESTRUCTURING AVIATION DIVISION

Paris L'USINE NOUVELLE in French 1 Oct 87 p 33

[Article by Jean-Pierre Casamayou: "Aerospatiale: The Aircraft Division Takes Off"; first paragraph is L'USINE NOUVELLE introduction]

[Text] New organization, new structure.... In a strong position due to its success, the aircraft division is stepping up its efforts: large-scale search for subcontractors and partners, investment in the manufacturing process.

Aerospatiale's aircraft division is being restructured. This is not in order to cope with difficulties, as is all too often the case, but because of success. The commercial success of the Airbus and the ATR-42 will increase the company's annual production rate from 60 aircraft in 1986 to 250 in 1995.

To sustain this growth Jacques Plenier, the division's director, has decided to establish a new organization and step up efforts to improve productivity. The new structure hinges on a reduced general management in Paris and on operational management offices based in Toulouse and run by Jean-Louis Fache.

Complementing the two departments which already exist, four new ones are being created: systems and avionics (derived from Aerospatiale's electronics department), data processing, manufacturing, and purchasing. Daniel Huet, former manager of the Nantes factory, will become director of manufacturing with authority over all the division's factories.

The other department which is taking on importance is headed by Henri Sala, who is in charge of purchasing and contracts. The division will rely increasingly on partnerships and subcontracting. "I am in favor of subcontractors," asserts Jacques Plenier. "They are cooperative and have lower costs than we do." Negotiations are already taking place with Hurel-Dubois, Reims Aviation, and Latecoere. The specializations sought are the manufacture of small mechanical parts (spars, panels), riveting, and surface treatment.

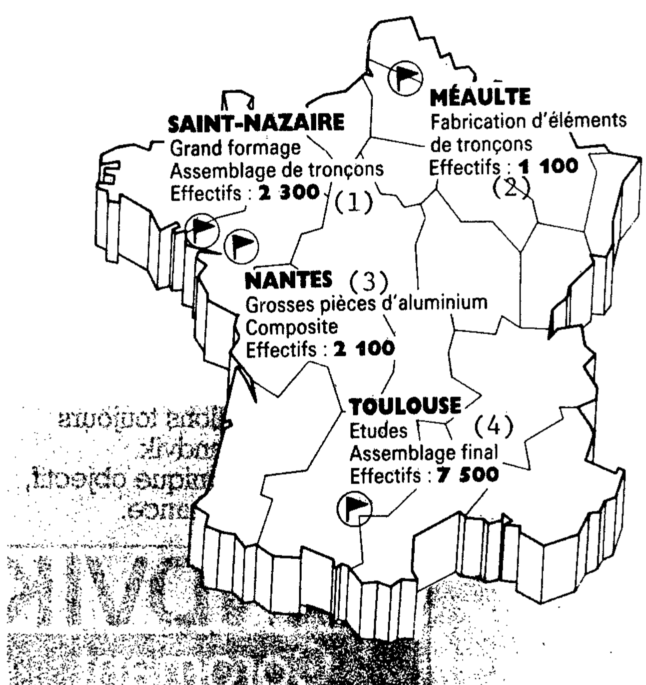
However, French subcontractors will not be in a privileged position. Plenier intends to draw on foreign countries, specifically Singapore and South Korea. But he also wants to enter into agreements with foreign partners, following the example of Airbus Industrie with Fokker and Belgium's Sabca. They are partners willing to share the manufacturing risks (and profits) of the A330 and A340 programs by supplying funds for research or equipment. The first manufacturers to be contacted are Sweden's Saab, Canada's Bombardier (Canadair), and the American firms Grumman, Rockwell, and Lockheed.

Together with this operational reorganization, Plenier wants to improve productivity through more specialized factories (see diagram) and staff and through massive investment in the manufacturing infrastructure. Over the next 5 years the division will invest more than Fr 2 billion. The pilot composite structures workshop in Nantes will receive more new machines and automation of the manufacturing and quality control processes will continue. It is a question of being able to meet the growing demand for composites in aircraft structures.

However, the highest investment concerns Toulouse where, after the new research center, an assembly factory for A330/340's is to be built. A total of Fr 1.5 billion has been earmarked for this revolutionary assembly line designed by the engineering firm Setec. No more linear assembly lines, with each aircraft moving from one position to the next. They are being replaced by a new concept. Each aircraft is entirely assembled in a single module; it is the equipment and engineers which move around.

These improvements in the manufacturing process will go hand in hand with improved use of staff, particularly in the fields of task preparation and management. Thus, in spite of the increased workload, there will be no increase in staff. For Jacques Plenier, this point is fundamental. "Today, the role of our factories is to manufacture high technology products as cheaply as possible," he explains. "They can no longer be used to create jobs or for regional development." A compulsory change of attitude and industrial culture if Aerospatiale is to win the battle of competitiveness.

Figure. The four centers of the aircraft division



[Key on following page]

Key:

1. Saint-Nazaire: large-scale forming, assembly of sections; staff: 2,300
2. Meaulte: manufacture of section components; staff: 1,100
3. Nantes: large aluminum components, composites; staff: 2,100
4. Toulouse: research, final assembly; staff: 7,500

25065
CSO: 3698/A034

JAPANESE AUTO STRATEGY IN EUROPE REVIEWED

Paris CPE BULLETIN in French Aug-Sep 87 pp 18-19

[Article signed R.B.: "New Japanese Tactics in Europe"]

[Text] Beginning in 1989 Volkswagen's Hannover plant will manufacture 8,000 Toyota Hi Lux small pick-up trucks. Two-thirds of European sales will go through Volkswagen and the remainder will go through the Toyota network. Beginning in 1990 production figures will reach 15,000 units per year.

Toyota's interest is obvious: The number one Japanese car manufacturer will have an industrial foothold on the Old Continent in cooperation with a European manufacturer.

Several recent events have demonstrated Japanese domination of the world production of small utility vehicles. Nissan, the number two Japanese car manufacturer, controls the Spanish Motor Iberica company. Also in Spain, Suzuki manufactures under the license of Santana. In the UK, General Motors' subsidiary Bedford assembles and sells under its trademark Isuzu vehicles, which are renamed Midi. A joint subsidiary (General Motors holds 39 percent of Isuzu's capital) is currently being formed in the UK, production may reach about 40,000 vehicles per year by 1990. Mercedes, in order to expand its range of smaller cars, will produce a small Mitsubishi utility vehicle in Spain as of 1988, it will be marketed through both their sales networks.

These examples of cooperation show the development of the Japanese carmakers' strategy: To circumvent protectionism, they manufacture in Europe at local integration rates which allow them to get around the barriers. For example, as of 1988 the Richard company, which imports Nissan in France, will be able to import British-built Nissans into France above the famous 3 percent quota. The Japanese are thus going to put European equipment manufacturers to work: For example, Valeo will manufacture the brake discs for Euro-Japanese cars under the license of Akebono.

On the other hand, Volkswagen's worldwide strategy highlights the timidity of French automobile manufacturers.

25041
CSO: 3698/A035

BRIEFS

EEC'S BAP PROGRAM MEETING--From 23 to 26 March the Commission held a symposium in Louvain-la-Neuve, Belgium, on genetic and cellular engineering of plants and micro-organisms important to agriculture, as part of the biotechnology research action programme (BAP) (1985-89). It regularly organizes such meetings between contractors working in the same area of this research programme. The meeting in Louvain-la-Neuve gave scientists from the 63 laboratories in the Community which--under the BAP--study cultivated plants and their associated micro-organisms the opportunity to compare their results and problems and to exchange any information that could be of use in their further research. This meeting was therefore in line with the Commission's efforts to set up, in the various major fields of biotechnology research, truly European "laboratories without walls" which bring together skills otherwise scattered around the Community. Also taking part in the meeting were representatives of 32 companies engaged in industrial development of the discoveries made and processes devised in the biotechnology research laboratories. [Text] [Brussels BULLETIN OF THE EUROPEAN COMMUNITIES in English Jul 87 p 27]

CSO: 3698/A012

FIRST EUROPEAN CONFERENCE ON VLSI

Amsterdam COMPUTERWORLD in Dutch 29 Sep 87 p 45

[Article by Wim Amerongen: "Communication Is the Major Bottleneck"]

[Excerpt] The problem of communication was the leitmotiv in the lectures at the recently held first European conference on VLSI [very large-scale integration] and advanced systems. The conference was organized by the University of Amsterdam (UVA) and held in its scientific center at Watergraafsmeer.

Initiator, president, and also driving force behind the conference is Adriaan Ligtenberg, employed by AT&T Bell Labs in New Jersey. Ligtenberg, an electrical engineering graduate from the Technical Advanced School in Delft, was granted sabbatical leave by his American employer and used the occasion to work for Professor Hertzberger from the UVA.

"Professor Hertzberger teaches data processing and I noticed that quite a lot of effort was put into instrumentation. Since I have gained considerable experience in the area of design and development of complicated chips at AT&T, I decided to grab this chance," explains Ligtenberg of his choice.

He is enthusiastic about what he encounters at the UVA. "At the UVA they are currently working on a very fast communication chip capable of functioning at a speed of 10 MHz, which means that four 32-bit messages can be sent within 100 nanoseconds. That is approximately 30 times faster than the transputer's maximum speed. Consequently, very high-level research is being conducted here."

Intelligent Architectures

Ligtenberg was the first speaker at the conference. He discussed the major trends in the area of VLSI. One of these trends is the application of innovations using "intelligent" architectures. He also expects a limit to the number of chip layers and an increase in the use of optical connections. Thus, for some years already an optical clock has been used in the 5ESS switch.

Ligtenberg stresses that a good VLSI design requires both high- and low-level knowledge of the design process. "You must be able to oversee the entire process. Only then can you arrive at a chip that meets all requirements. Chip layout is very important. From a layout-technical point of view, it is sometimes better to implement a complex multiplier with four rather than three multipliers, even though it is doable with three. You can only make that decision when you understand the entire design process, because the layout then shows, for instance, that actual connections can be kept much shorter with four multipliers."

Parallel processing is being used more and more for the design of VLSI circuits and has become an absolute necessity especially for large-scale data processing applications.

Jim Hesson discussed image processing. Hesson, employed by ISYS in Silicon Valley, has built an infrared scanner using parallel processing. Simon Tol has produced a chip suitable for ISDN transmission. Tol, who is employed by AT&T Philips Telecommunications, discussed the system design and technology. An outstanding characteristic is that his chip consists of an analog and a digital part.

Patrick DeWilde read a paper on the various methodologies for system design. Wim Mooy of the UVA has designed a VLSI chip intended for a large communication network. S. van Meerbergen (Philips) gave an overview of the architectures that can be used for digital signal processing. He described two approaches: In the first one, system design is based on a particular algorithm; in the second, the choice of the architecture depends on the limiting conditions of silicon.

25048
CSO: 3698/A032

FRENCH MINISTRIES, INDUSTRY DEVELOP SCIENTIFIC TOOLS

3698A306 Le Chesnay BULLETIN DE LIAISON DE LA RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE in French Apr-May 87 pp 2-5

[Article by Jean-Francois Abramatic of GIPSI-SM90-INRIA: "GIPSI-SM90: From Birth to Adulthood"; first four paragraphs are BULLETIN... introduction]

[Text] Tasks of GIPSI-SM90

GIPSI-SM90 [Public Interest Group for Science and Data Processing-SM90] was established by a decree published in the JOURNAL OFFICIEL on 20 June 1984. CNET [National Center of Telecommunications Studies], INRIA [National Institute for Research on Data Processing and Automation], and Bull assigned the group the development of hardware and software to build a series of scientific workstations using the SM90 architecture.

GIPSI-SM90 is not responsible for the production or marketing of its work. Also, the group's charter states that the research findings are transferred to Bull for production and marketing. However, the group distributes the software it develops through INRIA. This distribution makes it possible to accelerate updating the environment of the research laboratories working on SM90 architecture. For this task, the group received the support of the Ministry of Research and Technology, the Ministry of Industry, and the Data Processing Agency [ADI].

The development of GIPSI-SM90 can be broken down into two phases:

-the formation of a team (1984-1985)
-the confrontation with international competition (1986-1987).

One of the first lessons the GIPSI-SM90 group was able to give--or rather confirm--is that an operation of this size requires time and that only multiyear commitments can lead to tangible results.

1. Team Formation (1984-1985)

The start of the group's activity is usually considered to be on 1 January 1984. Even though GIPSI-SM90 was legally created in June, CNET, Bull, and INRIA had already agreed upon its creation in late 1983. Therefore, actual work could start at the beginning of 1984.

Situation in Early 1984

At the time several hundred machines had been built by CNET, Telmat, and Bull. As of February 1984, INRIA was distributing a version of the Unix V7, called SMX 3.2, that gave users a minimum software environment composed of a Unix operating system with C and Pascal compilers.

At the birth of GIPSI-SM90, this software base operated on the then available SM90 machines equipped with a 68000 central processing unit, 511-K memory cards, disk controllers, and 8080 asynchronous lines.

To have a line of scientific workstations, therefore, meant increasing this hardware-software base by at least three additional functions--efficient floating-point calculation, a graphics environment (screen and printer), and a network environment. In 1984 little know-how was available to achieve these goals. In 1984-1985, a technical team capable of solving these problems had to be created.

1984-1985 Task

The summer of 1984 was devoted to the improvement of reliability and system performance and to the incorporation of new functions--optimization of memory and disk management, addition of a Fortran compiler, asynchronous communications software and Numelec screen memory management. The result was the SMX 3.3, first delivered in October 1984.

In early 1985, the group completed its first hardware developments--SMbus-VMEbus interface, Canon LBP-CX laser printer interface, and a floating array accelerator. The software environment underwent a major change with the implementation of the multiprocessor facilities of SM90 architecture. In addition, the graphics environment was upgraded by a GKS [graphic kernel system] interface and a pilot laser printer [?pilot d'imprimante laser]. That was the SMX 4.1, which became available in February 1985.

The SMX 4.2, reserved for internal use, and the SMX 4.3, distributed in October 1985, offered, for the first time, a complete "workstation" environment through the introduction of the Ethernet local area network interface (disk management and remote log-in), the floating array accelerator software support, and a minimal graphics capability (bitmap terminal emulator).

The team formation phase ended with the SM90 fair in December 1985, where a prototype of the SMX V.1 version was demonstrated. This system is based on a SPIX 21 version operating on Unix system V which Bull integrated in the SM90 architecture. This version offers a quite competitive graphics environment thanks to a window management system and the integrated 4.2 Berkeley Unix network environment through the incorporation of socket interprocess communication devices. In addition, GIPSI-SM90 provided in this environment the management of OSI protocols (transport and session) as well as electronic mail based on X400 standards. An initial version of the SmScript interpreter, developed at GIPSI-SM90 on the specifications of PostScript page description language, was also provided. (Footnote) (PostScript is a registered trademark of ADOBE System) Since February 1986 SMX V.1 has been distributed to SM90 users having obtained a SPIX licence from Bull.

2. Confrontation With International Competition (1986-1987)

The spectacular success of the SM90 fair (100 papers read, 60 demonstrations, 700 participants) showed that the coordination of efforts at the national level can bear fruit. However, at that very time, the pressure of international competition was building up.

After having been, between 1982 and 1985, the private domain of small companies, some of which have become large (e.g., Apollo and Sun), the market of distributed architectures for scientific applications has seen the arrival of the "majors" (IBM PC-RT, DEC VaxStation, HP-9000). This development was accompanied by an attack on non-U.S. markets, with Sun and Apollo again scouting out the terrain.

The year 1986 sounded the call to arms in the battle to impose standards. For the core, there was System V versus Berkeley; for network environment, Streams-RFS versus Sockets-NFS; for graphics environment, X versus NeWS.

Finally, 1987 saw the arrival of personal computers on the scientific market--IBM PC-386 and Apple Mac II.

Bull SM90 Offer: SPS7 Line

The emergence of the 32-bit microprocessors (e.g., Motorola 68020) enabled Bull to market the SPS7/70 and SPS7/300 systems in 1986.

The SPS7/70 is compatible with 16-bit hardware (SPS7/50) by using the CNET memory management unit. It is therefore possible to build multiprocessor configurations using 16- and 32-bit central units and thus gradually upgrade the existing computer base.

The SPS7/300 uses the Motorola PMMU component which makes it possible to incorporate a virtual memory operating system. Although marketed in a more packaged (or less open) version, the SPS7/300 still uses the disk controllers, magnet tape, networking and graphics of the SPS7 line.

This product line is competitive with the multiuser computers of the competition (Sun 3/160, DEC Micro Vax II). For the line to be complete, it was necessary to include a low-end package to serve as the point of entry or rather as the incremental growth element: a diskless workstation. GIPSI-SM90 was assigned the responsibility of pursuing this development to its completion.

Work of GIPSI-SM90 for 1986, 1987

The activity of GIPSI-SM90 can be described in four chapters which are illustrated in detail in other articles of this publication. Only a short overview is presented here.

The group is active in the field of basic hardware and software for the development of a diskless workstation and the adaptation of the SMX to this new hardware. To offer high-performance computation, accelerators have been produced for symbolic and floating-point array computing. Regarding the graphics environment, research is conducted in both hardware (B&W and color screen memories and laser printer interface) and software (window management system, man-machine interface, and PostScript interpreter). Finally, the objective of the network environment is the insertion of SM90 work stations into a heterogenous hardware environment, for the moment limited to machines equipped with a Unix-type operating system.

All the hardware and software work must yet be done on current and future SPS7's diskless workstations.

By the end of 1987, when this work will be completed, the SM90 package will be competitive with the international market, including foreseeable announcements in the course of the year.

3. SM90 Versus Competition

Positioning the SM90 workstation relative to the competition consists in comparing our product line with those of our competitors and identifying its advantages ("strong points"), its similarities ("comparable features"), and the advantages of competing products ("weaknesses").

Strong Points

The strong points comprise the originality of the SM90 package:

-the multiprocessor environment,
-the simultaneous offering of the OSI and TCP-IP protocols,
-the PostScript printing interpreter,
-the floating array accelerator.

Comparable Features

These points will be assessed at the end of 1987. At the end of 1986 they constituted areas where progress was lagging but where the gap could be closed:

-the diskless workstation,
-the basic graphics environment.

Weaknesses

The main technical subject which has not been raised in the SM90 context is the feature of three-dimensional color graphics, which requires the development of dedicated hardware. This work has not begun and the gap cannot be closed before 1988 at the earliest.

Furthermore, integration of complementary products in a given user environment is still complex because of the open design of the SM90 and the pursuit of parallel development work, so well illustrated by the December 1985 fair or the catalog of ADI products. An effort to rationalize this area is called for.

It would appear that the passage from the SPS7/50-70 line to the SPS7/300 diskless workstation line provides an opportunity to better define the environment in which additional products--both hardware and software--must be developed and validated.

4. Initial Lessons

Research involving the SM90 architecture has taken advantage of a break in the development of the technology to make up for time lost during the 1970's.

The emergence of distributed architectures in the scientific arena constitutes the introduction of a third generation of systems, following multiprogramming and time-share systems.

This generation is based on the integration into each user workstation of one or even several central units, man-machine interaction devices, and their connectability to other machines, workstations, or file servers. This integration was made possible, from an economic standpoint, by the drop in component prices.

The unavailability of 32-bit mega-minicomputers had constituted a impasse for almost 10 years. Making up that lost time required that three types of activity be pursued simultaneously: creating new know-how; benefiting from the strong points of know-how existing elsewhere; and ensuring the necessary industrial and commercial structures by the time products came out.

Creating Know-how

Like many others (Apple, Sun, DEC), GIPSI-SM90 was able to take advantage of research conducted in the field of distributed architectures, especially research done at the Xerox Park Research Center. Similarly, the emergence of Unix as a scientific computer operating system substantially facilitated the system core choice.

These two elements constituted a favorable context for building a competitive technical team in short order.

Benefiting From Existing Know-how

Taking advantage of the SM90's multiprocessor facilities and of domestic skills in both OSI protocols and digital computing made it possible to individualize the SM90 package.

Furthermore, GIPSI-SM90 lost no time in taking advantage of coincidental events such as the issuance of PostScript language specifications and the complementary nature of Unix System V (shared memory and semaphore) and Unix Berkely (network environment).

Ensuring Transfer From Research to Industry

The increasing integration of computer packages to areas that previously were clearly distinct (management, science, and process control) calls for involvement of computer firms on all fronts. It also requires R&D investment on a level that practically no firm can afford alone. The situation was ripe for Bull to follow the path blazed by CNET and INRIA and to use the SM90 architecture and the GIPSI-SM90 know-how to speed up its entry into the scientific market. With the announcement of the Questar 700, this commitment has now been extended to the office automation field.

In concrete terms, the collaboration between Bull and GIPSI-SM90 has, with the passage of time, grown ever stronger, evolving from simple technical exchanges in 1984 to a true sharing of plans in 1986.

If It Were To Be Done Again,...

Between 100 and 150 man-years have thus made it possible to quickly accomplish the tasks described above. In my opinion, the great strength of GIPSI-SM90 will prove to be its belief in its own power, thus resisting the adherents to the famous maxim that "one Silicon Valley start-up is worth more than two national laboratories."

GIPSI-SM90 will terminate its activities on 20 June 1988. The last 6 months will witness a gradual slowdown in those activities. Therefore, at the end of 1987, I invite the faithful and the skeptics to judge the results of a 4-year effort at a show which I hope will confirm another maxim: "there is no such word as impossible...."

Until then....

25050/12913

BRITISH MILITARY R&D BENEFITING INDUSTRY

Paris ZERO UN INFORMATIQUE in French 31 Aug 87 p 20

[Article by Rex Malik: "UK: Technological Spin-Offs--Defense Software for Civilian Industry"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] The British DTE organization, founded 4 years ago, is starting to penetrate the civilian market with programs produced by military research.

Of the 200 "partners" paying an annual fee to DTE (Defense Technology Enterprises Ltd), three are French: Alain Buley, Innovation 128, and Bertin et Cie. The partner status grants them access to most of the research done in four research establishments of the British Ministry of Defense (employing some 23,000 people) with a yearly budget of 400 million pounds (Fr 4 billion).

On behalf of its partners, DTE is currently "tracking down" some 400 research projects, representing only about 10 percent of the total. This is being done at RAE (Royal Aircraft Establishment), the RSRE (Royal Signals Research Establishment), and Army research establishments.

