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SCIENCE AND TECHNOLOGY

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12 July 1985

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

AEROSPACE

EUROPE LOOKS TO TWENTY-FIRST CENTURY WITH HERMES

Paris REVUE AEROSPATIALE in English Jun 85 pp 9, 11, 15

[Text]

Hermes, a manned spacecraft launched by Ariane 5, will be capable of orbital missions lasting at least one week and will be able to service the future European, US or Soviet manned space stations, to which it will be able to remain docked for longer periods of up to three months. On completing its mission, it will glide down to its base after reentry into the atmosphere. While in orbit it will be capable of working on automatic spacecraft and earth satellites and of performing towing and assembly missions. It will be capable of carrying two pilots and two scientists, or two pilots plus four scientists in the event of a rescue mission arising in the course of a crew relieving operation. The payload will vary between 1 metric ton plus two men and 4.5 tons and four men, depending on the mission.

Target orbits are primarily low earth orbits (400 km/400 km, 30-deg. inclination) and sun-synchronous orbits (800 km/800 km, 99-deg. inclination). Thus Hermes will be, in succession, the upper portion of its launcher, a manned orbiter, a reentry body and a hypersonic glider.

As proposed by Aerospatiale, Hermes will be a double-delta type low-wing design featuring a central fin with hinged surface and two fixed fins at either wing-tip. The fuselage comprises a pressurized section (the cabin) and a nonpressurized section (the payload bay). A further rear section contains the engines and supports the central fin, while a front section includes the pressurized cabin, the nosegear, the power generating sytem, a portion of the attitude and orbit control system, and a vertical airlock topped by an extendable docking mechanism.

A central section corresponding to the bay will enable large payloads impossible to manipulate through the airlock to be carried and deployed. In orbit, the doors of the payload bay open along its entire upper length. This bay has a capacity of $35m^3$ and a useful diameter of 3 meters and is supported on the wing box-member. The doors and the extendable radiators (which are part of the thermal control system) are hinged along the bay's upper longerons.

The aft section contains the rear section of the attitude and orbit control system, the two main propulsion engines, the propellant tanks and the hydraulic generating units.

The wing is a box-member structure that forms the floor along the major part of the spacecraft. The elevons, wing-tip fins, the fuselage flap and the maingear are attached to it.

Composites

To enable Hermes to withstand the very severe physical and thermal stresses to which it will be exposed, Aerospatiale opted for a 'warm structure' approach based on carbon/resin composites in the 180C to 200C class. These composites will result in significant weight saving by comparison with light alloys. External thermal protection will be indispensable for the reentry phase since the temperature on the nose and on the wing and fin leading edges will reach 1200C or more; these parts will be subject in addition to heavy mechanical stresses due to the aerodynamic airflow. The solution here is to use a carbon/carbon composite, a technique now fully mastered by Aerospatiale as a result of its work on the reentry bodies of ballistic missiles for the French deterrent force.

It is difficult to use a single material to meet the requirements at once of mechanical strength on the outer surface, low conductivity through the thickness of the section, and flexibility at the junction with the main structure. The problems experienced with the thermal tiles on the space shuttle are well known. Certain parts where the reentry temperature does not exceed 700C can be covered with flexible silica-felt blankets. For the bottom wing and fuselage surfaces, however, where the temperature will reach more than 1000C, metal cladding has been adopted in the form of Norsial paneling with a Hastelloy super-alloy skin that will serve as a reflecting heat-shield.

The propulsion system consists of two bipropellant engines developing 20kN each, fueled by monomethyl hydrazine and nitrogen peroxide. They will endow Hermes with a maneuvering capability during the ballistic phase, authorizing a 2500 km lateral shift to reduce the severity of the reentry phase. They will also be used for the orbit circularization, orbit correction, rendezvous and orbit-exiting maneuvers. The propellant tanks will also feed the rear portion of the attitude control system and will have a capacity of 2.5 metric tons. The attitude control and orbit refining functions will be performed by two groups of eight thrusters developing 200 N each and employing the same propellants. These thrusters will be located at the fore and aft portions of the fuselage.

The different power requirements called for different approaches. A hydraulic system energized by a hydrazine turbine will supply the power needed for the aerodynamic actuators for the elevons, flaps, etc. The electric power required for the mission (2-3kW) will be supplied by H_2/O_2 fuel cells or by an alternator driven by a heat engine.

Thermal control is based on both active and passive principles. The onboard equipment needs to be warmed by thermostat-controlled electrical resistances when the spacecraft is in the earth's shadow, and cooled when it is exposed to the sun and during reentry. Superinsulation covers the internal face of the bay, and felt lines the interior surface of the fuselage. Excess heat is carried toward two deployable radiators via the freon-gas loops. The radiators beneath the doors of the bay are deployed throughout the orbital phase. This system is capable of dissipating 9 kW. When the radiators are retracted, heat is evacuated via water or ammonium evaporators, depending on the altitude.

Rendezvous

The docking mechanism is designed to be compatible with the US space station, with Columbus and with the Soviet station. The mechanism will be capable of a 45-deg. forward inclination, causing a sealing bellows which is normally retracted into the cabin roof to deploy.

As for the sequential piloting/guidance navigation channel, information is transmitted over three standard serial multiplex buses. For greater reliability, the various, sensors, computers and actuators are all 'subscribers' of each bus.

Reentry body

The task of locating Hermes in orbit autonomously is made possible thanks to advances in satellite technoloy, examples being the GPS and Navstar satellites. Such a system is infinitely more flexible and economical than a ground-based tracking network like the one used for the space shuttle.

The reentry phase can be likened to that of a maneuverable reentry body, this being an area of expertise in which Aerospatiale excels not only in hypersonic to subsonic aerodynamics and the mechanics of flight but also in all aspects of navigation.

The approach and landing phases at the end of a Hermes mission are similar to those which follow the end of an ordinary aircraft's supersonic cruise phase. Aerospatiale has drawn on its experience with Concorde and the Airbus, adhering to the same safety standards required for a civil passenger transport. The maingear is set into the apex of the wing and the wheels retract flat into the wings by a 90-deg. rotation. The hydraulic brakes feature an antilocking device. The twin-wheel nosegear is located under the forward end of the cabin.

The cabin

The cabin is an independent light-alloy structure with four hardpoints securing it inside the main airframe. This approach stems from weight and safety considerations (there is less risk of leakage in the event of a metèorite impact for example). Only the cabin is pressurized and offers about 26 cubic meters of space (bare of fittings) to the crew, plus 6 cubic meters under the floor for the avionic and environmental control equipment. The two pilots' seats are set onto the front floor section. During the final approach (see 'Aerospatiale' No.19, May 1985), these seats are raised to their maximum extent so as to give the pilots adequate downward visibility. All the flight instrumentation and controls are mounted on the instrument panel, on a central stand and on the side benches. Piloting is by means of a sidestick controller and rudder-bar with pressure sensors as on the Airbus A320.

The two scientists' seats are fixed to the intermediate floor section. It will be possible to stow two additional seats between them if need be.

The cabin is equipped with a washbasin, but no shower, a toilet, lockers, shelves and consoles and with utensils for preparing food.

Access to the cabin from the ground is via a 90cm-diameter circular door on the left side of the fuselage, and while in orbit via the vertical cylindrical airlock at the rear of the cabin. A door is also provided for access to the bay from the airlock.

Piggyback on an Airbus

The Hermes system will require numerous other logistical and ground support facilities. At the Guiana space complex, for example, a new launch pad will be needed for Ariane 5 (ELA-3), plus a runway, a Hermes maintenance shop, and a crawler/erector. The mission control center will be located in Europe and will be linked via satellite to the launch complex. Hermes will be carried piggyback on a specially modified Airbus. This method will have the advantage of enabling Hermes to be released in flight for atmospheric flight tests similar to the ones made by the US Space Transport System's orbiter from the Boeing 747.☐

HERMES: WHERE TECHNOLOGIES CONVERGE

Aerospatiale is well placed in the contest for industrial leadership in the Hermes program for several reasons. A top aerospace manufacturer, Aerospatiale is the only company in Europe with such broad-based engineering expertise and the know-how needed to build the Hermes spacecraft. Moreover Aerospatiale possesses acknowledged proficiency in managing the engineering side of such major projects as Ariane, the SSBS and MSBS silo- and submarine-launched ballistic missiles and the Airbus family of transports, as well as enviable experience in international cooperation.

EXPERIENCE WITH LAUNCHERS

Hermes is the 'final stage' of a launcher. It will be subjected to high acceleration and vibration stresses during this critical phase of the flight, and this is where Aerospatiale's experience in developing the Diamant rocket, the Ariane and ballistic missiles is directly applicable. The Hermes spacecraft's avionics package will replace the Ariane 5's equipment bay, which is why Aerospatiale's experience in building equipment bays and cockpits has obvious relevance.

Hermes and its engines behave like a launcher's upper stage and will be required to maneuver the spacecraft toward its rendezvous point in space; and as it happens, Aerospatiale is a leading specialist in guidance, steering and attitude control problems as well.

EXPERIENCE WITH SATELLITES

After it separates from the launcher, Hermes becomes a manned satellite. Depending on the nature of its mision, it will remain in orbit for anything between a week and several months, during which it will be subjected to severe thermal cycles. Supplying the power required for proper functioning of the spacecraft and life support to the crew and controlling the thermal environment are problems in which Aerospatiale has come to specialize over the last 25 years as a result of its involvement in thirty or so satellite programs.

EXPERIENCE WITH HIGH ALTITUDES

The Hermes crew will live in a controlled atmosphere thanks to the life support systems. With Concorde, Aerospatiale solved this type of problem as it applies to supersonic flight at high altitude. Hermes will be orbiting 800 km above the earth, at zero pressure. Concorde flies at an altitude of only 20 km at a pressure of O.05 atmosphere, and its hundred passengers fly in perfect comfort.

UNMATCHED EXPERIENCE WITH REENTRY BODIES

Hermes will become a reentry body and will have to withstand the kinetic heating caused by its reentry into the earth's atmosphere at hypersonic speed. Aerospatiale is the only manufacturer in Europe to have mastered this problem through having developed successive generations of reentry bodies for the French nuclear deterrent's ballistic missiles. As well as having investigated this problem in great depth, the company has developed advanced materials for the heat shields and already possesses the test facilities - unique in Europe - required for their qualification.

EXPERIENCE IN THE APPROACH AND LANDING PHASE

Hermes finally becomes an airplane, or more exactly a hypersonic glider during the final half-hour of its mission. After hypersonic reentry it decelerates from Mach 1 at an altitude of 18 km to a speed of 85m/sec at touchdown. It covers 1500 meters of runway before coming to a stop, or 2000 meters if the runway is wet. The whole of this terminal phase can be likened to that of the Concorde SST after cruise flight ends. And Aerospatiale will be applying its experience with Concorde and the Airbus to maintain the same safety standards as for passenger transport.

CSO: 3698/486

NETHERLANDS REVIEWS ACADEMIC-BUSINESS TIES IN BIOTECHNOLOGY

Rotterdam NRC HANDELSBLAD in Dutch 22 May 85 pp 3, 7

[Article by Wubbo Tempel: "What is Good for Industry is Good for Science"]

[Text] On Wednesday of next week, at the symposium "Netherlands active in biotechnology," the biotechnology program committee will present its final report: the remaining portion of the first "innovation program" to bring the authorities, the universities and the business sector closer together. The program seems to work; enterprises such as DSM, Duphar and Gist-brocades again know how to find the way to the universities. The universities respond willingly, they adapt to the wishes of the business sector.

The chemical-pharmaceutical enterprise of Duphar works together with the department of virology of the University of Utrecht on the development of vaccines against coronary viruses. The viruses cause, among other things, an infectious bronchitis in poultry, peritonitis in cats and disturbances in the stomach and intestinal canals of pigs. The project will last for 3 years, the university has engaged eight new staff members for the project. Duphar contributes 5 to 6 million guilders and, in return, gets the most important say on the research project. Duphar has got approximately 50 percent of that amount as a subsidy from the Ministry of Economic Affairs.

