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ADVANCED MATERIALS

EC: Coatings for Plastics, Ceramics Presented

92WS0667C Paris INDUSTRIES ET TECHNIQUES in French 5 Jun 92 p 69

[Article by Michel Le Toullec: "Vacuum-Processing Applications Becoming More Common: New Coatings for Plastics and Ceramics"—first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] Diamond on polyethylene, titanium on a ceramic: all types of coatings seem possible...

The 11th International Vacuum Metallurgy Congress, which took place in Antibes in May, was paradoxically marked by the announcement of innovative developments concerning non-metallic materials!

Researchers from the University of Hull, Great Britain, presented papers on the deposition of a diamond carbon film on a plastic, PET [polyethylene terephthalate]. The interest of such a coating is that it improves the chemical-resistance, hardness, and friction-resistance characteristics of PET. Until now, it was difficult to obtain a film that would not alter too much the transparency of the plastic; the researchers got around the problem by reducing the carbon content of the plasma and using a mixture of acetylene and hydrogen. The operation takes place around 50°C, a temperature that the plastic will easily withstand. The film, 12 or so micron thick, proves particularly adhesive to the plastic, at least as adhesive as a gold-based coating, and far more so than a titanium deposit.

Serge Paidassi, of the CEA [Atomic Energy Commission] Center for Studies and Research on Materials (CEREM), emphasized the interest of carbon as a solid lubricant. Besides diamond and graphite, the third crystalline form of carbon (the famous fullerene, or buckyball) seems interesting in this respect. However, in this case, thin-layer deposition techniques remain to be developed.

The Toulouse chemical engineering laboratory, for its part, has developed a process for the deposition of silicon nitride on a silicon substrate. The technique is used, among other things, to make semiconductors. Silicon nitride heated to 800°C is deposited through a CVD (chemical vapor deposition) process, starting with a mixture of tetramethylsilane, ammonia and nitrogen. According to researchers, the film obtained is purer than those obtained by existing techniques. Deposition around 500°C yields a film containing a significant amount of hydrogen, while processing beyond 1000°C may result in undesirable reactions with the silicon substrate.

Vacuum metallurgy is also used to bond metal and ceramic materials. The problem is to circumvent the lack of compatibility between these materials and to obtain an interface that is not brittle. The Lyons Central School is working, among other things, on a copper-alumina assembly onto which a film of titanium or titanium hydroxide is deposited. The final assembly of the two elements is done under vacuum, in an oven heated to 820°C. Tensile tests have demonstrated the strength of the assembly up to 200 MPa. This could be explained by the formation of chemical titanium-oxygen-aluminum bonds.

Germany: Siemens Uses Polymers in Automotive Sensors

92WS0706A Toddington NEW MATERIALS INTERNATIONAL in English Jul 92 p 1

[Article: "Germany: Siemens Uses Polymers for Sensor Parts"]

[Text] Siemens has commercialised a series of automotive sensor components after a two-and-a-half year joint development programme with Du Pont. Three different engineering plastics are used for these sensors.

Specialists from Siemens's Sensor Development division in Nuremburg and Du Pont's technical centre in Bad Homburg worked to resolve the complex design of the sensor mouldings, which must withstand harsh temperatures and substances in car engines.

Siemens selected Rynite thermoplastic polyester resin for the housing material on a wheel speed sensor based on an integrated Hall-circuit, for antilock braking systems (ABS). Rynite was selected for this application because of its long term heat resistance and its good mould flow properties which facilitated the moulding of thin yet strong moulding walls, thereby reducing manufacturing costs.

For engine management systems, a pizoelectric knock sensor was developed by the company, based on a piezoceramic element. This sensor detects knocking and regulates the engine in areas where knocking occurs, resulting in improved environmental protection and the use of unleaded fuels.

Siemens selected glass-reinforced Zytel nylon resin for the overmoulding of this sensor because of its heat resistance and its weldline strength, essential for sealing the sensor element. The overmoulding of the sensor contributed to a reduction in manufacturing costs.

Due to its heat resistance and good mould flow characteristics resulting in manufacturing cost savings, Zytel was also selected by Siemens for several other recent sensor developments. These include a TDC sensor for the regulation of the angle of ignition in combustion engines; sensors to measure the temperature of engine coolants and also several electrical connectors.

In another new application—a sensor to measure the temperature outside of the car—Siemens chose Delrin acetal resin which allowed for the design of snap fittings for assembling and mounting the sensor. Snap fitting is

an important design consideration in view of legislation regarding disassembly at the end of the car's life cycle.

UK Firm Develops Yttrium Oxide-Strengthened Turbine Blade

92WS0706B Toddington NEW MATERIALS INTERNATIONAL in English Jul 92 p 4

[Article: "PM Turbine Blade Wins EPMA Award"]

[Text] The 1992 Award for 'Innovation in Powder Metallurgy' has this year been awarded to Inco Alloys International of Hereford, England, for the development of the world's first oxide dispersions-strengthened superalloy blade. Inco Alloys International is the world's leading producer of high-performance nickel-based alloys.

The blade was developed by Inco Alloys for use in European Gas Turbines Ltd's new hurricane engine which specifies highly creep resistant PM dispersion strengthened first stage turbine blades capable of operating at elevated temperatures without cooling. The alloy involved is Inconel alloy MA 6000 produced by mechanical alloying at Inco Alloys International's plant in the UK.

The high creep strength of this alloy derives from an ultra-fine dispersion of sub-micron size yttrium oxide particles which inhibit dislocation movements within the alloy matrix. The disperoid is incorporated by mechanical alloying in specially adapted 1.8 m diameter commercial ball mills producing up to 1 tonne of powder per batch. A range of superalloys is produced by this process of which Inconel alloy MA 6000 is currently the strongest. While strength is maintained by the disperoid at temperatures up to 1,150°C, the alloy also contains refractory elements and conventional gamma prime precipitation strengthening to meet the design requirements in the cooler regions of the blade.

The relatively high chromium content of 15 percent, together with 4.5 percent aluminium is said to ensure the alloy has a high level of intrinsic corrosion and oxidation resistance which protects the blade in the event of the applied coating being damaged in service.

After mechanical alloying, the metal powder is consolidated to 100 percent density by extrusion in the 5,560-tonne press. The extruded bars are then zone annealed to produce a coarse, highly elongated grain structure which further enhances the elevated temperature creep resistance. After release testing, the bars are machined to rectangular blocks, and further finished to the final shape at European Gas Turbines Ltd. A NiCoCRALY coating is applied after machining and an aging heat treatment given to develop the intermediate mechanical properties.

This powder metallurgy component, which weighs only 50 g, is also environmentally sound—the environmental impact of power generation is minimised through greater efficiency in the conversion of fossil fuels. In small CHP (combined heat and power) installations such as schools and hospitals the overall efficiency of the hurricane-based unit can be extended to 75-90 percent. The first two production hurricanes have been installed at the new Westminster and Chelsea Hospital in London, each unit being capable of 1.55 MW of electrical power with surplus heat being used to raise steam with an overall efficiency claimed to be 89.1 percent. When fitted to the hurricane, the innovative PM blades are designed for a minimum 25,000 hour interval between major overhauls.

The Award, by the European Powder Metallurgy Association, was presented in Brussels, Belgium, last month.

AEROSPACE

Germany: DASA Proposes European Space Program Salvage Strategy

92MI0585 Bonn DIE WELT in German 13 Jun 92 p 10

[Text] "Although the Europeans know how to get into space, they do not know how to get back again." This is how a French critic described the extremely difficult times currently being experienced by the European space industry. Briefly, the Europeans simply do not have the know-how for the reentry into the earth's atmosphere of the ESA's [European Space Agency] most ambitious project, the Hermes manned space shuttle. Apparently there is also not enough money now to overcome this technical shortcoming in the short term.

Five years ago, the research ministers of 13 European countries agreed to develop Hermes at a meeting held in The Hague. Hermes was to be launched into space by the Ariane-5 carrier also to be developed from scratch. However, the ministers also wanted to participate in the United States space station Freedom project with the Columbus program. All these programs and further projects up to the year 2000 were to have cost about 60 billion German marks [DM] with Germany's contribution of DM20 billion amounting to one-third of the total.

According to German Research Minister Heinz Riesenhuber this is now out of the question due to the costs of reunification. Only DM11 billion can be provided until the year 2000. So the Hermes program is now threatening to become a complete failure even before the first piece of sheetmetal for the wing section is developed. In order to avoid this, German Aerospace and its French partners have now drawn up a salvage plan for Hermes and the European space program. This plan was presented by a member of the German Aerospace board of directors, Werner Heinzmann in Bonn yesterday.

Heinzmann maintains that it would be possible both to complete the Ariane-5 carrier and also to continue with Columbus space station activities, if the high Hermes costs were to be reduced by first building a much cheaper, unmanned "Demonstrator X-2000," to use for developing the reentry technology. This would require

DM12.8 billion by the year 2000 and not the DM11 billion proposed by the research minister. Without this increase, the new terminal concept would not be feasible either and the German and European space industry would suffer a serious setback.

Italian Space Agency Funding, Restructuring Discussed

92MI0604 Rome SPAZIO INFORMAZIONI in Italian 17 Jun 92 pp 6-7

[Text] The new provisions that will apply to the management of relations with the ESA's [European Space Agency] ESRIN [European Space Research Institute] center have recently been published in the official Gazette (No. 122 of 26 May 1992). "The Italian Space Agency (ASI)," it is stated, "will replace the CNR [National Research Council] in those areas relating to activities carried out by the ESA. In particular this involves the obligations of the Italian Government provided for under Act No. 574 of 26 July 1978, which ratified and implemented the agreement signed in Rome on 23 June 1970 between the Italian Republic and the European Space Research Organization (ESRO) relating to the ESRIN center. The CNR will adopt the provisions and take the steps necessary to transfer certain areas defined and described in the layout to the ASI. These areas will be ceded to the ESRIN in accordance with the conditions already laid down in a footnote to the said agreement made between the Italian Republic and the ESRO." The decree published in the Official Gazette also refers to the financial needs of the ASI and the Italian Aerospace Research Center (CIRA). It has been affirmed that: "the ASI is entitled, after obtaining specific authorization from the Ministry of Universities and Scientific and Technological Research, the Treasury, and the Ministry for Economic Planning, and, within the limits therein established, to apply to the financial market, for the funding necessary for its management, as already provided for in the current long-term plan approved by CIPE [Interministerial Committee for Economic Planning]. Amortization or repayment will be taken from the annual contribution made by the state. Likewise, to meet the international obligations arising from Italian participation in the Scirocco project (plasma tunnel project to be constructed at Capua), CIRA will be entitled to obtain funds from the financial market in accordance with the conditions and the limits established for the ASI.

German Airbus Faces Difficulties

92MI0605 Bonn DIE WELT in German 10 Jun 92 p 11

[Text] Although Deutsche Airbus GmbH [DA] in Hamburg is riding on a strong upcurrent, the risk potential remains considerable. The GATT round promises nothing good for German civil aircraft manufacture, and the structural crisis of the large airlines is reducing the demand for new equipment. The considerable currency risk arising from the fact that products manufactured on a German mark basis will be sold on a dollar basis is compounded by a further explosive political risk: that to the Jaeger 90.

According to Hartmut Mehdorn, president of the Management Committee, cancellation of the Jaeger 90 would have a considerable effect on DA activity in northern Germany. Although DA has not been formally consolidated as part of the German Aerospace AG (DASA) group, it was in fact an integral part of the group. If the Jaeger 90 went, DASA would have to reoptimize its structures, which would mean the relocation of northern German DA business to the south. Of the 14 aeronautics works, at least two were threatened, said Mehdorn.

The structure of DA was now very good, and it would fight any such development, stressed Mehdorn. The three works in southern Germany taken over from MBB and Dornier at a cost of DM111 million had been integrated, and the expansion and reorganization of the company in Hamburg for final assembly of the A319 and A321 were virtually completed. "Provided the sky, or the Jaeger 90, doesn't fall on our heads," said Mehdorn, DA would be able, in the long term, to sustain the high flying position initiated in 1991.

The results submitted for 1991 are much improved, and contain a number of positive factors. For the ascent from the loss zone (1990: DM376 million) to the clear profit heights of DM421 million, DA can thank, first of all, the high level of preparatory work within the company and the rising production figures. Secondly, a positive financial result of DM15 million has been achieved as a result of the advantageous investment of high advance payments, and the Airbus Industries Consortium, in which DA has a 37.9 percent interest, made good profits. DA received DM151 million in investment earnings. Finally, the government reimbursed DA for dollar-related profit shortfalls amounting to DM380 million, which DA receives through the increased turnover (by 18 percent to DM5.1 billion). The profit is being transferred in full to the DA equity capital, so that 35.1 percent of the original capital of DM1.95 billion is restored.

The dollar has again put considerable pressure on the results. With a year-end dollar exchange rate of DM1.51, the statutory loss-free evaluation of the DA order book (DM18 billion) caused an additional reserve requirement of DM664 million. According to Mehdorn, the order volume of currently 929 firm aircraft orders was free from currency risks at an exchange rate of DM1.75. The dollar problem had been reduced by DA for the years ahead through futures contracts, declared Mehdorn, although these could not be used to compensate for the diminishing government subsidies.

Mehdorn was anticipating a positive, albeit not as good, result for the current year. The current weakness in demand did nothing to alter the fact that the aircraft market remained a market of growth. Production in the

current year was being extended to 161 units, and by 1995, was due to be expanded to an annual cycle of 250 aircraft.

FRG's Riedl on Aerospace Cooperation With Russia, Eastern Europe

92WS0607A Stuttgart FLUG REVUE in German, Jun 92 pp 46-47

[Interview of Dr. Erich Riedl, Parliamentary Permanent Secretary in the Ministry of Trade and Commerce, and Federal Government Coordinator for Aeronautics and Space, by Goetz Wange of FLUG REVUE]

[Text] Aid to Russia must be restructured. Contacts with the countries of Eastern Europe are the central focus of the International Aeronautics Exhibition '92. Dr. Erich Riedl, Parliamentary Permanent Secreatary in the Ministry of Trade and Commerce and at the same time Coordinator for Aeronautics and Space for the Federal Government, has discussed this topic several times in the last few months. But many cooperative ventures don't even get to the starting post, because the eastern European companies have no currency and potential western partners are afraid of the high risk. New models for support are asked for.

FR [Flug Revue]: To want to be the turntable between East and West is a high standard. What status does the new International Aeronautics Exhibition in Berlin have in the international setting?

Dr. Riedl: We have in fact high expectations in regard to the function of Berlin as a turntable not only between Western Europe, but also between the whole western world and the newly emerging countries of Eastern Europe. To be sure, the market for aeronautics and space exhibitions of a worldwide scope is not so very large. One must surely consider whether with the competition of the large trade fairs in Paris, Farnborough, and recently also in Singapore, there is really room for another large fair like the International Aeronautics Exhibition in Berlin. What I would most like would be if in Europe an agreement could be made between France, Great Britain, and Germany, that each would hold an aeronautics exhibition there on a three-year rotation. This would also surely be in the interest of the industry, which will become heavily burdened by the increase of large exhibitions. Ultimately the market also will decide this. The International Aeronautics Exhibition in Berlin must be a success, and if it is successful it will gain acceptance.

FR: What impression have you gained during your visits there in the last few months of the capability of the aeronautics industry in Eastern Europe?

Dr. Riedl: In Poland and Czechoslovakia there is a very capable, although in its inner structure very obsolete, airframe and engine industry, which, if suitably modernized, will be thoroughly competitive with the aircraft industries of western European countries such as Italy and Spain. For the medium- and long-term these countries are also worth considering as suppliers for the Airbus program. With regard to its technical qualifications Russia is the most interesting country by far—also Ukraine and Kazakhstan. The Russians in principle can do anything. Their weaknesses lie in the field of electronics and in their assessment of available technologies from the viewpoint of economic utilization.

FR: What forms of cooperation would come to mind then with partners who bring in know-how, but who have old production facilities, little experience in management, and above all no money?

Dr. Riedl: Yes, that is exactly the point. Any consideration of cooperation with Russia must proceed from the assumption that the western partner must bring credit with him. At present there is no money available there, and this will remain so for some time. For this reason the Russians are in fact trying to sell their exisiting technologies to the West at bargain prices and on favourable terms, in order to acquire at least a minimum of currency. From a technical viewpoint cooperation with Russia is undeniably attractive. But the West must bring money along, which in the long-term will surely pay itself back.

FR: Are there, for the above reasons, any plans in the Ministry of Trade and Commerce to make support funds available to firms who wish to develop cooperation with eastern European partners?

Dr. Riedl: In the conversations I had in Russia I heard again and again the word restructuring. The Russians told us that in their country no one was starving. There was enough food to go around, but there were distribution problems. And much was being diverted into dubious channels, especially western aid. Restructure at least a part of the assistance—including guaranteed amounts, EC financial aid, and national programs—into scientific and technical, and investment outlays. This appeal came from all quarters. I heard it from politicans, as well as from scientists, and from the working people with whom I came into contact.

FR: Who then is called on to bring about a change in thinking? Only the EC or also the federal government?

Dr. Riedl: Here one must differentiate clearly. The EC definitely yes, and here I take it for granted that any effective aid from the western European countries must be voted on. There is no place for solo efforts here. What individual enterprises wish to show in the way of initiative is no concern of the government. Members of the group of industrialists who accompanied me to Russia concluded there almost a dozen contracts or precontracts. Once there is a willingness to put appropriate investments into Russian enterprises, the door is wide open to private initiative. If you're talking about the German Federal Republic as a whole, I am of the opinion that the very sizeable amount spent on Hermes, for example, and the German obligations to Russia, which amount to about DM75 billion and till now have

been firmly agreed to, should be carefully examined, to see whether they could not be increasingly put into investment projects rather than into costly outlays of funds. And here I see an important starting point for the aircraft and space industry.

FR: In the case of aeronautical and space technology a sensitive area is involved, since the knowledge can also be used in the military sphere. Isn't this still obstructing plans for cooperation?

Dr. Riedl: Today the Russians are showing us a very great deal more than they were earlier. They are allowing us to take a thorough look at the technical secrets of a proton rocket for example, of cryogenic engines, and of military as well as civilian aircraft construction. In the filing drawers of the Construction Office other quite different technologies undoubtedly also lie hidden. This becomes quite clear from the MIG programs of the 30-series and from the new aircraft of Sukhoy, and by way of helicopters, it extends also to new materials and to engine construction. If democratization continues in Russia I am therefore sure that we have yet to encounter amazing items of knowledge. For this reason many Russians see in the COCOM list an insult to eastern technologies. Whereby it once again becomes clearly evident that the COCOM list must be gotten rid of as soon as possible. In the wake of detente this is still another method of protecting broad sectors of American industry.

FR: Initially you mentioned the Airbus Program as a possible means of bringing in eastern European firms as suppliers. What kind of plan do you have in mind here?

Dr. Riedl: Here one must distinguish between the Airbus Program up until now and its future activities. Until now Airbus Industrie and the national companies have been responsible for how they get the parts which it is up to them to produce—whether by producing the parts themselves or by passing them on to subcontractors. The admission of Russia into the Airbus Consortium is at the moment not under discussion. Reason enough for this is the fact alone that Russia lacks the necessary funds. In new programs it is urgently required however—and I have stated this quite clearly also in Russia—that, for example, with the 600-seater, the future European large-capacity aircraft of the Jumbo class, technical knowledge, experience, and industry will be integrated. This is an important European point of view.

FR: What might the division of labor in the Airbus A350 look like then?

Dr. Riedl: The future European large-capacity aircraft will be achieved certainly also with substantial American participation. Possibly even in a cooperative venture between Airbus Industrie and Boeing. Also conceivable is the realization of the 600-seater through a cooperative venture between Airbus Industrie and Russia. In any case, however, with such a large aircraft there will be room enough for collaboration with the eastern European aircraft industry. This presupposes, however, that Russia will then have appropriate financing opportunities available. A "humanitarian" industrial program, in view of the western philosophy of entrepreneurial sole responsibility, is unthinkable.

FR: What possible further areas of cooperation have you been able to identify in addition to these?

Dr. Riedl: Space naturally. If European space travel were not suffering from such a conspicuous lack of funds, I would immediately plead for large-scale cooperation. But every mark that we would make available to the Russians would have to be withdrawn from our own already very limited funds. This is a major dilemma. It is important that in the meantime the availale potential of qualified personnel be utilized, by inviting scientists from the CIS to the West as guest lecturers. This might at least serve to keep these people in good spirits, so that they will continue their research. Certainly ground installations and certain research facilities for the ESA [European Space Agency] long-term program can be used.

FR: You were recently also in Japan. Could the strain on the ESA budget be eased from that direction?

Dr. Riedl: Japan is striving for leadership in systems for all technical fields—not only electronics and automobiles, but also in aeronautics and space travel. Quite otherwise than in Russia, in Japan money plays no decisive role. If the Japanese decided that they would pursue manned space travel, then they would do it. And if they decided to build a large commercial aircraft, it would be the same. My impression is that they are striving for leadership roles in both fields.

FR: Airbus Industrie is presently having talks with the Japanese about their participation in building the 600-seater. Have you seen any willingness on their part to do this?

Dr. Riedl: Yes. They are thinking about it, and I believe that it would make sense. At the moment this is in fact only a dream. However I could thoroughly imagine that a giant large-capacity commercial aircraft such as this, which is supposed to fly and will fly from the year 2000 up until the year 2050 would be most economically constructed through a world-wide cooperative effort. In this way markets would also be secured.

German-Russian Cooperation on GLONASS Satellite Navigation System

92WS0607B Stuttgart FLUG REVUE in German, Jun 92 p 69

[Article by Rudolf Hofstaetter]

[Text] In the West very little was known about the Russian satellite navigation system GLONASS. The Braunschweig Avionics Center has determined through tests that the system functions with greater accuracy than had been previously supposed.

Because of troublesome problems of financing it is questionable at present whether the planning, which originates from the better times associated with early Soviet space travel, can be carried out. According to the plans GLONASS, the Russian counterpart of the U.S. satellite navigation system GPS, is to consist of a total of 24 simultaneously operating satellites. Even today, however, the system already has enormous capability. In combination with western receiver technology an accuracy in the fixing of a position can be attained which—at least for civiliasn use—up until now is not being offered by GPS.

With a carrier-rocket of the Proton type, three of the navigation satellites are put into space with each launch. The last time this took place was on 4 April 1991, with Kosmos 2139, 2140, and 2141, which were put into orbit at an altitude 19,000 km (with an inclination of 64.8°), and had an orbital time of 11.2 hours. For the new generation, beginning in 1995 the life of the satellites is supposed to be increased from three to five years.

Frequencies and a receiver type for GLONASS were developed by the scientific and technical radio institute in Leningrad, which only recently has been renamed as the Russian Institute for Radio Navigation, St. Petersburg. As of now 1,500 of the receivers have been delivered and put into service. In addition to this the institute is participating in the government commission fort testing the performance of GLONASS. For this reason about a year ago contacts were made with the Braunschweig Avionics Center. In the meantime the cooperation has borne fruit, and in St. Petersburg a "navigation company" was founded in concert with the German Aerodata.

The Braunschweig Avionics Center received two Russian GLONASS receivers for its own tests. As a result of this for the first time in the world, in cooperation with the Institute for Time Standard of the Physico-Technical Federal Institute in Braunschweig, a time comparison between GLONASS time and GPS time was carried out.

The time difference was measured at 17 to 25 nanoseconds. Dr. Wolfgang Lechner of the Braunschweig Avionics Center concludes from this that the GLONASS real time "appears to be probably somewhat more stable than the GPS time." One of the reasons for this could be that the orbital measurement and time synchronization are carried out independently of each other from separate ground stations. Orbital measurement takes place, incidentally, by means of fixing the direction of the laser reflectors on the side of the satellite which faces the earth. Present plans provide for 16 ground stations with lasers. Some of these are already in operation. Financing for the construction of the remaining ones is still uncertain.

