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2 MAY 1986

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SCIENCE AND TECHNOLOGY

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WEST EUROPE/ADVANCED MATERIALS

NETHERLANDS DEVELOPMENTS IN LASER OUTLINED

Rotterdam NRC HANDELSBLAD in Dutch 16 Nov 85 p 13

[Article by Zeger Luyendijk: "Netherlands Not Ignoring Laser Development"; first paragraph is NRC HANDELSBLAD introduction]

[Text] The Netherlands wants to get into lasers; this was made clear by our country during the ministers' conference on Eureka in Hannover. The Netherlands showed "interest" in a project concerning the development of a high-performance carbon dioxide laser for materials processing. The Netherlands is not participating in this specific project, but by showing interest, it clears the way to participate in future laser projects. What is really happening in the Netherlands in the field of lasers? A selective look.

Rotterdam, 16 Nov--If there is one discovery which the Netherlands could contribute to President Reagan's Strategic Defense Initiative (SDI), if the project were officially supported by our country, it would be the laser range-finder developed by TNO [Netherlands Central Organization for Applied Natural Scientific Research]. With this instrument it is possible to measure the distance of "celestial bodies" from the earth, up to at least 10,000 km into space, with an accuracy of one centimeter.

TNO does not frankly admit the usefulness to the Americans of the laser range-finder, but a slip of the tongue by Director Ir H. J. Raterink of the Technical Physical Service (TPD) of TNO in Delft is revealing: "With the laser, the distance of missiles . . . uh . . . satellites to the earth can be easily measured," he hastily corrects. "No," he says after the journalist grins, "I cannot talk about it. When the Americans asked about participation in SDI, we discussed in a small group what we can offer, at the request of the cabinet. In the field of lasers, but also of optical instruments, TNO is doing quite a few things."

Pulsed

Apart from a few specific development projects mainly in space flight--such as the laser rangefinder and, more importantly, an instrument (not a laser, but full of optics) to determine the position in space of the satellite Giotto which will take a closer look at Halley's Comet next year--TNO is investigating particularly the extent to which lasers can be of interest to industry. For

this purpose, TNO has an experimental set-up of two types of lasers in Apeldoorn. Thus, TNO is mainly concentrating on laser applications. TNO is not involved in basic laser research, nor does it build lasers itself.

In the Netherlands, the combination of basic research and laser development only exists on the university level at the Twente Institute of Technology, in the Technical Physics Department under the guidance of Prof Dr Ir W. J. Witteman. In other universities lasers are used mainly for specific research projects. Nevertheless, the Catholic University of Nijmegen has built its own carbon dioxide laser.

"It struck me that the Netherlands was so interested officially in lasers in Hannover," says Witteman. "We have already talked about lasers in a FOM (Institute for Basic Research into Matter) context, but we never reached the stage of concrete proposals or projects."

At present, Witteman and his people are working on a laser suitable for separating uranium isotopes for UCN/Urenco [Netherlands Ultracentrifuge Uranium Enrichment Company], the uranium enrichment organization of the Netherlands, Great Britain and the FRG. In time the separation of uranium isotopes by laser is to replace the current centrifugal technique. UCN started with "exploratory" research of these laser techniques after the Americans had concentrated on it with full force.

This research is a new challenge for the Technical Physics Department at the Twente Institute of Technology. "We have just started," says Dr G. J. Ernest, a co-worker in the department. "UCN makes money available; we are mainly interested in physics. We also receive money from the Ministry of Economic Affairs for a pulsed laser, i.e., a laser which produces short flashes and is, therefore, very suitable for surface hardening of materials. At the moment we are building such a laser. Although we are the only ones at the moment, I understand that FOM wants to stimulate laser research and development."

In Twente, they are also working on an excimer laser, a type of laser that is also mentioned in the SDI plans as a potential candidate for the space shield because of the short wave lengths on which it operates. The advantages of an excimer laser are a large capacity with good output, which means in laser jargon that little energy is lost.

The high-performance carbon dioxide laser, which is part of the Eureka plans, is considered an interesting project in Twente. "Twenty kilowatts is the maximum capacity of carbon dioxide lasers for materials processing," says Ernst. "To reach 50 to 60 kilowatts, a lot of problems still need to be solved."

The Japanese

The reason why Europe has so clearly opted for a high-performance laser for materials processing is, besides the good market prospects, the fact that the Japanese are investing money in the development of such a laser. "Over the past 7 years," says Raterink of TNO, "the Japanese have had a cooperative program for the development of such a laser. So far, it has been relatively small, but

you may expect that it will grow fast." Raterink expects that the Americans will still have a rough time with the Japanese. "Now, they still have a lead, but the question is whether they will be able to keep it."

In the Netherlands, Philips in particular is interested in the Japanese efforts in this field. Philips is one of the largest laser manufacturers in the world, and the only private laser manufacturer in the Netherlands. It produces the so-called diode or semiconductor laser, a miniscule laser used for the compact disk, video disks, fiberglass cable, and the equipment reading the well-known bar code on peanut butter, etc. Philips has made the principles of this laser known as far as possible in order to set a standard. It has succeeded in this. The semiconductor lasers of the Japanese are the same as the lasers manufactured in Nijmegen by Philips Elcoma in dust-free rooms.

Meanwhile, the Japanese are also manufacturing compact disk and video disk equipment and, for the time being, Philips is not doing badly at all. In the opinion of Ir R. J. Nienhuis of Philips Elcoma, the Japanese are far ahead in fiberglass cables. "All over the world research is being conducted to how lasers should be connected to fiberglass cables," says Nienhuis. "In Japan eight companies are working simultaneously on such connections under the auspices of the Ministry of Trade and Industry. All tasks are shared. Here, Nienhuis has to do it all by himself."

In the opinion of Nienhuis, the laser is at the same stage as the computer chip 20 years ago. "Then, we managed to get three switches on a silicon chip, and this number grew continuously over the years. Three years ago, the semiconductor laser was transferred from the Physical Laboratory to Nijmegen. As with the chip 20 years ago, we burn the lasers in for a week as a test."

Gallium Arsenide

A stone's throw away, at the Catholic University of Nijmegen, Dr H. J. A. Bluysen is using a laser for tests of semiconducting materials, particularly gallium arsenide, which is used in the semiconductor laser among other things because of its translucence. "This material will soon become very important. When we learn more about the qualities of this material, we will probably be able to develop the optical chip, i.e., a chip that operates on light rather than on electrical current, as it does now. Here the semiconductor laser will play an important role. The whole world is busy rendering this material as pure as possible."

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WEST EUROPE/AEROSPACE

ARIANE V, HERMES TO BENEFIT FROM CHALLENGER LESSONS

Paris L'USINE NOUVELLE in French 6 Feb 86 p 36

[Article by Marc Chabreuil: "Challenger: Lessons from a Tragedy"; first paragraph is L'USINE NOUVELLE introduction]

[Excerpts] The 28 January in-flight explosion of the manned shuttle Challenger will paralyze the U.S. space program for several months. Europe, which will draw useful lessons from this catastrophe for its Ariane V and Hermes projects, could start booking new reservations on Ariane in 1988.

In Europe engineers are on the watch for every bit of information coming from across the Atlantic. The configuration of the future Ariane V rocket, developed under the industrial supervision of Aerospatiale, is indeed very close to that of the shuttle: a large SEP [European Propulsion Company] cryogenic engine fueled by 120 metric tons of liquid oxygen and hydrogen will surround two propulsion units carrying 170 metric tons of solid propellants, whose construction is the responsibility of SEP and the Italian SNIA [National Industrial Aerospace Company]-BPD [Bombrini Parodi-Delfino]. In other words, Ariane V could theoretically present the same defects as Challenger. Therefore, solutions adopted by NASA will be at least partially applicable to the European shuttle, even before its construction.

The Hermes spacecraft program will also benefit from the NASA study. Philippe Couillard, director of the Hermes program for CNES [National Center for Space Studies] in Toulouse explains: "Of course, NASA's conclusions will be taken into account and inspiration will certainly be drawn from the remedies it adopts. However, the two spacecrafts are quite different. Hermes, smaller and mounted on top of Ariane V, will not present exactly the same safety problems." Moreover, security has already been under careful consideration by CNES, Aerospatiale, and Dassault engineers for several weeks now. Nevertheless, the rapidity and violence of the Challenger explosion could lead French engineers to conclude that ejection seats are useless in certain configurations. "In fact, basic safety lies in the maximum reliability of the whole Ariane V and Hermes assembly. It must be defined from the beginning of the design. That is what we are doing now," concludes Philippe Couillard. However, that is also what the Americans thought they had done!

Strengthened by Challenger's misfortune, Europe should not, 10 years from now, find itself in the present situation of the United States where the space

program is completely paralyzed. Today, for lack of conventional launch vehicles, some 20 scientific satellites and satellites with American and foreign payloads are grounded, and several "Star Wars" preparatory experiments will be delayed.

Europe Must Concentrate Technological Means and Expertise

In the short run, this situation will not be all that favorable to Arianespace in spite of the very attractive insurance premiums it offers through its S3R subsidiary: between 11 and 13.2 percent instead of 20 to 25 percent (when companies agree to cover the risks). Indeed, there are practically no more places available on board Ariane until 1988. Besides, "when a client has chosen a system, he will not change. We noted that following previous Ariane failures," say Arianespace officials. This is undoubtedly due to the expensive modifications and long ground trials needed to adapt satellites to the competing launch vehicle.

"However, with only three shuttles until the end of the decade, it is likely that NASA will not be able to meet all the demand for foreign satellite launching. Thus, new clients might turn to Ariane IV. Out of sympathy for NASA we will not solicit them; but if they turn up, we will find a place aboard," the Arianespace spokesman declares.

The Old World will draw many lessons from the failure of the shuttle's 25th mission which occurred in spite of NASA's unequalled know-how and experience. "This tragedy shows--as if it were still necessary--that Europe must concentrate all its means and technological expertise on the Hermes program," confides the CNES spokesman: a last appeal to the Germans who, through the Spacelab laboratory, benefit from solid industrial experience with manned spacecraft.

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WEST EUROPE/AEROSPACE

MORE FREQUENT ARIANE LAUNCHES FROM KOURU PLANNED

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 5 Mar 86 p 35

[Article by Guenter Paul: "Ariane Launches in Kouru May Now Be More Frequent. New Systems in Operation. Separate Assembly Areas for Rocket and Payload. Rigid Steel Structures"]

[Text] With the construction of a second launch complex for the Ariane rocket in Kouru, French Guiana, the European aerospace industry and its marketing firm, Arianespace, have substantially increased their launch capacity. Because preparations for each launch take approximately two months, five to six launches annually have been possible up to now from the complex; in the future there will be 15 to 18. At the new launch complex, ELA 2 (Ensemble de Lancement Ariane)--unlike at ELA 1--the "rocket preparation zone" and the launch pad are in different areas, thus enabling a second Ariane to be assembled even before the first is ready for launch. The first Ariane launch from ELA 2 is expected take place in mid-March.

The focal point of the ELA 2 rocket preparation zone is a large, impressive structure containing three separate shops of different heights. Rocket stages which have been delivered are placed in intermediate storage in the first and lowest shop. A crane moves the stages into an upright position in the second shop, and from there they are moved into the third shop, the dock, in which the 45-meter tall Ariane is vertically assembled. The dock is 19 meters wide, 25 meters long and 68 meters high and has a volume equivalent to about 50 single-family homes. On one side is a huge door which is 16 meters wide at the bottom and reaches nearly to the ceiling. The assembled rockets can be rolled out of the building through this door.

The German firm, MAN, which is responsible for the mechanical and structural steel engineering work for ELA 2, was faced with several challenges in terms of dock design. Among other things, the steel structure had to be nearly completely air-tight due to the climate-controlled interior. Only one "hole" with a total area of at most one square meter was permitted. This is an extremely small area when one considers how much the door alone, by virtue of its own weight, might warp and thus cause cracks to form.

The biggest challenge, however, involved the rigidity of the building. Within the dock are a number of platforms which are moved up close to the rocket to

permit assembly and testing of the Ariane. The joints between the rocket stages in particular must be accessible at all times. This huge building must exhibit exceptionally high dimensional stability even in high winds in order to prevent movement of its attached platforms in relation to the stationary rocket. (Even the tip of the Eiffel Tower can sway as much as three meters in a high wind.) Without suitable countermeasures the platforms could crush the rocket which has a very thin skin in order to reduce its weight. The special structures department at MAN in Gustavsborg under the leadership of Rainer Tuerk therefore decided to use twice as much steel to construct the dock as would have normally been necessary were it not for these stringent requirements. The building weighs 2250 metric tons.

One month after rocket assembly has begun and following testing of its electrical circuitry, Ariane will be moved via a transporter "platform" traveling on rails to the launch pad just under a kilometer away. This transporter exists in two designs: a 12 meter high model weighing 427 metric tons for the Ariane 3 and a 5 meter high model weighing 342 metric tons for the Ariane 4. The different heights allow both types of rocket to be accessible from the same platforms during assembly.

The transporter must also be very rigidly constructed. Should its platform bow due to the increased weight when the Ariane is fueled, the umbilical arms attached to the rocket would bend inward and press in on its thin walls. Moreover, the transporter platform might deform during travel because the rails are not entirely even and this would also have fatal results for the rocket. Ariane's transporter platform is so rigidly constructed that if a section of the rail dips by even a millimeter, that side of the transporter remains suspended in the air.

The transporter with the Ariane mounted on it is pulled by a special 320-horsepower truck with a continuously variable hydrostatic drive. The vehicle can be driven extremely slowly so as not to endanger the rocket. During transport this vehicle combination passes over a turntable with a load capacity of 640 metric tons supported by 72 cushions of air which keep it uniformly level. This turntable is also used to move an empty transporter platform returning from the launch pad onto a sidetrack, making room for the oncoming Ariane-bearing transporter.

Finally, at the launch pad the Ariane is moved into position over an exhaust-gas channel and connected to the launch tower. During launch the exhaust gases from the main engines and boosters (solid-fuel auxiliary engines) flow through the platform into the channel where they are diverted laterally by means of deflectors. The launch tower, to which Ariane remains connected until the actual launch, contains the fueling equipment, electrical cables and pneumatic tubes, lines for helium (with which overpressure is generated in the fuel tanks) and water for cooling the engines, as well as equipment for loading the rocket's on-board computers and for an additional check of the electrical circuits.

In order to prepare for the launch, a "gantry" located 85 meters away is moved into position and together with the tower encloses the rocket on all sides.

The gantry is 21 meters long, 21 meters wide, 86 meters tall--the Mainz cathedral is 87 meters tall--and weighs 3200 metric tons. In terms of volume it is possibly the largest mobile structure in the world. In order to permit it to be transported via the rails it must be raised 4 centimeters. When it is again set down it must be anchored in order to eliminate any risk to the rocket. Like the dock, this structure is open facing the rocket. In a worst-case situation in which high winds might come blowing around the corner, the gantry could twist and lift up on one side. Transport of the gantry is electronically controlled--16 hydraulic motors drive it forward and are synchronized such that the structure maintains dimensional stability. The speed is limited to a maximum of 5 meters per minute.

Like the dock, the gantry contains several platforms which are moved up next to the Ariane to permit loading of the payload and fitting of the boosters. The boosters are not fitted in the dock because they always represent a certain risk. If they were to be hit too hard unintentionally with a screw-driver, heat could develop due to the increased pressure, causing the powder-based fuel to explode.

For the final check and loading of the payload a "clean room" is located above the 62 meter level within the launch tower. An overpressure is generated within this room in order to ensure that air flows outward rather than inward through any small unsealed areas. This creates a level of cleanliness comparable to that of a hospital operating room. No more than 100,000 dirt particles per cubic foot of air may be present in the room. Throughout the entire gantry and in the launch tower all electrical equipment is installed in an explosion-proof manner due to the explosion hazard presented by the fuel. Upon the completion of the work at the launch pad, which takes another month, the gantry is moved aside and the final countdown phase can begin.

The Americans have selected a different procedure for preparing the shuttle for launch. Before the shuttle lifts off only the clean room itself, which is a movable part of the launch tower, is swung out of the way. Moving other parts of the system aside would be impossible at Cape Canaveral due to the greater size of the equipment involved there.

The construction of the ELA 2 launch complex has cost the Europeans somewhere between DM 350 and 400 million. That is less than the cost of a single shuttle flight. With ELA 2 the European Space Agency (ESA) and Arianespace have not only obtained greater launch capacity but also the means for launching the Ariane 4 which is too large for ELA 1. The first launch of an Ariane 4 is planned for the fall of 1986. ELA 1 will be decommissioned in 1988 or 1989. By that time the "smaller" Ariane 1, 2 and 3 models will have been phased out.

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WEST EUROPE/AEROSPACE

FRG PARTICIPATION IN HERMES SPACE PROJECT EXAMINED

Stuttgart FLUG REVUE in German Jan 86 p 23

[Article by Gotz Wange: "No Support for Hermes"; first paragraph is FLUG REVUE introduction]

[Text] After the green light given by French space flight authorities two months ago for the next research stage, the decision was made: Under the project name Hermes, Europe will have its own small space shuttle. This mini-shuttle, which will cost about DM5 billion, is scheduled to take off for the first time in 1995 in a low orbit, atop an Ariane-5 rocket.

Aerospatiale, the main contractor, and Dassault, its partner and runner-up in the bidding, will very soon be involved in developmental work. In the meantime, the FRG is remaining on the sidelines. A January 1985 ministerial decision formally excludes participation in any future large space flight project.

Dr. Heinz Riesenhuber, Federal Minister of Research, stressed this point once again during his press conference with the Spacelab D1 Mission astronauts. But is this actually the last word? Nobody really thinks so, not even his own ministry officials.

Dr Wolfgang Finke, the space flight director in the BMFT [Federal Ministry of Research & Technology], discussed the government's vote as the main topic of his comments before the Aeronautics Press Club in Bonn. However, he added the following personal comment: "The French know that they can rely on us. I am sure that we shall take part in Hermes."

Gain Time by Extending the Delay

Although the FRG space flight budget will be doubled in the next few years, additional millions would be necessary for the space shuttle. In Bonn, it is hoped that the French will put the brakes on their ambition and not test the Hermes space shuttle as early as the third Ariane-5 flight. A two or three year postponement would give the budget the necessary flexibility. Right now, it is impossible to guess the extent of future German participation. About 20 percent was originally discussed, certainly a minimum for reasonable technological; participation in an industry. Frederic d'Alleste,

president of the French space flight authority CNES, said at a conference of ESA [European Space Agency] member countries: "I am sure the Germans will contribute at least eight to ten percent." France will pick up 50 percent, with the remainder contributed by Britain, Sweden, Switzerland, the Netherlands, Italy, Belgium, Austria, Denmark, Spain, and Ireland.

Dr Finke, BMFT spokesman, does not agree with the criticism from American experts who advise against Hermes because it is a copy of the shuttle technology of the sixties: "When I consider, for example, primary components made of composite materials technology just being introduced in large passenger aircraft, and light wave flight control then there are enough tasks in this project that make extremely high demands."

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WEST EUROPE/AEROSPACE

FRG UNIVERSITY RESEARCHES TURBINE BLADE MANUFACTURE IN SPACE

Stuttgart FLUG REVUE in German Jan 86 p 70

[Article by Dr Walter Guenther: "Drive Propulsion Technology--Casting Process for Turbine Blades: Synthetic Crystals"]

[Text] Viewed superficially, participation in space research is hardly expected of a university institution whose task is to teach and conduct research in foundry technology. Specifically, we are referring to the Foundry Institute of the Rhine-Westphalia Technical University in Aachen directed by Professor Dr Eng P.R. Sahm. But the connection is quickly established concerning turbine blades for aircraft propulsion mechanisms and their possible manufacture in space.

In order to reach the best thermal efficiency and the highest output increase for a thruster, fuel should be burnt stoichiometrically. The resultant temperatures of approximately 2,000°C reached by turbine blades cannot be handled by the high temperature resistant materials available today, whose range is very limited. The turbine inlet temperatures of the most advanced thrusters are still less than 1,500°C. The enormous gap between the turbine inlet temperature presently allowable and the ideal promises a considerable output increase for the thruster along with reduced fuel consumption if it becomes possible to develop materials with higher thermal resistance. Mastery of high temperatures is considered as an international measure of the efficiency of the industry.

Modern high temperature turbine blades are manufactured in a casting process involving directed solidification of the molten metal. If the transition of a molten metal from liquid to solid after casting into a mold is allowed to proceed freely, a small-grained crystalline structure is formed next to the cold mold shell because of rapid cooling, whereas a coarse-grained structure is formed in the central part of the mold due to convection of the molten metal. Local temperature variations cause density differences in the cooling melted mass, causing thermal convection due to gravity. The effect of the different structures and grain sizes is a reduction of strength.

With a combined heating and cooling device, it is possible to obtain solidification in one plane [front] that is then moved through the molten metal at a

specific speed and on which the crystals form in columns. Turbine blades manufactured by directed solidification along their longitudinal axis have better characteristics than traditional blades. The thermal application range of blades made of only a single crystal is some 30°C higher and their service life is doubled or tripled.

Experimental and mathematical research on directed solidification processes, particularly of single crystal turbine blades and eutectic alloys, is an important field of activity of Professor Sahm. In order to detect and eliminate the negative influences of the gravity related thermal convection on solidification processes, he took part in the experiments of the Spacelab D1 Mission whose scientific project management was his responsibility.

The research served also for the study of liquation behavior under weightless conditions. Molten metals with alloy components having great variations in density separate very rapidly on earth. In zero gravity this gravitational separation does not take place and it is possible to produce alloys with previously unknown structures.

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WEST EUROPE/AEROSPACE

BONN HOLDS TO SCHEDULE FOR D-2 MISSION

Munich SUEDEDEUTCHE ZEITUNG in German 20 Feb 86 p 48

[Text] According to an assessment by Research Minister Heinz Riesenhuber (CDU), German and European space programs are "not significantly affected" by the accident of the U.S. space shuttle Challenger. At the same time, the federal government prepares for additional costs of the space programs amounting to DM 5-10 million, since delays may occur in a number of projects. But the second flight of the Spacelab under German control (D-2 mission) will probably have to be postponed. Therefore the invitation to applicants for five German scientist astronauts stopped after the Challenger catastrophe is to be formally reinstated in April.

As Riesenhuber reported on 19 February to the research committee of the Bundestag, the launching of the solar probe Ulysses, which was planned for 15 May, will be delayed for a year. That costs the FRG one million DM. The solar probe is a joint project of the European Space Agency ESA and U.S. NASA.

Also postponed for one year is now the start of the German-U.S. Jupiter probe Galileo initially planned for 21 May. That caused additional costs of DM 2-3 million, the research minister reported to the parliament.

Moreover, also possible is a postponement of the start of the German-British-U.S. X-ray satellite ROSAT considered for September 1987. However, a delay until April 1988 has been under consideration anyhow.

Riesenhuber does not expect any effects on the French project of the mini-space shuttle Hermes. In view of French requests that Bonn should soon decide on a German participation in Hermes, it has been reported that Federal Chancellor Kohl once again will inform French President Francois Mitterrand at the Paris summit meeting at the end of the month that the Federal government will adhere to the schedule of not making a decision until 1987.