An agreement has been made in advance with regard to publication of the results of the research in order to avoid problems between the university which is interested in scientific publications and the industry which wants to keep the findings secret as long as possible. The university people may publish, but not until Duphar has applied for patents.

DSM, the large chemical concern in Heerlen, has the Department of Genetics of the Agricultural University and the Medical Biotechnology Laboratory of TNO [Organization for Applied Scientific Research] in Rijswijk examine the enzymes which produce the fungus Aspergillus. The three parties try together to change the fungus in such a way that it will be capable of producing the so-called hydroxylated aromatic compounds. The substances thus obtained are used in the protection of vegetation, in medications or as food, scent and flavoring substances. DSM will, in the next 3 years invest "millions" (no exact figures are given) in the research. DSM got 45 percent of that amount as a subsidy from the ministry.

The department of genetics of the University of Groningen studies how to make commercially interesting enzymes from the bacterium Bacillus subtilis. The Delft enterprise of Gist -Brocades, which already uses the bacterium in many production processes, is the principal. The enterprise so far invests 2.2 million guilders in the research, which for the time being has been arranged for 4 years. In addition, together with Unilever, Gist is in advanced negotiations with another department at the University of Groningen, the department of structural chemistry, which will engage in basic research on enzymes.

Cooperation

Not too long ago, in the sixties and the seventies, there was hardly any contact between universities and the business sector. On the basis of the above-mentioned examples, it is assumed that that time is over. There are, moreover, more of such forms of cooperation on the way. The contacts comprise more than an assignment of a research project. It is invariably a question of long-term projects, performed by teams set up by both parties.

The Ministry of Economic Affairs subsidizes these forms of cooperation between industry and universities from the special fund "integral applied scientific research projects," one of the initiatives of the program committee biotechnology.

That committee has itself arisen from the policy for "research programs aimed at innovation," usually referred to the "IOPs" [innovation research programs] which was started by former Minister for Scientific Policy Van Trier together with the Ministry of Economic Affairs. The purpose of the programs is for industry and the universities to make better use of one another's knowledge and interests.

The first group that started was the program committee biotechnology, which was established in 1981 and started working in 1983. The committee will next week Wednesday have completed its session when it presents its final report in the assembly hall of the Technical University of Delft. The overall conclusion is that the work has appeared to be a success but is still far from completed.

According to the committee, composed of scientists and representatives of the six large biotechnological enterprises Akzo, Avebe, DSM , Duphar, Gist-Brocades and Unilever, the most important result is that business and science have, indeed, come closer to one another. "Biotechnology," it says in the final report, "is really making advances in the Dutch research world and business sector."

Work in the Netherlands

To secretary of the committee, Dr Rob van der Meer, a graduate engineer, especially the arrangement of the integral applied scientific research projects, the ITP's, [integral applied projects], are a proof of this. Van der Meer, formerly with Civi Consultants, says, "DSM, Gist-Brocades and Duphar are multinational enterprises, and this program has, no doubt, had influence on their decision to have this part of their work done in the Netherlands. Dutch researchers are preferred over foreigners. Duphar, for example, could simply have had this work done at a Solvay subsidiary in the United States."

The subsidies are not decisive for the decisions of the enterprises, says committee chairman Prof Dr Rob Schilperoort: "No, that is of secondary importance for them. They make a strategic decision, and the first research is merely a small part of that. After that, you get the entire translation into the production process and the marketing." The consequences for our country are first the knowledge and, in the second place, the industrial spin off which results from the activities.

Also the arrival of two minor American biotechnological enterprises, Centocor and Molecular Genetics are, according to the program committee, a proof of the improved climate. The enterprises have decided to set up their European office in Leiden, incidentally, in order also to obtain the proposed co-financing from the Company for Industrial Projects. Also here more enterprises are likely to follow.

As another positive point, Van der Meer adds that there has been a clear distribution of tasks in the research at the universities: the Technical University of Delft and the University of Leiden work together on plant cell biotechnology, industrial microorganisms, such as yeast, and the more technical aspect of the matter, the production installations. The University of Utrecht does primarily medical biotechnology research, the University of Groningen works on protein engineering where desired proteins are produced and applied.

The Municipal Universities and the VU in Amsterdam work also on plant cell research and, in addition, on industrial technology, while the Agricultural University devotes its time to enzyme processes, bioreactors and purification processes, primarily with the food industry as client in mind.

"A very nice picture," says Schilperoort, "and such a picture is extremely necessary because the users within the government and in industry now also know exactly where they have to be for such a cooperation project."

Other successes to which the committee refers are extensive fundamental research programs which are also aimed at their practical application and where each of the five centers have chosen their own main function.

Multi-Disciplinary

The five centers, however, also have to be able to work on a multi-disciplinary level. That is to say that they have to know about the bacterium, the animal, as well as the production process and equipment. Schilperoort: "Only then will you get concrete successful results. A scientist says: Look here at the nice thing that I have found. However, the technologist, who is called in puts it into his equipment and then for the most part it does not appear to work too well. Communication between the two is necessary."

The reason why industry and the universities have found one another is, among other things, the unorthodox procedure followed by the committee. To use its own words, it has started "at the market side." Schilperoort: "A whole lot of the research is extremely good, you thus have to use other criteria to arrive at priorities."

Industry provided these criteria. The committee first looked at which enterprises would be interested. The eight which came forward (Akzo-Pharma, Avebe, DSM, Duphar, Gist-Brocades, Heineken, Shell and Unilever) were, subsequently, asked which research they would have carried out in the Netherlands and which research groups they would prefer.

When a subject was mentioned at least five times, it was given a priority, and the subjects were, in principle, given to the favorite groups. Quite a tough approach, it seems to me, says Van der Meer: "We have not had any comments on this from the universities. None at all."

ON the basis of such a picture thus obtained, a preliminary proposal was made, on which the universities could react with the submission of research programs. The program for the Delft-Leiden combination is, however, O.K., including a financial contribution by the state of 1.2 million guilders. Groningen, Utrecht, Amsterdam and Wageningen will follow quickly.

"You cannot, of course, attribute everything to the committee," says Van der Meer, "for we had here in the Netherlands two clear ingredients. In the first place, we had the scientific basis in the Netherlands. In addition, the scientists appeared to be prepared to cooperate with industry. Biotechnology is a pragmatic field, and many researchers appeared to be pragmatic people. Furthermore, we have an eminent biotechnological industrial sector which can pick up the knowledge."

Final Recommendation

The work has not yet been completed. The final recommendations of the program committee do not differ too much from what other committees usually produce: It is a plea for more money and more committees.

The underlying reasoning is simple, says Van der Meer: "If we do not go through with it now, the whole structure will collapse like a house of cards."

Schilperoort: "Because biotechnology is such a broad field, there are all kinds of forces which may further the development of the further research in all directions."

"A reinforced continuation" of the program is necessary, writes the committee in its final report. The plan must be that the program committee of now comes back as an advisory committee, which formulates four component programs. Such a one already exists and becomes a continuation of the present program, which is primarily aimed at the industrial sector.

It is also already known how much extra money is needed: the committee arrives at 5.3 million guilders for the advisory committee and 16.4 million for the industrial program. Van der Meer points out that that "is really not much;" of the 70 million guilders which the committee received when it first started its activities, approximately 35 million guilders were intended for the more basic work, and approximately 21 million guilders of that amount are still over.

The committee uses that money to support research projects for mostly 30 percent, and 40 percent at a maximum. "That is necessary in order to ensure in a time of retrenchment that biotechnology grows."

Other Plans

In addition to the industrial program, comparable plans must come for agriculture, environment and health care. The amounts that will be needed here can still only be estimated by Schilperoort. They must primarily come out of the budget of the respective ministries. For agriculture, it is a question of 10 to 15 million guilders, for environment 5 million. In that sector, the industry is somewhat smaller and the research easier to survey.

For public health, the amount would again be around 10 million guilders. Van der Meer expects no opposition: The environment is already nicely on its way, agriculture is off to a start, only in the health sector will it still be necessary to carry on some negotiations.

In its report, the committee warns against dispersion, but it opts itself for four subcommittees, in addition to the strong support which must come from an advisory committee. Van der Meer says in this connection: "A master plan under one committee for biotechnology is, unfortunately, aiming too high. Each ministry would there have to contribute from its own budget. That does not work. Only when the ministries have such a plan themselves, will they defend it.

Schilperoort goes one step further. "They also have their own line to their institutes. If we as a committee would become involved in that, they simply would not listen to us."

Labor Market

In addition to the feared dispersion, there is also still the problem of the labor market. The committee pleas in its report for a supplementary second phase of professional training for multi-disciplinary biotechnologists. The committee has estimated that, on the basis of the existing projects alone, 50 per year are already needed. On the basis of the reaction to the most recent proposals on the part of the Ministry of Education, which previously has been strongly opposed to the plans, Schilperoort now again feels cautiously optimistic.

A problem which no longer is viewed as the main problem, and therefore is only item 17 of the recommendations concerns the dangers associated with the production of bacteria with altered genetic properties. Not too long ago it was often pointed out that they would cause great disasters if they got into the environment. Van der Meer says now: "The safety is in our view taken well care of."

Finally, if things go so well with innovation within the area of biotechnology, why does the recipe then not work so well in the case of the other research projects aimed at innovation? Schilperoort and Van der Meer have a clear opinion on the many, smaller research programs aimed at innovation which arose after biotechnology. "We do not find the watering down of the innovation-research program principle good. As program committee we have strongly pointed out to the authorities: do not start so many innovation programs, each of which only cover small areas. Through that it becomes extremely difficult to set priorities.

Informatics

The contrast between the success of biotechnology and the difficult start of informatics may also be explained in simple terms: "We started early in the Netherlands on the stimulation of biotechnology. We may therefore decide ourselves what we want to do, we are not controlled from abroad."

Secondly, according to the reasoning, the basis for informatics is much less clearly present in the Netherlands. For biotechnology a figure in the form of a triangle may be drawn to indicate the available Dutch manpower of researchers at universities and scientific institutes. The lower edge is the basis, with approximately 1,500 researchers in the basic areas.

In addition, there are 300 to 400 researchers who, in their work, already have somewhat more to do with biotechnology. On top of them, in the top of the triangle are what is really important: the 300 multi-disciplinary workers. In the area of informatics, the situation is different. Van der Meer: "There, the triangle is standing on its head."

7262
CSO: 3698/465

BIOTECHNOLOGY

NETHERLANDS COMPANY GETS 40 MILLION GUILDER BIOTECH SUBSIDY

Rotterdam NRC HANDELSBLAD in Dutch 4 Jun 85 p 14

[Article: "Avebe Biotechnology Receives Subsidy of 40 Million From Ministry"]

[Text] Amsterdam, 4 June—The Avebe potato flour concern in Veendam has been promised a subsidy of 40 million guilders by the Ministry of Economic Affairs [EZ] for the further developement of the firm's biotechnology program.

EZ does attach to the subsidy the stipulation that Avebe find a financially strong partner for its biotechnical activities. Of the subsidy, 20 million guilders are earmarked for research and 20 million guilders for a testing plant.

Chairman of the board A. Mak displayed optimism yesterday at noon about finding a partner backed by sufficient capital, during an explanatory statement on the annual report.

According to Mak, Avebe has already at this point developed five new products based on biotechnology that have a good chance of becoming commercially successful. The furthest development has been made in cyclodextrine, a type of starch consisting of ring-shaped molecular compounds. Vitamins and other substances can be stored within the ring compound, and again released over a long period. "There is interest in the applications of cyclodextrine in the pharmaceutical world in particular," according to Mak.

In addition to a partner for its biotechnological activities, Avebe is also looking for a partner in setting up a wheat flour plant. Wessanen has been mentioned in this regard, but according to Mak there are also negotiations under way with other candidates. The outcome of this depends in part on the result of talks being conducted by Avebe with its two most important creditors: the government and Rabo Bank.