These establishments are mostly involved with software R&D, which some claim could be used for civilian applications. The basic technology can be sold where possible, but not the direct application. How? Defense research establishments, aiming at reliability at any cost and stressing security, do not apppear to have a commercial orientation.

DTE, which is now starting to find its rhythm, was founded for this reason in 1983. It is a unique organization, supported by various investment organizations, which deals with the above-mentioned research establishments and looks for products that can be put at the disposal of its partners. Its function is to develop and modify these products for civilian use.

Of course, so far military implications have prohibited DTE from progressing rapidly and in fact its operations really started only last year. DTE has set up a database containing various subjects of interest to its partners. Its staff then tracks down the research results that can possibly be adapted for use by its partners.

Thus, for instance, there is a software package (in Fortran) called Boom producing enhanced color graphics. Its name demonstrates its relevance for the defense industry: impact simulation of bombs, shells, and missiles. After all, if a modest airborne missile costing Fr 1 million on the international arms market is capable of neutralizing or even sinking a destroyer currently costing Fr 2 billion, this research is largely justified.

This software can also be used at other levels, namely for the measurement of more common collisions between people and vehicles, vehicles and buildings or other vehicles, highway fences, etc.

There is also the RSRE digital map display software, written in the Coral 66 programming language of the Defense Ministry and running on 8-bit systems (a C-version for 16/32-bit machines is also foreseen).

This software digitizes, displays, and processes cartographic data. As it was intended to be used by the Army on portable systems, one of its characteristics is data compression. Thus, a 400,000-square kilometer area displayed on a topographic map at a scale of 1:50,000 only requires a 60-Mb memory; this would cover an area as large as the FRG. A 64-Kb memory (two EPROM's) could thus hold a 400-square kilometer map.

Briefly it concerns a powerful cartographic data processing system capable of locating, among other things, the highest point in any region offering perfect visibility. All basic cartographic data can be treated in this way.

DTE has traced a large number of software packages developed in the framework of defense research, including Scribel, a Wordstar-compatible spelling verifier for VAX and UNIX systems; Flex, a program support environment; and Malpas (Malvern Analysis Suite), a product for the verification of statistical analysis software and for designing complex software. The military version of Malpas appears to have been used to design a remote controlled aircraft.

25048
CSO: 3698/A014

WEST EUROPE SEEKS TO HALT JAPANESE INROADS IN MACHINE TOOL SECTOR

36980024 Paris L'USINE NOUVELLE in French 8 Oct 87 pp 16-18

[Article by Philippe Escande, including an interview with Berthold Leibinger, CEO of Trumpf, by the same journalist; first paragraph is L'USINE NOUVELLE introduction]

[Excerpts] European machine-tool builders are stepping up mutual agreements. Only Germany, Italy and Switzerland still have the resources to halt the taking over of a strategic industrial sector.

With the world's largest machine-tools exposition about to open next week in Milan, the European industrialists are launching large-scale maneuvers. Germany's Gildemeisteir is buying into France's Sonim, Italy's Comau is buying another French firm, Intelautomatisme, while Germany's Maho takes over Graziano, Italy's number one in lathes... And that's not the end of it!

Europe is fearful. The heart of its machine-tool industry is undergoing Japanization. After having inundated the United States, the Japanese wave is surging over Europe in as concerted a strategy as was the one in optical and electronic leisure products. Even the German colossus, sure until now of its power, is beginning to wonder.

The threat this poses is cause for concern to industry as a whole. Control of the machine-tool sector is the key to control in large measure of all industry. Without a powerful machine-tool industry, there would have been no German rearmament in 1930. Nor, for that matter, without machine tools, a Japanese industrial ambition. The recent Toshiba affair is still another illustration of this phenomenon. The Pentagon has not hesitated to bring charges against one of Japan's biggest enterprises...for having sold a single machine to the Soviets and thus enabled them to build quieter submarines.

The Nippon machine tool's penetration of the United States--22 percent of the market!--enabled the installation of Toyota, Nissan and Honda automobile manufacturing plants on American soil. In 1982, the Japanese became, at one and the same time, the world's number one in machine tools and automobiles. What will the situation be in Europe 5 years from now?

Today, the Old Continent is the target of the Japanese machine-tool industrialists. Japan's investment crisis and the rise of the yen have entailed for them a profit shortfall of Fr 3.5 billion. In addition, the self-restraint agreements signed with the United States have cost them another Fr 1 billion in outlets. As a consequence, the Japanese are left with Fr 4.5 billion of overcapacity--amounting to one and a half times France's total production and more than 13 percent of the EEC member countries' total production--which they are now trying to dump on Europe. Of even greater concern is the fact that, with Japanese exports already representing 10 percent of the European market, the Japanese are not hesitating to increase the number of their plants in Europe. After Toyoda [as published] and Amada, which are producing in France, Mori Seiki, which is contemplating doing so, and Makino, which manufactures in Hamburg, it is on the Yamakazi plant at Worcester (Great Britain) that all sights are set today.

The world's leading manufacturer of machine tools (annual revenues of Fr 3 billion, with 2,500 employees) has, with aid from the British Government, invested close to Fr 300 million to build the most modern plant of its type. Over the short term, Yamazaki will be producing in England close to 100 machines a month, or 20 percent of the Japanese group's worldwide production. With the European market not in an expansion phase, the marketing of these machines at prices 20 to 40 percent cheaper threatens to wreak considerable havoc. Even the least pessimistic among those concerned are predicting that "Many will bite the dust," citing the American example.

The European Governments consider this industrial sector to be strategic. In Germany, the outlay for research is being considerably subsidized by the Government and the banks. In Italy, the Sabatini law has contributed to the revival of its machine-tool industry. Even in France, where the Government has definitively given up the subsidizing of moribund industrial sectors, the Liberal minister of industry is maintaining the aid being granted to the last big French machine-tool enterprise, MFL [French Heavy Machines]. What indeed would be the reaction of Arsenaux de Cherbourg [Cherbourg Naval Dockyards], which build our nuclear submarines, if they had to dialogue with a Japanese builder? For in that business, builder-user relations are of considerable importance. They are the source of progress for both partners. MFL's breakthrough in the field of composites was possible only thanks to its cooperation with Dassault and Aerospatiale. The same is true in a domain as high-technology-intensive as high-speed machining.

Without national builders, the big French users will no longer have a competitive edge, either from a technical standpoint or that of delivery times. The German automobile industry boom produced costly delivery delays for the French automobile industry, since the German manufacturers naturally favored their own national clients. Losing control of this industry will also mean, for French and British clients, a lag of 3 to 5 years behind German and Japanese users as regards knowledge of the latest manufacturing technologies.

The Japanese strategy is now well known: A mid-range starting position, very few different models (NC [numerically controlled] lathes and NC machining centers], and prices as low as 40 percent below those of the competition. Then, as their market share grows, the Japanese expand their product line. "The big danger," says Lucien Rama, secretary of CECIMO [European Committee for Coordination of Machine-Tools Industries], "lies in finding oneself gradually being pushed towards the top of the line. One maintains technical excellence, but loses shares of the market. One's volume shrinks, his prices rise, and very soon he is outside of the market looking in."

This is not yet the case for Germany, which alone represents half the European market and remains number one in quite a few domains. Trumpf, Gildemeister, and Maho are a match for the Japanese. But will these companies be able to stay the course in a production race against adversaries whose domestic market is equivalent to the entire European market (over Fr 50 billion)? The only solution for them is to make Europe its own domestic market. This explains the maneuvers that are being set in motion today. For the situation calls for expansion, and fast! Volume is the only solution to the problem of producing the 5 to 10 percent of annual revenue needed for research and development. This is why a family-owned enterprise like Maho, which manufactures machining centers in Germany, has recently gone public on the Stock Exchange (an extremely rare occurrence in the German machine-tool industry) in order to raise sufficient capital to take over Italy's Graziano firm.

Aside from Germany, only two other European countries remain in the race. Switzerland, which succeeds in perpetuating its image as a top-of-the-line manufacturer--and in remaining Europe's number two exporter--of machine tools, and Italy. The latter provides proof that, despite all appearances, the game is not yet over. As Europe's number two manufacturer, it is the country that is progressing the fastest worldwide in this domain. In a market characterized by innovations, changes and constant adaptations, the family-owned Italian PME's (small- and medium-sized businesses] have succeeded in entering the court of the big ones. In 1986, their revenue rose by 15 percent, and 60 percent of their production was exported. The Italians, however, are at a crossroads. Can Mandelli, which recently went public on the Milan Exchange, continue for very long devoting 8 percent of its annual revenue (Fr 500 million) and dedicating 100 of its 650 employees to research and development? In Italy too, there must be growth. There can be no other explanation for Comau's takeover of the French milling-machines and machining-centers giant, Intelautomatisme, even if the number one Italian firm, highly specialized in systems for the automobile industry, did need a position in the general-purpose machine-tools niche.

On the eve of 1992, each player is positioning itself on the European checkerboard. The Japanese have been playing the same card successfully for the past 10 years. All the other manufacturers are regrouping...or disappearing. All are aware that the European machine tool of tomorrow, if not Japanese, will have a heavy accent...the Germanic.

[Following table is compilation of figures given in map format by source, with heading and caption as below]:

Machine-Tool Market Profile of the Five Largest European Countries

Country	Total Market (Millions of Francs)	Japanese Share (Percent)
Federal Republic of Germany	22,360	7.0
France	6,980	8.0
Great Britain	7,884	9.8
Italy	7,192	2.8
Switzerland	3,432	10.3
Total Europe	57,120	

Direct exports from Japan average 10 percent. But those figures do not include Japanese production in Europe, which is considered domestic production in each country.

Interview With Trumpf CEO Berthold Leibinger: 'Europe Is Our Domestic Market'

Trumpf is riding the surf of the crisis. With revenues of Fr 1.5 billion (55 percent from exports) and 2,200 employees, the Stuttgart-based firm has 60 percent of the European market for cutting, stamping, and forming machines. In its sector, it is one of the world leaders. It sole major rival: Japan's Amada, which has just made its entry into France with its takeover of Promecam. Trumpf's strategy? Top of the line. Its weapon? Ongoing investment in research and development.

Thus, the German industrialist did not hesitate when it came to investing some Fr 60 million in laser technology, so as to become, in less than a year, the European leader in this domain.

Trumpf has subsidiaries throughout the world and produces in Germany, Switzerland and France. Besides, the Hexagon is its biggest European client.

The opinions of Berthold Leibinger, 57, its chief executive officer, are highly valued in Germany. He is not fazed by the Japanese. Herein, he explains why to L'USINE NOUVELLE:

[Question] The Japanese are gaining a foothold in Europe. The world leader, Yamazaki, which has announced its intention of entering the cutting and forming markets, is maufacturing in Great Britain, and Amada, your chief rival, is making its entry into France. Are you in a position to compete with regard to production tools?

[Answer] The objectives of the Japanese are well known, and we are ready to meet them head-on: On the one hand, as regards research and development--I'm thinking in particular of our line of lasers and our innovativeness in forming techniques--and on the other hand, in terms of machine tools for production as well as our marketing organization. In view of our rapid expansion, we have had to adopt very modern production methods. The fact is that in terms of recruitment of sufficient qualified personnel we have been unable to keep pace with these developments. It is only owing to a severe streamlining of our methods in all our production branches that we have been able meanwhile to achieve a revenue per employee exceeding the European average.

[Question] Many Europeans are concluding mutual agreements with or taking over other European enterprises (Gildemeister-Sonim and Comau-Interautomatisme in France). Do you contemplate doing the same?

[Answer] We consider Europe a sort of domestic market in which France plays a preponderant role. As for teaming up with or taking over other enterprises, the question, for the time being, does not arise as far we're concerned.

[Question] To survive in the world market, is it necessary to attain a critical size? And what would you consider this size to be?

[Answer] The size of an enterprise does not play a determinative role. It is far more important to assert one's presence in the principal markets and to adapt quickly to constant developments, remaining at all times very flexible. This means in all domains, including research, production and sales. Thus the decisive criterion is not the size of the enterprise, but rather its presence in the market and its flexibility. That having been said, to be competitive, the builders of standard machines must have a certain volume so as to be able to realize economies of scale. We are well past that stage...

[Question] The Japanese are heavily subsidized by their Government as regards research. Do you feel you are being sufficiently aided at the German and European levels?

[Answer] The majority of our innovations have been realized without governmental aid. But we work in very close cooperation with university institutes and with major research centers so as to fully integrate pure and applied research. Presently, we are devoting around 6 percent of our annual revenue to research and development, and we have no intention of reducing our outlay.

9399

R & D TRENDS, INDUSTRIAL TIES OF FRANCE'S AUTOMATION LAB 'LAAS'

36980041 Paris INDUSTRIES ET TECHNIQUES in French 10 Oct 87 pp 81-84

[Article by Michel Alberganti: "Automation: Irreplaceable LAAS"]

[Excerpts] For 20 years now the Automation and Systems Analysis Laboratory of Toulouse has been betting on combining basic research and collaboration with industry. Today private-sector contracts account for the bulk of its research equipment investment budget. While it is big firms that benefit the most from the results of LAAS operations, LAAS has been wise enough to create a key network of small and medium-sized businesses. Especially thanks to the emigration of its own researchers to industry.

A model contradiction of the traditional, pessimistic picture of research-industry relations, Toulouse's LAAS seems to have discovered the magic formula that makes research useful without it's for all that losing its soul in the process. "Promoting relations with businesses is something we have somewhat harped on," said Alain Costes, the current director. "The fact is that we are a unique case. Working with industry was inscribed on our birth certificate." In today celebrating its 20th anniversary, this CNRS [National Center for Scientific Research] laboratory, unlike the others, is measuring the ground it has covered.

"LAAS performs four missions: It conducts basic research, passes on its know-how to industry, trains people through and for research and finally, helps local industry and promotes the creation of new businesses." In 20 years time the laboratory has created a sizable capital: 4,200 publications, 140 agreements signed with foreign organizations, 600 industrial contracts, 35 patents and licenses, 540 dissertations and collaborations with 167 firms. And lastly--and perhaps especially--LAAS has participated in the creation of 26 new firms, generally founded by former laboratory researchers. LAAS' activity is not slackening today. On the contrary, it has even become the biggest CNRS laboratory, to the astonishment of all the sciences. With a complement of 346 people, it annually produces 400 publications and 45 dissertations and from 80 to 85 industrial contracts are in progress. In 1987 it also expects to have entered into 30 agreements with foreign countries for the exchange of researchers. The laboratory's total budget comes to 80 million francs. If we deduct salaries, which are almost entirely taken care of by the CNRS, the operation and equipment budget is 20 million francs, 11 million of which are provided by industrial or European contracts. That is, it is 55-percent financed with external funds. "We've always wanted our researchers not to be paid on a contract basis," Alain Costes explained. This policy is aimed at preserving the laboratory's independence with regard to fluctuations of contract volume. On the other hand, it is essentially jobs for industry that provide LAAS with the means for spending 15 million francs a year for equipment. In 1986 investments in data-processing equipment alone represented 7 million francs. About 150 personal computers and 10 work stations have now been installed and they are in process of being formed into a network.

Some departments are very expensive. "Our microelectronic technology station is a real bottomless pit." While the high-tech environment of Toulouse, which is grafted onto the aerospace and aeronautics industries, aids the laboratory in its search for contracts, the privileged relations with firms created by former researchers constitute the best door to industry. Whether it be Soterem [not further identified] in the field of advanced mechanics, Orion in electronic card testing, Verilog [not further identified] in reliability of software, Dinov [not further identified] in high-level training, Micro-Systemes in industrial data processing, Midi-Capteurs for the marketing of artificial skin, Logabey [not further identified] in underwater robotics or even Midi-Robots, the leading CNRS subsidiary, for mobile robotics, all these firms exploit research initiated at LAAS or manufacture products based on it.

In a certain number of cases the laboratory grants licenses to existing companies. In the others it plays the role of American incubator by "hatching" researchers for industrial firms having difficulty in creating them. This help in getting started may take a year. During this gestation period the new company benefits from LAAS facilities (premises, equipment...). After that it is on its own. "Of course, when such companies have a problem, they don't forget the laboratory's research potential and with just a telephone call we are able to send a researcher." For Alain Costes this is a way of unequivocally demonstrating that even their basic results are not necessarily condemned to winding up in the bottom of a drawer. Another decisive advantage: The language barrier does not exist with ex-researcher managers.

Another key focal point for expansion: Europe. "We have great faith in a regional Europe." For Alain Costes this means through direct relations with laboratories and even with foreign companies. Thus LAAS is involved in a dozen European programs. We note, for example, its participation in the management of Esprit, in SEDOS (Software Environment for the Design of Open Distributed Systems), in Delta 4 (Definition and Design of Open Dependable Distributed Systems) and SKIDS (Signal and Knowledge Integration with Decisional Control for Multisensory Systems). With Eureka LAAS is involved in Prometheus (Program for a European Traffic with Highest Efficiency and Unprecedented Safety) and FAMOS (Flexible Connection Workshop). Collaboration, association, a constant principle that applies equally to the training facilities and which presided over the birth of the laboratory.

The Best Door to Industry: Firms Created by Former Researchers

In 1987 the laboratory is organized about five research fields: automation, data processing, microelectronics, production technology and robotics. These major subjects are handled by 31 teams distributed in 10 research divisions. A typical example of a research field in which international competition calls the shots: microelectronics and the development of components based on gallium arsenide (AsGa). In the face of enormous Japanese resources like NTT [not further identified] or American ones like Rockwell, J.P. Bailbe's team has been fighting since 1977 to study the bipolar AsGa transistor. It is a matter of having this material take the place of silicium, the limits of the stocks of which are gradually being reached. The objective: to improve the speed, power and frequency characteristics of transistors. LAAS was one of the first laboratories to tackle the characterization of bipolar AsGa components. An advance fraught with problems inasmuch as no samples existed. "We had to make them ourselves." J.P. Bailbe explained that in 1977 the laboratory produced the components in a liquid epitaxis oven. But the process limited progress and in 1985 LAAS acquired a molecular jet epitaxis oven. The results have already surpassed those of the former installation.

The Henri Martinot team is working with the same process on the AsGa microstructure for more optoelectronic applications. They are in particular exploring the quantical effects that appear with extremely small thicknesses of material: from 10 to 20 atomic layers. What is at stake involves laser diodes for telecommunications (a very stable 40 mW power rating) as well as power diodes (from 2 to 3 W). A hot item in the field of space communication between satellites. LAAS is the only European laboratory that is working on diodes that emit light in the red end of the visible spectrum. The applications involve the storage of information on compact discs as well as laser printing or stamping, or even, thanks to an optical efficiency of 50 percent, utilization as an optical source.

Even more extraordinary: optical interconnection of printed circuits. The "field effect circuits and components" division, headed by P. Roussel, is analyzing the functional characteristics of the new generations of field effect components (MOS, TEC GaAs). The study of intelligent circuts (Smart Power) is one of its major objectives. "They will revolutionize the microelectronics industry in the 10 years to come." In the meantime this division is getting real products out of its work in the form of CAO [computer-assisted design] software for electrical and component design simulation. Thus, oriented toward unipolar components, BIDIM 2 was handed over to Thomson. As for CIRCEL, it is intended for the teaching of circuit design. The P. Roussel team collaborates with about 10 companies. The J.C. Laprie team is also working on software. Its specialty is a promising one: operational safety. The industrial market is a considerable one. Two computer programs designed by different teams are being applied simultaneously on the Airbus, or American space shuttle. In this field LAAS is a participant in the development of the Hermes on-board data-processing system. The laboratory is developing computer programs to combat computer crimes, programs that are capable of cutting all of a company's files into pieces and reassembling them. "It's a matter of inspiring users of data-processing systems with confidence." The team is working on a project for computer-controlled switching for the SNCF [French National Railroads].

Another key field concerning safety: sensors. With a team of 25 people, Daniel Esteve heads the LAAS projects on "integrated perception systems." This activity became famous with the development of artificial skin. Marketed today by Midi-Capteurs, applications have been found for this product in biological and medical engineering for the analysis of electrical images of the skull. Now, it is a matter of applying microelectronic technology to sensors to replace the present mechanical systems. This is, for example, leading to the design of a pressure sensor made entirely of silicium so that it can be integrated into an engine injection system.

In the field of vision LAAS has Systeme Sud, which supplies CCD [not further identified] cameras, as a partner and Renault, PSA [not further identified] and Bendix as customers. Infrared is in the foreground for night vision and obstacle detection. In the latter field the Daniel Esteve team is collaborating on the Prometheus project, which has assembled 14 Europeans to design the automobile of tomorrow. It is essentially a question of increasing highway traffic safety with the ne plus ultra of technology: artificial intelligence, obstacle detection, communication.... "An experimental vehicle" should see the light in from 5 to 6 years, Daniel Esteve estimated. An infrared sensor has already been perfected. At night it "sees" for a distance of 150 meters and it will perhaps be coupled with an ultrasonic sensor to gauge [the distance from obstacles] in the immediate environment.

This work on multisensor systems is, of course, closely linked with the concerns of the robotics team, headed by G. Giralt, whose work is principally focused on mobile robots. These studies have been undertaken since 1977. They have resulted in the experimental mobile robot, Hilare. Despite criticism of the real future of such robots, G. Giralt sticks to his conviction. "This subject constitutes an ideal support for speculative research." Their current efforts have begun to be rewarded. IBM has just bought a prototype version of Hilare through the intermediary of Midi-Robot, the industrial realizer of the project. And LAAS is associated with the AEC and MATRA [Mechanics, Aviation and Traction Company] on the Eureka AMR (Advanced Mobile Robot) project. Artificial intelligence constitutes the second major focal point of the robotics laboratory's research. The laboratory is working alongside MATRA and CNET [National Center for Telecommunications Studies] on the development of software.

These examples show just how far LAAS has succeeded in combining basic research and collaboration with industry. It is nevertheless evident that the big national companies constitute the bulk of its clientele. The small and medium-sized companies that are part of the action are particularly those whose creators came from the laboratory. They already constitute an appreciable number.

Ten Research Divisions, 31 Teams

Under the direction of Alain Costes and his assistant, Daniel Esteve, LAAS is organized into 10 research divisions and 31 teams:

Distributed nonlinear stochastic systems (SNL). Head: Y. Sevely. Signals and systems theory. Biotechnological process. Thermic process. Power systems.

Decentralization, hierarchization, parallelism in optimization and control (DHP). Head: J. Bernussou.

