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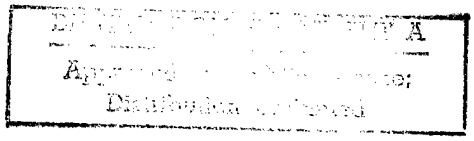
West Europe Report

SCIENCE AND TECHNOLOGY



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15 April 1986

WEST EUROPE REPORT
SCIENCE AND TECHNOLOGY

CONTENTS

SCIENCE AND INDUSTRIAL POLICY

TECHNOLOGY TRANSFER

ADVANCED MATERIALS

SITES, FUNDING FOR NETHERLANDS ADVANCED MATERIALS RESEARCH

Rotterdam **NRC HANDELSBLAD (Supplement) in Dutch 26 Feb 86 p 3**

[Article by Jan Libbenga: "Challenge for the 1990's: New Materials"]

[Excerpts] Minister of Education and Sciences Deetman and Minister of Economic Affairs Van Aardenne feel that Netherlands business is still not aware enough of the possibilities offered by new materials. We must analyse, test, and understand materials so as to develop stronger synthetic materials and composites, according to the recent Materials Memorandum by the two ministers. Their concern does not appear to be exaggerated: if something does not happen soon, developments threaten to pass the Netherlands by. Forty million guilders in government support should permit research institutes like the Netherlands Central Organization for Applied Natural Scientific Research [TNO] and the universities not only to work more closely with one another but also to better coordinate their research. There are "large gaps in the knowledge" of graduates. Finally they point out the importance to the environment of developing new materials. The Memorandum speaks in this connection of an "anticipatory policy": develop the knowledge now that will permit business to comply with future environmental demands without taking losses.

Staff Shortage

In this country materials research is primarily directed at relatively narrow applications, such as aircraft construction and semiconductors. Large institutes like the National Aviation and Space Flight Laboratory (NLR), the Netherlands Energy Research Center (ECN), and the TNO cooperate in these areas with the universities. At the TNO materials research is concentrated primarily in the Metals Institute, the Synthetic Materials and Rubber Institute, and the Institute for Construction Materials and Construction, whilethe NLR concentrates on construction materials for aviation and space flight, such as aluminum laminates and composite materials. The ECN, finally, is very knowledgeable in the field of technical ceramics.

Nonetheless, there is a serious shortage of expert staff. Now particularly when industry is doing a larger proportion of the work of developing applications, the demand for chemical technologists is increasing. Dr. Ir. H.P. Van Leeuwen of the NLR's main section for construction and materials: "Fokker and the NLR have a composites working group, but there is a lot of pressure on that, because

the people in the working group also have to work on other projects too. There is also the fact that in the Netherlands we cannot find any experts in the composites field. We have to bring them over from Britain. Fokker too can use them by the dozen, and the competition is just growing since Akzo and DSM [Dutch State Mines] are also going to be working on the development of fiber materials."

In the meantime steps have been taken to provide the infrastructure in two areas of materials research: Enschede and Apeldoorn are the sites of the recently established workshops of the Advanced Metals Science Foundation (cost, 10 million guilders), and Petten is the site of the National Ceramics Workshop at the Netherlands Energy Research Center (7 million). The facilities of both "interdisciplinary centers" are available to firms, research institutions, and university research groups.

The National Ceramics Workshop, which is to reach full capacity in 1987, contains all the facilities to prepare technical ceramics. Here it is possible to produce and test ceramic components of a reasonable size to one's own specifications and in not too small numbers. Dr. R. Blackstone, program manager at the Netherlands Energy Research Center: "We asked ourselves which area of materials research we should concentrate on. The answer was ceramics, because they have already been working at the ECN for years at producing and doing research on ceramic materials. They already had a good basic set of equipment. Having this workshop does not bring us level with developments abroad. We have created the tools to let us get along for the time being."

Blackstone denies that the Netherlands is several years behind in the entire field of ceramics. "People get that impression because in Japan in particular research results are turned into products much more quickly. Therefore it is senseless for us to concentrate on applications like semiconductors and engines."

Important possible applications for ceramics in the Netherlands are, Blackstone says, to be found in the field of processes industry--sensors and membranes, for instance. The latter are used for such things as separating organic materials and gas mixtures at high temperatures in the petrochemicals industry.

In 5 years the Ceramics Workshop will have to be able to survive independently, as will the workshops of the Advanced Metals Science Foundation. At the latter they are concentrating on what they call the "metals science approach to a number of production techniques." Students from the technical universities and young engineers receive training there, after which they can be put to work in medium-sized and small businesses.

At this moment there is still only a little formalized contact between business and educational institutions. In order to strengthen that relationship, the government suggests it might be possible to create a number of transfer centers with the goal of encouraging the mutual exchange of knowledge between medium-sized and small businesses on the one side and the institutions of higher technical education on the other. There are other bottlenecks, the Materials Memorandum notes, in regard to expert teachers, curricula available, and

equipment. That is blamed on a "certain rigidity" on the part of higher technical education and on the "often inadequate conditions in terms of staff and physical equipment."

Prof. Ir. P. Jongenburger, professor at the Technical University [TH] in Delft, thoroughly agrees with that: "Education gives too little support in the area of materials, because the infrastructure of higher technical education is not good. The programs at the lower, middle, and higher technical schools and at the TH's are hardly coordinated with one another at all. The TH has nothing at all to say about what a higher technical school does, and vice versa."

The government believes that the number of programs offered at the higher technical schools in materials technology should be expanded, and it also wishes to strengthen the attention given to materials in the construction training at higher technical schools.

Training

An important development in the field of materials training is undoubtedly the experimental program in materials science engineering at Delft TH. This program--the only one of its kind in the Netherlands--has attracted an average of 50 first-year students each year since 1981. Jongenburger: "We are not unhappy with that, although the interest in all of the TH's programs depends very strongly on the economic situation. With the energy crisis the number of chemistry students dropped drastically; the aircraft construction section, on the other hand, showed an increase the moment Fokker announced it would be working with McDonnell Douglas. Now we are seeing another increase, and that is probably the Wubbo Ockels effect. Students do not seem to realize that when they graduate in 6 years, the situation in the marketplace could well be very different."

Future materials science experts are expected not only to broaden and deepen their knowledge and capabilities, but also to be able to detect on their own the "latent needs in the market." Koumans (TNO) takes the profile even further: "He has to feel it in his bones. And he has learned there absolutely is not a single, indivisible truth, and that there is more than one way to skin a cat. It is the power of lateral thinking, he has to be able to make that lateral connection."

It is still an open question whether the educational system can provide such "interdisciplinary engineers" in the short term. The Ministry for Education and Sciences has earmarked barely 7 million guilders for graduate training and for developing curricula with the appropriate equipment. A great deal more than that will have to be invested if we are not to see materials research largely being carried on outside the Netherlands.

Optimism Too

There are optimistic signs too. At DSM in Geleen they are working on stanyl, a synthetic material patented all over the world with a melting point of just

under 300 degrees C. If this new kind of nylon, which can be used for such things as gear boxes, V-belts, and conveyor belts, can be put into production, it will be possible to create 150-200 new jobs. Akzo too wants to multiply its efforts in the field of fibers research.

Although the government has announced new preliminary studies in the fields of recycling and re-use of non-ferrous metals and has made money available for research into polymer composites and metal processing techniques, the general opinion is that the 40 million guilders of support is not adequate. Koumans (TNO) feels that the same kind of effort is called for as in data processing, "and then you would be adding one or two zeroes at the end." Jongenburger of the Association for Materials Science: "Promising research will not lead to much if nothing is done with it. There will have to be a lot of money for further development. That calls for a different attitude on the government's part. We in the Netherlands are working on a number of fine projects, but with so little capacity that for right now we are falling behind."

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AEROSPACE

VOLVO FLYGMOTOR OF SWEDEN INVOLVED IN ESA, ARIANE

Contracts for Ariane Engines

Stockholm NY TEKNIK in Swedish 9 Jan 86 pp 40-41

[Article by Jan Lothigius]

[Text] Trollhattan--At Volvo Flygmotor, 1985 was a big year for aerospace technology. The number of development engineers increased from three to 30 in 2 years.

Half the aerospace work consists of development contracts with the European space rocket Ariane 5 and future projects. The other half consists of producing engine parts for the Ariane rockets that are already being used.

It is only in recent years that Volvo Flygmotor has received development assignments from the European Space Agency (ESA). S. O. Furebring is the head of Volvo Flygmotor's aerospace activities. He explained how Volvo Flygmotor became involved in aerospace projects.

"The French rocket engine manufacturer SEP knows what Volvo Flygmotor can do, after 10 years of cooperation."

"Sweden pays 5 percent of the ESA budget. Most of this money must be sent back to Swedish companies."

Since 1974 Flygmotor has produced combustion chambers and nozzles for Viking rocket engines, which are used in the European Ariane rockets.

But the production of Viking parts has served as an entryway into aerospace technology.

"To be successful in this production, we were forced to become best in electron beam welding," S. O. Furebring said.

The nozzles are made of a cobolt alloy that is extremely difficult to weld.

The aerospace production has also required the development of new technology in the workshop in order to shape the parts. Volvo Flygmotor has had to meet the extremely high demands on quality made by ESA.

Now that the next generation of rocket engines for the Ariane 5 is being developed, Flygmotor has its advanced production know-how to fall back on. As a result, Flygmotor has been given the task of developing the nozzle and two turbines for the fuel pumps of the HM 60 engine, which will be driven by liquid hydrogen and liquid oxygen. This corresponds to 10 percent of the development work on the engine.

The French company SEP is the primary contractor for engine development.

Nozzle and turbine work has been underway in Trollhattan for some time now.

Flygmotor signs development contracts with ESA for 2 or 3 years at a time. The agreements must be renegotiated for each new period.

In principle, other companies can compete for the new development jobs, but if Flygmotor does a good job it can be relatively certain of receiving additional development assignments.

"Our biggest problem is that the times allowed for development are so short," S. O. Furebring said.

"We wage a constant battle against time and many of us work double shifts."

The first prototype for the pump turbine must be delivered in late 1986. Flygmotor's first test of the completed turbine is planned for January and February. So far, the components have been tested separately.

The development work will continue until series production begins in 1994, the goal being improved performance, modifications of the geometry, and so on.

The HM 60 engine is a project that has final approval and a definite timetable. An HM 60 engine is supposed to launch the first Ariane 5 into space in 1994.

But Volvo Flygmotor is also involved in more long-range projects.

One of these projects involves electric fuel pumps to help transfer satellites from elliptical orbits around the earth into geostationary orbits.

Another is a flywheel for storing energy when the satellite's solar panels are shaded by the earth and do not produce electricity.

These projects are in the early stages of development and are still only loosely defined. ESA has called on Volvo Flygmotor to develop the technology. So far, no decision has been made as to how or when the technology is to be used.

"These are small assignment that will hardly yield any profits," S. O. Furebring said, "but it is important for us to show ESA what we can do."

The division for future development also includes work on composite materials by the materials science laboratory. Leif Larsson is head of the materials

science laboratory. He said that heat-resistant materials such as tungsten fibers in steel and ceramic composites--fibers of silicon carbide included in that same material--would be valuable for use in the pump turbines for the HM 60, for example.

Five members of the materials science laboratory are involved in developing composite materials. One of the projects involves the production of the fiber key rings on the rotor for energy storage.

S. O. Furebring believes that Flygmotor is devoting about the right amount of energy to the development of space technology. The company has just undergone a major expansion, although there are still a few vacancies in the organization. Thirty highly trained engineers and doctors of engineering are now working on aerospace technology development projects at Flygmotor. In addition, there are about 20 technicians involved in production and quality control.

"Now our job is to follow through on the major commitments we have made in a number of high-risk technical projects," S. O. Furebring said.