12356

CSO: 3698/368

WEST EUROPE/AEROSPACE

ESA DIRECTOR ON FUTURE SCIENTIFIC, ECONOMIC PROSPECTS

Vienna INDUSTRIE in German 12 Mar 86 pp 12-13

[Text] That the various programs for the exploration of outer space will be continued despite the disaster of the American space shuttle "Challenger" was demonstrated by the European space agency ESA. It also shows optimism for the future. Adelbert Reif talked with the ESA head, professor Dr Reimar Luest about the scientific and economic aspects of the European aerospace program.

[Question] Space research has developed to a huge project consuming billions. Could you give a brief outline of the concrete successes of this costly investment?

[Luest] The most consistent break-through has undoubtedly been achieved in the communication area. We regard it nowadays as a matter of course that a Boris Becker, wherever he plays, can be watched on the TV screen or that we can get global weather reports. The situation is similar with telephone communications which are now possible with a worldwide network. All this represents quite astounding progress which would not be possible without the use of satellites. What is still in the initial stage of application is the area of earth exploration in the broadest sense: This encompasses primarily the exploration of deposits, oceanographic research, and environmental supervision. Noteworthy commercial perspectives may result in this field in the future. In a stage of basic research are, however, still the experiments in the microgravitational field. From the growing of crystals to the pharmacy, interesting results may here be possible also for the application on earth.

[Question] How high is the share of the scientific program?

[Luest] The share of the scientific program of the ESA lies at present in the vicinity of 14 percent, of which a substantial part is allocated to astronomical research.

[Question] What projects are hereby involved?

[Luest] The European scientists were especially successful with the gamma ray satellite "COS-B" launched in 1975, for which the Max-Planck-Institute for Extraterrestrial Physics made substantial contributions. An additional project is the X-ray satellite "Exosat" which is still in orbit. In preparation for

the launch is the astronomical satellite "Hipparcos". In the planning stage is furthermore a satellite for infrared research. Beyond that, the ESA is participating in the large space telescope to be launched in the fall of this year.

[Question] What are the costs of the European space astronomy?

[Luest] The costs vary, of course, from project to project. The "Giotto" satellite, for instance, which was launched in July 1985, had a price tag of roughly 150 million European calculation units (ECU) or approximately DM 335 million. The amount for the large telescope, the main share of which is borne by the Americans, is about 1 billion US dollars. The costs for the "Hipparcos" project are about 300 million European calculation units (i.e. DM 670 million) and about 317 million European calculation units corresponding to about DM 700 million are earmarked for the infrared satellite ISI.

[Question] Of course, there arises the question of the benefits gained by such high expenditures...

[Luest] These admittedly extremely high amounts can, of course, be used as a yardstick only for what scientific objectives can be attained with them. The following is to be said on this subject: Just as a great acceleration of particles is necessary in high-energy physics in order to obtain new findings in the area of the microcosm, so does the astronomy need advanced engineering to find out something new about the universe and its genesis, the origin of the stars and their transitoriness. The astronomy is pure basic research. Scientific projects with a promising future have, however, provided again and again the basis for technological developments. Science must precede all technology.

[Question] How does the European share in space research look compared to the USA?

[Luest] It would border on arrogance for us to say that we can keep pace with the Americans in all areas. It must be noted first of all that the space budget of the Americans for the civilian sector is considerably higher than that of Europe. In the USA the expenditures per taxpayer for the civil space flight is DM 68. Here in Europe it is only DM5.5, i.e. at a mutual ratio of 12:1. Yet, Europe is absolutely on a par with the USA in the number of inhabitants and economic power. Nevertheless, the Europeans have succeeded by skillful selection of projects in advancing into top areas of research and in catching up with the Americans. Expressed in different terms: Wherever the Europeans participate, they are right up front. What they are lacking is the range. For instance, the Europeans don't have a planetary probe like the one now employed by the Americans for the observation of Uranus. The reason is that a planetary project is much more expensive than a normal satellite project.

[Question] What place does the Federal Republic of Germany occupy within the framework of the European space program?

[Luest] The FRG is in second place behind France. France expends about 50 percent more for its civil space program than the Federal Republic. In addition, France maintains a not to be neglected military space program, the financing of which is not included in these 50 percent. Unquestionably, however, the FRG has carried out a whole range of excellent scientific projects. I would like to call to mind in this connection the project "Helios". In preparation is the X-ray satellite "Rosat". Finally, one should also mention the successful mission "D-1". With the above, German science, as well as German industry have proven their capacity.

[Question] What are the plans of the European space research for the future? Where are the main points of emphasis?

[Luest] The future space activities of Europe comprise essentially four large projects. Europe intends to participate in the space station planned by the USA with its own contribution, named Columbus. The Federal Republic of Germany will occupy herein a leading position, just as in the development of Spacelab. Secondly, a new version of the Ariane, Ariane 5 is to be developed in order to keep Europe competitive during the next ten years in the area of the space transport systems. No decision has been made as yet on the incorporation of the manned spacecraft "Hermes" proposed by France into the future program of the ESA, which is to be started with Ariane 5. The majority of the member states has let it be known, however, that they would like to participate in this program. Besides, we are just developing a data relay satellite in order to secure with it first of all the communication with the space station, but also with other satellites.

[Question] Within what time frame are the projects cited by you to be realized?

[Luest] All these projects are to be carried out by the end of the year and should contribute to Europe becoming a strong autonomous power in space. Regarding the realization of the programs for Columbus and Ariane 5, all member states of the ESA are practically in agreement, even though the decision on the construction will be made only at the beginning of 1987.

[Question] And what are the long-term prospects of space research?

[Luest] This is a subject the Americans in particular are thinking about. It is planned to install a manned station on the moon and to undertake an also manned venture towards Mars. In both cases we are dealing with plans the realization of which can only be expected within the next 50 years.

[Question] What consequences will the disaster of the American space shuttle "Challenger" have for the European space research?

[Luest] The "Challenger" catastrophe is, of course, not only a setback for the American space program but affects also projects in which the Europeans are participants. More precise statements on the effects of the disaster can only be made, however, when the final results of the American investigations have been submitted. Everything else would be pure speculation.

[Box] The Europeans continue working

According to information received from the ESA, the Scientific Program Commission of the ESA decided unanimously to initiate two new space flight projects for exploration of the sun and its influence on the earth atmosphere. These projects named "Soho" ("Solar and Heliospheric Observatory") and "Cluster" are to be carried out with five space probes from 1993 to 1995. ESA is optimistic for the future also in other respects. In the meantime, two new satellites were placed into the predetermined orbit at the end of February with the 16th launch of the European carrier rocket "Ariane": the French "Spot-1" and the Swedish "Viking". The French satellite developed by cooperation with Sweden and Belgium at a cost of Fr2.3 billion shall serve the purpose of supplying agricultural and geological information from space and of facilitating the charting of the Third World. Almost simultaneously, the French space agency CNES has announced that it was firmly determined to bring the project "Hermes", a European "mini space shuttle", to realization by the year 1995. This is a manned space vehicle for the transport of a maximum of 6 persons.

WEST EUROPE/BIOTECHNOLOGY

DEVELOPMENTS IN NETHERLANDS FIRMS

Rotterdam NRC HANDELSBLAD in Dutch 14 Nov 85 p 9

[Article by Wubbo Tempel: "Biotechnological Mayonnaise"]

[Text] Unilever mayonnaise will keep, thanks to biotechnology, according to this week's issue of the quarterly magazine BIOTECHNOLOGIE IN NEDERLAND. The magazine gives a survey of the industrial activities in biotechnology in the Netherlands, along with articles written by the companies themselves.

To keep mayonnaise without preservatives, Unilever uses a class of enzymes called phospholipases, which convert phospholipids. The latter are fats which can be found in egg yolk, one of the ingredients in mayonnaise. The yolk in the mayonnaise is treated with phospholipases. It can then be included in the pasteurization process without risk of the mixture separating. If the original yolk had been used, it would have separated. One side effect is that the product may turn out less sour, "which is appreciated by the consumer," the company writes.

Unilever also claims to have the first flavorings made by biotechnology already on the market. In addition, the company "converts" other fats by means of microorganisms. In this way, substitutes for cocoa butter are made.

Cold-Water Washing

The Netherlands biotechnological "champion" Gist-Brocades places much hope on a new generation of enzymes for detergents, "in a market like China, for instance, where cold-water washing is customary."

The magazine's editorial staff regrets that of the large Netherlands firms Heineken did not wish to participate. When asked, a spokeswoman of the company explained over the telephone that it was not to protect important secrets, but rather because financial information was being requested, which the company does not customarily give out. However, she reassured us, "with us it is all biotechnology."

Naarden

The same applied to a number of other companies, though of course none of them revealed all their good ideas. Nevertheless, a nice survey has been provided with some interesting facts here and there.

Some further information: the flavorings company Naarden International (formerly Naarden Chemistry) produces a range of industrial enzymes. These are used in breweries and the starch and alcohol industry inter alia. In the brewing process, for example, alpha-amylases, proteases and beta-glucanases increase the output, carbohydrases raise the degree of fermentation, and glucanases speed up beer filtration.

In addition, Naarden makes use of microorganisms for the preparation of flavorings. Frequently they use the same bacteria which provide the aroma in natural food. However, since they are incubated in a different culture medium in the industrial process, a much greater flavor concentration is often attained.

Avebe, a potato-starch company in Oost-Groningen, has ambitious plans which depend in part on whether the state is willing to give a subsidy of some 20 million guilders. According to research leader H. Hokse, this question will be answered in a few months. The situation has thus remained unchanged for the past year. However, rumors that biotechnological activities in general are up in the air (pending Avebe's planned reorganization) are completely unfounded, says Hokse.

One of the things Avebe would like to produce is cyclodextrines, which are circular compounds made from starch. The classic argument holds for the application of biotechnology: It is impossible to make these materials chemically. By means of a bacillus bacterium (with the revealing name *Bacillus circulans*), however, they can be produced. Through the use of ring-shaped compounds other chemical materials can be "concealed" in the ring. In this way, for example, drugs can be better protected, and fatty materials can become water soluble.

DSM [Dutch State Mines], the chemical company in Heerlen, also makes use of bacteria where ordinary chemical processes are insufficient. One example is the utilization of phenylalanine-methyl ester, one of the two building-blocks of the sweetener aspartame. In the chemical process, both the material's left and right isomers are used, although only the left one is needed. The right one produces a bitter substance. The laborious purifying that is so necessary afterwards is superfluous when an enzyme is used, since it reacts only with the right isomer.

Other DSM programs include the production of the sweetener fructose out of inulin, which can be found in chicory. DSM also wants to develop hydroxylized and halogenized aromatic compounds in cooperation with universities. Both of these circular compounds (to which, respectively, hydrogen or chlorine, bromine or fluorine atoms are connected) serve as raw material for pharmaceuticals and chemicals.

A relatively unknown biotechnological company is Oce-Andeno, a subsidiary of the office equipment manufacturer Oce-van der Grinten. Oce-Andeno manufactures highly finished chemical products. Here, too, bacteria are used to precisely use only the right one from a mixture of two isomers, a so-called racemic mixture.

It also appears from the survey that the contributions of the American companies Centocor and Promega thus far consist mainly of plans. There is also mention of the small company HBT Holland Biotechnology, which must sell technology from the University of Leiden and TNO [Netherlands Central Organization for Applied Natural Scientific Research]. Sanbio in Nistelrode and Eurodiagnostics, two other more or less small-scale companies, are not considered.

Also mentioned are Akzo Pharma (diagnostics and vaccines among other things), Duphar (vaccines), CCA Biochem (lactic acid and lactic acid derivatives) and Bio-intermediair (monoclonal antibodies), as well as De Ruiter Milieutechnologie and Clairtech, which both work on environmental purification.

BIOTECHNOLOGIE IN NEDERLAND, Staatsuitgeverij [State Publishing Company], The Hague.

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BRIEFS

DANISH SCIENCE PARK EXPANDS--The research center in Horsholm--which is part of the Education Ministry--will be expanded during the course of the next year-and-a-half. The biotechnology firm of Chr. Hansens Laboratorium A/S has leased space in the research park and thereby will consolidate its administrative offices and plants. The firm develops, among other things, products for treating allergies. The general contracting firm of Hojgaard & Schultz is behind the construction of the four new buildings which are to be ready for occupancy during the fall of 1987. The project will cost about 155 million kroner. Chr. Hansens Laboratorium currently has factories in Osterbro and on Amager, while the administrative offices are located in central Copenhagen. Director Steen Engel figures that the fact that 200 workers now will be consolidated in one place will have a positive and productive effect. [Text] [Copenhagen AKTUEL in Danish 4 Mar 86 p 9] 12578

CSO: 3698/389

WEST EUROPE/CIVIL AVIATION

AIRBUS A-310-300 GETS TEST LICENSE; A-320 GETS SIMULATOR

Stuttgart FLUG REVUE in German Feb 86 pp 63

[From the "News from Research and Development" column]

[Text] Airbus A-310-300 LBA License

The Federal German Aeronautics Office (LBA) and the French Aeronautics Authority, DGAC, have granted a test license for the A-310-300 Airbus. With 218 passengers on board, this version has a flight range of 8,500 km, 1,500 km more than the standard A-310 model. The maximum takeoff weight has also been increased in the A-300 by 8 tons for a total of 150 metric tons. This model has Pratt & Whitney JT9D-7R4 engines. The license for General Electric CF6-80C2 engines is expected shortly. Until the middle of 1987, the A-300 will also be equipped with the Pratt & Whitney PW4000. The first customer is Swissair.

A-320 Simulator: Early Start

Airbus Industrie has ordered new technology simulators for the A-320 from Thomson-CSF. Of the total of six flight simulators ordered, the first three are to be delivered in 1987, even before the test license of the A-320, and are to be used for pilot training at Aeroformation in Toulouse. They can be adapted to new systems through software exchanges.

8613/12913

CSO: 3698/M040

BONN TO PRESS FOR HIGHER INDUSTRY SHARE IN AIRBUS COSTS

Stuttgart STUTTGARTER ZEITUNG in German 28 Feb 86 p 13

[Text] For the state the approval of the federal chancellor to expand the Airbus program by additional models will probably lead to new subsidies running into billions. Thus far the federal government has granted subsidies amounting to DM 3.85 billion for development, production, and sales promotion of the Airbus models. A firm promise has already been made for an additional billion for the development of the A 320 type--a short and medium-range aircraft with short fuselage and a seating capacity of about 150, which is supposed to fly for the first time in 1987. For the models A 340 (long-range aircraft) and A 330 (medium-range aircraft) now planned, the development costs alone are estimated at \$ 2.6 billion. The German share is likely to be about one third. According to past financing practice, a Bonn subsidy figures to be DM 1.6 to 1.7 billion at the present dollar rate of exchange.

The coordinator for German air and space travel, the parliamentary state secretary with the Federal Economics Ministry, Martin Gruener (FDP), announced in Bonn that industry will be urged to participate more with its own resources. It is not yet certain what additional requests will be addressed to the federal government for additional sales subsidies. In the past two years, the high dollar rate of exchange has greatly facilitated the Airbus sales efforts. The market has become considerably more difficult with the current rate of exchange. The principal competitor, the U.S. firm Boeing, is now able to count on less aggressive prices of the Airbus competitors. The Airbus industry, which includes companies from the FRG (MBB), from France (Aerospatial), from Great Britain (Aerospace) and from Spain (Casa), thus far has sold 496 A 300, A 310, and A 320 aircraft to more than 50 customers. Thus far, 333 A 300 and A 310 aircraft have been delivered. Gruener noted that thus Airbus had a 43 percent share in the world market for large-capacity aircraft. However, Airbus had only an about 18 percent share in the sales value of the big three commercial aircraft manufacturers (Airbus, Boeing, and McDonnell Douglas) in the past year, amounting to about \$ 23 billion. This is the result of the fact that the competitors also include smaller aircraft in their program.

Profitability of the Airbus program will be achieved, according to Gruener, when sufficiently large numbers are sold. Two years ago the sale of just under 900 aircraft was regarded as that threshold at which the threshold for profit is reached and surpassed. Gruener was unable to update this figure when

questioned. He conceded that safe predictions of when the Airbus program will be economical in the future are not possible at this time. What will be important is to be able to gain a better foothold in the U.S. market. Thus far, fewer than 100 Airbus aircraft have been delivered to the United States.

On 21 March the government negotiations between the European governments participating in Airbus and the U.S. government on state aid in the aircraft industry will start in Geneva. According to Gruener, the negotiations are to be conducted in mutual understanding. He said Boeing, too, received strong state support for financing its programs. Moreover, Boeing reacted to the Airbus with "extraordinary price concessions."

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WEST EUROPE/CIVIL AVIATION

FINLAND COULD MANUFACTURE AIRCRAFT WITH USSR

Helsinki HELSINGIN SANOMAT in Finnish 21 Mar 86 p 35

[Article: "Gunnar Korhonen: Finland Could Build Aircraft With USSR"]

[Text] Finland could begin manufacturing aircraft in cooperation with the Soviet Union. The question would involve aircraft suitable for international air traffic, says Finnair's General Director Gunnar Korhonen in an interview published in the new MAAILMA JA ME publication.

According to Korhonen, the aircraft could be manufactured as a joint project between the two countries inasmuch as the Soviet Union wants to embark on the manufacture of such aircraft under a European or American license.

"In the area of aircraft manufacture Finland could serve as the link in which the technology of the West and the considerable resources of the Soviet Union as a manufacturer and consumer of aircraft could be combined," says Korhonen.

The resumption of air traffic between the Soviet Union and the United States will increase traffic between the super powers "and a Finnish airline will also receive its share," thinks Korhonen.

It has been said in public that the Soviet Union has conducted negotiations for the manufacture of commercial aircraft under license at least with England's aircraft industry.

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WEST EUROPE/COMPUTERS

PHILIPS, SIEMENS MAKING CONTRIBUTION TO MEGACHIP TECHNOLOGY

Gent EOS in Dutch Jan 86 pp 7-13

[Article by Chriet Titulaer: "Europe Is on the Verge of Becoming a Third-World Country--The Megachip: Europe's Last Chance"]

[Excerpts] Siemens, in an effort to make up the ground lost to Japan, recently signed an agreement with the Japanese company Toshiba. It is well known that in Japan Hitachi, NEC and Toshiba ("Japan, Inc.") are also working on a megabit chip. The ground lost seems to be one year rather than less. Toshiba needs Siemens's wealth of semiconductor patents. With a signature, this coveted treasure is passed on to Toshiba in exchange for Toshiba's megabit chip blue-prints.

According to Siemens, you can do two things when you notice that you are lagging behind: Accelerate your research or turn your opponent into an ally. Siemens did both. However, there are certain limits to the acceleration process, because more engineers have to be brought into action and bigger laboratories have to be provided for. The recruitment of 850 engineers is being accelerated, but the stakes (surviving as an industry) are so high that Siemens also decided to begin cooperation with the "enemy."

The result of all this is that the first European megachip will already be produced in the fall of 1986 instead of in the fall of 1987. That will not be in time to beat the Japanese competition, but the lag will have been reduced to a few months. The companies that are still in the race do not expect, however, to become rich by selling megachips, as the investments are too high. In the years to come, Siemens (supported by the Ministry of Research and Technology) will pour DM 1.7 billion into the development of the megachip. Philips (with the help of the Ministry of Economic Affairs) will spend the same amount.

On 7 October 1985, the European Commission also stated that the development of the megachip is a matter of survival. In his speech at the end of the Symposium "Europe 2000, the Technological Challenge," Michael Poniatowski, president of the Committee on Energy, Research and Technology, notes that Europe is on the verge of drifting towards the level of a Third-World Country. The lag in the field of microelectronics is dramatic. The development of the megachip gives European industry a last chance.

One Single Speck of Dust Can Ruin a Chip

Thus, designing new circuits first of all means making a plan in which blocks, building blocks from this library of integrated circuits, are assembled. The computer can then calculate what the new chip will do, how it will work. The electronics industry thinks that the demand for very complex chips, those made for a specific purpose (custom chips), will steadily increase in the future. Between the megabit memory chips that are to be mass produced and the small series of custom chips, there is a large group of semi-custom chips. These chips can be used for varying purposes, although the different customers use different parts of the chip and different ports. These chips can often be recognized by the large number of ports.

In this context, it is essential for the megabit project that a new generation of chip design with advanced computers and software be developed. Philips and Siemens have largely solved this problem, possibly better than the Japanese companies, which are able to assemble a million components on a chip but cannot produce complex custom chips.

Production steps 3, 4 and 5* require among other things:

- a new technique for etching the patterns onto the silicon;
- the creation of cleaner production areas;
- the construction of a new generation of production machines.

The choice had already been made in an early stage. Optical lithography would be used to etch the microscopically small structures. This has now been made possible by the availability of greatly improved lenses. Philips as well as Siemens already had some experience with advanced optical techniques.

* The following steps can be distinguished in the production of chips:

1. Designing the desired circuit.
2. Converting this design into a form that can be produced as an integrated circuit.
3. Producing masks.
4. Preprocessing the silicon wafers.
5. Processing the silicon wafers, actually creating the circuit on the wafer.
6. Testing the fresh chips on the wafer. Defective chips are marked.
7. Cutting the individual chips out of the wafer.
8. Fastening each chip to a base, putting it into a casing and testing it again.

Clean areas are necessary for the production because one speck of dust can completely ruin a chip. Many years ago, the so-called "clean-room" technique was already used in a primitive form in the operating rooms of hospitals. The degree of cleanliness is defined by the number of dust particles per cubic foot, i.e., per 27 liters of air. Class 100,000 means that at most 100,000 dust particles the size of half a micron are present. This seems an awful lot, but no operating room will achieve this degree of cleanliness. There are millions of dust particles in the air that we breathe.

Space travel was not satisfied with this degree of cleanliness and improved the technique to class 10,000. For the production of chips (and video and compact discs) even 10,000 was not acceptable. Thus, class 1,000 and less were attained. At present, 256K chips are produced in clean-room class 100. For the magachip, which begins to work in submicron sizes, even this is not sufficient. Class 10 must be achieved, i.e., not more than 10 dust particles in 27 liters of air (otherwise too many chips are rejected). In practice this means that the air in the production room is exchanged every 30 seconds, in the future even once every 5 seconds. People who work here are completely dressed in spotless white, only the eyes are uncovered. Philips has a 2,400 square meters clean room in its brand-new Submicron IC Center. Half of this room is superclean: class 10. Siemens as well as Philips now aims at a class 5 clean room.

For the construction of new production machines Siemens called on the help of Toshiba. In exchange for all its semiconductor patents, Siemens is allowed to take over Toshiba's knowledge in the field of submicron process technology. This almost dramatic exchange of knowledge has reduced the extent to which Philips and Siemens lag behind the Japanese to a few months. Siemens has further accelerated developments and now wants to produce the first megachip in the fall of 1986 (originally the fall of 1987).

The Ultimate Weapon

Finally, a substantially new technology for testing the chips is needed. Philips and Siemens have developed a method to penetrate into the chip with an electron ray. They are literally capable of viewing a train of zeros and ones, travelling through the chip. To do this electronic microscopy is combined with a stroboscopic technique.