Production systems (SP). Head: F. Roubellat. Modelization and driving analysis. Methods for processing driving data.

Robotics and artificial intelligence (RIA). Head: G. Giralt. Modelization and movement control. Manipulation, perception and modelization of the environment. Artificial intelligence. Flexible connection cell. Hilare. Mobile robots. Artificial intelligence machines.

Tools and software for communication (OLC). Head: M. Diaz. Multilayer architectural structure design principles. Languages and architectural structures for parallel, distributed programming. Formal specification of protocols. Verification of protocol networks.

Error tolerance and data-processing operational safety (TSF). Head: J.C. Laprie.

Field effect circuits and components (CCEC). Head: P. Rossel. System integration. MOS power components, Field effect components. Microwaves. MOS technologies.

Bipolar components (CB). Head: J.P. Bailbe. AsGa-based bipolar transistors. Power structures. Background noises and polysilicium emitters.

Microstructures 3-5 (M.3-5). Head: H. Martinot. Light emitter components. Molecular jet epitaxis structures.

Integrated perception systems (SIP). Head: D. Esteve. Optoelectronic applications of heterogeneous connections. Physics and technology of vision systems. Low-level microstructure. New sensors.

11466

BRIEFS

FRENCH ROBOT BASE--By the end of 1986, the total number of robots installed in France was estimated by the AFRI (French Industrial Robotics Association) to be 5,270 units of which 1,897 (36%) were imported (this figure does not take into account the C and D classes of programmable robots). The number of robots installed during 1986 is estimated at 1,120, that is an increase of 27% in comparison to the previous year. Imports are said to account for 490 units, that is 44% of the total. French production has been put at 810 units of which 180 were exported. Of the 1,120 robots installed in France last year, 629 were made in France, 256 were of European origin (166 Swedish, 48 West German, 20 Italian, 2 British, 12 Austrian and 6 Norwegian), 127 were imported from the United States and the remaining 108 from Japan. While the automotive industry is the largest user of robots in France with a total 414 units in service and an annual growth of 23%, the largest growth rate recorded was in the aerospace construction sector at +74%, but only with a total 17 systems. The mechanical industries come second with 224 robots (+25%), followed by the plastics parts sector with 185 units (+31%). The breakdown by operations shows that loading, unloading and handling operations are the biggest users of robots with 526 units (+37%); assembly operations follow far behind with 168 units (+37%). Glueing operations with 39 units installed in 1986 registered the highest growth rate at +163%. [Text] [Paris FTS--FRENCH TECHNOLOGY SURVEY in English Sep 87]

CSO: 3698/A025

BELGIAN-AMERICAN CHIP COOPERATION

Groot-Bijgaarden DE STANDAARD in Dutch 22 Sep 87 p 16

[Article: "Still Searching For Industrial Partner--Mietec Concludes Agreement With VLSI Technology"; first paragraph is DE STANDAARD introduction]

[Excerpt] Mietec, the chip manufacturer from Oudenaarde and a joint venture between the Flemish Regional Development Authority and the Bell Telephone Manufacturing Company (BTMC), is about to sign a technological cooperation agreement with the American VLSI Technology company, an internationally reputed chip manufacturer.

According to managing director Jean-Pierre Liebaut, VLSI Technology masters the very latest techniques in the manufacturing process, in so-called cell libraries (basic cells shortening the development time of a customized chip), as well as in C-MOS computer aided design. This would allow Mietec to update its technological know-how. In Liebaut's opinion, this technology is of paramount importance to attract an industrial partner.

Partner

Furthermore, Mietec is still searching for such an industrial partner to help finance its technological innovations. Talks are said to be in progress but Mietec is extremely cautious. As Mietec now belongs to the international Alcatel (CGE-ITT) concern, some suspect that attempts to attract a non-French partner might displease the French. Within the Alcatel group Mietec helps supply chips for the System 12 telephone system.

They refer to the delay already incurred in concluding the technology agreement with VLSI Technology.

Indeed, at the Flanders Technology International exhibition last May, Jean-Pierre Liebaut hinted that an agreement with the American company would be concluded "before the summer." However, more information about the terms of the agreement is required to correctly assess the importance of this technology agreement for Mietec. Mietec's possible access to the cell libraries of its American partner would allow the company to process orders more rapidly.

In 1986 Mietec's revenues totaled about 900 million Belgian francs. However, the year closed with losses, although the last quarter showed a positive cash flow (depreciations plus net results). The first quarter of this year also appears to have yielded a positive cash flow. For fiscal 1988 a financial balance in the accounts is expected.

25012
CSO: 3698/A028

NETHERLANDS ADOPTING CHIP PROTECTION ACT

Amsterdam COMPUTERWORLD in Dutch 15 Sep 87 pp 35-37

[Article by W.F.R. Rinzema, attorney at Stibble, Blaisse & De Jong in Amsterdam: "The Netherlands Will Have Their Own 'Chip Act' Fairly Soon"; first paragraph is COMPUTERWORLD introduction]

[Excerpts] Amsterdam--The provisional protection granted by the American Administration to Netherlands chip designs will end on 7 November 1987. If Netherlands designers want to see their designs protected in the United States after that date, the Netherlands legislation will have to meet American standards from then onward. The Netherlands bill relating to this matter will probably soon be approved by both chambers.

Because of this temporary measure the Netherlands government submitted a request to the Commissioner of Patents and Trademarks on 3 June 1985. The requested protection was eventually granted until 7 November of this year. Meanwhile, a directive for the legislation of the member countries was being worked out within the EEC.

On the basis of the EEC treaty the Council of the European Communities elaborated an EEC chip directive in record time. The preamble of the directive emphasizes the Community's need for chip designs to be clearly protected by all member states. The directive also aims at abolishing discrepancies in the nature and range of protection, especially because some of the member states are preparing their own legislation as a result of the SCPA [Semiconductor Chip Protection Act].

Differences in legal protection could jeopardize the Common Market. The directive therefore dictates that its contents be incorporated in the legislation of the member states by 7 November 1987. The EEC members themselves may decide if copyright laws are to be introduced for chip designs or whether a special protection (sui generis) is to be worked out. Furthermore, the directive determines how matters should be settled rather than what should be stipulated regarding those matters.

In March 1986 Netherlands minister of justice appointed a working group to advise him on how chip designs should be protected according to Netherlands law. The present bill submitted by the government to the Second Chamber on 24 March 1987 was prepared entirely by this working group. It opted for a special legislation on the American model and consequently not for the introduction of copyright laws.

The main stipulations of this bill are discussed hereunder.

Object of Protection (1)

If a chip design is to be considered for protection it must be "original." This term is also familiar in copyright legislation and has a different meaning than "new." Originality means that the design have a typical or personal character.

On the basis of the bill, the designer can take action against whoever borrowed his work to achieve his own, but not against someone who independently achieved the very same design. The government choice of "originality" over "newness" reflects its desire to also protect the designer who independently achieved an identical result.

Right of Origin (2)

As with copyright, the exclusive right to the chip design originates at the moment of creation. Consequently, the right is not immediately known to third parties. Hence, the design must be registered with the Bureau for Industrial Property in Rijswijk within two years after the first use. The interested party is entitled to take legal action only after registration, even though that right previously existed.

If registration does not take place within two years, the right expires. This regulation may entail a reduction in the number of claims by inattentive (foreign) designers.

Duration of the Right (3)

According to the bill the chip design is protected for 10 years after its registration. The maximum protection period could thus amount to 12 years. This period is notably shorter than the duration of a copyright, as an author's works are protected during his lifetime and up to 50 years after his death.

The government has opted for this shorter period to allow the designer to recover his investments without slowing down industrial developments too much.

The exclusive rights of the designer comprise: the right to duplicate the design, to manufacture a chip using the design, and to market the chip(s).

Restrictions

With regard to the designer's rights, some restrictions have been incorporated into the bill. For instance, a third party can sell a chip (design) once its circulation has been allowed in one of the EEC member states by the holder of the exclusive right or in his name. This prerogative applies only for a specific specimen and not for copies manufactured without the entitled party's permission. This rule is called "first-sale doctrine" and can also be found in the American chip act (SCPA). In Europe the word "exhaustion" is used.

Moreover, chip designs can be duplicated for educational purposes or for analysis. A third party is allowed to take pictures of the design and to study and analyze them. This rule can also be found in the SCPA.

This practice, called reverse engineering, is an important industrial tool enabling the manufacture of a chip which is competitive with the other without merely copying it. The results of this reverse analysis may be used to develop a competing chip, provided the final result again meets the originality requirement.

This exception has been included in the bill to prevent the Netherlands industry from being in an unfavorable position in relation to holders of an exclusive right from another country.

Third Party Acting in Good Faith

The third exception again corresponds with the SCPA. He who obtains a chip (design) in good faith, being marketed without the permission of the rightful owner, may continue its exploitation. The reason is that it is usually unfair to expect a third party to ensure that a certain product does not include an infringing chip. Incidentally, this rule deviates from standard industrial property law. However, it has been incorporated into the bill to prevent differences between the situation in the Netherlands and in the United States.

Not Under Copyright

This law will be applicable to designs made by a subject or resident of an EEC member state. Chip designs exploited for the first time in an EEC member state with permission of the maker will also be protected. The government hopes, as does the American Administration, that non-EEC countries will protect foreign chip designs to be taken into consideration for European protection.

The bill explicitly states that chip designs will not fall under copyright laws. Protection on the grounds of other laws, such as the National Patent Law and the Uniform Benelux Law on Designs and Models, will remain possible. Violation of the maker's exclusive right may be punished by six months imprisonment or a 100,000-guilder fine.

Conclusion

The Netherlands Government has two goals in mind with this bill. It wants to adequately protect the designer of a chip and hopes that the Netherlands legislation will lead to "Presidential Proclamation" resulting in Netherlands designs also being protected in the United States.

In particular the last goal accounts for the great resemblance to the American chip act. In this context the specialist P.B. Hugenholtz has been tempted to use the expression "chip act clone."

It is not yet known whether the Netherlands bill will lead to presidential proclamation. Rumor has it that the American Administration might switch to "interim orders" instead of proclamation. This could result in new conditions being attached to protection. Such a procedure is favored by the American chip industry. Here again is demonstrated to what extent law and economics are closely knit.

It appears from a recent memorandum of the ministers of justice and of economic affairs, referring to the report of the Permanent Chamber Commission for Justice, that the commission's attitude toward the bill is positive. The ministers therefore expect the act to be passed before 7 November.

Finally, it is interesting to note that within the framework of the World Intellectual Property Organization (WIPO) a committee of experts is also preparing an international agreement to protect chips. This clearly illustrates the need for reliable legal protection of chip designs! If the American Administration wants to follow suit, the SCPA must be changed.

25012
CSO: 3698/A029

LEADING FRENCH BIOCHIP AUTHORITY INTRODUCED

Paris SCIENCES & AVENIR in French Jul 87 p 14

[Article by Dominique Commiot: "Organic Molecules To Process Information"]

[Excerpts] What enthusiasm, what dynamism! The cliches of the etherial scientist, far removed from concrete realities, do not apply to Andre Barraud. As much a basic research man as he might be, this CEA [Atomic Energy Commission] research scientist designs the machines and complex equipment required for his work. Andre Barraud, a solid-state physicist trained in electronics, is a devotee of technology; Barraud designs "molecular structures." Barraud turns out organic molecule assemblies with one or multiple molecule layers capable of performing a specific function based on a method developed by Irving Langmuir (winner of the 1930 Nobel Prize) and Katherine Blodgett. The substance, made of amphiphil molecules (water absorbant on one side and water repellent on the other), is placed in a receptacle filled with very pure (osmotically demineralized) water. The molecules "float" to the surface and are deposited by pressure on a substratum. The film that is formed, layer by layer, is a crystalline solid. This research has multiple applications--from biomimetic structures with certain properties of biological molecules to information processing by organic components. Barraud's team has thus developed a molecular structure which is able to function in a manner similar to the way blood hemoglobin functions in relation to oxygen. This achievement could lead to the development of a membrane which is able to withdraw oxygen from a gas. In 1984 the team also produced the first molecular-dimension electric conductor. Next July, it will introduce a molecular magnetic substance.

The primary stake in this research is the development of organic components capable of processing electric signals (to amplify, block, route signals, etc.) with the ultimate aim of developing computers that use organic components. The primary advantage of such components is that they have a three-dimensional structure, whereas silicon chips (or chips made from other mineral materials) can only be used for two-dimensional circuits. Although they are well suited to conventional sequential computers, inorganic components are particularly limited when it comes to developing parallel data processing machines. Until now, no one has developed an active organic component which is able to process information. However, over the past few years numerous teams throughout the world have intensified their research efforts, especially on the basis of CEA findings. In Japan Barraud has found several dozen laboratories and about 1,000 research specialists. National research programs have been launched in the United States and in the UK. France, for its part, has a team at the leading edge. In 1981, DARPA, the top U.S. Defense Department research agency, consulted Barraud to implement a vast work program in this area, one which the Japanese initiated after seeing the Saclay (CEA) findings. Barraud's team, however, is merely a staff of 10, of which only five work full time. "Nevertheless, we are at the top," reassures Barraud. "Our very modest size does not prevent us from being terribly efficient. We are obliged to make the right choices in our areas of research, and in our career as researchers we have experienced very few dead ends."

This scientist of world renown (who spends too much time at international conferences for his taste) produces with his staff of five more than 20 professional papers a year. He works without letup to discover logical gates and organic memory circuits. "I have very precise ideas on these subjects," Barraud says.

Barraud would like other French teams to participate in such advanced research projects. Only a small team from Thomson's central research lab is working on the use of such molecules in optics. It would be unfortunate if, because of inadequate resources, France were unable to maintain its leading position in so promising a field of research.

25050
CSO: 3698/A308

SIEMENS STRESSES CIM, DATA PROCESSING, SEEKS JOINT VENTURES

36980022a Paris L'USINE NOUVELLE In French 1 Oct 87 p 28

[Article by Munich special correspondent Jean-Pierre Jolivet: "Siemens in Search of Partners"; first paragraph is L'Usine Nouvelle introduction]

[Text] Priority to telecommunications, data-processing, automated production and components . . . This is the strategy of Siemens, which is seeking alliances in Europe and the United States.

CGE-ITT, Bull-Honeywell, Thomson-SGS, Asea-BBC, Thomson-General Electric: it is questionable whether Siemens can remain outside the great alliances shaking up the world electronics industry for long. Without disavowing its strategy, based primarily on domestic growth, the German giant--the number 7 electrical and electronics manufacturing firm in the world and the second-ranking European company after Phillips--is waking up and doing some soul-searching. In the analysis of Karl Hermann Baumann, Siemens' assistant financial director, "We must prepare ourselves for some new ripples in the electronics world. We will meet the challenge through an ambitious investment program, which may include the acquisition of companies."

In 3 years, Siemens has increased its investments threefold, boosting them from Fr 5.6 billion to 20 billion. Five billion was allocated to acquisitions in 1986. These efforts will be continued in 1988. With more than Fr 72 billion in "cash", the group of 363,000 people managed by Karl-Heinz Kaske can well afford it!

Aware of the danger of isolating itself, Siemens--whose sales will climb only 8 percent in 1987, to reach Fr 168 billion--has established priorities: telecommunications, data-processing, automated production and components (to maintain mastery of rising technology). Europe and the United States will be the targets of its offensive.

Isolated in the European telecommunications arena following the CGE's buy-out of ITT and Ericsson's entry into the French market, Siemens is trying to recapture the initiative. Its objective is to weld together, through a network of alliances, a federation of the CGE-ITT accord "rejects." In Italy, where it is already well established (16 percent of the market) after its buy-out of the American GTE's European operations, Siemens would like to conclude a joint venture deal with Telit. It is having some difficulty in doing so. In Great Britain, the German firm is on the look-out for the slightest opportunity that would allow it access to that market. So far, to no avail. The story is the same in France, where, as an unfortunate candidate in the CGCT takeover alongside Jeumont-Schneider, the Munich group in getting back on its feet with a bid offer for mobile telephones in cooperation with the General Water Company.

Table 1. Sales by Activity (Average annual growth rate in billions of DM)

Sector	1981	1986	Percent Change
Components	1.6	2.2	+ 6%
Electrical energy and automation	9.2	12.0	+ 6%
Installation and automobiles	3.3	3.2	+ 0%
Communications and data-processing	5.4	8.7	+ 10%
Medical techniques	3.0	4.8	+ 10%
Telecommunications and safety systems	6.3	8.4	+ 6%
Power plants	3.2	4.0	+ 4%
Lamps	1.4	2.0	-
Other	1.2	1.7	-

Without abandoning its European ambitions, Siemens is sparing no effort on the American market. In 1983, Fr 3.3 billions were invested in the United States, 2.5 billion for the acquisition of several GTE divisions. These investments were a success--Siemens' activities (carried out by a staff of 24,000) are climbing 24 percent a year, and its goal is to make Fr 18 billion in 1988. Its EWSD digital telephone switchboard was selected by five BOC's (local operators born of the AT&T breakup). Its Boca Raton factory manufactures private UAX's (unit automatic exchanges) for the American and Japanese market, an opening Siemens intends to exploit to impose its RNIS network.

The American assault includes some ulterior motives in the area of computers. The United States could well be the point of departure for the conquest of the British and French data-processing markets. Munich officials barely conceal their interest in future buy-outs of American computer manufacturers, particularly mini-computer manufacturers.

9825

BRIEFS

NETHERLANDS SUPERCONDUCTIVITY APPLICATION--Rotterdam, 1 September--The Netherlands Energy Research Center [ECN] at Petten has succeeded in producing new superconductive materials in usable forms. This is the first step on the road to practical applications. Until recently, researchers in this area almost exclusively used ceramic powder pressed into tablets, which was then sintered in an oven. ECN's current manufacturing technique uses very thin sheet and tape material, which is so flexible and easy to handle before sintering that it can be wound into coils. Subsequently, these coils are sintered and prepared for various experiments. During the past few weeks ECN has successfully conducted a number of tests demonstrating the presence of a current flow in the coil as well as the magnetic field produced by that current. [Excerpt] [Rotterdam NRC HANDELSBLAD in Dutch 1 Sep 87 p 13] 25024

CSO: 3698/A018

EC CALLS FOR COHERENT S&T POLICY

Text of Motion

Luxembourg EUROPEAN PARLIAMENT SESSION DOCUMENTS in English Doc A 2-14/87, 10 Apr 87 pp 1-7

[EC report on Europe's response to the modern technological challenge, drawn up by M. Poniatowski on behalf of the Committee on Energy, Research, and Technology]

[Text]

In its resolution of 8 October 1985 the European Parliament instructed its Committee on Energy, Research and Technology to submit periodic reports on Europe's response to the modern technological challenge.

On 25 February 1986 the Committee on Energy, Research and Technology appointed Mr PONIATOWSKI rapporteur.

The committee considered the draft report at its meetings of 27 January, 23 February and 18 March 1987. It unanimously adopted the motion for a resolution as a whole on 18 March 1987.

The following took part in the vote: Mr PONIATOWSKI, chairman and rapporteur; Mr ADAM, first vice-chairman; Mr KOLOKOTRONIS, third vice-chairman; Mr CHIABRANDO, Mr FORD, Mrs LIENEMANN, Mr LINKOHR, Mr O'DONNELL, Mr PETERS, Mr PETRONIO, Mrs PEUS, Mr RINSCHE, Mr ROBLES PIQUER, Mr SMITH, Mrs VIEHOFF, Mr WEST and Mr TURNER.

The report was tabled on 25 March 1987.

The deadline for tabling amendments to this report will be indicated in the draft agenda for the part-session at which it will be debated.

The Committee on Energy, Research and Technology hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

MOTION FOR A RESOLUTION

on the second report on Europe's response to the modern technological challenge

The European Parliament,

- having regard to its debate on Europe's response to the modern technological challenge during the October 1985 part-session,

- whereas the Single European Act, one of whose objectives is to strengthen the scientific and technological basis of European industry and enhance its international competitive position, has been adopted in the Council of Ministers,

- having regard to the stage reached by the Council in its deliberations on the second multiannual framework programme of scientific and technical activities and its implementation by means of specific programmes,

- having regard to the outcome of ministerial meetings in the framework of EUREKA,

- having regard to the report of the Committee on Energy, Research and Technology (Doc. A 2-14/87),

A. whereas the current fall in the value of the dollar will inevitably enhance the competitive position of American products in the high technology sectors,

B. whereas Japanese penetration of international markets is continuing and Japan is increasingly diversifying its basic research efforts in all fields,

C. whereas the launching of the Human Frontier Science Programme is evidence of Japanese ability to conduct a vast worldwide research programme,

1. Believes that the technological challenge confronting Europe has intensified in the last two years;

2. Once again draws attention to the particularly harmful political, economic and social consequences of this situation;

3. Reaffirms that it is convinced that Europe's evident technological weakness calls into question neither its creative nor its innovative capabilities but simply reflects its difficulty in producing and selling competitive technological goods on the world market;

4. Takes the view that pre-competitive research must be reinforced in the Community, otherwise all the Member States will lag even further behind technologically;

5. Again urges the Council to adopt forthwith the second multiannual Community framework programme of technological research and development in accordance with the provisions of the Single European Act in order to enhance the industrial competitive position of all the Member States;

6. Also calls for immediate implementation of the framework programme by means of specific programmes once it is adopted;

7. Takes the view that priority should be given to programmes to promote information technologies, telecommunications, biotechnology and advanced materials;

8. Also considers that research into alternative energy sources, the rational use of energy and improved use of existing resources should, despite fluctuations in the price of oil, be given priority in view of the scale of the energy problem in Europe and its endogenous potential;

9. Draws attention to the fact that Europe has need of the benefits it can reap from worldwide scientific and technological cooperation once it is established on a selective and reciprocal basis if it also wants to safeguard its own research capabilities;

10. Considers that the European Community should encourage the establishment of a network of science and technology parks throughout the EEC and help with the creation of 'incubators';

11. Notes that despite these recommendations, the European Community still has no structure that provides access to funding for innovations comparable to those that exist in the United States and Japan;

12. Encourages the European Investment Bank substantially to reinforce its action to support high-technology projects launched by laboratories, research institutes or small and medium-sized undertakings;

13. Urges that rapid decisions be taken on proposals to create a European risk capital market, and in particular, to create investment companies (e.g. Eurotech Capital), a guarantee mechanism (e.g. Eurotech Insur), action to develop risk capital activities (e.g. the Venture Consortium of the European Venture Capital Association), harmonized fiscal incentives etc.;

14. Considers that it would be essential to set in train a European research and innovation programme for the small and medium-sized undertakings to provide assistance and grants for researchers and enable undertakings to set up new high-technology activities and products, on the lines of the SBIR developed in the United States;

15. Takes note of the research and technology projects that are being launched as part of EUREKA, on which a separate report should be drawn up;

16. Must nevertheless point out that EUREKA projects form no part of any global strategy so that EUREKA's potential role in strengthening Europe's technological capacity has been weakened;

17. Restates its opinion that a policy of major European projects commensurate with Community objectives should act as a catalyst and make it possible to strengthen research and development structures;

18. Takes the view that in many respects Europe lacks information on its real technological situation and is as ignorant of its weaknesses as of its strengths;

19. Calls on the Commission to draw up an annual status report on European technology;

20. Warns the governments of the Member States that European research workers and scientists are in a very unfavourable situation and that this will merely speed up the brain drain and thus in the long term call into question our research structures;

21. Calls on the Commission, when revising the STIMULATION programme, to put forward proposals for improving the situation of research workers and more especially encouraging university-industry contacts which all too often are non-existent or formal;

22. Stresses that the nature of our response to the technological challenge depends to a very large extent on the scale and quality of our educational and technical training structures which still do not meet the needs of industry;

23. Reiterates its conviction that the European response to the technological challenge must devote especial attention to the needs and potential of the less-developed countries of the Community, favouring the objective of economic and social cohesion enshrined in the Single Act;

24. Proposes to re-examine our technological situation just before the 1989 European elections so that it becomes one of the main topics of the election campaign;

25. Instructs its President to forward this resolution to the Commission, the Council, the Economic and Social Committee and the parliaments of the Member States.