In mid-February of this year a constellation of 29 navigation satellites, consisiting of 16 Navstar/GPS and 13 GLONASS, made its appearance over Germany. Eight of these were available within only half an hour. By this means, many opportunities for comparison were provided.

Through long-term tests, lasting 15 months, the Russians determined with coordinates the horizontal position with an accuracy to within about 20 m and the vertical position to within 30 m. However, this was still with the old standard receivers. These data were then confirmed by the tests in Braunschweig. "Very nice values," commented Dr. Lechner. "However this limited accuracy was not sufficient for us." The receiver was therefore modified by the Avionics Center.

As a result of this, new two-dimensional position measurements of an automobile took place with the assistance of three GLONASS satellites. The results showed an accuracy to within 7 m in width and 8 m in length. The predictions of the Russian engineers, who had claimed a resolving power of 10 m for the improved GLONASS receiver, were thus even surpassed.

In summary Dr. Lechner explained at the Congress on the Occasion of the International Space Year in Munich: "GLONASS appears to be better than we had earlier thought—perhaps also on account of the ionosphere model with the relevant parameters in all the receivers."

German Office for Technology Assessment Announces End of Saenger Era

92MI0614 Bonn DIE WELT in German 2 Jul 92 p 9

[Article by Anatol Johansen: "German Space Shuttle Remains a Dream"]

[Text] A dream is over: The dream of the German spacecraft Saenger. The Bundestag's Office for Technology Appraisal (TAB) has examined the project and yesterday announced very sober findings from its efforts in Bonn: Saenger would be very costly, there was no certainty that it could be operated at a profit, and the environmental damage caused by its regular use would be too great.

The project was devised at the end of the 1980s by Messerschmitt-Boelkow-Blohm (MBB). It envisaged an enormous 85 meter long aircraft (Boeing 747 jumbo jet: 70 meters). Five engines would have carried it to these heights like the wren on the back of the eagle.

This rocket plane would then have gone on into space and later landed again on an airfield in the normal way like the large aircraft carrier. The original hope was that because the two aircraft would be completely reusable, the costs of carrying men and materials into space would be reduced from the present 15,000 German marks [DM] or so per kilogram to one fifth of that amount.

This was an unrealistic assumption, Professor Herbert Paschen, head of the Office for Technology Appraisal at

the German Bundestag, told the scientific press conference in Bonn. The development costs for Saenger had risen from an initial estimate of DM23 billion to more than DM45 billion.

The original plan of using the large aircraft as a hypersonic passenger aircraft (five to seven times the speed of sound) had been dropped, for technical and environmental reasons among others. The politicians had now to make a fresh decision on the Saenger project in the light of the facts and figures available.

EUTELSAT To Launch Upgraded Satellite

92WS0614A Paris AFP SCIENCES in French
27 May 92 pp 11, 12

[Unattributed article: "Eutelsat Points Its Antennas To the East"]

[Text] Cannes—The 51st launch of the Ariane rocket, scheduled for 9 July, will be followed with increased interest in Eastern Europe: that is because the European launcher will carry Eutelsat-II-F4, the fourth of the second-generation satellites of the European Organization for Satellite Communications (Eutelsat), which was specially modified for them.

Eutelsat-II-F4M ("M" for modified), which will be launched on an Ariane-44L rocket together with the Indian communication satellite Insat, has just undergone a major modification at the Aerospatiale plant in Cannes, designed to provide improved wide-beam coverage of Europe and extend it all the way to Moscow. From space, it will cover a broad region, from the Canary Islands to the Russian capital and even beyond, and from Turkey to Greenland. In North Africa, Tripoli and Cairo will also benefit from this modification.

The decision to point antennas more to the East was made at a meeting of Eutelsat members last February. Initially, the decision was to be implemented only on the fifth and sixth units in the series, but in view of steadily increasing requests for telecommunication service capacities between Western Europe and the republics of the former Soviet Union, the council decided to do it sooner. Eutelsat-II-F5—and probably the following satellite too—will also be altered to meet the new requirements.

Even though, outwardly, the new Eutelsat does not differ much from the previous units, these alterations did require some rather complex work: the emitter and receptor sources had to be reconfigured and the antenna gain at the center of the wide beam slightly reduced in order to stretch it to the East, without reducing coverage of the western part of the continent. Fourteen of the satellite's 16 repeaters may now be switched simultaneously to the new coverage.

As Mr. Emmanuel Sartorius, director of satellites at the Aerospatiale Space and Defense division, pointed out on 21 May, when he presented the modified satellite to the press: "Today, we are nearly done. Already on 4 June, Eutelsat-II-F4 will be on its way to Kourou."

It will join seven other Eutelsat satellites on orbit—four first-generation and three second-generation satellites which provide traditional telephone and radio and TV broadcasting services, as well as business lines (satellite multiservice system—SMS) which route a whole range of digital communication services. It is in this last field that the demand for point-to-point links and for the creation of VSAT [Very Small Aperture Terminal] networks is especially strong in the East.

At present, the Eutelsat organization consists of public and private telecommunication operators from 33 countries. Last year, it made a profit of ECU21.7 million (174 million French francs [Fr]), i.e. 55 percent more than in 1990. After the merger of the former Soviet bloc's Intervision network with the Eurovision network of the European Broadcasting Union (UER), next January, the new pan-European union will be in a position to serve some 40 countries in Europe, North Africa, and the Middle East, from a single Eutelsat.

"We are an organization that is expanding in a changing environment," its general director, Mr. Jean Grenier, pointed out. He also did not conceal his surprise at the contrast between Eutelsat's success in Eastern Europe and the way he was recently received by EC authorities in Brussels which, he said, viewed Eutelsat's activities as counter to the principles of free competition. "That is not so," Mr. Grenier added. "We are a democratic organization that ensures that all members, large or small, have the same rights. And we are not asking for anything. Just to be liked a little better..."

ESA Postpones ISO Launch

92WS0614B Paris AFP SCIENCES in French
27 May 92 p 12

[Unattributed article: "Launching of the ISO European Satellite Postponed to 1994"]

[Text] Paris—The launching of the European Space Agency's (ESA) ISO [Infrared Astronomy Observatory] satellite, initially scheduled for mid-1993, was postponed to 1994, the head of the Atomic Energy Commission's (CEA) astrophysics department announced on 25 May, in Saclay.

The delay is due to an anomaly in the cryogenic system valves, which generates dust, and to the contamination of the flight mirror, Mrs. Catherine Cesarsky explained at a press conference. Technicians are now trying to identify the cause of these problems.

The result of the collaboration of 35 European companies, ISO, which will be launched into orbit on an Ariane-4 rocket, should make it possible to study cold sources in the universe (sources that radiate only in the infrared) and perhaps to discover star births.

ISO will replace the U.S. IRAS [Infra-Red Astronomy Satellite] observatory, which already explored the sky in the infrared spectrum in 1983. During its 10 month mission, IRAS discovered over 200,000 infrared sources unknown at the time: stars, comets, stars being formed, dust filaments, and other clouds of particles.

German Finance Minister on Aerospace Industry Prospects

92MI0615 Bonn BUNDESREGIERUNGSBULLETIN in German 24 Jun 92 pp 660-662

[Excerpts] The following is a speech by Federal Minister of Finance Dr. Theo Waigel at the opening ceremony of the International Aviation and Space Exhibition in Berlin-Schoenefeld on 15 June 1992. [passage omitted]

Aviation and space travel are a key area for economic progress. So Berlin and Brandenburg will benefit if all the major German and foreign suppliers exhibit and sell their high-technology products here.

The Berlin Aviation Exhibition is capable of forming a bridge to Central and Eastern Europe. From here markets of the future will be opened up. At the same time, the countries of Eastern Europe, in particular the countries of the former Soviet Union, will be able to present their products, some of which are technologically very advanced, to the international market.

For the economic area of Berlin and Brandenburg, the International Aviation Fair points the way to the future. The destructive effects of the country's division are still visible everywhere. But at the same time your ability to take responsibility for solving your own problems is growing, and the metropolis of Berlin and the surrounding area will regain the leading role, nationally and internationally, that it had before the calamity of the war.

We can only claim to keep pace with the international competition for major aviation fairs because we worked for many years to have a strong German aviation and space industry in the framework of European cooperation.

Above all, it is to the great and lasting credit of Franz Josef Strauss that he recognized the opportunities here at the right time. There has been no shortage of opposition and setbacks in past decades.

But the fact that the European Airbus, with significant German participation, is today reaping handsome profits and supplying about one third of the market for large commercial aircraft, is decisive recognition of the efforts made by the former Federal Finance Minister of Bavaria. His forward-looking decisions have been properly honored in the naming of Munich's new airport.

Over the past few months there has been a lot of discussion about Germany as a place to invest. The arguments, however, were sometimes lacking in sophistication. And some comments revealed all too clearly where the speaker's interest lay.

So far as our country's economic prospects are concerned, we have no cause for complacency. But it is harmful to speak of industrial Germany only in gloomy terms of decline.

There are a few basic facts of life. One of them is that we can only afford top wages and extensive leisure if our productivity remains outstanding. Affluence and hostility towards technology do not mix.

If we want a constantly improving standard of living, we must also be clearly achievement-oriented and seek to promote competition, technological development and industrial investment.

There are signs of a change of heart. While in the 1970s there was fear that the influx of students to the humanities would marginalize all other fields of research, the trend is now clearly changing. In the 1981-82 winter semester the number of students of mathematics, sciences, and engineering was still only 33.3 percent of the total. In the 1989-90 winter semester it was 37.5 percent.

But for the future we still have the important task of removing the contradiction that many still feel between technological progress and the preservation of traditional living conditions. Many of mankind's achievements, from aviation to comprehensive medical care, are taken for granted.

In our detailed discussions of the situation in which we find ourselves, I think two critical issues are of particular importance.

The first concerns the level of taxes and levies paid by firms in Germany. If we look at the relevant comparative tables, we see that Germany clearly heads the list for nominal rates of tax on profits and earnings. That something needs to be done about taxation is beyond dispute. Baden-Wuerttemberg's new social-democratic Minister of Economic Affairs recently advocated a cut of 10 percentage points in the "top rate for firms."

Despite reports to the contrary in recent weeks, the Federal Finance Ministry has as yet no drafts prepared for a tax law making Germany, an attractive place to invest. The drafting work is so difficult because on the one hand we have no scope for net reductions in tax, while on the other hand we want to give investing firms as much scope as possible to meet the increasing competition within the single European market.

We are in the process of making a very thorough examination of when and in what stages the necessary tax reform can be put in place. By 1 January 1993 enterprises must know what benchmarks they are to use for their future strategy.

The second important aspect of the discussion for me is the accusation that German workers—but management

as well—are not mobile enough and are too provincial. Of course, we do not like such criticism, but while we categorically reject it, we ought also to take a look at ourselves. We should ask ourselves whether we could not be more adaptable and more internationally-minded.

There is a real danger of embarking on a wrong course if our horizons are too narrow. We are not living on an Island of the Blessed where we alone are the masters of our fate. On the contrary, the affluence we will enjoy in the future and the security of our employment are decided primarily on the world's markets.

The aviation and space industry in particular is facing far-reaching decisions about its future. We need to look at civil and military output in its entirety and take account of the changed priorities and sources of finance.

The ending of the East-West conflict and of the specific threat of communist hegemony is reducing the need for armaments worldwide. That is the peace dividend for which for decades we invested in our defense readiness.

The weight of militarily-oriented industrial orders will decline. Companies in the aviation and space industry are already adjusting to this. But there must be no massive cut-backs and no loss of know-how or technological expertise. Because the defense of democracy and freedom is an on-going task that can only be fulfilled if industry has the necessary technology available.

The defense policy of countries like Switzerland or Sweden with their decades-long tradition of neutrality underlines the fact that the development of the most modern military technology cannot be understood as just a response to concrete external threats. On the contrary, the desire to remain in the lead in this field internationally stems more from wanting to make our own contribution to the preservation of sovereignty and freedom.

In this light, I do not believe that the question of the purchase of the European Fighter Aircraft can be decided on the strength of a not very reliable "public opinion" or of intuition, but only by weighing up the concrete pros and cons.

There is no doubt that the Phantom—which in the year 2000 will have reached the ripe old age of nearly 30—cannot fly forever. But the following questions remain open:

- Is there a contender that is both cheaper but just as capable of fulfilling the defense task as the Fighter 90 that has almost completed its development?
- What would be the concrete effects of abandoning the Fighter 90 project for the overall economic and technological balance?
- What would be the financial consequences of any alternative procurement programs if all the spinoffs are taken into account?
- What would be the consequences of pulling out for cooperation with our partners in other fields, for example for the talks on the future of EC financing?
- Is there any possibility of looking at the purchase of the European Fighter Aircraft again in the context of future financial policy decisions?

The decision will certainly not be easy. It will be part of my responsibilities as Finance Minister to seek a solution that takes account of both the financial and the overall economic aspects of the problem.

We must in particular look at the effects this will have on civil aircraft construction, which is increasingly standing on its own feet after decades of state subsidy. We can be pleased at having made such decisive progress, because it will only be on the basis of our firms' growing independence that we will be able to talk on equal terms with the Americans about extensive liberalization of international competition in the aircraft industry during the GATT negotiations.

In the long term it will be of advantage to all countries—for the Europeans, for the Americans, and for other regions, too—if there are now at least three major suppliers competing for market shares in large aircraft construction. Because all the rules of the market economy say that supply is better and prices lower, the greater the variety available.

In the current GATT negotiations there is a chance that we shall obtain a limit to subsidies. Such "disarmament" in the subsidy "race" does not mean a permanent disadvantage for industry. On the contrary, reducing the burden on government budgets will be of indirect benefit to the economy by cutting taxes and levies.

There are important decisions to be taken regarding the direction we shall take in space travel, just as there are in aviation. The need for consolidation in Germany—and in other countries of Europe, too—means that all existing plans must be looked at again. Only by planning for the long term can we avoid sudden financial squeezes when it may be necessary to make unexpected cuts to research programs.

Space research will remain primarily basic research for many decades to come. It will only gradually become possible to reduce its complete dependence on public funds by making commercial use of the research findings and instruments. But the successes of the joint European Ariane project are showing us the way forward.

In order to compensate for the necessary financial restraints, we must embark more firmly along the road of cooperation. In so doing, we should look beyond the European Community and seek greater cooperation with the United States and Russia, too.

But the first concern so far as Russia is concerned is to secure the research capacities, experience, and know-how for the future. In return for wider-ranging cooperation, Germany and Europe could gain the experience of Russian research into space travel. In the months ahead we shall be putting out feelers to see what openings there

might be in this field. At the same time, of course, there should be no question mark over the hitherto successful cooperation in the European Space Agency (ESA).

It is not just the aviation and space industry, not just Berlin and Brandenburg or the other new laender, but the whole of Germany that is faced with enormous changes and the need for far-reaching adjustments.

About two and a half years ago, the Iron Curtain that divided our continent was rent in two. Now, after decades of oppression, our eastern European neighbors are looking for our help and support. For the sake of democracy and freedom—but also for the sake of trade and progress for mankind—we have to fully accept our responsibility there.

The collapse of communist tyranny makes integration in the European Community more important. Through the single European market we shall achieve economic and monetary union and also, step by step, complete the political union that is already in part a reality today.

The alarming news reaching us daily from Yugoslavia, and the impending constitutional crisis in Czechoslovakia, are a warning not to interpret European integration as centralization or bureaucratization. Europe's citizens do not want a rampant European bureaucracy, they do not want any new European taxes or regulations governing every conceivable aspect of their life and work.

As a convinced European I will therefore be doing all I can to keep unwarranted Eurocratic interference in its place and to limit the Commission's spending plans.

In times of drastic change, people become afraid of the future. For this reason, clear policy decisions need to be taken for our future to give the people a sense of direction.

Anyone taking decisions has to accept risks. That is something people in positions of responsibility in politics and in companies have to live with. But it is at least equally risky to make no decisions at all.

In a rapidly changing world, standing still in the end means going backwards. We must not—to take the Biblical example—bury our talents, but we must use them for the sake of our future and to make provision for our children and grandchildren.

We must have faith in progress and combat the fear of change. As the Spanish philosopher Ortega y Gasset said, progress is "not to destroy the past, but to preserve its essence, which has the power to create a better present."

We must be clear about the connection. Then we will be able to awaken additional creative powers and step by step achieve a better world. [passage omitted]

Increased French 1992 Space Budget Assessed

92BR0616 Paris LA LETTRE DU CNES in French Apr-Jun 92 p 2

[Text] France will allocate 10,730,090 million French francs [Fr] (all taxes included) to space activities for 1992. This budget represents an increase of 6.5 percent over the 1991 budget.

CNES [National Center for Space Studies] program authorizations amount to Fr7,790 million; ordinary expenses to Fr808.602 million, and equity capital to Fr2,131.488 million.

The 1992 budget is growing compared to 1991. This is due to:

- The continuation of the Ariane-5, Columbus, and Hermes programs;
- The continuation of the development of the DRTM [Data Relay and Technology Mission] and ERS-2 [Earth Remote Sensing] satellite programs decided in June 1990;
- The upgrading of the Guiana Space Center in line with the development of the Ariane-5;
- France's commitment to the POEM-1 [Polar Orbit European Mission] program in accordance with the development plan adopted during the Munich conference;
- The continuation of the SPOT-4 [Probational Earth Observation Satellite] program in line with the Helios program;
- The increase in scientific programs both on a European scale and in cooperation with the major space powers;
- The French-Soviet agreement concluded at the end of 1989 in relation to manned flights and, especially, the 1992 Antares flight;
- The continuation of activities carried out in the framework of the research and technology projects and the preparation of future programs in order to keep France at the forefront in the area of proposing and executing space programs.

The CNES budget can be broken down into five major categories:

Title I: Multilateral cooperation (European programs); Title II: Bilateral cooperation; Title III: National programs; Title IV: Technical program support; and Title V: General operating costs.

The changes in these five budget categories since 1990 (in current million francs) is illustrated below:

	1990	
Title I	3,641.000	40.09%
Title II	549.630	6.05%
Title III	2,432.550	26.79%
Title IV	1,373.498	15.13%
Title V	1,083.950	11.94%

1991		
Title I	4,246.00	42.94%
Title II	635.280	6.42%
Title III	2,275.840	23.02%
Title IV	1,570.332	15.88%
Title V	1,160.805	11.74%

1992		
Title I	4,725.000	45.35%
Title II	565.802	5.43%
Title III	2,320.300	22.27%
Title IV	1,597.784	15.33%
Title V	1,210.392	11.62%

Efforts are subdived as follows:

—Scientific activities (12.04 percent);

—Application programs (17.46 percent);

—Space transport and orbital infrastructure programs (46.37 percent);

—Activities in research and technology (3.91 percent);

—Technical resources of the CNES and its operation (20.21 percent).

[Box]

The national program covers two major areas:

—The SPOT satellites network and their operating systems;

—The research and technology program, which is a major instrument of preparation for the future.

Indeed, activities under the national program carried out during 1992 will contribute to the achievement of three main objectives:

- To improve competitiveness in the field of radiocommunications and to maintain technological advance in the field of earth observation;
- To continue efforts aimed at developing new orbital infrastructure applications (robotics, rendez-vous sensors, etc.);
- To acquire the basic techniques and research prospects linked to future launch facilities.

France Sets Up Agency for Space Cooperation With CIS

92BR0617 Paris LA LETTRE DU CNES in French Apr-Jun 92 p 9

[Text] On 13 February 1992, the CNES [National Center for Space Studies] announced the creation of a special organization to further the development of industrial exchanges in the space sector with the CIS.

The DERSI [Development of International Industrial Space Relations] is a 99 percent subsidiary of the CNES.

Its aim is to promote and facilitate industrial relations between the two countries by capitalizing on the former USSR's knowledge and experience in the space sector.

The activities of the DERSI include the exchange and dissemination of information; the establishment of contacts between manufacturers; and the organization of visits, seminars, and commercial fairs.

The DERSI opened an office in Moscow at the beginning of March. Its head office is at the CNES headquarters in Paris.

The manager of this subsidiary, Mrs. Helene Bourlakoff, is currently in charge of space cooperation with the CIS within the International Affairs Department of the CNES. At the end of a two-year trial period, the CNES will decide on the adaptations necessary for its future activities.

Germany's Riesenhuber Defends Manned Space Flight

92WS0618A Duesseldorf WIRTSCHAFTSWOCHE in German, 15 May 92 p 96

[Interview of FRG's Research Minister Riesenhuber by Uwe Dietz, WIRTSCHAFTSWOCHE]

[Text] "To drop out would be fatal." Research Minister Riesenhuber defends manned space flight.

Dietz: Minister, there is harsh criticism in the German research community regarding the scientific gains of the Flade flight to the Mir Station. Will you once again shell out 44 million German marks [DM] to send a German astronaut into space, only to let him return empty-handed?

Riesenhuber: As far as I know, the researchers who took part in the Mir project are completely satisfied with the course of their experiments. The exact data are at the present time still being evaluated. If one always immediately asks whether our involvement in space is already paying off in the short-term, there is a danger that long-term prospects will come off badly.

Dietz: The protagonists of space travel have been talking since forever about long-term prospects, also in connection with scientific investigations of weightlessness. Even the Russians, who have more experience in this field than any other nation, are meanwhile having an extremely hard time justifying the sense and aim of orbital research.

Riesenhuber: If we speak today about manned space travel we mean the construction of space stations, for which the collaboration of the humans on board is indispensible. To renounce our participation in these developments would mean for us giving up this scientifically and technically, but also strategically important

area of space travel. The future potential for application and development in this field cannot as yet even be assessed today.

Dietz: If the potential for use is not even calculable, how can you still argue for manned space travel?

Riesenhuber: To drop out would be fatal. There are ample negative examples of cases where we once dropped out of a technological discipline, and then could no longer get back into it. But I believe that with a 6 percent share of the budget of the Federal Minstry for Research and Technology going for manned space travel, as compared to 40 percent for pure research, a thoroughly defensible financial scale is being presented.

Dietz: All European projects, from the Hermes Orbital Taxi to the Columbus Space Lab, have already been realized in outstanding quality and on a considerably greater scale in Russia. They have been tested, proven, and are available to the West at give-away prices. What then is the point of the billions in investments which are going into the ESA plan?

Riesenhuber: It is true that through the inclusion of the relevant experience and capacities of Russian space travel, totally new opportunities will be offered to western European space travel. The programs which have been planned until now, especially those for orbital infrastructures and possiblities of manned transport, are presently being seriously examined against this background. Under no circumstances, however, can it be a question of renouncing the capacities which have been developed up to the present time, and which are the result of the industrial and political involvement of the member countries of the ESA, and renouncing as well the close transatlantic link, in order to replace them with Russian space travel.

Dietz: Even considering that manned space travel will be beyond our resources in this country?

Riesenhuber: Our goal must rather be to integrate the capacities and capabilities, which now should be understood as All-European, and together with the Russians to develop a long-term, All-European strategy. This does not exclude the possiblity of obtaining quite soon from the Russians in greater quantities individual space systems which have proven themselves.

Dietz: In spite of all the budget cuts you are still trying to develop competence in all fields of space travel. Would it not be more appropriate to limit yourself to economicaly lucrative fields such as satellite technology and telecommunications?

Riesenhuber: The shortage of funds in all the European member countries forces us to concentrate our space efforts on those fields in which, because of their long-term strategic importance, as well as their special technical and operational risks, and the large amount of necessary investments, public spending is called for. As soon as economically lucrative fields become apparent, however, it is up to economically oriented initiatives to provide the necessary investments. This was done with great success in the case of satellite communications. And 20 years ago scarcely anyone had expected this.

Dietz: Through their Space Exploration Initiative the Americans, in spite of budget cuts, want to put colonies on the moon and on Mars in the next 20 years. What kind of German involvement would there be in such future projects?

Riesenhuber: I see the priority as being not so much the man on the moon as rather a concentrated application of efficient space technology for the human being on earth.

Airbus Strategy, Technical Developments Viewed

92WS0618B Duesseldorf WIRTSCHAFTSWOCHE in German, 15 May 92 pp 74-81

[Text] In competition for shares of the market the Europoeans through top performance are increasingly taking over territory from the Americans.