Including deferred interest (approximately 14 million guilders), Avebe's debt to the National Investment Bank N.V. amounts to almost 45 million guilders, and that to Rabo Bank to almost 123 million guilders. According to Mak, there are three possible ways to reorganize the awkward position of Avebe's capital:

the debts are converted into new private capital, additional new capital is obtained, or a solution is found in the realm of debt remission. Mak refused to anticipate the results of the debt reorganization, but displayed optimism about the settlement of Avebe's debt problem.

That optimism is in part based on the expectation that Avebe will be able to get out of the red in 1986. It is also hoped that by that time fixed costs will have been drastically reduced, which is one of the pillars of the Strategic Plan devised in 1983 to save Avebe from ruin.

The extent to which this operation will result in forced firings is still unclear. Regional newspapers reported last week that 300 jobs at Avebe would be threatened. At present the company employs some 2,200 people. According to Mak, these reports are as yet unfounded. "We intend to bring in an agency to look over our personnel situation. Furthermore, we have yet to talk to labor organizations. Our point of departure in this is the sober assessment that Avebe's personnel liabilities are too high in comparison with other companies in this sector."

Mak also pointed out that the company's environmental liabilities are disproportionately high. On that front, Avebe is expecting an additional disappointment. A planned purification installation (cost: 75 million guilders) at the plant at Ter Apelkanaal must be technically adjusted. In the planning process thus far, no account was taken of ammonia emissions, which is one of the causes of acid rain. Mak: "We will probably have to do something about that as well, and that results in two problems. We don't know how it should be done technically, and a conservative estimate indicates that it will raise the cost of the entire project by 10 million guilders."

12271
CSO: 3498/499

CIVIL AVIATION

EXAMINATION OF SF-340 DESIGN, FINANCIAL PROBLEMS

Stockholm NY TEKNIK in Swedish 11 Apr 85 pp 38-41

[Article by Jan Lothigius]

[Text] NY TEKNIK has examined Saab's new civilian passenger plane, the SF-340.

After experiencing many problems the plane has now been in the air for a year.

Technology: Engine failures, overweight and a poorly-designed air intake caused initial problems. Along with bad publicity. Now the early problems have been corrected.

Financing: The taxpayers have financed the project--with the loan to be repaid after 570 planes have been sold. Today only 77 have been ordered.

Customers: Swedair bought the plane and had many breaking-in problems. "We are hoping that things will get easier within a few months," Swedair's technical director Arne Streling said.

Competitors: For the moment Saab is about a year ahead of its competitors. Now it is a question of market shares.

Technology

Engine breakdowns, production chaos and an overweight plane. Those are some of the problems that have plagued Saab-Fairchild 340 so far. But the plane is also a successful design that can produce cheap flight kilometers--the only measurement used by airline companies.

Swedish civil aviation's flagship was built quickly. Only 2 years and 9 months after the first sketch was drawn the king went to Linkoping to wave the first airplane out of the hangar. The first passengers were flown on the plane 1 year and 9 months after that.

It was the first on the market, as expected. Four competitors were hot on Saab's heels. At around the same time a number of airplane manufacturers had decided to make a new generation of regional airplanes. They would carry between 30 and 50 passengers, run quietly and use little fuel.

Saab-Scania and the American Fairchild, Inc. managed to get in the air first with their SF-340. The closest competitor is about a year behind. The haste was felt to be necessary to ensure sales but it has also had its price.

Flight Ban

Engine problems have given Saab-Fairchild the most but not the best publicity.

The first engine failures occurred in airplanes that were in operation with Swiss Crossair. For a while last fall the airplane was under a flight ban. What had happened?

The engine, model number CT7-1, is not a new design. In its original version over 2000 engines have been delivered for use in helicopters. The manufacturer, General Electric, modified the engine in several respects so that it could be used in airplane operation. The modifications did not prove to be very successful.

There were three types of engine damage:

1) The blade in the second compressor stage hit the surrounding housing and came off. The space between the compressor blades and the housing was too small.

2) Some of the blades came off because of fatigue. They were installed too tightly.

3) One bearing broke. It had been installed with the wrong tool which according to the plant instructions should have been thrown out.

Paper Plate

Some of the engine damage occurred in connection with the big air show in Farnborough in the fall of 1984.

The damage at Farnborough was caused by the fact that a paper plate (pastry tray) was sucked into the air intake and caused the compressor to break down. This was established by General Electric's technical breakdown committee.

In Saab-Scania's latest analysis the paper plate accident was given a positive interpretation: "This breakdown led to a solution of the compressor problem."

As far as one can tell General Electric has succeeded in correcting the engine defects. The gap between the compressor blades and the housing has been widened and the blades have been strengthened while at the same time their aerodynamic properties have been changed. Since the modifications were made the engine has functioned properly.

Cleaning Out Intake

Why do Swedair's mechanics plunge their hands into the engine's air intake as soon as the plane has landed? What are they looking for? They are looking for ice.

During one of Crossair's flights last fall there was a bang in one engine. The engine continued to function but some blades in the first compressor stage cracked as a result. Investigation showed that clumps of ice from the air intake had probably been shaken loose and sucked into the engine.

The air intake has a built-in bird catcher in the form of an elbow that is intended to prevent birds from getting into the engine. Water had collected in the elbow and had then frozen.

Now the air intake has been modified in all airplanes that are in service.

Arne Streling, technical chief at Swedair, confirmed that the careful check of bird catchers in the winter showed that the ice problem has now been solved.

"It was a bad winter for ice formation when were were conducting our test flights," said Thure Svensson.

"The modifications of the air intake are part of the program to follow up on and improve the plane's durability under ice-forming conditions," he said.

The past winter was a good one for this work.

Heavy Airplane

The SF-340 was heavier than intended, from what NY TEKNIK has learned. But this has not affected flight economy, which would have ruined the entire project.

However the starting properties were poorer than intended. When Crossair has to take off from Luganos Airport in Switzerland, it cannot carry both a full load and full fuel tanks because that would make the plane too heavy. The airport is surrounded by mountains. Therefore there must be a margin for turning and climbing quickly enough after takeoff even if an engine stops.

"The weight increase is due to altered specifications and increased equipment standards," explained Thure Svensson who also referred to "what people in the branch call normal weight increases."

Saab and Fairchild have tried to solve the weight problem in various ways. For one thing engine power was raised from 1600 to 1700 horsepower and larger propellors were installed. And an intensive and presumably expensive weight search has been conducted.

In an early stage of development the thickness of metal in the fuselage was reduced to keep the weight down but this measure was evidently not enough to compensate for the branch phenomenon of "normal weight increase."

Some of the modifications that aviation authorities required before they would certify the plane undoubtedly also added to the weight problem. One example:

The authorities noticed that the rudder lines were placed too close to each other. They demanded that the lines be separated. This was to reduce the risk that damage would lead to total breakdown. If a piece of a propellor breaks off and goes right through the fuselage it would be unable to knock out all the rudder lines. Saab was forced to redesign the fuselage frame and the rudder line guide rails.

Many Small Defects

First in the air. This meant that Saab was forced to start manufacturing the airplane before it had been completely designed. For this reason a very large number of design changes had to be introduced in the middle of production.

The engineering plants have been put under great pressure by all the changes. Every one of the first dozen planes was manufactured with constant improvisations in the production planning. It was not possible to carry out rational production planning in 1984.

"It has been rough to change our plans all the time," agreed Thure Svensson, who is convinced that the hard times are now over. He gave some eloquent examples:

"The supply of materials is functioning much better now. In the past delays in equipment delivery led to many problems. It destroyed all our plans.

"At one time we had 1800 work orders per plane in addition to the planned work. Today we are down to 200 orders.

"In one section of the main plant where the final assembly takes place we have been able to cut man-hours by 75 percent."

Thure Svensson does not take credit for these advances.

"I am reaping the benefit of the efforts made by my predecessors and fellow workers," he said.

One Plane a Week

In 1984, 12 airplanes were delivered. This January two shifts were put in on some parts of the production line. By the end of this year an airplane should leave the plant every 5 working days.

Around 35 planes will be delivered this year and next year the plans call for delivery of 45. If one looks at the number of planes that have been sold in relation to the production tempo it can be seen that today's backlog of orders will be enough to last until the summer of 1986.

Economic Aspects

Will the production of the SF-340 ever be profitable? According to Saab at least 200 planes must be sold before the project goes in the black. Today the firm has 77 solid orders.

But it will take much more than that in the way of orders before taxpayers get their money back. The state loan will not be repaid until 570 planes have been sold.

"It is now a question of turning the planes out, of leading the market. It is true we have had delays but we are still a year ahead of our competitors. They have had their own delays. That is part of the business," said Thure Svensson, recently appointed head of the civil sector of Saab-Scania's aviation division.

It is a hard job. During Saab-Fairchild's brief lifetime two people have held the job before him.

The project leader for Saab's part of the SF-340 project is also the third man on the job. There have been even more people in charge of selling the plane. And they have been hard to find if someone wanted to locate them. They had offices in Paris or in Linkoping and now there is an office in Windsor, outside London.

"My job is to make sure we make the project profitable and reach the break-even point with the delivery of approximately 200 airplanes," he declared.

Thure Svensson has a military background. He was a Viggen pilot and technical chief of the air wing in Soderhamn. When he started working at Saab-Scania last November he came from FFV [National Defense Manufacturing] where he was in charge of airplane and helicopter maintenance.

"They told me that it was primarily my leadership experience and my general knowledge of airplanes that got me the job," said Thure Svensson.

According to Thure Svensson the break-even point has been set at 200 planes since the project began. But he admitted that it might be necessary to manufacture more planes than that before the investments start to pay off.

Minimum of 570 Planes

For the state and the taxpayers the break-even point for the loan of 350 million kronor lies at 570 delivered planes. If one adds to that the market interest value on the loan the break-even point is somewhere over 1000 airplanes.

The following figures were taken from government bill 79/80:115. If only 100 airplanes are sold the state will not get a single ore back. When 200 planes have been sold, the number Saab-Scania is using as its break-even point, the state will get 40 million kronor back. For the state to get the entire loan repaid (without any interest payments at all), 570 planes must be sold.

Taxpayers can keep their fingers crossed for this kind of success. Today Saab-Scania believes it can sell between 250 and 400 planes.

Saab cannot afford to have those who are selling the planes fail. But have they succeeded? Today Saab-Scania says that there are 77 solid orders, including the airplanes that have already been delivered. In addition there are around 30 options (which are more like indications of interest).

It was announced 3 years ago, before a single test plane was in the air, that 100 planes had been ordered. Over the years early orders and options have been canceled while new ones have come in.

It is probable that the current figures are less "inflated" than those from 1982. There are fewer options included now.

One explanation for the slow order inflow can be that many airline companies are waiting for Saab-Fairchild's competitors to get off the ground. The market is also affected negatively by the high exchange rate of the dollar.

One of Fairchild's main attractions as a cooperative partner in a civil aviation project is said to be "production and sales experience in the area of passenger planes." Saab-Scania might have reason to feel dissatisfied with its cooperative partner, Fairchild, Inc., but if so it has kept its opinions to itself.

In reality the sales organization has been built up without much help from Fairchild's subsidiary, Swearingen, which was said to have the needed expertise. Today only a few of the sales company's personnel have had previous experience in selling civil aircraft.

History of SF-340 Project

"At a very early stage it was obvious to the board of directors that state orders for combat planes would decline as soon as the air force completed its expansion and that it would then simply be a question of delivering replacements to the air force for outdated planes and those that were taken out of service for other reasons."

Is that Saab-Scania's rationale for building the Saab-Fairchild-340? No, the quotation was taken from the management report for Svenska Aeroplan, Inc. for 1946/47.

The report went on to say that the company had "decided to go into the production of so-called minicars."

First Civil Aircraft in 1949

The reduced orders from the air force were also compensated for through production of the Scandia passenger plane, 12 of which were manufactured at the Saab plant in Linkoping between 1949 and 1951.

Six more Scandia planes were delivered a few years later, but by then military orders had pushed civil aircraft production aside. Saab let the Dutch Fokker company turn out the last batch of Scandias.

Saab was handsomely compensated by the state for discontinuing the civil production that was in the way of the rapidly growing military orders.