There is another conceivable development project in the future, however, that could attract more engineers to Volvo Flygmotor. If Hermes, the French space shuttle, becomes a joint European project, it could mean jobs for Flygmotor. Flygmotor could help develop parts of the Hermes engine, perhaps in cooperation with the German company MBB. So far, however, no decision has been made.

"The future of Hermes will probably be more clear in 2 or 3 months," S. O. Furebring said.

Aerospace technology could easily take up more and more of Flygmotor's workshop capacity. S. O. Furebring estimates that in 1990 aerospace technology production will be 1.5 times greater than it was in 1985.

According to plans, Volvo will produce parts for the Ariane engines past the year 2000. This is in addition to production of the nozzles and turbines for the HM 60.

In terms of cash, Flygmotor's profits from the production of rocket parts are not great. The agreement with ESA limits the company's profits to a maximum of 10 percent and ESA has the right to monitor the company and make sure it abides by the agreement.

"Sometimes we are forced to use our own money in the development projects," S. O. Furebring said.

Other types of profits are high, however. Aerospace activities are now the driving force in technological development that military projects once were.

The knowledge Flygmotor gains in production technology, materials science, and quality control are extremely valuable in the other activities of the company. S. O. Furebring also mentions project management as an important skill that is developed through the aerospace projects.

"And we have been forced to go back to school and study French!"

Development of Electric Pump System

Stockholm NY TEKNIK in Swedish 9 Jan 86 p 40

[Article: "Electric Pump Makes Lighter"]

[Text] A 4-ton satellite can be made 50 kg lighter if an electric fuel pump is used instead of pressurized tanks. As a result, Volvo Flygmotor has received funds from ESA to develop this technology.

In an orbit 36,000 km above the equator, satellites can remain still with respect to the rotating earth. This is called a geostationary orbit.

Geostationary orbit is achieved in two stages. First the satellite is placed in an elliptical orbit that is tangent to the geostationary orbit. Then the satellite pushes itself into the correct orbit with its rocket engine.

Flygmotor believed that the energy from the satellite's large solar panels could be used for this push. The acceleration from a 3,000 N liquid fuel rocket engine is low enough so that the panels may remain folded out during the push.

If a 4-ton telecommunications satellite can be made 50 kg lighter, the actual payload can be increased by almost 10 percent, since the payload comprises only 15 percent of the entire weight of the satellite. The propulsion system accounts for over half the weight.

After making a technical study in which various possible solutions were evaluated, Flygmotor has now been given the task of constructing a prototype. It should be complete in early 1986.

A high-speed motor with electronic commutation will drive a centrifugal pump. Two such pumps are needed for the nitrogen tetroxide and monomethylhydrazine fuels. The fuel pressure is controlled by regulating the motor speed.

Electronic commutation means that the position of the rotor is registered and the magnetic fields that drive the rotor are controlled electronically. Thus, the motor has no brushes, which would function poorly in the vacuum of space. The motor is being developed by the Swiss company Etel.

The control electronics and bearings are cooled by the pumped fuel, which passes through channels in the hull.

The most difficult design problems are balancing efficiency with effective sealing and selecting materials that can withstand the highly corrosive nitrogen tetroxide.

AEROSPACE

SWEDISH GOVERNMENT SUPPORT FOR SPACE R&D 40 MILLION

Stockholm DAGENS NYHETER in Swedish 12 Mar 86 p 11

[Article by Eric Dyring: "Space Investment Continuing"]

[Text] A billion kronor over 4 years for Swedish space efforts. That is what the government has proposed. Sweden will join in the European space plans to build a manned space station and a space shuttle of our own. The emphasis on Kiruna as a space center will continue.

These are the major points in the government's new space bill which was presented to Riksdag on Tuesday.

People at the Industrial Affairs Ministry were content to come up with 1 billion kronor for Swedish space activities in spite of the tight budget situation. This means a continued investment at the level set by Riksdag in 1979. That resolution is commonly known as the "space lift-off."

"The bill is primarily an industrial policy investment," said ministry official Bjorn Englund. "Sweden will now have a chance to participate in the big space projects that have been started by the European Space Agency, ESA."

One of these projects involves an improvement of the "Ariane" cargo rocket. Others involve the "Columbus" space station and the space shuttle "Hermes." With this effort Europe will take up the fight against the two space superpowers, the United States and the Soviet Union. Swedish cooperation on smaller projects will also continue.

Boost for Kiruna

The bill also involves regional policy. The success of the Swedish research satellite "Viking" and the French video satellite "Spot" gave Kiruna a boost. The city is making a bid to become a national and European space center. The Esrange missile base is located there and the Space Corporation installed its Satellitbild, Inc. there. Now the govvernment is stepping in. The bill estimates that the number of space workers in Kiruna will increase from 140 to 230 by the end of the century.

People at the Space Corporation are satisfied with the bill.

"It's good," said the corporation's new executive director, Lennart Lubeck. "But there is a risk that the resources will be split up. We are forced to spread a thin layer of funds over a lot of good projects."

The government has discussed joint financing of the national space program with industry. The end result is that the state will provide 40 million kronor and industry 60 million. The 100 million kronor will be used to prepare Sweden's private business sector for the international space market. The money will go for research and development.

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AEROSPACE

SAAB PARTICIPATES, INVESTS IN SPACE INDUSTRY

Stockholm DAGENS NYHETER in Swedish 1 Mar 86 p IV

[Article by Nils-Erik Lindell: "Future Bright for Saab's Space Industry"]

[Text] Goteborg--The Viking satellite, now in its planned orbit in space--where it will remain for another 10-20,000 years--is a real breakthrough for Swedish space technology.

"There are 100 man years of engineering work behind the Viking," said Ivan Ofverholm, executive director of Saab Space. "Although the expertise we are building up is fairly recent and goes back only a few years, we now have a good starting point for new projects. We are doing practical work on the Tele-X satellite, the European Cluster project and the Swedish Mailstar, the mailbox in space."

Along with Volvo Flygmotor and Ericsson, Saab Space has offered to come up with half the investment, 50 million kronor, in a national Swedish space project within the framework of the European space program. This offer may be included in the bill the government will present on 10 March.

Good Estimate

Saab Space is especially proud of its accurate estimate, with a modest profit, of the cost of the Viking project and feels that the Viking shows that it is possible to build a functioning low-price satellite--on the international scale, 120 million kronor is a very low price.

Saab Space is one of 17 companies in Saab Scania Combitech, a group in the concern that has had very rapid and profitable results.

"We now have our third year of activity behind us and we have achieved a rapid increase in invoices and a yield of 42.4 percent on our working capital," said executive director Per Risberg. "That is very satisfactory for an expanding high-tech firm with large expenses for technical and marketing development."

Under One Hat

Sales reached 1.471 billion kronor in 1985 compared to 863 million kronor the year before. Profits before bookkeeping adjustments and taxes totaled 194 million kronor. That is a yield before taxes of 13.1 percent on total capital and 42.4 percent on working capital, with a solidity of 41.9 percent.

"The idea of Combitech was to gather the Saab Scania group's high-technology firms under one hat, allowing them to continue to exist as relatively small companies while giving them the advantage of access to the combined technical expertise," said Per Risberg.

Combitech has 2,250 employees, 1,000 of them engineers. Last year it recruited 430 people, 225 of them engineers.

Military projects accounted for 58 percent of sales in 1985 and the reason why sales increased so much that year is that deliveries of the RBS-15 marine missile got going in earnest.

Combitech is constantly trying to increase the civilian aspect of its firms, including Saab Space and the other Goteborg-based company, Saab Marine Electronics. In 1973 the latter firm began to develop a radar level gauge for tankers and had a head start until now, but it has begun to have some competition from a Norwegian company.

In 1980 Saab's gauges were found on 30 percent of the world's tankers and it still retains that percentage. Now a new generation of gauges has been developed that can also be used on land. The market is estimated to be 10 times larger than the marine market which accounts for sales worth 65 million kronor.

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AEROSPACE

PLANS FOR LAUNCHING SMALL SATELLITES FROM ESRANGE IN SWEDEN

Stockholm NY TEKNIK in Swedish 9 Jan 86 pp 42-43

[Article by Lars Eriksson]

[Text] Kiruna--Beginning in 4 years, satellites may be launched from the Esrange Space Center in Kiruna.

Rymdbolaget wants Esrange to become a European base for small satellites that will be launched with a new rocket called the Marianne. There is no other space center in Europe.

But ESA, the European Space Agency, must first approve the idea.

At 0800 my photographer, Torbjorn, and I drove just over 40 km from Kiruna to the Esrange Space Center. It was -10°C and dark. There was a dull red light in the east. That was the sun which, for several weeks, had not managed to get above the horizon.

On the way out, we met several snowmobiles. They were driven by Lapps who were out after stray reindeer. We were in the land of the Lapps, which is now becoming the land of space exploration.

The Esrange Space Center in Kiruna has been operating for almost 20 years. Almost 300 probe rockets and 100 scientific balloons have been launched from there since 1966. Researchers have been attracted primarily by the aurora borealis.

For several years now workers at the Esrange base have received pictures from Landsat earth-resource satellites. In mid-January next year Esrange will receive data and pictures from the Swedish Viking research satellite and from the Swedish-French Spot satellite.

In 4 years it may be time for the next step--launching satellites.

"Yes, I hope so," said Kiruna native Jan Englund, who is head of Esrange's operative section for probe rockets and balloons.

"But," he pointed out, "we are talking about small satellites that weigh about 500 kg. The Viking, which now rides piggyback with the Spot, is of that size class."

The idea of launching small satellites came from a paper written by a technology student at Chalmers. He had been over to the United States, seen satellite-bearing rockets, and realized that there should be a market for launching small satellites from Sweden.

That student, who is now a civil engineer in technical physics, is named Ulf Palmenas. He has been employed at Esrange for several years now.

What is the point of launching small satellites from Esrange?

"First of all, it will be simpler than sending up small satellites with the space shuttle or with the large European Ariane Rocket. It will also be less expensive," Ulf Palmenas said.

"Small satellites are often used in polar orbit, from pole to pole. If satellites of this type are launched from Kouru (the ESA launching pad in French Guyana) they often do not enter the correct orbit immediately. They need a "push" in the right direction by an auxiliary engine. Here at Esrange, they go into a polar orbit immediately."

"Of 14 planned small satellites, 11 are suitable for launching with a Marianne rocket from Esrange, so there must be a market," Jan Englund said. He believes that Esrange could send up three satellites each year.

The satellites will fly over Norwegian air space. What do the Norwegians think about this?

"According to the Foreign Ministry, this should pose no problems. In addition, the Soviet Union has proposed at the United Nations that air space above 100 km should be considered international air space. The rockets we may eventually send up would cross the border at an altitude of 140 km."

"In addition, we have made a thorough study of safety questions and concluded that we meet all the requirements," Jan Englund said.

The satellites may be used for scientific research, navigation, communications, remote sensing, rescue services--and military purposes.

In the multiyear program for Swedish space activities, published by the parties involved, Saab Space indicates that small satellites should be used for military purposes, among others.

Saab Space states in the multiyear program:

"Sweden must now increase its preparedness with regard to the future military utilization of space. This includes areas such as communications, navigation,

radio intelligence, and remote sensing. By participating in a satellite project, Sweden will gain the experience necessary for planning, outlining, and conducting programs for the military use of space."

Jan Englund said:

"Saab Space is on its own there. If small satellites are launched at all, it will be within the framework of an ESA project and ESA does not permit military involvement."

Rymdbolaget will present its plans to ESA in the spring of 1986.