Hartmut Mehdorn is an airplane enthusiast. The Managing Director of Deutsche Airbus GmbH in Hamburg loves these slender birds, especially if they are of his own construction. There is only one jet which he cannot put up with at all—the Jumbo Jet of his mighty American competitor, Boeing. "If they had no 747s today we would already be number one in the world," boasts the self-assured manager, who has succeeded in making Hamburg once again the site of major aircraft construction. In the district of Finkenwerder the A321, an elongated version of the successful A320, is assembled. In addition to this short-haul jet, two further Airbus planes are now in regular service—the large-capacity aircraft A300 and A310, for medium and long distances respectively.

The next to follow will be the A340, which is for extra-long-distance flights. The fifth member of the proud Airbus family will be the twin-jet large-capacity jet A330, which is already assembled and should start on its maiden flight in October. The A321, the first Airbus to be produced in Hamburg, is still a long way from being the end. The development of a true giant of the airways is already being thought about, which, with two floors, is expected to carry at least 600 passengers—50 percent more than Boeing's Jumbo Jet. And the management of Airbus also sees the possiblity of expansion towards a lesser scale. With the A319, a shortened version of the A320, in the beginning of May the development of an 120-seat regional jet was agreed upon, which will be assembled in Hamburg.

Behind this ambitious program lies the fact that the Airbus Consortium, which was founded in 1970, is laying claim to an ever larger share of the world market for aircraft. The only question is whether the Europeans have sufficient capital to cover the program. For the development of a completely new aircraft, costs of at least $2 billion must be planned for. And Airbus can no longer expect any significant tax revenues. Every subsidy

of this type brings the competition, and in their train the government in Washington, down on the plan (see p 78).

Airbus, to be sure, can be thoroughly satisfied with what has been achieved so far—with extensive government assistance. Between 1975 and 1991 the Europeans have been able to increase their share in the civilian jet aircraft market in the U.S. from 1 percent to a proud 30 percent. The share of Airbus in the world market was at 27 percent last year, while Boeing came to 64 percent. Also the consequences of the Gulf War, when managers through fear of assassination attempts for some months avoided flying on airlines, and the worsening economy, which has led to numerous cancellations of aircraft orders on a world-wide scale, have been coped with better by the Europeans than by the American manufacturers.

"In spite of all the grave uncertainties," Henri Martre, head of the French Aerospatiale Group, rejoices, "1991 was for us generally a positive year, where growth came primarily from civilian aircraft construction." The Aerospatiale Group holds 37.9 percent of Airbus shares—(Deutsche Airbus holds 37 percent, British Aerospace 20 percent, and Casa 6 percent).

The tone in which Martre customarily recites such facts is not completely free from verbal side-swipes at the competition on the other side of the Atlantic, long held to be superior. It is the tone of a challenger, who shows his muscles and weathers the odds. The aircraft builders of Toulouse, who presently are realizing 44 percent of their turnover volume of DM14.6 billion, converted, through the construction of Airbus components, in 1991 once again increased their expenditures for research and development by 300 million, to DM4.3 billion, in order to raise their technological fitness in the tough competition against the Americans.

In times when the balance can shift, any handicap of one's adversary can be just what is needed. He who, like the Americans, must continually sneak a glance at the quarterly results will easily become short-winded, and may then, even though sneeringly, still learn something from a newcomer. "In our profession," says Juergen Schrempp, president of the just three-year-old Deutsche Aerospace AG (DASA), "we must think in terms of long time spans."

The aircraft industry in any case is beginning to prepare for favorable prospects in the future. An Airbus expert's report assesses the worldwide demand for new pasenger aircraft in the next 20 years as amounting to 13,400 units. This would correspond to a calculated market value of about $770 billion. A similarly optimistic prognosis was submitted by Boeing at the end of March. "Of this volume," the German Airbus spokesman Theodor Benien hopefully claims, "we intend to find at least a 30 percent share on our order books."

In order to secure this quota for the long-term, the factors of economical operation, more efficient propulsion engineering, and less discharge of harmful substances have the highest priority in the performance specifications of the developers and designers of future generations of jets. In the technologies of materials, which are critical for operating costs, the Europeans have already been able to successfully focus their know-how, and to increase considerably the share of light metals, such as aluminium and titanium, as well as of fiber composite materials. Rudder units, landing flaps, and horizontal tail units of the more recent Airbus types are made up almost completely of these light high-tech materials. In the next stage of development even weight-bearing wing sections and segments of particularly sensitive fuselage will be produced with composite materials.

Further improvements of the electronic cockpit and of aerodynamics are also among the most important goals, and at the same time are arguments in favor of successful marketing. Aircraft which are optimized in these areas use less fuel, generate less exhaust fumes, and are also quieter. The engine manufacturers also make an important contribution here.

However the ever more demanding airlines are no longer satisfied with modifications in detail alone. In order to enhance the ecological balance sheet, they demand from the manufacturer reliable data on environmentally relevant maintenance and waste management. "Ecological themes are becoming increasingly important for purchasing decisions," Jost Schmidt, business manager of the MTU Motoren- und Turbinen-Union Muenchen GmbH, drums into his sales mamgers at every opportunity. It all seems to come down to a duel between Airbus and Boeing, since the U.S. manufacturer McDonnell Douglas Corp., which until now has been in number three position worldwide, has been increasingly losing in turnover and returns. The aircraft division of the aeronautics and space concern in St. Louis, which is involved in the production of several product parts, has gone into a spin as a result of persistent liquidity problems, and intends to receive life-saving financial injections from the Taiwan Aerospace Corp. Whether the planned liaison with the island Chinese will put the firm into high-altitude flight is more than doubtful, primarily because of political opposition in Washington.

The trouble at McDonnell Douglas lies in a new generation of aircraft which is technically not yet bid to strength, as well as in too small a variety of different aircraft types. Whether the bold plan, which was put forward a few weeks ago, of developing a completely new four-jet aircraft for more than 600 passengers, can be realized, is more than questionable. McDonnell would have to invest at least $5 billion, which it would have difficulty getting together. The large-capacity MD-11 jet, which went into production in 1990, is essentially only a further-developed version of the old DC-10.

Airbus on the other hand is offering aircraft of completely new construction. However Boeing is also not asleep. At the present time the Americans are developing the B777 twin-engine long-haul jet. They have furthermore even brought Japanese firms into the project. This airplane is due to make its first flight in 1994. But the

Europeans don't allow themselves to be frightened by this. They are self-assuredly chalking up a real technical lead over their competitors.

The prime example is the cockpit of the A320. When the plane was introduced four years ago it was the first in which the fly-by-wire principle was realized. The pilots no longer operate the units of the aircraft, such as thrust, landing flaps, as well as the elevators and vertical rudders, through hydraulic systems, but with the help of data lines (wire). The commands are carried in digital code to receivers, are interpreted there, and then implemented by motor operators. These planes are steered with a type of joy stick. All flight-relevant data appear on high-resolution color monitors. On-board computers, which reciprocally check themselves, analyze every flight command of the pilot. In the case of misactions the computer refuses to transmit the command to the appropriate motor operators—as, for example, if such a tight curve were to be flown that the A320 would become unstable. If, however, pilots set down beside the runway, begin their landing approaches too early and plow into a mountainside, or in extremely low flight collide with trees, this would be too much for the technology as developed so far. For the Airbus developers there still remains much to do.

The three crash-landings of the jet with the electronic cockpit in India and France have scarcely tarnished its image. "This has had no effect on the order books," Horst Schmidt-Bischofshausen, the chief manager for innovation at MBB, one of the suppliers of Airbus, points out. The new Airbus types will also be flown by wire. Already at the end of this year the first A340s are to be delivered. Since these jets can remain in the air up to 17 hours, during extremely long-distance flights two cockpit and also two cabin crews must be on board. Part of the crew have the opportunity to refesh themselves in recreation rooms.

The prize bird of the Europeans is the first aircraft in the world which will be partly assembled through a giant robot facility. For the present time the robot is capable of affixing by itself with titanium rivets a complete wing, as delivered. The A330, which is of almost the same construction, will also be assembled with robot assistance.

From the automation experience which is collected in the huge Clement-Ader Hall at the edge of the Toulouse Airport the people in Hamburg also should profit. Correspondingly smaller versions of the wing robot will be used for the assembly of the short- and medium-haul A321 jets, which begins in June. Delivery of the first plane is scheduled for January 1994. After that up to five aircraft of this type are to be turned out per month. As of now a total of 140 orders are on hand. "The German Airbus," a speaker of the Federal Association of the German Aircraft and Space Equipment Industry rejoices, "is revving up."

DASA's Plans for Regional Airliners Discussed

92WS0618C Duesseldorf WIRTSCHAFTSWOCHE in German, 15 May 92 pp 81-84

[Article by Andreas Beuthner and Wieland Schmitz]

[Text] With newly constructed planes direct connections inside of Europe are becoming more convenient.

The seaports of Hamburg and Marseilles are separated from each other by all of 1,400 km. Managers from the city on the Elbe, however, can't even consider a one day's visit to the city on the Mediterranean. There is only one time-consuming connection by way of Munich without any possibility of a return flight on the same day.

Businessmen travelling between Cologne/Bonn and Ankara, or between Munich and St. Petersburg, fare just as badly. Direct connections are lacking between industrial regions which are away from the country's central urban agglomerations. But regional airlines and also the large airlines are about to close these gaps. For this purpose they need fast, comfortable jets, which are smaller and more economical than the usual planes in service.

The market researchers of the Daimler subsidiary, Deutsche Aerospace AG (DASA), have discovered that planes with capacities of between 70 and 100 seats are in particularly growing demand. This demand, according to DASA's plans, is to be met in the second half of this decade by an aircraft which bears the project designation of Regioliner, but which has a crucial disadvantage—no one knows who will assume the development costs, which will easily amount to DM2 billion.

However the ambitious president of DASA, Juergen Schrempp, has resolved to obtain the system leadership for a larger passenger jet. The fact that in this field "no one has so far really deserved this," as he himself admits, doesn't scare him. Until now only the Dutch Fokker group has offered such an aircraft—the thoroughly successful F 100. A short time ago Canadair Group, which belongs to Bombardier Inc., also put a jet of this type on the market. And this company has already made the move to Europe. The Canadair regional jet with the serial number 7003 is painted with the colors of the recently founded Lufthansa Cityline (previously DLT).

Even thuogh Richard R. Albrecht, Vice-President of the Boeing Corporation, is doubtful "whether such jets can ever be operated profitably," DASA Vice-President Johann Schaeffler prefers to rely on his own market assessments. "We expect the world-wide demand for jets of this type to be at 2,400 units by the year 2000," said officials of the DASA board of directors in charge of aircraft construction. The experts expect a huge market volume of $3.2 billion per year in this sector.

This also tempts manufacturers of turbo-jets. BMW Rolls-Royce GmbH in Oberursel, as well as the DASA subsidiary MTU Motoren- und Turbinen-Union GmbH in Munich, who have gotten together with the American

Pratt & Whitney for this purpose, intend to develop engines for future regional aircraft. Since both are afraid of the high costs, however, and Bonn has already given the signal that it would give support funds—if at all—only to a project, BMW and MTU had already had talks for the purpose of a joint development of turbo-jets. However the talks were recently—for the time being—broken off without having had any results, because at the present time neither of the two wants to give up its claims to the leadership of the system. "They are thinking over our offer now at their leisure," DASA spokesman Detmar Grosse-Leege conjectured.

In order to minimize the risks of their Regioliner, DASA invited the French Aerospatiale and the Italian Alenia, (who in the ATR consortium are cooperatively building propeller-driven aircraft with 40 to 80 seats), to participate in the project company, Regionalplane GmbH, each with a 25 percent ownership.

However when something will come out of this is, in the meantime, more open to question than ever. Unexpectedly two months ago Schrempp reopened negotiations with the Dutch aircraft builder Fokker NV, with which he had, without result, discussed closer cooperation a full year before. The proud Dutch have only now become ready for compromise, because they lack the money for new projects. If it comes to the majority takeover of the 3.4 billion German mark [DM] company, which DASA is pushing for, the Regioliner, which originally was supposed to be put on the market in 1996, will be postponed for years. It could then become the modern successor of the Fokker 100.

In addition to this the Dutch are bringing into the marriage the project of a Fokker 100 which is scaled down to 70 seats, of another which is lengthened to 130 seats, a project for an extended 60-seat version of the long ago proven Fokker 50, and—of incalculable value for Schrempp—a worldwide sales and service network. Problems with DASA's cooperating partners Aerospatiale and Alenia are programmmed, however, since not only must the French jealously look on while they are being outstripped by the DASA-Fokker combine, but with its Fokker 50 the new group will also come into direct competition with the 42- and 72-seat ATR aircraft.

Competition is also coming from another quarter—from Airbus Industrie. After the company management in Toulouse, headed by Heribert Flossdorff, who is in charge of sales, had pushed for months for the development of the A319, a shortened version of the A320 with 120 seats, a decision was recently made in favor of the Mini-Airbus. A jet of this type, Flossodrff repeatedly urged, could be produced for a total of $500 million, which is exactly 40 percent of the costs which Dasa must reckon with.

Schrempp's plans gain added force, since DASA as well as its planned partners in France and Italy also act as suppliers for all Airbus types.

The DASA subsidiary Dornier Luftfahrt GmbH in Oberpfaffenhofen, near Munich, calmly looks on at this wrangling. Its newly developed Do 328 is markedly smaller than the A319, the Fokker 100, and the Regioliner, and therefore presents no competition in this sector. The first two models of this turboprop plane are now undergoing flight tests, and the third will shortly make its first flight. And while DASA president Schrempp is still looking for the first customers for his planned regional jet, Dornier proudly points to 45 firm orders and 28 options. And, taking a side-swipe at their unpopular parent company, DASA, the people in Oberpfaffenhofen, who also have been building the 20-seat Do 228 for years, triumphantly conclude: "Dornier is the only German company which has retained the capability to develop, produce, and market complete passenger aircraft."

The Do 328 accomodates 30 to 33 passengers. With a speed of 640 km/hr this turboprop plane comes very close to the speed of jet aircraft, which fly at a maximum of 900 km/hr. The cabin offers the same comfort as do large passenger aircraft. The already satisfactory comfort of today's regional planes, such as is offered by the Brazilian Embraer, the French ATR, and the Fokker 50, is even surpassed. The Dornier engineers have also understood how to reduce drastically the noise level in the cabin, which in propeller-driven planes is traditionally fairly high. For this purpose, among other measures, they have placed the engines unusually far from the fuselage. The fast propellers, in turn, are veritable giants, with a diameter of 3.50 m. The cockpit can stand comparison with that of the most modern Airbus. Instead of using countless mechanical instruments, the pilot is provided with all the necessary data with computer assistance by way of high-resolution screens.

Like the Airbus, the aircraft is built by a number of firms which are geographically widely separated. The British Westland Aerostructures manufactures the engine pods, and the South Korean Daewoo Heavy Industries manufactures the fuselage shells. From these and from cockpit shells of its own manufacture, the Italian Aermacchi assembles the complete fuselage, which is then hauled by truck to Oberpfaffenhofen. Dornier is in charge of the wings, the final assembly, and the flight tests. Authorization of the model is expected for the beginning of 1993.

Deutsche Airbus's Plans, Profits, Subsidy Concerns

92WS0622A Duesseldorf HANDELSBLATT in German, 10 Jun 92 p 23

[Text] Hartmut Mehdorn, Chairman of the Board of Deutsche Airbus GmbH, Hamburg, sees the world aircraft industry this year as being in an interim depression, triggered by the Gulf War and the problems of low profits of the airlines. This has led to the cancellation of 38 aircraft at Airbus in the last few months. Consequently, according to Mehdorn, Airbus plans to turn out

only 161 aircraft in 1992, as compared to 170 in the previous year. Nonetheless Mehdorn is confident of raising the production level to 230 planes a year by 1995, in other words one aircraft per working day.

The problems which have stalked Deutsche Airbus during this year can be summarized with the catchwords "Jaeger 90," GATT, dollar-dependency, and the structural changes in the airlines which are leading to increasingly fewer businesses with stronger control of demand.

The abandonment of the Jaeger 90, Mehdorn stressed, would have grave consequences for Deutsche Airbus. Of the 14 factories of the Airbus holding Deutsche Aerospace AG (DASA), Munich, 10 of which are Airbus factories, with the discontinuation of the Jaeger 90 "at least two" are superfluous, and will have to be closed completely. In addition to this, Airbus will have to transfer further operations from its factories to southern Germany, in order to help reduce losses at DASA. Already with the integration of the southern German factories at Laupheim, Speyer, and Munich, which have taken place in 1991, the company has transferred at least 700,000 man-hours of work from its own factories, as well as 100,000 man-hours of suppliers, to southern Germany.

The negotiations at GATT over subsidy practices in the airline industry could end in the German abandonment of rate of exchange guarantees, Mehdorn states. According to the original agreement between Bonn and Daimler-Benz AG, the parent company of Airbus, compensation for losses caused by the exchange rate was provided for by the association at a dollar exchange rate of between DM1.80 and DM1.60. From this Airbus received DM380 million, last time in 1991. In the future Airbus wishes to cover the risks of the exchange rate to a large degree itself through exchange-rate-safe future transactions, this having already been initiated in 1991. In 1991 on account of the good back-log of orders, proportional guarantees, until 1995, at an exchange rate of DM1.78 could be made. Nonetheless on account of the discontinuation of rate of exchange guarantees the reserves against imminent losses must be evaluated once again. These reserves are still the "Achilles heel" of Deutsche Airbus GmbH, finance chief Gerard Blanc emphasized. Of the DM4.1 (3.4) billion of reserves over 80 percent are allotted to the Airbus Program.

Deutsche Airbus is receiving no further subsidies, Mehdorn affirmed, if one doesn't take into account the assistance for research and development, which in fact must be repaid. With DM682 million in development payments in 1991, the company used only DM93 million of its own resources.

In the financial year of 1991 after prolonged hard times the breakthrough for civilian aircraft construction has been achieved—Mehdorn is certain of this. With an increase in turnover of 18.3 percent to DM5.1 (4.3) billion, the company realized through good management a yearly surplus of DM421 million, as opposed to the deficit of DM376 million of the previous year. The entire amount will go into company capital. The balance of losses from the year 1990 will thereby be reduced from DM1.69 billion to DM1.27 billion. The original company capital of DM1.95 billion is thereby restored to the extent of 35.1 percent. Mehdorn's aim is to achieve profits also in the coming years—even though 1992 will not be on the level of the previous year—and to replenish the company capital by 1995-96

The positive result in Mehdorn's view was essentially caused by increased deliveries of the large-scale construction parts for the various Airbus programs and of the Fokker program, by economy measures for the improvement of the cost structure, and by improving production efficiency. Of the DM452 million in total investments, DM111 million were allotted to the acquisition of the three southern German factories, and DM119 million to the improvement of production efficiency.

Other factors affecting the "gratifying" year's closing were the positive financial result of DM15.5 million. In addition to this, improved results of the marketing consortium supporting Airbus Industrie, from which about DM150 million went to Deutsche Airbus, had its effect.

Of the turnover which was realized in 1991 with 21,990 workers, 80 percent is being allotted to the Airbus Program, 10 percent to the construction of regional aircraft, and 5 percent each to aircraft maintenance and to the production of defense technology. Orders in hand amount to 929 aircraft with a value of about DM18 billion.

In Hamburg in a few days the final assembly of the first A321 will begin. Mehdorn is also placing his hopes on the A319. With 124 passengers this would be the smallest plane of the Airbus family. Its marketing possibilities are presently being tested. Its final assembly would take place in Hamburg, and it would utilize the final assembly line of the A321 still more fully.

British Aerospace's New Regional Jets

92WS0622B Duesseldorf HANDELSBLATT in German, 10 Jun 92 p 23

[Text] British Aerospace Plc (BAe) has formally presented a new family of regional aircraft with 70 to 115 seats. The jets belonging to the new family are in fact modernized versions of the exisitng Model 146 according to the announcement of the company in London. However since the beginning of production in 1983 they have been so extensively modified that they could be called a new introduction. The demand for regional jets of this size up to the turn of the century could be expected to amount to 1,700 aircraft with a total value of $30 billion according to the company announcement.

The first of the new four-jet regional aircraft are supposed to be put into service by the Swiss Crossair in March 1992. The company already has orders and options for 56 aircraft. BAe guaranteed that the jets of the new family cost no more than the two-jet Fokker 100. The BAe jets are to powered by Textron Lycoming LF507 engines.

The chief competitor of British Aerospace in this market is the Dutch Fokker.

BIOTECHOLOGY

France Adopts Genetic Engineering Legislation

92WS0614C Paris AFP SCIENCES in French 27 May 92 p 22

[Unattributed article: "Bill on Biotechnologies and Genetic Engineering Passed"]

[Text] Paris—On 25 May, the National Assembly passed the bill on genetically altered organisms which is designed to regulate biotechnological research while protecting the environment and public health, and ensuring that the people are kept informed. The socialists were the only group to vote for the bill, which writes the content of two European guidelines into French law. The other groups abstained.

Genetically altered organisms (OGM) obtained by introducing certain genes into natural organisms are used, among other things, to produce vaccines, bacteria for the agrifood business, vegetables with new characteristics enabling them to withstand difficult climates or to resist certain viruses or herbicides.

The new way paved by research leads to large markets in the medical, pharmaceutical, and agrifood sectors. But it also opens the door to certain risks, such as the appearance of new viruses, or an increasing agricultural imbalance between developed countries and countries that do not use biotechnologies.

Sponsored by the minister of environment, Mrs. Segolene Royal, and by the minister of research and space, Mr. Hubert Curien, the bill is the first, according to Mr. Curien, that introduces "administrative control at the heart of research," since research on genetically altered organisms will now be subject to approval, and since the introduction of these new products on the market will require a special authorization. Researchers will also have to comply with various safety measures designed to protect the environment.

Wishing to guarantee the people's right to be informed, the deputies passed an amendment stating that the application for approval will be subject to a public inquiry whenever it covers the initial use of a genetically altered organism presenting health or environmental risks. Also, the Dissemination Study Commission, a consulting body, will include members of parliament and members of environmental protection associations, in addition to researchers.

Mr. Axel Kahn, president of the biomolecular engineering commission, was "furious" that the amendment passed; he said that this was a "very dangerous" prerequisite "that may have economic consequences for Europe and France, especially at a time when the Americans and Japanese are investing billions of dollars in activities of this type."

"These techniques are safe, 'green,' far more so than chemistry or nuclear technology," Mr. Kahn added. "They are far better controlled than anything else. In my opinion—and I am not the only one to think so, as I saw once again in the United States, from where I just came back—this is currently the safest of man's activities. If developed countries, and Europe and France—which have expertise in these biotechnologies—do not use them, they may be used elsewhere, where there will be no control.

For Mr. Kahn, the position taken by the deputies is the result of "an outmoded ideological notion that believes it is opposing what is good, according to Rousseau's concept, to what is evil, which it equates with what is modern."

COMPUTERS

ESPRIT Project Develops Advanced Test and Simulation Software

92BR0556 Amsterdam COMPUTABLE in Dutch 5 Jun 92 p 16

[Text] According to the Amsterdam Center for Mathematics and Computer Sciences (CWI), there is an urgent need to develop tools which can assess the quality of new database management systems (DBMS) at an early stage. The Pythagoras project, which is part of the EC's ESPRIT [European Strategic Program for Research and Development in Information Technologies] program, aims at achieving this goal. The project will take three years and has a budget of ECU4 million, half of which is contributed by the EC. The CWI is project leader; the other participants in Pythagoras are the multinationals ICL [International Computers Limited] and Bull, the British Heriot-Watt University, the CCIP, Infosys, the French IFATEC [Institute for Training in Advanced Technologies], and the German ECRE [European Computer Research Center]. One of the principal goals of the Pythagoras project is to develop a software test pilot which could virtually replace a human being in determining a system's reliability and quality. Simulation models for DBMS's based on parallel systems are also being developed. Pythagoras is a follow-up program to the previous PRISMA [Parallel Inference and Storage Machine], TROPICS [Transparent Object-Oriented Parallel Information Computing System], and EDS projects, in which the CWI also participated.