History repeats itself. That applies to Saab too. In this case it took 30 years before reduced military orders again forced a civil aviation effort at the airplane division in Linkoping.

In the 1950's and 1960's Saab's airplane division made a good living from extensive military orders. Earnings were extremely good and the profits were used to expand other areas besides the airplane division. Saab set up an agreement framework with the air force administration and was able to work on an open account.

Costs were not a primary concern. Thus there were no business reasons why Saab should eye considerably more risky civil airplane projects.

Then came the criticism of the Viggen in the early 1970's. The marriage between air force officials and Saab was questioned, especially by outside critics like Maj Wechselman. After the usual delay to begin with, national politicians joined in the criticism. During a large part of the 1970's it was politically impossible to reach a decision on big new military airplane projects.

B3LA and Asling

Proponents of military planes tried out various suggestions for future projects. Who remembers the B3LA today?

"The airplane division's future development depends heavily on the final decision the government and parliament make on...the B3LA," Saab-Scania wrote pleadingly in its 1977 annual report.

But Saab-Scania's motives for developing the B3LA could not offset the fact that the air force couldn't really figure out what to use it for. In

February 1979 the government rejected the B3LA and all the other versions of the plane that had turned up over the years. The politicians had tried on several occasions to find various ways to make the proposal more appealing. Who doesn't remember the "Asling," a version that journalist Karl-Gustaf Kohler claims was improvised by Nils Asling in the middle of a live broadcast?

At the same time the government promised to provide financial support for civil production in order to maintain Saab-Scania's competitiveness.

In February 1980 the government kept its promise. The state lent 350 million kronor to Saab-Scania on very favorable terms. So favorable that at least half the amount could be better described as a subsidy.

Customers--Many Problems in Early Stage

"We are still in a breaking-in period with many disruptions in activity," said Arne Streling, technical chief at Swedair.

Swedair has been using the SF-340 on routes between Arlanda and Borlange, Kramfors and Trollhattan for the last 3 months.

"It has been a hectic time with many minor problems that interrupted activities," said Arne Streling. "These were typical breaking-in problems and I think things will get much easier within the next few months."

Swedair's goal is to complete 98 (preferably 99) out of every 100 flights. Both weather and technical reasons are included in the statistics.

"It is a good airplane and we are making it much easier to use," said Thure Svensson of Saab-Scania.

A few weeks ago the airlines that use the SF-340 reported success rates of between 93 and 100 percent on their regular flights. During the week in question 650 flights were made.

PHOTO CAPTIONS

1. p 40. The frame is automatically riveted to the fuselage panel. In a single operation holes are drilled, countersunk, filed, tightened and riveted. The quality is much more consistent than in work done by a trained riveter. In addition the machine pushes the rivets in instead of pounding them. This means the riveting is almost silent. Riveting is traditionally a very noisy operation.

2. P 41. Glue is used to fasten all large flat and single-curved sheets of metal together. Claes Tornqvist inspects a fuselage panel that has been glued. First the outer shell was glued

to the inner shell which has cutouts to reduce the weight of the panel (see the sections at the top edge of the panel). Then the horizontal reinforcements, trim and window frames were glued to the panel.

After each gluing operation the bond is checked ultrasonically, a method that reveals the smallest space between two sheets of metal.

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CIVIL AVIATION

AUTOMATIC PROGRAMMABLE RIVETING SYSTEM FOR A 320

Paris REVUE AEROSPATIALE in English Jun 85 pp 31, 33

[Text]

The Macsyflex automatic programmable riveting complex was set up in 1983 at the Aerospatiale plant at Méaulte in Picardy. It is intended particularly for flat and curved aircraft structural components, and more specifically for Airbus sections. These large elements, with their complex shapes and frequent recesses, require an orientable riveting head. The answer to the problem has been the rotary 'Bouterolle', a riveting head with eight degrees of freedom, with which it is possible to gain access to corners in the recesses and to work inside the box members. The system enables thousands of rivets to be set in a very short time (more than 18,000 are used on the skin panels and door frames of the A320 at Méaulte). This has resulted in a time-saving of 30%, or 18 seconds instead of 25 seconds to set and crush each rivet.

The conventional drilling and riveting method was labor-intensive and involved successive assembling and dismantling of items to be joined together. And because the riveting is done on a cured waterproofing substance, extensive fastening was necessary. The method was costly, noisy and tiring. Automatic riveting of the Macsyflex type represents a major technical advance, as well as a source of progress inasmuch as it cuts costs and improves work standards and working conditions.

The onboard machine is associated to a mobile platform which is numerically-controlled about two axes.

The introduction of the Airbus A320 in 1984 led to having this machine associated to a complex tool system with an additional three numerically-controlled degrees of freedom. The system's work cycle deals with the phases of approach and clamping, drilling, beveling, depositing a waterproofing substance, setting the rivet, crushing it, and then unclamping the fastened items.

The new automatic riveting complex eliminates all weight handling problems, the tedious, repetitive nature of rivet setting, unnecessary noise, tool positioning difficulties and the risk of error. It also significantly reduces physical fatigue for the machine operator and ensures higher quality standards in the end product.

Regarded as a laudable endeavor to improve working conditions, the operation of setting up the automated workpiece-support for this riveting complex was granted a subsidy by FACT (*'Fonds pour l'Amélioration des Conditions du Travail'*).

The development of the Macsyflex complex was carried out with proper regard for ergonomic concepts aimed at embodying in the system the dual aspects of improved working conditions and an upgrading of tasks involving human constraints as well as engineering solutions. □

(*) *'Machine Système Flexible*

NANTES HAS ONE ALREADY!

Recoules, the French machine-tool company, already scored a first last November when it installed a dedicated five-axis numerically-controlled riveting machine at Aerospatiale's Nantes facility for the fabrication of ATR42 and A320 wing panels.

As already noted, this constitued a European first for both the Recoules company and Aerospatiale (see our February 1985 issue).

THREE STAGES SINCE 1979

The integration of the automatic riveting system at the Méaulte facility took place in three stages in connection with the fabrication of Transall and Airbus subassemblies and assemblies.

- ***Stage One (1979).*** *Installation of the first manually controlled automatic riveting machine. Built by Gemcor (Drivematic Division) in the US, the machine was capable, on the basis of a suitably identified location, of performing a continuous drilling and riveting operation, with the workpieces being held together under pressure throughout the operation. It was possible at the same time to apply a sealing substance between the rivet head and the rivet hole (known as 'wet riveting'). This machine also made it possible to evaluate the capabilities and advantages of automatic riveting.*
- ***Stage Two (1981).*** *Installation of a French machine built by Recoules et Fils, the Preca 600. Set into the floor, the machine was intended for fixing stringers to Airbus skin panels. It was soon realized however that it would be possible to fit stringers for imparting rigidity to cylindrical skin panels by having the machine carried on a numerically-controlled shaft (provided suitable specialized tools were also installed). This was done by a specialist Aerospatiale department, after which it was possible to write the automatic-riveting software and to look into ways of implementing this technique in the case of large assemblies and more complex structures.*
- ***Stage Three (1983).*** *Installation of the Macsyflex automatic programmable riveting complex.*

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CIVIL AVIATION

'COMPUTERIZED INTEGRATED WORKSHOP' AT AEROSPATIALE NANTES

Paris REVUE AEROSPATIALE in English Jun 85 p 47

[Text]

Forming a self-contained entity at this Aerospatiale plant, the machine-shop unit, now called the 'computerized integrated workshop', has benefited from leading-edge technology which has resulted in more efficient utilization of the machines and thus made them more cost-effective.

This unit carries out the machining on structural elements of the Airbus A300/A310 and ATR aircraft — most of them of large and complex shape — entirely automatically.

This first in Europe was the outcome of preliminary studies by Aerospatiale's Aircraft Division, which gave the Sodeteg TAI concern the task of implementing this unique computerized system on a turnkey basis to permit integrated management of the Division's machine shop. The latter contains 24 numerically-controlled milling machines, 20 of which are currently hooked up to the system. The whole project has cost 14 million francs.

The system revolves around a central master station located inside the machine shop under the control of a technician whose job is to coordinate the activities of the different departments using the machines, so as to ensure optimum utilization. In addition, decision-making at shop management level is aided by the system, which makes full information available concerning the following:

- **Fabrication requests** from the plant's production management. (Production is managed by a TZAR software package developed by Production Systèmes.)
- **The technical data** required to implement these requests (production files, component routines, machining instructions, materials, tools, etc.)
- **The status of the machines**, progress of the work, available machinery (by real-time follow-up).

In short, from this veritable 'control-tower' the technician is able to follow, on his color screen, all ongoing operations, the machine commitment status at any particular time, shop assignments, and the availability and movements of materials and production tools. It is also possible to display the projected workload for each machine, an 'activity budget' for the entire machine population, and the machine shop's daily log.

The number and diversity of the components (there are between 500 and 1000 designations) and the frequent modifications made to very small production batches implied the need for a sophisticated information and decision-making system capable of closely controlling production and necessitating the use of integrated electronic data processing.

The new computerized system now operational provides total management of the machine shop in liaison with the plant's production management, CAD/M* workstations and machine shop control, on the one hand, and the machines and the various users on the other.

The efficient way in which the information and decision-making system is organized makes it possible to reduce downtime and waiting time so as to ensure maximum machine commitment times. Ancillary services, including central distribution, stores and maintenance, are also linked to the master station and provide data inputs.

Each numerically-controlled machine is equipped with something called a 'machine-tool terminal' (MTT) that provides interactive communication between the operator and the central data processing unit. These MTTs are designed to be simple to use and have two main functions: to enable the operator to call up the component routines required for fabrication, and to furnish the data needed for overall machine-tool management.

The Nantes works expect improvements in two essential areas to emerge from this centralized machine-shop management system, namely in machine utilization and in productivity. The resulting gain is expected to be in the region of 8%.

The longer machine commitment times will come from the fact that the machine shop will now have a more efficient organization and management system and the means to enable response times to breakdowns and other disruptions to be shortened.

As for productivity, it will be improved thanks to the optimization of manufacturing cycles, the lower rejection rates, and the elimination of punched-tape systems.

It has not been possible as yet to translate all the expected benefits into actual figures. Nevertheless, savings are expected in materials (no punched tape), in tasks performed outside the machines (no tape-reader maintenance and repair), in programming time due to the shorter times needed to develop the routines, and in machine-shop personnel (used previously for handling and moving equipment and documents).

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COMPUTERS

FRANCE'S THOMSON LAUNCHES APPLE COMPETITOR

Paris AFP SCIENCES in French 9 May 85 p 36

[Article: "Thomson in Apple's Footsteps"]

[Text] Paris--Thomson decided to follow in the footsteps of the U.S. company Apple, and next October it will market a computer called the T09 that will be both a personal and a professional computer, Mr Jean Gerothwolh, chief executive officer of Thomson Micro-informatique announced on 6 May in Paris.

This new machine, whose prototype was presented to the press at the opening of the SICOB [International Data-Processing, Communication and Office Organization Show], is designed for individuals, but also for executives and professionals. It arrives on a market that is already saturated by many manufacturers such as Apple, the pioneer, Commodore, Sinclair, Atari.

The T09 is compatible with the present peripherals and software of the previous models (M05 and T07-70) and will cost less than FF 10,000 for the central processing unit and the keyboard. Preseries production will start next June, and production at the Saint-Pierre-Montlimart (Maine-et-Loire) factory near Angers will begin late in August. The nationalized group is planning to produce 20,000 machines in 1985, which will be distributed mainly through microcomputer shops.

"Thomson will follow a cautious commercial and industrial policy, as many microcomputer companies fail because their inventories are too large," Mr Gerothwolh pointed out. He indicated that the group does not intend to produce any higher-end models such as machines for professional uses.

The T09, with 128 K of memory, is an 8-bit computer using the 6809 microprocessor of the U.S. company Motorola, which is already used on the other Thomson models. It will be possible to connect it to an optical wand and to a mouse (independent control box).

Thomson, which has conquered 30 percent of the French domestic microcomputer market in two years, sold 120,000 computers in 1984 and is counting on 400,000 this year, one fourth of which to be exported. It is penetrating foreign markets through subsidiaries or in association with foreign partners.