The rocket required for the launchings must be able to lift 500 kg to an altitude of 500 km. Rymdbolaged has considered the American Scout, among others. The Scout was found to have poor performance, however. The Japanese M-3-S-II has also been examined, but the current plan is to use parts of the European Ariane rocket. It is called the Marianne, which is a short form of Mini-Ariane. It is estimated that a launch with the Marianne would cost no more than 150 million kronor. It costs about three times as much to launch the larger Ariane version.

The first launch could occur around 1990. This probably would involve the ESA Cluster project, which consists of four satellites weighing 700 kg each.

How is this possible, if the Marianne is designed for a 500-kg payload?

Ulf Palmenas said:

"This is done with boosters. With four boosters we can lift 1,700 kg to the desired altitude, which is 300 km. In this way, we can do the job with two launchings. If an Ariane were launched from Kouru, we would still have the problem of getting the satellites into the correct orbit."

The first satellite could also be a Swedish satellite, the "flying mailbox" Mailstar. According to this concept, someone at an earth station could send a message up to a satellite, which would store it on board in a computer memory. When the satellite is then called by another earth station, it sends the message back down, if it is addressed to the station in question.

"Mailstar should also be of interest to developing countries, which have a poorly developed infrastructure," Jan Englund said.

Several hundred meters from the launching pad for probe rockets outside Kiruna, there is a site reserved for launching small satellites. A launching pad, assembly building, and control station are to be built here.

"We can have the facilities ready by 1990," said Jan Englund, who estimates that it will cost just over 200 million kronor.

So far, there are only preliminary plans. There are no finished designs, but only preliminary drawings. It is ESA that must make the final decision. According to Lage Elgstrand, chief of the aerospace section of the Industry Ministry, the government will allocate no money for small-satellite facilities at Esrange.

"We have nothing against an expansion at Esrange, but this is a question of a commercial market, so that these activities must be carried out on a commercial basis," he said.

If these plans are carried out, Esrange will hire 25 to 30 new employees.

Esrange is receiving more and more assignments. A control station for the Viking has been completed up on a mountain. A building for monitoring the Tele-X communications satellite has also been completed.

In addition, ESA recently decided to construct a permanent earth station for ESA satellites here at Esrange. The station will be used initially to monitor the ERS-1 earth-resource satellite, but there are also additional plans.

"The station could be used as one of the control stations for the Hermes project, the European manned space shuttle," Han Englund said.

We left Esrange at 1400. It was -25°C and dark. Light from the sun, which never came above the horizon, could be seen in the west. We met a Lapp who was on skis and holding a lasso. Aerospace technology and reindeer herding must coexist in this region.

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AEROSPACE

NORWAY ESTABLISHES CENTER FOR TELEMETERING DATA

Oslo AFTENPOSTEN in Norwegian 13 Feb 86 p 10

[Article by Martin Eide: "Will Process Satellite Observations: Satellite Researchers Get Center in Bergen"]

[Text] Fridtjof Nansen in entering the satellite age. A Nansen Center for Telemetering is in the process of being established in Bergen. Observations from satellites will be analyzed and processed by scientific personnel here. With this, the data will be able to become of use in weather forecasting, the oil industry, mariculture and, besides, in advanced research. Moving is already under way, into premises the center has had placed at its disposal by a Bergen firm.

First Research Assistant Ola M. Johannessen of the Geophysics Institute at Bergen University hatched the idea of a separate research center for this high-technology and interdisciplinary field.

Considerable Speculation

"In the next few years at least 10 so-called earth resources technology satellites will be put into orbit. Now there will have to be considerable speculation if we here on land are to get to exploit the enormous possibilities this entails," Ola M. Johannessen says to AFTENPOSTEN.

"Observations from this type of satellite will give us opportunities for thoroughgoing progress in our understanding of the marine environment. The measurements will be decisive in weather forecasting and monitoring of our economic zones in the future. The forecasts will become of use again in offshore operations, mariculture and navigation," the initiative taker for the new research center asserts.

As far as mariculture is concerned, the telemetering of fjords is a field the researchers at the Nansen Center will plunge into. This is research which will be welcome when, for example, the site of new breeding facilities is to be evaluated.

Connecting Link

The idea is that the Nansen Center for Telemetering, which will carry on both research and development work, will be a connecting link between the university and industry. Many of the 10 to 15 researchers who, to begin with, will get their work at the center will also have appointment positions at Bergen University. In addition, the weather forecasting in West Norway and at the Christian Michelsen Institute will also play a role in the interdisciplinary environment the center will function within.

New Types of Instruments

"In the longer term there also should be opportunities for the development of new types of instruments in cooperation with the Christian Michelsen Institute and the Physics Institute at Bergen University. Here there are good chances for Norwegian technology's being able to become part of the European space shuttle program," First Research Assistant Johannessen says.

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BIOTECHNOLOGY

BRIEFS

SWEDISH GENE MACHINE--The Swedish company Pharmacia is introducing the first European machine for assembling genes. Nucleotides can be assembled according to a preprogrammed sequence to form genes or portions of genes in a few hours and under automatic electronic control. This research machine can also help in diagnosis of genetic diseases. [Text] [Paris LE NOUVEL ECONOMISTE in French 7 Mar 86 p 17] /6091

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CIVIL AVIATION

AIRCRAFT, AEROSPACE TESTING AT EUROPE'S LARGEST WIND TUNNEL

Amsterdam DE VOLKSKRANT in Dutch 8 Feb 86 p 33

[Article by Hans Friedeman: "The Wind Tunnels of the NLR [National Aviation and Space Flight Laboratory] Pull Clients from Afar"]

[Text] Scattered across the city and the polder, the National Aviation and Space Flight Laboratory is working on new aircraft, computer systems, earth observation, environmental monitoring, and dozens of other high-tech fields. Hans Friedeman takes a look at a Large Technological Institute with a healthy pair of lungs, so to speak, in its wind tunnels.

The largest wind tunnel in Europe rises like a futuristic work of art from the icy desolation of the Northeast Polder. A monument to one of the things in which the tiny Netherlands, conquered from the sea, has grown great: aviation and space flight. "When it was still new you could see the blue sky and the clouds reflected in the aluminum sides," says Press Officer Anke van Esch of the National Aviation and Space Flight Laboratory. "A pity it's gotten dull."

Seventy-five kilometers to the southwest, hemmed in among the expressways, residential neighborhoods, and businesses of Amsterdam-West, is the old NLR complex with its offices, laboratories, workshops, and wind tunnels crowded upon each other like some technolgical Manhattan. "Expansion is impossible now. Anything new goes to the polder," says NLR General Director Ir. J.A. van der Bliek. "And the goal is that in the long term we will all move out there."

What began modestly in 1919 as the State Study Service for Aviation has expanded anno 1986 to become the second largest of the so-called GTI's (Large Technological Institutes) in the Netherlands. Van der Bliek can only confirm that things are going well at the NLR, with an annual turnover of more than 100 million guilders (30 million of which from the state), around 800 staff, a permanent agenda of hundreds of contracts, and last but not least a resounding name in the international aviation and space flight world.

Besides research and test work for Fokker's new aircraft, the NLR also does a wide variety of other things, ranging from detecting environmental pollution from the air and studies for the European Columbus space station to research into wind barriers in residential areas and determining the air resistance

coefficient of new car models. The contracts come from all over the world, from Indonesia to the United States.

"We are offered more work than we can accept," the NLR director says. "We try to take on everything we are suited for. Right now we have hired some 50 people on temporary contracts." But he makes it clear that he is cautious about a permanent expansion of NLR activities. This is not unconnected with the fact that about one fourth of NLR activity is carried out under contract to Fokker. The Fokker 50 and the Fokker 100 projects have kept the NLR'ers very busy in recent years, but when the test programs are completed, there may be a pause before the next large project gets underway.

A research proposal for such a next project has been presented to the Netherlands Institute for Aircraft Development and Space Flight (NIVR) in Delft by the NLR and Fokker. The NIVR is the body that judges and gives out contracts for aviation and space flight projects in the name of the Netherlands government. The Aircraft Technology Program which the NLR has in mind is intended to bring the new aviation technology of the 1990's to the Netherlands aircraft industry, with government aid.

"The new Fokker 50 and the Fokker 100 were developed from existing aircraft," Van der Bliek says. "In the 1990's we can expect totally new aircraft with new aerodynamic forms, new wings, new engines, new materials, and so on, and they will be much more efficient than the current generation."

Supercritical Wing

Can the NLR do world-class pioneering work for the aircraft of the 1990's? Van der Bliek compares the new program with the development of the so-called supercritical wing that the NLR began on its own hook in the 1960's. The goal was to discover a wing profile that would produce less air resistance at speeds just under the speed of sound than a conventional wing profile. That would provide considerable savings in fuel.

The supercritical wing which was developed with the help of the NLR's computers and wind tunnels looked at first glance like an upside-down wing. But it did what the designers expected it to. It was a quiet revolution in aviation, starting in the Netherlands. However, the drum roll for the invention of the supercritical wing came a bit later from the United States. NASA applied for a patent on it at the end of the 1960's. But the NLR has disputed that and is still doing so today.

Together the NLR and Fokker developed the supercritical wing further. First for the F-29 project, which continued with McDonnell-Douglas and finally had to be stopped because it was thought too risky, and later in the Fokker 100 project. The result is an aircraft that represents the state of the art in civil aviation with its supercritical wing, extremely economical engine, and video display cockpit.

What will the Aircraft Technology Program for the 1990's include? "There is still a lot of potential in the aerodynamics," Van der Bliek says. He

says it is feasible to "reduce resistance by another 10-20 percent" by keeping the so-called laminar boundary layer intact between the air stream and the surface of the wing for a longer distance toward the back edge of the wing before it becomes turbulent. This can be done for instance by blowing air out of or sucking it into small holes in the wing, something which some types of gliders already do.

The NLR director sees new aircraft engines in the second half of the 1990's, the so-called propfans. These differ from the present-day turbofan engine in that they use a larger portion of the air flowing through the engine to drive a multi-blade propeller that projects from the engine casing. The propfans are expected to use 10-15 percent less fuel than current turbofans. But they may also make more noise. The NLR is going to study both propfans and the noise problems in its laboratories.

Fiber-reinforced Materials

Another important part of the Aircraft Technology Program is made up of new materials. The NLR is increasingly interested in these, Van der Bliek says. The materials section was expanded a few years ago, primarily for research into the so-called composites. These are materials that are reinforced with very strong synthetic fibers, such as carbon fibers and aramide fibers.

These new materials are still used primarily in non-bearing aircraft parts. Van der Bliek: "The question is how far can you go with them? In military aviation there are already examples of aircraft wings constructed entirely of synthetic materials. For aircraft like that we will have to take a look at the maintenance aspect and at repair possibilities."

There are other aluminum materials on the way too. The combination of aluminum and lithium can give a weight reduction of 10 percent. A difference that does not sound like much but that produces a chain reaction in the design. Less wing surface, smaller engines, less fuel, more passengers. It still remains to be seen whether these materials will be reliable, Van der Bliek says. "The number of applications is still very limited. Boeing wants to work on that. What is certain is that there are still tremendous possibilities hidden in the new aircraft materials."

The final result of the Aircraft Technology Project is supposed to be a new Fokker for the market of the later 1990's. The studies for this advanced machine are to start at the end of this year. Approval has been given in principle for the research financing. The NLR's share will be financed by the government through the Netherlands Institute for Aircraft Development and Space Flight. "The government support has always been very positive," Van der Bliek says. "An independently creative aircraft industry is seen as being in the national interest."

The NLR receives an annual subsidy of about 30 million guilders from The Hague. "That is for work nobody else wants to pay for," according to the NLR director. "We are talking about more basic research. We try to make the success rate there as high as possible."

The government itself gives the NLR a large number of contracts. It does a great deal of work for the State Aviation Service in the area of air traffic safety and testing and certifying new aircraft. The NLR also makes flights to measure air pollution, and it measures sound barriers around airports. For the Royal Netherlands Air Force it developed an advanced automated flight preparation system that makes it possible within a short time to provide pilots with all necessary information, including maps.