High-Speed Computer Network Formed in Netherlands

92WS0661R Edam SUPERCOMPUTER EUROPEAN WATCH in English May 92 pp 10-11

[Article: "A High-Speed Network in the Netherlands"]

[Text] The Dutch National Computing Facilities Foundation will subsidize a 34 Mbit/s network facility between the Technical University of Delft and the Dutch national supercomputer facility at SARA in Amsterdam.

The Dutch National Computing Facilities Foundation (NCF) and the Technical University of Delft will collaborate in a project of distributed computing and visualization. NCF will subsidize a network facility between Delft and the Dutch national supercomputer facility at SARA in Amsterdam. The money is being provided by NWO, the Dutch research organization.

The NCF aims at providing the Dutch scientific scene with advanced computer facilities, which are too expensive for one institution, faculty or group.

The Dutch national supercomputer is a Cray Y-MP 4/464, located in Amsterdam. Some very specific needs, such as Delft's interest in interactive visualization, could not be accommodated on it (due to network problems). Such work requires enormous quantities of data transfer between the Cray and the local facility, a Convex C3820 (with a connected Gbit/s network). Hence, the new network, operated by the Dutch Research networking organization, SURFnet, an experiment whose goals are:

—to gain experience with software for distributed computing;

—provide Delft researchers with a fast access to the Cray at SARA (and provide fast access to the Delft facilities as well);

—to gain experience with high-speed, long-distance networking, this will be of importance to further enhancement of the national network;

—cost effective through resource sharing.

"This sets a significant step towards a real distributed computing environment on a national scale."

NCF's manager, Patrick Aerts, commented that "this project with Technical University Delft and SURFnet, which encompasses the 34 Mbit/s trunk to the national supercomputer sets a significant step towards a real distributed computing environment on a national scale. We will learn from the experiment and eventually not only the computational scientist, but all SURFnet users will benefit from the investment." He admits that Europe is lagging behind the U.S. when networking is concerned. He thinks, however, that the demand is here more focused at a national scale, not so often across the continent as is the case in America.

France: Computer Industry's 1991 Performance Presented

Leading Companies Ranked

92WS0666A Paris INDUSTRIES ET TECHNIQUES in French 5 Jun 92 pp 35-36, 39-40, 42

[Unattributed article: "The 200 Actors Who Count: The 1991 Annual Report of Industrial Data Processing in France"; first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] In France, the 1991 sales ranking for industrial data processing [DP] retains its three leaders from 1990. After them, many changes appear.

To be exact, there are 202 of them and they take in, in France, 14.3 billion French francs [Fr] in sales. They are the manufacturers of automation hardware, engineers, computer engineering service companies [SSII], software publishers, or distributors.

Among the 200 "actors who count," two heavyweights exceed Fr1 billion: the Schneider group—with Telemecanique and its subsidiaries, plus Merlin-Gerin—and Alcatel-Alsthom—with Genelec. Following them, there are 33 companies who count somewhat more than the others: Those that are above the symbolic Fr100 million bar.

For the leaders in this ranking, industrial DP sales must be considered as educated estimates; in large groups with multiple activities, it is very difficult to obtain very precise figures concerning activity in this sector.

Thus, Telemecanique, which claimed Fr2,500 million last year, revised its balance for the sector to Fr1,543 million, more in line with reality (the figure announced for 1989 was Fr1,100 million). After all is said and done, it is still number 1 in our ranking, even though it was very close. In fact, Cegelec, in an opposite move, and for obscure reasons, would only reveal its sales (Fr2,750 million) for all its automation activities—in the service sector (53 percent) and in industry (47 percent). This covers a field much broader than mere industrial DP. Thus we took the same boundaries as in 1990—industrial automation—which yields a result of Fr1,293 million, and leaves the Alcatel-Alsthom subsidiary in second place behind the Schneider subsidiary.

Cap-Sesa, still the leading SSII in the sector, by far, reports a figure absolutely identical to that of last year and holds firmly to its third place.

The situation is worse for the number one software publisher, Computervision. Prime, of which Computervision is only a department, is going through a very difficult period. CAD/CAM business is no exception. With an 11 percent drop in sales—"due basically to reduced hardware sales," the manufacturer hurries to explain—Computervision moves down one notch to the advantage of Siemens which, for its part, booked a 26 percent increase.

Nevertheless, Computervision continues to outstrip the other representatives of the "software publishers" family. The second, Intergraph, ranks only 17, and the third, Dassault Systemes, is number 22. These figures must however be taken with a grain of salt. They refer to sales in France alone and, specifically, they include sales of hardware and service. Referring to page 49 where the publishers are ranked by sales of software only, it is obvious that the hierarchy is quite different.

Also among the revised estimates is that of L'Entreprise Industrielle. This ?ingenieriste booked no more than 3 percent of its sales in industrial DP, compared to 7 percent last year. With Fr160 million, it thus moves from number 8 to 24. For its part, Clemessy moved in the opposite direction: In 1991, industrial automation accounted for 16 percent of its sales, compared to 12 percent the year before. With the help of 26 percent growth, it jumped up five notches.

As for CGI, its jump is much easier to explain. In 1991, this SSII bought Prodstar, a specialist in CAPM [computer-aided production management] software on mini-systems (for its part, it is ranked number 59). Already strong with Production Systemes (another large supplier of CAPM software packages), CGI has become a heavyweight in production management and, consequently, in industrial DP. It thus found itself propelled to number 12 in the general ranking and number 3 among SSIIs.

The movement toward concentration in CAPM has been accompanied by two major technical evolutions: A shift, already underway, from CAPM packages to the UNIX operating system; and the arrival of "expanded CAPM," i.e., an extension of the functions of software to include commercial management, logistics, etc. According to Pierre Audoin Conseil, this two-fold movement could impact the leadership of companies such as IBM, GSI, and CGI to the advantage of publishers from the management sector: The German Sap, and the Americans Dun & Bradstreet and Cincom Systems. Stay tuned...

Euriware made a brilliant entrance among the top 10 and is the number 2 SSII, behind Cap Sesa. For those who were not aware of it, this newcomer is none other than a reincarnation of Esia, the industrial DP subsidiary of SGN. The CEA offshoot has grouped all its DP subsidiaries: Esia, Graphael (which consequently has disappeared from the ranking), and Eurilor into one organization. Since then, a new company, Intellitic, has also come into the fray. A Euriware subsidiary, it markets an object database management system, partially resulting from the work of Graphael.

For Itmi, the name has not changed, but the movement is the same. In this case, it is within the Cap Sogeti group and the "new Itmi" is becoming the Cap group's focus for "advanced production engineering technology." It incorporates the old Itmi, Aptor, and Apsis (which has disappeared as such, and thus no longer appears in the ranking). Aptor, a specialist in industrial LANs, has retained its name and it is number 86 in the ranking. It is a good bet that Itmi will not remain in 32nd place forever. All indications are that it will continue to grow, by acquisition or digestion of other production engineering entities of the group.

The cases of Euriware and Itmi are not unusual in the SSII sector. During the four years that INDUSTRIES ET TECHNIQUES has been making this ranking, the leitmotif has been: "SSII, concentration." This concentration translates into the swallowing up of specialized companies by the large generalist SSIIs. The INDUSTRIES ET TECHNIQUES ranking of SSIIs active in industrial DP is, from this point of view, significant; due to purchases and regroupings, there is no longer a single specialized company at the top of this hit parade, but rather the major consulting firms: Cap Sesa, CGI, Steria, Sligos (numbers 1, 8, 14, and 2, respectively, among French SSIIs), or subsidiaries of large groups: Euriware, Dataid, Alcatel TITN Answare, Syseca (from SGN, AT&T, Alcatel, and Thomson, respectively).

These regroupings, reorganizations, and buyouts respond to three major motifs: first, integration of services, because industrial DP no longer considers itself independent from the rest of the DP in the industry; next, the desire to implement a more global marketing process; and, finally, in their markets the SSIIs now favor an approach based on the sector of activity rather than the type of service.

Nevertheless, the huge appetite of the large SSIIs for production engineering may seem disconcerting due to the fact that industrial DP is known to be a limited market, highly competitive, and difficult because it is extremely technical, and much less profitable than the areas where these SSIIs usually prosper. According to Pierre Audoin Conseil, the explanation is simple: Industrial DP is essential to succeeding in the industrial market, which is in turn essential to becoming a major power in the service sector. It should be remembered that industry is the primary market for DP, representing 30 percent of the opportunities.

The 200 Actors Who Count

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
1	TELEMECANIQUE (Schneider)	M	1543	10	36	Automatic devices
2	CEGELEC (Alcatel Alsthom—estimate)	E	1293	30	12	Automatic devices
3	CAP SESA	S	900	0	23	nr

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
4	SIEMENS SA	M	834	26	38	Automatic devices
5	COMPUTERVISION	P	608	-11	88	CAD/CAM
6	CTIE (Compagnie generale des eaux)	E	600	20	12	Automatic devices
7	CLEMESSY	E	383	26	16	Automatic devices
8	APRIL (Telemecanique)	M	350	nr	97	Automatic devices
9	EURIWARE (SGN)	S	321	15	100	Automatic devices
10	NUM SA (Telemecanique)	M	302	-6	100	Automatic devices
11	OCE GRAPHICS (Oce—sales estimated)	M	300	nr	100	CAD/CAM
12	CGI INFORMATIQUE	S	273	46	21	CAPM
13	XEROX ENGINEERING SYSTEMS (Xerox)	M	270	8	100	CAD/CAM
14	STERIA	S	250	27	28	Automatic devices
15	SLIGOS (Credit Lyonnais)	S	245	23	8	Automatic devices
16	DATAID	S	245	11	36	CAD/CAM
17	INTERGRAPH FRANCE	P	233	11	100	CAD/CAM
18	ALCATEL TITN ANSWARE (Alacatel)	S	230	10	30	Automatic devices
19	ALLEN-BRADLEY (Rockwell)	M	198	-1	100	Automatic devices
20	MATRA DATAVISION (Matra)	P	185	14	100	CAD/CAM
21	SYSECA (Thomson-CSF)	S	183	12	14	Automatic devices
22	DASSAULT SYSTEMES (Dassault Aviation)	P	174	32	100	CAD/CAM
23	MENTOR GRAPHICS	P	163	-7	100	CAD/CAM
24	L'ENTREPRISE INDUSTRIELLE	E	160	7	3	Automatic devices
25	HONEYWELL	M	160	-13	22	Automatic devices
26	COMELOG	S	160	3	46	CAPM
27	TEKELEC AIRTRONIC	D	155	3	12	Automatic devices
28	ISTC	D	154	12	100	CAD/CAM
29	SOLERI-CIGEL	S	150	25	44	CAPM
30	MERLIN GERIN (Schneider)	E	150	nr	2	Automatic devices
31	FOXBORO	M	143	-16	89	Automatic devices
32	ITMI (Cap Sogeti)	S	130	132	100	CAPM
33	SAUNIER DUVAL ELEC. (Cie gen. des eaux)	E	128	97	5	Automatic devices
34	CISIGRAPH	P	111	nr	100	CAD/CAM

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
35	FORCLUM (Fougerolle)	E	100	33	6	Other
36	SNEF ELECTRIC FLUX (Lyonnaise des eaux)	E	90	13	7	Automatic devices
37	MABE UNIC (Unic Technologies)	D	90	50	69	CAD/CAM
38	EDS INTERN. FRANCE (General Motors)	P	87	21	nr	CAD/CAM
39	COURBON	E	86	0	70	Automatic devices
40	SINFOR	S	85	6	87	Automatic devices
41	ARM (group)	S	85	35	23	Automatic devices
42	IBS FRANCE	S	74	-5	80	CAPM
43	SEI	S	70	40	70	CAPM
44	SAFAIR TECHNOLOGIE (Open Technologie)	P	70	75	100	CAD/CAM
45	SOTEB	E	65	8	54	Automatic devices
46	GTME (GTME Entrepose)	E	61	24	3	Automatic devices
47	GROUPE SILICOMP	M	61	42	97	Other
48	SA SYDEL	E	60	2	100	Automatic devices
49	AUTODESK	P	60	0	100	CAD/CAM
50	GSI INDUSTRIE (GSI)	S	59	9	100	CAPM
51	SCHLUMBERGER GFAO	P	56	2	100	CAD/CAM
52	RENAULT AUTOMATION	E	55	nr	5	CAD/CAM
53	FRAMASOFT+CSI (Framatome)	P	54	93	100	Other
54	CISI INGENIERIE (Cisi)	S	54	4	13	CAD/CAM
55	AEG MODICON AUTOMATION	M	52	13	100	Automatic devices
56	GE FANUC AUTOMATION	M	52	4	40	Automatic devices
57	SDRC	P	51	38	100	CAD/CAM
58	CAD SERVICE (Decobecq)	P	51	2	100	CAD/CAM
59	PRODSTAR (CGI)	P	50	11	71	CAPM
60	PHILIPS AUTOMATISATION IND. (Philips)	M	50	0	10	Other
61	PRODUCTION SYSTEMES (CGI)	P	47	31	100	CAPM
62	INTERELEC (Groupelec)	D	46	5	92	Automatic devices
63	SOFRESID	E	45	-10	6	Automatic devices
64	KONTRON ELEKTRONIK (BMW)	M	45	88	63	Automatic devices
65	FACTORY SYSTEMS	D	43	54	100	Automatic devices

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
66	MISSLER INFORMATIQUE	P	39	22	100	Automatic devices
67	ACQUITAINE SYSTEMES (Corelis)	S	39	11	100	Other
68	REAL TIME SOLUTIONS	D	38	23	100	Other
69	ANGALIS	D	38	-5	29	CAD/CAM
70	ACCESS PRODUCTIQUE	S	38	0	100	CAD/CAM
71	ROSEMONT (Emerson)	M	35	25	16	Automatic devices
72	RACAL REDAC	P	35	9	92	CAD/CAM
73	ODS EUROPE (ITM/Gardy)	P	35	nr	85	CAPM
74	ECRIN AUTOMATISMES	D	35	-15	100	nr
75	KLOECKNER-MOELLER SA	M	35	0	11	Automatic devices
76	DAZIX FRANCE (Intergraph)	P	33	nr	100	CAD/CAM
77	SII	S	32	7	52	Automatic devices
78	ADL AUTOMATION (ADL Industrie)	E	32	45	40	Automatic devices
79	CDF PRODUCTIQUE (RDC)	D	31	35	100	CAD/CAM
80	SPRING	S	30	15	100	CAD/CAM
81	SOCETEC (Sofresid)	E	30	25	21	Automatic devices
82	SEREA (Sofigep)	E	30	0	83	Automatic devices
83	Cie GEN. DE PRODUCTIQUE (GEC-Alsthom)	E	30	-25	14	Automatic devices
84	SAPEX	P	29	-6	94	CAD/CAM
85	BERTIN ET Cie	E	29	32	7	Other
86	APTOR SA (Itmi)	M	28	4	88	Automatic devices
87	MICROPROCESS	M	27	-10	90	Automatic devices
88	EFISYSTEMES (L'electricfil)	M	26	-19	87	Automatic devices
89	SYSPRO SA (Seva)	E	24	-4	81	Automatic devices
90	MAPP	S	25	4	100	CAD/CAM
91	CR2A (CGI)	S	25	25	11	Other
92	ADVANCED GRAPHICS SYSTEMS (Aerni)	P	25	14	100	CAD/CAM
93	TELESYSTEMES (France Telecom)	S	22	120	2	CAPM
94	DCA (CDME)	D	22	10	100	Automatic devices
95	ADCIM	S	22	100	100	CAD/CAM
96	SEIC	E	21	-22	100	Automatic devices
97	PEC ENGINEERING (Pavix Holding)	S	21	11	66	CAD/CAM

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
98	DELTA TECHNOLOGY GROUP	S	21	-5	100	Automatic devices
99	COMPEX	M	21	-36	91	Automatic devices
100	YREL (MB Electronique)	D	20	11	11	Other
101	OPEN TECHNOLOGY (Open)	E	20	nr	32	CAD/CAM
102	IGE SA	P	19	90	100	CAD/CAM
103	UNIRAS SARL	P	18	6	100	Other
104	SINORG (Caisse des depots et consign.)	P	18	nr	6	Other
105	SANA	E	18	-18	13	Automatic devices
106	REGMA TELL	P	17	6	100	CAD/CAM
107	CN INDUSTRIES-TELL (Regman/Unic)	P	17	6	89	CAD/CAM
108	CEFI TECHNOLOGIES	D	17	55	100	CAD/CAM
109	LE TULLE PRODUCTIQUE SA	P	16	167	100	CAD/CAM
110	EMC	P	16	-16	100	Other
111	ABVENT SA	P	16	33	100	CAD/CAM
112	XAO INDUSTRIE	P	16	6	100	CAD/CAM
113	VALMER	P	15	88	88	Other
114	SFERCA	P	15	0	79	Automatic devices
115	PROSYST	P	15	36	100	Automatic devices
116	MARBEN	S	15	200	4	Automatic devices
117	PROGRETIC	E	14	27	93	Automatic devices
118	INSTRUMENTATION SERVICE (GTIE)	E	14	27	19	Automatic devices
119	ICGA SA (Sonepar)	M	14	75	93	Automatic devices
120	ACTION INSTRU-MENTS FRANCE	M	14	8	88	Automatic devices
121	SORMEL (Matra)	E	13	-66	100	Automatic devices
122	SERETE PRODUC-TIQUE (Serete)	E	12	-20	24	Automatic devices
123	DECAD	P	12	-8	100	CAD/CAM
124	CODRA	S	12	20	100	Automatic devices
125	ALISA	D	11	10	100	CAPM/Automatic devices
126	MII	M	10	25	100	Other
127	HUMELEC INFORMATIQUE	S	10	67	100	Other
128	DIAGMA	S	10	0	50	Other
129	CYBERNETIX	S	10	43	14	Automatic devices
130	CAROLINE INFOR-MATIQUE	P	10	0	77	CAD/CAM
131	ATELUTION	D	10	nr	100	Automatic devices

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
132	ACKSYS	M	10	0	100	Other
133	PROCAMA	P	9	29	100	Other
134	MECANORMA TECHNOLOGIES	D	9	80	100	CAD/CAM
135	EXA INGENIERIE	E	9	50	100	Automatic devices
136	DECISION INTERNATIONAL (CGI)	S	9	0	9	CAD/CAM
137	ARC INDUSTRIE (Arc Informatique)	S	9	0	100	Automatic devices
138	ORDICONSEIL (Lefebure Conseil)	S	8	0	20	CAPM
139	MSPI	E	8	0	67	Automatic devices
140	LOGARITHME	S	8	nr	100	Automatic devices
141	INGENIERIE SOLUT. ET SYST. (Random)	S	8	700	18	CAD/CAM
142	GROUPE CRITT SA	S	8	33	100	Other
143	COGISTEM	P	8	14	73	CAD/CAM
144	CODY AUTOMATION	S	8	33	100	CAPM
145	SYNERSOFT	S	7	40	70	Other
146	PROGETIM (Cetim)	D	7	17	88	Other
147	PROGES-PLUS	E	7	40	100	CAPM
148	MULTISTATION	D	7	40	100	Automatic devices
149	MU2AS (GTIE)	E	7	0	100	Automatic devices
150	MIEL	D	7	75	30	Automatic devices
151	LOGIQUE INDUSTRIE	P	7	17	100	Automatic devices
152	EFFICIEL	S	7	0	100	CAPM
153	CJB AUTOMATION (Sinorg)	E	7	nr	100	Other
154	BA SYSTEMES (Legris)	E	7	75	17	Automatic devices
155	NOVATECH INDUSTRIE	S	6	nr	100	Automatic devices
156	NODIER EMAG (Emag)	M	6	0	6	CAD/CAM Automatic devices
157	CICAL CYBERNETIQUE (Cical SA)	E	6	-25	100	Automatic devices
158	ATEMI	P	6	20	100	CAD/CAM
159	ASK COMPUTER SYSTEMS SA (Ask)	P	6	-45	100	CAPM
160	APPLICAD (Decobecq)	P	6	0	100	CAD/CAM
161	IDESSYS (Idessa)	D	6	83	100	CAD/CAM
162	VECSYS	S	5	25	50	Automatic devices
163	ULTEC	D	5	0	71	Automatic devices
164	SILMA SARL	P	5	150	100	CAD/CAM
165	SERMA SYSTEME	D	5	25	100	Automatic devices
166	REGA	S	5	67	100	CAD/CAM
167	PRODYS	S	5	25	100	Automatic devices

The 200 Actors Who Count (Continued)

Rank	Companies (Group or Division of)	Activity	1991 Sales in Industrial DP in France (MFr)	Growth 1991/90 (%)	Share of Industrial DP in Total Sales (%)	Major Activity in Industrial DP
168	MG TRONICS	D	5	25	100	Other
169	INSTITUTE TECHNIQUE NEU	E	5	0	33	CAD/CAM
170	FOCALIS	S	5	0	100	CAD/CAM
171	CERIC (Systems division, Ceric)	E	5	-64	10	Automatic devices
172	AUTOMELEC SA	M	5	0	100	Automatic devices
173	AUTO-TROL TECHNOLOGY	P	5	-17	100	CAD/CAM
174	ZEBOTRONICS	D	4	-33	100	Automatic devices
175	SSV	M	4	33	80	Automatic devices
176	SEMSO	M	4	0	100	Automatic devices
177	SECAD	M	4	33	67	CAD/CAM
178	PRODITEC SA	E	4	33	100	Automatic devices
179	PLM INFORMATIQUE	D	4	33	100	CAD/CAM
180	MESURES INSTRU-MENTS SYST.	E	4	100	100	Other
181	GROUPE MANIK	S	4	100	80	Automatic devices
182	CAD LAB	P	4	100	100	CAD/CAM
183	TOP-LOG FRANCE	D	3	nr	3	CAD/CAM
184	TOOL	P	3	-25	60	CAD/CAM
185	LOGISUD	E	3	0	100	Automatic devices
186	LOG'IN SA	P	3	0	100	Other
187	GENERATION DIGITALE	P	3	0	100	Other
188	ELINTEC	S	3	0	100	Automatic devices
189	EGO INDUSTRIE	S	3	-40	100	CAD/CAM
190	CERSA	E	3	0	75	Other
191	CADLM	S	3	0	100	CAD/CAM
192	BERNARD GENTIL SARL	E	3	200	33	CAD/CAM
193	ALPHAO TECHNOLOGIES	S	3	0	100	CAD/CAM
194	SAVOYE NSA	E	2	0	3	Automatic devices
195	MECASOFT INDUSTRIE	P	2	100	25	CAD/CAM
196	CIMTECH	P	2	80	72	CAD/CAM
197	MICRAUDEL	M	2	88	100	Other
198	SAEMME	E	1	100	50	nr
199	GIGA	S	1	0	100	CAD/CAM
200	CADEMIA	S	1	0	100	CAD/CAM
201	CJ INTERNATIONAL	P	1	0	100	Other
202	ARCANE	S	1	67	83	Other

Activities: M—Hardware manufacturers. D—Distributors. P—Software publishers. E—Ingenieristes. S—SSII. nr—not reported.

Production Activities

92WS0666B Paris INDUSTRIES ET TECHNIQUES in French 5 Jun 92 pp 47-49

[Unattributed article: "Hit Parades by Specialty: The 1991 Annual Report of Industrial Data Processing in France"]

[Text]

The Top 20 Exporters

The champion is Dassault Systems! With 78 percent of its sales in exports, putting it in second place in the hit parade, the father of Catia is doing good business. However, software publishers are playing the game well, with Matra Datavision exporting 59 percent of its production and Cisigraph, 42 percent.