In Europe, Thomson is hoping to get 5-10 percent of the market in every country. Outside Europe, the firm will target only institutional needs, such as public contracts and national education.

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COMPUTERS

BRIEFS

PHILIPS WANTS IMPORT RESTRICTIONS--Measures must be taken to restrict the imports of a large part of the Japanese "consumer" electronics industry, a spokesman for the Dutch group Philips stated on 6 May. According to an internal survey of the company, Japan is concentrating all its strength to try and achieve a decisive advantage over its foreign competitors. It has already eclipsed the United States in the field of "consumer" electronics and will do the same in Europe if no measure is taken there, the survey adds. Japan might become the world leader in the field of sciences and the industry, and the result would be that the United States and Europe would become increasingly dependent on Japan, the survey goes on, expressing the fear that the same fate might await professional electronics. In that case, the experts state, "other sectors will follow, namely all industrial branches in which electronics play a part." Philips concludes that it is urgent to create a truly European market and necessary for the European industry to control it. [Text] [Paris AFP SCIENCES in French 9 May 85 p 38] 9294

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FACTORY AUTOMATION

RESULTS OF FRG INDUSTRIAL TECHNOLOGY PROGRAM, 1980-83

Frankfurt/Main FRANKFURTER ZEITING/BLICK DURCH DIE WIRTSCHAFT in German 8 May 85 p 5

[Research Funds for almost 400 Projects. An Interim Report on the Support Program "Manufacturing Technology"]

[Text] Frankfurt. An interim report on the manufacturing technology support program for the years 1980 to 1983 was submitted by the Nuclear Research Center Karlsruhe GmbH. During this period, almost 400 projects in 210 firms and research institutions received support funds amounting to approximately DM 164 million. Fifty-five percent of funds went to private industry and 45 percent to research institutions. The funds for private industry went primarily to smaller and medium-sized firms: firms with annual sales of up to DM 150 million received three-fourths of the funds allocated for industry. The Nuclear Research Center, which is the program sponsor of the manufacturing technology program of the Federal Republic, reports that in terms of technical areas 20 percent of the funds for industry were allocated for machine tools and manufacturing equipment components.

Program funding was concentrated in the areas of planning, design and disposition (CAD/CAM), handling systems, quality control, machine control, flexible manufacturing systems and related sociological, ergonomic and economic research. The key areas funded were the development of flexible manufacturing systems with 47 percent of total funds and CAD/CAM (computer-aided design, computer-aided manufacturing) with 25 percent. Related sociological research received approximately two percent of total funds.

As an example of a funded project the Nuclear Research Center Karlsruhe mentions the project of an integrated flexible manufacturing system for dynamically balanced workpieces which is carried out jointly by the Gear Factory Friedrichshafen, five research institutes, seven machine tool manufacturers and four project consultants. According to the Nuclear Research Center the knowledge gained here will yield a series of various new systems which have "good prospects for economic success" and are adapted to each product line. The concept contains all required elements, including the training of workers, the organization of work processes, profitability and investment planning as well as procedures for the gradual expansion of such systems.

According to the Nuclear Research Center considerable progress has also been made in the CAD/CAM area in bringing together CAD and CAM components. Reference is made to a German-Norwegian cooperative project involving the development of a module of compatible computing programs to support the design process, geometric modelling of bodies, planning the machining process up to the preparation of control information for the machine tools and documenting the complete product information using a data base. The interim report which is divided into four parts is available from the Nuclear Research Center Karlsruhe GmbH (Manufacturing Technology Project Sponsor, Mrs. Wiesner, PF 3640, 7500 Karlsruhe 1).

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MICROELECTRONICS

PHILIPS INVOLVED IN UNIVERSITY RESEARCH GRANTS IN NETHERLANDS

Rotterdam NRC HANDELSBLAD in Dutch 21 May 85 p 13

[Article by Zeger Luyendijk]

[Text] The Technical Universities of Twente, Eindhoven and Delft have this week had their financial situations eased. After 2 years of difficult negotiations with politicians and government, the long promised funds were finally released last Friday for the stimulation of microelectronics at the technical universities; 130 million guilders. This will enable the technical universities to purchase vital equipment until 1990 in order to provide the business sector with the equally important specialists in microelectronics, in chips.

According to Professor F.N. Hooge of the Technical University of Eindhoven, this will not mean any increase in the number of students over the present number. The three technical universities annually supply a total of 300 electrotechnical engineers, one third of whom specialize in microelectronics. "That number will remain the same," says Prof. Hooge, "since there will be no increase in the influx of students."

According to Prof S. Middelhoek of the Technical University of Delft, the importance in the stimulation of microelectronics is primarily associated with an improvement of the quality of the research and the training. "We saw the reputation of the instruction in microelectronics in the Netherlands slowly but surely eroding. Abroad, the importance of stimulating the microelectronics field has been appreciated at a much earlier stage."

Prof S. Middelhoek, subsequently, mentions the example of Belgium, which does not have an as large and advanced electronics concern as the Dutch Philips, but which nevertheless has invested 120 million guilders in a brand-new laboratory, specializing in research into and the development of chips. "Also Great Britain has invested much money in microelectronics, and the same thing applies to West Germany, which in various areas has advanced laboratories. The Netherlands need to be able to continue to contribute to teaching and publishing; otherwise, enterprises such as Philips will say, well, we do not need those people anymore," said Prof Middelhoek.

Philips

According to Prof Middelhoek, Philips has played an important role in obtaining the grants for the three technical universities for the stimulation of microelectronics. Together with the German electronics concern Siemens, Philips recently became involved in an ambitious project for the development of a new generation of chips, the megachip, for which an investment of 1 billion guilders is needed (each enterprise will contribute 500 million guilders). The Dutch government has subsidized the said project with an amount of 200 million guilders. "Since the demand for specialists in microelectronics is extremely great, also Philips will still have a great shortage of staff for the development of these chips. All over the world, the industry attracts people."

According to Prof O.W. Memelink of the Technical University of Twente, Philips has put pressure on the authorities to provide the--promised--money for the technical universities, while threatening to remove all activities in the area of chips from the Netherlands.

"After having raised the alarm in writing as well as in oral discussions with politicians, the technical universities approached Philips in 1983. There, something was said about doing something about the deadlock," Prof Memelink said. "We have had a talk with the Director-General of Higher Education and Scientific Research R. J. in 't Veld, at which meeting Mr Rauwenhoff of Philips (president of Philips Nederland, ZL) was also present. He said that Philips felt that it would no longer be profitable to continue the activities in chips in the Netherlands unless something was done to stimulate the instruction in microelectronics. Mr In 't Veld then said O.K., make a plan."

This did not mean that the money had yet been granted. In the fall of 1984, well over 12 months after the discussion in the Ministry of Education, the authorities and the technical universities discussed the matter with a panel of specialists from abroad in the area of microelectronics. "Only at that meeting were the cards, in fact, shuffled," says Prof. Memelink. The Ministry of Education denies that there has been any involvement on the part of Philips in connection with the allocation of the money to the technical universities.

Philips was still this morning unable to make any comment on the statement made by Prof Memelink.

Philips absorbs well over 75 percent of the approximately 100 graduate engineers in electrotechnology. "The Netherlands is behind in the area of microelectronics, the figures speak for themselves," says Prof Middelhoek. "Also medium-sized and small enterprises are making increasingly urgent demands for specialists in microelectronics, and this circumstance is belived to have played a role in the decision on the part of the authorities to grant the money to the technical universities."

Prof Hooge adds somewhat mockingly: "The time seemed ripe. I do not understand why they had to wait so long, the technical universities were already agreed on it." That means, according to Prof Hooge, that once the money is available, the plans may become implemented immediately, for everything has been put down on paper. The plans involve investments in equipment to keep the research areas free from dust and at the right temperature. It is especially important to keep the areas free from dust since a microscopic dust particle may influence the functioning of a chip. According to Prof Middelhoek, the investment in such equipment for the technical university at Delft alone will involve an amount of 7 million guilders.

"We have the problem that the equipment for the development of chips, one of the areas on which the instruction in microelectronics will be specially focussed, each years becomes about 10 times more expensive," says Prof Middelhoek. "Ten years ago, we were able to manage by means of the money we got from the governing body, that has now become impossible."

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MICROELECTRONICS

ACTIVITIES OF FRENCH PHILIPS PLANT IN OPTOELECTRONICS

GaAlAs Development

Paris ELECTRONIQUE ACTUALITES in French 17 May 85 p 1

[Article by J.P. Della Mussia: "The Caen Factory of RTC Won Its Industrial Optoelectronics Bet on GaAlAs"]

> [Text] In 1978-1979, the Caen factory of RTC [Radiotechnology-Compelex] made a major technological decision concerning the development of its new optoelectronic components: betting on the GaAlAs/GaP material when the Americans were pursuing GaAsP.

Certainly, GaAlAs was initially a lot harder to tackle than its competitor, but it was more stable, intrinsically 10 times faster, and it allowed a priori for greater candle powers.

Nowadays, LED [light-emitting diode] production using this material amounts to several million parts per week, and RTC believes that it ranks second in this field, behind Stanley.

Unlike Stanley or Toshiba, RTC is not announcing 2-cd or 5-cd laboratory models, but it knows how to produce 0.5-cd devices at low cost and in very large series: for this company, the leading-edge technologies used in Japan do not make it possible, today, to envision the low costs required for any industrially significant market openings. RTC is now introducing this material in a great many optoelectronic products, including infrared devices and photocouplers. Performance is improving by leaps and bounds.

70 Percent of the LED Market

In addition to the above-mentioned advantages, GaAlAs makes it possible for RTC to use only three basic materials (to emit in the yellow and green wavelengths, and in the rest with GaAlAs) out of the 10 used throughout the world.

Indeed, GaAlAs will cover the range from orange (600 nm) to infrared (800 nm) for LED and lasers.

This "universalization" of the material was made possible only through a major reduction in manufacturing costs, which itself was the result of excellent control over the Bridgman process used to pull monocrystals, and of a single-cycle process to obtain two liquid-phase epitaxic layers (normally, two successive deposits are required). RTC thus achieves production efficiencies on wafers of the order of 60 percent, which result in production costs that are certainly greater than those of GaAsP in the red range but lower than those of GaAsP/GaP used for super-red diodes.

RTC's goal in staking all on GaAlAs is to get 70 percent of the the LED market for indicator lights (orange, red, dark red) and the company expects a growth of 30 percent per year, compared with a market growth of 16 percent per year. Thanks, among other things, to its industrial expertise with this material, the company hopes to grow by 20 percent per year on the market of infrared emitters/receivers (which is growing at the rate of 8-10 percent per year). Also thanks to this material, in a few weeks RTC will be in a position to hand over to car manufacturers the first prototypes of LED-based red tail lights meeting current standards (and having a consumption half that of present tail lights).

GaAlAs will also enable RTC to offer 10-15-MHz photocouplers already by the end of this year, and later on probably 40-MHz models.

Thanks to GaAlAs, a few years ago RTC could give to Velec/CGCT [General Telephone Engineering Company] an infrared emitter/receiver couple for the Cable Plan whose emitter operates on 50 MHz.

Finally, RTC is supplying its material to Philips/Holland, which uses it for audio-disc lasers.

Expansion Planned

Paris ELECTRONIQUE ACTUALITES in French 24 May 85 p 20

[Article by J.P. Della Mussia: "In Optoelectronics, RTC/Philips Wants to Grow Faster Than the World Market"]

[Text] In our last issue, we described how the various optoelectric markets might increase in years to come, and what part the RTC Caen factory played within the Philips group as far as optoelectronics are concerned.

Actually, not only does RTC/Philips expect the market to grow at a very fast pace, especially for discrete components (+ 22 percent per year), but the group intends to grow still faster than the market in several sectors. Today, therefore, we shall review its policy for each market segment.