The arrival of microelectronics has caused an economic world war, which is now at its peak. Philips and Siemens are convinced that it has now become a life and death struggle. An electronics company that does not possess its own submicron technology has no future. This view explains the gigantic amounts of money being put into the project. The American companies are still fighting on but they have already given up on the market for the big DRAM (Dynamic Random Access Memory] memories.

For Siemens the megabit project is the biggest project in its already rich past. Siemens has opted for dynamic RAM's because the company has been working in this technology for many years. Switching to static RAM's, chosen by Philips, would cost a lot of time and mean loss of capital. Philips could

choose another memory technology, because it entered this market later than Siemens. Microelectronics is being applied more and more in speech recognition, speech synthesis, ABS [Anti-Blocking Braking System] systems in cars, medical nuclear spin tomography, pacemakers, etc. Due to these applications the economic importance of the chip is becoming very big. The megachip is only a way of acquiring tomorrow's technology. The megachip has become a weapon in the economic world war. Through SDI (Star Wars) the Americans also hope to fight in this war. The outcome is difficult to predict, but it is not exaggerated to say that Europe's future depends on the success of the megachip project.

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WEST EUROPE/COMPUTERS

BRIEFS

NOKIA-LUXOR INFORMATION SYSTEMS ESTABLISHED--Stockholm (CWN)--Two Scandinavian electronics giants are combining: The Finnish computer manufacturer Nokia, Helsinki, and the Swedish electronics giant Luxor, Stockholm, are about to merge two Swedish branch establishments and set up the Nokia-Luxor Information Systems company. According to a spokesman, the new enterprise will be formed from the Nokia Information Systems company, the marketing area of the Finnish parent company, and the Luxor Datorer AB, manufacturer of micro- and mini-computers. Among other things, Nokia-Luxor is to sell the Luxor ABC 800 micro-computer series, as well as the Luxor 9000 mini-computer family. The Scandinavians expect that the new enterprise will sell systems valued at approximately \$39 million this year and will secure a market share behind the industry giant IBM. [Text] [Munich COMPUTERWOCHE in German 24 Jan 86 p 72] 8970

CSO: 3698/380

WEST EUROPE/FACTORY AUTOMATION

COMPUTER-AIDED DESIGN, MANUFACTURE AT FRANCE'S AEROSPATIALE

Paris REVUE AEROSPATIALE in English Mar 86 pp 42-44

[Text] At MICAD '86, the fifth conference and international trade show on computer-aided design and manufacture (CADM) and computer graphics, which has just ended in Paris, Aerospatiale's Aircraft Division delivered two series of papers which attracted attention. Without CADM, building an aircraft as sophisticated as the A320 or conceiving an ambitious program like the Hermes spaceplane would be a difficult task indeed. But in the space of ten years, there have been such advances in CADM that it has become an invaluable asset which Europe's premier user in the aeronautical field can no longer do without.

There seems to be no end to the spinoffs from the Concorde program, for as it got underway it soon emerged that new methods would be needed to study and draw the contours of the aircraft. The classic method -- the drawing board -- could no longer meet the precision requirements for the first civilian supersonic transport, in addition to which reproducibility was going to be indispensable and there was also a need to cut down on manufacturing times.

Following a feasibility study which produced positive results, the Aircraft Division's design department went on to develop a dedicated software package which it called SIGMA (for integrated computer-aided geometry system). This was one of the very first design software programs which made it possible to obtain full three-dimensional drawings on a screen instead of having to produce them on a drawing-board. But another tremendous advantage was that the machine could memorize all the tentative solutions envisioned, thus enabling the calculations to be optimized and significant gains both in time and quality to be achieved.

Its entry into service in 1976 and its subsequent intensive use by France's biggest aircraft manufacturer led to other applications being considered a year later. After all, if a computer enables a part to be drawn, then it would be possible to control the precise motions of the cutting tool that would produce the part in question. Which is how CADM came about, with

the machining commands being sent to the mill or the robot either directly or by the numerical-control tape. This accumulated data is available for direct retrieval by the program management services, which facilitates costing. Furthermore, the sales department can obtain immediate information concerning the production costs of different versions.

The Sources

Now installed in the Aerospatiale group's thirteen plants belonging to the Aircraft, Helicopter, Tactical Missiles and Ballistic and Space Systems Divisions, CADM activity involves some 500 graphics terminals connected to powerful IBM and CDC mainframes, plus more than 70 CADM microcomputers -- the whole worth about 500 million francs. Used daily by more than 1500 different people, these systems already have more than 25 billion bytes of information available.

A more detailed examination shows that each system corresponds to specific applications. To take a few examples, in the case of the Airbus A320 program, SIGMA (see above) is used to define the external forms of all project hardware being studied by the Aircraft Division's design department, making it possible to develop complex shapes both externally (aerodynamics, visibility, etc) and internally (housings and enclosures, piping, ergonomic aspects, etc). Thanks to this software, cycle times for fully exploiting conformal shapes have been cut down by 50-60%.

Then again, an interface used with SIGMA means that mechanical parts drawn on the Computervision system incorporate data extracted directly from three-dimensional models. All their detailed engineering drawings are 100% computerized. Because they are encoded with the SPIDER (Footnote 1) (Integrated system for the production of grouped elements) system, they can readily be identified both by the design department and the production services for establishing operation sheets relating to the parts.

Computers also afford appreciable aid where electric circuit diagrams are concerned. A modern aircraft may involve about 15,000 circuit diagrams that have to be kept up to date throughout its service life (a minimum of 20 years), so it is not difficult to see what a valuable contribution the CIRCE (Footnote 2) (A French acronym for computerized and rationalized design of electrical wiring) software program has made in managing all this documentation.

All this information is stored and managed in the different compartments of the drawings database, and this total volume of some 8.5 billion characters is accessible to all users in the Aircraft Division.

After the design stage, these data can be used for manufacture proper. The aircraft's geometry, for example, which is stored in the design department's database into which it was fed by the SIGMA system, can be transmitted directly to the production shop's CAM system to determine the motion of the numerically-controlled tools.

Independence Retained

In contrast to some other companies, it is not Aerospatiale's policy to develop and market CADM systems but to procure the best hardware available from outside suppliers. This procurement policy calls for diversifying one's supplier to ensure healthy competition and enable the company to retain its independence in selecting only the most advanced systems offering maximum performance. It also implies having small, highly competent teams to evaluate the best candidate systems and to subsequently adapt them to Aerospatiale's own highly specific needs.

Consequently the Aerospatiale central technical directorate operates a laboratory at its Suresnes facility outside Paris, whose role is to carry out expert assessments and to guarantee a data interchange capability among the new systems. This led it recently to develop a so-called Interchange and Transfer Standard which has since become the AFNOR 268300 standard adopted for Airbus Industrie for the A320 program and which is being considered for the Ariane 5 and the Hermes project. It is also in the process of being adopted in other industrial sectors, notably by the Peugeot automobile company, and is furthermore being proposed to the International Standards Organization (ISO) as an international standard.

Clearly, one of the first companies in the world to use CADM is maintaining its technological lead.

/12851

CSO: 3698/394

WEST EUROPE/FACTORY AUTOMATION

CAD/CAM MARKET IN ITALY EXPECTED TO ACCELERATE

Milan PRODUZIONE E COMPUTER in Italian Nov 85 pp 69-71

[Article by Engineer Giuseppe Dellisanti, of Reseau, Recherche e Studi su Elettronica e Automazione, Milan: "CAD/CAE in Italy"]

[Text] A survey of the diffusion of CAD/CAE [Computer-Aided Design/Computer-Aided Engineering] systems in Italy shows that our country is rapidly narrowing its lag with respect to the other industrialized countries, thanks to the innovative drive of its small- and medium-sized firms.

The results of the recent Italian CAD/CAE market survey conducted by Reseau indicate the definitive taking root of a technology rightly considered by many to be the true point of departure of the factory automation process: The number of working positions equipped with a CAD/CAE workstation as of yearend 1984 totaled almost 2,000, or four times the number in 1982, and encompassed over 600 firms equipped with at least one CAD system.

CAD/CAE and Factory Automation

A comparison of the above figures with those for the intensity and, above all, the dynamic of the diffusion of industrial robots (a little over 1,800 as of yearend 1983) or FMS's [Flexible Manufacturing System(s)] (not more than 20 in Italy, including the simplest of flexible cells), indicates that most firms prefer an automation strategy that starts with the product conceptualization and design phase, then extends to the production engineering and process management phase, and only thereafter to the shop and other manufacturing facilities, rather than a strategy that starts "from the bottom." In reality, a firm's choices are more complex and interlinked, and rarely proceed along a single track and in a single direction: The difference in rates of introduction of the new CAD/CAE and FMS technologies can therefore be explained by comparing the two innovation processes. The introduction of an FMS in a factory requires, as of today, an investment starting at between 0.5 and 1 billion lire for the simplest of systems and rising to several billion lire for the more complex systems; these investment thresholds are not expected to drop significantly, given the fact

that "mature" technologies (machine tools, vehicular equipment, and other facilities) make up over 70 percent of the cost of such systems.

The average investment necessary to install a CAD system--over 300 million lire only 2 to 3 years ago--is now of the order of 150-200 million lire and is fast dropping below a threshold level of 100 million lire, owing to the introduction of high-performance, low-cost dedicated CAD/CAE workstations and of systems based on personal computers.

Thus, in the case of CAD systems, microelectronics is exercising in full its explosive innovative capacity and its capacity for reducing cost/performance ratios, while concurrently and to a growing extent, economies of scale in hardware (with beneficial impact now in the CAD market as well) and increasing standardization and industrialization of software are signaling eventual reductions in overall system costs.

First of all, a major difference between CAD/CAE and CIM [Computer-Integrated Manufacturing] is in the average thresholds of their required initial investments. The contention that the cost of an industrial robot is equivalent to that of an average CAD/CAE system does not change the situation when it is considered that--except for a few simple applications--a robot is effective and applicable only if inserted in a robotized system, the cost of which is normally 2 to 3 times higher than that of the robot alone. A second consideration relates to the process of substitution which the introduction of an FMS involves and which, on the contrary, is absent or not very significant in the case of CAD/CAE.

In fact, if one excludes the extremely rare cases of totally new factories, an FMS is normally installed to replace a rigid-transfer line (in large-scale production lines seeking flexibility) or a group of isolated machine tools (in small- to medium-scale lines seeking automation): In both these cases, the substitution involves, among other things, evaluations of the average age of the installed machines, their productivity, their residual value, and hence, in sum, a decisional process that is slower and spaced out with respect to time.

A third consideration hinges on the criticalness of the manufacturing operation to the firm, from the standpoint of not being able to tolerate risk of interruptions or serious disturbances of the manufacturing cycle or of product quality, even on a transitory or partial basis.

Thus, the lengthy introduction times, underutilization of systems, initial duplications between CAD/CAE and traditional design and engineering operations, etc. that occur in almost all cases with respect to CAD/CAE systems are totally unthinkable with respect to FMS's.

Given the criticalness of the investment, FMS supply market pressure cannot be expected to speed up company decisional times by more than a certain

amount or to provoke hastily-arrived-at decisions such as unfortunately has frequently occurred in the case of CAD/CAE systems.

Further considerations having to do with the diverse extents of maturation of the technologies concerned--in particular, those of software, in which FMS's suffer from a serious shortage of standardization and modularization of the functional capabilities offered, with consequent upping of the costs of development and customization--and the diversity of structure and technological origin of the supply--typically data processing in the case of CAD, and mechanical with need of integration of data processing capabilities in that of FMS's--amply justify the present diffusion gap between the two technologies.

In terms of market and with reference to Western Europe, a comparison of CAD/CAE versus FMS confirms the above-cited developmental differences, while evidencing a trend towards equalization of the two markets around 1995.

Reseau estimates European demand for CAD/CAE as of 1984 at \$0.8 billion, versus \$0.2 billion for FMS; whereas projections indicate a market of \$3.7 billion for CAD in 1990 versus \$1.5-1.7 billion for FMS in 1990.

CAD in Italy

In this regard, updated figures on diffusion of CAD/CAE systems in Italy, as compared with those available at the international level, are particularly significant.

The lag as of 1982 in the number of applications and the total value of the CAD/CAE demand, with respect to the principal European countries, besides the United States, of course, could in fact, if confirmed, have indicated a progressive and disturbing distancing of our country from the emergent trends towards CIM in the major Western industrial systems.

Instead, in just 2 years, Italy went from 34 billion lire, or 7.7 percent of the European CAD/CAE market in 1982, to 130 billion lire, or 9.1 percent of the European market in 1984, with an average annual growth rate of 96 percent in lire, corresponding to +73 percent in dollars!

If it is considered that Italy's characteristic share of the European data processing market, and more generally speaking the electronics and automation markets, is around 10 percent, and that medium-term forecasts of the Italian CAD/CAE market indicate still slightly higher growth rates than average West European rates, the conclusion can be drawn that--at least from an overall quantitative standpoint--we need no longer suffer from unjustified inferiority complexes.

Stretching the analysis to the typology of CAD/CAE users in Italy lends cogency to this viewpoint.

With respect to Western Europe, for example, the big Italian firms appear to have moved belatedly and, above all, not as decisively in adopting CAD/CAE systems: Rarely, as of 1984, did the count of workstations per firm in Italy exceed 15-20 units, versus frequent counts of 50-100 units in the big European aeronautical, automobile and electronics firms.

On the other hand, the user sector made up of small-sized firms and technical design studios (generally, less than 50 employees) is more numerous and more dynamic in Italy than elsewhere, a sign of a greater inclination towards risk and innovation on the part of the very small Italian firm, but also of a higher degree of decentralization of conceptualization and design than the European average.

Projections to 1990 indicate the following trend lines:

--The big firms will comprise not more than 10-12 percent of CAD/CAE users (versus 50 percent in 1982); however, they will comprise over 50 percent of the demand in terms of quantity and, above all, of value, attaining CAD/CAE diffusion indices comparable to those of Western Europe (1 station per 10-12 employees in conceptualization and design, in the big firms); to be noted--incidentally--is the fact that this relative lag of the big Italian firms will now be translatable into the advantage of being able to accede to newer and tested CAD technologies free of the burdensome problem of compatibility with past investments and their recovery;

--The very small firms will maintain highly significant positions in terms of quantity (over 40 percent of projected users as of 1985-90), above all from the standpoint of the size of the end-use market in Italy, such as civil construction, architecture, plant engineering, industrial engineering and cartography, characterized by a high degree of decentralization of design activity and a high degree of fragmentation of the activity;

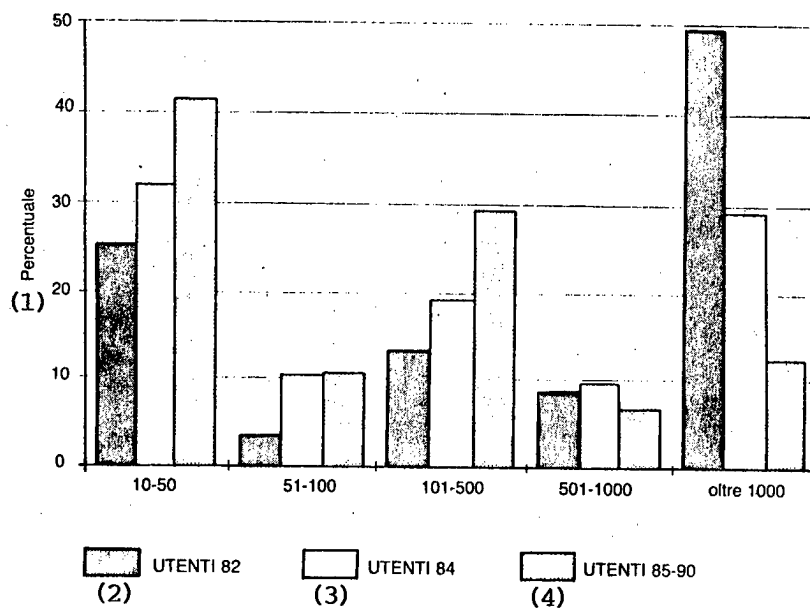
--A sharp growth, relative to the past, of the economic weight of the small- to medium-sized manufacturing firm (50 to 500 employees), which comprises the load-bearing structure of fundamental sectors such as the mechanical, the electromechanical and the electronics sectors, and which will comprise over 40 percent of the CAD user sector in 1985-90 as compared with 20 percent of that sector in 1982.

The "Italian way to Computer-Aided Design" thus stands to be original and intimately linked to the structure of our industrial system, but, on the whole, solidly based and on a scale commensurate with the European average.

Any complaints, at worst, must stem from the standpoint of supply, where the market share covered by Italian firms or capital does not exceed 20-22 percent. At least four enterprises, however, figure among the leading 20 present in the market (Selenia, Autotrol, Cad Lab, Eurobit, and Olivetti Tecnost), while more than 70 Italian systems and software houses are of very singularly limited size.

Chart 1

Number of Users by Size of Firm - As Percentage of Sampling



Source: Réseau Survey. Samples: 91 cases, 1982; 137 cases, 1984; 181 cases surveyed in 1984 for 1985-1990.

Key:

1. Percentage.
2. Users in 1982.
3. Users in 1984.
4. Users in 1985-1990.

Chart 2
Number of CAD/CAE Workstations

(1) Settore	82	%	84	%
(2) Mezzi di trasporto	134	25,5	350	18,6
(3) Meccanica	74	14	300	16
(4) Elettromeccanica	20	3,8	70	3,7
(5) Elettronica	80	15,2	300	16
(6) Impianti	60	11,4	280	13,8
(7) Civile/arch.	46	8,8	240	12,7
(8) G. territorio e servizi pubblici	80	15,2	210	11,2
(9) Tessile e abbigliamento	22	4,2	75	4
(10) Altri	10	1,9	75	4
(11) Totale (arr.)	525	100	1880	100

Source: Réseau.

Key:

- | | |
|-------------------------------|---|
| 1. Sector. | 7. Civil construction/architecture. |
| 2. Transportation facilities. | 8. Land management and public services. |
| 3. Mechanical. | 9. Textiles and clothing. |
| 4. Electromechanical. | 10. Other. |
| 5. Electronics. | 11. Total (round figures). |
| 6. Plant installations. | |

Chart 3

Italian CAD/CAE Market - Billions of

Current Lire

	1982	1984
(1) Mercato Italia	34	130
(2) % Italia/Europa Occidentale	7,7	9,1
(3) % Italia/Mondo	2	3

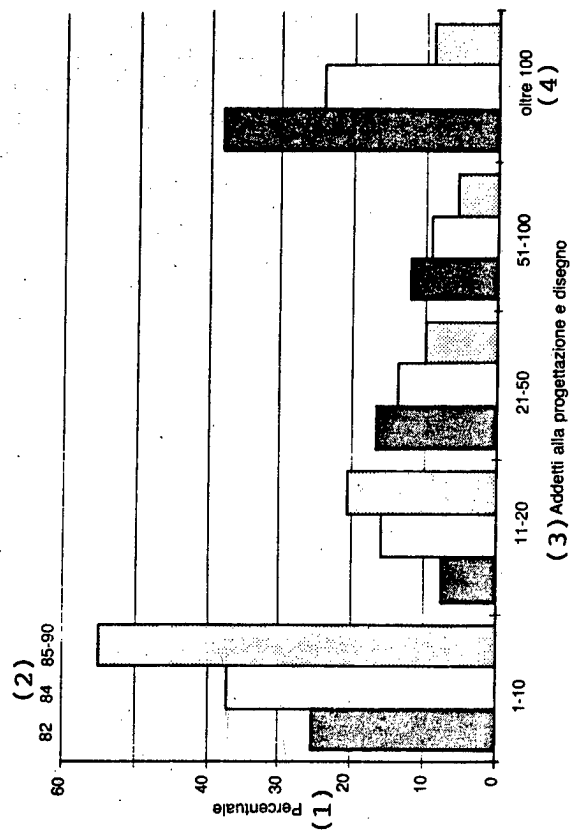
Source: Reseau.

Key:

1. Italian market.
2. Percentage Italy/Western Europe.
3. Percentage Italy/world.

Chart 4

Users by Design Area Size



Source: Reseau Survey. Samples: 91 cases, 1982; 137 cases, 1984; 181 cases, 1985-1990.

Key:

1. Percentage.
2. Key to shades of gray used in bars.
3. Employees in Conceptualization and Design.
4. Over 100.

While Computervision and IBM continue entrenched in top position (15-20 percent of the market), followed by Calma and Tektronix in that order, the degree of concentration of CAD/CAE supply in Italy is lower than abroad. This can translate to a greater availability of choices, but also to greater risks and problems for the potential user, from the standpoint of orientation of decisions: This too, however, is typically Italian.

9399

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WEST EUROPE/FACTORY AUTOMATION

FRG LASER RESEARCH, APPLICATIONS, MANUFACTURE INCREASE

Duesseldorf WIRTSCHAFTSWOCHE in German 7 Feb 86 pp 70-72

[Text] Laser technology in the FRG wakes up only slowly from its slumber. However, most German enterprises are still far removed from an offensive use of the new systems with a promising future.

The tinkerers of the Maschinenfabrik Trumpf GmbH & Co in the Swabian Ditzingen themselves had hardly expected such success. Within a few months they sold over 50 sheet-metal-working installations which are equipped with a laser that they themselves had developed (WIRTSCHAFTSWOCHE 38/1985). The installations cost between DM 350,000 and DM 1.3 million.

The laser development was in a way forced upon them. The U.S. beam source with which their first machines were equipped were too unreliable. On the domestic market, too, which thus far does not even meet 40 percent of the German laser demand, no suitable equipment could be found. Thus Trumpf developers dared the hazardous undertaking: they built a laser of their own even though to start with they knew nothing about electronics. Today a subsidiary of the brave Swabians now produces even in the laser paradise Japan. The computer controlled installations cut shapes however complicated from nearly any thickness of sheet metal--e.g. gears or car body parts, which in the past had to be punched out. Even the smallest series can be handled without big change-over time.

The Ditzingen machine manufacturers are among the few in the country who are not scared of lasers. Bochum scientist Karl-Heinz Krahn words it drastically: "In Germany, the development is simply being missed by sleeping through it." The laser researcher, who won a research prize announced by Philip Morris GmbH, Munich, in 1985, has every reason to be embittered. As early as 1979 he applied for a patent for an advanced gas laser, which has not found any industrial manufacturer to this day. This equipment, according to Krahn, has an improved beam which can easily be fed into a glass fiber. Thus the concentrated light could even be directed into the human body, so as to so-to-speak blast open partially constricted arteries.

Krahn now offers his laser to Japanese enterprises. However, the Bochum man is afraid that the industry will wait until he is unable to pay the patent fees for Europe, the United States, and Japan within a few years. Then his development would be available to all interested parties free of charge.

Matthias Heister, chairman of the board of the Deutsche Aktionsgemeinschaft Bildung-Erfindung-Innovation (Dabei) (German Association for the Promotion of Education-Invention-Innovation), however, does not believe that the Japanese depend on that. Their tactics are simply: "They let us do basic research and assess the results for their own benefit."

With success apparently: Japan is in the process of further developing its laser top position--next to the United States--even further. For this purpose, a 7-year plan was launched in which 20 enterprises are included. They have \$ 5.7 billion at their disposal.

In the United States, too, they slog away: Over \$ 2 billion was available for laser research in 1985 alone. Although most of these funds came from military pots, civilian researchers and manufacturers also indirectly benefit from the findings that have been obtained.