This performance is all the more significant because sales abroad are not a traditional in the area of industrial DP and that is an understatement: More than half of the 200 companies in the ranking do not export at all. The total export sales, Fr3,900 million (27 percent of total sales other than DP manufacturers), are thus made entirely by 87 companies. Alone, the top 20 among them make 85 percent of sales abroad; the top 10, 79 percent. The top 20 exporters in the adjoining table take in 34 percent of their industrial DP sales in the export trade.

However, a significant absence from this hit parade should be noted: Cap Gemini Sogeti. Here, we have only the results of the subsidiary Cap Sesa which operates only in the French market. But, the Cap Gemini Sogeti group makes some two-thirds of its sales abroad. If we assumed this ratio for industrial DP, Cap Gemini Sogeti would rank number one among the exporters.

The Top 20 Exporters

Rank	Companies	Activity	Export Sales in Industrial DP (MFr)	Export Share (%)
1	TELEMECANIQUE	M	1213	44
2	DASSAULT SYSTEMES	P	611	78
3	CEGELEC (estimate)	E	351	27
4	MATRA DATAVISION	P	265	59
5	NUM SA	M	174	37
6	CGI INFORMATIQUE	S	166	38
7	MERLIN GERIN	E	150	50
8	SYSECA	S	92	33
9	CISIGRAPH	P	81	42
10	SORMEL	E	57	81
11	CLEMESSY	E	35	8
12	EURIWARE	S	33	9
13	ALCATEL TITN ANSWARE	S	23	9
14	APRIL	M	20	5
15	GTIE	E	20	3
16	PRODSTAR	P	20	29
17	CERIC (Systems division)	E	19	79
18	FOXBORO	M	19	12
19	SOTEB	E	17	21
20	SEI	S	15	18

Activities: M—Hardware manufacturers. D—Distributors. P—Software publishers. E—Ingenieristes. S—SSII.

The Top 20 Hardware Manufacturers

Automation equipment manufacturers—excluding DP manufacturers—are the strong men of industrial DP. They are the ones who make the largest overall sales (Fr4,000 million). They are also the ones who make the largest individual sales. And finally, they also have the highest average sales: Fr190 million. The top 20 equipment manufacturers include all the cream of the crop of the manufacturers of programmable automatic devices and numerical control systems—April, Num, Allen Bradley, AEG Modicon, Kloeckner-Moeller. From the general ranking, it is obvious that for these companies, the year was difficult: Num's sales dropped by 6 percent; Allen Bradley's, 1 percent; Kloeckner-Moeller is stagnating. Only AEG Modicon increased by 13 percent. As for April, it has not disclosed its 1990 sales, but last year it presented sales of Fr450 million in our ranking.

Two plotter manufacturers—Oce Graphics and Xerox Engineering Systems—and two process control systems manufacturers—Honeywell and Foxboro—have moved up into position among them. These last two suffered a great deal this year: Honeywell saw its sales drop by 13 percent; Foxboro, 16 percent. Rosemont, the one to watch in this sector, played its cards well with growth of 25 percent.

The Top 20 Hardware Manufacturers

Rank	Companies	1991 Sales in Industrial DP in France (MFr)	Industrial DP Share in Total Sales (%)	Software and Services Share (%)
1	TELEMECANIQUE	1543	36	5
2	SIEMENS SA	834	38	20
3	APRIL	350	97	15
4	NUM SA	302	100	20
5	OCE GRAPHICS (estimate)	300	100	25
6	XEROX ENGINEERING SYST.	270	100	25
7	ALLEN-BRADLEY	198	100	15
8	HONEYWELL	160	22	40
9	FOXBORO	143	89	13
10	GROUPE SILICOMP	61	97	0
11	AEG MODICON AUTOM.	52	100	30
12	GE FANUC AUTOMATION	52	40	25
13	PHILIPS AUTOMAT. IND.	50	10	25
14	KONTRON ELEKTRONIK	45	63	20
15	KLOECKNER-MOELLER SA	35	11	0
16	ROSEMONT	35	16	30
17	APTOR SA	28	88	25
18	MICROPROCESS	27	90	20
19	EFISYSTEMES	26	87	15
20	COMPEX	21	91	19

The Top 20 SSIIs

The top 10 computer engineering service companies (SSIIs) made off with some 80 percent of the sales by SSIIs in the area of industrial DP and automation. The 20 companies in this hit parade exceed 90 percent by far.

As mentioned elsewhere, the only SSIIs left at the very top are large companies (Cap Sogeti, CGI, Steria, Sligos...) or subsidiaries of large groups (Alcatel, Thomson, and since recently AT&T, which has taken control of Dataid).

Those which could be dubbed SSIIIs (for industrial SSIIs), i.e., specialized companies for which the bulk of sales comes from this area, are well on their way to becoming an endangered species. Consequently, the top 10 in the list now hardly make a third of their sales in this activity, although they include Euriware (formerly Esia), the only one other than Itmi to make more than Fr100 million [Fr] and 100 percent of their sales exclusively in industrial DP.

The very strong third position of CGI—which in fact announced good results for this year for all its lines of business combined—should be noted in this ranking as should the relative decline of Syseca relative to last year (it was third with sales of Fr245 million...). The explanation? Syseca, a Thomson subsidiary and a specialist in technical DP, applied too broad a definition of the term industrial DP for 1990: It was typically one of the companies that mixed "industrial DP" and "technical DP." The result booked for 1991 is closer to reality.

The Top 20 SSIIs

Rank	Companies	1991 Sales in Industrial DP in France (millions of Fr)	Industrial DP Share in Total Sales (%)	Distribution by Activity (%)		
				Hardware	Software	Engineering and Services
1	CAP SESA	900	23	nr	nr	nr
2	EURIWARE	321	100	0	18	82
3	CGI INFORMATIQUE	273	21	1	23	76
4	STERIA	250	28	5	2	93
5	DATAID	245	36	8	20	72
6	SLIGOS	245	8	20	15	65
7	ALCATEL TITN ANSWARE	230	30	5	5	90
8	SYSECA	183	14	0	15	85
9	COMELOG	160	46	0	0	100
10	SOLERI-CIGEL	150	44	15	20	65
11	ITMI	130	100	10	15	65
12	ARM (group)	85	23	2	3	95
13	SINFOR	85	87	5	10	85
14	IBS FRANCE	74	80	4	20	76
15	SEI	70	70	20	25	55
16	GSI INDUSTRIE	59	100	20	40	40
17	CISI INGENIERIE	54	13	0	0	100
18	ACQUITAINE SYSTEMES	39	100	nr	nr	nr
19	ACCESS PRODUCTIQUE	38	100	50	30	20
20	SII	32	52	0	0	100

The Top 20 Ingenieristes

For the ingenieristes/ensembliers in our ranking, industrial DP seems to be a truly ancillary activity. On average, of the 40 or so companies that we survey, they hardly make more than 10 percent of their sales in this specialization. This puts them far behind the other categories: Even the SSIIs make 23 percent.

Nevertheless, these are very large companies, which means, for example, that a modest 3 percent brought in in industrial DP still puts L'Entreprise Industrielle in ... fourth place, and Merlin Gerin is in fifth place with only 2 percent.

These average figures are virtually the only common points between these companies. In their response to the tasks of industrial DP, they are far from having a homogeneous approach, as is the case for the service companies. There are two large families. On the one hand, there are those who count on this activity as a new source of revenue; on the other hand, there are those who are tending toward getting out and no longer being involved in industrial DP except through subcontracting or joint contracting. The first family includes Cegelec and Clemessy. In the second are companies like L'Entreprise Industrielle and Merlin Gerin.

There are also those which have more or less given this area up for lost. The extreme case is that of Renault Automation. The Renault subsidiary which once had the ambition of being the spearhead of production engineering in France, has completely revised its strategy. Bit by bit, its magnificent production engineering architecture has collapsed. Currently, the company has almost completely refocused on its original business: the fabrication of machines for the auto industry.

The Top 20 Ingenieristes

Rank	Companies	1991 Sales in Industrial DP in France (millions of Fr)	Industrial DP Share in Total Sales (%)
1	CEGELEC (estimate)	1293	12
2	GTIE	600	12
3	CLEMESSY	383	16
4	L'ENTREPRISE INDUSTRIELLE	160	3

The Top 20 Ingenieristes (Continued)

Rank	Companies	1991 Sales in Industrial DP in France (millions of Fr)	Industrial DP Share in Total Sales (%)
5	MERLIN GERIN	150	2
6	SAUNIER DUVAL ELECTRICITE	128	5
7	FORCLUM	100	6
8	SNEF ELECTRIC FLUX	90	7
9	COURBON	86	70
10	SOTEB	65	54
11	GTME	61	3
12	SA SYDEL	60	100
13	RENAULT AUTOMATION	55	5
14	SOFRESID	45	6
15	CIE GEN. DE PRODUCTIQUE	30	14
16	SEREA	30	83
17	SOCETEC	30	nr
18	BERTIN ET CIE	29	7
19	SYSPRO	25	81
20	SEIC	21	100

The Top 20 Software Publishers

It seemed to be of interest to rank software publishers by their sales in software alone. This cannot be done without significantly shaking up the hierarchy: In broad terms, those who make more than half from software (i.e., 46 percent of sales for all the publishers) move up when ranked by gross sales; the others lose ground.

In this little exercise, Computervision, for which only one-third of sales are in software, all but dropped to second place. Conversely, Dassault Systemes, fortified by its 88 percent rate, made a large jump upward (it would have been fifth if ranked according to total sales) and, as a result, moves ahead of its main French competitor, Matra Datavision. The big losers are Intergraph (it would have been second, but is fifth) and even more so Schlumberger CFAO (16th instead of ninth) and Framasoft+Csi (20th instead of 10th).

It is probably obvious that the hierarchy of software publishers is almost the same as that of CAD/CAM suppliers. Only Prodstar bears the standard for production management; Framasoft+Csi, for structural calculation; and Uniras, for graphics DP.

Another fundamental characteristic of this family of representatives of industrial DP: extreme specialization. On average, the top 20 make 97 percent of their sales in industrial DP alone. They are also focused on one and only one business, CAD/CAM, for the most part.

The Top 20 Software Publishers*

Rank	Companies	Software Sales in Industrial DP (France 1991) (millions of Fr)	Total Sales in Industrial DP France (millions of Fr)	Industrial DP Share in Total Sales (%)	Major Activity
1	COMPUTERVISION	182	608	88	CAD/CAM
2	DASSAULT SYSTEMES	153	174	100	CAD/CAM
3	MATRA DATABISION	102	185	100	CAD/CAM
4	MENTOR GRAPHICS	98	163	100	CAD/CAM
5	INTERGRAPH FRANCE	70	233	100	CAD/CAM
6	AUTODESK	60	60	100	CAD/CAM
7	CISIGRAPH	42	111	100	CAD/CAM
8	SDRC	40	51	100	CAD/CAM
9	RACAL REDAC	28	35	92	CAD/CAM
10	SAFIR TECHNOLOGIE	28	70	100	CAD/CAM
11	PRODSTAR	25	50	71	CAPM

The Top 20 Software Publishers* (Continued)

Rank	Companies	Software Sales in Industrial DP (France 1991) (millions of Fr)	Total Sales in Industrial DP France (millions of Fr)	Industrial DP Share in Total Sales (%)	Major Activity
12	MISSLER INFORMATIQUE	23	39	100	CAD/CAM
13	CAD SERVICE	18	51	100	CAD/CAM
14	UNIRAS SARL	14	18	100	Other
15	IGE SA	14	19	100	CAD/CAM
16	SCHLUMBERGER CFAO	14	56	100	CAD/CAM
17	DAZIX FRANCE	13	33	100	CAD/CAM
18	CN INDUSTRIES-TELL	13	17	89	CAD/CAM
19	SAPEX	12	29	94	CAD/CAM
20	FRAMASOFT+CSI	12	54	100	Other

*The ranking is based on software sales, exclusive of hardware and service.

Distributors Making More Than Fr10 million

For the "hit parade" of distributors, we accepted only the most significant: Those who take in more than Fr10 million in sales. Among these, the average is roughly Fr50 million. They are specialists in this sector, because, on average, the share from this business amounts to 85 percent of their total sales.

Distributors are the featherweights of industrial DP with only 3 percent of total sales. This is generated primarily by sales of hardware. Among the most valued specialties: Automatic devices and CAD/CAM.

Distributors Making More Than Fr10 million

Rank	Companies	1991 Sales in Industrial DP France (millions of Fr)	Industrial DP Share in Total Sales (%)
1	TEKELEC AIRTRONIC	155	12
2	ISTC	154	100
3	MABE UNIC	90	69
4	INTERLEC	46	92
5	FACTORY SYSTEMES	43	100
6	REAL TIME SOLUTIONS	38	100
7	ANGALIS	38	29
8	ECRIN AUTOMATISMES	35	100
9	CDF PRODUCTIQUE	31	100
10	DCA	22	100
11	YREL	20	11
12	CEFI TECHNOLOGIES	17	100
13	ALISA	11	100
14	ATELUTION	10	100

France: Bull Subsidiary Launches Microcomputer

92WS0672C Paris AFP SCIENCES in French
11 Jun 92 pp 13, 14

[Text] Paris—Zenith Data Systems (ZDS), a microcomputer subsidiary of the French group Bull, announced 9 June that it was launching a new line of business computers. According to its president Enrico Pesatori, it will be "the most sweeping product launch in [the] 13 years" the group has existed.

The company presented some 40 models grouped into five families, most of which are expected to be available in Europe this month. According to Mr. Pesatori, they reflect the group's new strategy and its four priorities: ergonomics, ease of use, simple hookup with another computer or network, and modularity. The microprocessor in certain computers, for instance, can be swapped for a more powerful model.

In addition to its new line of business computers, ZDS is expected to come out with a line for the home market

shortly. It is designed for buyers who are more "sensitive to the price" of their equipment than to its technical performance, said Mr. Pesatori. It will be the first time ZDS, whose annual sales are in the neighborhood of a billion dollars, has offered any products especially for the home market.

Mr. Pesatori did not divulge which portables IBM ordered from ZDS as part of the Bull/IBM agreements announced last January. The company has already begun deliveries to IBM, but will not reach the 150,000 annual units that were stipulated in the agreements in 1992.

In the ultra-competitive world of microcomputers, ZDS hopes in this way to boost its European market share from 4.9 to 7 percent, and its share of the European portable-computer niche from 7.4 to 10 percent, said Francis Lorentz, the CEO of Bull. ZDS currently ranks third in the European portable market, behind Toshiba (Japan) and Compaq (United States).

ZDS should generate 20 percent of the Bull group's total sales this year (Fr33.5 billion in 1991) and 35 percent of its sales of actual hardware, compared to 10 percent in 1988.

Finally, the Bull group subsidiary plans to withdraw from the ACE [Advanced Computing Environment] consortium of some 200 computer manufacturers. ACE aims to strengthen the compatibility and performances of microcomputers by using RISC [Reduced Instruction Set Computing] type microprocessors. ZDS is thus following the example of Compaq, which announced its departure in April.

ZDS was taken over by Bull in late 1989 and has run a deficit since, although the exact amount of its losses is not known. Bull replaced the company's management team a year and half ago and has since trimmed many jobs—some 1,500 of the 4,000 the subsidiary offered.

DEFENSE R&D

Dassault, SAT To Develop Dual-Mode Homing Devices

92BR0464 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 14 May 92 p 12

[Article: "Homing Devices: Dassault Enters Alliance With SAT"]

[Text] Dassault Electronique is preparing to enter into a cooperative agreement with SAT (Telecommunications Corporation (SAGEM group)) for research and development in the field of homing devices on missile guidance systems. The principal goal is to develop "dual mode" homing devices (electromagnetic and infrared guidance), drawing on each partner's know-how. Dassault Electronique is the European leader in electromagnetically guided homing devices, while SAT holds the same position in infrared models. The agreement, which has been submitted to the authorities, could subsequently be extended to cover other homing devices.

Decisions on Future of Eurofighter Reported

Germany's Withdrawal

92MI0611A Bonn DIE WELT in German 1 Jul 92 p 1

[Text] Germany is pulling out of the hotly disputed "Fighter 90" program. But it will build a new, much cheaper "Eurofighter 2000" with its existing partners: Great Britain, Italy, and Spain. This was agreed by the parliamentary coalition parties of the CDU/CSU [Christian Democratic Union/Christian Social Union] and FDP [Free Democratic Party] in Bonn yesterday.

Defense Minister Volker Ruehe (CDU) was instructed to begin talks on the matter with the partner nations at once. Federal Chancellor Helmut Kohl stressed that it was crucial that the new fighter aircraft should also be a European development. The previously planned "Fighter 90" was described as too expensive.

The CSU described this decision as a victory. It was not a total pull-out from the fighter program but a further development "at a lower level." In the coalition, the compromise was interpreted as a correction of the maximum demand, advocated by Ruehe, that Germany should "pull out" of the "Fighter 90" program. At the same time, the parliamentary parties had on the other hand met Ruehe half-way in accepting that the money still available should be used to create a "fighter aircraft appropriate to the future risks and with reduced tactical requirements." The decision on the new fighter will be taken by 1996 at the latest. With the disappearance of the threat, the aircraft is to be adapted to the changed situation and made "easily financible" so that it can also be contained within the plans for the Federal Armed Forces.

The new aircraft is to cost significantly less than 100 million German marks [DM]. The system price for the "Fighter 90" had been given as DM133.9 million. CDU/CSU parliamentary group defense spokesman Paul Breuer said the modern fighter must be equipped to deal with the security situation of the next 40 to 50 years.

European Cooperation Sought

92MI0611B Bonn DIE WELT in German 1 Jul 92 p 2

[Article by Ruediger Moniac: "Ruehe: Adapting the Defense Budget to New Circumstances"]

[Text] The basis for the further treatment of the topic of the "procurement of a new fighter aircraft" for the German Air Force by the Federal Minister of Defense will be an agreement negotiated between Volker Ruehe and the CDU/CSU [Christian Democratic Union/Christian Social Union] executive.

The text of the agreement is given below. Ruehe has approved it and following its submission to his own

parliamentary group also defended it before the FDP [Free Democratic Party] parliamentary group.

1. The world situation and the Federal Republic of Germany's security position have fundamentally changed. Our overall political responsibility demands that our defense efforts and thus also the budget resources devoted to them be adapted to the new conditions.

2. The reorganized Federal Armed Forces, now reduced to 370,000 men, must be forward-looking in equipment and manpower resources. Air defense will be of crucial importance for the fulfillment of their future task. Air and ground-based defense systems will continue to be needed to offer the necessary protection in the country's air defenses. Replacement of the F 4 F-Phantom fighter aircraft around the year 2000 is therefore essential.

3. The current design of the Fighter 90 is too expensive. The system price now quoted for the year 2000 must be considerably reduced. The changed conditions allow the requirements for a fighter aircraft to be reduced in quantity and adjusted in quality.

4. The European cooperation with the existing four EFA [European Fighter Aircraft] partners should be continued and if possible expanded to include new partners. If Germany and Europe are to remain competitive in the technologies of the future, it is of the utmost importance that they maintain and expand their technical ability in aviation and space travel.

5. In the context of this cooperation, the existing technological developments and the EFA development resources still available will be used to develop a modern European fighter aircraft equal to the future risks and with reduced tactical requirements.

UK Position

92MI0611C Bonn DIE WELT in German 2 Jul 92 p 6

[Article by Reiner Gatermann: London Wants to Keep the Fighter 90"]

[Text] Although Federal Defense Minister Volker Ruehe will be welcomed by an honor guard when he visits London Monday, his ensuing talks with his British counterpart Malcolm Rifkind are likely to be very frosty. The German compromise of replacing the Fighter 90 with a lighter and cheaper version is not finding much favor here. Jonathan Aitkin, Secretary of State responsible for equipment procurement, called it "arrant nonsense."

All the signs are that the British will stick to the Fighter 90 in its present form and want to build it with or without German involvement. Rifkind sees no equivalent alternative and now intends to discuss with his Italian and Spanish colleagues how to proceed. In this view, the costs have already been "considerably reduced." According to some assessments, they could be cut still further if Bonn withdraws because there would no longer be high German labor costs to pay and assembly could be concentrated in Great Britain.

While Rifkind admits of no doubts about the Fighter 90's future and can count on opposition support in this—some labor MPs are going so far as to demand the project be continued even if Italy and Spain pull out—a kind of "Denmark effect" is being felt in other places. Although no aspect of the project has been questioned in the past, since Germany's decision the cautious question is being raised as to whether such an aircraft is needed.

The TIMES comments: "Britain should not stick to a £20 billion flying job-creation scheme that no longer has a strategic objective." The German doubts are likely to meet with interest in the British Treasury at least, since the "biggest cost-cutting exercise in the last 10 years' has just begun there in preparation for next year's budget."

Rifkind is expecting Ruehe to bring "a few clarifications of the German position," saying that the Bonn statement leaves too much unclear. Reporting of the German decision completely fails to mention that when the four Fighter 90 partners concluded their agreement in 1985, it was expressly stipulated that a fresh decision would be taken before going into production.

ENERGY, ENVIRONMENT

German Firm Develops Biosensor-Based Effluent Testing Device

92MI0581 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 3 Jun 92 p 5

[Text] The firm Aucoteam GmbH Berlin has developed a portable field instrument that determines the degree of purity of waste water from its degradable component content. The device is called the BODypoint and makes it possible to perform repeatable, short-duration measurements under field conditions using a biosensor. This means both that the degradation process can be precisely monitored and that the measurement data can be used to optimize environment-compatible purification processes, as the precise quantity of precipitating agent to be administered can be calculated.

The biosensor stands out for its very short reaction time and high sensitivity compared with the conventional process, which takes five days. An O_2 electrode is combined with a microbial membrane that degrades the assimilable components. The proportion of matter that can readily be assimilated biologically can be determined from the electrode current.

Samples can be taken immediately on site at ambient temperatures of +5 to +35°C and 15 computer-controlled measurements performed per hour. The new process does away with the errors that arose out of the previous need to transport the samples.

A special version of BODypoint makes it possible to record measurement values continuously over a 24-hour

period. Biotechnological processes can thus be better monitored, assessed in chemical engineering terms and controlled. (For further information: Tel. East Berlin - 438 84 66).

German Firm Develops Polyurethane Recycling Process

92WS0661L Toddington NEW MATERIALS INTERNATIONAL in English Jun 92 p 5

[Article: "Germany: Krauss Maffei Develops PU Recycling Route"]

[Text] In collaboration with Dow-Plastics, Tragerwilen (Switzerland), Krauss-Maffei Kunststofftechnik GmbH, Munich has evolved a process for the recycling of RIM- and RRIM polyurethane mouldings, which it claims is economically viable.

Whereas some experience has been available for the recycling of thermoplastics and individual projects have been put into operation, little knowledge has so far been gained with the recycling of thermosets.

The process developed now operates to the principle of the triple-flow technology, with the individual components of the PUR-system being fed to the mixing head in three separate streams.

For RIM-recycling, painted car body parts were ground into a fine powder. This powder was then mixed with the basic polyol. The mixture with the amine-containing component would have resulted in a structural alteration of the foam system, however. The volume-ratio of polyamine to the basic polyol-powder compound was around 1:2 parts.

The third stream was responsible for supplying the iso-component. The process was tested with a production tool for the moulding of sound-absorbing pods for a transport vehicle, made available by Osbra Formteile GmbH of Mindelheim. The mouldings weighed 1,700 g and had an average wall thickness of 4 mm. At the end of the test, 30 percent of recycled material was being used. The articles were ready for demoulding after a cure-time of 35 s, at a mould-temperature of 60°C.

Subsequent investigation of the mouldings showed excellent results in all points. The surface quality was given the 1A rating. Painting trials at 120°C in an on-line plant were also successful. In this case the inherent coloring of the starting-material had no negative influence. The mechanical as well as the thermal properties were identical with the data of mouldings produced in the conventional way.

Krauss-Maffei Kunststofftechnik GmbH also ran trials with a glass-filled, amine-containing recycling component in a RRIM-system. In this case, nucleation of both components proved an advantage. Subject to application, the gas at 15 to 20 percent can be combined with a 10 to 15 percent recycling-material content.