Explanatory Statement

Luxembourg EUROPEAN PARLIAMENT SESSION DOCUMENTS in English Doc A 2-14/87/B, 13 Apr 87 pp 1-21

[EC report on Europe's response to the modern technological challenge, drawn up by M. Poniatowski on behalf of the Committee on Energy, Research, and Technology]

[Text] EXPLANATORY STATEMENT

Introductory remarks: the stakes get higher

1. In the period that has elapsed since Parliament adopted its first report on Europe's response to the modern technological challenge , most developments have confirmed the anxiety expressed by Parliament that failure to meet the challenge would jeopardize 'its political and economic independence, and its social and cultural identity' . In that same resolution , Parliament committed itself to work with the other European Community institutions to make up, in the next ten years, i.e. by 1995, the loss in industrial competitiveness in high technology goods that has occurred in the last 20 years. No-one seriously imagined that important results would be achieved in the first year. However, there are encouraging signs that, at least the major European firms and communication media have got the message that European cooperation is essential for survival even if the national governments and administration have not.

2. In most Community countries, firms that have managed to transform their basic and applied research into tangible, marketable products have had positive results. Special mention must be made of the Federal Republic of Germany, which seems to be making a breakthrough in applied pharmaceutical research, nuclear physics, advanced energy and lasers. Public and private R&D expenditure in the Federal Republic has increased by 20% in the past three years, and now stands at 27.3 billion dollars. There are still large patches of shadow over the whole of the technological map of Europe, however.

It is also becoming increasingly clear that Europe is lagging technologically not because of lack of creativity, inventiveness or basic research, but because of its inability to produce and sell competitive technological products that can bear comparison on the world market.

Europe has a creative intellectual environment, but its industrial and commercial environment is generally ill-adapted. The electronics sector is one example.

3. It is estimated that by the year 2000 world sales of electronics will account for 1 000 billion dollars, making it by far the largest industry in the world. By then it is estimated that the EEC will have a deficit in the electronics trade of nearly 50 billion dollars: and the industry will actually employ 200 000 fewer people. At the same time, Japan and the USA will have created an additional 2 million jobs between them in electronics. In other words, unless Europe reverses the world trend, even its most important growth industry will suffer significant job losses: it then becomes

very difficult to see how Europeans will be employed by the turn of the century . For the electronics market now - estimated at around 200 billion dollars, only Japan records a positive balance with a surplus of 55 billion in 1984 . In the past 5 years, Japan has considerably increased its surplus (twofold with Europe and the rest of the world and fivefold with the USA). The USA has managed to double its surplus with Europe but has fallen back slightly with the rest of the world, particularly as a result of the new industrialized countries of South East Asia, and saw its deficit with Japan increase from 3 billion to 15 billion. Europe's position is bleak - a slight fall in its traditional surplus with the rest of the world and a doubling of its deficit with the US and Japan. These trends apply in varying degrees to electronic and computer equipment, entertainment electronics, active and passive components, measuring instruments and equipment, electronic medical equipment, receptional electronic equipment, automation equipment, data processing equipment and even trade in telecommunications equipment. For computer services and software, Japanese/American trade is very slight, with neither side enjoying a surplus, but Europe is substantially in deficit vis-à-vis the United States.

4. European citizens and even their political representatives, will not always see the immediate link between these statistical assessments, and the day-to-day realities of economic life. Perhaps the most important fact to emerge since we last examined these questions is that for the first time, the average standard of living in Japan is now higher than that of the USA - a standard far superior to the average standard enjoyed in Europe.

Part I - Europe's response

5. Since the end of 1985, two major developments have dominated European policymakers' attention:

- the development of EUREKA;
- the discussions leading to a new Framework Programme for Research and Development activities of the EC.

Both of these developments have shown a new mood in Europe, particularly in industry, one of cooperation and collaboration. Industry has been outspoken in its support of a major increase in EC funds for Research and Development, believing that the Commission's proposal (7.7 billion ECU for 5 years) represents an absolute minimum . Industry has proposed a series of new collaborative ventures in the EUREKA framework: 72 joint projects decided since the beginning of the year, 45 more in the pipeline - and this despite the fact that participating firms do not automatically enjoy commercial or financial benefits. But EUREKA projects, unlike those that form part of Community programmes, seem to escape control by the public authorities. It is therefore difficult to make any lasting assessment of their scientific and technological value, given the very sketchy specifications available. Nevertheless, the EUREKA projects, particularly those with catchy names (Eurobot, Euromark) are still very popular in national political circles.

6. The Round Table of European industrialists has come forward with proposals for large-scale technological integration projects (for example silicon chip factories, robotics factories, automatic translation and word processing facilities)[1]. Already Bull, ICL and Siemens cooperate in a joint research centre of advanced computer software. Siemens and Philips have set up a 1 billion dollar joint venture in the area of micro-chip technology. Bull and Olivetti are cooperating on banking terminals.

7. Community projects began to bear fruit in 1985-86. A significant number of ESPRIT projects have already produced tangible results . For instance, a 10K-gate array has been developed with characteristics comparable to the best in the world. A new line for production of these circuits is being built by Siemens at a cost of 100 m ECU. The development of prototypes is planned for next year, to be followed by full production. In information processing systems too prototypes have been developed and evaluated. GIE-Emeraude produced a software product called EMERAUDE and put it on the market in September 1986, one example of timely exploitation of ESPRIT results by industry.

BRITE projects have been in an active phase since the beginning of 1986 and contacts we were able to make with industrialists in several Community countries revealed how necessary and valuable the programme was.

8. Nevertheless there is no doubt that these programmes must not remain at the basic research stage. Feasibility must be taken into account at the precompetitive stage of each project so that the transition to demonstration and then development stage is increasingly rapid. That is what is planned with the new ESPRIT programme.

The remaining constraints, legal (the 'rules of competition'), institutional (hardware for military use is not covered by the Treaties) and economic (lack of a proper internal market and slowness in adopting common standards) should not however be underestimated. Community research is yielding results that can be quantified in economic terms, and the momentum provided in the last two or three years must be sustained, particularly in the second framework programme, where adequate funds are essential.

It is to be hoped that politicians in all Community countries will take a little more account of the opinion of industrial circles and the confidence they place in European research programmes.

---

[1] Although the welcome for such proposals from the political authorities, notably the Council, has been tepid

9. At the same time, the Commission is preparing new proposals, not just to revise and strengthen existing multi-annual Research and Development programmes (and there are now a dozen major revisions in the pipeline) but also infrastructural proposals covering high technology innovation financing (Eurotech, SPRINT) and training and education. The next few months will provide an opportunity for governments of the Member States to demonstrate their seriousness in supporting and promoting technology policies, when it comes to adopting these varied proposals.

It has been to be admitted that some Member States' governments are neither enthusiastic nor unanimous in their support of the European Community's technological objectives. Although most of the Member States have agreed with the Commission's proposals on the new framework programme, the United Kingdom, the Federal Republic of Germany and France have been very much less enthusiastic. It seems that this is due to budgetary considerations which are difficult to understand since the amounts involved are small and spread over five years; the governments of these three countries have either not understood or not wanted to understand that the framework programme provided for in the Single Act is above all the expression of joint political resolve that is in no way prejudicial to either adoption of specific programmes or the Community budget procedure. A real and perturbing equivocation vis-à-vis the very concept of European solidarity in response to the technological challenge is also discernible.

10. This situation is partly due to the fact that each country still thinks it can tacklet he technological challenge alone. And it is true that their performances vary widely. Relatively speaking, the competitive position of the United Kingdom and, to a lesser extent, France, has deteriorated. Italy, thanks to its buoyant underground ecnomy, is showing considerable adaptability to the new technologies. Spain's dynamism augurs well for the future. The best European performance by far is that of Germany, whose trade surplus has increased from 30 to 42 billion dollars (official estimates, 1984-1986). Germany is thus reaping the rewards of a policy of austerity and public funds for industry.

11. In the autumn of 1985, it appeared that some of the national efforts among EC Member States would be distracted by cooperation with the USA under the Strategic Defence Initiative programme. It has emerged in the last 12 months that SDI's impact on Europe has a limited importance partly as a result of impositions concerning technology transfer[1]. Of the EEC Member States signed up formally, the UK may benefit to the tune of 30 million dollars, financing various projects within the UK. In the German Federal Republic, MBB's research on the application of infra-red in space will take the lion's share of finance available, possibly up to 15 million dollars over the next few years. Other German companies, like Zeiss, in the sphere of advanced optics, have decided not to participate in SDI so as not to jeopardize their East European markets. Most EC countries have not concluded formal intergovernmental agreements with the USA, leaving their industries free to participate if they wish, and if the opportunity arises.

[1]Peterson report of the North Atlantic Assembly

12. In fact, future opportunities may not arise because of heavy Congressional constraints on overseas and competence contracts because of increasing budgetary constrictions on the programme itself and because of the workings of the GRAMM/RUDMAN/HOLLINS Acts. As views changed on a European research programme and the scale of possible funding from outside, a new phenomenon and the opportunities and dangers associated with it have become apparent - the very substantial inward investment from the USA and more particularly from Japan[1].

13. Whereas until a few years ago plans to open plants by Japanese or American companies provoked difficulties, indeed protests from the potential host countries and local communities, now there is intense competition among EEC Member States to attract inward investment. At the end of 1985, total aggregate investment of the USA in Europe was over 100 billion dollars. It had reached 11 billion dollars for Japan. The reasons for Japanese investment in Europe are attributable to three factors:

(a) the threat of curbs on direct Japanese exports to Europe;
(b) the steady increase in the value of the yen[2];
(c) the financial and non-financial inducements offered by EEC Member States.

At the end of 1986, MATSUSHITA opened a manufacturing unit for tuners in France, one for typewriters in the UK and two, one for video-tape recorder spare parts and the other for electronic components, in Germany, and concluded an agreement with PHILIPS for the production of large-scale integration circuits.

14. Of course, the European Community is suffering from very high levels of unemployment and is starved of adequate domestic investment for new technology industries. It therefore looks to inward investment as a means of coping with these problems. However, alterations in the factors which have contributed to the growth of this inward investment can just as easily lead to it tailing off, or a reversed trend. It is in any case an indirect and fragile basis for a revival in Europe's indigenous high technology industries. In some cases, European plants have tended to be of a low added value ('screwdriver projects'), only a few Japanese firms locate technological lead-edge sites in Europe[3]. In some cases, European/Japanese joint ventures have had unhappy outturns with a relationship of dependence, or with benefits flowing in only one direction.

---

[1]Article in the Financial Times by Guy de Jonquières, 10.11.86

[2]Japanese industry is having its worst year in more than two decades as a result of the massive revaluation of the yen against the US dollar and against most of the currencies of the Asian region. Companies and industries ranging from electronics to shipbuilding and from motors to ballbearings face a situation in which exports are no longer the key to growth and when the only chance of survival as a profitable concern may be to shift production out of Japan to one of the newly industrialized Asian countries or the US (or to Europe). (Far Eastern Economic Review - 25.12.86)

[3]See 'Japan's European presence' - article by Nick Garnett and Ian Rodger, Financial Times, 27.8.1986

15. It seems that, in order to become less hampered by the upward trend of the yen and get round tariff and non-tariff barriers, Japan's strategy will be to have more and more products manufactured abroad, with however one notable exception. Japan will reserve the right to produce new and prestigious pre-series models itself and thus export and sell them at very high prices. Once demand has become established, there will be nothing to prevent very large numbers of these products being manufactured in Europe (and the USA). Thus Japan could gradually become not just a producer but a centre of creativity and knowledge that would enable it to attain a position of real and lasting economic dominance.

Part II - the Japanese challenge sustained

16. The latest indicators confirm that despite the rapid rise of the yen which has promoted substantial competition for Japanese products, Japan's technology remains formidable with a current account surplus of 95 billion dollars, an ever-increasing share of world trade and more than 200 Japanese wholly owned or joint venture enterprises now assembling and manufacturing in Europe. Japan's economic basis on which to confront the new research challenges is extremely strong.

The Japanese filed 486 948 patent applications in 1984 (latest figures available), in other words 44% of all applications filed throughout the world that year.

This is not to deny that Japan may have some problems. A spectactularly soaring yen together with any further fall in the dollar rate would inevitably lower Japan's competitive trade position. The profits of major Japanese firms fell during the 1986 tax year, and employment forecasts for the years to come are not good. The political and social cohesion of Japan in the last 40 years could be called into question. Like all industrialized countries, Japan will have to face up to the crisis but its assets (a record trade surplus, strong currency, key positions in high technology) are enviable.

17. From this position of strength, Japan is showing signs of being prepared to share more of its technology. For example, the Japanese Information Centre of Science and Technology (JICST) is to provide English language information on domestic technology. Its Human Frontier Programme, still to be defined, reposes on the idea of technology shared with the rest of the developed world, for the benefit of mankind as a whole.

18. All the indications confirm that Japan is moving very rapidly into those high technology sectors where until now its presence had been negligible. It is simply no longer the case that basic research is a weak point in the Japanese eye; recent successes in quantum research at Hitachi's central research laboratory in Tokyo demonstrate this point yet again. The innovative energy of its manufacturing companies like NEC, Fujitsu and Sony are bringing into the market a constant stream of new high technology products, with the time lapse between basic research and marketing pared down to the minimum. To take the most celebrated example - super computers - Japan moved from a position of non-existence in the market-place in 1980 to controlling 40% of it in just 4 years. In space, Japan has transformed itself into a serious competitor with the successful launch of the H1 on 12 August of this year, and the new generation of H2 rockets is already planned for 1992. The commercial profile of its space programme - concentrating on small, expensive and high-performance satellites - may make it a lethal competitor for Europe, particularly as its rocket components have a near-perfect record.

19. In the area which is one of Japan's main strengths, entertainment electronics, the strategic sense operates most effectively. Since 1985, Japan has developed the new digital audio tape form DAT - which can record as well as play back, whereas the cassette compact disc can only play pre-recorded material. Once DAT is launched on the market place there is little doubt that it could swamp compact discs, not least because of the size of the DAT cassette and the recording time of each cassette. It could have been launched in 1985, but it has been held back to allow the compact disc market to develop in the first place so that supply may meet existing demand. This kind of controlled entry into the market can only be orchestrated by extremely confident suppliers.

20. Only in the area of software and software products does it appear that Japan may lag behind American and European efforts for a considerable time to come. Here again, however, a new 100 million dollar research programme has just been launched to improve tools and methodologies available to the software industry. In the other areas of computers, telecommunications and electronic equipment, Japan emerges as a seemingly unstoppable force. It has taken the lead in a new technology, bioelectronics, a combination of electronics and biotechnology, whereby sensing, measuring and monitoring devices can be produced for various purposes, from measuring the level of sugar in the blood and of pollution to controlling the freshness of fish and robot 'sniffers'. Some fifty firms, including FUJITSU, NEC, KAO and the Tokyo Institute of Technology, are already working in these sectors.

Moreover, Japan's ascension is such that its information technology industry is currently studying a computer architecture that could serve as a standard throughout the world. This 'TRON' (real time operating system nucleus)[1] project is aimed at devising interchangeable modular systems that could serve as basic units for ultra high-speed computers. The fifty or so firms taking part in the TRON project are thus evidence of Japan's increasing determination to become independent of American standards.

21. In the annual assessment made by the magazine 'Expansion' (7 - 11 November 1986) of the competitiveness of major world economies, Japan is once again placed high in terms of industrial performance in all sectors (taking into account the evolution of exports, trade balance, exports to expanding markets, cost changes, productivity). If these last two factors - productivity and unit wage costs - are isolated, then the long-term strength of Japan can be most clearly seen. In 1985, Japan increased productivity overall by 4% compared with the European average of around 1.5 - 1.8%: for the USA, the appropriate figure was 0.2%[2].

[1] New York Herald Tribune, 4.2.1987

[2] The yen revaluation will produce a far greater impact than the 1973 oil shock. If the yen/US dollar rate continues to float at its present level, some Japanese industries, such as coal and non-ferrous metals will be forced out of existence. This will be a difficult transformation period lasting 4 or 5 years. At the end of that time its survivors will be stronger than ever. (Interview with TAKASHI ISHIHARA, President of Nissan Motor Company and President of KEIZI DOYUKAY - Japanese Committee for Economic Development) (Far Eastern Economic Review - 25.12.86)

22. Unit costs increased for the Japanese more than for the Federal Republic of Germany; however, this was still considerably less than for the USA, France, the UK and Italy - and it follows on a long period when Japanese unit costs, and particularly wage costs, were significantly less than those of European and American competitors.

Part III - the United States in 1986: a turnaround for its high technology industries

23. If 1986 is the year in which the USA moves into deficit in high technology trade for the first time, it is also the year in which the rapid decline in the value of the dollar makes its high technology goods formidably competitive once more. After 2 - 3 years in the doldrums, its information technology is well placed to recuperate business lost during that period; research and development efforts have not been relaxed, even by companies such as Wang which lost profitability for at least part of that period.

24. However, the American performance has been hit by a certain sluggishness. IBM itself, which saw its volume of trade double from 1980-1985, has seen its market share for some of its products declining in 1986, particularly for software, micro-computers and personal computers. A recent study highlighted some American weaknesses in the area of industrial robotics[1]. A Harvard business school pointed out that the competitiveness gap between the USA and Japan is being widened as a result of developments in automation which themselves reveal structural weaknesses in American enterprises. If one takes firms operating flexible manufacturing systems (robotics plus computer controlled machines, etc.), the average number of parts produced by such a system totals ten in the USA, 93 in Japan. The Japanese are far further ahead in terms of what is described as 'technological literacy' of Japanese workers and managers. Of Japanese firms studied, 40% of the workforce were college graduate engineers, all of whom had been trained on computers. For the USA, on the other hand, only 8% were engineers of university level: of those only 25% were computer trained. Training itself was more thorough in the Japanese case, taking three times as long. In Japan, the sytems were frequently reprogrammed and improved by small teams assigned directly to the factory floor. In the US, the teams are larger and the structure far more inflexible. It almost goes without saying that the contrast between the Japanese and European flexible manufacturing systems would be even more dramatic.

25. In a recent article[2] on world technological competition, the American magazine FORTUNE denounced the weakness of the US educational system by comparison with Japan's. It particularly mentioned an international competition held two years ago between several thousand American and South-East Asian students in which the Japanese, closely followed by Hong Kong Chinese left the Americans far behind. The journalist's conclusion was that the school year had to be lengthened and the quantity and quality of scientific education improved.

[1] Herald Tribune, 7.11.1986

[2] FORTUNE - 13 October 1986 - The high tech race - Special Report

26. The USA has resorted to certain bilateral agreements with Japan to prevent dumping and undercutting of electronic goods, and particularly computers and to force the opening up of the Japanese market to the USA. These agreements, however, are fragile in that they are bilateral and secondly are not covered by that part of production which no longer takes place in Japan itself.

27. If certain sectors within the US have suffered as a result of different factors - the space programme is the prime example - and if the National Science Foundation has had its position weakened as a result of controversy relating to earthquake studies, the government has made some intelligent choices for future research priorities with a new and extensive software project, not dissimilar from the Japanese one, highlighting the importance of this area for the two leaders of world technology[2].

28. The American authorities have just demonstrated that major research programme decisions can be taken quickly if the paralysing attitude of public authorities so frequently encountered in Europe is avoided. At the beginning of 1987, the American Government in fact approved a $6 billion project to construct a "SUPERCOLLIDER" particle accelerator. This will be the most costly research tool in the history of science. Being designed for basic research, it obviously has no direct industrial objective, although a number of derived applications or basic innovations are to be expected since the American Secretary of State for Energy does not hesitate to compare this project with man's first step on the moon. The United States knows that by approving a project of this size, it will forge ahead of Japan and Europe in the field of high energy physics in the next decade, and that this step will enable it to score important points in the technology race.

29. But ultimately, the strength of the USA rests with the profitability of its top companies and the high disposable income of its citizens. Of the top one hundred world companies in 1985[3], the USA holds 49 places (just one less than in 1981). Japan in the same period has seen its chart ratings move from 10 to 12; for West Germany, France and the UK, reductions from 9 to 8, 8 to 6 and 7 to 5 respectively tell the story; South Korea has moved from one of the top one hundred companies to four in the corresponding period. So during a time of exceptional turbulence, despite the huge fluctuations in the value of the dollar and despite the challenge both from Japan and the newly industrialized countries, the USA dominated big business in 1986. In nearly all the different industrial sectors with high added value resulting from Research and Development, the USA remains either the largest factor, or shares that position with Japan.

[1]FORTUNE - 13 October 1986 - The high tech race - Special Report

[2]In connection with the debate in the United States on the policy of exporting high technology products to East bloc countries, a recent study conducted by the National Academy of Sciences reached the conclusion that not only were these restrictions ineffective, they also accounted for the loss of 9 billion dollars a year as well as of 188 000 jobs.