Next to all that, the German efforts look rather pathetic: in 1985 Federal Research Minister Heinz Riesenhuber made all of DM 15 million available for this field. He has set aside another DM 125 million up to 1989. North Rhine-Westphalia, the most populous federal Land, contributes an additional DM 6-7 million for laser research and Lower Saxony, which wants to blossom into the research Land, plans a laser institute.

There is no doubt: there is a push going through German research in this field. Laser medical centers were founded in Berlin and Ulm with industrial participation. A Fraunhofer Institute was established in Aachen, in which the application of this promising tool is to be researched, and the first laser chair in Germany is to be set up. The German Research and Experimental Institute for Air and Space Travel established an institute for high energy processes in Stuttgart.

The meanwhile remarkable domestic efforts in laser research can expect enormous economic successes. In the civilian field alone, growth rates of 30 percent are now recorded. Prof Gerhard J. Mueller, chief of the Laser Medicine Center in Berlin, believes that even growth rates of 40 percent are possible in the coming years. In the Western world, about DM 14 billion was spent for laser equipment in 1985. Europe had a modest one tenth of that, roughly one third of it the Federal Republic.

At any rate some German enterprises come up with notable achievements even in a worldwide comparison. Thus the Messer Griesheim GmbH in Frankfurt, by its own statement, offers the most efficient European carbon dioxide laser for material processing. Medical lasers of the MBB-Medizintechnik are exported all over the world. Also in demand is the laser scan microscope of the optical firm of Carl Zeiss in Oberkochen. It is used for quality control in the semiconductor industry.

Despite all individual successes, the German position remains weak. Prof Michael Ulrich Dardenne, institute director in the Bonn University eye clinic and a pioneer in laser medicine, considers Bonn's sponsorship policy as one of the essential causes of this wretched state of affairs. "The state should sponsor above all small and medium-sized enterprises which are more strongly motivated and more flexible than the big ones."

It is a small enterprise that the federal research minister refers to as world market leader in a special field: The Lambda Physik GmbH, which is typically 80 percent owned by the U.S. company, Coherent, Inc. The Goettingen firm builds so-called Excimer lasers whose future lies mainly in medicine and material processing. The Bonn professor of ophthalmology Dardenne is enthusiastic about this "third generation laser.": With it inconceivably clean cuts are possible." Before this year is up, he wants to be one of the first Europeans to use this type, e.g., in the case of eye lens corrections to overcome myopia. This technique is almost routine in the United States. Dardenne, however, continues to fight bureaucratic adversities. He needs a high-voltage connection. However, the university has not promised him that until mid-1987.

The entire spectrum of application can hardly be imagined now. The Ditzingen Trumpf machine builders thus far have reached the limits of the new technology only once. At the behest of a noodle manufacturer, they were supposed to find out whether pasta, which is traditionally sawed out of dried sheets, can be cut with the laser. The tests were successful but the cooks protested, Trumpf marketing manager Rudolf Thalheimer reports. After the cutting, the noodles were slightly singed.

The new technology is already firmly established in the printing industry and in electronics. Lasers "etch" printing plates and displace conventional techniques such as print wheel and ink ribbon. By compact disc, the thin beams provide maximum enjoyment of music and needle-sharp TV pictures. Lasers automatically read prices at department store cash registers. Nearly all car manufacturers even now cut and weld with the light beam and the Continental Gummi-Werke AG in Hannover check the quality of their tires with the new technology. Finally surgeons use the laser for surgery.

"Nonetheless," Berlin laser professor Mueller complains, "we are only at the dawn [of the possibilities] not only in the medical field." But he and other experts already see the coming of a bright future. Experts compare the future development with the rapid happenings in the microelectronics market--with a time shift of 17 years. "Laser technology is the key to the industrial future of each industrial country," it is noted by Reinhart Poprawe, member of the leadership team in the Aachen Fraunhofer Institute for Laser Technology. The latest experiences give him hope: Especially in the past few weeks his house recorded a veritable onslaught of enterprises which want to apply the laser technology and seek professional advice. A further positive indicator: In 1985 laser producers, too, for the first time competed for the Innovation Prize of German Industry.

However, today hardly more than a dozen manufacturers play a role on the laser market. Established enterprises, such as Siemens, MBB, Messer Griesheim, and Zeiss have involved themselves here, but also newcomers such as Lambda Physik in Goettingen and the Hamburg Rofin-Sinar Laser GmbH. There is also still room for a few outsiders which successfully discover gaps and fill them, such as the Berlin Spektrum GmbH, which creates each of its lasers especially according to the wishes of the customer. Experts give such midgets courage. After all, many of the present electronics giants also started out as midgets.

12356

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WEST EUROPE/FACTORY AUTOMATION

VW OF FRG STEPS UP IN-HOUSE ROBOT DESIGN, USE

Landsberg ROBOTER in German Sep 85 pp 24-31

[Article: "Latest News from the World of VW Robots"; first two paragraphs are introduction]

[Text] The appetite for robots is growing. If the VW production planning division is to completely satisfy the subsidiaries' desires for robots, it would have to provide at least 380 robots by the end of 1986. That is the projected number for 1990.

At the beginning of 1984, production manager Dr Eng Guenther Hartwich announced that VW would possibly be discontinuing the development and production of industrial robots since what VW needs is now available for purchase on the market. However, VW's faith in the robot market does not appear to be particularly steady, because those involved in development are more creative and those involved in production are more industrious than ever before. The present VW plan includes 10 types of robots, and the 1,150 units currently in use should immediately double in number. Is VW thus once again becoming what it was before a short interruption: Germany's biggest producer and user of robots? All of this, however, is being played out within the company--VW does not have its eye on the "free" robot market.

The fact that VW is once again able to roll the new Golf off the assembly line in mass like the Beetle at its apex is certainly due to the more than 10 different types of robots with the VW emblem. In fact, without the flexible assembly line in Plant 54, the car could not be had at the present price (cynics say that it is in fact because of Plant 54 that the Golf is so expensive). Thus, despite all prophecies of doom, the development of new types of robots for new areas of application is continuing without interruption in Wolfsburg. One- and two-armed assembly robots are already putting together 30 different types of radiators and screwing together component parts. And the next generation, which is supposed to deal with the flexible setting and tightening of workpieces, is already undergoing the first "working experiments" in the laboratories. Thus, the VW prognosis for 1990 certainly does not fall in the realm of science fiction: in all of the company's plants the number of robots should have increased from approximately 1,150 now to 2,200 by then.

Early in 1983, approximately 1,000 VW robots were involved in the construction of VW and Audi models. The current statistical overview of 1 April 1985 shows 150 more units. As Friedrich Luenzmann, who as manager of the central production planning division is also responsible for the development of robot mechanics, knows, there will again be greater movement towards robot applications in the future. At the Wolfsburg plant, where handling machinery is still built to a certain extent at the same time by humans who otherwise work in auto production, 100 brand new machines are already waiting to be transported to Ingolstadt. And 38 more are about to be used in their future workplaces in other plants. The next 200 robots are in the preliminary planning stage. Thus, the short breather after the show of strength in using automation in Golf assembly at Plant 54 appears to be over.

After the Lower Saxony mother plant, which with nearly 500 units is still the main customer for VW's own robots, most of the equipment--320 units--is used in Ingolstadt and Neckarsulm. The production figures of 700 autos a day in those plants mean that robot use is predestined to continue. With a Golf production level of 3,000 cars a day, there are limits on the robots--because of the extremely short assembly time--if production cannot be broken down into a honeycomb structure. In the Hannover van plant as well, where 16 different sides for 700 vehicles must be welded each day, it was not until robots with their flexibility were introduced that economical automation became possible. In the meantime, 127 robots are involved in van construction there.

The fact that 71 of the Wolfsburg robots are in use at the VW subsidiary in the United States is not a self-evident truth. The Americans would rather have bought a Cincinnati. It was not until after a six-week "working battle," in which a Robby and a Cincinnati on the right side and the left side of the assembly line put welding spots on the same bodywork--working together, but ultimately in fact working against one another--that the U.S. boys chose the Wolfsburg robot despite the higher price.

The remaining 150 or so robots are distributed among the other VW plants; a few robots are even doing service in the Latin American branches, in Brazil and in Mexico, where the level of wages puts a wistful look in the eye of many entrepreneurs here.

The fact that for VW, as for all automobile manufacturers, the main area of application is still spot welding--for VW this accounts for 61.8 percent of robot applications--has not changed, even though this percentage has decreased significantly with respect to earlier statistics. This is admittedly only because other fields of application have been added, such as coating, which occupies 12.2 percent of the VW robots, and assembly, where the percentage has risen from 2.5 to 4.3. Pure handling activities still have high status: 16.2 percent of all robots are involved in this. Continuous welding and "other" rank at the bottom of the list with 3 percent and 2.5 percent, respectively.

In terms of numbers, the so-called "tube machine" of the R 30/6 type, with 613 completed models, is still in the lead, but clearly in the running now are the six-axis jointed arm robot G 60 (421 units) and G 15 (126 units), with load capacities of 60 and 15 kilograms, respectively. This family is now being expanded upwardly and downwardly with the G 100 and the G 8. The two most

recent developments--at least, the most recent ones that Wolfsburg is willing to reveal--are one- and two-arm column machines, simply identified as "S1" and "S2" VW models. Even if the standard VW principle of unit assembly was retained for these robots, they hardly at all resemble their predecessors in strictly external terms, except for their orange color. The main component of these machines, as the name indicates, is a standing column that can revolve around its own axis. The kinetics is undoubtedly oriented towards the movement possibilities of the human arm. On the S1, an arm with two vertical rotation joints can make translatory movements along the column axis. On the S2, there are two arms. Including hand axes, the two-armed model can be equipped to be a 12-axis robot. The fact that machinery with this sort of complicated axis configurations is not driven by continuous-path control is intentional, especially since multipoint control is sufficient in the preferred area of application--assembly--where translatory movements are required and this was kept in mind during development.

The first four of these robots are already working in production, of course in Golf assembly in Plant 54, where else. It is here that VW was the first automobile manufacturer in the world to automate 25 percent of its assembly processes, a tremendous jump compared to the five percent figure for the first Golf, which--in international terms as well--is still a standard industry-wide figure. The column robots, two four-axis S1s and two eight-axis S2s, are responsible here for constructing and moving Golf radiators.

Work is already in progress on further areas of application for column machines. An S1 will soon be automating tool changing for a copy milling machine, on which heavy press machinery is milled; another S2 will soon run a laser gun to cut "windows"--not the glass kind, but rather holes for pedals and the steering column--into unfinished car bodies. This does indeed sound strange, but it make sense because there is a desire in Wolfsburg to decide as late as possible whether a vehicle will have its steering on the right or on the left.

S1 and S2 are not last on the list of types of robots. There is already a series of new contractions: GP 100/6, GP 8/5 and P 200/3, /6, P 50/3, P 30/3. GP stands for jointed arm portal, P for portal, and the numbers indicate the load capacity together with, after the slash, the number of axes. "For the new generation, we must soon set up a new column in our statistics on areas of application." Friedrich Luenzmann is initially very cautious in his statements, and then reveals a little of the secret. What is involved is the flexible mounting and setting of building components. Certainly a development associated with special difficulties. The jointed arm portal and portal robots should assume these tasks in the future. Luenzmann's description of the characteristics that the new tensioning robot is to have is quite vivid: "As large as a knitting needle, it must be able to pinch as hard as an ant and be as maneuverable as an elephant's trunk. That would be the ideal tensioning robot. However, since it will not be possible to combine all three characteristics, we will have to make compromises." The results of this will not be revealed for another year and a half or so, when the first tensioning robot turns up in the production plant. At any rate the first "pinching tests" are under way.

Thus, there can be no talk of restricting robot development at VW. Nevertheless, the "full-time" robot producers hardly need to fear the auto manufacturer from Wolfsburg as a competitor before 1990. Sales outside the company have been a total of 87 machines. After all, robots do not sell "easy as pie," but rather only as a solution to a problem, and VW does not have enough free capital to accomplish that. The fact that VW machines are occasionally higher in price than most others may also play a role in the stagnating sales by the authorized concessionaries, Expert and Oerlikon-Buehrle. Licensee General Electric as well has not yet made any moves towards its own production, but has initially only obtained a few machines from VW.

For the time being, moreover, the Wolfsburg company itself needs all its machines. If the demands of subsidiaries alone--at present 380 robots--were to be met as quickly as they wanted, the 1990 planning figures would be achieved in 1986, according to Friedrich Luenzmann. This because the trend is again moving like wildfire in the direction of greater flexibility. Luenzmann is sure of himself: "We will have to make our assembly lines more flexible. When you consider that a new vehicle today costs at least a billion marks with an operational life of only 7 to 8 years--and our adversaries in the Far East talk about 4 years--then this immense sum can only be earned if we become flexible. It is quite clear that whoever gets these truly flexible assembly lines will be one step ahead in the future."

12271

CSO: 3698/133

'MEGAPROJECT' AFFECTED BY TOSHIBA 4-MEGABIT DRAM ANNOUNCEMENT

Amsterdam ELSEVIERS WEEKBLAD in Dutch 8 Feb 86 p 7

[Article by Willem Kraan: "Philips and Siemens Lose Battle of the Superchip"; first paragraph is source introduction]

[Excerpts] The much acclaimed megabit project was supposed to banish the gap between Philips and Siemens and their Japanese competitors at a single blow. The German and Dutch governments wanted to jointly invest a good half million guilders in this. But now their competitors from the Far East seem to be too fast off the mark for the European twosome.

We do not know if the top people in Philips' chip division suffer sleepless nights over every trifle, but it is to be feared that in recent weeks many a night in Eindhoven was spent staring at the ceiling. Whether the eyes, longing for a night's rest, are projecting intertwining images of white flags with red balls onto the ceiling will probably always remain a subject for speculation, but it is certain that the eternal competition from the Far East is threatening to firmly put a spoke in the wheels of their West European counterparts in the field of chips.

For NEC and Toshiba have announced that they will be exhibiting a specimen of the megachip, which Philips and Siemens are striving to develop with the help of the Dutch and German governments, at a conference to be held this month in Los Angeles. If this is so, the West European resolution to catch up in the field of memory chips has been sunk with a single shot. The megabit project, proclaimed as a heroic attempt to catch up, would then seem to have failed. The only remaining consolation is the thought that Philips and Siemens at least went down fighting.

Admittedly, this is setting a rather dramatic, maybe even pathetic tone. But the interests at stake in the megabit project were also painted in sharp colors by the very people involved in it.

"The megabit project is Europe's last chance in the competition against the Japanese chip invasion," admitted Dr Hermann Frenz, the man in charge of the megabit project at Siemens, before a number of journalists drummed up in Munich last year. "If you do not keep pace in the chip industry, above all with the Japanese firms, in this era of submicrotechnology, then you won't survive the next decade," he added threateningly.

A year earlier, Chairman of the Board of the Dutch Philips firms Engineer F. Rauwenhoff also addressed the issue: By combining the forces of the two European governments and the two large companies, Europe will have a unique opportunity to achieve a preeminent position in tomorrow's world of microelectronics."

And, in justifying the 200 million guilders of Dutch government support for the megabit project, the Ministry of Economic Affairs stated in an explanatory memorandum to the 1985 budget that the Siemens and Philips joint development program "will have far-reaching consequences for the global picture of microelectronics and for the role of Europe."

Crumbs

The battle of the megachip is thus a life and death battle. Winner takes all is certainly a maxim that prevails in this world. The experience with earlier generations of memory chips has shown that the manufacturer who puts the first one on the market will scoop up the profits; the three or four manufacturers who follow within a year may still pick a good number of crumbs off the table, after which the rest of the funds invested in research pretty much have to be viewed as a write-off.

The announcement by NEC and Toshiba concerns the 4-MB DRAM [Dynamic Random Access Memory] chip, thus the chip that Siemens is working on.

At Philips, the reaction to this announcement was decidedly not alarmed. "We will wait quietly and see what they present," says a Philips spokesman. "We have made our plans and we will simply carry them through. We will probably be able to introduce the first prototypes of the one-megabit SRAM [Static Random Access Memory] chip in 1988, and then begin mass-production in 1989."

Catching Up

For the Ministry of Economic Affairs, the most important reason for supporting this development with 200 million guilders (along with 300 million DM from their German colleagues at the BMFT [Federal Ministry for Research and Technology]) is the expectation that Philips and Siemens would finally be able to close the gap between themselves and the Japanese. This now threatens to come to nought. Has EZ [Economic Affairs] already made over the 200 million guilders to Philips?

"No, that's not the way things work," according to a spokesman for EZ. "That sum is paid out in phases and, as far as I know, nothing has been paid yet." The people at EZ don't want to hear anything of the suggestion that a better use could now be found for this money. "It is a matter of Philips and Siemens independently acquiring these manufacturing techniques," according to EZ. "That another manufacturer is also acquiring this technology has nothing to do with it."

This seems a reasonable standpoint, but in view of some recent maneuvers Siemens, for example, seems to think differently about it. In preparation for the production of the four-megabit SRAM chip, the Bavarian electronics giant worked on a one-megabit SRAM chip. But the research was scarcely begun when Toshiba introduced the first model of such a chip. Rather than reinvent the wheel, Siemens halted the research work, wrote off some 70 million DM in research costs (of which about 32 million DM had been paid by the BMFT) and bought a license from Toshiba. Naturally, the BMFT reacted to this with irritation, whereupon Siemens assured them that the technology for producing the four-megabit DRAM chip definitely would not be bought in Japan.

But if the Japanese put the chip on the market two years earlier, as now threatens to happen, one will just have to wait and see whether this promise will be kept. And given that the four-megabit DRAM chip is of a degree of difficulty on the same order of magnitude as Philips' one-megabit SRAM chip, one does not display any too great hypochondria in fearing that they will also steal a march on Philips in the same way within the foreseeable future.

That the Americans do not yet want to concede that, contrary to expectation, they have been beaten, was made clear a couple weeks ago when G. Wanrooy, director of Texas Instruments of the Netherlands, tried to explain in DE TELEGRAAF that this American chip manufacturer had produced the first four-megabit DRAM chip. But Wanrooy added that regular production could not be expected until 1988, so that Texas Instruments, Philips and Siemens seem to be starting out nicely alike.

There is, on the other hand, every indication that the Japanese once again worked extra hard on this. "That is certainly the case," says the Dataquest spokesman. "Under pressure from the declining chip market, the Japanese have stepped up their research efforts drastically."

Underestimate

Up till now, the people in Munich and Eindhoven have acted on the assumption that the Japanese would not be able to display the first example of the 4-MB SRAM chip until fall of 1988. This probably now seems to have been a gross underestimate. Such a mistaken appraisal is easy to make in the hectic world of chips, but this mistake may well have some very annoying consequences, since the Japanese have shown in the past that they can evolve from the first prototype to the regular production phase much faster than their European and American competitors. For this reason, Toshiba's announcement is much more disquieting than that of Texas Instruments.

A year and a half ago, when the Netherlands was in euphoria over the just announced megabit project, the British computer expert and ex-IBM worker James Martin, in this country at the time, ruffled some feathers by asserting that Philips and Siemens were going to reinvent the wheel, with all the attendant financial consequences. This was greeted with considerable laughter at the time. And now? Should Martin be considered right? And did the Ministry of Economic Affairs put 200 million guilders on the wrong horse? It looks like it.

BRIEFS

SIEMENS, PHILIPS RECEIVE SUBSIDIES--Siemens and Philips have received joint financing from the governments of the FRG and the Netherlands, respectively. This credit, which totals DM480 million (about 320 billion lire), will finance the joint development of 1 megabit chips. In anticipation of Japanese competition, both companies aim at appearing on the market as soon as 1988 with a 4 megabit chip, which will be able to record 4 million signals. The FRG Government will allocate two-thirds of the sum in question, DM 320 million. The total investment in the project is equivalent to 2,000 billion lire, shared between research and construction of three plants in Regensburg, Hamburg and Eindhoven (the Netherlands). According to Osen, a Siemens official spokesman, series production will start in 1989. However, time is quite short as IBM is already working at full capacity on a 16 megabit chip. If it appears on the market by the end of the decade, it would make the 4 megabit chip obsolete. According to Osen, it does not seem that other companies will participate in the present project, not even Thomson which showed great interest in a possible partnership. If such participation comes about, it will be limited to a superchip project, which is still at a very early stage of development. [Text] [Milan ELETTRONICA OGGI in Italian No 14, Feb 86 pp 23, 23] 8603/6662

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG RESEARCH MINISTRY ALLOTS FUNDS TO EUREKA PROGRAM

DW151020 Frankfurt/Main FRUNKFURTER RUNDSCHAU in German 15 Apr 86 p 5

[Gerda Strack report: "Riesenhuber Has Money and Ideas for the Eureka Program"]

[Text] Bonn--The European research program Eureka "is supposed to increase the productivity and competitiveness of European industries and economies," said Research Minister Heinz Riesenhuber (CDU) in praise of the idea that is now just 1 year old. France took the initiative in April 1985 to prevent an even greater lead by the United States and Japan in top technologies.

Riesenhuber plans to spend about DM 400 million by 1995 for the first four Eureka projects. The Federal Government promised participation in 4 of the 10 programs in November 1985 at the Hannover ministerial conference.

However, Bonn has not made financial promises in the last year, while the French announced in 1985 that they wanted to pay F1 billion in 1986, about DM 300 million. At the next Eureka conference on 30 June in London, Riesenhuber will be able to hand out cash. Of the four already established Eureka projects with German participation, Riesenhuber wants to allot most to the Eurolaser project. In the 1986-1993 period a total of DM 410 million is envisaged, with DM 155 million coming from the budget of the Federal Ministry of Research and Technology (BMFT). From that program the BMFT expects, for example, the development of laser systems suitable for material processing. The BMFT hopes also for great progress in laser chemistry and the production of integrated circuits using lasers. The FRG, France, Great Britain, and Italy participate in this development. Eurolaser is a favorite of German firms and research institutes. Some 15 FRG firms and 8 research institutes have decided in favor of it. The technology is considered a basis for developments in biotechnology, material technology, information and communications technology.

In addition, German industry will become involved in phototronics, dealing with the production of amorphous silicon for solar cells, exploiting solar energy. In a first phase, from 1986 to 1990, a total of DM 100 million is envisaged for phototronics, with DM 25 million coming from the BMFT.

Euronet and Eurotrac will run without the participation of firms because infrastructural projects are involved. Euronet is the only project where all 18 Eureka partners want to participate.

Eurotrac is supposed to investigate the movement of air pollution material in Europe. The BMFT plans to contribute DM 93 million to the total cost of DM 200 million. The Eurotrac program will run from 1986 to 1993.

Moreover, Riesenhuber had further research programs prepared for the next ministerial conference in late June in London, programs Bonn would like to incorporate in Eureka. Among them are five projects in which industry is expected to cooperate. The BMFT has in mind a biotechnological project (protein design) for the production of pharmaceuticals, the development of fiber-reinforced ceramics for diesel engines and vehicles, research into light-weight materials for transport systems, a computer-aided software production system, and a strategy study for a European supercomputer.