All tests were conducted on a standard lance-type PU-machine of the Comet KK240 range, equipped with the microprocessor system PUC 04. A standard MK 16-3FK mixing head for filed systems was employed for dispensing.

The system used was an IMR-RRIM-system, based on Spectrim RD 408. The RRIM mouldings for recycling were supplied by the companies PEBRA, of Esslingen and Phoenix, Hamburg.

The new mouldings produced from the recycled material and PUR-system were tested and investigated by well-known car manufacturers which rated them as being of best quality. Since then, a number of practical tests are also being conducted.

The successful conclusion of the tests show that the recycling of RIM- and RRIM-mouldings is possible without problems, so the automotive industry's demand for recyclable plastics can be met.

France: Lyons Laboratory Creates Expert System for Purification Station

92WS0667A Paris INDUSTRIES ET TECHNIQUES in French 5 Jun 92 p 26

[Article by Thierry Mahe: "Expert System to Aid Waste Water Management: One Thousand Parameters for a Giant"—first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] A data-processing research laboratory of Lyonnaise des Eaux [Lyons Water Company] has developed software that can take into account all the variables of a waste-water treatment plant.

The European Community is enacting increasingly severe regulations on waste-water treatment. In particular, waste-water station operators must now guarantee a 95 percent operating rate. In other words, these stations must work no matter what! This is far from being the case. Michel Guillon, head of the LIAC [Compiegne Advanced Data-Processing Laboratory], the research laboratory of Lyonnaise des Eaux-Dumez, explained: "Where a serious problem occurs—for instance the proliferation of filamentary bacteria in a vat—the intervention procedure is long and powerful. A group of experts comes on location, makes analyses... Of course, the station is shut down. Setting it back into service may take two days... or two months!" To meet the requirements of Lyonnaise des Eaux, the LIAC has been working on software designed to aid the diagnostic of dysfunctions occurring in waste-water treatment plants. The Geant (Expert Purification Management) system aims to "comply" with standards and reduce operating costs. According to Michel Guillon: "Even if the operator cannot correct the failure on his own, at least the system enables him to state the problem correctly." Geant has been installed as an experiment at the Lille-Marquette station, which has a treatment capacity equivalent to the consumption of 750,000 people. Between

now and the summer, six treatment plants will get the software. Their feedback will be used to refine the program which will eventually be used at all mid-size sites (the equivalent of 30,000 to 50,000 people), i.e. 40 percent of the 1,400 stations managed by Lyonnaise des Eaux-Dumez. In fact, large waste-water treatment plants represent only 2 percent of the total and are staffed with full-time experts. As for smaller stations—the majority—they are less prone to failure because they use simpler treatments.

Computer-aided failure-diagnostic systems are relatively common in industry. This is one field where artificial intelligence is working minor miracles. Yet, Geant has gone through a long and difficult three-year development period, its principles as well as its tools being repeatedly called into question. It kept three LIAC researchers busy, plus an army of experts from Lyonnaise des Eaux. Why such an expenditure of energy? Water purification is a complex process. It resorts to various mechanisms (screen cleaning, filtration, degreasing, reagent actions, etc.) and uses mechanical, chemical, bacteriological, and other processes. To understand the process, the design operation of the station had to be modeled. "This is where our major methodological contribution resides. Initially, we were merely making assumptions (starting from the facts to go back to the cause) based on a superficial expertise. We failed. We then understood that the system should rely on a full description of the equipment and the processes."

That is what they did. And just this description required 1,000 parameters! In fact, configurations vary markedly from one site to another, based on the type and contents of water pollutants.

The phenomena involved are so ill-defined that the Geant reasoning sometimes leads to paradoxical situations. "It can happen for instance that some clues point to too much oxygen in the water, while at the same time others indicate that there is not enough oxygen... At first, we tried to solve these contradictions by re-examining the previous assumptions. Actually there was no way out... With the present system, we no longer ignore contradictions, we manage them! They reflect a situation that means something, they tell us something!"

Another major problem which the LIAC researchers had to face was the heterogeneousness and the lack of reliability of the data collected. Sensors have a tough job to do... They soon get clogged and they supply unreliable information. "There are some 50 parameters to characterize the condition of the water upstream from the station: the flow, the percentage of suspended matter, various measurements of bacteriological activity, etc. But the most relevant information are those based on observations: the color of the water, the appearance of scum on the surface, and above all odors!

The second facet of the software program is devoted to failure diagnostic. This takes the shape of a dialogue between the operator and the computer. The Geant expertise is based on some 100 rules. When that stage is completed, Geant suggests an intervention procedure. Initially developed in Lisp around a Nexpert core (Neuron Data), Geant was fully rewritten in C++ in the Snark environment (Synapse). It runs on a DecStation.

[Box, p 26]

The LIAC: A Private Laboratory With University Connections

Created in 1985, the Compiegne Advanced Data-Processing Laboratory [LIAC] regroups the data-processing activities of Lyonnaise des Eaux-Dumez. With a staff of 40, it has strong connections with the Compiegne Technological University (UTC): many of its researchers came from it, and it is working with it on four ESPRIT [European Strategic Programs for Research and Development in Information Technology] research projects. The LIAC activities have to do with water management (for Lyonnaise des Eaux) and with the construction industry (for Dumez). Its main research orientations include water management (drinking and waste water, network maintenance), the construction industry (construction, highway traffic forecasting, etc.), garbage collection, and energy management. Whether for the highway network, water supply, or energy transport, in most cases numerical models predicting traffic or consumption must be built and operated. Artificial intelligence is at the heart of all this work.

Finland: Neste Develops Low-Emission Traffic Fuels

92WS0706C Toddington NEW MATERIALS INTERNATIONAL in English Jul 92 p 5

[Article: "Neste Develops Low-Emission Traffic Fuels"]

[Text] Further reduction in traffic-related emissions is the aim of a new Emissions Laboratory just commissioned by Finland's Neste Corporation at its Technology Centre in Porvoo, east of Helsinki. The new laboratory will supplement the work of Neste's existing Oil Fuel Laboratory and of the Fuel and Process Technology Laboratory run by the State Research Centre of Finland (VTT).

The Technology Laboratory in Porvoo will investigate car-exhaust emissions under a range of different climatic and loading conditions, using a road simulation dynamometer which allows a test car to be driven on a set of rollers, under carefully controlled laboratory conditions. The new laboratory also houses Finland's first SHED [Sealed Housing for Evaporative Determination], which measures the level of hydrocarbons released by a vehicle's fuel system while stationary, with the engine switched off. Finland was one of 21 signatories to the ECE [Economic Commission for Europe] environmental protocol (November 1991) for a 30 percent reduction in volatile hydrocarbon emissions by the year 2000.

Neste's research into clean-burning fuels has already led to the development of Neste Oil's City Gasoline, launched in 1991 and on sale throughout Finland since 1 May 1992. It is the first low-emission fuel of its type in Europe to have widespread distribution. Neste has also developed City Diesel, a new fuel with substantially reduced sulphur and particulate emissions. These latest fuels, which permit immediate emission-reductions from the vast majority of vehicles in current use, promise to have a great impact on pollution reduction together with catalytic converters.

The chassis dynamometer and associated equipment installed in Neste's Emissions Laboratory are capable of accurately simulating driving speeds up to 200 km/h, replicating wind resistance and other forces affecting a vehicle on the road. The appropriate wind speed is set automatically, in accordance with the vehicle's speed. The system also permits analyses of fuel performance in areas such as ease of starting, stop-start driving or fast acceleration. Tests can be undertaken in temperatures from -30C to +40C. Extended testing, as well as research on heavy vehicles, is normally carried out on engines mounted on a test bed.

A computer-controlled exhaust-gas sampling and analysing system measuring mainly levels of carbon monoxide, carbon dioxide, nitrogen oxides and hydrocarbons, usually dilutes the emissions with air, prior to measurement, in order to increase accuracy. In addition, undiluted exhaust gases can also be measured, at two points simultaneously, thereby allowing catalytic converter performance to be monitored. Particulate emissions from diesel engines are also measured after exhaust gases are diluted with air. Particulate collected in filters is measured to an accuracy of a millionth of a gram.

FACTORY AUTOMATION, ROBOTICS

Matra Marconi Develops Smart Robot

92BR0415 Paris SCIENCES ET AVENIR in French May 92 p 9

[Text] It will be capable of maneuvering in a factory in flames, find its bearings for locating the injured in a tunnel, and seek out toxic products. Adam is a European robot; Matra Marconi led the project, Spaniards and Italians helped design it in association with French partners, including LAAS [Laboratory for Automation and Systems Analysis], Framatome, and Technicat. Its chassis, which was supplied by the Planetary Mobile Robotics Institute in St. Petersburg, has six independent wheels and holds a variety of instruments for perception, navigation, guidance, and supervision. A laser telemeter located up-front reconstructs the relief of the surrounding area. Three accelerometers and three gyroscopes continuously provide data about its balance and effective movement.

Adam also knows what it is capable of doing. Thanks to its on-board database, it avoids prohibited areas which are too dangerous. Since it cannot cross gradients of more than 30 cm or ascend slopes of more than 45°, it produces its own "trip map" to avoid dangers and dead ends. The robot prototype is both cautious and very accurate; on a 40-meter trajectory, it reaches its target within 3 cm.

Germany: CIM Technology Transfer Center Opens at Bochum

92MI0580 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 3 Jun 92 p 4

[Text] At the beginning of the week, the "Center for Information Processing in Production" (CIP) was founded at the Development Center at the Ruhr University, Bochum, in order to offer small and medium-sized enterprises the chance to participate in university research results right from the precompetitive stage. The CIP offers scientific advice, assistance with new developments, and training programs. It also runs a CIM model factory, where solutions can be worked out and put to the test.

The CIP maintains that, "information" is the production factor of the future. Improved symbiosis between man, machine, and material in a company and, with ever-shorter product life cycles, survival in tough competition, will depend on its economical and efficient use. Larger companies are particularly well-equipped for this, as they work closely with the universities.

The CIP was officially opened on 1 June with an event on Germany as a location for production attended by Federal Research Minister Dr. Heinz Riesenhuber, North Rhine-Westphalia's Minister of Economic Affairs Guenther Einert, the mayor of Bochum, the rector of Bochum University, the chief executive of the Bochum Chamber of Industry and Commerce, and 180 other dignitaries from industry, ministries, local authorities, and science. The opportunity was also taken to present the model factory for computer-integrated manufacturing (CIM) to the public.

Germany: Studies on Industrial Robots for Assembling

92WS0591A Coburg MASCHINE & WERKZEUG in German Apr 92 No 8 pp 190-200

[Article by Uwe Schweigert, scientist at the Fraunhofer Institute for Production Technology and Automation (IPA) in Stuttgart: "Faster and More Flexible: Precision Assembly With Industrial Robots"; first paragraph is MASCHINE & WERKZEUG introduction]

[Text] Several investigations and studies identify the assembly area as one of the focal points of future technological development and rationalization measures in production. Like shorter product service lives, the growing trend toward shorter process times linked with smaller lot sizes imposes increased demands on the flexibility of assembly systems. This development is also

taken into account in an increasing use of industrial robots in flexible automated production systems.

Flexible manipulation devices with industrial robots of various designs and a broad palette of modular, programmable axes are available on the market as well as gripping tools and devices for delivery of parts. With these devices alone, it is however possible to automate only a very limited number of assembly tasks. For comprehensive automation of assembly, flexible gripping systems, tools with process integration (e.g., soldering, gluing), tolerance compensation systems, assembly strategies, and components to assure tool function and monitoring of the assembly process are needed. Such systems demand increased use of sensors, which is made possible by the most recent developments in this field.

A great potential for rationalization exists in the precision engineering industry, whose various branches have by far the highest share of assembly costs in the production costs of its products [1 through 4]. Compared with small parts assembly with the most industrial robot applications to date, there are in precision engineering extremely high assembly technology specifications and quality demands which necessitate extreme accuracy of devices. Consequently, automated solutions exist only in the area of mass production (the watch and clock industry, electronics production) with rigid assembly automatons and low flexibility. The reasons for the low level of automation in the assembly of short and medium sized series include the following:

- high variety of types and variants,
- small lot sizes,
- technical obstacles to automation,
- shortage of flexible automation components.

High wage costs, due to long assembly times as well as extreme accuracy and quality specifications in assembly, which often exceed those in human production, require the use of flexible automation assembly systems for precision engineering products for both economic and technical reasons.

The basic prerequisites for flexible automated assembly of precision engineering products are provided through the development of robot technology and new sensors. Initial solutions are already in use in the Far East. However, widespread industrial use demands the development of appropriate assembly processes and new robotics tools.

Analysis of Assembly Tasks

To determine the transferable approaches in the assembly of precision engineering products, a survey was performed by the Fraunhofer Institute for Production Technology and Automation (IPA) and selected assembly tasks have been investigated using workplace analyses. The survey in one of the industrial regions characterized by precision engineering had the objective of narrowing the product spectrum with regard to numbers of pieces, variety of types and variants, lot sizes, tool characteristics, scope of assembly, and obstacles to automation. The evaluation of the survey of 45 companies from seven branches yielded the following results:

- annual numbers of parts of approximately 100,000 through 10 million with extreme values of a few thousand in the area of precision devices and as many as 3 billion in electronics components;
- number of variants per product between 10 and 3,000, apart from electronics components sometimes with a single variant;
- typical lot sizes of approximately 10 to 5,000 items/lot, in the watch and clock industry and manufacture of electronics components sometimes in mass production;
- product volumes from 0.01 to 500 cm^3 with the exception of the production of complex precision devices (several m^3).

To be able to assess the rationalization potential obtained in the form of production numbers and scopes of assembly, the companies were asked about currently existing obstacles to automation and they were ranked separately according to organizational and technical obstacles. In addition to small lot sizes and the large variety of types and variants, the most significant obstacles to automation are the small size of the tolerance-dependent workpieces as well as small clearances with no bevels. For determination of tolerance compensation demands, it is necessary to perform a study of tolerances and to establish the cumulative tolerances for an assembly system with industrial robots.

In automated assembly, all tolerances which lead to deviations in position must be taken into account. Cumulative tolerances adding all tolerances and deviations are calculated from the workpiece tolerances and the tolerances of the assembly system. The cumulative tolerances relevant to the assembly of precision technology products are based on measured values, manufacturer data, and empirical values.

The components of the manipulation system (industrial robots or x-y-assembly table) and delivery devices as well as the tolerances of the parts added constitute a significant share in the cumulative tolerances. Position deviations caused by the assembly system depend heavily on the choice and design of devices.

Position deviations at the assembly cross-section level (x-y planes with vertical assembly movements) have crucial significance for the success of the assembly process and the demands on tolerance compensation. The total deviation within the cumulative tolerances up to 0.45 mm compares with the minimal clearance of the respective pairs being joined. In the assembly tasks of precision engineering, it is necessary to also consider environmental influences such as temperature, vibrations, and air currents.

Flexible Assembly Systems in the Precision Engineering Industry

From the analysis of the assembly task and the definition of the "assembly" function, it is possible to derive the partial functions of an assembly system for precision engineered products and to allocate them to subsystems according to the definition of a programmable assembly system. The subsystems are supplemented by subsystems for performance of ancillary functions (control systems, energy and data communications systems) and subsystems for process materials (e.g., application of adhesive). The fundamental demands on a combined system for precision engineered products apply equally to all subsystems:

- product flexibility: assembly of varied product types and variants without manual retooling,
- monitoring of assembly processes and quality inspections,
- completion from modular subsystems/components,
- reduced share of task and type specific tools,
- high accuracy requirements.

The small size of the parts added found in the analysis to be the cross-sectional problem along with the small clearances imposes high demands on the gripping system. These are:

- highly accurate centering of the workpieces without center shifting with variable diameters,
- high mechanical rigidity and freedom from play,
- no hysteresis and no stick-slip effect,
- no error functions with tolerance-dependent workpieces,
- secure holding of the workpiece during transport and joining process with the least possible gripping forces/ no slippage,
- highly accurately adjustable/programmable gripping forces,
- no damage to workpieces from grippers,
- gripper jaws adjustable/exchangeable for different workpiece diameters and gripping surface geometries,
- the smallest possible gripper jaw geometry and gripper opening paths for tight gripping spaces,
- simple, space-saving design/compactness,
- integration of sensorized process monitoring,
- short gripper opening and closing times,
- interfaces to tool changing devices,
- high reliability and availability.

In addition to the essential high accuracy and rigidity of the gripper mechanism and gripper jaws, programmable gripper systems with high-resolution of gripping force and the gripper closing path are required for sensitive assembly parts.

To permit compensation for workpiece and assembly system tolerances, new processes for tolerance compensation must be developed to meet the extreme demands for the accuracy and resolution of the tolerance compensation. This leads, in addition to the demands on tolerance compensation systems, to demands on sensor systems to monitor tolerance compensation and to perform essential measurement tasks. Chief among these are highly accurate measurement of:

- workpiece position and position deviations,
- angular deviations of the assembly axis,
- assembly force and moment,
- spring deflection paths of tool elasticities.

State of the Art

Since the beginning of the 1970s, many investigations of assembly methods and developments of assembly mechanisms have been conducted. The focus of the investigations and developmental research was tolerance compensation methods for conventional bolt and hole problems. The systems known to date operate with three different fundamental principles:

- measurement of position deviation and precision positioning,
- application of search strategies,
- elasticity of the assembly mechanism.

For precision assembly tasks, the known tolerance compensation systems [5, 6] have only limited suitability, because only assembly parts with diameters greater than 2.0 mm have been investigated and it has only been possible to achieve resolutions from 0.01 mm with pairs of items to be assembled with bevels and 0.02 mm without bevels. As yet, no tolerance compensation systems exist for assembly clearances less than 0.01 mm.

Development of Tolerance Compensation Processes

In addition to compensation for position errors in the x-y plane, tolerance compensation in assembly with vertical assembly movements also includes compensation for tip errors and assembly axes of the workpieces. These errors can be compensated for during insertion of the part added and the base part into each other by means of passive assembly aids (RCC = remote center compliance). However, the "search function" of the tolerance compensation system is of utmost importance to the control of precision assembly tasks. Consequently, a priority must be placed on investigating processes which permit compensation for position errors in the x-y plane.

The processes developed for tolerance compensation may be classified as regulated, controlled, or uncontrolled processes. Regulated processes process sensor data for the position deviation of the part added and the base part and then perform precise positioning. Crucial to the applicability of these processes to precision assembly tasks are the resolution of the sensors and precision positioning movements. Controlled processes compensate for position errors of the part added and the base part through specific search and position motions. The sensor outlay required is limited to recognition of

the target position in order to halt the search process. Uncontrolled process use the reactive forces during the action of an assembly force to perform tolerance compensation through appropriate elasticity of the assembly system. For this no sensors are needed. The applicability of uncontrolled processes is however limited to workpieces with bevels or requires mechanical assembly aids.

Furthermore, tolerance compensation processes are classified as first, second, and third order depending on whether the tolerance compensation occurs via the movements of a workpiece (first order), a tool (second order), or a manipulation device (third order). Compensation movements of the first order through direct movements of the workpiece in the force field (e.g., magnetic field) or in the flow field (e.g., suction and blowing) can only be performed with difficulty with current technology. Compensation movements of the third order require manipulation devices with very high resolution, which can only be obtained with great technical outlays and associated costs.

For sensitive assembly parts, tolerance compensation can only be performed with certainty with a regulated process with contact-free measurement of position deviation and subsequent precision positioning. Possible positioning errors due to production tolerances of the parts added are not included in this and can only be compensated for through prior straightening of the part added [7].

Generally, regulated processes require a large technical outlay for sensors and precision positioning and, because of the sensor data processing in mostly multiple iteration loops, require a clocktime which is not insignificant. Consequently, of the processes investigated, search strategies with workpieces vibrating relative to each other under the effect of an assembly force are best suited for the demands imposed on the tolerance compensation system.

Vibration-Assisted Tolerance Compensation

In vibration-assisted assembly processes, the oscillation pulses of a tool are transferred to a workpiece, and a specific area in the assembly plane—the tolerance compensation field—is searched until the joining force initiates the connection phase of the assembly process upon contact of the added part and the hole in the base part. During the connection phase, tilting of the added part and the base part can be prevented by continuing the vibration. Due to the smaller dimensions and weights of the part added compared to the base part, during tolerance compensation it is recommended to have the added part vibrate relative to the stationary base part. The more favorable dynamic behavior due to the lower weights to be moved permits greater amplitude of the vibrations and consequently

- larger tolerance compensation fields,
- shorter assembly process times,
- higher resolutions, and
- increased probability of joining

The principles of vibration-assisted search movements of the part added differ in type and direction of the oscillation pulse as well as the transmission of the vibration from the tool to the part being added. Depending on the design, there are vibration sweeps of the added part in the cross-sectional plane of the joint. The vibration sweeps of the center of the part added can be represented as trajectories of the search motion in the tolerance compensation field.

The surface of the tolerance compensation field TCF brushed over determines the size of the position deviations which can be compensated; the maximum distance between trajectories a_{TM}, the least possible clearance of the parts to be joined. The maximum search time and the resultant assembly process time, like the probability of joining, depends on the interplay of several search parameters:

- type of search movement,
- amplitude of the vibration frequency,
- overlapping of several vibrations, and
- regularity of the vibration sweep in the tolerance compensation field.

Spiral search movements are, of course, technically simple and can be implemented without great expense and enable compensation of large position errors, but permit only low vibration frequencies and large distances between trajectories a_T. The resolution attainable, maximum search time, and probability of joining do not satisfy the demands of precision assembly.

Tolerance compensation using irregular vibrations has already been successfully tested for the assembly of bent parts; however, the results are only partially transferable to the conditions of precision engineering and precision assembly. In particular, the assembly process time and the probability of joining are indefinite due to the irregular, haphazard search movements; and a distance between trajectories cannot be preset. Consequently, guaranteed compensation of clearances in the micron range is not possible.

Using two orthogonal linear vibrations with a slight phase shift or different frequencies, a vibration sweep which systematically searches the tolerance compensation field is created in the cross-sectional plane of the joint. The trajectories of the search movements form so-called Lissajous figures, which cover the entire tolerance compensation field like a grid. The amplitudes x and y of the linear vibrations determine the position deviations which can be compensated; the frequency ratio f_x/f_y determines the maximum distance between trajectories and, consequently, the least possible clearance of the parts to be joined. This and the absolute amplitude of the frequencies f_x and f_y yields the maximum assembly process time.

Theoretically, with the process, infinitely small clearances can be obtained, if virtually equal frequencies are selected. However, in practice, resolutions less than 1 micron can be obtained only with difficulty because, due

to the differing masses which must be moved in the x and y direction and the attenuations, the elasticity constants, and the vibration transfer behavior which cannot be exactly determined in advance, the tolerance compensation system always has a slight difference in the frequencies in the x and y direction.

Prototypical Robot Tool

To test the processes elaborated theoretically for vibration-assisted tolerance compensation and to determine parameters for use, a prototypical test tool was developed and produced. The tool consists of four plane-parallel plates which are disposed one over another and which can be moved in different directions relative to each other.

The top plate connects the tolerance compensation module with the bottom of the standard gripper exchange system with which the tool can be flange-mounted on the wrist of the industrial robot. The second plate can be moved in the x-direction relative to the top plate and the third in the y-direction relative to the second against leaf springs. Two compressed air vibrators drive the vibration movements of the second and third plates perpendicular to each other and permit frequencies up to 150 Hz respectively. Through the use of linear magnetic drives, piezotranslators, or electric motors with eccentric disks, even significantly higher frequencies may be obtained; however, the creation of a functional model requires significantly greater expense.

Even with the preferred solution with compressed air vibrators, it is possible to preselect the frequencies by the pressure applied to a manometer and the amplitudes using the volume flow of two chokes. The bottom plate of the tool has a parallel-jawed gripper with a gripper jaw changing system and can give way in the joining direction against the third plate through bent leaf springs applied on all sides and tilt around the assembly axis. Thus the spring deflection of the tool during the search phase can be monitored by a built-in proximity switch and at the same time compensation of the tipping of the part added relative to the base part can be made possible during the contact and connection phase of the assembly process.