Robot Arm for Hermes

The NLR owns two laboratory aircraft, a Swearingen Metro II and a Beech Queen Air; these can be outfitted with all kinds of test equipment, infrared and ultraviolet cameras, and sideways looking radar to study the earth's surface by remote sensing. One use of this technique is to detect oil in the North Sea. The NLR has developed an operational system for that purpose.

The Amsterdam laboratory has a flight simulator to test new steering systems and procedures. The simulator, like a real aircraft, can move about three axes, and pilots make their takeoffs and approaches over a deceptively real looking landscape. In reality that landscape of 23.7 x 9.4 kilometers is located at a scale of 1:2000 on a vertical panel almost 12 meters long and almost 5 meters high. A camera moves along it, reacting to the steering signals from the cockpit the way the plane being simulated would.

The Metro II is also used for so-called null-g flights, where the plane pulls up out of a dive in a parabolic course, which makes everything on board weightless for about 8 seconds. Null-g research is part of the NLR's space flight activities, which have grown quickly. On the latest Spacelab flight, the German D-1 mission, they took along an NLR experiment to study the behavior of a fluid in a fuel tank in weightlessness.

Through contracts from Fokker and the European Space Agency ESA, the NLR has gained much experience with systems to position and steer satellites, such as for instance the American-Netherlands-British IRAS satellite. Along with Fokker the NLR is also doing studies for the European space station Columbus and aerodynamic research for the French Ariane 5-Hermes space shuttle project.

"Fokker wants to make a robot arm for Hermes," Van der Bliek says. He views robotics as a worthwhile new field for Netherlands industry. That would also mean new tasks for the NLR. "In the more distant future," he says, "we'll have totally automated space stations with robots working in them. That could provide a very great deal of work for a highly-developed Netherlands industry. The Ministry of Economic Affairs sees considerable possibilities. I think we'll see some decisions being made next year."

Although it sees the much promising future possibilities in aviation and space flight, the NLR also works on more every-day but useful activities. Such as environmental monitoring with planes and satellites, and receiving and disseminating the information that natural resource satellites like the U.S. Landsats send to the earth day after day. Or studying the effects of winds on drilling platforms in the stormy North Sea, the wind barriers around large building complexes, or the spread of air pollution from high chimneys.

Many of these socially-oriented activities are carried out in the wind tunnel. The NLR has a total of 10 wind tunnels of all kinds and sizes. Topping the list in terms of wind speed is the supersonic wind tunnel in Amsterdam, which can blow a stream of air through the steel tunnel at Mach 6, or six times the speed of sound. The NLR's supersonic tunnel has an international reputation. Among other things, it has been used in the development of the French-British Concorde, the European Tornado fighter-bomber, the Swedish Saab Viggen, and ESA's Ariane booster rockets.

The champion in terms of size is the German-Netherlands wind tunnel in the Northeast Polder, which cost 125 million guilders to build. It surpasses any other wind tunnel in Europe in size. And in quality it stands high in the top ten in the world. The monster tunnel has measuring locations of varying dimensions. The largest has a cross section of 9.5 x 9.5 meters, so that a large truck will fit into it easily.

The German-Netherlands wind tunnel is intended for stream research at relatively low speeds of up to 550 kilometers an hour. The advantage of the enormous size is that relatively large models can be tested in it. The closer a model comes to the true size, the more accurate are the results of the wind tunnel research. In addition, in the large measuring area the surrounding walls have a much less distorting effect on the measurements.

Dunk Regularly

The German-Netherlands wind tunnel's special qualities have made Fokker and Airbus regular customers and even attracted the American NASA and aviation giant Boeing to the Northeast Polder. Not to mention just about all the large European car manufacturers.

New cars regularly stand there, carefully hidden under concealing cloths, waiting to have their air resistance coefficient, or Cw value, determined. The tunnel has now become the standard for this fashionable measurement ever since Audi disputed Renault's claim to have the lowest Cw value. Both models went out to the Northeast Polder. The tunnel blew, and made its decision. The Audi 100 beat the Renault 25 by a bumper length.

What is so special anyway about this softly blowing giant among the Holland cows? Do the Americans, for instance, have no large wind tunnels? "Of course," says Ir. A.H. Runge, deputy director of the German-Netherlands wind tunnel, "but wind tunnels have their secrets. If a new tunnel is not good right from the start, you'll never get it to be good. That's what happened to Boeing. An enormous new wind tunnel they've had problems with for years now."

How did that happen? "Nobody can tell," Runge says. "And don't forget," he adds confidentially, "a wind tunnel that works well has to be dunked regularly. Every year dunk it well for a few weeks. Then it stays good."

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CIVIL AVIATION

DETAILS ON FRENCH BANK LOANS FOR AIRBUS DEVELOPMENT

Munich SUEDDEUTSCHE ZEITUNG in German 26 Feb 86 p 37

[Text] Paris (own report)--A portion of the costs for the construction, already under way, of the small A320 Airbus, which is designed to carry 150 passengers, is to be financed for the state industrial concern Aerospatiale S.A. by a consortium of 12 French banks. The leading banking and financial group of the consortium, Paribas, will sign this already a relevant agreement for this with Aerospatiale, at whose facilities in Toulouse the final assembly of all Airbas aircraft is concentrated.

It is planned that the bank consortium will grant Aerospatiale a variable-rate loan for the construction of an initial 150 A320 Airbusses. This will be done, however, only within the limits of the repayment amounts which the building can make per aircraft sold.

The rate for this is to amount to 14 percent of the actual sales price. Paribas estimates the possible loan to Aerospatiale at an initial Fr billion (DM333 million). That appears relatively low when one considers that the required financing for the development and initial series production of the A320 Airbus, including all partners of the Airbus industry, is esimated at $3 billion. In France, a bank loan of this sort would, however, be a first step towards gradually getting away from state subsidies in the financing of Airbus aircraft, which are strongly criticized by the competing civil aviation industry of the United States.

The HWWA's [Hamburg World Economic Archive] Institute for Economic Research, Hamburg, severely criticizes the Airbus managers' plans for the future. The subsidies for the development of the A320 Airbus--the German portion amounts to DM1.5 billion of the resulting total costs--are reportedly not entirely paid out and now the Airbus industry is already preparing a new dip into the pocket of the European taxpayers. To wit, the latter would have to pay the lion's share of the development costs for two more aircraft types, the construction of which the board of directors has decided upon: the four-engine long-range version A320, and the two-engine intermediate-to-long-range aircraft A330.

To be sure, the payments would again be declared to be conditionally repayable subsidies. In view of experiences to date, however, it must be doubted

that the conditions, which establish the repayment obligation, will ever occur. For HWWA therefore, the question as to the "economic rationale" for such a shifting of entrepreneurial risks to the state, appears appropriate. A government which took office with the goal of "not introducing new subsidy cases, but dismantling existing failed regulation, distortions in the competitive system, and discrimination," and which accordingto its own statements views the retrenchment in, and constant supervision of, the granting of subsidies as a permanent task, ought to thoroughly investigate whether or not this is one of those many cases in which the choice of the activity to be subsidized is hardly to be justified economically.

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CIVIL AVIATION

FRG ON GOVERNMENT SUBSIDIES FOR CIVIL AIRCRAFT

Duesseldorf HANDELSBLATT in German 28 Feb 86 p 1

[Text] Bonn--In preparation for the negotiations which begin on 21 March in Geneva between the four European countries participating in Airbus and the United States over the subsidization of civil aviation industries, Parliamentary State Secretary for Economics Gruener has pointed to similar, considerable state support for U.S. aircraft manufacturers.

In addition, Boeing has supposedly reacted to the Airbus with unusual price concessions. Gruener quantified the subsidies to date of the FRG to the Airbusses as amounting to DM2.7 billion. A pledge for additional subsidies of DM425 million, and, some years ago, as compensation for the then very low dollar exchange rate, production assistance in the amount of DM686 million, was granted. However, no new production assistance is foreseen because of the dollar exchange rate, which in the meantime has begun to fall again, according to Gruener.

Each 10-Pfennig drop in the dollar debits Airbus' final account over the lifetime of the entire program by DM850 million. In this manner the break-even point could be postponed further. Definitive statements as to whether the Airbus program will attain its full profitability in 1995 or in the year 2000 are, moreover, not possible. This will also depend upon whether the world civil aviation market develops as is presently expected by the aircraft manufacturers and airlines companies.

Furthermore, for Airbus it will be important to gain full access to the U.S. market. To date, only less than 100 Airbusses have been delivered in the United States, while in Europe more than 1,000 aircraft of U.S. manufacturers are flying. For example, 93 percent of Lufthansa's fleet still consists of American airframes. Of course, Gruener emphasized again that the Federal Government would not meddle in Lufthansa's affairs in this matter.

The Federal Government welcomes the new A 330/340 program "on a basis which promises economic success." The Airbus industry has made no proposals as yet, however, but at present is analyzing the program's profitability. The German share of the new program's DM2.6 billion overall development costs

is estimated at approximately one-third. In addition, the Federal Government intends to increasingly make the Airbus program industry's responsibility.

In the case of A 330/340 "appropriate industrial responsibility" will be required as well. In any case, this project is more important than new space programs, Gruener stressed in regard to relevant French criticism of German willingness to cooperate in such programs.

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CIVIL AVIATION

DETAILS ON SAAB-SCANIA 1985 EARNINGS

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 6 Mar 86 p 16

[Text] Saab-Scania Inc., Linkoeping--The Swedish automobile, aviation, and space company was able to close 1985, for the ninth consecutive time, with higher sales and profits. The group's sales rose by 23 percent to 31.8 billion krona (DM9.9 billion); moreover, in foreign markets (a 64-percent share as opposed to the previous year's 62-percent share) by 27 percent to 20.4 billion krona (DM6.3 billion). The yield improved by 9 percent to 2.8 billion krona (DM870 million) before reserve deductions and taxes; profit per share after taxes amounted to 60.60 krona as opposed to 56.35 krona (DM18.80 as opposed to DM17.45). All branches of the business wound up with a positive balance.

For Scania (trucks, engines), in volume of business the most important area, sales rose by 16 percent with a 90-percent export share. Some 25,820 (23,980) trucks and busses were delivered, market share in Western Europe was improved, and the sale of trucks in the United States was begun. North America remained the most important market for Saab passenger cars, of which altogether 109,015 as opposed to 102,562 were sold, 76 percent of them abroad.

In the field of aircraft, sales could even be increased by 70 percent, above all by increased deliveries of commercial aircraft (Saab SF340) and components for McDonnell Douglas and British Aerospace. The American joint venture partner Fairchild withdrew last autumn from the SF340 project; in the future, all sales of this aircraft type will be accounted for by Saab-Scania. In 1985 26 SF340's were delivered.

In 1985 1.9 billion krona (DM580 million) were invested in capital facilities by the group, 89 percent of it in Sweden. The number of employees rose at an average annual rate of over 2,100 to 45,181. At the general meeting of the parent company (21 April) a dividend of 14 krona as opposed to 10 krona (DM4.35 as opposed to DM3.10) for each share of common stock, and, unchanged, 2.50 krona (DM0.78) for each share of preferred stock, will be proposed.

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COMPUTERS

GMD, OTHER FRG INSTITUTES DEVELOP 'SUPRENUM' SUPERCOMPUTER

Munich SUEDDEUTSCHE ZEITUNG in German 3 Mar 86 p 36

[Article by Egon Schmidt: "Ways to a Supercomputer." "Interdisciplinary Work on Project SUPRENUM"]

[Excerpts] In the fields of fluid mechanics, meteorology, plasma physics, nuclear physics, geology and microelectronics, science today is aware of a wealth of specific problems, with which it would like to deal by computation, but for which the capacity of today's large computers is not sufficient by far. It is hoped that the project SUPRENUM will yield the realization of a German supercomputer designed to accomplish the previously impossible.