[3]See Expansion, 7 - 11 November 1986

30. In the agro-food industry, vital for the development of biotechnology, the USA holds 7 of the top 10 world places for firms. For machine tools, mechanical and electronic, the USA holds 8 of the top 20 places, Japan 6, Europe 4 and South Korea 2. Of the top 20 chemical firms in the world, 7 are American, 3 German, 2 Japanese and and 2 Dutch. In the world of communications, 60% of the top firms are American. In information technology, 13 of the top firms are American and 4 Japanese and Europe figures only with Siemens as the 10th largest, Olivetti 12th and Bull 16th. The different placings only tell part of the story. Siemens' turnover was approximately 5 billion dollars in 1985; IBM's was more than 80 billion dollars. Even though its profit margins are on a downward trend, they are still in absolute terms far greater than any European firm could hope for.

31. With no immediate prospect of a sharp rise in the value of the dollar, the competitiveness of USA high technology still seems strong.

Part IV - The disposition of other forces

32. The major development relating to other nations and blocs is the emergence of South Korea as an important potential challenger in high technology products. The growing strength of Korean multinationals has already been commented on. A company such as SAMSUNG which already exports 60% of its total turnover is set on becoming one of the top 7 electronics firms of the world by 1990. Ambitious targets such as these are in no way treated with derision by informed observers. In such areas as machine tools and micro-processors, Korea has already established itself as a major force.

33. There are many signs that the ground is favourable for American research and technology, as could be gleaned from the American President's State of the Union address in January. For instance, the budget of the National Science Foundation should double in the next five years, new technological centres will be created, and special attention is also being given to transfers of military technologies to civil technologies and between science and industry.

Likewise, the mass recruitment of scientists and research workers seconded to American embassies is intended to implement a real scientific and technological monitoring strategy.

The Federal Government intends to increase research expenditure by 12% in 1988. These efforts cover all new technology fields - space, earth sciences, biotechnology (particularly as applied to agri-foodstuffs), particle physics, composite materials, etc.

34. The rapporteur would like to make a further comment on the USSR: in his first parliamentary report he referred to the determination of the new Soviet leadership to modernize the country's industrial and technological structure. On the basis of its vast technical potential, the Soviet Union has more than one million scientists; it has more skilled engineers, researchers and doctors than the USA. But it is hamstrung by the huge scientific bureaucracy and a poor rewards sytem for its scientists[1]. According to recent reports, Mr Gorbachev wishes to sack large numbers of unproductive researchers. Already 2 000 production engineers have been sacked at the Ministry of Chemical Industries, but these measures have not shaken up the bureaucracy responsible for managing science itself; they do not

---

[1] New Scientist, 2 October 1986

institute a promotion by merit system; they do not tackle the topic of scientific plagarism. In any case, this type of 'sacking' has occurred at various periods but the system has by no means changed. The main question today is whether there is any desire to change the system itself[1].

35. It is only with selective and qualitative measures that the Soviets will begin to realize their formidable potential. Despite their marked weakness in information technology, they began research on fifth generation computers in 1986 (SPRINT programme) and had encouraging results in molecular biology research (Moscow's Molecular Biology Institute, Chemyakin Institute), lasers and space[2].

With a better general environment, more scope for enterprise and research and better computers, the USSR could become one of the leading high technology competitors in a few years.

But very few senior Soviet officials are in favour of radical economic reforms such as have taken place in China since they would threaten the existing bureaucratic system. The success of Mr Gorbachev's policy does however depend on a certain amount of reform and the systematic introduction of new technologies.

Given the mediocre industrial and agricultural production levels, the drop in the number of non-Muslim workers in Russia, the more expensive raw materials and energy, and the trade balance deficit, the only answer is to increase and improve production and production earnings by using new techniques, technology and structural reforms. This is a lot to ask of a blinkered and insular bureaucracy. In all probability, progress will be slow.

36. In general, admission to the top table of the technological world is proving a slow and difficult progress for countries outside Europe, the USA and the Pacific rim. This is in part because of the scale of investment required to reach take-off point. The superabundance of micro-processors has stiffened competition to the point where even established industrial countries find making progress extremely slow and painful. Lastly, many potentially advanced countries are struggling with huge problems of indebtedness.

---

[1]According to the Quotidien de Paris of 12.12.86, what has been most evident so far is the negative aspect of this upheaval (more repression). In one year, more than 13 000 officials were sacked for gross misconduct or abuse of power, according to a report submitted to the Supreme Soviet by Mr Alexei Chkolnikov, chairman of the People's Supervisory Committee, on 19.11.86

[2]According to a study carried out by the American National Academy of Sciences and published in the International Herald Tribune on 13.1.87, the United States and its allies have a 5 to 10 year technological lead over the Soviet Union

Part V - The main sectors of high technology development

Information technology

37. Here, as was explained earlier, Europe is weakly placed in comparison with the USA and Japanese giants. It is worth pointing out that the largest share of the world market is now attributable to peripherals, print outs, screens, disks, etc., which represent up to 27% of the market, software accounting only for some 7% of the same market. In the crucial area of semi-conductors, NEC is now the world leader. Previously well placed, Europe is gradually withdrawing from the software market where the dominant position is held by the Americans; the world market is developing extremely rapidly: according to estimates it will expand from 13 billion dollars in 1984 to 33 billion dollars in 1990.

38. But in the crucial area of software products, it is the USA which holds 50% of the world market with no non-American firms flourishing in the USA itself, but with a two-thirds share of the European market held by the Americans. Although software has continued to be neglected by European firms, individual researchers have had remarkably successful results, which means that the Americans have found it relatively easy to recruit top software experts from Europe.

39. In the semi-conductors sector, Western Europe holds only 21% of the world market. SIEMENS, PHILIPS and THOMSON have begun talks on the joint design of very high capacity chips so as gradually to reach 64 megabits. The dominant position of Japan[1] and especially of South-East Asia - witness the take-over of FAIRCHILD by FUJITSU - is confirmed by massive investment, whereas the Americans are reducing their expenditure (26% lower in 85 than in 84, 16% lower in 86). The position Japan has acquired in the development of gallium arsenide would seem to guarantee it supremacy in components for future computers and telecommunications network equipment.

40. Europe has still not succeeded in producing supercomputers or 5th generation computers, and only considerable intensification of the ESPRIT programme could remedy this situation. The outcome of the 'strong arm' tactics of the Americans and Japanese is still very doubtful, and depends largely on the results of Japanese efforts with the '5th generation' project, especially the production of high-level software. The Soviets for their part have embarked on two computer development projects, START and MARS, whose possible findings should perhaps not be under-estimated in view of their real capacity in mathematics and logic.

Telecommunications

41. 1985 and 1986 saw the upheaval of the telecommunications sector, mainly because of deregulation in the United States, but also to varying degrees in some European countries. The European Community has drawn up its RACE programme. However, there seems to be resistance at national level in several countries to embarking on the main phase of this programme, which is scheduled to start shortly. The value of the project is not being questioned, quite the contrary, but it seems that national governments are unwilling to commit themselves now to a system in which the telecommunications sector will be completely taken over by the Community in 1995. Paradoxically, whilst there is prevarication on the part of the Community, associations are being formed with undertakings outside the Community and major American firms are increasingly penetrating the European market. Particularly worthy of mention are the agreements between AMERICAN TELEGRAPH AND TELEPHONE (ATT) and

[1] Since 1984 Japan has overtaken the USA in the production of electronic components

TELEFONICA and OLIVETTI, and ITT with the CGE group, whilst IBM, having concluded a very important contract for the future German BIGFON service network seems to be in a favourable position to conclude a similar contract in France. Conversely, attempts to bring together major European companies have failed one after the other because of ill will on one side or the other. As we predicted in our preceding report, telecommunications have entered a critical strategic phase, and we must be even more vigilant in the months to come.

Optoelectronics

42. Optoelectronics is the combined use of electronic and optical devices, whose applications range from fibre optics to lasers. In the category of 'large' lasers used industrially for machining and determining the chemical composition of substances, the Japanese, strangely enough (but it has to be admitted that their technology is much older) rank among the best. The Americans are in the lead, closely followed by the Europeans and the Soviets, for whom this sector is one of their technological strong-points. On the other hand, for all the other technologically most advanced and most promising applications of optoelectronics, Japan's dominant position is undisputed, since it has more than 10 research laboratories comparable to those of BELL LABO that are the pride of American scientists. European efforts have been very fragmented. It is for instance astonishing that the EJOB project, developed as part of the 'stimulation' programme to develop a prototype optics computer, the first results of which seemed very encouraging, has been given a very cool reception by national authorities, although it could perhaps be a means of catching up, to some extent at least, in the optoelectronics sector.

Energy

43. The period 1985/1986 has been characterized by a decline in energy research and development throughout the world, as a direct consequence of the fall in the oil prices. According to the OECD's 1985 estimates, spending on energy research generally has declined by some 30% in real terms since its 1980 peak. The downward trend has been particularly dramatic in the areas of alternative energy resources and energy conservation.

44. The EC alternative energy research programmes and demonstration projects are a significant proportion of the world effort. There is no indication of the necessary investment to enable Europe to obtain a long-term commercial advantage from its technology lead. It seems likely that the new Framework Programme to be decided by the EEC for 1987-1991 will actually devote a smaller proportion to energy Research and Development than the previous programme. This is particularly regrettable in view of the fact that it is precisely in this area that Europe has a relatively strong position - particularly as regards nuclear fission, thermonuclear fusion research and alternative energies.

Space

45. In the area of space research and exploitation, the world balance of forces has shifted rapidly as a result of the Challenger accident and the NASA shake-up. Japan, as indicated above, has made a particularly strong entry into the field, and the Soviet Union programme continues apace.

Even China with its "LONG MARCH III" launcher is proposing launchings for 15% less than the market rate. Contracts have seemingly already been signed with Sweden and with American firms.

In one important field - teledetection - the SPOT programme (trial earth observation system) once again demonstrates Europe's scientific capabilities, since the programme is well ahead of its American rivals, particularly in the precision of the measurements made (multiplied by a factor of 3).

43. Europe has to make specific decisions early in 1987 on the next generation of Ariane launchers (Ariane V), whether or not to go ahead on the Hèrmes project (which now has German support for the initial feasibility studies), Messerschmit's Sanger project and the British Aerospace Hotol project. The governments of the European countries most involved in the space programme are now heavily committed to strengthening and expanding this programme which represents one of Europe's best hopes to catch up technologically. Space Research and Development has a knock-on effect on all areas of high technology. It will simply not be possible to develop a successful indigenous space programme unless computer science, new materials and telecommunications keep apace.

47. In a space-related field, aeronautics, AIRBUS INDUSTRIE is confirming that it is possible for a group of European firms to succeed technically and commercially. A significant number of orders for the Airbus A320, whose first flight is scheduled for this year, have already been received. This new model includes real innovations (use of electronic flight commands, a new generation of cockpits, intensive use of composite materials) that are a major asset. This success is also the result of fantastic know-how in new technologies, particularly in production techniques. Success however is not definitively guaranteed, given the increasing pressure the United States is exerting on European countries concerning the reimbursable advances to AIRBUS INDUSTRIE, to the extent that one tends to forget the colossal sums the American Government grants its aeronautics companies through military activities.

Biotechnology

48. According to the Arthur B. Little Consultancy, biotechnologies have as yet not reached the stage of influencing the relative strengths of the main chemical and agri-industrial firms. Coordination of biotechnology research is much more difficult because of the variety of firms, universities and institutes involved. Moreover, unlike information technologies, biotechnology has not led to the rapid emergence of new industrial giants. The reason is very simple. Biotechnology presupposes a very high coefficient of basic research and applied research over a long period, so that quick profits cannot be expected.

49. Nevertheless, pharmaceutics and medicine in general are beginning to appreciate the results of biotechnologies at commercial level (hepatitis B vaccination). American firms such as CHIRON, GENENTECH and CETUS are working on substances that will be able to necrose tumours and dissolve blood clots, and on the development of AIDS vaccines. As regards chemicals and agri-foodstuffs, although the commercially critical point has not yet been reached, companies such as MONSANTO and DU PONT DE NEMOURS are making important strategic moves towards biotechnologies, and there has been some very interesting diversification in Europe by the Franco-Belgian cement manufacturer LAFARGE COPPEE.

50. Although the Community's biotechnology programme, even on a limited scale, has had an initial success, it is probably too small to have any significant impact on the competitiveness of Europe's industry. In Europe, both sectors have witnessed huge corporate battles throughout 1985-1986: perhaps a new corporate structure with larger firms will emerge which will free larger sums for research and above all industrial and commercial applications.

51. According to the National Science Foundation, the United States allocates 10 billion dollars a year to biotechnologies, more than all other nations. Japan alone, with more than 130 companies developing the practical aspects of biotechnologies that could enable it to occupy key positions similar to those it has for entertainment electronics, is regarded as a serious rival by the Americans. Its strategy vis-à-vis the United States is exemplary: more than 300 research workers sent there and more than 200 cases of financial aid being granted to highly innovative small and medium-sized undertakings in the sector in three years. The Japanese bring new money into these companies that enables them to continue their work and acquire knowledge and manufacturing permits. Europe is carrying out important work, for instance at the Max Planck Institute, the Institut Pasteur and INRA, but efforts are still dispersed. Companies such as GIST BROCADES and NOVA are having considerable success, but in selected areas only.

Robotics

52. This sector is currently undergoing a crisis with excessive supply and insufficient demand. Various firms have significantly over-estimated demand for automation in factories. In this sector, and through the intermediary of joint ventures, Korean firms like DAEWOOD have made an important entry into the American market. The Japanese are also concentrating on inward investment in a sector where Europe scarcely figures in anyone's calculations. There is a tendency for Japanese car manufacturing plants in the United States (20% of the American market) to become automated using equipment imported from Japan.

Advanced materials

53. The unmistakable need for advanced materials in the high technology industries is reinforced daily as the number of potential applications increases. The Americans continue to dominate basic research, but the Japanese have now taken first place for applied research, so that they can manufacture materials for the electronics and optoelectronics sectors, particularly at MITI's Joint Optoelectronics Research Laboratory (director, Izuo HAYASHI)[1]. The Americans are estimated to have lost the lead in seven of the nine key technologies in these two sectors. Europe's position is extremely unsettled. There have been some remarkable achievements in each Community country, however, that bear witness to our actual capabilities. Here, more than anywhere else, isolated achievements reflect the lack of any real European strategy. The USSR is in a fairly similar situation to Europe. The Soviets are carrying out some interesting reseach work and have for instance devised a method of depositing an ultra-thin layer of diamonds on substances to make them exceptionally hard that many experts, particularly in the semiconductors industry, consider to be very important.

[1] Following a visit to some ten Japanese laboratories, a group of American scientists submitted an alarmist report (on how far behind the USA was) to the National Academy of Sciences and the National Academy of Engineering

Marine research

54. The vast majority of the Member States of the Community have a direct interest in marine sciences and technology. Their scientific level is therefore perfectly adequate. European marine technology, particularly the French submarine "Nautile", is a match for American marine technology. North Sea oil has prompted a number of European countries to obtain extensive savoir-faire. Here, as in other areas, technological advances will depend on a combination of electronics, advanced materials and biotechnology. Outside the United States, after setting up the KAIKO programme with a French team, the Japanese Government is planning to build a submarine capable of reaching depths of 8 000 to 9 000 metres.

The inclusion in the second framework programme of a chapter on marine science and technology is thus essential. However, in its resolution[1] of 10 December 1986, the European Parliament pointed out that Community action should be extremely selective, having regard to the limited resources available. The development of a marine technology programme of any significant size depends on the results of the feasibility study we asked the Commission to carry out, which should be communicated to us before the Commission puts forward proposals.

Part VI - Strengthening the response

55. The sombre message which Parliament sought to impart in 1985 has not become any the less sombre in the 12 months that have since elapsed. The efforts of European public authorities and private firms, laudable though they be, are not sufficient to reverse the trend, let alone make up lost ground.

56. Yet there is no doubt that competition between the United States, Japan and Europe will become even more intense with the deregulation of telecommunications, high-definition television, spin-off from the SDI programme, Japanese penetration of the semi-conductors sector, breakthroughs with fifth generation computers, etc.

In a lot of sectors, Europe's response will depend on overall strategies defined by firms and governments. This is particularly true of the electronics sector where many variable parameters have to be taken into account: information technology, telecommunications, electronics industry, software, military and civil applications, etc.

At present, Europe's response is poor. It has neither the political and economic power of the United States for its strength is dispersed and divided by petty national frontiers, nor the aggressive scientific and marketing approach of the Japanese. Very few European firms have the international stature to act alone without political support, and only a resolute European policy will enable Europe to catch up in most sectors of electronics.

57. Your rapporteur proposes that once the Framework Programme is adopted, and once the different sub-programmes (ESPRIT II, RACE main phase, BRITE, Stimulation, etc.) have been approved, more attention should be given to the financing of innovation and rapid approval for Community-wide guarantees for a venture capital market in Europe. Such measures should encourage Europe's finance houses to promote indigenous research and development. It is not surprising that out of the 20 largest banks in the world, 9 are Japanese. They have cooperated with the government to create a climate supportive of domestic research and development

58. Europe must also now face squarely the issue of the role of public authorities in supporting the exploitation of research results. The Eureka endeavour will not succesd unless in the end there is some public support for harnessing technologies to specific product goals, e.g. super computers or voice-activated computer terminals[1]. This requires joint product development, probably with a public stake. Why not bring together in certain joint ventures leading French and German biotechnology firms and institutes? Why not push forward with a further generation of post-A320s for Airbus? Why should not the six or seven major European information technology firms pool resources for the development of a European super computer? Why not stimulate a Europe-wide HST with important stakes for France, Germany, Belgium, Holland and the UK?

59. Projects of this scale cannot be undertaken without some public stimulation; this need not mean civil servants running the programme. There is a new political concensus in Europe that recognizes that for European technology to be successful, it must be exposed to market forces. At the current state of development, however, and given the acreage size of Europe's firms, the industrial organization in Europe is just not such as to be sufficient without public support. Perhaps the most important thing that governments can do is to stimulate domestic demand for electronic products in industry and in the home. This has certainly been the motive force for American and Japanese electronic companies. There is no point in stimulating greater demand if it is merely going to be met by rapid increases in Japanese, American and Korean imports. The first stage should be a rationalization of European electronic companies, which are probably too numerous and too small to compete successfully outside our frontiers.

60. Our preconceived notions of the frontiers of private and public actions must be seen to be irrelevant. These notions may satisfy some European politicians, they certainly are of no interest to American and Japanese industrialists.

61. It has finally become clear that new technologies need a favourable economic, administrative and trade climate before they can bear fruit. The European technology gap is not a gap in knowledge but a lack of good management and good marketing techniques. It is all very well giving research financial aid, but today it is even better to aid production and find market outlets. All too often governments think they have done their bit when they have helped to finance research. But that is only half the story. There is also the environment from the production to the marketing stages. Technological success means that just as much attention must be given to research and marketing.

62. A separate report should be drawn up on the improvements needed in the technological environment. Some aspects are vital:

---

[1] Hewlett Packard is already on the point of marketing 'Office Talk' a combination of personal computers, applied software, entry and exit cards, telephone management, electronic diary and vocal messenger services.

- not enough people are trained to a sufficiently high level for the high technology sectors[1],

- not enough school pupils enter higher or university education[2], and employment policy must be entirely rethought in modern and forward-looking terms,

- relations between university and industry could be much more fruitful,

- intra-Community monopolies and protectionism are the cause of weakness rather than strength,

- the inflexibility of small national markets are detrimental to industrial competition,

- social costs and tax burden in Europe bear no relationship to those in the USA and Japan,

- working conditions and tax arrangements in the USA (with further improvements for individuals and firms in 1987) increasingly attract European researchers, etc.

As regards education, the Japanese system can in no circumstances be transposed to Europe or to Western educational systems in general. Besides, their education system gives rise to a number of serious problems that we could not accept. It is nevertheless true that Europe has to make an effort as regards education and in particular as regards scientific and technical training, which must be intensified at all levels, from the worker to the engineer. Proof, if proof be needed, lies in the fact that it is the European country with the best organized system of industrial apprenticeship, the Federal Republic of Germany, that is in the best position by comparison with the Americans and the Japanese.

63. In order to derive more benefit from its strengths and to remedy its weaknesses, Europe must also learn to know itself better. In several previous reports, our committee has had occasion to denounce the relative lack of information on its technological situation in key areas. Apart from the technological data bank we consider necessary, the Commission should draw up a separate annual report on the technological situation in Europe, a European technological state of the art, on which Parliament could deliver an opinion and formulate political proposals.

64. Strength, wealth and progress have long been the preserve of regions with space, energy, raw materials and human resources. Traditional geopolitics will from now on have to incorporate geotechnology and perhaps even become subservient to it one day since there is no doubt that possession of the new advanced technologies confers power and esteem.

---

[1]Number of scientists, research workers and engineers for every 1 000 jobs: United States 6.2; Japan 5.4; Federal Republic of Germany 4.7; UK 3.9; France 3.6; Netherlands 3.5; Italy 2.3; Spain 1.1

[2]Percentage of secondary school leavers per age group that can go on to university and higher education: Japan 87%; United States 72%; Netherlands 44%; Italy 39%; France 28%; UK 26%; Federal Republic of Germany 26%; Denmark 25%. There is one exception in Europe, Sweden with 28%

Level of knowledge and education, the quality of human resources and their ability to use and exploit information are gradually becoming more important than natural riches. Quality is increasingly taking the place of quantity. Before our very eyes geotechnology is giving birth to a new world economic order: United States/Japan/Europe (both west and east). Unless the European Economic Community is actively involved, it will become a dependent fringe area rather than the special partner that once gave birth to the modern world.

CSO: 3698/A021

NETHERLANDS BANKERS RELUCTANT TO FUND EUREKA PROJECTS

Amsterdam COMPUTABLE in Dutch 18 Sep 87 pp 1, 3

[Unattributed article: "Coordinator Criticizes Financiers: Banks Hamper EUREKA's Progress"]

[Text] The Hague--The European EUREKA technology program is currently slowing down due to lacking cooperation by the banking community. Commercial banks and holdings are reluctant to invest in EUREKA projects. Private finance companies have thus far adopted an aloof attitude because of their ignorance of modern technological developments.