The evolution of the vibration-assisted assembly process is characterized by alternating assembly motions of the industrial robot and search motions of the vibration tool. The robot positions the part to be added above the joining position of the base part and travels linearly in the assembly direction (z-axis) until the sensor responds to the spring deflection of the tool. This triggers the search movement by the vibration tool and continues it until the part added has found the hole in the base part and the spring deflection sensor switches off. Then the robot continues the assembly motion until the assembly process is completed. The assembly process can be interrupted again by a tilting of the part added in the hole. This is detected by the spring deflection sensor and compensated for by renewed vibration movements.

Testing

To test the process developed and the tool produced, a series of tests were performed in which cylindrical pins without bevels were to be assembled into holes also without bevels in a test plate with a clearance of less than 0.01 mm. Pins with diameters between 1.0 mm and 5.0 mm were used and tests were performed with position deviations from 0.1 mm to 0.6 mm. In all tests the pressure set with the manometer and the choke settings of the tool were varied and suitable frequencies and amplitudes of the vibration motions were measured empirically. High-speed photographs confirmed the findings previously derived theoretically. The process developed and the tolerance compensation system permitted assembly tasks with a clearance of less than 0.01 mm and position deviations of e = 0.5 mm in a search time of less than 0.3 seconds with a joining probability of virtually 100 percent.

The practical test of the tool was performed using the example of the assembly of a valve piston in a valve housing with a permissible clearance of 4 to 8 microns. The valve piston has four control edges without bevels, which are inserted in sequence into the housing during the assembly process. With the fourth control edge, four assembly points with a respective clearance of 4 to 8 microns have to be managed simultaneously. This so-called multipoint contact brings added difficulty to the assembly task. Because the piston also tends to tilt constantly because of the very small clearance, manual assembly is possible only with extreme sensitivity and is very time-consuming. In a series of tests with a Scara robot and the test tool which was developed, it was possible to assemble the valve piston with an assembly time of less than 3.0 seconds and a joining probability of more than 98 percent.

Outlook

The vibration-assisted tolerance compensation system developed is suitable for compensation of large position errors with clearances in the micron range for workpieces without bevels. The selection of frequencies and amplitudes permits simple and quick adaptation of the tool to different assembly tasks. In a next step, regulated processes must be developed for tolerance compensation for very sensitive workpieces, which enable tolerance compensation using sensor determination of position deviation and subsequent precision positioning without making contact with the workpiece.

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Switzerland: Status, Prospects of Machinebuilding Industry

92WS0591B Coburg MASCHINE & WERKZEUG in German Apr 92 No 8 pp 166-175

[Unattributed article: "Swiss Machinebuilding Industry at the Crossroads—No Alternative to the EC: In Principle Yes"; first paragraph is MASCHINE & WERKZEUG introduction]

[Text] Switzerland must pack its bags for a one-way trip. It is now free for adoption by the European Community. It can only be an act of self-preservation for it to change its spots and dress itself in economic egoism. Switzerland has its foot in the door for union with the EC with the EFTA [European Free Trade Association], in the meanwhile the EES [European Economic Space] will be a station. Its machine tool industry, far from mediocre, needs weatherproofing against hard times. In Europe, time is running out for the sector—Japan is already on the move.

On 5 May when the Duesseldorf Fairgrounds opens its gates for "Metav 92," two countries which otherwise occupy top positions do not head the list of exhibitors in this "Marketplace for Metal Processing": Neither the leader in worldwide export of machine tools, the Federal Republic of Germany, nor the largest machine tool producer in the world, Japan.

Instead, the chief contingent of exhibitors will be a major European producer of machine tools with 118 companies represented directly and indirectly: Switzerland. Italy follows with 111 exhibitors and Japan is next but far behind (55 exhibitors).

Because of their small domestic market, the Swiss are dependent on the flourishing of their export trade. The Swiss machinebuilding and metal industry brings in more than 60 percent of their export proceeds (in some areas even more than 90 percent). In addition to actual machinebuilding, this includes plant construction, the electrical industry, vehicle manufacture, and producers of instruments and apparati of extremely varied types as well as the electronics sector, which has now become increasingly important to virtually all sectors.

Mouthpiece for the Industry

The Union of Swiss Machinebuilding Industrials (VSM) thus speaks to a large extent for the capital expenditures industry in general. More than 500 member companies, which together employ roughly 200,000 workers, are united in the VSM. This corresponds to approximately two-thirds of all workers employed in this industrial sector. Thus the VSM is one of the largest industrial organizations in the country and representative of the entire branch.

From the standpoint of company size, the VSM is a reflection of the structure of small- and medium-sized industry in the Swiss economy: 19 percent of the member companies employ fewer than 50 workers, 61 percent between 50 and 499, and 20 percent 500 or more. The average work force of VSM member companies is 400. In terms of products and markets, and also in terms of company size, the Swiss machinebuilding industry is very heterogeneous.

Precision engineering has characterized the reputation of Swiss products in the markets of the world. The Alpine Republic is constantly concerned about this reputation. In the 1970s its watch and clock industry endured a debacle which should not be repeated. The ETH [Swiss Technical University] of Zurich has recently documented in an investigation that the competitiveness of the Swiss export industry was never seriously in jeopardy. One contributing factor in this—according to national adviser and professor of sociology in Geneva, Jean Ziegler—is the fact that "thanks to banking secrecy, numbered accounts, and free exchange operations, the Swiss financial market is a giant ... playground for the world's money jugglers."

This certainly compensates for the by no means optimal local factors in the Alpine Republic: High wage levels, significant capital costs, and considerable inflation. Stability might have required participation in the European Monetary System (EMS), but the Swiss are for the time being not interested.

Strong in One Sector

In fact the Swiss machinebuilding industry holds the worldwide lead position in various product areas. The machine tools group with its product catalog includes all the modern production processes. Swiss machine tools are used in demanding mold making (jig boring machines and grinders, erosion machines) as well as for those mass production processes which require high, consistent quality precision (grinding, sharpening, turning, gear cutting, non-cutting shaping, precision

stamping, etc.). The extent to which the Swiss machinebuilding industry is concentrated on machine tools is reflected in the number 1.02 percent: Its share of total industrial production in 1990. By way of comparison, this figure is only 0.55 percent in the Federal Republic of Germany, 0.33 percent in Italy, 0.37 percent in Japan, and 0.06 percent in the U.S.

In 1991 in Switzerland, 13,000 workers in 115 companies produced machine tools with a value of 3,643 million Swiss francs [Sfr]. This included Sfr2,790 million for cutting units and Sfr844 million for forming units.

The export figures are proof of its competitiveness. In 15 important countries, Switzerland has sold machine tools in recent years as follows: 1988—22,152 units at a value of 874 million German marks [DM]; 1989—36,827 units at a value of DM1,020 million; 1990—90,336 units at a value of DM1,163 million. Domestic consumption (defined as the difference between production and exports, plus imports) was DM604 million in 1988; DM1,600 million in 1989; DM1,910 million in 1990; DM1,620 million in 1991.

Of the total exports of the sector in 1989 valued at Sfr37.2 billion, Sfr21.7 billion (58.3 percent) went to the 12 countries of the EC. In contrast, machine imports into Switzerland from the EC amounted to approximately Sfr15 billion, which represented 36 percent of all imports (Sfr41.1 billion).

Always Up and Down

With capacity utilization of approximately 90 percent, growing orders from abroad (up 18.6 percent in 1989 compared to the previous year), and a 7.7 month supply of orders in hand (6.9 at the end of 1988), the sector entered the 1990s "at full power."

From an economically and competitively dominant position, the more intense competition after the introduction of the single EC internal market should catch on confidently. Because the EC market, with a share of approximately 60 percent, is the largest market for the Swiss machinebuilding and metal industry.

However, the annual results of the Swiss machinebuilding and metal industry have never been completely without fluctuations in recent years. Actually in 1990, the beginning of the year was brilliant, then domestic orders melted by 12.7 percent and orders in hand dropped from 7.2 months at the end of 1989 to 6.1 at the end of 1990. There was still growth of exports in the EC by 10.2 percent, in EFTA countries by 8 percent, to the U.S. by 8 percent, to Latin America by 2 percent, to Asia by 12 percent, and to Africa by 3 percent.

In all economic regions of the world, there was a decline in the export of Swiss machine tools from 1990 to 1991. In Europe it totaled -12.4 percent (including -7.9 percent in the EC and -29.6 percent in the rest of Europe), -3.7 percent in Asia (including -11.1 percent in Japan) and -11.9 percent in the U.S.

All years prior to that still demonstrated growth rates in Swiss exports, which, for example, in the EC last stood at 22.4 percent, at 16.5 percent for Japan, and 10 percent for the U.S. The economic slump was unexpectedly fast and massive in all machine tool markets, and thus for Switzerland as well.

Customer and Competitor

When 1991 began, the year 1990 for VSM had gone "well as a whole." However, this statement "certainly takes into account" the fact that the 1990 inflation rate in Switzerland had climbed to 6.4 percent. The Swiss franc suffered from overvaluation and was also exposed to large rate fluctuations. Consequently, there were losses in market shares abroad. However, in 1991 the Swiss managed to curb the retrogression in the economy, although there were isolated plant closures. Unemployment also rose to 1.1 percent—still atypical for Europe, but a maximum since 1985 in the absolute number of 40,000 unemployed.

When the cost situation of companies in the FRG was aggravated for social and labor policy reasons (introduction of workweeks between 35 and 38 hours), the Swiss machinebuilding and metal industry came into a more favorable competitive situation.

In the past year of 1991, cutting machine tools with a value of Sfr2,419 million and shaping machine tools with a value of Sfr731 million went into exports. In all this was a share of 86.6 percent of domestic production. Machine tool imports in 1991 were on the order of Sfr884 million and thus covered 64.8 percent of domestic consumption.

With Sfr1,042 million in 1991, the FRG was by far the largest purchaser of Swiss machine tools. France was far behind with only Sfr288 million, ahead of the U.S. with Sfr279 million, Italy with Sfr229 million, Japan with Sfr176 million, and Great Britain with Sfr136 million.

The FRG was also the leader of the pack in suppliers of machine tools to Switzerland: With Sfr438 million, ahead of Italy with Sfr124 million, Japan with Sfr91 million, France with Sfr79 million, Great Britain with Sfr32 million, and the U.S. with Sfr17 million.

Machine Champions Today

Because, with a contribution of approximately 45 percent of the total export of goods from Switzerland, machinebuilding is the country's largest export sector and the largest employer with almost one-half of all workers in the industry, according to VSM President Wolfgang Marti, one thing is certain: "Without a flourishing export industry Switzerland would still be a developing country as it was 100 years ago when tens of thousands were unemployed and had to emigrate to all parts of the world."

In the 19th century when old industries disappeared in Switzerland and new, larger ones emerged, there were

major conflicts between the industrial workers of the period and the companies. They were not directed against long working hours (it was not until the first federal factory law of 1877 that the maximum work week was set at 65 hours) and low wages, but simply against modern technology, against the machines which threatened to replace working hands.

The most vivid demonstration of this came on "Uster Day" in 1830. That day a ban on mechanical looms was demanded by the people. Two years later when nothing had happened under the law, a spinning mill in Uster was set on fire and on an "Uster Day," as a signal of taking matters into one's own hands. "They promised us to get rid of the machines but did not keep this promise," said the arsonist. "We owe it to ourselves and to our children to destroy the machines because they are stealing our income." One hundred sixty years later: Industry long ago took the creative hands from once dominant agriculture (whereas around 1800, 65 percent of the population were farmers, the figure is now only 11 percent), and earnings are so good with the despised machines that "salary expenditures almost exceed what the companies can bear," according to GF administrative board member Dr. Hannes Goetz.

Going It Alone is a Lost Cause

Switzerland is a member of the EFTA. When talks began in June 1990 between Switzerland and the EC about a common European Economic Space [EES], many Swiss sensed an opportunity. However, in 1990 heated discussions developed about a stronger connection with Europe between the supporters of a politically and economically independent position for Switzerland and the advocates of a policy linked to the EC.

In light of their problems Swiss exporters, led by representatives of the machinebuilding industry, are considering closer dependence on the EC since it remains its best customer. Approximately two-thirds of Swiss machinebuilders were no longer making any real profit in the first half of 1990. An investment boom in Western Europe as a "fitness program" for the introduction of the EC internal market would be the guarantee of having full order books again. Then, a rethinking process set in rapidly, touched off by the official celebration of the 700th anniversary of the Swiss Federation in June 1991. The memory of the mutual assistance pact concluded in the summer of 1291 between the cantons of Uri, Schwyz, and Unterwalden gave impetus to the progressive strategists.

VSM president Marti expresses what is expected from Switzerland's participation in the EES and even in the EC as follows: "It is obvious that the extremely export-oriented Switzerland would inevitably have to fall behind without discrimination-free access to the Western European Economic Space." In another place, Marti thinks it would be "truly grotesque if in the era of the emergence of Europe, the so-called option of Switzerland going it alone were taken."

Precisely for the Swiss machinebuilding industry, a refusal of the EES or the EC could not rule out a set of technological discriminatory actions. If, however, within the EC technical obstacles are also constructed, then as a member Switzerland would be protected by the mutual recognition of standards.

Brussels is in a Hurry

The fact that within the framework of an EES treaty in record time some 60 Swiss laws had to be changed is for many Swiss an uncomfortable image where they would like radical changes of all kinds to move more slowly.

In the country the enormous amount of time needed for results of a political decisionmaking system with direct Swiss democracy does not match Brussels' tempo. Nevertheless, Switzerland can no longer avoid a political anchoring with the EC, even if it means the loss of national jurisdictions.

In a referendum at the end of 1992, the citizens of the country must decide whether they want to step beyond the EES into full membership in the EC. This decision exposes the country to a really crucial test. Its beloved referenda would then only be possible in those areas which the EC permits them.

The economic integration into a greater European community is already anticipated in many ways. But to move from national sovereignty to European sovereignty requires a response to the difficult question: How much of their own sovereignty must be surrendered under these circumstances? In terms of the entire economy, Swiss industry has always valued free economic development potentials.

Frightening EC

The colossus of the European Community seems strange and threatening to many Swiss. The current dictatorship in Brussels does not match their expectations. In contrast to their country, the Swiss see the EC as absolutely undemocratic. They feel that Brussels' interest is exclusively in free traffic in goods, capital, services, and workers.

Nevertheless, 57 percent of French speakers and 33 percent of German speakers want to be involved in the integration adventure with the EC. Thus, in June 1991 the Swiss Council of Ministers solemnly declared its intention to join the future European Economic Space between the EC and the EFTA countries.

The fear of economic policy makers is deep-seated about Brussels' charges that the Swiss only wanted a free ride, to profit from the large market, but not to sacrifice any independence themselves.

Representatives of the machinebuilding industry see the benefit primarily in further intensifying the treaty network with the EC and its members. According to Jean Ziegler, "Europe must save Helvetia. The sooner, the more radical the integration, the better."

For the Swiss machinebuilding and metal industry beneficial impulses could also come from the eastern European area and the volume of investment opening up there could initiate follow-up orders through Germany as well.

Danger From the Outside

The coalescence of the machine tool industry in Europe is increasingly intensive and further stimulated by the Common Market. The Swiss machinebuilding industry has a dominant position internationally, its economic engine is foreign trade, and its major products are (in addition to chemicals) first quality machines. After a recessive economic situation since 1983, 1992 is expected to bring a slight economic recovery.

That will be necessary since the common internal market increases the prospects for success of the Japanese among others. They have arrived in Europe with their campaign for conquest of the machine tool industry. The competitiveness of Swiss manufacturers must be demonstrated in this crisis. For the Swiss who were once strong in exports to the East, the collapse of the eastern markets is an additional difficulty. The Japanese are countering the structural problems, particularly in the large European manufactures, with adaptable structures and strong financial reserves. Their sales returns in the double digit range during "fatter" years afford them broader price latitude and significant financial staying power.

In Europe, structural problems and management errors in the past were masked by the booming economy; adaptability lacked the necessary urgency. Plant closures in Switzerland occurred because the financial reserves to weather a long fight for existence were lacking.

Nothing Without Fanuc

The Japanese campaign to conquer Europe is in full swing and is advancing from three sides at the same time: Through imports from Japan (the Japanese delivered machine tools to Switzerland with a value of DM15.2 million in 1988, DM17.8 million in 1989, and DM22.1 million in 1990), through imports from Japanese subsidiary plants in the U.S., and through production sites of the individual manufacturers in Europe.

The Swiss machine tool industry is in the same situation as the industry in Europe, suffering from increasing loss of competency in key technologies and components. The semiconductor industry in memory chips is firmly in Japanese hands, and that of microprocessors in American hands. "The European machine tool producer who wants to be successful with standard machines in the United States or in Southeast Asia can hardly do without Fanuc anymore," is the opinion of the UMB Unternehmensberatung Munich GmbH.

Because of the fact that in the new German federal states, the machine tool capacities are not internationally competitive from a market-economy point of view, the Swiss industry anticipates only a slight impetus from eastern Germany. Instead, it is focused on its internal market.

Transportation Stimulant

Here according to information from VSM, an increase in forces of domestic production in the second half of 1990 was caused by large orders from the transportation and energy sector. Things are happening in this sector in Switzerland: In mid-1993 construction of new railroad tunnels under Saint Gotthard (length 49.3 km) and Loetschberg (length 28 km) is supposed to begin. However, the so-called Neat (New Railroad Transversals) valued at Sfr24 billion were still contested as late as mid-1991.

Another imposing transportation project is based on truck traffic through Switzerland. At the beginning of 1991, the EC Commission demanded the opening of a transit corridor for trucks up to 40 metric tons and made the integration of the EFTA into the European Economic Space, among other things, dependent on it.

As a condition for joining the EC, on the other side in March 1991 one of the Swiss political parties required the Swiss to establish the limit for truck traffic through the Alps at 28 metric tons, among other things. This dispute is still smoldering.

Such a fiscal policy of the public budget with domestic demands could very well counteract a slack recovery in the Swiss machinebuilding industry. According to the Basel Team for Economic Research (BAK) this is anticyclic and completely desirable.

Switzerland took the offensive when in 1991 it was a partner country in the Hannover Fair. The fact that in 1991 the 700 year existence of the Swiss Republic was also celebrated was the breakthrough of a new realization: For the long or the short term, Switzerland can only survive jointly in the European household. If it keeps to itself, it will perish.

Siemens Invests in New Facilities for Automation Technology

92WS0593A Duesseldorf HANDELSBLATT in German 1 Jun 92 p 14

[Unattributed article: "Simatic World Market Leader in Controls: Siemens Automation Technology/DM180 Million for New Production Facility in Amberg"]

[Text] Munich, 30-31 May (Handelsblatt)—With Simatic stored program controls Siemens Automation Technology Division in Nuremberg is number one worldwide, far ahead of the second competitor, according to division chairman Guenter Wilhelm. Siemens AG has been able to expand this market position even farther in recent years despite some significantly better basic economic conditions in other countries, primarily in Japan.

The Japanese competitors must however be taken seriously, stressed Wilhelm. Since 1983, the largest Japanese manufacturers of stored program controls have moved up from sixth and eighth place to second and third. Wilhelm attributes the strength of Japanese competition primarily to the large difference in capital costs, working hours, and labor costs, but also to the different behavior of Japanese workers compared to their German counterparts.

Nevertheless Wilhelm is not pleading for uncritical adoption of Japanese working conditions. He did however speak out in favor of more worker discipline and higher quality consciousness as well as stronger identification with work in Germany. At the time of the presentation of the new production hall in the Amberg/Oberpfalz electronics plant, Wilhelm warned against additional reductions in working hours and recommended higher flexibility.

In the Amberg plant, Siemens produces the smallest automation system in its performance class in the Simatic product group. A total of approximately 120 million German marks [DM] have been invested in the new production hall, and an additional DM60 million in a new office and lab building. Wilhelm characterized the Simatic devices as the "backbone of automation," for example, of assembly lines in an auto factory or in the blast furnace area of a steel mill. They are also used in machine tools and packaging machines. But small controls from Amberg also control carwashes, garage doors, and escalators. With Simatic Systems Siemens is reportedly achieving annual sales of approximately DM2 billion. Of this a significant portion originates in the Amberg plant, where approximately 1,000 workers are employed. No less than 200 of these people work in development. Siemens AG's Automation Technology Division has a total of 20,000 employees, who achieved sales of almost DM6 billion in the 1990-91 fiscal year (September 30).

MICROELECTRONICS

EC: Competition Seen for JESSI SMI in Custom Chip Design

92BR0425 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 30 Apr 92 p 10

[Article by Didier Girault: "Two European Projects Are Competing in the SME [small and medium-sized enterprise] Market"]

[Text] Just as QuickChips is entering its commercial phase, IndChip, the other ESPRIT [European Strategic Program for Research and Development in Information Technology] project, is making approaches to JESSI [Joint European Submicron Silicon Initiative] SMI [small and medium-sized industry] to establish a competing European network for ASICs [application-specific integrated circuits].

Complementarity or overlap? Two European ESPRIT projects expected to promote the use of application-specific circuits among SMEs [small and medium-sized enterprises] (some 25,000 in Europe) are having a go at each other for the design and manufacture of ASICs. QuickChips, a project for small-batch manufacture of ASICs started by the German subsidiary of Lasarray (a Swiss manufacturer of mini-fabs [as published] designed for direct writing systems by laser), is now entering the commercial phase. For this purpose, a private company called QuickChips will be set up in Luxembourg in June 1992. Its stock will be owned by Lasarray and several of its partners in the project, as well as by some chip founders, such as Siemens. QuickChips has already begun to set up a European network.

In June 1992, IndChip, an ESPRIT project for SMEs devoted to manufacturing prototypes (10 units) will be officially renamed Chip Shop. Chip Shop and JESSI SMI Support are coming in closer contact as they use the same institutes and universities to act as intermediaries toward SMEs. This will give Chip Shop access to an existing infrastructure, since JESSI SMI Support uses the same centers as those used for three years within the framework of the EuroChip project. EuroChip is identical to Chip Shop except that it is concentrated on universities. Recall that the aim of JESSI SMI Support ("Jessica" is the name of the French subproject) is to provide training, information, and support to SMEs in the area of ASICs.

Chip Shop Will Rely on Existing Centers in Each Country

QuickChips denies that it is competing with Chip Shop; its backers emphasize that QuickChips deals not only with prototypes, but also with low-quantity orders (less than 500 units). However, if Chip Shop's aim is to satisfy demand for prototypes, its partnership with JESSI SMI Support will certainly smooth its transition toward mass production. And this is what QuickChips is telling its customers that it can offer. Moreover, the commercial organization of QuickChips, on the one hand, and the "JESSI SMI Support + Chip Shop" venture, on the other, are both stressing the large range of technologies that they can service: bipolar technologies, complementary metal-oxide semiconductors [CMOS], and bipolar CMOS [BiCMOS]. Chip Shop will also be able to produce application-specific circuits in gallium arsenide.

Chip Shop is dependent on a dozen or so European centers (LETI [Laboratory for Electronics and Information Technologies] in France, the Fraunhofer Institute in Germany, the Rutherford Application Laboratory in Great Britain, the Microelectronics Center in Holland, and IMEC [Interuniversity Microelectronics Center] in Belgium) that are responsible for the collection of orders from SMEs. The orders are forwarded by these centers to a centralized agency, made up of seven individuals. This agency will negotiate with chip foundries (seven or eight) that can process prototypes, either by using dedicated processes (ES2 [European Silicon Structures]) or by

adopting a multiproject technology (CMP [multiproject circuit]) on the premises of the larger founders (SGS-Thomson, MIETEC [Microelectronics Technology Center]). By centralizing orders emanating from SMEs, Chip Shop hopes to become a strong spokesman vis-a-vis these founders. Lasarray disputes this argument, maintaining that the large founders cannot process small volumes.