SUPRENUM is the acronym for a joint project to develop a "supercomputer for numerical applications," which brings together various research institutes, universities and companies and which is headed by Ulrich Trottenberg from the Institute for Methodic Principles of the Society for Mathematics and Data Processing, St. Augustin (GMD). The objective is to create a computer structure where a multitude of microcomputers together with respective won storage modules are joined to form a highly efficient general unit capable of processing numerical algorithms (extensive numerical computations) "superfast."

Analogous to weather forecasting, there are many tasks which are characterized by local relationships to grid structures like the observation network in meteorology. But while science was still contemplating parallel computer architectures to handle such grid processes, the GMD developed new numerical methods elsewhere which are considerably more efficient than the previously known methods, and therefore more rapidly achieve their goal. Insiders know it as "multigrid principle" for short.

After this multigrid principle had been developed, which in Trottenberg's opinion is "very generally applicable," the architects of new supercomputers were convinced: it only makes sense to conceive a new computer if the latter would permit exploiting all of the progresses promised to be derived from the multigrid principle. Otherwise, from the very beginning a large part of the gain in performance, which the development of the new parallel-computer architecture was to furnish, would just be given away.

Project SUPRENUM, started in 1985 after more than a year of preliminary work, in an initial partial phase plans the building of a high-capacity computer having all those architectural features demanded by the intended specific tasks and multigrid algorithms. In view of the given correlation between multigrid principle and concrete computer architecture, the decision was made in favor of a concept submitted by Wolfgang K. Giloi, director of the Research Center for Innovative Computer Systems and Technologies of GMD.

Nodes and Clusters

It is planned to assemble so-called "nodes", each of which is comprised of a 32-bit microcomputer (a bit is an elementary information unit) of the type "68020" known to the experts, one for arithmetic calculations as well as of a "private" storage module (one megabyte and larger, with byte meaning a group of 8 bits), and then to combine up to 16 of these nodes, via a common data collection line--termed bus--into a so-called "cluster." Several of these clusters in turn are coupled via other buses to form a two-dimensional, i.e. grid-shaped structure, and this then provided additionally with special computers to facilitate programming work and maintenance as well as to handle the individual "processes" of the computer operating system--thus forming a system which controls the correct interplay of all parts of a computer.

The individual processors of project SUPRENUM will communicate with each other in such a manner that so-called "messages" are exchanged among them. Whether everything will work as planned is to be demonstrated in 1988 at the latest by a first prototype to consist of 256 nodes, or of 16 clusters having 16 nodes each, respectively.

In the coming years, this prototype will be used to systematically examine how the present concept proves itself and how SUPRENUM can be programmed and operated efficiently. If the hopes of participating scientists and engineers are fulfilled, even more complex configurations of far higher capacity are to be developed in a second phase of SUPRENUM; for with computers of the outlined parallel architecture, Trottenberg and his colleagues are counting on the opportunity to some day play a role which will be taken seriously internationally. Which cannot be said for the German computer industry in the area of today's supercomputers--where not different instructions, but always only the same one is being processed at high speed. These computers are presently being imported from the USA or Japan.

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COMPUTERS

PHILIPS' TIES TO JAPANESE TECHNOLOGY

Rotterdam NRC HANDELSBLAD in Dutch 15 Jan 86 p 9

[Article by Dick Wittenberg: "Philips Wants [to Develop] New Chips With Matsushita"]

[Text] Osaka--It is conceivable that the European companies Philips and Siemens will be cooperating in the future with the Japanese concern Matsushita for research into new generations of chips.

So say A. Harada, the Matsushita vice president, and H. Hoksbergen, the Philips director in Tokyo. Such a joining of forces is apparently dictated by the ever-increasing costs required for the development of chips.

All present, Matsushita and the Philips-Siemens connection are working independently on the development of a megabit chip to be put into production by the end of the eighties. Philips and Siemens together are investing 1 billion guilders in that project. The Dutch and German governments together are contributing 500 million guilders to support the European companies in their struggle to survive the Japanese [competition].

Philips is now also involved in the Matsushita megabit project, because the developmental activity is incorporated into the Matsushita Electronics Corporation (MEC), a joint venture with the Japanese in which Philips has a 35 percent interest. The agreement between Philips and MEC implies that within the limits of their common activities, they can freely use each other's expertise.

H. Hoksbergen, the Philips director in Tokyo, says that this arrangement is not necessarily valid for the expertise originating from both megabit projects. However, it is theoretically possible that Matsushita will ask for such an extension when the renewal of the Philips-Matsushita agreement is negotiated at the end of this year.

Hoksbergen says that in that case Philips considers itself bound by its agreements with the Dutch and German authorities about the protection of acquired knowledge that were made when funds for the project were provided. These agreements could only be altered if both governments approved.

"If Philips and Siemens are the first to produce the megabit chip, MEC might ask for help from the European connection," says A. Harada, the Matsushita vice president. The opposite is equally conceivable in his opinion.

Harada expresses concern about Japan's large trade surpluses with the United States and Europe. He says that Matsushita's aim is to sell half of its production on the home market, to export a quarter and to assemble a quarter abroad. At the moment export amounts to 35 percent, and only 15 percent is produced abroad. This means that Matsushita will increase its investments abroad. According to Harada, Matsushita has not the slightest inclination to restrict its exports. "Just like the Netherlands, Japan cannot live without exports," says the vice president.

Hoksbergen, the Philips director in Japan, thinks that the leaders of the three largest blocks should put their heads together as fast as possible to find a solution for increasing trade frictions, thus providing room for all three parties. "The alternative is trade war and protectionism," says Hoksbergen.

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DEFENSE INDUSTRIES

FRENCH SFIM PROVIDES DIVERSIFIED TECHNOLOGIES

Paris L'USINE NOUVELLE in French 6 Mar 86 p 43

[Article by Jean-Pierre Casamayou: "SFIM Goes Over the Top"]

[Text] Financial reorganization and a constant research effort have enabled the group to diversify outside the aerospace sector, in land and naval weapons, while increasing its sales abroad.

"We have never lost money. This year, we shall earn some more!" Jacques Larpent, the SFIM chief executive officer, remains reasonably confident despite difficult conditions in the aeronautical sector. With a backlog of orders of Fr 1.27 billion--21 percent more than last year--he is doing all right.

In a despondent sector in which equipment manufacturers see their activities decline or at best stagnate, Jacques Larpent is increasing his sales by close to 8 percent. He even finds himself with an overload of work. A sound condition which did not remain unnoticed on the stock exchange where the price of the group's stock doubled within 15 months.

According to the SFIM chief executive officer, these good results are due to financial reorganization and to a research effort that led to diversification. The group's financial expenditures decreased by 30 percent in 2 years and amounted to only 3.5 percent of sales in 1985.

The improvement continued with the repayment of short-term debts. It was made possible through the issuance of a Fr-150-million loan in the form of subscription bonds that were soon placed, which shows that SFIM is popular among investors. The company's cash flow is now sound again. The other factor of success is the constant research effort--close to 10 percent of sales last year--although it should drop to around 8.75 percent this year. This effort has enabled the group to diversify, in particular outside the aerospace sector, and therefore to increase its direct sales abroad without being affected by the ups and downs of orders for aircraft or helicopters equipped with SFIM products.

Although it is a specialist of navigation and guidance systems for the aeronautics industry, and a leader in the field of automatic pilots for

helicopters, it is in naval and land weapons that SFIM finds the reward of its diversification efforts. Since 1978, it has developed a whole line of gyrostabilized platforms for tactical missiles and gunsights for tanks and combat helicopters. That was just as well, as the helicopter market experienced a 60-percent decline! The market for military helicopters and land weapons is the only one that is still progressing. And now that its diversification process is nearing completion, SFIM is reaping its rewards.

It supplies missile guidance systems to the Italian Oto Melara, gunsights for Hughes and Bell helicopters and for the Italian Agusta and the German BO-105. In land weapons, it is very successful with its gyrostabilized gunsights for armored vehicles and, of course, it will equip the future French Leclerc tank with a gunsight that will permit firing during driving. Thus, the gunsight division is expecting to achieve sales of Fr 270 million this year, compared with Fr 90 million in 1983.

With its new products, SFIM has launched into direct sales, especially on foreign markets where there is a very strong demand to retrofit and modernize helicopters and armored vehicles. The results are encouraging. The latest order involves 200 tank gunsights in the Far East, and a strong chance of equipping close to 1,000 other armored vehicles. Of the Fr 565 million in export sales (68.1 percent of sales), half is due to direct sales, although the percentage of direct sales abroad was only 10 percent in 1975. "Of course," Jacques Larpent acknowledged, "it does cost us something. Two trips to Seoul every week will cost a lot, but it is worthwhile." These trips are often made in good company, since 56 airlines are using SFIM flight recorders, the famous "black boxes."

10 Highly Profitable Subsidiaries

The parent company's effort to diversify is also supported by its 10 subsidiaries. ("None of them is losing money," Jacques Larpent acknowledged. "They have enabled us to diversify and concentrate.") For the activities of the subsidiaries are complementary. For instance, Sere-Bezu is the engineering division of SFIM, whereas Impar, a precision mechanics specialist, is making gunsight bodies or delicate gyro mechanisms. Similarly, SMA (subcontracting tank turrets for Creusot-Loire) is making antenna stands for Starec. The latter, specialized in telecommunication antennas, will also soon be listed on the second exchange.

Another jewel of the group, the Reosc company (advanced optics) just completed two good deals: it supplied an astronomy center to Korea and a special mirror for the most powerful laser in the world, for the U.S. Navy. And if one wonders why a group geared to advanced technologies would include a company like Sinbro (specialized in industrial broaching), Jacques Larpent willingly answers: "It is a small business in a highly specialized niche, which offers excellent profitability."

The SFIM Group (Company for the Fabrication of Measuring Instruments)

In 39 years, SFIM has turned into a group of 2,500 people with 10 subsidiaries. With 1985 sales of Fr 1.22 billion, it is one of the few French

equipment manufacturers with an 8-percent sales increase and, above all, an overload of work.

Company	Activities	Personnel	1985 Sales (Million Francs)
SFIM	Parent company	1,570	830
Cerme	Electronics	150	70
Impar	Precision mechanics	42	16
Kinoptik	Optics	70	32
Oritel	Measurement and testing	35	20
Reosc	Advanced optics	40	19
Sere-Bezu	Engineering company	135	63
Setaram	Instruments	110	65
Sinbro	Industrial broaching	25	9.5
SMA	Mechanics	100	46
Starec	Antennas	181	58

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FACTORY AUTOMATION

FRG DEVELOPS LASER FOR NON-DESTRUCTIVE TESTING

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 Feb 86 p 5

[Unattributed article: "Laser-Tronic Measures Tools Without Contact: Determination of Shape and Position Even on Rotating Tools"]

[Text] The Sitzmann and Heinlein Company in Zirndorf, active in the sector of specialty tools and an operation of Krupp Widia GmbH, has designed a testing machine for non-destructive testing of tools. Even complicated profiles, such as blade-base mounts on turbines, molding cutters and stepped tools, could be tested and monitored with the "Laser-Tronic." It would also be possible to determine shape and position on rotating and fixed tools as well as to monitor the notching on cutting edges for precision and high-precision machining. The system also serves to monitor accuracy of form for thread gauges and gauges for Christmas tree profiles.