This was said by L.J.A.M. van den Bergen, the Netherlands EUREKA coodinator, on a press briefing on the EUREKA program last Thursday. In his view, many more projects could be started if only the banks became more actively involved. The head of the Netherlands EUREKA secretariat pointed out that Netherlands bank managers still have a lot to learn from their American colleagues who make sure that they have access to the necessary know-how to judge advanced projects, for instance, by seeking the advice of engineers and technicians who are able to "separate the sheep from the goats." Recently the WRR [Scientific Council for Government Policy] reached similar conclusions in its report entitled "Investments and the Financial Infrastructure."

Small and new companies, in particular, receive very little support from the banking business. Financial institutions refuse to participate in high tech ventures, partly because they are incapable of judging the merits of advanced technology. Furthermore, banks usually want to see tangible results first. As for new companies, the very nature of the activity makes it difficult to produce such tangible results within technological programs such as EUREKA, which are aimed at research, development, and investment. In these stages it is virtually impossible to present potential financiers with concrete achievements.

The Ministry of Economic Affairs did make attempts to try and convince venture capital suppliers to adopt a more willing attitude. Long discussions were held with banking institutions, with little success, though.

According to F. de Bruine, general technology policy director at the Ministry of Economic Affairs, EUREKA's limited popularity in the banking world can also be explained by the strongly nationalistic attitude of their holding companies.

Currently, some 111 EUREKA projects are in their preliminary or research stages, 26 of which involve Netherlands companies or research institutions. Virtually none of these projects are financed privately. Y.M.C.T. van Rooy (Economic Affairs) recently declared at the opening of the Netherlands EUREKA exhibits in the Paris science museum "La Villette" that the Netherlands would continue to participate enthusiastically in this international cooperative program. Some time ago the government increased the EUREKA budget to reach 50 million guilders a year. According to EUREKA coordinator Van den Bergen, that amount should be enough for the time being. He commented that participating companies often consider government subsidies not to be the main issue. Money is not a priority. It is far more important that the government creates the right circumstances for projects to flourish. Thus, industry especially benefits from the removal of such barriers as red tape and long delays at borders. Uniform standards can also greatly contribute to the success of specific projects.

There is as yet little to say about tangible EUREKA results. This year the first projects are to reach the end of the feasibility stage. Then follow the research, the development, and the investment stages. According to the Ministry of Economic Affairs, most projects are on schedule.

25024
CSO: 3698/A016

BANKS TO SUPPORT EUREKA INITIATIVES

Amsterdam COMPUTABLE in Dutch 25 Sep 87 pp 3, 29

[Unattributed article: "Netherlands Contribution to EUREKA Considerable--Banks Adopt More Positive Attitude"; first paragraph is COMPUTABLE introduction]

[Text] Madrid--The Netherlands continues to play a significant role in the European technology program (EUREKA). Thirteen projects in which Netherlands companies are involved obtained EUREKA status at the fifth EUREKA ministerial conference in Madrid. Fifty-eight projects were added to the international list in the Spanish capital.

The Netherlands already participated in 26 projects. There are currently 165 different EUREKA projects in all. EUREKA is a program for European industrial cooperation in which 19 European countries and the European Commission are involved.

A major point scored at the EUREKA conference was the basic decision of some five international banking organizations, including ABECOR (ABN, Barclays, etc.), to give financial support to this technology program. It is still uncertain whether this will really lead to a considerable flow of money, but it is important that a definite step forward was taken. Shortly before the EUREKA conference L.J.A.M. van den Bergen of the Netherlands EUREKA secretariat expressed his great concern regarding the limited cooperation of private financiers such as banks and profit-sharing companies. The banking business was blamed for being too conservative.

However, the banks have now made statements about a possible participation in the project. To the satisfaction of the Ministry of Economic Affairs, these financial institutions are inclined to adopt a more positive attitude. According to a spokesman of the ministry, the aim is to involve banking representatives in the various EUREKA projects from the beginning, even before any agreement on a financial contribution. During the feasibility study phase the banks will be allowed to look over the shoulders of the participants.

"By allowing the banks to take a look behind the scenes in the early stages, they will be more inclined to provide funding later," the spokesman expects. The advantage of this approach is that the banks get to know the projects. Then, when further funding is needed, the banks are familiar with the status of the project. These positive statements from the banking business have given EUREKA conference participants the feeling that after a hesitant start more capital will become available.

Another significant point scored in Madrid is that the Netherlands has succeeded in averting the danger of EUREKA developing into a more bureaucratic program. "It is still a threat, but only a minor one," says a spokesman. In particular France tried to move toward more centralization and launch all kinds of time-consuming studies. The Netherlands, supported by the FRG, opposed this.

In the eyes of the Netherlands Government, EUREKA must be a flexible program operating close to the market. The so-called "bottom-up" approach is crucial when setting up projects. Eng R.F. de Bruine, general technology policy director at the Ministry of Economic Affairs, commented: "The industries make the projects and the authorities support them. The best guarantee for success is a careful selection of the projects by the industry itself." The Netherlands delegation leader therefore pinpointed the danger of too much bureaucracy in the program. "The establishment of projects must not be delayed by complicated procedures and regulations. EUREKA must generate projects, not problems."

25048
CSO: 3698/A030

EUREKA COSINE R&D NETWORK EVALUATED

Amsterdam COMPUTABLE in Dutch 25 Sep 87 p 11

[Article by Yvette Cramer: "Coupling R&D Network via OSI"; first paragraph is COMPUTABLE introduction]

[Text] Amsterdam--A few years ago it still happened that a researcher at the CWI (Center for Mathematics and Data Processing) in Amsterdam could eventually use applications on a system in Nijmegen via computer systems at the American universities of British Columbia and Wisconsin. By coupling scientific and industrial R&D networks, communication can now be made a lot simpler and faster. This is the goal of the EUREKA COSINE project.

The COSINE project stands for Cooperation for Open Systems Interconnection Networking in Europe and is meant to create a European networking infrastructure for European researchers in universities and industry. The goal is not to create a new network, but the coupling of networks via standard protocols. In the long run OSI will automatically be accepted as the standard. The COSINE reasoning behind this is the following: Once there is a large user group using the OSI model as communication system, OSI will be snowballed as the de facto standard.

Eng R. Brinkhijsen from the James Martin Associates consultancy firm, which is involved with COSINE, stresses once more that COSINE is restricted to formulating standards that serve as guidelines. It is up to national organizations to decide whether or not to follow the standards recommended by COSINE.

As yet the problem faced by universities in--and also outside--Europe is caused by manufacturer-bound network configurations. For instance, the Netherlands alone already has two university networks: SURF-net [Cooperation of University Computing Centers], supplied by DEC, and the Netherlands part of the EARN-net [European Academic Research Network], supplied by IBM. Neighboring countries also have several networks, each of course with its own protocols.

Networks can now be coupled via so-called "gateways," but this is not the method advocated by COSINE. Gateways can be avoided by setting standards for both hardware and software. Here the OSI (open systems interconnection) model plays a significant role. The first step towards a universal communication infrastructure was taken when FTAM (file transfer, access, and management) was accepted as international communication standard. FTAM has recently been adopted as standard at the application level (layer seven) of the OSI model.

EUREKA

COSINE was officially initiated in July 1987 by a group of European countries, including the Netherlands and Belgium. It was a special case within the EUREKA framework because the project was submitted by public bodies (universities) and not by industry. COSINE's specification phase will last for 1 year and is managed by RARE (Associated Networks for European Research), associating both operators and users of R&D networks. It was recently decided that the implementation phase, the last step, can start after the summer of 1988 because activities are well enough advanced. The RARE secretariat is located in the Watergraafsmeer Scientific Center in the Netherlands. Within the COSINE framework a workshop will be held in Brussels on 3 and 4 November where representatives from industry, the PTT's, the R&D networks, the authorities, and the EEC will discuss the project's progress.

25048
CSO: 3698/A031

DRAFT BMFT R&D BUDGET FOR 1988 PRESENTED

Bonn TECHNOLOGIE NACHRICHTEN-PROGRAMM INFORMATIONEN in German No 405, 4 Aug 87 pp 1-14

[The Role of the BMFT in German Research]

[Text] R&D in the FRG is not financed primarily by the government. In 1987, R&D expenditures will probably total DM59 billion. Of this amount, DM7.3 billion is part of the BMFT budget (12.4 percent of the national R&D budget).

Therefore, the BMFT budget represents only a portion of German R&D expenditures. In 1988, it will grow by 5 percent, as compared to 1987, for a total of DM7.631 billion, according to a recently presented government draft. This above average increase in the federal budget is primarily due to additional expenditures for the ARIANE and COLUMBUS space projects.

In recent years, the portion of basic research in the BMFT budget rose from 26.1 percent (1982) to 35.4 percent (1986). The federal minister of research said that this reflects the importance the federal government gives to the task of supporting efficient basic research at a high international level.

Following an agreement with the Lands, the basic financing for the Max Planck Society (minus special financing and project budgets) has been increased to DM21.1 million (5 percent) in 1988. This will significantly support the research capabilities for the acquisition of new basic knowledge, and especially for the definition of new areas of research.

The increased budgets for basic research topics in natural sciences (+ 16.2 percent) and the deep well drilling program (+ 92.6 percent) also serve this purpose. However, financial aids for basic research have been increased even within the framework of long term programs and [for the] subsidy of key technologies. The overall share of basic research in the BMFT budget will probably reach 37.2 percent in 1988.

Research funds for key technologies

Also in the area of new key technologies, subsidies are increasingly designated for basic scientific [research], while technical, and especially materials research are regarded as industrial areas. This concept has been used right from the start for biotechnology (+ 7.9 percent) and materials research (the portion of basic research in biotechnology is 45 to 50 percent).

The project budget for research on the basic characteristics of new materials and technologies within the framework of physical technologies has also been raised significantly (+ 6.5 percent).

In sectors of information technology, where there is still a considerable backlog on the world market, there is a trend toward reorientation with stronger emphasis on basic research. This trend is already evident in the new budget for information processing, where the appropriations for project subsidies have been reduced by 3.7 percent, but [at the same time] increased by 12.8 percent within the framework of scientific research institutions.

The 7.5 percent increase in funds for the Fraunhofer Society also supports basic scientific research in the area of modern technology. Scientific institutions, as strong cooperative partners, continue to alert [potential associates] to German research in this field. The growth areas of key technologies distinctly show the reorientation toward [specific] fields of interest.

Space research and technology

The funds for long term strategic programs in the area of space research and technology have been increased by 9.6 percent in the 1988 draft budget. In space research, the federal government aims at offering opportunities for international cooperation to national research [institutions] and industry. Mr Riesenhuber, the federal minister of research, stressed that both in Germany and throughout Europe Germans are facing the challenge of developing their own competency in order to be able [to carry out cooperative projects].

The engagement of the government in the area of space is sensible and necessary because of the long term nature of the work and the initially high proportion of basic research required. Important new projects are first thoroughly examined in preliminary investigations. This is also the case on the joint European and transatlantic space projects (COLUMBUS, ARIANE 5, and HERMES). This investigation phase is expected to conclude by the end of this year. The federal government will then decide on German participation in the development phase.

Independently of individual decisions there should be no doubt of the significance of space research for science (for example earth observation, astronomy) and industry (telecommunications, materials research).

BMFT - DAF Summary

Print: 3.7.1987
Status: 1.7.1987

Budget 1988 - Individual Plan 30

Profile Subsidy area/ subsidy priority	Gov't draft 1988 million DM	'88 share of individual plan %	Increase 1988/87 %	Estimate 1987 million DM	Actual 1986 million DM
Indiv. plan 30, total	7,631.8	100.0	1.3	7,535.6	7,198.4
				-263.7*	-74.6*
			5.0*	7,271.9*	7,123.8*
1 Program--overlapping basic research	1,568.4	20.6	2.9	1,523.7	1,423.2
Basic financing	442.8	5.8	2.9	430.3	420.4
Special areas of basic research (especially large equipment)	981.6	12.9	-0.2	983.4	907.3
Geosciences (especially deep well drilling)	57.4	0.8	82.9	31.4	25.1
Humanities, social sciences	86.6	1.1	10.0	78.7	70.5
2 Government long term programs	1,578.2	20.7	7.7	1,465.0	1,252.9
Oceanography	90.2	1.2	7.5	83.9	88.9
Polar research	62.0	0.8	-0.7	62.4	61.2
Space research and space technology	1,231.9	16.1	9.6	1,124.2	917.6
Nuclear fusion research	194.2	2.5	-0.2	194.5	185.2
3 Living conditions (preventive research)	984.7	12.9	5.3	935.3	813.4
Ecological research	193.8	2.5	9.3	177.4	156.9
Non-polluting technologies and technologies for environmental protection	162.1	2.1	1.8	159.3	139.6
Water research	19.3	0.3	-2.2	19.7	19.0
Climatic research	39.5	0.5	15.1	34.3	29.0
Safety research and safety technology	8.0	0.1	-11.1	9.0	9.8
Health R&D	319.4	4.2	9.4	292.0	253.7
R&D for humanization of working conditions	110.5	1.4	-0.3	110.8	103.3
Civil engineering research and technology	36.0	0.5	9.1	33.0	33.9

Cross-sectional activities (including estimates of the impact of technology)	96.1	1.3	-3.7	99.8	68.0
4 Market oriented technology subsidy	3,111.3	40.8	-5.1	3,278.4	3,253.6
Oceanology	86.1	1.1	6.0	81.2	78.4
Coal and other fossile energy carriers	212.2	2.8	-9.3	234.0	250.9
Renewable energy sources and rational energy consumption	240.3	3.1	3.1	233.1	179.1
Nuclear energy research (including reactor safety)	738.2	9.7	-14.9	867.1	1,091.3
Information processing	228.5	3.0	3.4	220.9	191.0
Technical communications	158.9	2.1	0.3	158.4	141.9
Electronic components	224.7	2.9	-4.0	234.0	238.3
Use of microelectronics; microperipherals	73.6	1.0	-8.0	80.0	65.4
Manufacturing technology	118.1	1.5	-26.7	161.0	156.2
Biotechnology	227.9	3.0	7.9	211.2	167.9
Materials research	205.8	2.7	1.4	202.9	177.3
Chemical processing technology	21.2	0.3	-0.5	21.3	17.5
Physical technologies	144.0	1.9	3.9	138.5	103.4
R&D in aeronautics	199.6	2.6	5.4	189.4	166.0
R&D for earthbound transportation and traffic	208.2	2.7	-6.1	221.8	207.4
Safeguarding of raw materials	24.2	0.3	3.0	23.5	21.7
5 Basic conditions, infrastructure	477.2	6.3	0.3	475.6	399.0
Basic financing FHG (Fraunhofer Society)	144.3	1.9	7.5	134.2	125.0
Indirect subsidy of R&D personnel in trade and industry	80.0	1.0	6.7	75.0	41.0
Improvement of technology and knowledge transfer	82.0	1.1	5.7	77.6	70.7
Subsidy for technology establishment of technology oriented companies	63.0	0.8	-21.3	80.0	48.2
Technical information	107.9	1.4	-0.8	108.7	114.1
6 Overall shortfalls, planning reserve of the	-150.0	-2.0	-25.0	-200.0	0.0
Federal minister of research and technology	62.1	0.8	7.8	57.6	56.2

In comparison to the government draft 1988, the following must be considered: (in million DM)

-1987 budget spending freeze..................................-188.7

-1987/86 virtual expenditures for the radioactive waste dump in Gorleben converted since 1988 into the individual plan 09 of the BMWI [Federal Ministry of Trade and Industry].-75.0 -74.6

Corresponding relative rate of increase for 88/87..........5.0 percent

List of increases in 1988 BMFT Draft Budget compared to 1987 budget (exceeding DM5 million and 3 percent)

Research priority/ Motivation of increase: -sequence according to program structure	without basic R&D				with basic R&D			
	Proj. 1987	Proj. 1988	Increase Million DM	%	Proj. 1987	Proj. 1988	Increase Million DM	%
Basic financing of the Max-Planck Society (MPG) (without special financing)	221.7	442.8	21.1	5.0				
Basic financing of the Fraunhofer Society (FhG) (construction of new institutes)	135.7	145.9	10.2	7.5				
Special areas of basic research, especially with large scale equipment (Start of ESFR and HFML of the Max Planck Society in Grenoble; continuation of HERA--with still available subsidies--SIS, BER II, LEP	392.1	413.4	21.3	5.4	938.4	981.6	-1.8	-0.2
Ocean research (2 new research cutters)	77.6	84.0	6.4	8.2	83.9	90.2	6.3	7.5
Space research and technology (preparation of Hermes, progressing COLUMBUS and ARIANE 5; impact of Rome agreements, reinforcement of strategic investigation and national space programs; space installations of the DFVLR)	1,001.1	1,095.8	94.7	9.5	1,124.2	1,231.9	107.7	9.6

Ecological research (increased activities in basic R&D)	60.0	74.3	14.3	23.8	177.4	193.8	16.4	9.3
Climate research (increased activities in basic R&D)	23.0	24.0	1.0	4.3	34.3	39.5	5.2	15.1
Health R&D Priority program, increased project subsidy for precautional health measures, fighting of diseases (creation of project groups for AIDS research, continuation of cancer therapy study), and clinical research; new priority (Tumor virology" at the DKFZ [German Cancer Research Center]	129.0	144.1	15.1	11.7	292.0	319.4	27.4	9.4
Biotechnology Priority program, increased subsidy of biological safety research and research in the area of private middle class plant breeding, new genetic engineering center in Duesseldorf)	152.1	165.8	13.7	9.0	211.2	227.9	16.7	7.9
Renewable energy sources and rational use of energy (continuing growth by 30.1 percent after 1986/87 high increase by 34.8 percent)	210.0	217.0	7.0	3.3	233.1	240.3	7.2	3.1

Physical technologies (new development prospects for super conductivity research, EUROLASER projects within EUREKA)	66.4	70.7	4.3	6.5	138.5	144.0	5.5	3.9
Information processing (intensified activities in basic R&D)	125.6	121.0	-4.6	-3.7	220.9	228.5	7.6	3.4
R&D in astronautics program development according to plan, including main construction phase of ETW)	94.0	100.2	6.2	6.6	189.4	199.6	10.2	5.4
Geosciences (progress KTB)	28.2	54.3	26.1	92.6	31.4	57.4	26.0	82.9
Humanities and social sciences (increased subsidy)	78.7	86.6	7.9	10.0				
Overall shortfalls (decrease of the global budget cut)	-200.0	-150.0	50.0	25.0				

30 01 Federal ministry of research and technology

Title		Function	Purpose	1988 Proj. DM1,000	1987 Proj. DM1,000	Actual 198 DM1,000
Income						
			Administrative income			
113	01	011	Revenue from the sale of single objects up to DM10,000	1	1	1
119	01	013	Income from publications	4	8	3
119	99	011	Mixed income	45,000	45,000	49,936
124	01	011	Income from rent, lease, and utilization	0	0	0
132	01	011	Income from the sale of individual items of mobile goods above DM10,000 and motor vehicles	17	17	17
			Other income			
162	02	179	Special domestic interest income	10,000	10,000	6,870
166	02	179	Interest income from abroad	0	0	1
182	02	179	Amortization of loans, mortgages and others	15,000	25,000	18,078
282	01	011	Income from donations	0	0	0
282	02	011	Subsidy contributions from third parties	8,600	8,600	8,600
			Total income	78,622	88,630	83,498

30 01 Federal ministry of research and technology

Expenditures

			Labor costs			
421	01	011	Salaries of the federal minister and of the parliamentary state secretary	471	457	454
422	01	011	Salaries of scheduled officials	30,307	28,230	27,703
422	02	011	Salaries of official auxiliary personnel	970	940	816

425	01	011	Remuneration of employeeses	11,126	10,777	10,667
426	01	011	Wages for workers	1,833	1,776	1,708
427	01	011	Remuneration and wages for auxiliary personnel with contacts limited to less than 18 months	2,948	2,948	2,944
441	01	940	Assistance based on assistance laws	1,600	1,500	1,478
442	01	940	Benefits based on benefits regulations	4	4	0
443	01	940	Welfare measures	5	5	6
443	02	254	Costs for the use of interoffice, medical, and safety services (centers) as well as contracted medical doctors according to the work safety law	65	65	28
453	01	011	Severance pay, mileage compensation, and moving compensations	600	600	750
			Administrative expenses for fixed assets			
511	01	011	Office supplies, books, and newspapers	701	670	644
513	01	011	Fees for post, telephone, radio, and TV	1,300	1,300	1,218
514	01	011	Cost of official cars	99	99	104
515	01	011	Appliances, furniture, equipment, and machines for administrative purposes	470	470	357
516	01	011	Work and protection clothing, personal fixed assets	19	21	22
517	01	011	Management of real estate, buildings, and rooms	718	718	618
518	01	011	Rents and leases	340	340	312
519	01	011	Maintenance of real estate and buildings	148	148	138
526	01	011	Legal expenses and similar costs	20	20	24
526	02	011	Cost of consultants	280	280	260
526	03	011	Cost of members of professional boards and similar panels	235	235	230
Expenditures						
526	20	011	Patent applications in the public interest	5	5	4
527	01	011	Payment of national travels	548	522	596
527	02	011	Payment of international travels	1,103	1,050	924

527	03	011	Compensation for travel as a proxy in personnel matters and in the interest of disabled persons	39	37	31
529	01	011	Extraordinary costs for official matters in special cases	31	30	28
531	01	013	Publicity work	510	510	494
531	02	169	Cost for publication of scientific technical information	467	467	474
531	03	011	Settlement of copyrights	1	5	1
532	01	011	Cost of clerical work outside the office	0	0	0
539	99	011	Miscellaneous administrative expenses	43	43	48
			Allowances and allocations (without investments)			
684	01	011	Contributions to domestic associations, federations, and societies	5	5	4
686	01	011	Contributions to associations, federations, and societies abroad	2	2	1
			Cost of investments			
711	01	011	Small buildings, building alterations, building expansions	145	260	98
711	02	011	Construction work for the safety of official buildings	1,840	0	0
711	09	011	Measures for energy saving in federal buildings	10	70	816
811	01	011	Purchase of official cars	90	125	46
812	01	011	Domestic purchase of appliances, fixed assets and pieces of equipment for administration purposes	230	320	970
			Cost of investments			
972	01	989	Total shortfalls	150,000-	200,000-	0
980	01	990	Payments to federal offices for services rendered	0	0	0
Title group		01	Cost of data processing	(2,742)	(2,524)	(1,074)
511	42	011	Office supplies	35	35	15
513	42	011	Cost of data transmission	33	33	23