The Research Ministry is discussing seven more Eureka projects in the promising fields of material research and information and communications technology.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

NIXDORF PROMOTES MODEL FOR INDUSTRY, UNIVERSITY COOPERATION

Bonn DIE WELT in German 13 Mar 86 p 10

[Article by James Rover, "New Kinds of Cooperation with "Cadlab": Nixdorf Offers Paderborn Additional Infusion Worth Millions"]

[Text] Once again Heinz Nixdorf came up with a surprise move: At the dedication of the "Cadlab" research and development center in Paderborn, funded jointly by Nixdorf, the Land of North Rhine Westphalia and the comprehensive University of Paderborn, he made an additional donation of DM 50 million. With this donation he wants to support the school in further expanding its emphasis on information science. But he also wants to see a return on his investment. Nixdorf therefore made it a condition of his donation that North Rhine Westphalia provide eight percent interest on the DM 50 million--in the form of additional professorships, people to be employed within the budget at a cost of DM 4 million.

Such quick moves, however, by which a successful manager like Nixdorf has achieved a good part of his business advantage, can only be digested slowly by bureaucracies. Science Minister Brunn said something about "great sympathy," and that was the end of that for the time being. She did announce, however, a desire to still speak with Nixdorf about "concrete details."

For Germany, "Cadlab" (computer-aided design laboratory) represents an unusual joint effort between industry and higher education in the area of third-party research. Nixdorf pointed out how necessary this cooperation is, particularly in the field of microelectronics, in order to stay competitive with the Japanese and Americans: "A university cannot guarantee that industry will remain in a certain place, but unless the university serves to regenerate industry, it will not be able to maintain itself for any length of time.

"Cadlab" in Paderborn, as the university also proudly proclaims, combines the scientific potential of the university and the practical experience of a computer manufacturer in the development of innovative systems which use highly integrated circuits. Thanks to this new facility, new R&D results should be more quickly translated into industrial applications. Research at "Cadlab" will be oriented toward practical applications with a strong emphasis on more far-reaching scientific efforts.

Professor Franz-Josef Rammig, head of the "Cadlab" project, will initially be in charge of a team of 17 scientists and engineers; all of whom, in his estimation, are "highly motivated." In the final expansion phase more than 20 people will be working on "Cadlab"--open also to other interested parties. DM 1.7 million is being invested--almost exclusively for the acquisition of computers. North Rhine Westphalia and Nixdorf each spend DM 1.2 million annually to support this joint project. And two floors officially rented out to the university are also devoted to training the next generation: 55 computers have been installed within a 1290 square meter area where around 500 beginning students of information science have already had the opportunity to obtain practical experience since the beginning of December 1985.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH POLL REVEALS IGNORANCE OF ESPRIT, BRITE, RACE

Paris L'USINE NOUVELLE in French 6 Feb 86 p 71

[Article by Marc Chabreuil: "Technological Competitiveness: Industrialists Give Their Opinion"; first paragraph is L'USINE NOUVELLE introduction]

[Text] To catch up French companies are relying mainly on their internal research capacities. A poll made by ANRT [National Association for Technical Research] reveals that companies, although not well informed about the European programs, are critical of their management, yet still want to see them developed, and plan to participate in the near future.

French companies are aware of Europe's technological lag behind the Americans and the Japanese, a lag involving processes as well as products, often both at once. To close the gap companies are giving priority to increasing their internal research and development activity, according to the poll just completed by ANRT with 126 of them, a representative sample of the large industrial sectors, drawing equally on PMI's [Small and Medium-sized Industries] and companies of more than 500 people.

Favoring the delineation of industrial strategies on a European level, the companies questioned prefer to cooperate within the Old World to the detriment of alliances with American and Japanese manufacturers. More than one-third of the companies expect the governments and the Commission of the European Community to create a European market without borders. Jacques Delors, president of the Community, declares that he is optimistic about this. "By the beginning of the nineties, this problem will be settled," he said at the yearly ANRT luncheon.

When asked how governments or the Community should promote the comeback of European enterprises, the French companies answered: "By granting fiscal incentives for research and development no matter what the size of the company." Other recommendations were the creation of research projects in strategic technologies and measures favoring personnel mobility. With regard to this last point, Jacques Delors announced the establishment of an exchange program for 10,000 student-researchers.

EUREKA, the Unknown Giant

Generally speaking, the industrialists complain about a lack of information about their possible European partners (59 percent) and also about proposed EEC programs (83 percent of the PMI's). For that matter, 39 percent of the industrialists are unable to name any of them. Where there is an answer, ESPRIT [European Strategic Program for R&D in Information Technologies] (electronics-data processing) is cited 39 times out of 100, BRITE [Basic Research in Industrial Technologies for Europe] (industrial modernization) 33 times, RACE [R&D in Advanced Communication Technologies for Europe] (telecommunications) 16 times, and EUREKA [European Research Coordination Agency]...8 times! Yet half of the companies (62 percent of the PMI's) intend to participate in these projects in the future although 44 percent of them criticize the management of the projects. Between 72 and 80 percent would like to see a simplified procedure for applications and contracts. This provided the opportunity for Jacques Delors to announce the appointment of a "PMI commissioner, Abel Matutes, who will provide financial consultation and alleviate the constraints on small companies."

Given electronics and data processing (30 percent), biotechnology (17 percent), robotics (14 percent), and advanced materials (11 percent) as priority sectors needing support, the companies polled have listed the criteria for allocating financial support in descending order: costs or risks too high for a company to bear, stimulation of cooperation beyond research and development to result in marketable products or immediately exploitable processes, and aid to PMI's which do not have the means to finance their own research. Almost everyone wants better coordination between national and EEC programs as well as an increase in their size, and 74 percent believe that they should participate in financing the projects. For them, it is proof of the seriousness of the research.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH ANVAR, FIM EVALUATED

Paris L'USINE NOUVELLE in French 30 Jan 86 p 34

[Article by Marc Chabreuil: "ANVAR Listens to Business"; first paragraph is L'USINE NOUVELLE introduction]

[Text] The impact of its actions, compliments and criticism from its industrial clients, improvements.... These conclusions from ANVAR's [National Agency for the Implementation of Research] evaluation report permit in particular an extension of its support to the service component of companies and to firms selling services to industry.

Do you understand the procedure for receiving ANVAR financial aid for innovation? Half of the PMI's [Small and Medium-Sized Industries] surveyed do. However, 28 percent think that ANVAR has authority primarily in financial matters, and only 15 percent consider it able to intervene in technological choices. These figures are from the agency's evaluation report made at the request of its director Christian Marbach. This is a highly original step for a government institution to take. Marbach states: "This exercise was meant to give us better knowledge of industrialists' expectations and to measure the impact of our financial support."

In fact for the first time, ANVAR activities are well defined. Thus, the evaluation shows that innovation aid--"the top-ranking transaction," which provided Fr 4.8 billion in grants to 7,000 companies over 6 years--focuses on new product development 80 percent of the time. Manufacturing processes account for only one-fifth of the aid. One out of two times the contribution accelerated the innovation program, but in 25 percent of the cases the project would never have come into being without ANVAR financial support.

Overall, these operations fall into three equal groups: high-tech projects, conventional technological projects, and new combinations of existing techniques. This explains the relatively low (15 percent) failure rate (three out of four times due to a poor understanding of the market). In any case it is worth it: for programs in progress 1 franc in aid has generated 5 francs of turnover per year, including 1.5 francs from exports. These ratios are doubled when the cases are brought to a successful conclusion.

The Establishment of Technological Companies Will Be Favored

These spectacular results do not keep companies from criticizing: The delays in allocating aid are too long and the preliminary evaluations are handled with reticence. Industrialists would prefer to get assistance while preparing their proposals and to receive advice before delineating the program.

All of ANVAR support programs have been screened this way and particularly the FIM (Industrial Modernization Fund) which has mainly supported medium-sized companies (between 200 and 2,000 employees). Unlike innovation aid, however, this form of support is concerned more with manufacturing processes than with products. Whereas 60 percent of these projects include the financing of intangible investments, they only add up to an average of 8 percent of the total sum of all programs. Here again, the weak points were emphasized, especially the unsatisfied desire of industrialists to receive a "modernization diagnosis" even before submitting a proposal to the FIM.

On the whole, even though the ANVAR acronym enjoys a good reputation, its image is ill-defined. Consequently, clients want the agency to emphasize its policy of direct representation on their behalf, concludes the evaluation report, which proposes some improvements (priority to PME's [Small and Medium-Sized Enterprises], emphasizing regionalization, etc.) and suggests new activities. Christian Marbach has turned these suggestions into objectives for 1986.

In this way ANVAR will promote the establishment of technological companies, especially those born of research, and will extend its support to the internal service component of companies. After CAD, production control, logistics, etc., aid will also be expanded to include data processing and office automation (digital automatic switches, local networks, work stations, servers, etc.) and software applications as well.

Companies offering services to industry will likewise be involved. Project development firms; consultants; legal experts and accountants; SSCI [Data Processing Service and Advisory Companies]; ground freight companies; industrial maintenance, security, and advertising companies; research organizations; etc. will benefit from ANVAR support. "After the end of this year, industry's service sector could represent 10 percent of the total amount of innovation aid," states Christian Marbach.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALY PUBLISHES RESOLUTION ON RESEARCH SUBSIDIES

[Editorial Report] Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA in Italian on 19 November 1985 publishes a resolution adopted on 19 September by the Interministerial Committee for the Coordination of Industrial Policy (CIPI) concerning the admission of company project proposals to the "special revolving fund for technological innovations" of the Ministry of Industry, Commerce and Crafts. The following are selected records from this document which identify the companies admitted to the fund, fields of research, and the terms of financing for government sponsorship:

Cinotto Technomeccanica S.p.A.-Small Firm Classification

Program: formation and stamping of the elastomeric part of the torsional vibration damper for eight-cylinder and diesel engines. Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 3 May 1985.

Place of execution: North Italy.

Form of financing: Credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15 law No 46 17 Feb 1982.

Maximum amount: a) credit facility: 17.5 percent of the allowed costs (331.1 million lire); b) contribution: to be worked out by the Ministry of Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 17.5 percent of allowed costs applying the calculation procedure as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 January 1983.

Ending date of the program: 30 June 1986.

Edwards Alto Vuoto S.p.A.-Large Firm Classification

Program: automation controlled by the microprocessors of the cycles of industrial and pilot lyophilization, and robotization of the movement in the sterile areas of the products under treatment.

Admissibility (law No 46/82, Article 16): resolution of the Minister of Industry, Commerce and Crafts dated 12 July 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (3,316.32 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 June 1983.

Ending date of the program: 30 May 1986.

Enrietti S.p.A.-Small Firm Classification

Program: technology and new mold components to obtain complex products in thermoplastic materials, for automobile and industrial applications which will allow a reduction of the employed energies for product unit.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 3 May 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (574.2 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of the contract.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 3 May 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15 law No 46, 17 Feb 1982.

Maximum amount: credit facility: 22.5 percent of the allowed (919.435 billion lire); b) contribution: to be worked out by the Ministry of Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 January 1983.

Ending date of the program: 31 December 1986.

Lucchesi S.p.A.-Small Firm Classification

Program: innovation of an integral cycle process for the production of calendered PVC crystal.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 12 July 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by the Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15, law No 46, 17 Feb 1982.

Maximum amount: a) credit facility: 22.5 percent of the allowed costs (768.776 billion lire); b) contribution: to be worked out by the Ministry of Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.
Starting date of program: 2 January 1984.
Ending date of program: 30 June 1987.

Industrial Materials Acid Recirculation-M.I.R.A. S.p.A.-Small Firm Classification

Program: remarkable technological advance in the application of advanced thermosetting technopolymers for the production of large hollow bodies.
Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 21 June 1985.
Place of execution: North Italy.
Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.
Maximum amount: credit facility: 45 percent of the allowed costs (320.460 billion lire).
Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.
Starting date of the program: 1 February 1983.
Ending date of the program: 30 September 1986.

Nava Moto S.p.A.-Large Firm Classification

Program: development of process and products based on compounded structural technopolymers with three-dimensional shaped hollow bodies having a continuous mesh structure of isotropic hexagonal fibers to be employed in aeronautical and automobile industries.
Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Craft dated 3 May 1985.
Place of execution: North Italy.
Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15 law No 46, 17 Feb 1982.
Maximum amount: a) credit facility: 22.5 percent of the allowed costs (855.504 billion lire); contribution: to be worked out by the Ministry of Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.
Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.
Starting date of the program: 15 November 1982.
Ending date of the program: 31 December 1987.

O.M.C.M. S.p.A.-Small Firm Classification

Program: considerable technological development obtained by the introduction of electronic controllers in the motion and processes of arc welding, sand-molding and varnishing in a flexible line for the production of containers 150.
Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts needed 12 July 1985.
Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (516.620 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 15 January 1983.

Ending date of the program: 31 December 1986.

Perros Industrial S.p.A.-Small Firm Classification

Program: design and "prototizzazione" of computerized electronic control system for the filling up of hollow laminated and manufactured goods with thermoplastic technopolymers, to be used as insulation in the household appliances industry and in the automobile industry.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 12 July 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15, law No 46, 17 Feb 1982.

Maximum amount: a) credit facility: 22.5 percent of the allowed costs (270 billion lire); b) contribution: to be worked out by the Ministry for Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 15 March 1983.

Ending date of the program: 31 December 1986.

Pirelli Auto Components-Large Firm Classification.

Program: new products and processes for the braking system of motor vehicles and new experimentation systems.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 21 June 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (2,105.1 trillion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 January 1984.

Ending date of the program: 31 December 1986.

Reggiani Machines S.p.A.-Small Firm Classification

Program: production of computerized milling machines

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 21 June 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (883.046 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of the contract.

Starting date of the program: 1 October 1984.

Ending date of the program: 30 June 1986.

Rossi Motor Reducers S.p.A.-Small Firm Classification

Program: designing and execution of a productive process using advanced and innovative technology in order to provide quality and flexibility in the manufacturing of reduction gear and gearmotors of excellent performance.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 3 May 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15 law No 46, 17 Feb 1982.

Maximum amount: a) credit facility: 22.5 percent of the allowed costs (805.192 billion lire); b) contribution: to be worked out by the Ministry for Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 February 1983.

Ending date of the program: 31 December 1987.

Sapici-Shareholding Company for the Italian Chemical Industry S.p.A.-Small Firm Classification

Program: technopolymers in water emulsion for special uses.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated on 3 May 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (718.154 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting of the program: 15 January 1983.

Ending of the program: 30 October 1986.

Simplas S.p.A.-Small Firm Classification

Program: designing, experimentation, and development of new highly cybernated productive processes for the production of equipment able to extrude polymers and technopolymers.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 12 July 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982; contribution as per the second paragraph of Article 15, law No 46, 17 Feb 1982.

Maximum amount: a) credit facility: 22.5 percent of the allowed costs (196.425 billion lire); b) contribution: to be worked out by the Ministry for Industry, Commerce and Crafts on the date of the drawing up of the contract as per the third paragraph of Article 16, law No 46/82, on 22.5 percent of the allowed costs applying the procedure of calculation as per Article 15 of the above law.

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 30 April 1983.

Ending date of the program: 31 December 1987.

Lardarello Chemical Company S.p.A.-Large Firm Classification

Program: development of a process of the production of high titer calcium hypochlorite.

Admissibility (law No 46/82, Article 16): resolution of the Minister for Industry, Commerce and Crafts dated 21 June 1985.

Place of execution: North Italy.

Form of financing: credit facility at the annual rate of interest provided by Article 15, law No 46, 17 Feb 1982.

Maximum amount: credit facility: 45 percent of the allowed costs (2,186.1 billion lire).

Amortization: ten years, plus a term of five years of utilization and preamortization from the date of contract.

Starting date of the program: 1 March 1985.

Ending date of the program: 31 December 1987.

Terms: increase of the company's capital in order to reach the value of 0.5 of the "index of perspective financial compatibility" as per the resolution already mentioned in the introduction. The Ministry of Industry, Commerce and Crafts will communicate to the CIPI the implementation of the above terms.

Furthermore, CIPI has adopted the following alterations: Resolution passed on 2 October 1984 and 2 May 1985 concerning the program of technological innovation put forth by the firm "Ansaldo Trasporti S.p.A." regarding the introduction of advanced technologies in the design and development of components and equipment for public and electrified transport systems, prototypes and their experimentation.

Maximum amount: credit facility: 45 percent of the allowed costs (3,078,449 billion lire) will be charged to the contribution of South Italy.

Resolution passed on October 2 1984 concerning the program of technological innovation put forth by the firm "Microfusione Italiana S.p.A." regarding the design, experimentation, development and preindustrialization of jets melted by the cire perdue process in aluminum alloy and superalloys, to be employed in advanced technology industry.

Alteration to be made.

Maximum amount: credit facility: 55 percent of the allowed costs (1,106.622 billion lire).

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CSO: 3698/M081

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

OLIVETTI: DE BENEDETTI'S MANAGEMENT TEAM PROFILE

Milan ESPANSIONE in Italian No 190, Mar 86 pp 42-47

[Article by Cesare Martinetti: "Who Plays on De Benedetti's Team?"]

[Excerpts] When, on the morning of 4 November, Carlo De Benedetti and his son Rodolfo crossed the threshold of the Hotel Principe di Savoia in Milan, the Banca Commerciale and Medobanca had already managed to find a market for 25 million shares of Cofide (in only a few minutes, say people working in the bourse). Cofide is the new holding company owned by De Benedetti, an engineer born in Ivrea whose debut in society was to be celebrated that very morning by the world of finance. It was a grand "coming on stage," almost a "De Benedetti day," similar to that celebrated by Gianni Agnelli and Cesare Romiti for "their" Fiat in New York 2 months earlier. Invitations for Cofide's "entree" were sent to a number of personalities, all of whom had obviously been chosen with painstaking care. What this invitation really represented for all those who received it was honorary membership in the "De Benedetti club," a club made up of associates, friends, supporters and advocates of the new and so-called King Midas of the Italian Stock Exchange. This man from time to time is referred to as the "anti-Agnelli," the nonaligned member of the Cofindustria [Italian Manufacturers' Association], the capitalist par excellence who is not adverse to talking to the PCI and the capitalist "responsible" for Italian informatics who, if the occasion is attractive and profitable enough, as was the case with Buitoni-Perugina, is ready to pounce upon a dish of spaghetti and a box of chocolates even if this means risking excommunication by the traditional cardinal of finance, Mr Enrico Cuccia, the senior director of Mediobanco.

Therefore, on that morning of 4 November, numerous important people met in one of the private rooms of the Hotel Principe di Savoia. Together with a large part of the family (De Benedetti's father Rodolfo, who is 93 years old but proud of not looking his age, De Benedetti's mother Pierina Fumel, and De Benedetti's elder brother Franco), there were also the managers and entrepreneurs closest to the engineer, such as Salvatore Ligresti, majority shareholder of SAI [Industrial Insurance Company]; and De Benedetti's partner, Jody Vender; Guido Roberto Vitale and Alberto Milla of Euromobiliare-Cofindi; Giovanni Svetlich of Sovardino; and Isidoro Albertini, Giancarlo Gloder, Urbano Aletti, and Peter Treves. Despite the close family relationship, Camillo De Benedetti, 53 years old, was missing. He is the president of the Mercantile Bank of Florence, vice president of the General Insurances and head of the Gaic-Fineurop group. He is Carlo De Benedetti's first cousin, but despite that Carlo and Franco have never shared close business interests with him.

On the other hand, Cofide displayed a remarkable team, gathered around the table of the board directors. Next to the old Rodolfo (president) and Franco (director), Carlo De Benedetti, who is the vice president and managing director, had gathered a world championship team: Antoine Jeancourt Galignani, the only important shareholder in the company (7 percent of share capital) representing the Suez Group of Paris; Mr Onorato Castellino, an economist and professor of political economics at the University of Turin, who, against his will, is by now acknowledged as the chief expert in social security problems after the publication in 1976 of his famous book, "The Maze of Pensions." We must also mention the professional business consultant Giulio Segre of Turin, in whose office in Via Valeggio, which he runs with his wire, Franca, Cofide is housed. Also, there is Gaetano Lazzati, another business consultant and brother of Giuseppe Lazzati, former rector of Catholic University of Milan, who was already at De Benedetti's side when he owned Edilcentro shares and was later with De Benedetti in Euromobiliare. Finally, the most prestigious adviser--who had played a key role for the engineer on previous occasions--Mr Yves Andre Istel, the French banker and co-chairman of the First Boston International. He has long been at De Benedetti's side and--if we want to draw a comparison with the Agnelli family--plays the same role as Michel David-Weill, the director of Banque Lazard and longtime member of the board of IFI [Italian Financial Institute]. Andre Istel has taken part in many operations carried out by De Benedetti, such as the agreement reached in 1980 under which Saint Gobain Pont-a-Mousson became one of the Olivetti shareholders. The success scored on the stock exchange by the engineer's latest "creation" was confirmed by De Benedetti himself only 2 months later, on 7 January 1986, when Cofide convened its first extraordinary meeting of shareholders--held in a room of the Industrial Association in Turin--with the aim of increasing the company share capital by more than 111 billion lire. Carlo De Benedetti said on this occasion: "Gentlemen, this is the first time you are convened for an extraordinary meeting, following the offering of 25 million ordinary shares to the public which, as you know, has been a resounding success. To our great satisfaction we can now present some data to you which show how favorably this operation has been received by investors. The offer was closed on 4 November, just 1 hour after its opening. The demand for shares was 10 times the number of shares offered."

Engineer De Benedetti confirmed in financial terms Cofide's interest in the Milanese Agricultural Bank (in which Cofide now has a shareholding of more than 20 percent), an interest which is made explicit in the commitment expressed by the controlling group to promote the bank's development and in the plan to have the bank quoted on the stock exchange in the near future. De Benedetti placed one of his lesser known men in the controlling group committee of the Banca Agricola Milanese: Corrado Passera, 38 years old, a graduate of Bocconi University, who since September 1985 has taken his place in the CIR offices located in Milan on Via Conservatorio. This is the industrial holding of his group (the other holding of course is Olivetti). In order to enlist him in his court, it is said that Carlo De Benedetti broke an old rule which the management of his companies considered by now well established, that is, of choosing as aide-camps men of great expertise and with a solid career behind them. On the contrary, Passera made a considerable impression on the engineer thanks to his vitality combined with another quality--being able to handle a vast amount of

work from 8 am until late at night, just like De Benedetti. These assets were noted some years earlier when Passera had only recently been hired by the financial branch of Olivetti. His first professional experience was that of management trainer in the sector of finance, planning, and personnel of the Ivrea group.

This is the way the young manager from Milan entered the extremely select circle of the engineer's henchmen, who make up a highly specialized, dynamic, streamlined, and alert task force which is as determined and ruthless as its leader is made out to be. This pool also includes--with different titles and roles--Carlo's elder brother Franco, who does not often come out in the open but nevertheless plays a vital role in De Benedetti's organization, together with Vittorio Levi and Elserino Piol, Emilio Fossati, Guido Roberto Vitale, Renzo Guibergia, and Luigi Arcuti, (the president of IMI [Italian Credit Institute], who in 1982 entered Olivetti's board of directors) who seems to be the Italian banker closest to De Benedetti and the one who is in the closest agreement with him as the result of a mutual understanding essentially built up during their early business relations.