+ 30 Percent Per Year For Indicator Lights

The group's most surprising ambitions a priori are certainly those involving indicator lights and photocouplers. Indeed, planned growth for the former is + 30 percent per year, whereas the market is growing at the rate of about 16 percent per year. This rate is accounted for by the success of the Caen factory in achieving industrial expertise with GaAlAs/GaAs (see our previous issue). The goal of the Caen factory is now to stabilize the technologies and coatings. For red, the company is contemplating using only GaAlAs by 1990-1992.

The unit is now engaged in research to improve emission efficiency (to increase it threefold by using a transparent substrate structure and a reflecting rear-face technology) and to extent the emission range toward yellow-orange. For yellow, new materials are being researched to achieve better efficiency (they include GaAlInP). For green, they are trying to optimize a structure emitting at 550 nm (pure green) whereas present indicator lights are emitting at 565 or 570 nm (yellow-tinged color). To achieve this, RTC is considering using GaP undoped with nitrogen, and improving the crystal quality and purity of thick-layer epitaxy.

As far as packages are concerned, the major 1986 innovation will be the introduction of LED in packages for surface mounting.

For displays, Philips/RTC are staking all on liquid crystals, and in particular on the twisted nematic technology, but the flip-chip glass technology could possibly be used for the control circuit. According to RTC, the twisted nematic technology offers four advantages over the dichroic technology: viewing angle, manufacturing cost, off-state esthetics (screen-printing is apparent with the other models) and the range of colors available. According to RTC, Videlec is now one of the five world leaders in liquid crystals. On the French market, sales are said to experience spectacular growth: + 60 percent per year, thanks in particular to the automobile market. Videlec is now in a position to produce readouts of up to 33 x 16.5 cm^2.

As far as studies are concerned, the company is trying to generalize the use of color screen-printing on glass for its standard readouts, to improve readout contrast, to create new control circuits, and finally to develop monochrome displays compatible with data-communications systems and minicomputers. Its agreement with Sharp is probably designed to bridge an existing gap in this field.

10-MHz Infrared Emitters

As far as infrared components other than fiber optic components are concerned, RTC's goal is to grow by 20 percent per year on a market that is growing by 8-10 percent per year. As in the case of indicator lights, photocouplers, diode lights and fiber optic components, this optimism is based on the company's expertise in GaAlAs technology, which admits of very high infrared powers and very low response times. RTC is already producing a reference model, CQY52A, in this technology (0.45 mW/sr at 20 mA; 30 ns) and in the past four months it has been giving out samples of a CQW89A-2 model capable of supplying over 15 mW/sr at 100 mA while offering a response time of 30 ns. (Another model, CQY23, is presented in a lateral package).

Until now, GaAs infrared emitters available on the market were up to six times less efficient for this response time of 30 ns. Other, equally efficient models, on the other hand, offered a response time of 3 μs. The introduction of GaAlAs components produced in large series implies, for instance, remote-control capabilities of up to 10 MHz instead of 100 kHz, and with candle powers greater than formerly!

As far as photoreceivers are concerned, there are no major news, apart from the fact that the photodiode arrays used for closed-loop control in the Philips audio-disc are now included in the Philips component catalog (Ref. OF 585/586).

100-cd Lights

In the field of diode lights, on the contrary, there are many exciting news: RTC completed feasibility models for vehicle tail lights capable of emitting 5-100 cd along their axis, and a preliminary model of traffic lights emitting from 300 to 500 cd along its axis. The big news, of course, is the automobile lights. With present components, it is already possible to consider making lights that would use up half the power of present lights (12 W instead of 24 W) and whose price would be about the same, at systems level and for an equal market. Such lights would be of a simpler design). Advantages: smaller thickness; service life; esthetics (once off, all lights are of the same color and their shapes can be varied). According to RTC, the market for LED to be used in diode lights, in number of parts, is equivalent to the requirements of all other applications.

Over 20 Million of Photocouplers This Year

RTC had to wait a long time before it succeeded with its photocouplers, since the company introduced its coplanar technology--a world first--10 years ago and decided to conquer a large part of the French market in 1981.

A certification campaign was thus launched in 1982, with success; today, RTC is producing over 20 million parts per year and is said to cover 30 percent of the French market. Its goal is to grow in this field by 30 percent per year on a world market with a growth rate of + 19 percent per year, in part through the introduction of GaAlAs infrared emitters, as far as emitters are concerned, and through the integration of receivers and complex functions on a single chip. GaAlAs, in particular, proved still more stable than presently used materials and [its projected growth] is linear over two decades. For one year now, RTC has been marketing a photocoupler in a metallic package (CNX 91/92) and two DIL models (SL 55055 and CNR36) using a GaAlAs emitter. A 10-15 MHz model should be offered before the end of the year, and CMS [expansion unknown] models on ceramic in 1986. RTC believes that its photocouplers are now more stable than those of its competitors and says that it no longer fears technical competition, not even from General Electric, Hewlett-Packard or Toshiba.

In another issue, we shall review RTC developments in the field of fiber optic components.

9294
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MICROELECTRONICS

PHILIPS DEVELOPS NEW KIND OF SEMICONDUCTOR IMAGE SENSOR

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 8 May 85 p 5

[Sharper Images without Refining the Electrode Structure. Philips Develops a Semiconductor Sensor with "Accordion Effect"]

[Text] Frankfurt. The staff of the Philips Research Laboratory in Eindhoven has developed a new semiconductor image sensor. This new sensor contains twice as many light-sensitive elements per surface unit as the sensors currently known and does not require the refinement of the electrode structure which is put on the sensor surface with IC technologies. The improvement is due to a different method of applying the voltages to the electrodes. This makes it possible to accommodate one row of picture elements under two electrodes each, while so far four electrodes were required for each row of picture elements.

Due to the presence of only two electrodes per picture element, the transport of the image information from the receiving section to the storage section in this sensor with frame transfer is somewhat more complicated. The potential barriers which separate the information contained in the individual cells are first sequentially drawn apart and afterwards compressed again, similar to the bellows of an accordion.

A semiconductor image sensor, but also CCD-shift registers contain narrow, parallel channels of N-material in a P-silicon layer. On the surface electrodes in the form of lines are located perpendicular to these channels. These electrodes are insulated from one another and from the silicon layer. If the silicon area is exposed through the electrodes, the silicon releases electrons. If appropriate potentials are applied to the electrodes, these electrons gather in the N-channels under the positive electrodes. In this way, during a frame period a charge is collected with the size of the charge packages thus obtained serving as a measure of the local illumination strength in the image.

Subsequently, during the read-out phase the electrode potentials are changed in such a way that the potential walls and wells perform a "peristaltic" movement, which transports the charge packages from the image section to the storage section. From there, they are read out line by line and thus provide the video signal. During the following frame period the potential pattern on the electrodes in the image section is shifted by two electrode widths, which results in interlaced scanning customary in television technology. Although three electrodes per cell would be sufficient for transporting the charge collected, it is customary to use four electrodes per cell; according to Philips, this simplifies control, and a correct interlaced scanning is possible.

Using the customary 3.5 micrometer technology for the sensor production results in rather large cell dimensions. These can be somewhat reduced in size by using a three-layer electrode structure. However, the light hitting the sensor must pass three layers of electrode material (polysilicon) in several places before it is detected. This leads to reduced sensitivity, primarily in the blue part of the spectrum.

Theoretically, two electrodes per cell would be sufficient to collect the charge, however, transporting the charge would no longer be a simple matter. Here, the following solution was found: The image information is no longer transported to the storage section all at once, but each charge package is distributed initially and temporarily in the area below two electrodes beginning at the bottom edge of the image, with the charge packages being separated from each other by a potential barrier which is twice as wide as the electrode. Then, the charge can be transported again in the usual manner. This way the image information is "peeled" off line by line.

The short-term "expansion" of the information is undone when the charge packages reach the bottom edge of the storage section so that here too a row of picture elements is again located below two electrodes. During final read-out by line, space at the lower edge of the storage section is freed up automatically; this space is required for again expanding the charge packages for the transport to the lower edge.

In this manner much smaller cell dimensions are possible while the 3.5 micrometer manufacturing technology can be maintained. Now a total of 604 by 588 light-sensitive elements can be accommodated in an area of 38.2 square millimeters. It is even possible to greatly reduce the area in which the electrodes overlap. This fact combined with local reductions of the electrode width leads to increased sensitivity, particularly in the blue range. However, according to Philips the results described here apply exclusively to laboratory tests and will not necessarily lead to industrial production or the marketing of new products.

12831
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MICROELECTRONICS

FRANCE'S PECHINEY ENTERS ELECTRONICS CERAMICS MARKET

Paris AFP SCIENCES in French 9 May 85 p 42

[Article: "Pechiney Enters Electronics Ceramics Market"]

[Text] Paris--In the next few weeks, Pechiney and the Eurofarad company will create a company to develop and produce ceramics for high-density high-speed electronics, it was announced in a communique published on 9 May. The "development and production unit" will be "capable of meeting rapidly the needs of the French market and of gaining a foothold in Europe," Pechiney indicated.

According to a reliable source, the company would be created early in June and Pechiney would own a majority interest in it; however, for the time being, negotiations being still in progress, we do not know what the respective investments of the two companies will be, nor where the production unit will be established.

Pechiney is already engaged in the field of ceramics through its subsidiaries Criceram (powders) and Demarquest (thermomechanical ceramics), and it has now decided to enter the field of electronic applications.

Its partnership with Eurofarad, a specialist of the multilayer ceramic capacitor, should help it enter this important sector. Indeed, ceramics for electronic applications involve more particularly the multilayer interconnections that are used as supports for high-density high-speed integrated circuits made of silicon or gallium arsenide. Current progress in semiconductor performance, if they are to be fully realized, will have to be complemented by the development of high-density interconnection systems that can be made only out of ceramics.

9294
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MICROELECTRONICS

ORDER FROM 'MEGACHIP' PROJECT FOR SWEDISH CLEAN ROOM

Stockholm NY TEKNIK in Swedish 18 Apr 85 p 40

[Article by Ulla Karlsson]

[Text] Because of its knowledge of ventilation, Svenska Flakt has received a big European order for clean rooms. The extremely clean rooms will be used in the so-called Megachip project.

The goal of the project is that Siemens and Philips will start manufacturing semiconductor memory banks containing 4 million bits within 5 years.

Most of the steps involved in manufacturing integrated circuits must be performed in extremely clean rooms today. For instance this applies when the lines that give a circuit its properties are transferred to a silicon chip.

The reason is that dust particles can easily ruin a circuit.

In spite of clean rooms--today Rifa uses clean rooms with 100 particles per cubic foot of air--dust particles continue to be the major reason for defective circuits.

In keeping the number of particles in the room at a minimum it is vital, of course, that ventilation and air intake occur properly. Svenska Flakt is an expert in this area. This led to the order for clean rooms with an area of 4000 m^3. They are part of the estimated 10,000 square feet needed for the Megachip project.

Ready by 1990

The clean rooms are a must if West Germany's Siemens and Holland's Philips are to succeed in their goal of starting to manufacture semiconductor memory banks with a capacity of up to 4 million bits (4 Megabita) by 1990.

The clean rooms that have been ordered will be in Class 10. This means that they can contain a maximum of 10 particles per cubic foot of air. There are 500,000 particles in outdoor air. It costs around 20,000 kronor per square meter to build clean rooms of this type. This means that the order obtained by the Swedish company is worth around 80 million kronor.

6578
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MICROELECTRONICS

BRIEFS

ULTRA-FAST BELGIAN TRANSISTOR--Louvain--The Interuniversity Microelectronics Center (IMEC) is currently perfecting an ultra-fast bipolar transistor, which was developed earlier by the ESAT [Electronics, Systems, Automation and Technology] department at the Catholic University of Louvain. The application of this transistor in integrated circuits (chips) makes it possible to develop faster computers; specifically, the new transistor delivers a gain up to 14 times higher than that of conventional transistors. This is reported by Technivisie. A bipolar transistor is a building block of integrated circuits (ICs). A large part of classical digital components have been put into effect in bipolar technology. However, the speed of these components is limited by their basic resistance. Because the the new transistors have such a small basic resistance, their speed can increase considerably. This has resulted in the fact that their application in computers should raise the speed of computers considerably. [Text] [Brussels DE STANDAARD in Dutch 7 Feb 85 p 1]
12271

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SCIENTIFIC AND INDUSTRIAL POLICY

EC STRUGGLES WITH RESEARCH, SDI, EUREKA ISSUES

Zurich NEUE ZUERCHER ZEITUNG in German 8 Jun 85 p 15

[Article by "rg": "The Technological Community--Slogan Or Reality ?"]