Non-destructive testing is particularly important for tools with PCD-cutter bodies (polycrystalline diamond) to prevent damage to the highly sensitive knife edges. Via a microscope display with switchable magnification, an illuminating laser images the inserts on a high-resolution CCD-surface sensor (Charge Coupled Device). An image processing system evaluates the image information and passes corresponding differential values as check signals to the operator of the unit. Positioning accuracy is indicated with plus/minus 3 seconds of arc. Prior to measuring, but after placement of the milling head and manual adjustment of the first PCD-cutter, the cutter is being brought into the focal plane of the system by means of an autofocus process. Subsequently, the other inserts are introduced automatically by using the known division of the milling head. Positioning of the cutters is performed in two operations. In the first stage, working with sevenfold magnification, the cutters are roughly adjusted--meaning up to 5 micrometer accuracy--to the reference cutter. The system knows the relative position of the cutting edge in a radial and axial direction as well as the angularity, and displays these constantly. After rough adjustment, a switch to 50-fold magnification is executed. The diffraction effects already occurring with the image would be corrected. The relative position of the inserts is continuously determined from the stored image informations and displayed for adjustment monitoring. Setting accuracy for planning and rotary milling were smaller than or equal to plus/minus 0.001.

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CSO: 3698/348

FACTORY AUTOMATION

FRENCH SOFTWARE SPEEDS UP AUTOMATED EQUIPMENT PROGRAMMING

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 21 Feb 86 p 7

[Unattributed article: "Speed Up Programming with 'Omega': French Software Concept for Automatic Equipment Programming"]

[Text] Faster inputs, less time and energy expended as well as immediate modification capability in programming are made possible with a software concept that has been developed in France for programmable automatic equipment. Omega, this is the name given to the concept, was developed by the French company 3ip (11 rue de Clichy, F-75009 Paris). It would enable the user to create and run executive routines for automatic machines, fast, efficiently and with constant overview on the screen. Corner posts of the Omega system are the description and specification instruments "Grafcet" and "Gemma" with which control diagrams can be prepared and guidelines provided for the observation of start and stop operations, reports the French Information Center for Industry and Technology in Frankfurt.

Drafts and modifications of Grafcet-charts would be possible instantaneously at any time on the screen and could at the same time be monitored optically by the user. Modifications are executed according to a standardized automatic process. Because of the modularity, Omega could be expanded gradually. The center adds, that the manufacturer had designed Omega so that it would be open for any future developments.

The primary advantage of Omega is in the accelerated programmability of automatic equipment. Where previously the programming diagram had to be manually prepared or drawn, respectively, on an auxiliary medium (paper, foil or blueprint) so as to make programming of automated equipment possible, this procedure is being accelerated considerably in the Omega-system. Whereas formerly, in case of modifications to the programming diagram, the medium had to be revised in a time-consuming manner by erasure or redrawing, an analogous modification could now be performed ore efficiently on the monitor. The result is time gained and improved flexibility of application.

"Grafcet," "Omega-Liens," "Omega-Simulation," and "Omega-Gemma" are the four modules presently available as an option, all of which can be processed with the Omega-menu. Omega has been written in Pascal with the inclusion of

the operating system MS-DOS. It can be run on IBM Personal Computers and IBM-compatible systems. At the same time Omega is designed for expansion; compatibility of future equipment takes a leading position. The Zip Company is presently negotiating with the American Firm General Electric regarding their cooperation. Efforts are also being made toward the cooperation with manufacturers of automated equipment, so that Omega could be applied directly, without console, to the automatic programmer.

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FACTORY AUTOMATION

SEIAF: ELSAG/IBM'S NEW CREATION IN FACTORY AUTOMATION

Milan AUTOMAZIONE INTEGRATA in Italian Apr 85 pp 110-112

[Interview with Mauro Flego, director of SEIAF (Electronic and Computer Systems for Factory Automation); date and place not given]

[Question] Engineer Flego, what are the true objectives of SEIAF?

[Answer] SEIAF, or better--the joint venture ELSAG/IBM--concerns itself with electronic and computer systems for factory automation.

[Question] But who furnishes the automated factory?

[Answer] If a company decides to buy an automated factory (or subdivision) characterized by the maximum level of automation and flexibility, or turn-key operation--that is, complete with all the necessary operational machines and services--it will turn to companies experienced in systems and capable of designing such facilities, and in particular to ELSAG. ELSAG will propose designs which will maximize the use of system components, know-how, etc... found within ELSAG and in the companies of the group, and therefore within SEIAF for the fields of its competence. When we say "group" we mean the collection of companies of the Group Selenia-ELSAG (RSE) concerned with maximum factory automation.

It's clear that if the system components or the necessary skills for some portion of the entire system are not found within the companies of the group, ELSAG will turn to a third party, but will retain the responsibility for the entire system.

[Question] Thus clients of SEIAF are merely member companies of the group?

[Answer] SEIAF has well-defined objectives concerning its activities and sales; therefore it has to approach the market through various means: through its own member companies, through other integrated systems companies which will be actively considered, and finally through direct action upon interested end-users.

[Question] For example?

[Answer] SEIAF potential clients could be companies specialized in the installation of factories, large makers of machine tools, and end-users of high technology. It's clear that the marketing strategies have to be consistent with the capabilities of the products we ourselves have at hand and those of our competitors. Presently, demand for automation exceeds offer. To requests which often express very specific objectives there are responses unable to aggregate the right equipment and formulate acceptable proposals. There is a need to enter this market in a decisive way with interesting products, solutions, and designs which are easily acceptable by the interested parties.

[Question] Are your interests now only toward the Italian market or, as partner with IBM, are you already thinking of expanding outside of Italy?

[Answer] The factory automation market cannot be only national, the local market is justified only for those that produce software for specific problems and applications; it is not appropriate for a company that designs modules and systems which require a certain amount of integration and assembly.

Since SEIAF proposes to develop modules which are also based on the experience and products of our member companies, we will invest adequately on products which are in need of wide circulation. Therefore, surely Italy alone is not enough, and so we have planned subsidiaries in the principal industrialized countries.

[Question] Since there's a tie with IBM, should we assume that IBM has made similar accords wth other companies?

[Answer] IBM is following a policy of penetration in the world market also with joint ventures of the type we have. But ours, to this day, is the only one in the field of factory automation.

[Question] What experience do you have in factory automation applications?

The applications experience we have is that of the member companies. I should point out ELSAG activities in numerical controls; in automatic programming systems; in direct numerical controls (DNC), of which various functioning applications are in existence; in FMS control systems, also very complex.

Additional experience is available to us from companies under ELSAG control or that are members of the Selenia-ELSAG group of companies (RSE): measurement systems and robot systems from DEA, CAD/CAM systems from Selenia Autotrol, work cells from SAIMP. IBM, in addition to its experience in computer systems for business applications and production planning and control, and in CAD/CAM systems, can also claim in-house experience, especially for its own installations; for example, the FMS system of Vimercate. Therefore, there is an experience basis which allows us to make the right firststep.

[Question] After the official launching of SEIAP we were bewildered: as member of ELSAG or SEIAF or as a joint venture ELSAG/IBM you should sell the appropriate modules to come up with the automated factory, which is synonymous to flexibility. Don't you think that your size could reduce some of the flexibility necessary to achieve such goal?

[Answer] The ELSAG/Factory Automation group of companies is composed of many entities of adequate size, on the one hand, for the necessary investments in research, production and marketing, and on the other, for the characteristics of a very specialized market.

In ELSAG, which employs a total of 1800, the Division Factory Automation Systems has 200 workers, mainly technical personnel. DEA has about 900 employees, SAIMP 370, Selenia Autotrol about 100. The newborn SEIAF will have 80 employees by November of this year.

Therefore, these are certainly not big entities. Since management of individual activities is decentralized, although consistent with strategies defined at the central level, speed of responses are compatible with the needs of the market.

[Question] What criteria do you use to consider a company too small to be interested in factory automation?

[Answer] There are companies, even small in size with 50-100 workers, very specialized on a certain product, which can take advantage in a very profitable way of the opportunities of factory automation. But even below this size, the solution we can furnish is certainly a flexible one; we will try to emphasize evermore the solutions in which flexibility is obtained by different combinations of constant modules. The most trivial example is the one with lego: with lego and an able assembler one can do many things.

The greatest difficulty is in conceiving and combining the modules in the correct manner; I should point out the technique used by ELSAG to define the architecture of the ELSA line, a very worthwhile product for this type of assemblage, and the modularity that certainly IBM has strived to apply to its products.

[Question] How is the dialogue conducted between you and your potential clients? How do you approach each other?

[Answer] Usually the user perceives two things:--a shortcoming in his manufacturing process, for example in the assembly line, or during the working of the pieces, or in storage;--the necessity to take action in a logical perspective.

[Question] Be more specific, what does logical perspective mean?

[Answer] It means that what he does today should not be incompatible with what he will do tomorrow, and therefore today's investments will not be worthless when compared to those for the programs for the day-after-tomorrow.

[Question] This is the way the consumer behaves; and you?

[Answer] Our approach consists in trying to fully understand the problem, the level of priority of this problem relative to other ones, that is, if it is truly the most important one or not. Usually with the client we arrive at a definition of the maximum potential for his system. This gives a global picture of the long-term operations. We then study in detail the subsystem which has priority. Specificiations are defined and the economic justification for the investment is verified. We then get to formalize the order.

It's important for us to insert this operation in a more ample future context, to avoid future frustrations; in fact, a narrow solution of a certain problem, without means for evolution, is such that, if something is added, it explodes. The factory is like a live organism that is continuously evolving and does not stagnate.

This approach is usually much appreciated by the client, because the company has to justify to itself and to its stockholders actions which represent and assure an evolution in order to cope with more complex and more competitive situations.

[Question] Do you tend to automate more or less than what is actually needed?

[Answer] Automation should be at the right level, with potentials for the future.

[Question] In the year 2000 will there be nothing new, meaning what we have today, or will there be unmanned factories?

[Answer] There will surely be few unmanned factories, but also the situation will surely be different from today. Less parts will be produced with machine tools, because of the decreased need of these finished pieces in machinery, and because of the general decrease of machine components. Therefore, the factory will change appearance. The same flexible automation will contribute to a decrease in the number of machines for production.

Today, according to authoritative investigations, machine tools work at 6 percent of their maximum potential, an increase to 30 percent, is not an unreachable goal. One can see that there will be a five-fold reduction in machine tools. Thus, in the year 2000 there will be less machine shops because the remaining ones will be more efficient.

[Box, p 110]

Description of the SEIAF Consortium

ELSAG is a company within the Selenia-Elsag group (RSE) which is under STET, the financial arm of IRI for electronics and telecommunications.

Within the realm of RSE, Elsag has been assigned various tasks among which is the coordination of activities for the development of factory automation. This task is accomplished through the Factory Automation Systems Division which coordinates activities in this field for DEA, SAIMP, Italcad, and the SEIAF Consortium.

SEIAF Consortium

Location: 16154 Genova-Sestri P. - Via G. Puccini, 2

Management Office: 16152 Genova-Cornigliano - Via dell'Acciaio 139

Phone-(010) 600821

Founded: November 28, 1984

Member companies: Elettronica San Giorgio Elsag S.p.A. and IBM Italia S.p.A.

President: Doctor of Engineering Franco Bernardi

Director: Doctor of Engineering Mauro Flego

Activities: Development of electronic and data-processing systems and related services which formulate generalized solutions for the integration of various areas of factory automation.

[Box, p 111]

Who is Mauro Flego?

Mauro Flego is a mechanical engineer who, in his professional career, has been heavily involved in electronics and data-processing.

He has worked in this field for a long time. His career has developed in an exemplary way because from machine tools he moved on, first to production processes, then to electronics, and finally to data-processing; he moved on according to the requisites of the times, and by his own choice. He is, therefore, a person that knows the problems of mechanical production and the means for solving them. He has dedicated himself to many of the activities found in a company: from research to planning, to production, marketing, and management.