First of all there is Franco, 53 years old, who ostensibly plays a secondary role, especially when compared to the role of protagonist played by his unrestrainable younger brother Carlo. But this is just an impression, because all those who have come to know this duo a little bit better are aware that Carlo and Franco do not only get along extremely well, but also that together they constitute the real core of the "club." It would be worth recalling what Carlo De Benedetti usually says about this: "Maybe the real difficulty of my youth was the graduation examination, which I passed with an A average. I was very satisfied with that because before that I had always been considered the dunce of the family. My brother Franco was much smarter than me...."

To date, those who know him well say that Franco De Benedetti perhaps would have preferred to become an academic, maybe a university professor rather than an entrepreneur. He is an extremely well educated person, always present at the most important cultural events, including a front row seat at all the concerts of the Musical Union of Turin and of September Music. Franco De Benedetti, although he has always kept behind the scenes, has always carefully followed his brother's activities in the world of finance and commerce. He was with him during those stormy 100 days when Carlo became the second most important person in Corso Marconi (after Gianni Agnelli and before Agnelli's brother Umberto, the latter being Carlo's schoolmate). Carlo abandoned this position later, in mid-August because of conflicting viewpoints on company policy. Franco, however, lasted another 2 years in Fiat, working first as coordinator and later as head of the components section until Carlo (who at that time was only 43 years old) "landed" on the banks of the river Dora, in Ivrea, where Olivetti was on the verge of bankruptcy. During the last extraordinary meeting of shareholders on 13 February, Carlo recalled: "The company had a turnover amounting to 1,500 billion lire and liabilities for 1,000 billion lire."

Indeed, it could be said that Franco's arrival in Ivrea was the most natural thing for a production theoretician, as this was the site where Adriano Olivetti's utopian vision and his group had wedded the world of culture to the factory floor 20 years earlier, an event which was to have long-lasting effects.

Thus, a 2 October 1978, Franco De Benedetti was appointed second managing director, after his brother, and was also made responsible for Olivetti's cultural activities. But he did not have the time to deal thoroughly with this activity since Carlo immediately wanted him to deal directly with the company strategy oriented at converting Olivetti into a major informatics firm. This was a philosophy which Franco approached not only at a business level but also on a cultural basis. Indeed, during a meeting at the University of Bologna on 28 April 1983, Franco De Benedetti underlined the necessity of introducing informatics into schools: "A cultural revolution which could give schools as well as the teaching profession a working method oriented at objectives, based on programs in line with the requirements of the business world."

But before starting to work at Fiat and while climbing to achieve his present status as a financial leader, Carlo De Benedetti was helped by at least two other important partners: Renzo Giubergia and Guido Roberto Vitale. The former, 60 years old and an engineer, had been brought up in the milieu of the stock exchange as a child. Indeed, his father Giuseppe worked as a stockbroker since 1936, the "grand commis" of financial operations of the Israeli club in Turin. Renzo Giubergia effectively acted as "broker" for Carlo De Benedetti's purchase of Gilardini in the early 1970's.

This was a metallurgical and mechanical company and a Fiat supplier with such an extremely positive image that it was quoted on the stock exchange. This was a "must" if one was to play the game of finance. A few months later, in 1983, the young De Benedetti had "dealt his second blow" by selling to Michele Sindona the family shareholding in Edilcentro-Sviluppo, a rich real estate company. Part of the profit of this operation was immediately allocated to a new holding company, in which De Benedetti, Agnelli, Pierlli, and Montedison were shareholders. This was the way the "Intercredit Financial Company" was founded, which with the name of Euromobiliare now ranks among the leading Italian holding companies. The managing director and general manager of this company is Mr Guido Roberto Vitale, 49 years old, an economics graduate from the University of Turin. Mr Vitale majored in business administration at Columbia University in New York and has vast financial expertise as a result of his work first in Mediobanca and then in Edilcentro itself. De Benedetti now has a controlling interest in Euromobiliare, with Cofindi holding another 30 percent of the shares. This company is managed by Alberto Milla, one of the few stockbrokers in Italy dealing with properties management.

Guido Roberto Vitale has indeed established a profitable relationship with the engineer (on 14 February 1985 the Euromobiliare broker entered--with Franco De Benedetti and Emilio Fossati--the board of directors of the Buitoni holding company under the chairmanship of Carlo De Benedetti, in addition to the boards of IBP [Industrie Buitoni Perugina Industries], Perugina and Poligrafico Buitoni, which are all controlled companies.

However, what enabled Guido Roberto Vitale and others to express such drastic opinions is partly the result of the contributions made by the henchmen of the so-called Olivetti machine, that is, all those managers who weathered the "De Benedetti storm." Indeed, the latter, after having taken action on the top management of Fiat in those 100 days which earned him the nickname of Amin,

also earned another nickname in Ivrea, that of "manager-grinder." These managers accepted his pace and ideas and even introduced his financial philosophy into the company management. If, for example, Mrs Marisa Bellisario (now managing director of Italtel) and Mario Gabbrielli (financial director of ENI [National Hydrocarbons Agency])--just mention the most well known names--have accepted other attractive work opportunities, thus abandoning the attractions of Ivrea, Elserino Piol and Vittorio Levi (the two present general managers of Olivetti) are the linchpins of Carlo's present general team.

To be honest, even Levi, 45 years old, who has been working in Ivrea since 1967, "divorced" the engineer for less than a year to reach--at the invitation of Gianni Agnelli, with whom he plays golf at the club of La Mandria, near Turin--the prestigious position of managing director of Piaggio. But in the spring of 1984, Levi, who is, among other things a relative of the Olivetti family and Guido Roberto Vitale's cousin, went back to Ivrea. The alleged reason for this was that he had been given those guarantees of authority for the marketing side of the business which the engineer seemed to have partially denied him previously.

Elserino Piol, 53 years old and an engineer by profession, did not have to face these problems. After an extremely long period in the United States as head of the Olivetti Corporation of America (where he was replaced by Marisa Bellisario in her last position in Olivetti, almost an "exile"), he was almost immediately entrusted by De Benedetti with the task of directing the qualified team of experts to whom the engineer had given the task of examining thoroughly anything of interest in the exciting world of electronic technology in the United States.

And Piol, who is now in charge of the group's strategies, has led Olivetti toward the venture capital system. This system is being approached carefully and only after technical aspects have been brought into line with the specific requirements of the company in Ivrea.

Another man of particular importance in Carlo's team is undoubtedly Emilio Fossati, 48 years old a self-made man and an economics graduate from Catholic University of Milan, which he achieved while he was already working. He is manager of CIR, vice president of Buitoni, director of Olivetti (filling the post left vacant by the present secretary of the treasury, Bruno Visentini) and of L'ESPRESSO. As is the case with Levi, Fossati also comes from Fiat, where he remained until 1984.

As can easily be observed, it is an extremely homogenous team, almost completely oriented toward business and finance, which is implementing De Benedetti's strategies. It is a team whose affection and commitment are to the company colors. Unlike the Giovanni Agnelli's "general staff"--Leopoldo Pirelli, Raul Gardini and Mario Schimberni--De Benedetti's team, if anything, includes personalities with a variety of interests. On this front there are, in fact, fewer people in close contact. The lawyer, Giuseppe Bisconti, from Calabria, 54 years old with offices in Rome, Milan, London and New York, who handled the agreement with AT&T; or the Roman colleague Pietro Guerra, who is still working on the SME affair, or again the editors of LA REPUBBLICA Eugenio Scalfari, Alberto Statera of the other newspaper NUOVA SARDEGNA (who, among

other things, is the author of the book "Un Certo De Benedetti" [A Certain De Benedetti]), Giuseppe Turani of "Financial Letter" (but Scalfari is certainly the closest friend). Till his untimely death, Mr Giorgio Rota, the economist and professor at the University of Turin, was fairly close to Carlo De Benedetti; De Benedetti and Giorgio Rota would verify and compare data and concepts before the most important announcements to the public.

Finally, Giulio and Franca Segre deserve a place of their own. They are the engineer's two somber, modest and extremely silent business consultants. He looks like a brusque Elias Canetti, while she looks like a plain Yiddish teacher. Their office on Via Valeggio (prior to this it was on Corso Vinzaglio) reminds you of ancient times, when secretaries and employees used to wear black overalls. In their office work goes on from the very early morning hours until late at night, Sundays included. Mr and Mrs Segre have been responsible for the books of the De Benedetti family from the time when Rodolfo (De Benedetti's father) owned the BOA company, which produced flexible hoses. They could be considered as a parallel institution to De Benedetti's.

Is it possible to love and swear to be faithful to a man such as De Benedetti? Some succeeded in doing it, others simply gave up, while still others swore hostility to him forever. It is certainly hard to "live together" with the engineer. His managers are well paid but he keeps them under pressure around the clock. The goals to be pursued are very high and when they are attained he gets the credit for it. But now, since Carlo's horizons have broadened, everybody believes that the "assault entrepreneur," who had been called "tiger" in Turin 20 years earlier, has now more than one place to roar and, consequently, the members of his team can now be more confident about their roles.

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

EUROPEAN PARLIAMENTARIAN ON CONTINENT'S TECHNOLOGICAL STATUS

Padua AMBIENTE RISORSE SALUTE in Italian No 48, Feb 86 pp 41-44

[Report by Prince Michel Casimir Poniatowski, French member of the European Parliament and president of the parliamentary Committee for Development and Cooperation, entitled "Europe's Reply to the Technological Challenge":
"Europe: State of the Union"; date and place unknown]

[Text] Notwithstanding some undeniable successes, it is high time technological Europe woke up.

Two statements should catch our attention. First, the OECD [Organization for Economic Cooperation and Development] recently declared: "Europe increasingly is going to supply the rest of the world with food, raw materials, and low technology manufactured products." In 1984, the American Office of Technological Assessment wrote: "Japan will be the most serious competitor of the United States for biotechnology exchange: Germany, Britain, and France are late in comparison with the United States and Japan. These European countries do not have the courage to run risks on an industrial level and do not have many firms specializing in biotechnology exchanges." The same holds for electronics.

In 1980, the world market of goods included in information technology was appraised at \$240 billion. In 1990, this will reach \$500 billion. Biotechnology and telecommunications markets will amount to 100 billion each. On the market of technology Europe is an important operator, whose commercial balance has a little surplus (exports: \$100 billion; imports, \$90 billion). On the contrary, Japan shows a decidedly positive balance (exports: \$59 billion; imports, \$9 billion).

Thus, the global trade volume of European high technology products is greater than the United States and Japan, both in exports and imports.

And yet the situation in Europe is going to deteriorate. The comparative advantage Europe enjoys in the global trade of high technology products has been decreasing for 20 years by 20 percent, whereas the United States is unchanged and Japan has doubled its advantage.

The figures reported in the table outline the economic situation in which data concerning high technology evolve.

Europe's Technological Level

Europe spends very much for research and development. If public and private, civil and military expenses are considered, Europe spent in 1983 about \$51.6 billion (shares of public and private sectors, respectively, were nearly equal). However, only the FRG reaches the level of the United States and Japan in per capita expenditures for research and development. At least 3 out of 12 member Community states belong to the last OECD class, as they are very little or not at all interested in research and development.

Research and development expenditures are frail and vulnerable since they are subject to government reductions as well as industrial uncertainties.

In some member states increasing unemployment among researchers and engineers has been observed.

Despite this fragility, the extraordinary vitality of basic and applied research in Europe throughout the 20th century must be emphasized. Antibiotics, DNA, radio, television, radar, jet aircraft, stored programs computers, missiles, nuclear energy--fission and fusion--sound and image recording, and so on are of European origin. Nearly all our work and leisure activities have been modified by discoveries of European researchers. Here it is not simply a question of historical recollection. At present, Europe has several strong points. In the space field, after years of activity, Europe has realized greater commercial success than the United States thanks to the Ariane program under the auspices of the European Space Agency.

Despite the tendency toward poor cooperation by some European national air companies, Airbus Industries has obtained a substantial market share, starting from nothing, in a sector where they now carry on strong competition. They even give a striking demonstration on the U.S. domestic market.

With regard to energy, several EC programs are leading international technological progress: This undoubtedly includes the JET project, but also the research and development in alternative energies. Europe also indisputably holds a leading position in particle physics.

The Commission has also managed to associate enterprises and research institutes in a series of programs: ESPRIT for information technologies, BRITE for advanced production, RACE for research in telecommunications.

With regard to the aforementioned key sectors:

a) Europe holds a leading position in energy-related technologies. Its research on thermonuclear fusion has reached at least the level of Japan and the United States. With respect to nuclear fission, in fact, it seems that it surpasses the United States, which is slowed down by regulatory provisions and pressures for environmental conservation. The planned research on alternative energies and energy-saving is well coordinated in Europe, which has continued its efforts despite the oil surplus. With regard to hydrocarbons, the Community programs have usefully furthered the research on prospecting and optimal energy utilization technologies. Only in the field of coal technology is the Community behind compared with the United States and perhaps Japan.

b) Europe holds a strong position in the space field. Its competitiveness, as shown by the European Space Agency, is due to the reliability of its carrier rocket and satellite programs. The Spacelab and Columbus programs will allow Europe to score points in the utilization of space.

Regarding the Ariane program, despite 3 unsuccessful launchings out of 17, its success is partially due to its reliability vis-a-vis the American Shuttle (the Challenger tragedy is subsequent to this report: editor's note), and it also costs less. Second-generation shuttles, which are developed on the basis of lessons drawn from the gaps of the first generation, are able to exert keener competition.

c) In the telecommunications sector the situation has been made more difficult by the lack of European rules; the progress of the OSI model is fundamental for the maintenance of European competitiveness. With regard to public telematics, 10 European companies are each developing different programs totaling a billion dollars, whereas in the United States only three companies split up the market. The costs resulting from the application of regulations, which new companies must meet for telecommunications equipment on the Community market, can reach a hundred times as much the costs borne by their American competitors. The new RACE program, which aims at establishing an integrated broadband network covering all communications for the transmission of texts, sounds and images by 1995, seems to be a more comprehensive research target than any equivalent program in the United States. However, Japan has similar aims and terms in view. The impetus given by the SDI program to fiber optics and satellite research shows that telecommunications perhaps will be the decisive battlefield in terms of high technology by the end of the century. Some people are afraid that IBM, which entered by force into this field, will hold the same commanding position they achieved in the world of computers.

d) In the electronics sector, the weakness of the European position is clear, despite some laboratory research carried out by the big European companies which is at least equivalent to the best of that carried out in Japan and the United States. As regards central processing units and particularly the new generation of superprocessors, Europe had to face keen and hard competition from the United States. There are in Europe three producers of central processing units, each holding 1-2 percent of the world market, while IBM absorbs 70 percent. This phenomenon has spread almost to the entire computer sector. The United States and Japan now hold over 90 percent of the world market in semiconductors, with sales of \$30 billion. Even if Europe is able to set foot in some sectors, such as personal computers and the software market, it will have a hard time maintaining its position.

e) Biotechnology is typical of the great step forward made by Europe, in creating a wide potential market in sectors such as DNA technology, only to see it then exploited by others. Since the European discovery of the DNA structure, research efforts made so far have been much less important in Europe than in the United States. They have shown a typical lack of coordinating and commercialization ability. Nevertheless, according to several observers, Europe holds a peak position in the pharmaceutical and fermentation products sector (enzymes, antibiotics). Some gaps regarding commercialization and development have led to a waste of this potential and ended up by making Japan and South-east Asia the most feared competitors of the United States.

f) In the new materials sector, particularly ceramics, light alloys and composites, which are essential requirements for maintaining competitiveness in the transportation and electronics fields, Europe must start virtually from nothing, while the United States and Japan have made important public and private investments and achieved remarkable results. Furthermore, they have demonstrated greater effectiveness in orienting traditional industries, such as the mining and iron industries, toward raw and new material research.

Europe's Weak Points

The fundamental question is the commercial exploitation of research efforts, a field where Europe is weak as a result of a series of problems:

a) lack of a large and truly unique market: all observers think it is one of the main obstacles to the European technological effort;

b) notable regional differences as regards resources devoted to research and development;

c) salaries and social status which are unsatisfactory for European researchers and engineers, with the following consequences:

i) increasing interest in the American work and research environment and brain drain,

ii) decrease in the number of qualified, particularly young researchers in Europe;

d) duplications due to:

--lack of coordination

--divergent rules

--refusal to cooperate between governments and enterprises;

e) companies receiving less government subsidizing for research and development than their American and Japanese counterparts;

f) training and retraining inadequacies;

g) lack of a capital risk market;

h) hesitation regarding the role belonging to public authorities in promoting research and development as well as in strengthening the technological basis: no convergence on this point;

i) lack of instruments, which exist in several regions of the United States, to stimulate private research and development and coordinate efforts of local and federal authorities, industries and research organizations;

- j) economy vitiated by too many obstacles and regulatory shackles, the costs of which have increased in a crushing way in 20 years. Public expenses in the Community states were 32 percent of the gross domestic product in 1960, while in 1982 they already constituted 51 percent. Social and tax burdens of European enterprises are too high and seriously damage their international competitiveness. This situation explains to a great extent the European state of lethargy in comparison with the dynamism of other areas of the world as well as the regression of European employment compared with the increase in jobs obtained in America...;
- k) frequent hostilities between governments and the business world, employers and workers, workers and government;
- l) persisting reservations and mistrust between universities and enterprises;
- m) lack of creative projects on a large scale capable of galvanizing the efforts and making suggestions to the research world;
- n) lack of clear research strategy or even a lack of awareness of the problem.

The European Community's Role

The institutions of the European Community, and particularly the Commission, have searched for ways to overcome such obstacles, but the Community is handicapped by the weight of its decision process. In this connection, the responsibility must be attributed to a large degree to the Council, the essential function of which seems to be the struggle against Europe: trivial fault-findings on details of Commission proposals, budget reductions in programs representing modest but essential investments, civil officers who continue carrying on rearguard actions against the Commission programs, even after ministers and even chiefs of state have declared their support, and dealings worthy of Arabian "suks," with the working out of unjustifiable research programs which are conceived as compensation for facilitating the adoption of clearly valuable programs.

The Community has needed much time to develop separate structures for European research and development. The dichotomy between direct and indirect research as well as the modest budget of the Common Research Center (above all that of Ispra) have not contributed to the good reputation of the Community. But now, through the working group for flexible technologies, the Community acts as mediator and coordinator with industry and the research world. The approval of the ESPRIT program, a result of the insistent requests of the Parliament and despite the Council's opposition, has paved the way for a new network of relations between the Commission, enterprises and universities.

However, the research and development effort continues to be hindered by financial restrictions imposed by the Budget Council of Ministers, which seems to have lost touch with the reality, the needs, and the future of Europe.

Europe: The Challenge Has To Be Accepted

This restrictive leaning of the Council becomes stronger even while a new political consensus is taking shape in Europe which recognizes the need for a technological community and a wide-ranging research and development effort. Three factors seem to have contributed to the formation of this consensus:

- a) the awareness of the threat from Japan and the United States;
- b) pressures by the United States with regard to technology transfers;
- c) a catalyst, SDI, and a participation offer made to European companies and research institutes.

The position that single governments can adopt in relation to SDI problems is less important than any participation of European enterprises, universities and researchers in SDI research programs. However, it is likely that the extent of this participation will be lower than expected, since the financial future of SDI appears to be anything but sure. However, some aspects of SDI research, such as laser technology and energy-related problems, directly affect the Community. Unfortunately, restrictions on technology transfers could prevent Europe from getting some significant benefits through this program, even with the participation of European firms. Your rapporteur believes Community institutions should acknowledge the reality of any European participation in SDI, but should insist on a coordinated response in order to assure that research results are spread as widely as possible and to prevent an accentuation of the brain drain or an excessive diversion of the limited research means at Europe's disposal.

Whether SDI's influence is real or not in Europe, the impulse this program will give in general to research, above all in the United States, forces our countries to formulate their own response. Without it, Europe's delay will increase. A spectacular sign of this awareness has been the French Eureka initiative, which arose from a series of proposals and suggestions coming, above all, from industry. The announcement of the Eureka initiative, however ill prepared and imprecise it may be, has had the effect of inciting research ministers of the various member states to concentrate their attention on the question of the European technological cooperation.

As always happens in the Community, every initiative arouses hesitation and suspicion. The first meeting of the research ministers came to nothing. In particular, a suitable institutional structure has not yet been arranged. At least the most serious obstacle of a distinct agency outside the Community structure seems to have been avoided. The best form would be a flexible participation of the Community through the Commission, that is, a variable according to the projects assuring the necessary coordination and founded on the structure already existing within it; namely, the task force of the information technologies. The main uncertainty concerns allocations.

The initial proposal of the French government, amounting to a billion francs, has caused no comment among its main partners. However, it is absurdly impoverished and represents less than 2 per thousand of the expenses for research and development in Europe. A Eureka program makes no sense if it is less than 3 billion ECU a year.

In light of these steps toward realizing the Eureka initiative, the Commission's memorandum, "Toward a European Community of Technology," has aroused favorable comment: both the European Council and the ministers, gathered to discuss the framework of the Eureka program, have approved the 10 aforementioned sectors as components of possible mobilization projects.

The European Answer

The acceptance of a slow, tranquil and ineluctable decay is not a serious option for the European Community. Several observers, from Professor Dahrendorff to the former American ambassador to the United Kingdom, Elliot Richardson, have praised European cultural values, presenting them almost as a sort of alternative to a possible European technological collapse. This is unacceptable.

The standard of living and the relative social harmony in Europe depend mostly on the old continent's ability to offer reasonable living conditions to the bulk of its population. This living standard will be maintained only if Europe regains its industrial competitiveness, particularly in high technology sectors. Otherwise, a great part of West Europe is condemned to decline, poverty, and structural unemployment.

This decay is not inevitable; it can be successfully fought. If it occurs, it will be the result of our blindness and resignation. In this case, we would deserve our decline. No less important is the fact that if Europe continues to lose its economic independence it will become a subcontractor of the United States, Japan and other countries, and its political independence will not be able to survive for a long time. Europe must, above all, avoid becoming the first colony of the new economic revolution.

Of course, Europe has a specific part to play in this evolution, pointing out its social, human and physiological consequences.

The Community should constantly weigh its programs, in view of its own social and humanitarian aims. In this context the suggestions expressed by the Italian chairman for the IRIS project are useful. We cannot escape the present scientific revolution: we must make an effort to control and guide it.

From the practical point of view, it is desirable that the research ministers, who will meet in Germany at the beginning of November, decide immediately on the concrete form of the Eureka project. This means to search for an agreement on adequate financing from various sources: Community BEI budget, national contributions, private sector and, if necessary, also a special loan on the capital market. Public opinion would not understand if some developments in this field were hindered by abstract discussions based on contradictory financial theses.

This implies the creation of a slender structure not subject to national bureaucracies. The European Commission should be given a status of minority partner in every project in order to guarantee the coordination function and take on the general responsibility of the Community action. Finally, this implies a common definition as regards the Strategic Defense Initiative, and

a decision on the specific forms of cooperation with the United States and Japan. Your rapporteur further urges the adoption in the next 5 years of a series of general measures destined to create a climate which encourages and does not choke innovation. The Commission's Memorandum on the completing of the domestic market--COM (85) 310 def--which sets itself for completion by 1992, should not be simply approved in principle: the various measures must be adopted by the Council according to a strict calendar. The suggestions of the Commission concerning risk capital should be approved without delay. At the same time, the Commission should present more innovative proposals to create a risk capital market in Europe. It should study the various structures and possibilities used to build enterprises in different regions of the United States, and present short-term proposals.