515	44	011	Appliances, furniture, equipment, and machines	12	12	22
518	44	011	Rents for data processing, installations, appliances and equipment	734	841	851
526	44	011	Costs of consultants and system analyses	650	675	136
532	41	011	Data acquisition and programming by third parties	28	28	27
812	42	011	Purchase of appliances, furniture, and pieces of equipment	1,250	900	0
Title group		02	Training, advanced training, and retraining	(51)	(71)	(45)
525	51	011	Training, advanced training, and retraining	36	46	35
527	51	011	Business trips	15	25	10
			Total expenditures	87,879-	142,351-	56,158

30 02 General research subsidy

Expenditures

			Administrative expenses for fixed assets			
526	02	179	Subsidy for evaluation of the consequences of technology and for research planning	5,821	5,821	5,663
531	02	179	Participation in domestic and foreign exhibitions and trade fairs	2,500	2,300	2,400
531	04	169	Instruction about research and technology	2,160	2,160	2,161
532	02	179	Competitions and prices for the promotion of research and innovation	330	330	287
			Allocations and subsidies (without investments)			
652	50	179	Payments to the Kiepenheuer Institute for Solar Physics in Freiburg in Breisgau	2,254	2,054	1,735
681	05	179	Fellowships subsidizing the exchange of scientists	16,000	15,700	14,969
683	01	169	Subsidy of contracted R&D for companies in trade and industry	55,000	51,000	53,000

683	03	169	Research cooperation between industry and science	21,000	20,000	10,910
683	04	171	Subsidy for growth of the research and development capacity of trade and industry	80,000	75,000	41,034
683	29	171	Participation in the innovation risks of technology oriented product developments and founding of companies	63,000	80,000	48,195
685	02	179	Subsidy of selected researchers groups	6,750	6,000	2,250
685	04	171	Subsidy of technology transfer	6,000	6,600	6,771
685	05	179	Subsidy of peace and conflict research	2,900	2,868	1,886
685	06	175	Subsidy of research in social sciences	5,710	4,000	3,317
685	55	179	Subsidy of the programs of the academy of sciences	15,700	15,200	14,653
685	58	179	Institutional subsidy for institutions of the humanities	14,307	13,363	11,108
685	61	179	Subsidy for projects of the humanities	5,350	5,180	4,148
685	62	179	Contributions to the Institute for Scientific Films Public Utility GmbH (IWF) in Goettingen	4,774	4,661	4,474
685	98	179	Contributions to the German Society for Contemporary Problems, eV, Erlangen, and for the Institute for Society and Science, Erlangen	2,643	2,470	2,248
686	01	179	Payments to the European organization for astronomical research in the southern hemisphere (ESO) in Garching near Munich	13,807	12,980	18,173
686	30	169	Subsidy of cooperation with other states and of the internal German cooperation in the area of scientific research and development of technology	14,610	14,400	11,771
686	60	179	Payments for the international Institute for Applied System Analysis (IIASA) in Vienna	1,030	1,030	965
Title group	01		Max Planck Society for promotion of sciences eV (MPG) in Goettingen	(442,754)	(430,250)	(420,385)
685	52	161	Management	383,188	369,490	355,565

883	52	161	Investments	59,566	52,180	50,720
Title group		02	Fraunhofer Society for the promotion of applied research eV (FhG) in Munich	(144,349)	(134,242)	(126,380)
685	56	161	Management	78,585	71,872	64,980
893	56	161	Investments	67,284	63,820	61,400
980	56	990	Unspent funds deriving from reimbursements from the budget of nutrition, agriculture and forestry	1,520-	1,450-	0
Title group		03	Scientific research center for social scienced GmbH (WZB) in Berlin	(17,109)	(22,431)	(22.038)
685	57	179	Management	13,799	13,523	12,974
893	57	179	Investments	3,310	8,908	9,064
Title group		04	German Primate Center GmbH (DPZ) in Goettingen	(4,231)	(3,959)	(3,711)
685	59	175	Management	4,231	3,959	3,578
893	59	175	Investments	4,231	3,959	3,578
			Total expenditures	950,089	933,991	845,502

30 03 Scientific--technical R&D

Expenditures

			Allocations and subsidies (without investments)			
683	19	175	Subsidy of R&D and transformation of scientific achievements and related operational experience into improvement of working conditions	110,500	110,000	101,724
685	51	169	Contributions for the Institute of Spectrochemistry and Applied Spectrochemistry (ISAS) in Dortmund	5,191	5,326	4,380
686	01	165	Disbursements to the European Center for Nuclear Research (CERN) in Geneva	225.978	224,928	221,893
686	05	179	Disbursements to the European conference and the European laboratory for molecular biology	14,800	14,060	13,380

(EMBC and EMBL) in Heidelberg

686	08	165	German-Israeli endowment for the subsidy of R&D	20,000	25,000	0
686	09	165	Subsidy for scientific cooperation with foreign research institutes	12,500	12,500	11,600
686	50	165	Disbursements to the Max von Laue-Paul Institute	27,978	27,935	25,760
Title group		01	Subsidy for materials research and geosciences	(195,500)	(169,200)	(147,335)
683	20	169	R&D projects for new chemical technologies	10,000	10,000	7,868
683	21	169	Geosciences and mining technologies	54,500	29,000	23,442
683	22	169	Materials research and metallurgy	131,000	130,200	116,025
Title group		02	Subsidy of ecology and climate research	(232,700)	(193,000)	(151,353)
683	24	169	R&D projects of ecological research, environmental technology and environmental planning	147,700	110,000	89,003
685	26	179	Projects of climate research	24,000	23,000	17,102
892	24	169	Investment contributions for ecological research and environmental technology	61,000	60,000	45,248
Title group		04	Subsidies for biology and medicine	(304,840)	(275,000)	(212,577)
683	27	169	R&D in biotechnology	165,000	150,000	112,724
685	23	175	R&D projects for health services, medical research, and medical technology	139,840	125,000	89,853
Title group		05	Subsidy of selected priorities of basic research in natural sciences	(138,200)	(118,900)	(108,527)
585	01	165	Projects	75,200	71,900	66,057
893	01	165	Investments	63,000	47,000	42,470
Title group		06	Research institute Senckenberg of the Senckenberg Research Society for Natural Sciences in Frankfurt (Main)	(6,065)	(6,242)	(5,597)
685	50	163	Management	5,490	5,252	4,565
893	50	163	Investments	575	990	1,032

Title group	07		Endowment "German Cancer Research Center" (DKFZ) in Heidelberg	(119,946)	(103,082)	(92,268)
685	55	175	Management	85,296	80,647	78,703
893	55	175	Investments	34,650	22,435	19,565
Title group	08		Endowment "German Electron synchrotron (DESY I)	(286,088)	(329,693)	(282,976)
685	60	165	Management	98,013	95,143	83,883
893	60	165	Investments	188,075	234,550	198,093
Title group	09		Society for Heavy Ion Research mbH (GSI) in Darmstadt	(136,740)	(125,574)	(96,736)
685	61	165	Management	62,140	60,474	55,250
893	61	165	Investments	74,600	65,100	41,486
Title group	10		Hahn-Meitner institute Berlin GmbH (HMI)	(97,245)	(99,877)	(92,849)
685	62	165	Management	58,995	55,350	54,201
893	62	165	Investments	38,250	44,527	38,648
Title group	11		Society for Radiation and Environmental Research mbH (GSF) in Munich	(120,490)	(117,930)	(110,895)
685	63	173	Management	96,000	93,202	89,039
30 03 Scientific--technical R&D						
Expenditures						
893	63	173	Investments	24,490	24,728	21,854
Title group	12		Society for Biotechnological Research mbH (GBF) in Braunschweig-Stoeckheim	(57,740)	(55,013)	(36,074)
685	64	175	Management	31,730	30,578	25,000
893	64	175	Investments	26,010	24,435	10,994
			Total expenditures	2,112,501	2,039,560	1,739,518

30 04 Information technologies

Expenditures

		Allocations and subsidies (without investments)			
683	20 169	Subsidy of R&D in selected areas of physical technologies	23,000	18,000	17,228
683	21 168	Subsidy of R&D in selected areas of laser technology	47,700	48,400	24,976
683	23 169	Subsidy of R&D in the area of manufacturing technology	117,000	160,000	154,861
683	41 172	Subsidy of R&D in the area of technical communications	110,000	111,900	94,943
683	42 168	Subsidy of R&D in the area of information processing	121,000	125,600	111,618
685	07 175	Society for infrastructure institutions of social sciences (GESIS) in Mannheim	8,912	0	0
Title group	01	Subsidy of R&D in the area of electronics	(250,600)	(272,280)	(279,645)
683	40 169	R&D projects	153,000	168,300	173,000
683	46 169	Subsidy for R&D in the area of microperipherals	73,600	79,980	60,767
892	40 169	Investment contributions	24,000	24,000	44,700
Title group	02	Society for Mathematics and Data Processing mbH, Bonn (GMD)	(96,250)	(72,702)	(72,947)
685	50 168	Management	78,571	61,375	58,241
893	50 168	Investments	17,679	11,327	14,706
Title group	03	Heinrich Hertz institute for telecommunications technology (HHI) in Berlin	(12,994)	(14,469)	(11,431)
685	59 172	Management	8,994	8,469	7,806
893	59 172	Investments	4,000	6,000	3,425
Title group	04	Technical information, subsidy of R&D information services	(54,328)	(52,224)	(58,662)

685	60	162	Subsidy of individual projects	46,828	44,724	44,262
893	60	162	Investments	7,500	7,500	14,400
Title group		05	Institutional subsidy of interregional information centers	(35,529)	(41,426)	(39,447)
685	61	162	Installation and operation	31,063	37,542	37,038
893	61	162	Investments	4,466	3,884	2,409
Title group		06	Society for Information and Documentation mbH (GID) in Frankfurt (Main)	(3,567)	(15,058)	(15,311)
685	96	162	Management	3,567	14,208	14,823
893	96	162	Investments	0	850	488
			Total expenditures	880,880	932,059	881,549

30 05 Energy research and technology

Expenditures

			Allocations and subsidies (without investments)			
683	15	621	Federal risk participation in the area of nuclear energy	25,000	25,000	0
683	26	627	Subsidy of nuclear fuel supply (including uranium enrichment)	14,000	14,500	31,574
685	07	173	Subsidy for research in the area of reactor safety and general safety technology in nuclear research and technology	100,500	97,700	91,594
686	05	621	Payments to the International Atomic Energy Organization (IAEO) in Vienna	31,740	26,988	29,496
686	22	621	Contribution to the cost of the European Society for Chemical Processing of Irradiated Nuclear Fuels (Eurochemic) in Mol	9,000	9,300	8,296
Title group		01	Subsidy of non-nuclear energy research and technology	(417,000)	(432,000)	(393,478)
683	13	166	R&D for rational use of energy	85,000	71,500	58,890
683	16	166	R&D for coal technologies and other fossile energy carriers, generating plant technology	55,000	59,500	61,751
892	13	166	Investments for rational use of energy and new energy sources	132,000	138,500	96,121

892	16	166	Investments for coal technologies and other fossile energy carriers, power plant engineering	100,000	108,500	88,202
892	18	166	Development of installations for coal refinement	45,000	54,000	89,014
Title group		02	Building research and technology	(36,000)	(33,000)	(33,948)
683	17	176	R&D projects	31,000	28,000	28,045
892	17	176	Investment contributions	5,000	5,000	5,903
Title group		03	Subsidy for reactor development	(107,600)	(141,900)	(369,722)
683	12	165	Research and technology work for further development of high temperature reactors	35,000	45,000	0
683	19	165	Common use of a research reactor with lowly enriched fuel, and projects for the development of other reactors	1,000	1,000	700
892	11	165	Development of fast breeder reactors	71,600	95,900	338,775
Title group		04	Nuclear deactivation	(94,000)	(180,000)	(86,634)
683	27	165	Subsidy for R&D	60,000	77,000	52,585
893	27	165	Investments	34,000	103,000	34,049
Title group		05	Nuclear Research Center Karlsruhe GmbH (KfK)	(459,360)	(464,214)	(450,987)
685	50	165	Management	369,360	369,214	346,437
893	50	165	Investments	90,000	95,000	104,550
Title group		06	Nuclear Research Institution Juelich GmbH (KFA) in Juelich	(421,440)	(400,815)	(373,131)
685	55	165	Management	342,540	329,814	312,791
893	55	165	Investments	78,900	71,001	60,340
Title group		07	Max Planck Institute for Plasma Physics (IPP) in Garching near Munich	(84,111)	(81,000)	(78,372)
685	62	165	Management	57,111	55,202	53,681
893	62	165	Investments	27,000	29,790	32,440

Title group	08		GKSS research center Geesthacht GmbH in Geesthacht	(83,894)	(81,000)	(78,37
685	65	165	Management	65,394	64,404	61,05
893	65	165	Investments	18,500	16,596	17,32
			Total expenditures	1,883,645	1,991,409	2,033,85

30 06 Space research and oceanography, transportation systems

Expenditures

			Allocations and subsidies (without investments)			
683	05	167	Strategic research and basic technological developments in the subsidized area of space research and technology	18,200	8,500	4,300
685	09	167	Contributions to the operation of experimental installations and installations for the ground operations of space flight projects, and refund of expenses for projects in the area of space research and technology	48,000	35,500	33,771
686	01	167	Space organization (ENO) in Paris	749,000	699,225	559,191
Title group	01		Subsidy for orbital structures, space transportation systems, and selected utilization	(137,100)	(125,100)	(61,781)
683	06	167	Preparation, development, and utilization of space transportation systems	14,000	3,000	17,297
683	07	167	Preparation, development, and utilization of orbital systems	82,100	77,100	44,484
892	13	167	Investments and investment allowances	41,000	45,000	0
Title group	02		Subsidy for planning, development, manufacture, and operative demonstration of satellites and payloads	(51,500)	(49,000)	(16,998
683	09	167	R&D projects	36,500	28,500	16,998
892	15	167	Investment allowances	15,000	20,500	0

Title group	03		Subsidy of extraterrestrial basic research	(92,000)	(83,800)	(85,88
685	01	167	R&D projects	44,700	41,000	35,11
893	20	167	Investment allowances	47,300	42,800	50,77
Title group	04		Institute of Oceanography at the University of Kiel	(13,248)	(14,149)	(11,58
652	50	177	Management	10,150	9,620	9,333
882	50	177	Investments	3,098	4,529	2,247
Title group	05		Subsidy for oceanography and ocean technology	(109,500)	(102,000)	(106,943
683	21	177	R&D projects for ocean technology	45,000	42,500	43,310
685	26	173	R&D projects for oceanography	35,500	36,500	20,029
892	21	177	Allowances for investments in ocean technology	9,000	11,000	8,677
892	26	177	Allowances for investments in oceanography	20,000	12,000	34,927
Title group	06		Subsidy for R&D of earthbound transportation and traffic	(206,000)	(219,475)	(202,395)
683	23	172	R&D projects	66,000	68,000	64,511
891	23	172	Subsidies for investments	140,000	151,475	137,884
Title group	07		Subsidy for aeronautics research and technology	(100,200)	(94,000)	(76,342)
685	02	172	Subsidy of individual projects	54,200	51,300	49,539
893	02	172	Allowances for investments	46,000	42,700	26,803
Title group	08		Subsidy for polar research	(6,100)	(5,900)	(7,498)
685	22	177	Individual projects	6,100	5,900	5,392
893	22	177	Allowances for investments	0	0	2,100
Title group	09		Endowment "Alfred Wegener Institute for Polar Research and Oceanography" (AWI) in Bremerhaven	(62,059)	(62,797)	(59,599
685	50	177	Management	49,747	47,152	41,459
893	50	177	Investments	12,310	15,645	18,140

Title group		10	German Research and Experimental Institute for Aerospace eV (DFVLR) in Cologne	(271,558)	(254,320)	(239,081)
685	55	167	Management	211,758	203,479	183,942
893	55	167	Investments	59,800	50,841	45,139
			Total expenditures	1,864,465	1,753,766	1,510,042

30 14 Biological institute Helgoland

Income

			Administrative income			
113	01	177	Proceeds from the sale of individual items up to DM10,000	5	3	7
119	01	177	Revenues from publications	55	75	57
119	03	177	Revenues from contracts of third parties	0	0	93
119	99	177	Miscellaneous revenues	5	8	11
124	01	177	Revenues from rent, lease, and utilization	34	33	33
125	02	177	Revenues from the sale of living and sea animals and plants	35	40	30
125	04	177	Revenues from visits to the ocean aquarium	86	92	81
125	08	177	Revenues from the sale of food to guests	33	32	29
125	09	177	Revenues from the rent and utilization of rooms in the guest-houses on Helgoland and List/Sylt	190	178	183
132	01	177	Revenues from the sale of individual items of mobile goods worth over DM10,000 each and [from the sales] of vehicles	2	2	0
			Special income			
271	01	177	Refund of administrative expenditures by the endowment "Youth researches" eV	0	0	15
380	01	990	Reimbursement of funds from federal offices for contracts executed	0	0	0
			Total income	445	463	539

Expenditures

			Personnel expenses			
422	01	177	Salaries of scheduled officials	960	931	822
422	02	177	Salaries of official auxiliary personnel	0	0	0
425	01	177	Compensation for employees	5,984	5,796	5,806
426	01	177	Wages for workers	1,865	1,807	1,757
427	01	177	Compensations and wages for auxiliary staff with work contracts limited up to 18 months	350	350	350
453	01	177	Separation allowance, travel contributions, and payment of moving expenses	20	20	20
			Administrative expenses for fixed assets			
511	01	177	Office supplies, books, newspapers	45	45	57
513	01	177	Fees for post, telephone, radio, and TV	149	145	154
514	01	177	Cost of official cars	1,180	1,224	899
515	01	177	Appliances, furniture, equipment, and machines for administrative purposes	84	94	122
515	04	177	Appliances, furniture, equipment, and other fixed assets for research and experimental purposes	244	340	458
516	01	177	Work and protection clothing, personal fixed assets	10	10	10
517	01	177	Management of real estate, buildings, and rooms	1,566	1,405	1,561
518	01	177	Rents and leases	5	5	90
519	01	177	Maintenance of real estate and buildings	414	414	432
522	01	177	Consumable goods for R&D purposes	295	295	286
522	03	177	Cost of provisions for guests	25	25	24
523	01	177	Scientific collections and library	232	232	225
526	03	177	Cost for members of expert panels and similar panels	6	6	3

30 14 Biological institute Helgoland

Expenditures

527	01	177	Travel expenses for domestic business trips	73	73	67
527	02	177	Travel expenses for business trips abroad	52	52	52
531	03	177	Cost for the publication of research and experimental results	113	113	148
539	99	177	Miscellaneous administrative expenses	12	12	10
547	02	177	Preparation, conservation, and shipping of scientific research material	8	8	8
547	03	177	Outfitting of the work places for training courses and payments for outside teaching and auxiliary personnel	39	39	38
547	04	177	Expenses for supply, maintenance, and management of the display aquarium	26	27	26
			Allowances and allocations (without investments)			
681	04	177	Grants for the subsidy of junior staff	170	170	165
681	05	177	Exchange of experiences with domestic and foreign scientists	38	37	32
			Investment expenses			
711	01	177	Small buildings, building alterations and building expansions	440	544	102
811	01	177	Purchase of official cars	26	32	0
812	04	177	Domestic purchase of equipment, furniture, and fixed assets	594	557	541
817	04	177	Overseas purchase of equipment, furniture and fixed assets	78	54	55

Title group	01		Cost of data processing	(127)	(105)	(105
511	42	177	Office supplies	15	15	7
515	44	177	Appliances, furniture, supplies, and machinery	32	46	70
812	44	177	Domestic purchase of appliances, furniture supplies and machinery	80	44	28
Title group	02		Execution of contracts for federal offices and third parties	(0)	(0)	(548
425	11	177	Salaries of employees	0	0	218
427	11	177	Compensations and wages for auxiliary personnel with work contracts limited to less than 18 months	0	0	0
427	12	177	Salaries and wages for auxiliary personnel which was hired for a specific task with work contracts limited to maximum 3 years	0	0	297
459	19	177	Miscellaneous personnel expenses	0	0	0
515	14	177	Appliances, furniture and supplies for research purposes	0	0	0
522	11	177	Consumable assets for R&D purposes	0	0	25
527	11	177	Reimbursement of domestic business trips	0	0	0
547	11	177	Other non divisible administrative expenses for fixed assets	0	0	0
811	11	177	Purchase of official cars	0	0	0
812	14	177	Domestic purchase of appliances, furniture and supplies	0	0	0
817	14	177	Purchase of appliances, furniture and supplies abroad	0	0	0
			Total expenditures	15,230	14,971	15,309
			Income in individual plan 30	79,143	89,174	84,404
			Expenditures in individual plan 30	7,631,840	7,535,581	7,092,075

8617
CSO: 3698/M408

FRENCH GOVERNMENT INCREASING AID TO HIGH TECH

3698A312 Paris L'USINE NOUVELLE in French 16 Jul 87 pp 27-28

[Article by Pierre Virolleaud: "Innovation: The Comeback of Aid Programs"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Extension of tax rebates for research, incentives for companies to hire researchers, rehabilitation of ANVAR [National Agency for the Implementation of Research] and the Research Fund.... Will the approved financial outlay be up to these ambitious plans?

"The watchword is no longer 'liberalism', but competition," confided one of Alain Madelin's associates to us a few days ago. It is with this in mind that the minister of industry and his counterpart for research, Jacques Valade, have been preparing since early this year a range of measures to encourage innovation. During a visit to the plants of the European Propulsion Company [SEP] in Bordeaux last week, Jacques Chirac revealed the framework of this plan which strengthens major government aid programs in this area and which foresees new ones. This became clear by his conclusion: "Beyond major programs (Airbus, Rafale, Ariane 5, Hermes, and Colombus), our efforts must be expanded so that an increasing number of companies will be preparing tomorrow's techniques and products."