[Text] The Reagan administration's Strategic Defense Initiative (SDI) is the most significant scientific, technological and industrial effort undertaken by the United States in this century. European views on how to respond to it differ widely. For a variety of reasons, France has proposed "Eureka" as a European alternative. Even prior to its summit meeting in Milan, the EC Commission will submit its own plans for the creation of a technological community.

Debate on the $26 billion, multi-year program of the United States is very lively with regard to its defense strategy aspects. But even if the program succeeds in fulfilling military expectationsonly partially or not at all, there is a danger that transatlantic relationships with regard to R&D capabilities and, as a consequence, with regard to innovation and competitiveness will shift in favor of the United States. According to Karl-Heinz Narjes, the EC Commission vice-president responsible for the community's research policy, it is all the more realistic to look for spin-off effects in view of the fact that the boundaries between defense and civilian research in high technology are becoming less distinct all the time. The Brussels experts believe that about 80 percent of SDI will benefit both the military and the civilian sector. For this reason, they are also referring to SDI in terms of its being an American industrial policy of vast proportions.In order to prevent that bilateral agreements between the Americans and European governments and/or firms and institutions tie down too large a part of the research capabilities, European R&D policy will have to provide the qualitative and quantitative basis for a real technological community, sources at EC headquarters say. This slogan has not yet assumed any concrete shape; but closer cooperation in technology will be a major topic at the EC summit in Milan in late June.

European Diversity

The Community of Ten—or more generally, Western Europe—is still in pretty good shape in terms of R&D in spite of all the Cassandra cries. According to the EC Commission, Europe is still keeping pace with the United States (and Japan) or perhaps in the lead worldwide in such areas as atomic fusion, high energy physics and environmental technology. Europe is clearly behind, however, in future-oriented fields like information technology in the widest sense, in genetic engineering and in laser technology. The EC officials say that the reason why Europe is behind in some research areas is lack of personnel and funds. In 1979, the number of people doing research in the United States was 560,000; but still 360,000 in the European area and 330,000 in Japan. 1984 expenditures for civilian research projects are estimated at 35 billion ecu in the United States; 27 billion ecu in the EC area and 20 billion ecu in Japan. Europe's sore spots, which lead to corresponding losses in efficiency, are traceable, it is pointed out, to the many different languages; to geographic, institutional and disciplinary isolation and to insufficient cooperation between industry and the research community. European diversity and heterogeneity, in other words, has its price.

The above "deficiency roster" also demonstrates that EC research policies thus far have met with only limited success and that insufficient use has been made of the European dimension. Despite the fact that it could draw on a flexible and adaptable repertory of options, ranging from straight coordination (concerted action) to research by contract (indirect action) all the way to assigning the job to the EC joint research agency (direct action), this particular aspect of EC policy has in fact been relegated to a secondary role. Because of their diverse interests in research policy, the larger member nations have always preferred either to go it alone or to join with other governments rather than to opt for a truly joint effort. Of course there are some solid economic considerations behind each such decision. The intergovernmental route has led to some successes, as the Spacelab, Ariane and Airbus projects indicate. Thus, it is not surprising that France, Great Britain and the FRG spent 10 times as much on international projects than on joint EC research policies and that the research share of the total EC budget stands at just about 3 percent.

Focus on Nuclear Research

In contrast to other fields such as agriculture, foreign trade or transportation, the original EC treaties say nothing about clear obligations on joint research efforts. The sole exception to this rule is the Euratom treaty, eight articles of which refer to promoting research which, of course, is limited to the nuclear field. This is why nuclear research—or more broadly speaking, the more rational use of energy—is the real focus of EC research policy. The joint undertaking named "Jet", in which Switzerland and Sweden are also participating fully, has turned out to be a showcase project. "Jet," which has legal status of its own and is 80 percent financed out of the EC budget, has resulted in the establishment of the world's largest experimental fusion research facility in the world at Culham near Oxford. Construction on the facility was completed in June 1983 and "Jet" already started to provide test results in December of that year which the Commission says "give evidence of a clear lead ahead of all other comparable facilities in the world."

There is more of a difference of opinion concerning the meaning and purpose of the joint research agency (GFS) with its four research facilities at Ispra, Italy; Karlsruhe, FRG; Geel, Belgium and Petten in the Netherlands. The agency was established as part of Euratom but soon was relegated to a rather isolated existence. The reason for this was a Franco-German dispute on whether to give preference to light water or heavy water reactors. Attempts to revive GFS did not start until 1973 when some non-nuclear research functions were assigned to it. But many observers have their doubts as to whether the present staff of 2,000 and the 1984 budget of 180 million ecu are in any reasonable way commensurate with the research findings being turned out.

New Priorities

Already in the early seventies, EC research activities began to diversify appreciably and were strengthened through the introduction of "COST," an international cooperative effort of 19 nations, including Switzerland. But it was not until the ministerial council adopted the overall program for 1984 to 1987 in 1983, which projects expenditures of 3.75 billion ecu, that a global, comprehensive and consistent research policy was developed. Once again, a major portion of it is devoted to nuclear matters. Another focus will be on promoting industrial competitiveness; the overall program has set aside 1.060 billion ecu for this purpose. The program also calls for special emphasis on R&D efforts in the new technologies. An important start has already been made by launching the multi-year "Esprit" program in modern information technology—with a price tag of 1.5 billion ecu.

The Delors commission would like to start an effort similar to "Esprit" in the area of genetic engineering and telecommunications on an EC-wide basis. Great Britain and the FRG maintain that their opposition to these ambitious EC plans is based on financial considerations; but an EC official has told us that the real reason behind their opposition is that these countries (and France as well) would rather conduct their research programs alone or with selected partners—even in high technology. At any rate, the larger EC member states do not seem particularly keen on putting their money on the community—the more so since the consensus principle in the ministerial council requires them to consider the wishes of the small nations, whose research priorities frequently are different. This is probably another important reason why President Mitterrand is calling for creation of "Eureka," a European technological community—which is to be a research organization of which the EC would only be an associate member. The Paris government has said that "Eureka" would be engaged in research on large-scale computers, high speed and miniature electronics, artificial intelligence, high power lasers, optronics and new materials.

Test for Delors Commission

Jacques Delors, the president of the EC commission, recently complained before the EC parliament in Strasbourg about the fact that "the Americans are picking those things off the European shelf which are of technological interest to them—and we do not even have an institution to help us jointly to discuss it with them." This is another way of saying that the U.S. program could lead to a massive brain drain of highly qualified European scientists. And, since SDI is already under way, the community will have to decide as soon as possible, in the Brussels view, on a credible alternative with sufficient "sex appeal" for industry and the research community on this side of the Atlantic. Will SDI become a lever to promote European integration ? The EC commission is trying to take advantage of the opportunity.

Brussels has therefore officially welcomed the French proposal. But behind the scenes, there is a good deal of criticism of it and feverish efforts are under way to come up with an EC proposal as such which is to provide a basis for discussion at the EC summit. The main objection is that the Mitterrand plan calls for establishing an agency and, in that sense, fails to build on existing research (and industrial) policies. This intergovernmental project does not guarantee any European standards for high-tech products, nor does it automatically provide for free access to government contracts throughout the community. Thirdly, such an agency would not have any authority toward the outside (as the EC does) and this, in turn, might lead to everyone speaking for himself but no one speaking for the community as a whole. A communal solution on the other hand, the Brussels experts say, would not require all the member countries to pay for and bear responsibility for all research projects. For another thing, the technological community would have to provide an opportunity to interested third countries to join. But it is still a secret what exactly the EC believes the organizational structure, the decision-making processes as well as the selection and funding of research projects are to be like. Thus far, it has merely been said that the commission would like to see the technological community established on the basis of a new, tailor-made agreement rather than on the basis of the existing EC treaties.

During the coming weeks and months, the Delors commission will be faced with one of its first great tests. It must not only prove that a joint response to SDI would be advantageous in the sense of preventing the dreaded American lead in technology, but it must also convince all the member nations that a technological community integrated into the EC framework would be preferable to the French "Eureka" solution. As regards the former, not only the appropriate sectors of industry but also various member states are showing a great deal of interest in the SDI project. Until today, only France has officially said no to participation in the U.S. research program—on grounds of military strategy. Word from Bonn, London and Rome, for that matter, is that participation in both SDI and "Eureka" is perfectly compatible. At least in their official announcements, all member states have in fact said that they favor the French plan to step up research in high technology. The attempt by the EC commission to jump onto this moving train is quite understandable. On the other hand, past experience does not convincingly show that the EC way really is preferable to intergovernmental cooperation in Europe.

9478
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SCIENTIFIC AND INDUSTRIAL POLICY

SPANISH 'SCIENCE LAW' PROVIDES FIVE-YEAR PLAN

Paris AFP SCIENCES in French 9 May 85 p 12

[Article: "'Science Law' Approved by the Spanish Government"]

[Text] Madrid--Felipe Gonzalez's government decided to give a new dimension to scientific research in Spain when it recently approved a bill on the development and coordination of scientific and technical research.

Spain ranks among the last of all European countries as far as the percentage of the gross domestic product devoted to research is concerned. At present, this percentage varies from 0.4 to 0.5 percent, compared with an average of 1.5 percent or so for OECD countries.

According to the minister of education and science, Mr Jose Maria Maravall, the law should provide the country with the tools needed for researchers to carry out their activity on the basis of priority objectives adapted to Spain's socio-economic needs.

The bill, called "science law," provides that the government would adopt a five-year research plan setting the priorities and objectives of the public sector in this respect. The plan, the first stage of which will come into effect in 1986, will include research programs on a national and regional scale and by sector.

The "science law" will also reform and increase the power of major public organizations devoted to research, whose lack of coordination has often been denounced in the past. As an example, no less than six public organizations now have overlapping functions.

It will be the responsibility of state organizations to set goals for national research plans and carry out the resulting programs. This restructuring will also make for greater researchers' mobility.

The "science law" on which parliament will have to vote next fall also provides for a possible collaboration between state organizations and public and private firms in order to promote "a link between the industrial and scientific policies."

9294
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SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH SCIENCE PARK TAKES ROOT NEAR NICE

Paris SCIENCE & VIE ECONOMIE in French May 85 pp 28-31

[Article by Pierre Barrot: "Silicon Riviera"]

[Excerpts] For the past 15 years a town dedicated to science has existed near Nice (France). It hopes to become one of the main computing and high technology centers in Europe. A venture full of good intentions about which SCIENCE & VIE ECONOMIE presents some fascinating examples.

The countryside is ideal. Favorably located in the center of the Cote d'Azur near Antibes and about 15 km on the highway from Nice airport; the park is spread out on a hill planted with pine trees. Pierre Laffitte, head of the National Mining School and initiator of the program, spotted this site in 1960. At that time, there was nothing but brush. Fifteen years later, more than 5,000 people are working in 150 factories, parceled out over 2,400 hectares of greenery. In order to accommodate some of the personnel, two towns have been built: Sophia-Antipolis, which is administratively part of the municipality of Valbonne, counts more than 2,000 inhabitants by now.

How is this remarkable site to be described? In fact, it is not a new town, since the whole operation aims at action, rather than at housing. Sophia-Antipolis is to be classified among the "science parks," for which the model comes to us from the United States. The recipe is 30 years old: "Take (or create) a high-level university with pleasant surroundings near a big city. Encourage contacts between students, researchers and business leaders. Facilitate the creation of industrial firms to take advantage of the researcher's ideas. Wait a couple of years and you will obtain a Silicon Valley..." The example of Stanford University and its industrial park, which has become the nerve center of the American electronics industry, is of course the obvious reference.