He has recently arrived at the directorship of SEIAF; has participated enthusiastically to the ELSAG-IBM initiative, because this will contribute substantially and with first-class strength to new solutions for problems that are emerging.

He is 48 years old, married, with two children. He likes swimming, skiing, and motorcycling.

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MICROELECTRONICS

NEW FIRM PRODUCES, MARKETS GATE ARRAYS IN SWEDEN

Stockholm DAGENS NYHETER in Swedish 4 Mar 86 p 18

[Article by Osmo Vatanen]

[Text] Gate arrays--tailor-made electronic circuits--will open the way to a profitable application of data processing technology for Sweden's small and medium-sized firms. Saab-Scania, the FFV [National Industries Corporation] firms, and the National Telecommunications Administration, which have established a new company to produce and market the arrays, are firmly convinced of this.

The new company is called Swedish Gate Arrays, Incorporated. The partners will invest 13 million kronor, and the National Microelectronics Program (NMP) will invest an equal amount, over a 3-year period. The company will then be launched on the market as a fully commercial operation. The firm will be located in Linkoping and will cooperate with the Linkoping Technical Institute and the Technology Center, where design and production will take place.

Expensive Chips

Special-order chips for transistors are currently tailor-made in a long series of steps. It is both expensive and time consuming to come up with a chip that will perform the special function thought up by a customer, whether he wants it as part of a telephone exchange or to control some process.

The new technology involves buying a semimanufactured product in the form of preprocessed silicon wafers with their components (transistors) already installed. This makes it possible to skip a large number of steps in comparison with what would be required to tailor-make the wafer for a customer from the start. It also makes the wafer cheaper, since it can be produced in large runs.

Saves Weight

What remains then is to add the configuration--connect the transistors--in the form desired by the customer. This is done in the two final production phases.

"This means that a firm can save from 25,000 to 50,000 kronor on each application (order)," says Prof Krister Svensson of the Linkoping Technical Institute.

"The customer also gets the chips in about 2 weeks, compared to perhaps as much as 1 year."

Other advantages are the savings in both weight and volume. For one thing, no printed circuit cards are needed, since the etching is done on the chip itself from the outset.

"The gate arrays will reduce the 'silicon level' primarily for small and medium-sized firms," in the opinion of Tore Gullstrand, chairman of the board of the new firm and managing director of Saab-Scania.

Simple Technology

"An increasing number of mechanical products are becoming electronic, and the designers are having to do some rethinking."

The National Microelectronics Program also contributes to the dissemination of information concerning data processing, especially through courses of instruction. The program is investing about 300 million kronor over a 5-year period in the industrial application of electronics alone.

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CSO: 3698/351

MICROELECTRONICS

COMECON ELECTRONICS INDUSTRIES DETAILED

Milan INFORMATICA OGGI in Italian No 14, Feb 86 p 8

[Text] The division of labor within the electronic sector inside the Comecon is certainly one of the most obscure points in the technological events of East Europe. The distribution of the products usually follows a rigid pattern: The Soviet Union produces all types of equipment (domestic electronic devices, computers, telecommunications and office automation) and components, while every other Comecon country specializes in one or more fields according to multi-year plans.

However, a few countries have informally violated these guidelines, unable to limit their national production to training sectors. The need for technological automation is felt primarily by those countries, such as the FDR and Czechoslovakia, which can count on human resources trained in new technologies and on a solid industrial tradition. These last two countries specialize in the production of flexible automation systems which they distribute to other Comecon countries.

The Czechoslovak orientation, aligned with the Soviet model, is based mainly on large machines and systems while the FDR, together with Hungary, produces smaller systems. Not to be forgotten is the fact that the FDR is leading the field of robot applications (35,000 were installed in 1984 alone). It is also productive in the computer area, thanks to its contacts with the FRG, although its standard production is below general requirements. Fifty percent of this production goes to the USSR.

Hungary, through the Novotrade company, has sold software licenses for electronic games for a total amount of $1.5 million. The Polish industry seems to have regressed since 1980, when it was well positioned among producers of computers and public consumption goods. The economic crisis of recent years forced many researches to emigrate and its domestic demand is now partially unsatisfied.

Bulgaria, which along with Romania is of minor importance among industrial countries, produces magnetic discs for the entire Comecon and cooperates with some Soviet industries in the development of new computers. Romania has only a secondary role, producing only integrated circuits and telecommunications equipment.

MINIMAL CIVIL TECHNOLOGY SPINOFF FROM SDI FOR FRG

Hamburg DIE ZEIT in German 10 Jan 86 pp 16, 17

[Article by Wolfgang Hoffmann: "War Is Not the Father. On SDI: Military Research Brings Only Minimal Civilian Uses"]

[Text] Nearly 10 years ago, the secretary-general of the United Nations emphasized in a report the view to be taken of civilian uses of military research: "It is actually remarkable how many inventions of great civilian significance have absolutely nothing or very little to do with military research and development."

Once again, however, German Chancellor Helmut Kohl knows better. In the Bonn daily DIE WELT, the chancellor sounded the bell for the latest round of German debate on participation in the American Star Wars with the headline: "SDI Gives a Big Push to New Technologies."

Helmut Kohl will once again be faced with a lack of evidence. His own minister for research and technology, Heinz Riesenhuber, shattered many high-flying illusions when he soberly decided that the U.S. Strategic Defense Initiative (SDI) cannot be justified in terms of research policy.

Opinions and controversies such as this are in the meantime piling up, and they have served to liven up the fundamental debate on whether military research and development have spinoff effects, or derived uses for civilian technology. The "Council on Economic Priorities" in New York, a first-class address in the United States, only a few weeks ago in a very thorough, 215-page study raised suspicions that the spinoffs of the Star Wars plan will turn out to be extremely scant. The extent of commercial applications of the technological developments necessary for SDI could be small, since only a relatively small number of new technologies have to be developed for SDI. With SDI, it is much more a matter of refining existing technologies in order to get more out of them, the report said.

Nor did the hearing of SDI experts in the German Bundestag provide much illumination on the question of how important the military program might be for the civilian sector of the West German economy and industry. The 15 experts invited to Bonn were unable to find a common denominator. One part of the experts, who were divided into two camps, did indeed talk a great deal

about "a last-call mood" and "pushes to technology" and did not neglect fears that the Germans would not recover technologically if they broke off from the American strategic plans. In general, however, these gloomy predictions had no substance. The remarks of most of the experts amounted to the unverified assertion that "the participation of German firms is an indication of competitiveness."

Only one expert was able to provide more concrete evidence to the representatives of the German Bundestag that SDI could also have civilian uses. Guenter Hoff, a scientist from Erlangen and executive chairman of the Scientific and Medical Institute of the University of Tuebingen, nevertheless based his theory only on the past. Hoff's retrospective on the history of war: "The outstanding technological breakthroughs during the First World War were ammonia syntheses, which enabled Germany to conduct a long-term war without a supply of Chile saltpeter. This was the essential step on the road to great chemistry." Ammonia--and saltpeter before it--were necessary for the production of explosives.

Hoff attributes similar successes and consecutive effects to the development of military airplane motors and of hydrocarbon synthesis, which is necessary for rocket propulsion. Hoff was also able to produce examples from his own military research at Dornier: The basis for the kidney stone splitter that has in the meantime been adopted in medicine was provided by his own military research efforts, he said.

However, such military achievements for civilian purposes are contrasted with other examples. For example, Professor Juergen Schneider of Goettingen believes firmly that today there is an intensification in the trend of "developments from the civilian realm being used by the military rather than the other way around." As an example, he mentioned the use of microchips from the Japanese entertainment industry for developments in arms technology. Schneider: "Moreover, the first nuclear driven X-ray laser was not invented under the premises of military use." The Goettingen scientist from the Institute for Geology and Dynamics of the Lithosphere continues: "According to all findings, direct support of civilian research and development, meaning the direct investment of money and motivation, does more for the development of a national economy than does the laborious, expensive and questionable detour via arms research."

This is also the conclusion that can be drawn from the results of a study commissioned by Minister for Research and Technology Heinz Riesenhuber to the Industrial Installations Operations Company (IABG) in Ottobrunn, near Munich, a state-owned firm that does not exactly have a reputation for being of a fixed ideological bent. The state-owned company does a great deal of work for the Ministry of Defense in Bonn and prepares military studies. The researchers in Munich looked through the relevant scientific literature, searching for evidence of spinoffs from military research. What they found, however, has to lead to a sceptical assessment of the spinoff theory, instead of being adopted as an argument in favor of an arms program costing billions of marks.

The IABG considers it an irrefutable fact that, for example, a significant military-civilian technology transfer has taken place in aviation technology. It is true that specific requirements must also be kept in mind which are rather similar for both military and civilian applications. As an example: "An airplane must be able to fly, and it must be maneuverable, regardless of for what purposes it will be later used." Something similar is true for space satellites as well.

The situation is entirely different in many other areas where a military-civilian transfer is to be expected. One example of this is naval technology. The researchers in Ottobrunn found it at any rate remarkable that they could not provide evidence of "technology transfer in those areas of naval technology that are as specialized as submarine technology and aircraft carrier technology." In advanced production technologies as well, which according to the IABG were "early on a matter of concern to the military in the United States," there are "apparently no spinoffs" that can be ascertained. "On the whole, it can be assumed that the endeavors at technology transfer in the area of production technology have had a very slight impact." Similarly, in a very broad civilian technology sector such as, for example, conservation, only a very minimal transfer from military developments can be determined.

It instead appears that military programs work against civilian goals such as these. "The result of military primacy is that environmental aspects are largely not taken into consideration in the area of developing technologies and products." This is not least of all because "lower emissions in many military systems can be achieved only at the expense of a reduction in performance."

Furthermore, the study also shatters one myth about transfer that has stubbornly persisted in the FRG: The classic--because it is especially handy--example of the positive civilian use of space research is the Teflon pan, to which supposedly no food sticks. In fact, the substance Teflon was not invented for space flight, but rather much earlier, when flights to the moon and star wars were still science fiction. Teflon was developed in 1938 by the Du Pont Company.

Although the Ottobrunn study conveys scepticism, neither supporters nor opponents of the theory of military-civilian technology transfer will be able to find in it unambiguous proof for their positions. The respective facts were researched with too much differentiation for that. Nevertheless, the study does essentially confirm one insight expressed by political scientist Hans Guenter Brauch of the AG Peace Research and European Security Policy at the Institute for Political Science of the University of Stuttgart. Brauch believes that the significance of the spinoff effect is frequently greatly overestimated. He noticed in this that the significance of spinoff is emphasized most of all by groups that are also most of all interested in a high research and development budget for the military. If these groups were to employ enough cleverness in dissecting the Ottobrunn study, they would clearly find examples from which workable arguments for the plausibility of military-civilian transfer could be derived.

Consequently, in his work for the Bundestag hearing, Brauch did not get involved very much in the controversy surrounding spinoff effects. He aimed at the advocates of military research in general, and SDI fans in particular. His theory: "If you take the United States, Japan and the FRG and compare expenditures for military research and development, increases in productivity, economic growth and the share of top technology on the world market since the 1960s, then one ascertains that the country with the highest expenditures for military research and development showed the smallest rise in productivity and growth rate." This was the United States.

This is surprising at first glance, and it comes across as naive speculation. However, Brauch is not using conjecture, but instead provides the facts that show that Baden-Wuerttemberg Minister President Lothar Spaeth must have been wrong when he prophesized the consequences of German non-participation in SDI: "Western Europe will, within 10 or 15 years, become technologically irrelevant and lapse into the second or third ranks. After a phase of presumedly greater and yet ultimately fruitless efforts, a destabilizing economic structure would ensue, which for its part would have to lead to political and social disruptions."