The Commission, following its proposals regarding researcher mobility, should report about new systems that are capable of improving the financial and professional status of researchers and engineers.

COMETT's suggestions, recently presented by Commissioner Sutherland with the purpose of developing professional training and retraining, should be promptly examined.

In the medium term, the objective of greater international competitiveness in the field of high technology products will remain a mirage if the Community does not set ambitious projects for itself. The difficulties of the program framework of the Community for research and development activities, of Eureka, and of the Commission's Memorandum "Toward a European Technological Community," stem from the fact that scientific targets are traced too generically. To make the Community, the member states, the local organizations, the industry, and the researchers cooperate effectively and mobilize sufficient appropriations, a series of wide-ranging but precise projects, involving substantial consequences, must be set up.

The Parliament should suggest some specific projects to the Commission, the Council and public opinion, the feasibility of which should be promptly examined by the Commission, which should report to the Parliament and the Council in order to make a decision on those projects within the next 12 months.

In each of the main technological sectors it is useful to define strategic objects and plans which can be realized within the average and short term and must be able to serve as catalysts for the competitiveness of Europe.

1. With regard to energy technologies, Europe must set for itself the goal of reinforcing its competitiveness, particularly in continuing the nuclear fusion program and the reinforcement of research in the coal sector (liquefaction and gasification). At present, two projects must be examined and--in the event they are feasible--adopted: first, the development of very powerful lasers, and second the building of gigantic space-mirrors, in order to assure the transmission of electric energy without cable and at long distances. These projects are of vital importance for supplying energy to the Third World.

2. With regard to space technology, Europe must develop and realize an autonomous ability both for space exploration and launching systems. This independence should allow Europe to contribute, according to its own political goals, to space exploitation. In the medium term, two new important projects should be considered:

--The realization of a scientific station on the moon, which should allow in the particular conditions predominating there, new research in materials and biotechnology. Honorable Toksvig, rapporteur on the space policy (PE 95.639/riv II), has drawn this conclusion from his detailed study of the problem;

--Putting a solar energy station into orbit. Broad solar panels put in space can be a stimulating and effective source of alternative energy. Moreover, a part of the technology concerning the project must be developed within the SDI program. Even if the cost of solar energy can be reduced, its effective use on a large scale is still part of the speculative field. Such a project, which far exceeds the abilities of any European firm, could prompt various technological fields to begin a large cooperative effort in order to reach an unquestionable political target. The first stage could be the development of new optical techniques through the utilization of mirrors and detectors.

3. Perhaps the principal effort should be made to allow Europe to return to the electronics and information technologies sectors in general. This implies the fulfillment of European projects in microelectronics, optical electronics, artificial intelligence, manufacture and planning. Various future programs, and more particularly the ESPRIT program, have started giving life to the necessary conditions for cooperation on research efforts in this field. Large-scale projects meeting the aims and needs of the Community and likely to stimulate research and development activities in the various electronic technologies and information fields must be realized. The Community must first engage itself in the manufacturing of supercomputers, a large and developing market from which Europe has remained absent until now. Eureka's target, in terms of operations per second, is from 3 to 8 times higher than any performance recorded in Japan or in the United States. The long-term target should be the establishment, in a period of 8 to 10 years, of a European network of superprocessors and videocommunications which link Community institutes, public authorities of the member states, universities, and private users.

Like other countries in the world, Europe does not escape the economic crisis, but in Europe this also signals a deep structural crisis due to its industrial and technological decay. If Europe wants to face this situation, it must make a big effort in industrial modernization and technological research, coordinated through practical accomplishments. We cannot accept the prospect described in the report made in February 1982 in Congress by the U.S. Secretary of Commerce, "A lot of high technology industrial markets are now Japanese-American without the real presence of Europe. It is vital for the United States that this rebalance is kept in the eighties."

It is Europe's job to show that this future can be different and include our region in the world of the development of technologically advanced nations.

Europe cannot become the continent of missed opportunities.

EUROPE OF THE TWELVE IN THE WORLD
(1983-1984)

<u>Item</u>	<u>EUROPE TEN</u>	<u>EUROPE TWELVE</u>	<u>USA</u>	<u>JAPAN</u>	<u>URSS (1982)</u>
GDP (billions ECU)	2,777	3,010	4,639	1,441	1,515
GDP per capita ECU	10,797	9,404	19,475	12,088	5,610
Employment Per Sector (1983) in %					
--agriculture	7.5%	9.2%	3.5%	9.3%	15%
--industry	34.6%	35.3%	28.0%	34.8%	39%
--services	57.9%	55.5%	68.5%	55.9%	46%
Rate of unemployment (1984)	10.9%	11.5%	7.4%	2.7%	0%
Price Index (annual variation in % - 1984)	6.1%	6.3%	3.2%	2.2%	4%
Trade balance 1984 (in billions ECU)	-20.2	-34.5	-64.6	+23.6	+10
Balance of payments 1984 (in billions ECU)	+2.8	-1	-47.1	+23.6	?

8604/12859

CSO: 3698/M091

BRIEFS

TELECOMMUNICATIONS PRODUCT CONTRACT--ITALTEL, a company of the IRI-STET group, has been awarded an important contract to transfer products and technologies to the PRC. This is one of the most significant contracts ever concluded in China by a foreign company within the limits of purchases made in accordance with the program policies of the sector. The initiative, developed in accordance with the bilateral exchange programs, was concluded in Beijing with the signing of a contract by Italtel representatives, led by Marisa Bellisario, managing director of the company, and those of CNTIC (Organization of the Chinese Ministry of Foreign Trade). The order is worth 30,000 million lire but does not exclude the possibility of further growth in accordance with the increasing demands of the country. In accordance with the agreement, the first Chinese plant to manufacture digital transmission equipment will be built in Chongqing, in Sichuan Province. [Text] [Milan TELECOMUNICAZIONE OGGI in Italian No 12, Feb 86 p 10] 8603/6662

CSO: 3698/M604

GDR SPECIALISTS EXCHANGE CAD-CAM EXPERIENCES

East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 12, Dec 85 pp 710-712

[Text] Everybody is talking about the topic of CAD-CAM nowadays. This key technology will completely take over in the enterprises during the next several years. It is therefore necessary to make comprehensive use of all existing possibilities and to create the prerequisites for its introduction everywhere today already.

The editorial advisory board and the editors of the magazine FERTIGUNGSTECHNIK UND BETRIEB would like to support this process with the help of their technical talks which have by now become a long-standing tradition. Lessons available at various levels in many enterprises are to be passed on with the aid of these talks. The latter moreover offer participants opportunities for direct contacts.

On 1 October 1985, the editors together with the enterprise section of the KDT [Chamber of Technology] at the parent enterprise of the Erfurt Shaping Technology Combine VEB invited several representatives from advanced schools and enterprises to an exchange of experiences in Erfurt.

The following accepted the invitation:

Professor Kochan, Dresden Technical University,
Dr Broenner, Planeta VEB, Radebeul,
Dr Steinwachs, Planeta VEB, Radebeul,
Mr Tappert, "Heinrich Rau" Heavy Machine-building VEB, Wildau.
Mr Fritzsche, "Fritz Heckert" Machine-tool Combine VEB, Karl-Marx-Stadt,
parent enterprise,
Dr Hofmann, Machine-tool-building Research Center, Karl-Marx-Stadt,
Dr Hesse, Robotron Office Machine Plant VEB, Soemmerda,
Mr Schulz, Erfurt Shaping Technology Combine VEB, parent enterprise,
Mr Finke, Erfurt Shaping Technology Combine VEB, parent enterprise,
Mr Hornbostel, Erfurt Shaping Technology Combine VEB, parent enterprise,
Mr Wagler, Erfurt Shaping Technology Combine VEB, parent enterprise,
and representatives of the editors.

A plant walkthrough marked the beginning of the conference.

The Erfurt Shaping Technology Combine VEB presently holds 95 percent of the capacities of the GDR's sheet-metal, solid, and plastics shaping equipment.

The parent enterprise, which has been making presses and shears for 80 years, employs about 5,000 workers. Around 90 percent of the products are exported to about 50 countries; the USSR is the most important trading partner with a share of 70 percent.

The demonstration of work at the computer-assisted design station--where the graphic work station GD 80 is used along with GDR computer equipment--was a special high point in the plant inspection.

This equipment is presently being used for the design of the most frequently used components, e.g., for lever gears and spur wheels.

The plant walkthrough was followed by a round-table discussion moderated by Professor Kochan.

The discussion centered around the following main points:

What is CAD-CAM?

What contribution does it make to the rationalization of production preparation and implementation?

Prerequisite for the use of CAD-CAM systems (sample solutions and their results, CAD-CAM, and ESER [uniform electronic data processing system]).

These points were not taken up individually but rather as a whole.

Professor Kochan noted by way of introduction that computer-assisted work in design, technology, and production is a matter of concern to the national economy and should take effect in practice on a broad basis as quickly as possible. Theory can do its job only if it is expressed in material terms.

The individual participants commented on the question as to how their particular plants can pursue the CAD-CAM problem.

Mr Finke:

CAM systems have been used in technological preparation in the parent enterprise since November 1981, initially as information system. Today, 30 terminals enable the technologists to have access all day in keeping with their authorization and active changes are possible. The unit stores 142,000 primary work plan cards with 1,000 useful symbols. Two technologists man the video station.

The new solution must replace the old one in a consistent manner if this form of rationalization is to be effective. Safe operation (double manning of equipment to catch equipment damage) is an essential prerequisite.

Initial experience showed that the use of the dialog system doubles labor productivity during technological preparation.

Dr Broenner and Dr Steinwachs reported on additional lessons learned in this field.

The Planeta VEB in Radebeul proceeded in a manner similar to the Erfurt Shaping Technology Combine but the point of departure consisted of three island solutions. Parts list administration and the administration and updating of primary work plan cards are being handled with the help of ESER. The PR 4000 is used for stockpile and material management.

Mr Finke's statements were corroborated. The old technology was completely replaced also at the Planeta VEB in Radebeul. All technologists are now manning video stations.

Mr Steinwachs noted that efforts are currently under way as to how, in what sequence, and with what equipment one can work out partial solutions for continuity in operation. A continuous, computer-assisted solution has been worked out (from dimensioning all the way to the punched control tape) for curve production in the CAD segment.

The important thing is to make sure that the most varied solutions will be efficiently combined in the most varied enterprises.

Industry's equipment engineering should be so developed that software exchangeability will be made possible between enterprises.

Mr Tappert described the approach used in the introduction of CAD-CAM solutions.

Solutions already available in the GDR were tested for repeat utilization--e.g., Erfurt und Pritzwalk system--at the "Heinrich Rau" Heavy Machine-building VEB. This, in other words, involves a typical user of available solutions. The AUTOTECH-PRO system was picked.

Computer technology made it possible extensively to correct past error sources (analyses showed, e.g., 70 percent due to clerical personnel, 20 percent due to lack of concentration, 10 percent due to logic errors).

Besides, 22 work stations were used in a decentralized manner. Off-line operation was used to tie in with the next-higher ESER.

No lessons have as yet been learned regarding CAD use.

Necessary interfaces were kept "open" in order later on to facilitate continuity in operation. (See also the article on page 718 of this issue.)

Mr Fritzsche explained the situation in the parent enterprise of the "Fritz Heckert" Machine-tool Combine VEB.

The first essential step was taken to handle design and technological preparation as well as process control tasks and the attendant decentralized use of computers near the work station through the supply of the KBR A 6402, the AKT A 654, including pertinent graphic peripheral equipment, as well as office computer equipment made by Robotron Combine VEB. The available equipment is being used in the form of dialog operation during main working hours, while stacking is done at night. (See also Langer, G., Sonntag, G.: "Work-arrangement Aspects during the Planning of Work Assignments for Production Process Design," FERTIGUNGSTECHNIK UND BETRIEB, Berlin, No 9, Vol 35, 1985, pp 530-532.)

In commenting on this, Dr Broenner thought that he could see an important aspect to consist of the installation of central dialog machines which would facilitate broad-scale use.

Dr Hesse:

The Robotron Office Machine Plant VEB in Soemmerda is making series printers and office computers, among other things.

The complicated nature of the parts required the early use of computer equipment.

The plant has been working with CAD-CAM for about 2 years. As of now, there are two continuous solutions for technologist work stations. For example, modules for workpiece description and a large number of technological data for fringe pattern optimization are being computed, all the way to the preparation of punched control tapes for NC machines.

Plans call for the improvement of existing systems. Available solutions must be specifically spelled out for Rota parts. Using ESER equipment, Soemmerda is achieving continuous general design parts list management by means of dialog operation. Thirty terminals are in use at this time. Initial building blocks for setting up a CAP have been installed.

Dr Hofmann:

The Research Center has been working on software development for many years (RATIBERT, AUTOTECH-PRO general solutions).

It has been working on general CAD-CAM solutions for about 2 to 3 years. This, among other things, also involves continuous coupling. The process of detail indication is being started in the design section.

The Research Center basically concentrates on Robotron equipment and its broad-scale use in the GDR. This constitutes support for repeat or followup utility which has already been taken up in many enterprises.

Corrugated parts can already be worked in this manner. Software development will be completed by the end of 1986 for the other Rota [rotating?] parts.

The AUTOTECH-PRO program package has in the meantime been further improved. The data are retrieved by means of presystems.

(Further details on this point can be found in the article on page 713 of this issue.)

Dr Hofmann also covered some important lessons that were learned in enterprises during the introduction of CAD-CAM solutions.

Formation of software groups

For medium-sized enterprises, these software groups should consist of five staff members (technologists and programmers) who are particularly interested in this problem complex. That includes timely advanced training for the persons concerned.

Repeat utilization of general solutions is difficult.

About 20-25 percent adaptation effort are needed for this special problem.

The introduction of CAD-CAM is connected with certain consequences as regards the personnel. There is interference in the work contents of designers and technologists.

(Additional information on this point may be found in the articles by Erfurt and Rauch on pages 720 and 721.)

Specialization of engineers, which kept growing over the years, must be minimized because most of the knowledge is stored by the computer.

An RID [not further identified] guideline was drafted by the Fritz Heckert Combine. The idea is to prevent duplication of effort.

By way of summary, all participants once more commented on the question

"What are the rationalization effects that have so far been achieved through the introduction of CAD-CAM systems?"

Mr Finke:

Individual and small-series parts production at the Erfurt parent enterprise is characterized mostly by NC machine use.

CAD technology is definitely one of the main points. There is a great capacity here for responding to customer wishes (short-term offers) and the quality is also being improved.

Production processes requiring few operators are considered to be a source of additional effectiveness.

Mr Hofmann emphasized that computer-assisted work has so far made it possible to save 50 percent of the time involved in rationalization in the technical area.

Selected sample solutions showed a 95-percent time saving due to the use of CAD-CAM systems.

Mr Fritzsche, speaking from his viewpoint, noted by way of supplement that additional effects will materialize as soon as data from the CAD area can immediately be used for technology.

Mr Steinwachs noted that the absolute processing times can be reduced. One must start with parts that influence the processing time of the product as a whole. That means 30 to 40 percent of all parts. This processing time reduction also considerably reduces the material circulation times and 20 to 30 percent more goods output will be possible.

According to Mr Wagler, quality assurance in connection with CAD use begins already during the design stage. The ability to offer a product assortment is improved because one can give the customer information on the most varied versions much faster. This also benefits the development of field activity management.

Dr Hesse mentioned that, in addition to considerable time savings, it was also possible, for instance, to save about 0.5 ton of paper per year and per terminal use. That meant that two workers could be released in the enterprise per office computer use.

It is important to keep these requirements in mind when it comes to using high-grade computer equipment.

What are the prerequisites that the participants considered to be very important for the use of CAD-CAM systems?

When it comes to training--Professor Kochan remarked--it turns out that only 15 to 20 percent specialists are needed. It is important to develop all other students much more in depth in the field of CAD-CAM.

Mr Wagler added that involving the first management level--the party and the labor union--in the work on the solution is a fundamental prerequisite. In addition to computer-assisted technical primary data, the processes involved in planning, management, and control must also be accomplished in a computer-assisted manner.

Cooperation between software specialists and users must be guaranteed from the very beginning.

Mr Hornbostel:

What we need is not only experts for programming. Every engineer must be able to algorithmize his own problem.

Dr Broenner:

It is necessary to get into CAD-CAM only when the basic software is available. "Software tools" have to run on different "hardware." Maximum standardization is the goal.

The correct evaluation of the labor-sharing process is a prerequisite, Mr Tappert remarked as an afterthought. This is why a labor scientist must be consulted during the installation of computer-assisted work stations. It is important to create a good work atmosphere and to fashion the working conditions in such a manner that the high-grade equipment can be fully utilized through multishift operation.

The lessons learned at Planeta in Radebeul--Dr Steinwachs observed--showed that the employment of young researcher teams proved to have been effective during the introduction of CAD-CAM. The young researchers were faster in familiarizing themselves with the solutions. There are no biases against the new equipment.

Professor Kochan made the following concluding remarks:

"There is a whole series of possibilities for using CAS-CAM systems, both horizontally and vertically. But they can be implemented in the enterprise only through long-term, profound changes. If we figure on a factor of 1 in the use of NC machines and a factor of 10 for computer use, then we have a factor of 100 in connection with CAD-CAM use.

"Production cooperation efforts are needed on an entirely new order of magnitude when it comes to the introduction of the CAD-CAM key technology. Nobody can get ahead all by himself!"

All participants in this technical conference presented their experiences. The discussion was lively and the participants were frank and open-minded. Everyone tried to inject important aspects into the conversation so that new discoveries were also made.

The editors wish to thank all participants for their commitment to this task.

Special appreciation is due Professor Kochan in his capacity as moderator, as well as Mr Schulz, president of the KDT enterprise section of the parent enterprise of the Erfurt Shaping Technology Combine VEB, for good organization.

The report on this technical conference and the following technical articles on this topic are intended to inspire you, dear readers, to share your enterprise's experiences with CAD-CAM use in our technical publication.

5058

CSO: 2302/8

EAST EUROPE/METALLURGICAL INDUSTRIES

HUNGARIAN METALLURGICAL EXPERIMENTS ON SOVIET SPACECRAFT

Budapest NEPSZABADSAG in Hungarian 11 Jan 86 p 11

[Interview with Erik Fuchs by Katalin Magos: "Melting in the Cosmos. From the Research Results in Materials Science of the Soviet-Hungarian Space Flight"]

[Text] If we buy a washing machine, we only examine its practical features--its size, weight, energy consumption, the possibility of programming it--but we never become interested in the chemical composition of its various parts, or the structure of its materials. This, even though the usability of machines depends to a large extent not only on their construction but also on the details of manufacturing technology, on the chemical composition of the materials involved, on the heat treatment given, and on the structure of these materials.

Space-Materials Technology--BEALUCA Program

The experts of materials science achieve the ever improving, more and more exotic properties, the long useful life and the exceptional corrosion resistance of materials by influencing the structure of substances in a deliberate manner. This kind of research rarely gets the limelight because its results are often indirect and not always spectacular. Perhaps this explains why during the space flight of Bertalan Farkas and at its fifth anniversary, alongside all the other programs, hardly a word was spoken of the successes of Hungarian researchers in space-materials science, and of their still continuing work.

Space-materials science research projects could be started in Hungary in connection with the 1980 Soviet-Hungarian space flight--I learn from Erik Fuchs, honorary university professor and doctor of technical sciences, who as one of the chief engineers of the Metal-Industry Research and Development Enterprise together with Andras Roos, a docent at the Heavy Industry Technical University of Miskolc and others has developed in a few months those aluminum based probes which were melted on board of the Saljut-6 within the framework

of the BEALUCA program at the time of the space flight of Bertalan Farkas. (It is worth while to mention, concerning the strange name of the program--even though for reasons hard to understand, the researchers oppose this--that it was derived from the names of the wives of the two scientists, from Bea and Luca. We publicize this appealing gesture also because in this way the scientists are brought closer to us, become more like other humans and are appreciated more, and justly so).

Hungarian scientists were previously not involved with the problems of melting in space, but they used the unexpected opportunity the best way they could. As far as their investigations were concerned, the conditions of the space station differed from those on Earth only in the almost total absence of gravitation. This is a pretty big "only". Gravitation has a decisive effect on the behavior of materials that are at least partially fluid or gaseous. The fluid (the melted matter) assumes the shape of the container, dish, or mold on Earth due to gravitation. What is even more important in practice, gravitation causes the floating upwards of gas bubbles, slag particles and reduction products in alloys, and in general, gives rise to the convection currents due to differences in density.

We expected primarily the disappearance of gravitational movement in materials in the absence of gravitation, says the chief engineer. We have counted on the role of surface tension and we were interested in seeing how the structure of matter that has been crystallized in space differs from alloys made on Earth.

[Question] Were you intent on investigating the melting and crystallizing process in space?

[Answer] We were looking for those phenomena and opportunities which were essential for further experiments in space and an eventual later manufacturing attempt on board of the spaceship. We had some more immediate goals as well. For many years we investigated the mathematical simulation of processes occurring in metals and alloys, and the related field of computer-aided design of industrial technologies. We wanted to verify the validity of certain of our theoretical calculations with the experiment in space.

Checking the Model

[Question] And the results?

[Answer] In the BEALUCA-program we had an opportunity to conduct the melting and crystalizing of 12 samples. (In another experiment, the Eotvos-program, concerned with semiconductors, they have performed three additional melting operations.) The systematically designed experiment could be evaluated in a sophisticated manner. It became apparent that in the probes--according to our expectations--no gravitational currents appeared, and that the oxide layer covering the surface of the probes had also neutralized the current-causing effect of surface tension. Unfortunately, the gases produced in the alloy did not leave the metal but remained in the material as bubbles. Our mathematical models describing crystallization were, however, proven convincingly correct.

[Question] How are you using the results you obtained?

[Answer] Be it even very complex or very fortunate, a single experiment cannot produce a scientific or technological breakthrough. From the beginning we regarded the experiments in space as an organic part of our work on Earth. We were gratified that our former theoretical results were verified by the space experiment and that this has permitted us to advance a step in the mathematical description and computer modeling of the melting and crystallization processes. Many questions were clarified in case further space experiments can be done: it became apparent, for example, that we must devote more care than on Earth to the degassing and surface preparation of the materials to be recrystallized.

Actually it was to be expected that, as a consequence of recrystallization, all probes would lose their original, regular shape and would solidify into a more or less formless mass. From the shapeless, gas bubble filled, porous material one can obviously not make useful metal parts or products that fit certain requirements. For this reason the solving of the problem of crystallization to a given shape has become a central research task worldwide.

The theory of making castings on Earth is simple. In some fashion--say, in sand, ceramics or metal--a mold corresponding to the shape of the casting is produced. This mold is equipped with auxiliary spaces such as an entrance channel and the molten metal is poured through this into the mold. The molten material fills up the mold as gravitation acts on it, and it begins to cool. Since the specific volume of the molten metal decreases on cooling and especially on solidification, a full, solid casting can only be obtained if the decrease is made up by feeding more material from the auxiliary spaces above the main cavity (from the feeder and the head).