How many such innovative companies are now preparing the future? In 1986, 2,500 took advantage of the in tax rebate for research, including 1,500 small- and medium-sized companies. A generous assumption would be that 3,000 companies regularly conduct research in France. According to a comparable estimate, the FRG has over 10,000! The french Government's feasible goal is to double the number of French innovative companies by 1992. Since the larger ones are already included on the list, efforts will focus on smaller companies. The plan to be implemented is complicated because it affects the entire innovation structure: public and private research, development, and also dissemination and marketing of technologies.

The first important measure involves improvement of tax aid to companies. This year the research tax rebate system, allowing corporate taxation to be reduced by 50 percent of the increase in research expenditures from one year to the next (up to Fr 5 million), represents a yearly tax expenditure of Fr 1.2 billion. The prime minister has allocated at least an additional Fr 500 million in 1988. Allocation methods more favorable to companies will be announced before the end of the month. A rate increase from 50 to 60 percent? Raising ceilings for expenses involving several companies? Recognition of the absolute value of research efforts instead of an increase from one year to another, as employers would like? Widening of the definition of research expenses to include, for instance, the acquisition of French patents? We were told that the reform will in any case go in the direction of stimulating small- and medium-sized companies and cooperative research.

The same goals have led to the definition of a new direct aid plan. Greatly influenced by the "German model," it is meant to stimulate the creation of high tech companies and the hiring of R&D staff by existing companies. The management of this new aid program was assigned to ANVAR, which, as a consequence, sees its role being reaffirmed after a period of uncertainty. Alain Madelin even uses the expression "new ANVAR." The agency's budget will amount to Fr 627 million in 1988 (10 percent more than in 1987), which, taking into account the increase in revenues (reimbursement of loans to companies), will bring its total budget to Fr 917 million.

There will also be a reaffirmation of the role of the Research and Technology Fund (incentive funds separate from the budgets of the larger organizations) [?credits incitatifs exterieurs aux budgets des grands organismes], which had been subjected to considerable cuts by the Ministry of Research since the summer of 1986. The fund will be raised from Fr 750 million to Fr 825 million next year, i.e., a 10-percent increase which far from compensates for the cuts of the past, but is nevertheless encouraging. However, a settlement has apparently not yet been reached on the continuation of the mobilization programs initiated in 1982, joining companies with public and private laboratories to work on specific research themes. A new type of organization could be created modeled after the interministerial "advanced materials" program. With a Fr 200-million budget in 1988, this program will fund cooperative research involving industry, defense, Postal Services and Telecommunications, the Atomic Energy Commission, and the National Center for Scientific Research. Universities, engineering schools, and companies will participate in carrying out such joint research.

This is but one of the government's commitments to "decompartmentalize" the various innovation-stimulating organizations. Another major decision along the same lines is the creation of a "transfer bonus," amounting to 1 year's salary for researchers leaving their public organization permanently to go to work for a private company. For those wishing to work within the private sector temporarily, a range of measures is being studied which should include the coordination of employee benefits and an "assignment" to private industry during a researcher's career.

The same "decompartmentalization" effort includes incentives to make companies use the services offered by professional technical centers and subcontracting research companies: an increase in the bonus rate automatically granting such a laboratory state aid proportional to the amount of the contract signed with a company.

Thus, a large-scale plan is in the process of development and its components are not yet all known. It is large scale especially because of the range of applications. For the first time in France the innovation problem is being addressed as a whole, thus breaking down ever so slightly ministerial and professional barriers. One can also welcome the return to a policy of direct and indirect state aid, without which it is difficult to see how the government would be able to influence companies' decisions or modify their behavior in any way.

However, are budgetary resources up to this ambitious task? "This is only a beginning," the promoters of these operations affirm. A rather modest beginning considering the delays accumulated over 1 year and international comparisons. Because even if the Fr 627 million allocated to ANVAR in 1988 is added to the Fr 1.7 billion in tax rebates, that is still far from the DM1.3 billion (Fr 4.2 billion!) distributed each year by the FRG to its innovative companies.

[Box, p 28]

DM1.3 Billion Indirect Aid in the FRG

For approximately 10 years now the FRG Government has been offering, apart from government financial support to major projects on a case-by-case basis, a panoply of "indirect" subsidies mainly to encourage small- and medium-sized companies to put researchers to work. These procedures are indirect in that the government no longer controls the final destination of the granted aid once allocation rules are strictly defined. In 1986, a total of DM1.3 billion was devoted to such subsidies, which have been continued in 1987.

Small- and medium-sized companies receive aid to pay R&D staff (40 percent of gross salaries with a ceiling of DM120,000 per company) and to increase R&D staffing levels (60 percent of the cost when a position is created, with a ceiling of DM300,000 per company).

The hiring of young scientists coming from research institutes is also subsidized during the first 3 years.

External contracts between companies and research institutes would be subsidized for 30 to 40 percent of the amount by non-reimbursable grants.

R&D investments benefit from tax support and a special amortization schedule (over 4 years at a preferential rate). The tax loss alone for local authorities and the state resulting from these two measures was estimated at DM670 million for 1986.

To this plan should be added the six federal programs and about 30 "Lander" programs meant to support the creation of companies and small- and medium-sized business, in addition to the mere acquisition of scientific knowledge.

25048/12913

FRANCE'S RESEARCH MINISTER ON R&D FUNDING

Paris L'USINE NOUVELLE in French 1 Oct 87 pp 4-7

[Interview with Jacques Valade, minister delegate for research and higher education: "Reducing the Gap Between Public and Private Research"; date and place not given]

[Excerpt] [Box, p 6]

Jacques Valade is congratulating himself for ensuring that research will once more be a budget priority in 1988. He hopes the research efforts of firms will be the main beneficiary, especially given the 11 major national programs he will launch in the first quarter. The incentives he will offer to public sector research workers for joining private laboratories will also help.

L'USINE NOUVELLE [UN]. You have announced 11 major national programs. When will they be launched?

Jacques Valade [JV]. I want to move very quickly. Certain priority measures are taking over measures entered into under other names. However, we will be launching at least 25 percent completely new projects. We have already begun with the themes of AIDS in July and superconductivity in October. Thanks to the redeployment of funds from the ministry, we will have allocated Fr 60 million to national programs by the end of this year. Of the Fr 930 million in the 1988 budget, once the various European, regional, and other commitments are subtracted, we will have nearly half a billion francs for these programs. Funding from other ministries may be added to this total later on. Since we will have our papers in order, all the calls for bids corresponding to the 11 national programs will be sent out at the beginning of the first quarter of next year.

[UN] How will these programs work? And how long will they last?

[JV] There will be one or more scientific committees per program, according to its complexity. Representatives of industry and the public sector will serve on these committees, which will draw up the calls for bids, send them out, study the projects, and make proposals. Then, the minister will decide. I am also expecting scientific committees to evaluate the results of ongoing work. These committees will be supported by the Higher Council for Scientific and

Technical Research, which will fully execute its policy-making and evaluation roles.

The duration of these programs is very difficult to determine beforehand. I am in favor of an initial pilot period of 1 year. The scientific committee attached to the program will then evaluate the results, assessing whether the contract has been fulfilled and whether the results expected for this period have been realized.

The committee will also judge whether a program's chosen theme is still topical, since fantastic acceleration sometimes occurs in certain fields. In such cases we can quickly correct our focus or even abandon subjects whose anticipated results would be outdated. Once this stage is past, the program could be developed over a period of 3 years, for example. I want to avoid measures which are perpetuated without questioning their justification. Regular inquiry is a healthy practice.

[UN] You wish to attract research workers to firms. Are they ready for this mobility?

[JV] Inertia is strong among researchers employed in the large civilian research establishments: There is a fear of leaving the protected public service system. Therefore, it is necessary to find incentives to encourage temporary or permanent moves to the private sector. For permanent departure to industry we are offering a premium, the amount of which has not yet been completely fixed. In the case of temporary moves by researchers, whether from the public to the private sector or vice versa, we feel that there is no overall solution. Problems arising from disparities in salary and status can, however, be put in order on a case by case basis, by showing flexibility on both sides. Finally, there are young research workers for whom the situation is very different. For them, public sector research is not the only solution, they can also have a career in private sector research. In order to enhance this latter possibility, we are making every effort to increase research funding, both in size and extent.

[UN] Does favoring industrial research not mean putting basic research at a disadvantage?

[JV] Contrasting basic research with applied research is an outmoded debate today. Manufacturers are taking part in basic research. For example, if there had not been significant advances in large industrial groups and universities, we would not be leaders in the field of superconductivity. Conversely, researchers in the large French public institutions were well aware that they had greater resources from the moment they interested industry in their research subject.

So there is no basic research on the one hand and applied research on the other, but there is certainly public and private research. And since French industry does not devote enough effort to its research in comparison with its principal rivals, we have taken steps in the 1988 budget to correct this competitive handicap. Of course, the increase in the public research budget is moderate. In the past, major efforts have been made, and I consider our action plan to perform on the whole very well. We still have to make progress to improve the competitiveness of French research. The people I have spoken to in the scientific and industrial communities have immediately grasped that this budget is meant to reduce the gap between public and private sector research. It is still far too wide in this country.

25065
CSO: 3698/A033

CIPE, CNR AID ITALY'S R&D

36980032 Rome NOTIZIE AIRI in Italian May 87 pp 21-23

[Article: "CIPE Approves National Biotechnologies and CNR Targeted-Research Programs"]

[Text] At its meeting of 28 May, the CIPE [Interministerial Committee for Economic Planning] approved sizable grants in aid to the R&D sector.

Approved first was the National Advanced Biotechnologies Program (see NOTIZIE AIRI No. 34, item 11), which provides for expenditures totaling 400 billion lire over a 5-year period, to be financed on the basis of funding provided by Law 46. The areas to be subsidized by the program are: Medicine and veterinary medicine, chemistry, energy and environmental protection, agriculture and food. The Government also approved, at the same meeting, a resolution to proceed with the building of the Synchrotron Light Laboratory in the Trieste Research Area, and another providing for Italian participation in the European Laboratory of Grenoble (France), which is also working on the synchrotron.

But the largest subsidy has to do with approval of the CNR's [National Research Council's] 10, so-called third-generation, targeted-research projects, involving an investment of public- and private-sector capital totaling more than 1,000 billion lire, over a period of 4 to 5 years. The state's share of the investment will total 692 billion lire over the 5-year period, while that of the private sector will total 320 billion lire. The subjects of research under this program will concern building design and construction, optoelectronic technologies, superconductivity technologies, robotics, advanced materials, data processing and parallel computing, internationalization of companies, biotechnologies, telecommunications, and fine chemicals. The projects are premised on leading-edge research. The accompanying table shows the breakdown of planned public-sector investments in the CNR's 10 targeted projects.

At a press conference called by the research minister, Senator Luigi Granelli, to mark what he termed "an historic day"--the approval at a single meeting, on 28 March, of projects totaling over 1,000 billion lire--the minister stated that these projects will require the hiring of at least 8,000

Government Funding of CNR Targeted-Research Projects

(in Billions of Lire)

Projects	1987	1988	1989	1990	1991	Total
	Years					
Building design and construction	12,814	17,100	28,062	29,832	27,545	115,354
Optoelectronics technologies	9,857	10,688	11,685	10,951	9,771	52,952
Superconductivity technologies	4,929	11,368	14,366	7,836	---	38,498
Robotics	8,871	11,076	15,133	15,388	17,309	67,777
Advanced materials	9,857	17,197	24,423	20,297	12,842	84,617
Data processing and parallel computing	11,829	12,242	12,642	13,122	13,586	63,422
Internationalization of firms	1,971	2,429	2,969	3,210	----	10,579
Biotechnologies	15,771	16,226	16,857	17,465	18,053	84,372
Telecommunications	11,829	13,797	20,017	15,483	17,402	78,527
Fine Chemicals	17,743	18,540	19,190	19,860	20,554	95,887
Total	105,471	130,664	165,344	153,444	137,062	691,985

researchers by some 100 large- and small-sized industries. Most of these researchers will be needed for the CNR's 10 targeted-research projects: 4,700 in the CNR and the universities, research institutes, and industries involved in these projects. Added to these will be the 600 CNR research fellowships annually (for 5 years), and 500 contract employees in other jobs and training activities in the industries. Another 2,000 researchers (among universities, CNR, industries, etc) will be employed under the Advanced Biotechnologies Program.

Still another 150 researchers and engineers will be hired in permanent jobs by the future Trieste synchrotron (75 billion lire). And some tens of Italian researchers and engineers will participate in the planned European synchrotron at Grenoble (75 billion lire).

Minister Granelli expects actual work under the targeted projects to start in January 1988, and in April-May for the biotechnologies. Another important fact regarding the CIPE's approvals, Senator Granelli points out, is that the more than 1,000 billion lire were not just "sprinkled around," but instead are being concentrated under three main headings (targeted projects, advanced biotechnologies, and accelerating machines for research on the structure of matter, the latter having important fallouts in various sectors such as biotechnology and materials technologies).

Among specific subjects, Minister Granelli cited the development of medicinals, vaccines and diagnostic agents, and the production of proteins capable of guaranteeing the safety of blood plasma against viruses of the AIDS, hepatitis, etc types. In chemistry, nonpolluting natural processes will be studied for the production of chemical substances and the disposal of wastes.

Research in the area of agroindustrial food products is targeted on new selectively-bred and artificial seeds. In view of a biotechnologies world market estimated at 22,000 billion lire by 1995, and a domestic market of 2,000 billion lire, the program seeks to stimulate by that time a domestic production of around 1,000 billion lire. By July of this year at the latest, the list of specific research subjects will be published in the GAZZETTA UFFICIALE. Bids must be submitted by October-November 1987; and research contracts will be awarded during April-May 1988.

9238

ITALY, SPAIN COOPERATE IN S&T

36980032 Rome NOTIZIE AIRI in Italian May 87 pp 30-35

[Press release by Foreign Ministry's General Directorate for Cultural Relations; first paragraph is NOTIZIE AIRI introduction]

[Text] The following documentation, kindly furnished us by the General Directorate for Cultural Relations, in the Ministry of Foreign Affairs, demonstrates the excellent progress that has been made in Italo-Spanish cooperation between universities and government agencies, in science and technology. And what about industry?

At the fourth meeting of the Joint Italo-Spanish Committee for Cooperation in Science and Technology between the two countries, held in Rome from 18 to 21 May, expression was given to the intent to intensify this Committee's activity, in furtherance of the impetus imparted to it by the summits held at Taormina in April 1986 and at Palma de Majorca in February 1987. The parties, having reviewed and recorded with satisfaction the results attained to date as regards cooperation in this sector, agreed to hold a progress reporting session in Madrid during the third quarter of 1988, then proceeded with the work of the Committee, forming working groups to analyze the various items before the Committee, define priorities, and identify possible new subjects of cooperation. Following is a summary outline of the results of this work.

1) 'Integrated Actions' Program

The parties agreed to develop an "integrated actions" program, defining an integrated action as a research project, limited in terms of time and with pre-targeted objectives, which is set up between two university research groups of the two countries, to develop a previously agreed approach. The funds to be provided by the respective Governments for the development of an integrated action are specifically intended to enhance relations between the research groups of the two countries, and are limited to the financing of trips and sojourns.

Responsibility for the program is vested in the Ministry of Education, for the Italian side, and in the Vice General Directorate for International Cooperation, of the Technical General Secretariat, of the Ministry of Education and Science, for the Spanish side.

The parties to this program will issue a circular on 15 September 1987, with the object of rendering the program operative as of 1 January 1988.

2) Cooperation Between [Italian] National Research Council (CNR) and [Spanish] Higher Council for Scientific Research (CSIC)

The parties expressed satisfaction with the excellent progress made during the 1985-86 2-year period as regards the exchange of researchers under the CNR-CSIS Agreement, for work on the planned joint research projects. During that 2-year period, 79 Italian experts spent time in studies and research at Spanish institutes, while 103 Spanish experts spent similar time at Italian institutes. Cooperative activity, which was renewed in December 1986, will continue during the 1987-88 2-year period on 18 subjects of joint research in the following sectors: Mathematical sciences, astrophysics, new materials, microelectronics, geology, food technologies, and historical sciences.

3) Cooperation Between ENEA-DISP [[Italian] National Agency for Nuclear and Alternative Energies - Nuclear Safety and Environmental Protection Administration] and CSN [[Spanish] Nuclear Safety Council]

The parties cited their fruitful exchange of technical information and collaboration on nuclear safety and protection against ionizing radiation, under the terms of the agreement between ENEA-DISP and the CSN.

They reported that during the years between 1983 and 1986, the agreement has been developed on an ongoing basis through exchanges of documentation and meetings between delegations and experts, with respect to various sectors. As regards possible near-future collaboration between ENEA-DISP and CSN, the parties cited the following as the subjects of greatest interest from the standpoint of exchanges of information and test data:

--Historical and recent seismicity of the two countries as related to applicative nuclear power plant safety considerations;

--Probabilistic risk analysis of old plants and safety audit of recent in-service plants;

--Analysis and evaluation of operational experience;

--Safety analysis of present-generation PWR nuclear plants;

--Studies of severe accidents and their applications.

4) Nuclear, Subnuclear Physics and Synchrotron Light

Wide-ranging satisfaction was expressed with regard to the agreement between INFN [[Italian] National Institute for Nuclear Physics] and CICYT [[Spanish] Interministerial Committee for Science and Technology], which has enabled the undertaking of productive cooperative efforts in the sectors of nuclear physics, high-energy physics, theoretical physics, and synchrotron-light-based research. The parties agreed to proceed with an audit of the status of collaboration between INFN and CICYT at the fifth session of the Committee scheduled for 1989, for the added purpose of determining the existence of possible mutual interest in broadening and furthering their cooperation.

5) Telecommunications

As regards the telecommunications sector, the Italian Higher Institute of Posts and Telecommunications has proposed to its Spanish partner the following possible joint undertakings:

--Research on the propagation of electromagnetic waves;

--Processing of vocal data;

--Wideband networks;

--Optic-fiber communications;

--Automated testing and management of networks;

--Multi-service network design and evaluation methods;

--Studies on the influence of human factors in the new services.

6) Cooperation in advanced sectors

The parties stressed the desirability of instituting new collaborative efforts in the sector of advanced technologies, with a view to conducting joint high-level research on an ongoing basis.

To this end, it was pointed out that adequate means of implementation exist in the form of, on the Spanish side, new national programs under the "Science Law," and, on the Italian side, the CNR's targeted projects, and particularly those of the so-called "third generation," which are presently in the start-up phase.

Priority areas of possible cooperation cited by both parties are: Microelectronics, biotechnologies, new materials, oceanography and marine technologies, robotics, and optoelectronics technologies.

7) Microelectronics

Analogous programs exist in both countries at present for coordinating microelectronics activities over the intermediate time period: The National Microelectronics Program, in Spain; and the CNR's Targeted Project on Materials and Devices for Electronics in Italy. These programs pursue a common methodology and can yield sectors of activity in which the two countries can operate in a coordinated and complementary manner. The parties have therefore proposed a meeting at an early date between two groups of Italian and Spanish experts, to identify the areas of research in which collaboration can yield greater efficiency, and the objectives to be attained.

8) New Materials

The two parties expressed satisfaction with the collaboration between the CNR and the CSIC in this sector, in which productive joint research efforts are already under way. Other areas of possible collaboration between the Spanish and Italian scientific institutes were identified.

Also identified were the areas of joint interest under the New Materials Projects that are scheduled to be launched as soon as possible in the two countries.

During the session, the results attained and possible further forms of cooperation were examined in the following sectors: Public health and medicine; environment; food technologies; transportation; artificial intelligence; biotechnologies; oceanic technologies; robotics; and electronics.

Italy and Spain also agreed that closer cooperation between the two countries can constitute a better platform for attaining objectives in multilateral research contexts, particularly within the EEC. Both countries also consider it important to emphasize the need to activate trilateral Italo-Franco-Spanish projects approved by their respective Research Councils. The exact date of the fifth session of the Joint Committee is to be fixed later; tentatively, it is to take place during the second quarter of 1989, in Madrid.

9238

CZECHOSLOVAK SCIENTISTS PRESENT RESULTS OF FIBER OPTIC R&D

36980022b Paris ELECTRONIQUE ACTUALITES in French 2 Oct 87 p 29

[Article by Guy Cuciuc: "Work on Polymer Fiber Optics"]

[Text] As part of the scientific and technical cooperation agreement between France and Czechoslovakia, the Czechoslovakian Center for the Diffusion of Scientific and Technical Information, CDISTT, located in Paris, organized a "Polymer Fiber Optics Day" in its offices. The purpose of this organization is to initiate and maintain an exchange of information and scientific, technical, industrial and economic cooperation between organizations, firms, institutions and specialists of the two countries. The speaker was a researcher from the Macromolecular Chemistry Institute of Prague's Czechoslovakian Academy of Sciences.

The latter related the "laboratory" results obtained in this area, particularly those relative to light loss (weakening of the signal). The distance a fiber is capable of transmitting light is determined by the fiber's optical loss.

Certain parameters for limiting these attenuations are well defined, such as the type of fiber structure chosen, and the wave-length selected depending on the material chosen, such as PPMA (polymethylmethacrylate fibers) or PA (polysterene).

That leaves external attenuation factors related to manufacturing, influenced especially by organic impurities, dust, the orientation of molecules, and irregularities in the interface between the core and the sheath. All these factors are what the Czechoslovakian laboratory strove to bring out.

During manufacture of the fiber, its molecules undergo an orientation during drawing, which has a positive effect on the mechanical and a negative effect on the optical properties.

To achieve optimal mechanical and optical properties, the optical fiber must be drawn at a certain degree of orientation.

Priority to Drawing and Temperature Conditions

Molecular orientation was analyzed based on measurements of double refraction on speed, and the drawing temperatures of PPMA and PS fibers were studied. The results show an increase in double refraction values as the drawing speed rises. In contrast, double refraction drops when the temperature rises. Double refraction also increases with the molecular mass of the polymer. Attenuation is also influenced by shearing and by the type of polymer used. The results of the 5-researcher Czechoslovakian team show that for each polymer of a given molecular mass it is necessary to optimize drawing conditions, especially temperature and speed, to obtain the desired mechanical and optical properties. It should be noted that the level of research conducted by the Czechoslovakian institute would enable the country to undertake national production of plastic optical fibers.

The laboratory welcomes any and all collaboration with researchers and manufacturers, with a view to exchanging information and perhaps even collaborating in the future.

The only French manufacturer of plastic optical fibers, Optectron, has announced its intention of collaborating with the laboratory under the auspices of ACTIM (Agency for Technical, Industrial and Economic Cooperation).

9825 END