Nowadays everyone dreams of repeating this miracle. In the United States, 18 states have decided to create their own industrial and science parks. In Japan, about half of the researchers working for public research institutions have been brought together in a university in Tsukuba, a scientific town in which an enormous high technology fair is currently being held. In Europe, an equal amount of interest is focused on these "technopoli." The English, for that matter, have achieved a huge success thanks to the industrial boom of Cambridge. During the last 10 years, about 350 high tech firms have been created around this respectable university center. The Germans, for their part, have opened seven "innovation centers" since November 1983, and the Dutch are getting ready to start the construction of an immense park in Groningen.

Thus Sophia-Antipolis is not an isolated experiment, even if there are some differences between it and foreign examples. Sophia is the only industrial park in the world that was not created around an existing university. For that reason, the first thing its promoters had to do was attract a certain number of educational and research institutions to create the indispensable scientific nucleus. The Mining School, prompted by Pierre Laffitte, was one of the first to install some of its laboratories in the park. At times its computer specialists can work outside while inside advanced research on materials continues. A considerable number of public institutions was soon to follow: CNRS [National Center for Scientific Research], which decentralized its solid state physics laboratory; the Bureau of Geological and Mining Research (BRGM); the French Agency for Energy Management [Agence francaise pour la maitrise de l' energie] (AFME), whose center is more particularly charged with the development of solar energy; the Scientific and Technical Building Center (CSTB), and the National Institute for Data Processing and Automation Research (INRIA).

Large private businesses, both French and foreign, did not wait long to show interest in such an experiment. Among the firms that established laboratories in the park were Thomson-CSF, Telemecanique, Telesystemes, Dow Chemical, Dow Corning, etc. It was there that Digital Equipment built its European center of remote diagnostics and remote maintenance. Its technicians use the telephone to repair computers. Other firms have now decentralized their computer management services departments. The Air France building houses the computers that manage all passenger traffic operations: reservations made by 10,000 terminals spread all over the world, passenger registration at airports, etc.

Computers, big or small, are present all over Sophia-Antipolis. As a matter of fact, they are found in the laboratories, as well as in the Mining School, for instance, in which pictures of the earth taken by remote sensing satellites are examined. But they are also found in the two training centers that have already started their activities: the Higher Data Processing Institute (ISI), which delivers a computer and automation engineering degree after a 3-program and the Education and Research Center of Data Processing, Communications and Systems (CERICS), which offers a one-year specialization in software engineering at a very high level.

Will Sophia-Antipolis become the French equal of Silicon Valley, which its promoters hope to imitate? If so, it would be necessary that the effect of the cross-fertilization, which should arise from the coexistence of both fundamental and applied research laboratories, lead to the creation of small or medium-sized innovating firms. At this moment, these kinds of firms, the number of which is growing rapidly in the park, do not really have their roots there; they were in fact set up elsewhere and moved to the park in order to develop in the shadow of the big laboratories. The typical example is that of a small group of 13 computer specialists belonging to the American firm Mattel Electronics, which decided to establish itself by creating software for computer games under the clever and attractive name of Nice Ideas.

It is, of course, too early to know whether the operation has been successful. It will take another 5 or 6 years before a reliable opinion about the first French science park can be given. From now on, one thing is absolutely clear: the constant increase of firms moving in. The mixed-trade association, which ensures the development of the whole operation, is still searching for additional firms. It is working with the help of DATAR (Delegation a l ' amenagement du territoire et a l'action regionale) [vice Ministry of National Planning and Regional Action], especially in the United States and in Japan, although it is finding more and more spontaneous nominations. The movement has reached the point that by 1990 no more sites will be available. Unless, of course, new real estate is added to the area of the technopolis.

Another reason for the promoters of the scientific town to be satisfied is the substantial foreign presence. No deception about the merchandise:the park is international. Evidently, the close proximity to Nice airport, which has daily connections to the main European capitals and large towns,is a major trump card for the development of this international project. Various American multinationals have decided to set up their research centers or even their European headquarters in Sophia-Antipolis. The creation of an international school in the middle of the park in 1978 has also made its contribution. The 3,500 students are of about 50 different nationalities. They are now able to complete their baccalaureat, in either their native language or in bilingual French-English or French-German sections.

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SCIENTIFIC AND INDUSTRIAL POLICY

THREE-YEAR FRENCH PLAN INCREASES R&D EFFORTS

Paris ELECTRONIQUE ACTUALITES in French 24 May 85 p 2

[Article: "Increased State Effort for R&D Until 1988"]

[Text] The draft of the 1986-1988 three-year plan for technological R&D which the government will soon submit to Parliament should, during the next few years, intensify the rapprochement between public research and industry which has become apparent in the past three years. It is more particularly designed to encourage innovation and the industrialization of research results.

Under the draft plan, the percentage of the French gross domestic product devoted to research should increase from 2.25 percent now to 2.6 percent in 1988. In constant francs, from 1986 to 1988, the civilian R&D budget should increase by 4 percent per year.

In the general state budget as a whole, "the real value, by volume, of the research budget will be very much privileged," the Ministry of Research pointed out.

Under the three-year plan, several new mobilizing programs are to be launched, in particular concerning new materials. In addition, various measures will encourage researchers to get out of their specialties and innovate.

A research leave will be created, so that corporate salaried employees taking such a leave will be able to develop research in which they are interested.

The government also decided to double the amount of research tax credits granted to the industry. They will increase from 25 percent to 30 percent, with a ceiling of FF 5 million per manufacturer. "That will amount to injecting some FF 600-700 million into industrial research (i.e. 1.5 percent of the civilian research budget)," Mr Hubert Curien, minister of research and technology, pointed out.

Finally, under the three-year plan, 1,400 researcher and engineer jobs are to be created each year, and they will be essentially intended for the young.

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SCIENTIFIC AND INDUSTRIAL POLICY

COMMENTARY ON DANISH TECHNOLOGY DEVELOPMENT PROGRAM

Copenhagen BERLINGSKE TIDENDE in Danish 20 Feb 85 p 12

[Editorial: "A Policy's Renewal"]

[Text] With the consent of Parliament, the Technology Council has now launched a renewal of Danish industrial policy which will go under the name of the Technological Development Program. The basic plan for the expenditure of 1.5 billion kroner over 4 years has been published. The main point in the program is mobilizing Danish industry to meet the challenge which springs from revolutionary developments in the field of microelectronics, but the possibility of expanding the program to biotechnology and other industrial front lines has been created also.

When the state embarks on such a support program, discussion invariably arises over who will now benefit from it. That has happened this time as well, with suppositions that it will still be large and up-and-coming firms which will run away with the money at the expense of small and medium-large firms. This however is not the intent. The technological service net under the Technology Council's wings developed out of precisely a recognition of the fact that Danish industry by preference is made up of smaller firms which, lacking their own operations experts, need to draw on service-oriented research centers. One half of the first 500 million kroner has therefore been earmarked for activities in the public good in the management of such institutions.

The second half of the money is being made available for development work in the industrial firms themselves. It is a good thing that as much as half of the funds can be funneled into activities which are directly inspired by the firms themselves. And yet: this money will be allocated by foundations for development and product development which traditionally enjoy active good graces in smaller and medium-large firms. But firms will apply only if they can feel confident that the well guarded ideas in which their own future prospects are tied up are secure. For this reason Parliament will keep its inquisitive nose out of this if it wants to avoid puncturing the whole tank.

It is important for both the program and industry's self-esteem that the arrangement build on the help-to-self-help principle. New figures show that in 1985 for product development and the introduction of new technology industry itself will devote a sum which is ten times as great as state support. The same is true in the sector which is called export promotion. In the high interest period which the country has put behind it, Danish industrial support became unexpectedly expensive. The technology program can now be carried out in a unified support framework which had been quite drastically reduced for a few years. This too is good news.

It is perhaps especially promising for the future that the program also leaves an economic door ajar for the purchase of advanced equipment by teaching institutions and universities. Indeed for the long term it is of decisive importance for industry that cooperation with research and integration with the education system progress fruitfully.

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NETHERLANDS, FRG COMPANIES TOGETHER IN BRITE PROJECT

Rotterdam NRC HANDELSBLAD in Dutch 7 Jun 85 p 9

[Article: "Together With Germans in Technology Project"]

[Text] Helmond, 7 June--Three German and three Dutch companies have submitted a joint project proposal to the European Community within the framework of the BRITE program. BRITE stands for Basic Research for Industrial Technology in Europe.

Cooperating on the application are the German firms AEG Telefunken and Robert Bosch, the Federal Institute for the Testing of Materials (a sort of German TNO [Dutch Central Organization for Applied Scientific Research]), as well as Philips, Volvo Car and the small company Weld-Equip, located in Helmond. The project is directed at developing a method for using microprocessors to determine during spot-welding whether the end result is good. A method such as this could be used, for example, in welding automobile components, but also in linking connective fibers in chips. The project involves a figure of approximately five million guilders. If the request is taken up, the European Community will account for half of the cost. A total of 1.2 billion guilders are available within the framework of the BRITE program, which focuses on eight areas of basic research.

The Weld-Equip company was founded in 1957 as a one-man business and has since then developed into a commercial enterprise for specialized pressure welding equipment. It was not until 1975 that the firm decided to go into manufacturing as well. In the meantime, Weld-Equip enjoys international renown for its pressure welding technology. According to managing director H. Vroomans, there are practically no companies in Europe operating in this specialized area. The firm is considering extending its radius of activity to the United States and Japan as well.

Weld-Equip is still a tiny company. Last year its sales amounted to approximately 10 million guilders, and it employed about 50 highly trained workers. A tripling of sales is foreseen in the next 5 years. In order to finance this growth, Weld-Equip has joined up with the Brabant Development Corporation [BOM]. BOM received a 22 percent interest in the company in exchange for 500,000 guilders. In addition, BOM has invested another 500,000 guilders in the company in the form of a deferred convertible loan.

12271
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TECHNOLOGY TRANSFER

SHARP TO GIVE PHILIPS FACTORY-AUTOMATION KNOWHOW FOR LCD'S

The Hague ANP NEWS BULLETIN in English 21 May 85 pp 4-5

[Text] Eindhoven, May 21--Sharp Corporation of Japan will furnish the Dutch Philips electronics giant technical information and know-how on factory automation in the field of liquid crystal displays (LCDs) under an agreement announced here today.

Sharp will also supply equipment and tools to produce LCDs while the two concerns have licensed each other under their relevant patent rights, Philips said.

Philips recently announced that its Videlec LCD activity in Lenzburg, Switzerland, would be transferred to the Netherlands.

It said it had now been decided to locate this activity in Heerlen, in the southeast of the Netherlands, and to integrate these LCD development and manufacturing activities in Heerlen in the next 18 months.

In the meantime the continuity of Videlec A.G. and Videlec Hong Kong Ltd. as the base for customer services will be fully ensured, it said.

Economy of Scale

Moreover, the LCD manufacturing activities in Hong Kong will be reinforced and continued, Philips said.

Hitherto LCDs have mainly been used in high volume products such as watches and pocket calculators. But they are increasingly being used in more sophisticated market segments, such as consumer electronics, the automotive industry and telecommunications.

Philips said it considered the field of LCDs of strategic importance and in view of this was stepping up efforts to obtain the necessary economy of scale by setting up a large volume highly automated manufacturing centre.

As a further result of this collaboration the methods for the design and manufacture of LCDs used by Philips and Sharp will be compatible.

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TECHNOLOGY TRANSFER

BRIEFS

GREECE-USSR TECHNOLOGICAL COOPERATION--According to a protocol signed on 6 May in Athens, Greece and the USSR have decided to cooperate in the fields of laser technology, biotechnologies and data processing. The agreement, which was signed by the Greek minister of research and technology and the chairman of the USSR Commitee for Research and Technology, Messrs George Lianis and Guriy Marchuk, provides for an exchange of experts of the two countries to take place this year, we learned from the same source. Various programs providing for cooperation between the technical institutes of the two countries will be submitted to the next Greek-Soviet joint commission, which is expected to meet late in 1986, it was stated without any further clarification.[Text] [Paris AFP SCIENCES 9 May 85 p 11] 9294

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