The opposite of what Spaeth thinks could become reality. Specifically, if the United States puts SDI into effect, it would have to reckon with a further destabilization of its economy. This at any rate follows from the work of a commission set up by U.S. President Ronald Reagan in 1983 to shed light on the United States' competitive position. The findings of the commission, under the leadership of John A. Young, president of the technologically significant Hewlett Packard Company in Palo Alto, California, in its study completed at the beginning of 1985 should give the Americans something to think about.

The diagnosis in short: "Our ability to compete on the world market is dwindling... Our growth in productivity since 1960 has been miserable... The growth in productivity in the United States lags far behind that of our foreign competitors... The leading role of the United States in world trade is in a process of decline... Even our top position in the area of high technology is dwindling."

Examples from the study: "The United States has slipped in market share in 7 out of 10 sectors of the sunrise industries--new technologies. In the area of electronics there was a deficit in the total trade balance, and in our bilateral electronics trade with Japan, our deficit nearly exceeds that in the automobile sector."

The Young report also addresses indirectly the question of military-civilian technology transfer. It states: "The United States is currently spending more on research and development than Japan, France and Germany combined. Thus, in terms of the percentage of gross national product, the United States currently devotes more money to research and development than any of our competitors... Approximately half of our research and development expenditures is allotted to the federal government, which spends the largest part of this--approximately two-thirds--on defense and space programs. And in these two areas, any commercial spillover is not the main goal. If one looks at civilian research and development expenditures in the United States, we are at

a disadvantage with respect to both the Federal Republic of Germany and Japan."

An even clearer picture was provided by a study published at the beginning of 1985 by the "Center for Defense Information": "Immense expenditures for military research have only been of modest use to civilian industry. Only a few significant commercial technologies have resulted from military research." Moreover, the authors of this study fear that the United States will lose its lead in commercial technologies over its competitors on the world market.

For the United States, with its high budget for military research, this is more proof of what the Organization for Economic Cooperation and Development (OECD) determined as early as 1966: "The direct transfer of products and technologies developed for military and space purposes to the civilian sector (is) very small."

This certainly comes as no surprise. The SIPRI Institute estimates that military products are on the average 20 times as research intensive as civilian goods. A comparison of the relevant expenditures for arms research between 1955 and 1971 in the United States, the FRG and Japan brings Stuttgart scientist Brauch to the conclusion: "In the same period, the FRG experienced its economic miracle, and Japan, by supporting civilian research, was able to displace the United States and compete in a number of technological areas, such as in consumer electronics and increasingly in the area of office technology and computer technology. The Japanese success was not achieved by way of military research."

Brauch also points out something that is of increasing concern to Minister for Research and Technology Riesenhuber in Bonn: the fact that the enormous funding available for arms research draws away civilian research personnel, which cannot be recruited in any number. Brauch in fact believes that "the American economic problems in the 1970s were in part the result of the departure of qualified scientists from civilian into military research."

This is now a threat to the FRG, in fact regardless of whether or not Bonn participates in SDI. Ever since Defense Minister Manfred Woerner disproportionately raised expenditures for arms research, a migration of qualified researchers into the new buildup of capacities for arms research should be feared. Because there is less fiscal accountability and less questioning of usefulness in military research, many of them see their big chance there to freely pursue their own favorite areas.

It is true that the minister of defense was unable to spend the significantly increased research funding for 1985 in its entirety, but this is only a sign that the reorientation of research personnel is not possible overnight. However, once word has gotten around that the technological games of the military impose fewer financial restrictions on researchers than is the case with the tight funding for civilian research, the minister of defense should have no problem getting the money in people's hands.

In view of the disadvantages--which can hardly be overlooked--to be expected from an expansion of arms research, physicist Hans-Peter Duerr of the Werner Heisenberg Institute for Physics in Munich urges level-headedness. Duerr, a student under hydrogen bomb inventer and SDI protagonist Edward Teller: "In view of the perpetually limited material and intellectual resources, useful and meaningful plans should always be approached and supported directly, not pushed indirectly through "spinoffs" of useless and senseless projects."

SCIENTIFIC AND INDUSTRIAL POLICY

FINNISH PARTICIPATION IN ESPRIT, RACE POSSIBLE

Helsinki HUFVUDSTADSBLADET in Swedish 18 Feb 86 p 11

[Text] (PWZ)--Beginning in 1987, Finnish firms and institutions may have an opportunity to participate in ESPRIT and RACE, the European Community's high-technology projects.

The chief administrator of high-technology projects, Svend Kraemer, was able to announce the above at a meeting sponsored by the Finnish Foreign Trade Association.

It was not possible previously for any country outside the European Community to participate in those projects. But a couple of years ago, the EC and EFTA signed an agreement on increased cooperation within Europe.

As a result of that agreement, the EC is opening up the second phase of the high-technology projects ESPRIT and RACE to EFTA members.

"It is primarily Nokia which is interested in cooperation," says office manager Torbjorn Blomfeldt of the Foreign Trade Association. "Nokia has previously shown an interest in joining the projects."

Nokia Qualified

Blomfeldt says: "ESPRIT is concerned primarily with high technology in the field of automatic data processing. It has 40 subprojects. RACE is a data transmission project."

He does not believe that Nokia will have any difficulty in qualifying to participate in the cooperative venture.

Especially in the communications sector, Nokia has much to offer in a cooperative venture with the other European countries.

The firms with which cooperation would be established include Philips, Siemens, and Honeywell Bull.

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CSO: 3698/351

SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

JOINT SHARE OF EUROPEAN LINS MARKET--BAe Electronic Systems & Equipment Division and the West German Teldix have joined together in order to share a slice of the European market of gyroscopic laser inertial navigation systems. The field of application of these systems is considered to be vast and the identified areas--such as the new European fighter aircraft EFA--should amount to more than 100 million pounds (250 billion lire). The BAe Electronic Division recently completed the first European LINS, which was tested in flight in 1981 and is now in production for the EH-101 Anglo-Italian helicopter. Teldix, a Bosch subsidiary, has vast experience with gyroscopes and at present is developing a LINS with government funding. France, which is a very strong competitor in the military equipment field and which recently beat Britain in the competition for furnishing the United States with a complex battlefield military communications system, is now looking for a modest role in the development of the EFA program. This plan has met a cold response from other nations involved because of the very rigid position maintained by France during the negotiations last summer when the EFA group was formed by Britain, Germany, Italy, and Spain. [Text] [Parma AEREI in Italian No 3, 3 Mar 86 p 5] 8611/12624

RESEARCH IN ARTIFICIAL INTELLIGENCE--IRST, the Institute for Research in Science and Technology of the autonomous province of Trento, has launched a 5-year program for 1986-1990 with a budget of approximately 60 billion lire for investments and operating expenses. More than one-half of the budget will be used for research in the field of artificial intelligence, one of the two areas of interest to IRST. Luigi Stringa, the former managing director of Selenia, has been director of IRST for several months. The type of approach envisaged by IRST is destined to produce knowledge which can be directly transferred to industry. This is the reason for an organizational and operational structure which tends to follow the lines of a private company rather than those of a public research institute. In particular, a constant eye is kept on profitability of the various projects, since this is an improtant parameter for the evaluation of the programs to be financed and later to be transferred to industry. IRST's initial objective is to develop small sized expert systems, a commitment which together with the others on the agenda could also draw back to Italy researchers immigrated to the United States. [Text] [Milan AUTOMAZIONE E STRUMENTAZIONE in Italian No 1, Jan 86 p 98] 8617/12624

CSO: 3698/M062

TECHNOLOGY TRANSFER

SOVIETS ESTABLISHING DIRECT CONTACTS WITH FRENCH INDUSTRY

Paris L'USINE NOUVELLE in French 6 Mar 86 p 34

[Article by Philippe Lanone: "Clothing: French Look for Soviet Factories"]

[Text] The USSR just contacted French manufacturers concerning the renovation of 25 clothing factories. It has considerable needs in this field, due to the increasing success of Western fashions.

"Our women's fashion show in the Soviet Union was a smash hit!," a French clothing manufacturer rejoiced. Like several of his colleagues, he is actively working on projects to renovate Russian factories. French manufacturers could thus get contracts to overhaul 25 factories until 1987.

It all started last November. A Soviet delegation then visited the facilities of a number of French companies (Jacques Jaunet, Christine Laure, etc.). The technological level of these companies appealed to the Soviets who then asked them to overhaul Soviet factories.

The USSR has considerable needs in this field. Indeed, the Soviets are increasingly aspiring to Western-type production, but their industrial plant cannot follow. Most of their 300-400 clothing factories are obsolete. As a result, renovating them is the order of the day. In fact, it is a veritable revolution, according to Pierre Lasla, the chief executive officer of Christine Laure. The Soviets are expressing a determination to set up state-of-the-art factories! What is involved actually is automation and computerization rather than renovation.

For this operation, the authorities chose direct contacts. No framework agreements, no compensation agreements. The Soviets contacted each manufacturer directly (and discreetly) last November. Other contacts may have been made at the women's ready-to-wear show.

Faithful when it comes to business, the Soviets first contacted the manufacturers they already knew. In particular the Vestra Union group which has been working with them since 1977. A veritable pioneer, this group has already renovated several Russian factories. One of the French leaders in men's ready-to-wear, the group consists of three subsidiaries: Vestra with 8 factories (2,200 people) in Bischwiller, Alsace; Bayard, employing 800 people

in Lyons; and Deloustal with 300 people in Nimes. Vestra then promoted contacts with other French manufacturers.

The most advanced among them (Bidermann, Albert, etc.) are in the process of preparing quantitative proposals.

Not all of them could respond. Indeed, they must be able to dispatch several technical cadres for a year. Weinberg, for instance, a company employing 700 people, gave up for the time being. Similarly, Gaston Jaunet, currently about to launch a new production line in France, now feel that they are unable to follow up. In addition, the accidental death of Jacques Jaunet's technical director and his assistant during a working visit to the Soviet Union have temporarily shelved the project.

The companies chosen will not just provide engineering; they will also contribute the overall knowhow, starting with model creation, and they will choose the equipment. That is a windfall for companies like Lectra Systems. But the French offer of clothing equipment is meager, which is a cause for concern. "Coface will provide financing only for contracts involving French equipment," a manufacturer explained. "But in our case that will mean only 10 percent..."

Principal Current Projects

Company	Object of Negotiations	State of Completion
Vestra Union Group	Suit factory in Moscow Capacity: 250,000 per year. Overcoat factory in Moscow: 300,000 units - Construction of a turnkey suit factory in Kiev. Capacity: 250,000 units. - Renovation of three factories.	Completed. Started in 1983. Completed. Started in September 1985. Signed August 1985. Will start late in 1986. Under negotiation.
Christine Laure	Renovation of two dress factories: - Novossibirsk (Siberia): 1,000 people. Present production of 2.8 million units will rise to 5 million after 3 years. - Novotcherkassk (Caucasus). Present production of 1.8 million units will increase to 5 million in 3 years.	Draft agreement signed for both factories
Albert S.A.	Renovation of two children's (and some women's) clothing factories. - Oujgorod (Ukraine), 1,200 people. - Moscow	Draft agreement signed for both factories. Proposals under preparation.
Jacques Jaunet (Newman)	Renovation of five factories in the USSR.	Proposals under preparation.

Company	Object of Negotiations	State of Completion
Boussac	One shirt factory north of Moscow.	Financing under study.
Bidermann	Renovation of three men's and children's clothing factories in Central Asia: - Frounze. - Ashkabad (Turkmenistan). - Dushambe (Tadjikistan).	Draft agreement signed. Proposals to be submitted late in March.
Weil Besancon	Contacts to renovate four factories (suits, coats) in Kiev and in the Baltic republics. The company will renovate only one.	Mission currently in the USSR.
Claude Havrey Gerard Pasquier Weil Paris		Contacts in progress.

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