Replacing Gravitation

In space there is no significant gravitation. Precisely this causes the problem which we have been able to surmount with our patented process. In industry a wide variety of precision casting techniques is employed for the manufacture of machine parts. These gave the clue to the solution. We transform the basic material of the casting into the final form using an already known method. We cover the piece with a thermally-resistant ceramic shell, and we leave an auxiliary expansion cavity in the shell. We melt the piece from the side of the expansion cavity. During the volume expansion associated with melting the melt enters the expansion cavity but does not wet its sides; somewhat like the way mercury expands in the bore of a thermometer on heating. Next, in the practically gravitation-free environment, we cool the material from the side opposite to the expansion cavity. Depending on the type of cooling, the process of crystallization can be controlled so that, for example, one can favor the growth of single crystals. Crystallization, as I have mentioned, results in the reduction of specific volume, in shrinking. In our process the "feeding" is done by the capillary pressure of the melt in the expansion cavity. When crystallization is over, we get back the original shape of the material which differs from the starting conditions only in its structure.

[Question] In your process do surface tension and capillary forces replace the gravitational force?

[Answer] Precisely. And the most beautiful part is that the process works not only in theory but also in practice. We have made terrestrial castings which had the opening of the expansion space below the casting, pointing downwards, and still the molten metal did not flow out of the mold: due to the capillary forces we obtained intact castings in spite of the terrestrial gravitational field. It seems that we have developed a solution that can be utilized industrial-scale production in space.

The road that leads to production in space is, of course, long. Still, we are a step further ahead. For heat transfer, for providing the heat necessary for melting, we propose to use not the customary oven but heating elements operated with a computer and a microprocessor built into the ceramic shell that forms the mold. Our technological work can therefore significantly modify previous ideas about melting and crystallizing in space.

With the Standards of Today

[Question] What use can be made from this research? Are these investigations not too far removed from practice?

[Answer] The research in materials technology in space is as of now of the basic research type, although more and more significant manufacturing attempts are made on board of space vehicles. Results obtained there will produce direct benefit for the development of manufacturing technologies, for their modernization, for the development of new ideas and partial problem solutions on Earth. Hungarian research in space materials technology is conducted in the research and development laboratories concerned with basic metal-producing metallurgy, machine manufacturing technology, and with industrially oriented microelectronics. It is my conviction that these investigations will produce direct practical benefits even if they are based only in a small part on actual experiments performed in space.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

GDR DIRECTIVE GOVERNING SOFTWARE ISSUED

East Berlin GESETZBLATT DER DEUTSCHEN DEMOKRATISCHEN REPUBLIK in German 28 Jan 86 pp 33-38

[Text] Directive of 13 January 1986 Concerning the Planning, Accounting and Clearing of Software

The following regulations are issued for the planning, accounting and clearing of software with the agreement of the directors of the competent central organs of the State:

Section 1

The directive for the planning, accounting and clearing of software (Appendix) is declared binding.

Section 2

(1) These regulations are binding on the central state organs, councils of the regions and districts, combines, organs responsible for directing the economy and nationally-owned commercial enterprises, other nationally-owned concerns and organizations of the national economy (hereinafter referred to as enterprises), in whose scope of responsibility software is manufactured.

(2) The stipulations concerning the accounting of software as it refers to the field of reference in accordance with Section 9 of the Directive is binding for combines and enterprises which plan to undertake software development tasks for the fields of reference according to Appendix 1 of the Directive as well as for the accounting organs identified in this Appendix and their responsible ministries and other central organs of the State.

(3) These regulations are not binding for combines and enterprises which plan and clear on a reduced scale.

Section 3

These regulations take effect on 1 February 1986. They must be observed beginning with the implementation of the annual national economic plan for 1986. The state planning indicators according to Section 3, Paragraph 2 of the Directive must be submitted for 1986 with the account clearing that shall be carried out for the first time as of 30 June 1986, on the basis of the enterprise plans.

Berlin, 13 January 1986

The Chairman of the State Planning Commission

Authorized to Sign: Klopfer

Member of the Council of Ministers and State Secretary in the State Planning Commission

APPENDIX to the Foregoing Regulation

Directive for the Planning, Balancing and Clearing of Software

Increased efficiency in the development, production and maintenance of software is of critical importance for the stepped-up introduction of key technologies such as microelectronics, CAD/CAM, as well as other informational and communication technologies. Software substantially determines the use-value of microprocessors, computers and EDP facilities CAD/CAM work stations, machine tools and consumer goods. The development, production and maintenance of software must therefore be effectively integrated into the planning system.

For this reason the following stipulations are made:

(1) Definition of Terms

(1) Software is the totality of the means that are available in the form of programs and documentation for the operation of EDP facilities, mainframe, mini- and microcomputers as well as of automatic controls, devices and device configurations and manufacturing centers (hardware) on the basis of programmable computer components.

(2) Software products and software services shall be regarded as software in accordance with the sense of this directive.

(3) Software products are software which is manufactured by the hardware manufacturer itself for multivalent use and sold to third parties. Software products are therefore an inherent aspect of the production of industrial goods. Software products include basic software and applications software in accordance with Paragraph 7. An industry price in accordance with Section 7 must be basically established and is to be calculated as a sub-assembly price together with the hardware as a total price.

(4) The indicator for software production as understood in this Directive includes the total of sales (receipts) of software products manufactured

within a particular enterprise. Only those software products are to be included in software production figures which are manufactured by employees of said enterprise. Software that is purchased from other enterprises and establishments as finished, functional programs and which is resold in an unaltered condition may not be planned and cleared as software production (commodities). The copying of software manufactured elsewhere shall not be regarded as in-house manufacture.

(5) Software services are scientific and technological services and other services for the use of software for specific user solutions. Software services include basic software and user software according to Paragraph 7. Software services include:

- (a) Projects and programs for new hardware applications in accordance with Paragraph 1, including relevant documentation, such as problem and program documentation for the users and the computer center, also under the use of scientific-technological results in the form of components from project and program funds,
- (b) Results of applications research for the implementation of computer and office technology,
- (c) Application services, such as the customizing and maintenance (updating and preservation) of existing programs and projects, including relevant documentation

(6) The indicators for software services as understood in this Directive include the total of sales (receipts) from specific user software and software applications services. Software services are an inherent part of the production of non-industrial goods. To be included in software services are user software developed by the employees of a particular enterprise and the software applications that are produced. Software services that are acquired from other enterprises and resold in an unaltered condition to third parties shall not be planned and cleared as software services. A price must be determined for software services in accordance with Paragraph 7.

(7) Basic software is software for the multivalent use of universal user-dependent, device-specific processes. Included in particular in basic software are operating systems, functional and control software, compilers, interpreters, programming languages, data base systems, communications software, dialogue systems, real-time systems, graphics software. Applications software is software for the object-related use of the technical means for the processing of specific user problems.

(8) The following shall not be regarded as software in the sense intended in this Directive:

- organizational services for the rationalizing of data processing which are carried out prior to or subsequent to EDP, including reorganization services,
- consultations for the preparation of the taking over of software services and software production,

- information services

- training services for the servicing (maintenance and use) of software and related hardware technology.

(9) Software products and software services which are produced in-house within the framework of the in-house production of means of rationalization are to be planned and cleared as components of the indicator for the in-house production of means of rationalization. Software from the in-house production of means of rationalization is to be valued at the industry price in the case of sales to third parties, and at cost or price for in-house use.

(10) Costs of software production and/or costs of software services include all expenditures for the preparation, production and realization of software products and/or software services.

(11) Manpower for software production and/or services includes all wage-earners and salaried workers (in full employment units ["Vollbeschaeftigten-einheiten" = VbE]), who produce software, regardless of their qualifications and the area in which they work.

2. Basic Principles and Responsibility

(1) Producers and users of software are responsible for ensuring that the potential use-value of the technical means (hardware) becomes fully available for increasing the efficiency and raising the performance level of the national economy by making available in a timely manner a varied assortment of quality software. The following steps must be undertaken in this regard:

- the potential for the manufacture of software in the combines must be specifically strengthened and capacities for in-house production of means of rationalization must be directed towards the manufacture of software;
- labor productivity in the development, production and maintenance of software must be increased;
- quality and standardization must be ensured in the area of software;
- the multivalent use of software must be expanded;
- software must be protected from unauthorized utilization;
- software must be designed so as to prevent an uncontrolled flow of the data to be processed;
- international scientific and technological cooperations with the USSR and with other member states of CEMA must be intensified and the export of software must be increased.

(2) The ministries, other central organs of the State, combines and enterprises which utilize products, technologies and processes for the realization or export of which user software is necessary are responsible for ensuring that the demand for user software is met in a cost-effective manner.

(3) The Ministry for Electrical Engineering and Electronics and the pertinent combines and enterprises in this sector must ensure that the national economic demand for basic software is met in a cost-effective manner and that efficient technological means for the development, production and maintenance of software are made available and that standards are established in keeping with the accounting responsibility for software.

(4) The Ministry for Science and Technology, in cooperation with the State Planning Commission, must plan scientific and technological tasks for the development of software and software-related resources that are important for the national economy, within the framework of government contract awards for science and technology as well as of individual tasks of the state plan for science and technology.

(5) The State Central Administration for Statistics is responsible for meeting the need for applications software for customers of the VE Data Processing Combine, for offering marketable applications software for other application fields in consultation with the task profile of the VE Data Processing Combine, as well as for ensuring cooperation with the combines and enterprises in the sector of electrical engineering and electronics in the development of basic software and software-related resources, and for the establishment of standards in keeping with their accounting responsibility.

(6) The Office for Standardization, Measurements and Product Testing shall direct the drawing up of standards and basic regulations related to quality control in the area of software.

3. The Planning of Software Production and Software Services

(1) Enterprises which manufacture software costing over M 20,000 annually shall plan and clear the indicators for software in accordance with Sections 2 and 3 and Paragraph 6. The indicators must be submitted along with the complex plan draft to the organ to which in each case the enterprise directly reports.

(2) Software production and services shall be planned as a component of the annual national economic plan as follows:

- the scientific-technological tasks related to the production of new types of software as a component of the plans for science and technology;
- the following indicators as a component of the complex economic planning information of the areas of responsibility: [BP="Betriebspreis" or enterprise price; OEP="oekonomische Planinformation" or economic plan information]

- software production (revenues) (BP) OP 0539
- software services (revenues) (BP) OP 0544
- manpower for software (full employment units [VbE] on an annual average) OP 0937
- costs of the realized software OP 0160
- costs per 100 M of realized software $OP\ 0160 / (OP\ 0539 + OP\ 0544)$
- software from in-house production of means of rationalization (products and services) OP 0559

(3) The combines and enterprises shall plan the indicators for software production, software services and manpower for software as components of the Five Year Plan. The indicators are to be submitted to the organ which is in each case directly superior, for the Five Year Plan and for the Annual National Economic Plan, as components of the complex economic plan information.

(4) The acquisition of manpower for the manufacture of software shall be planned as a component of the Acquisition and Reinstatement of Manpower in accordance with Planning Regulation Section N, Paragraph 23-B No. 2 (Appendix to the Directive of 7 December 1988: Offprint No. 1190 of the law gazette). The measures required for the qualifying and advanced training of workers for the manufacture of software shall be planned within the framework of the Plan for Cadre and Training in accordance with the guidelines for planning in the combines and enterprises of the industrial and construction sectors, Section 6, Paragraph 6.4 (Appendix to the Directive of 7 December 1984: Offprint No. 1191 of the law gazette).

(5) In accordance with the guidelines for planning in the combines and enterprises of the industrial and construction sectors, the following planning must be carried out:

- planning of the scientific and technological tasks related to the manufacture of software in Section 3 of the plan for science and technology;
- planning of software production and software services in Section 1 of the plan for production;
- planning of the costs of software production and software services in Section 8 of the plan for labor productivity and manpower.

(6) In each case, the directly supervising organs must, based on plan drafts, decide on the increase in software production and software services and issue target figures aimed at improving cost effectiveness in the manufacture of software and at ensuring the availability of the necessary manpower for the production of software.

(7) The ministries, other central organs of the State and regional councils shall submit to the State Planning Commission the indicators for software planning as components of the plan drafts for the Five Year Plan and the complex plan drafts for the national economic plans, in accordance with

Sections 2 and 3. The indicators for software planning are to be separately set forth by the State Planning Commission in the Five Year Plan and in the annual national economic plans.

(8) The ministries, other central organs of the State and the regional councils shall obtain the indicators for software production and software services from the State Planning Commission as a state plan target for the Five Year Plan and the annual national economic plans. The indicator for software produced as part of the in-house production of means of rationalization shall be used as a state plan target for the annual national economic plan. The state plan target figures for the indicator costs per M 100 of realized software are to be communicated by the ministries, other central organs of the State and the regional councils to the combines within their areas of jurisdiction.

4. The Planning and Clearing of New Types of Software in the Plans for Science and Technology

(1) As a new type of software, software that was developed as a result of research and development tasks (if necessary also as GDR standard) on the basis of a confirmed specifications sheet or of a developmental contract shall be planned and cleared as a new product. New types of software must be produced and used for the first time in GDR enterprises or possess better use characteristics as compared with existing software, and must meet be on a par with international developments.

(2) New types of software can include:

- results of applications research for the implementation of computer and office technology,
- software as a component of the new development of products, technologies and processes,
- software for controlling devices, machines and robots and for computer-assisted systems for facilities operations,
- software for measurement, analysis and testing procedures and devices,
- software for the solution of research tasks,
- software tasks related to development, construction, project preparation and design,
- software for the technical preparation of production,
- software for the implementation of production and service processes (such as transportation and services),
- software for planning, management and administrative processes.

New types of software shall be planned as a component of the indicators for software production and software services.

(3) New types of software do not include:

- software offerings,
- consultations for the preparation of the adoption of scientific-technological services as well as the transfer of know-how that is directly involved in accomplishment of these services,
- services for the preparation and implementation of the creation of operating systems for users,
- the updating, maintenance and customizing of software for existing solutions of automated information processing, including the relevant documentation,
- services for the rationalization of software.

5. Assessment of Costs and Proceeds in Enterprise Accountancy and Statistics

(1) Separate cost units shall be carried forward for software production and software services in enterprise accounting and statistics. The costs of software production and of the costs of software services, as well as the sales figures from software production--divided according to domestic sales and export sales--and the sales figures from software services shall be thereby shown.

(2) The ministers and directors of other central organs of the State shall ensure that the necessary determinations are carried out for formulation of the costs of and receipts from software production and software services in accordance with Section 108 of the Directive of 6 August 1985 concerning accountancy and statistics in the enterprises and combines (Offprint No. 800/1 of the law gazette) by 30 April 1986.

6. The Clearing of Software Production and of Software Services

(1) The enterprises shall render an account each quarter for the following indicators, within the framework of the centralized statistical returns system of the State Central Administration for Statistics (annual plan, plan for the time period of the report and actual amount for the time period of the report, respectively):

- a) software production (receipts) (BP)
- b) software services (receipts) (BP)
- c) manpower for software (full employment units [VbE] on an annual average)
- d) costs of the realized software
- e) costs per M 100 of the realized software.

(2) Software from the in-house production of means of rationalization in accordance with Section 1, Paragraph 9 of this Directive shall be cleared quarterly by the enterprises, within the framework of the report concerning in-house production of means of rationalization.

7. Price Formation for Software

(1) In order to support the development and production of software and the real reflection in the evaluation of performance and in the economic accountancy of the combines and enterprises, industry prices for software shall be based on the necessary societal costs (self-costs plus normative profit).

(2) In the development and production of software, the manufacturers shall be entitled to a share of the economic benefit in the industry price; the share in the benefit is to be treated in such a way that the manufacturer realizes in the industry price a large portion of the cost reduction that is effected by software implementation and that a price reduction occurs simultaneously for the customer. Care must be taken to ensure that economic interest in the most efficient type of manufacture and the multivalent implementation of high-quality software is effectively stimulated via the industry price. The prices for software shall be formed in accordance with price order No. 9/85 concerning the formation of prices for software.

8. Financing of Software

(1) The manufacture of software is to be financed

- as a component of the tasks outlined in the plans for science and technology for the development of software from the fund for science and technology, as well as from state budgetary funds in accordance with the directive of 23 November 1983 concerning the implementation of economic accountancy in research and development (GB1. I No. 36 p. 387),
- as a component
 - of in-house production of means of rationalization as well as
 - of production and services for third partiesfrom planned costs.

(2) Financial resources from the service fund can be used for the production of software according to plan within the framework of the indicator "In-house Production of Means of Rationalization." These may be set off against the minimum claim for the implementation of 25 percent of the funds for rationalization investments, according to the Directive of 14 April 1983 regarding the planning, formation and utilization of the service fund of nationally-owned enterprises (GB1. I No. 11, p. 121). Additional resources of the service fund may be implemented for the production of software above and beyond the state plan target ("In-House Production of Means of Rationalization").

(3) For higher expenses that result from additional production and additional services, as well as from the faster development of software, resources of the reserve fund may be implemented in accordance with Article 30 of the Directive of 14 April 1983 regarding the financing directive for the nationally-owned economy (GB1. I No. 11, p. 110).

(4) The implementation or the purchase of software must be financed:

- for research and development work financed from resources of the plan for science and technology as well as from resources of the state budget according to the Directive of 23 November 1983 regarding the implementation of economic accountancy in research and development;
- for investments (software products according to Paragraph V of the Directive of 14 April 1983 regarding financing guidelines for the nationally-owned economy;
- for software with a price tag of under M 2,000 as well as software that is not tied to investments from budgeted costs.

9. Implementation Parameters for the Balancing of Software according to Fields of Reference.

9.1 Principles, Objective and Subject

(1) In order to increase efficiency in the development, production and utilization of software as well as for the rational meeting of the national economy's software requirements, the following is to be provided by the balancing:

- increasing the degree of multivalent use of existing software as well as
- influencing in a centralized way the most efficient implementation of the capacities for software development.

(2) The balancing of software shall be carried out for the reference areas (ELN numbers) according to Appendix 1 and in keeping with the information and advisory facilities for the development, production and multiple utilization of software in the GDR. It is obligatory for software with a planned development outlay of over 500 hours per year.

(3) Before assuming responsibility for software development tasks in the plan for the fields of reference listed in Appendix 1, the enterprises must obtain confirmation from the responsible balancing organs. The application must be submitted in duplicate copies on Form 1540 in accordance with Appendix 2. The form can be obtained after May 1986 from the Spremberg Publishing House for Printed Forms. The application procedure shall be carried out continuously in keeping with the current concrete requirements of the applicant. Approval of the application by the balancing organ in accordance with Appendix 2 is a precondition for taking up the software development tasks in the plan of the applicant with corresponding financing. Prior to submission of the application, the expert opinion of the information and advisory facilities which are competent for the particular fields of reference must be sought. The opinion given by these offices as well as the response of the applicant to the opinion are to be attached to the application.

9.2 Tasks and Duties of the Balancing Organs

- (1) The balancing organs shall register the applications of the applicants, examine them according to the criteria outlined in Section 9.1 Paragraph 1 and reach a decision within four weeks after receipt of the application.
- (2) After approval, the printed form is to be returned to the applicant with a registration number. This approval refers only to the technical aspect of the software development task which was submitted. The figures regarding the project preparation costs and the utilization of the software development task serve as information for the balancing organ. The applicant is responsible for planning and clearing these figures, as well as for meeting them.
- (3) Rejection of an application must be made in writing by the balancing organ. The grounds for the rejection must contain references to the unauthorized utilization of existing software and/or to the joint effect on current project development plans.
- (4) On the basis of the applications from the applicants, the balancing organs must individually according to the separate reference areas (ELN numbers) compile comprehensive balance lists and forward such lists as a component of the plan draft to the responsible ministries and/or other central organs of the State. The balance lists shall also contain evidence regarding the project planning costs and benefits, as well as an estimate concerning the degree to which the national economic demand for software is addressed.
- (5) The balancing organs are authorized to make independent proposals regarding the implementation of software capacities to ensure that necessary development tasks are carried out and to include these in the balance lists.

9.3 Tasks and Duties of the Balancing Organs of the Superior Ministries and/or of other Central Organs of the State

- (1) The ministries and other central organs of the State which are superior to the balancing organs shall undertake to inspect the balance decisions reached by the balancing organs on the basis of the balance lists which have been submitted.
- (2) In order to ensure that national economic priorities are met, the ministries and other central organs of the State are authorized:
 - to reverse decisions of the balancing organs and
 - to determine the implementation of software capacities in order to ensure that priority tasks are met.

After the submitted balance lists have been inspected, a confirmation shall be carried out.

- (3) In evaluating the confirmed balance lists, the ministries and other central organs of the State which are responsible for balancing shall draw up conclusions and measures and communicate these to the responsible ministries and to other central organs of the State.

APPENDIX 1 OF THE DIRECTIVE

Nomenclature for the Balancing of Software according to Fields of Reference

Balancing Organ

Products of Software Production

Programming languages	
Machine-oriented programming languages	VEB Robotron Combine
Problem-oriented programming languages	VEB Robotron Combine
Basic software	
Operating systems	
8 bit office and personal computers	VEB Robotron Combine
16 bit computer systems	VEB Robotron Combine
Desktop computers	VEB Robotron Combine
CRT	VEB Robotron Combine
32 bit computer systems	VEB Robotron Combine
EDP facilities	VEB Robotron Combine
Data base operating systems	VEB Robotron Combine
Research systems	VEB Robotron Combine
Dialogue systems	VEB Robotron Combine
Text processing systems	VEB Robotron Combine
CAD/CAM software	
For graphic and semi-graphic peripherals	VEB Robotron Combine
For digitizer technology	VEB Robotron Combine
For plotting technology	VEB Robotron Combine
Function and control software	
For machines and devices in electrical engineering and electronics	
For TSA for electronic components	V E B C o m b i n e f o r Microelectronics
For measurement, analysis and testing devices	Jena VEB Carl Zeiss
For control of devices, machines, facilities and robots	VEB Combine for the Construction of Automated Facilities
For devices and equipment for process supervision, regulation and control	VEB "Friedrich Ebert" Combine Electrical Appliance Plants
Software components	
For CAD/CAM user solutions	
For the design of circuit boards	VEB Robotron Combine
For the design of microelectronic switching circuits	VEB Combine for Microelectronics
Standard mathematical tasks	VEB Robotron Combine

User software
User-specific CAD/CAM software
Electrical engineering and
electronics sector
Manufacturing sector for general
machinery, agricultural machinery
and vehicles
Sector for construction of machine tools
and processing machinery
Sector for construction of heavy
machinery and equipment
Light industry sector
Sector for district managed industry and
foodstuffs industry
Transportation sector
Construction industry
Chemical industry
Trade and supply sector
User-specific software for management,
planning and economic accountancy

Computer Centers of the State
Planning Commission

VE Data Processing Combine

VE Data Processing Combine

VE Data Processing Combine

Ministry for Finance

State Bank of the GDR

Institute for Light

Construction

Inst. for Light Construction

Central Research Institute for

VEB Robotron Combine

VEB Robotron Combine

VE Data Processing Combine

VE Data Processing Combine

VEB Robotron Combine

V E B C o m b i n e f o r
Microelectronics