Up to 5,000 Units for Minifabs

The development of phase three of the QuickChips project, which is conducted within the scope of ESPRIT III, is expected to last two and a half years. This is a commercial phase, thus it receives no EC funding. In June 1992, a company named QuickChips will be set up in Luxembourg by Lasarray and Italtel Sit, partners in the previous two phases, together with new allies (an English and a German design company) and the founders (including Siemens). In addition, together, Lasarray's partners (Italtel Sit; the Portuguese INESC and CPRM [Portuguese Radio Marconi Company], a subsidiary of Marconi; Belgium's IMEC; Germany's IMS [Fraunhofer Institute for Microelectronic Circuits and Systems]; and Intracom and the University of Patras from Greece) have the intention of establishing a three-tiered organization.

The head office will work on the integration and maintenance of software originating with third parties; via satellite links, it will act as a liaison office between the prototype manufacturing centers (one each in Germany, Great Britain, Italy, Belgium, and Greece). The national centers for prototype production will be equipped with minifabs (Fr35 million to Fr40 million, each) to effect the final metallization of the silicon wafers purchased from the founders, at first in 1.2-micron technology, and by 1993 in 0.8-micron technology. These minifabs, completed during phase 2 of the program, can deal with gate-array or sea-of-gates circuits with a maximum complexity of 100,000 gates and carry out the packaging test. In the beginning, only Portugal will have a slightly different production center. All of them will collect the data produced by the secondary centers, whose network is being set up. National centers will communicate with one another by satellite and with the secondary design centers via high-speed telephone lines. These design centers have CAD [computer-aided design] equipment. They will sustain the libraries of silicon foundries and offer training and technical assistance to customers. Thus, the commercial organization of QuickChips proves to be completely competitive with the "Chip Shop + JESSI SMI Support" venture, both with regard to targeted customer base and the facilities it intends to offer them.

Belgium's Mietec Expands Submicron Products

92BR0445 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 7 May 92 p 10

[Article by Francoise Grosvalet: "Mietec Opens Department for High-Voltage BiCMOS Multiproject Circuits"]

[Text] At the end of a "good year" 1991, the semiconductors branch of the Alcatel group obtains the funds to meet increased demand in submicron technologies.

For Mietec [Microelectronics Technology Company] Alcatel, 1991 was a "good year." The company saw sales go up by about 16 percent to $105 million (sales outside the group representing 30 percent) and remained profitable; it started up the first portion of its second submicron plant; it remains the first European manufacturer of specific circuits in hybrid technology (and the second worldwide after Dataquest); and it received the ISO 9001 certification for all its design centers and its plant. This year promises to keep up. Construction of the first 1,500 m^2 portion of the submicron plant has been completed now, and the first prototypes in 0.7-micron CMOS [complementary metal oxide semiconductor] technology are expected by the end of the year. Completion of the entire plant is expected by mid-1993. This production line will have an annual production capacity of 60,000 150-mm wafers and require ECU85 million (about 580 million French francs [Fr]) in investments. Moreover, Alcatel's semiconductors branch has just opened a new department. It has upgraded its high-voltage BiCMOS [bipolar CMOS] circuits with multiproject circuit (MPC) technology. This technology consists in combining several types of circuits on the same wafer for production. This service has been available until now for CMOS technologies and offers certain advantages in both reduced costs (the masks and manufacturing costs—$1,300 per level—are spread over several projects) and flexibility of utilization. In fact, it can be used to evaluate the technical feasibility of a new design (certain elements can be checked during the preliminary study phase, before a more complex development is undertaken, and several options can be assessed during the design phase). Furthermore, the multiproject circuits are manufactured on the same lines as those used for large-scale production. This assures a certain continuity for users.

Three CMOS Generations at the Same Time

According to Jean-Pierre Liebault, general manager of Mietec, there is currently a genuine increase in demand of submicron technologies for reasons of size, performance, and consumption.

In order to upgrade the technologies based on the design rules available within JESSI [Joint European Submicron Silicon Initiative], Mietec has signed an agreement with IMEC [Interuniversity Microelectronics Center] of Louvain. The Belgian company develops the basic building blocks that will be assembled on a Louvain-based Mietec pilot line. Circuits in 0.7-micron technology have already been made on this line; 0.5-micron circuits should follow by late 1993 (late 1995 at Mietec). Mietec will then have three CMOS generations at the same time and will be able to make up some of its lag with respect to manufacturers who already produce in 0.5 micron.

France: Philips Operates 0.8-Micron ASIC Foundry

92BR0517 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 28 May 92 p 23

[Unsigned article: "Foundry Services in 13-GHz BiCMOS Technology"]

[Text] Philips is completing its product line for ASICs [application-specific integrated circuits] by opening up a foundry service for its 0.8-micron BiCMOS [bipolar complementary metal-oxide semiconductor] technology, whose bipolar portion has a typical 13-GHz cut-off frequency. This technology is in the process of being transferred to the industrial center at Caen, France. The remainder of Philips product line is primarily based on 1-micron CMOS technology, of which the libraries have recently been upgraded with bus control functions for automotive applications, with multimedia terminals, and with derivatives of the 80C51 class of microcontrollers. In addition, the company has developed a significant number of complex analogical functions.

"EuroAsic" Conference Evaluates Trends in ASIC Development

92BR0553 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 11 Jun 92 p 6

[Article by Francoise Grosvalet: "Programmable Gate Arrays Increase Their Influence"]

[Excerpt] Although, in terms of sales, their market still ranks low in comparison to that of gate arrays and standard cell circuits, programmable gate arrays are increasingly gaining ground on traditional application-specific circuits [ASICs].

Although the sales value of ASICs (apart from field programmable gate arrays [FPGAs]) increases by 15 to 20 percent per year irrespective of the overall industrial climate (in France, the increase was 15 percent in 1991, with sales totaling 500 million French francs [Fr], and it is expected to be between 15 and 20 percent this year), the number of new designs initiated each year remains relatively stable. In France, the number of gate array or standard cell designs is estimated at approximately 500 per year.

Slightly Higher Participation at the 'EuroAsic' Show

Jeff Schlageter, vice president of Alcatel, estimates that, at the international level, the annual number of new programmable-gate-array designs ranges between 30,000 and 50,000 circuits, i.e., twice to three times the number of traditional gate-array designs. Fujitsu, the world leader in ASICs, anticipates an annual market growth of approximately 10 percent in terms of new circuit designs (apart from programmables), resulting in some 5,000 new ASIC designs for the whole of Europe.

The growing complexity of ASICs is at the root of the difference between the number of designs and the sales value of the sector. Fujitsu expects the average complexity (currently estimated at some 20,000 gates) to double every two years; Daniel Tanniere, ASIC manager at NEC, sees two types of demand today: one for 5,000 to 7,000 gates; the other for 20,000 to 30,000 gates.

To J. Schlageter, this near-stagnation of the market in terms of the number of designs is representative of the fact that, ultimately, ASICs have not been the success predicted a few years ago due to their relatively difficult implementation, their cost, and their high failure rate. Moreover, this can be seen by simply comparing these figures with the number of new printed circuit designs (460,000 worldwide in 1990). This is only one step away from announcing that programmable gate arrays will be a major advance in the field of ASICs in the future, and J. Schlageter and others are eager to take that step: "FPGAs represent a relatively low-cost and low-risk entry point in the ASICs market," they say.

The above figures may explain why users were not exactly queuing up to get into the EuroAsic show last week at the CNIT [National Center for Industry and Technology] at Paris-la Defense. The figures announced by the organizers—1,500 visitors recorded over the three days plus 243 who signed up for the conferences—only represent a slight increase on the last show.

NUCLEAR R&D

France, UK Operate Highly Sensitive Gamma-Ray Detector

92BR0518 Paris SCIENCES ET AVENIR in French Jun 92 p 12

[Text] What exactly occurs within the nucleus of an atom during its long and tortuous quest for stability? Eurogam, the most sensitive gamma-ray detector in the world, could be instrumental in answering this question. Designed, built, and put into service in two years' time pursuant to an agreement signed in February 1990 between the British SERC [Science and Engineering Research Council] and the French IN2P3 [National Institute for Nuclear Physics and Particle Physics] of the CNRS [National Center for Scientific Research], Eurogam was put into operation at the Daresbury Laboratory in the United Kingdom on 14 April 1992.

Gamma-ray spectroscopy makes it possible to examine the dynamics of the atom's nucleus: An unstable nucleus, resulting from the fusion of two others during reaction, regains its stable state through successive energy losses caused by series of emissions characteristic of gamma rays. Eurogam will enable researchers to observe these sequential emissions and identify the corresponding intermediate stages through which the nucleus passes.

Initially, Eurogam's cost (55 million French francs [Fr]) was funded equally by the two organizations. Initially, it will operate in the Daresbury laboratory. Subsequently, in April 1993, it will be installed in Strasbourg alongside

the Vivitron, the most powerful electrostatic accelerator now in operation, designed by the Strasbourg Center for Nuclear Research.

Netherlands To Join European Synchrotron Radiation R&D

92WS0661N Zoetermeer SCIENCE POLICY IN THE NETHERLANDS in English May 92 pp 23-24

[Article: "The Netherlands To Take Part in Radiation Research"]

[Text] Together with Belgium, the Netherlands is to join the European research effort in the field of synchrotron radiation. The Minister of Education and Science, Dr. J.M.M. Ritzen, signed an agreement in Parts on Monday 9 December 1991, pledging an annual contribution of around 3.5 million guilders. Synchrotron radiation has become an important tool for research in the fields of chemistry, physics and the life sciences.

The agreement signed in December follows an earlier agreement concluded three years ago between France, Germany, Britain, the Scandinavian countries, Switzerland, Belgium, Spain and Italy to build the European Synchrotron Radiation Facility, or ESRF for short. The ESRF, which is an important addition to existing facilities of this kind in Western Europe, is due to become partly operational in early 1994 and fully operational a few years after that.

Synchrotron radiation produces the right kind of energy for studying the bonding of atoms in molecules and crystals. This will enable scientists to examine the structure of solid matter and molecules and improve our understanding of such diverse topics as the processes of life and the way in which semiconductors and superconductors work.

The Netherlands and Belgium will together contribute around 6 percent, or 7 million guilders a year, of the facility's total funding for the next 20 years. Of the 3.5 million guilders to be contributed by the Netherlands, 1.9 million will come from the Education and Science budget and 1.6 million from the Netherlands Organisation for Scientific Research (NWO). The costs and benefits will be shared equally between the two countries unless one enjoys a much greater academic or industrial return on its investment than the other.

In 1988 the Dutch Government decided against taking part in the project independently because the contribution the Netherlands would have to make was too high compared to the expected benefits for Dutch science. Although Belgium signed the agreement in its own right in 1988, it was still interested in joint participation with the Netherlands. The Dutch Government therefore decided to join forces with Belgium. Each now pays a lower contribution to ESRF than if each country contributed independently. Another argument which persuaded the Dutch Government to join the ESRF research effort was the need to secure a place for the Netherlands in the European research infrastructure. The country cannot afford to lag behind in the development of new large-scale facilities of this kind. International cooperation in scientific research is becoming more and more important, especially given the chance that such facilities might be built in the Netherlands.

Belgium and the Netherlands will alternate in supplying delegates to the various councils and committees each year, starting with Belgium. This will be organised in the Netherlands by the NWO. The ESRF has since invited the Netherlands to appoint observers to the councils and committees, prior to their obtaining delegate status. Moreover, the Dutch specifications are to be used for the design of the experimental facilities, and an order for equipment has already been placed in the Netherlands.

TELECOMMUNICATIONS

ISDN Status in Belgium Assessed

92BR0358 Antwerp DE FINANCIEEL-EKONOMISCHE TIJD in Dutch 22 Apr 92 p 17

[Article: "ISDN Status in Belgium Assessed; 'Second Phase' To Start This Year"]

[Text] (TIJD)—Do you also think that Integrated Services Digital Network or ISDN technology is completely new in Belgium? In that case, you are quite mistaken. The so-called first commercial phase of ISDN began on 28 June 1989; the second phase begins mid-1992. On the occasion of the TMAB conference, Chief Engineer and Director David of RTT [Telephone and Telegraph Authority]/Belgacom wrote a report summarizing the situation of ISDN in Belgium and we also spoke with Hughes De Stommeleir, technical and commercial advisor for ISDN at the RTT.

In the first phase of ISDN, both basic access (or BA) and primary rate access (or PRA) were available. The BA connection consists of two 64 kbit/s full-duplex channels and one 16-kbit/s full-duplex channel or, in ISDN terminology, two B-channels and one D-channel. Full duplex means that simultanous data traffic is possible in two directions along the same connection. A PRA connection consists of 30 B-channels and one D-channel; it is especially suitable for interconnecting large telephone exchanges, computers, or local networks.

The RTT is offering both access modes in Belgium; it also provides ISDN connections with France, Great Britain, the United States, Japan, Germany, the Netherlands, Sweden, Norway, Denmark, Switzerland, Finland, Australia, and Singapore. By mid-1992, Euro-ISDN, the European standard, will also gradually be introduced in Belgium.

First Phase

In its first phase, which is currently still in effect, the Belgian ISDN network consists of Brussels-based telephone exchanges and a number of concentrators which

can be installed throughout the country. They are connected to the exchanges via 2-Mbit/s transmission systems. ISDN subscribers with a BA connection are linked to the network by means of such a concentrator—a logical solution since the length of a BA connection is limited to maximum 8 kilometers. These concentrators make it possible to service areas which are located beyond the range of the three exchanges. The exchanges themselves are interconnected via bundles of several 2-Mbit/s systems, each consisting of 31 64-kbit/s channels. Each exchange is connected to the existing telephone system and the DCS [Data Carrier Service] packet switching network.

As part of this first phase, Belgian ISDN offers both circuit and packet switching as well as bearer services. These are basic services involving the installation, supervision, and termination of connections between terminals. All these services can be supplied upon request or on a semipermanent basis. Traditional telecommunications services, such as telephone, telefax, teletex, and videotex, are also available via the ISDN network, including all possible supplementary facilities: closed user groups, identification of the caller and the called person, secret numbers, direct dialing, restrictions on outgoing calls, etc.

How Much Will It Cost?

Besides the one-time installation cost of 12,000 Belgian francs [BFr] for basic access, rates seem to be reasonably flexible since figures under the heading "other rates" had been neatly erased in Mr. David's report. The rate structure is a lot clearer with respect to primary access connections. The monthly rental rate for PRA costs BFr28,200 on average, allowing some fluctuations depending on duration. This includes all circuit-switched services. An additional BFr6,000 is to be paid if packet switching is required. Supplementary services cost a further BFr150 to BFr500, depending on the use. Connection costs for circuit-switched applications amount to BFr6 per time unit for domestic connections between ISDN subscribers (some 20 percent higher than standard telephone rates) and BFr7 for international connections. Regular telephone connections with other subscribers remain unchanged at current telephone rates. User costs for packet-switched calls are BFr1.25 per 30 seconds, or approximately BFr1 per 25 kbits.

To launch ISDN, the RTT is offering special promotion rates whereby subscribers do not have to pay the rental fee for the first six months of the agreement. The campaign runs until mid-1992, when the second phase of the Belgian ISDN program is scheduled to start. In the meantime, the RTT has already approved a whole range of appliances for use in the ISDN system from domestic and foreign manufacturers.

Applications

The most widespread ISDN application is file transfer, whereby the user is able to transmit large amounts of data at low cost. A file consisting of some 300 A4 [European size] pages can be sent anywhere in Belgium within 40 seconds and for as little as BFr6. Group-4 fax machines can also be hooked up to the network, allowing a page to be transmitted at digital quality in a matter of seconds. High-quality and high-speed transmission of still and moving images will also be possible using a special scanning process. Videoconferencing, both locally and internationally, will really be feasible with this system.

The second phase, which is to start in mid-1992, will use the Euro-ISDN standard in accordance with the European Memorandum of Understanding on ISDN. From then on, ISDN will gradually become available throughout the country—85 percent with direct connection and 15 percent via concentrators—and international connections within and beyond Europe will also be opened. At that stage, the range of services is to be widely expanded, but perfect compatibility between phase 1 and phase 2 will be guaranteed at all times (including the terminals).

This is the Achilles' heel of the system at the moment, as many terminals used in the different European countries are incompatible. Moreover, the European market is very weak and this has resulted in a limited choice and high prices. Once Euro-ISDN is implemented, standard European specifications will apply in all European countries for both terminal equipment and approval procedures. The faster Euro-ISDN breaks through, the higher the increase will be—in diversity and number—of available terminals and applications, and the faster prices will drop, thus gradually bringing ISDN within reach of everyone.

British Telecom To Expand Global Data Services

92BR0465 Amsterdam COMPUTABLE in Dutch 15 May 92 p 7

[Article by Roel Mazure: "BT Puts 700 Million Guilders Into Global Network Improvement; Expansion in Number of Nodes and Frame Relay Service"]

[Text] Amsterdam—British Telecom (BT) is investing 700 million guilders over the next three to five years in the expansion of its worldwide network for data transport. The company seeks to increase the number of countries where it has its own access points. In addition, BT is heading toward being able to satisfy the demand for greater data communications capacity in 14 countries, including the Netherlands, by offering a network based on frame relay.

BT's expansion plans are intended to increase the number of countries which are directly accessible via its own Global Network Services (GNS). According to P. Morley, manager for BT's marketing programs, it is BT's intention to hook up 62 countries to the data communications network within two years. At the moment there are 23.

Expansion

According to Morley, BT can accommodate the wishes both of existing customers and of prospects with these plans. "We cover about 90 percent of the data communications needs of our customers with the present size of our GNS," he said. "But companies, particularly those operating multinationally, are expanding into even more countries. The need for data communications to these countries is also increasing."

The former East Bloc constitutes a primary target in these plans. In the short term, BT hopes to be able to have direct access to Czechoslovakia, Hungary, and Russia. The other eastern European countries will follow later. A second target in the plans is the southeast Asian countries such as South Korea, Singapore, and Taiwan. Morley finds expansion to these countries particularly important because of the advantages that can be gained over U.S. competition.

The expansion plans are directed not only toward increasing the number of countries where end-to-end services are available, but also toward extending the number of direct access nodes in those countries where BT is already present. This plan was inspired by the rates of local PTTs [Post and Telecommunications Authorities] for establishing a connection to the available BT access points. Morley gave Germany as an example, where the distance to a BT node is often great and therefore expensive. By establishing more nodes, BT hopes to make its network more attractive to potential users. BT is to extend its nodes in the Benelux countries from seven to 11 in the coming years.

Frame Relay

In order to be able to satisfy the demand for larger communications band widths, BT intends to extend its frame relay service during the coming year. So far, this service has been restricted to England, the United States, and France. "Before April 1993 we will have frame relay available in 14 countries, including the Netherlands," according to Morley, who continued by saying that the demand for this faster technique is growing. "Companies want to have frame relay links to interconnect local networks. In addition, it is the most appropriate technology for transmitting large amounts of data." Morley instanced data exchanges from CAD/CAM [computer-aided design and manufacturing] applications. However, according to Morley, frame relay will never be a full substitute for X.25 systems. "The two technologies are complementary. Similarly, in a year or so, broadband systems like cell relay and B-ISDN [broadband integrated services digital networks] will be complementary with frame relay." Morley thinks that each of the various kinds of communications technologies will find its own applications and its own markets.

Benelux Plans

According to M. Smith, managing director of BT Benelux, the expansion plans fit well into the aims of BT. "We want to be the most successful telecommunications company operating worldwide," he said. "The word 'successful' should be looked at from three angles. First, we want to be successful in the eyes of customers, or at least be recognized." Smith mentioned the example of IBM in the seventies and eighties. "If you had asked someone then to name three computer companies, IBM would have been mentioned by virtually 100 percent of those questioned. We are aiming for a similar reputation. Second, we want to achieve financial success; and finally we want to be successful with regard to our share of the telecommunications market."

BT's market share in the area of international value added networks—data lines and related services—comes to about 26 percent, according to figures produced by the American research organization Yankee Group. With this figure, BT is leading the pack, ahead of companies such as Sprint (24 percent), GEIS (16 percent), and IBM (13 percent).

BT's position can be called remarkable. A little more than two years ago, BT was no more than a nationally operating telecommunications supplier. At the end of 1989, however, BT took over the American company Tymnet for $350 million and the concern entered the international data communications business. In the last two years, BT has been able to increase its market share acquired through Tymnet from about 18 percent to the present 26 percent. "And there is more to come," said Morley. "We are aiming for 40 percent."

Dutch PTT Telecom's 1991 Results Discussed

Investment Strategy Outlined

92BR0468A Amsterdam COMPUTABLE in Dutch 8 May 92 p 1

[Article: "PTT Telecom Should Make Greater Investment"]

[Text] Amsterdam—Out of an amount of 3 billion guilders, PTT Telecom has invested around 300 million guilders more this year on tangible fixed assets. PTT Telecom's investment will continue to grow in the coming years. That was made evident in Groningen on Friday last week during the presentation of the Royal Dutch PTT's annual report. Profit and revenues both rose slightly. PTT top man W. Dik is not talking quite yet of "heavy weather".

The amount referred to of 3 billion, some 86 percent of the total investment by PTT Netherlands, has gone toward the improvement and expansion of the technical telecommunications infrastructure as well as toward the implementation of regulations to bring the quality of services in line with the demand for increasingly sophisticated services from the escalating international market.

Growing competition from foreign companies such as AT&T, British Telecom, and Deutsche Bundespost and the liberalization of the telecommunications market

have prompted PTT Telecom to try and look for increasingly higher volumes. To this end, the quality of service must be improved. According to PTT Telecom Director B. Verwaaijen, this will require greater investment which will above all have a pronounced long-term character and for which there is no immediate return.

1991 Results Discussed

92BR0468B Amsterdam COMPUTABLE in Dutch 8 May 92 p 15

[Article: "PTT Nederland Expects Leveling Off of Profits"]

[Text] Three successive years of rising revenues and profits have come to an end for the PTT in fiscal 1991. Although trading results dropped by 0.4 percent, a reduction in profits was averted due to a lower tax burden. Profits rose by 3 percent to 1.61 billion guilders, while trading results fell from 2,915 million to 2,904 million. Turnover, however, rose by 6.7 percent to 14.5 billion. Of the profit, 646 million guilders will be paid in dividends to the only shareholder, the state. This is 40 million guilders more than in 1990. That was announced during the presentation of the annual report last week. Chairman of the Board W. Dik revealed that the concern will take into account a leveling off of profits in the coming years. "We are not talking about serious difficulties, but rather of a changing situation," he said looking ahead. The problem lies primarily with PTT Telecom, which contributes about 1.3 billion guilders to the concern's profits. Increasing international competition in the field of telecommunications has led to considerable pressure on rates and therefore also on profit margins. According to Dik this means that turnover must be increased, which should be achieved particularly abroad, and by offering better quality. This will require greater investments, for which according to Telecommunications director B. Verwaaijen there is no immediate return, but which will demand more personnel. Staff costs of the Royal Dutch PTT (KPN), as the concern is now called, rose last year by 500 million guilders to 5.7 billion guilders. KPN has 100,664 people on the payroll, i.e., 4,400 more than in the previous year.

Abroad, Telecom is trying to remain a step ahead of the competition by means of joint ventures, by entering into cooperative arrangements and by setting up its own subsidiaries. In particular, the collaboration with AT&T and the Ukrainian telecommunications organization to jointly modernize and operate the telephone network in the Ukraine is seen as a surprise. Competitors three to seven times larger than PTT Telecom were also after this deal. The other sector of KPN, PTT Post, was able to maintain the same growth curve as in previous years. Turnover rose from 4.3 to 4.6 billion guilders. Trading results grew by 8.8 percent to 348 million guilders. KPN still intends to be traded on the stock market and, depending on the mood of the stock market, its introduction is scheduled for January 1994. The former state company is still very busy transforming itself into a commercial concern. The next major step to be taken is the transformation of the 2,400 PTT offices into "a chain of shops in which an extensive range of services and products is on offer." A start has already been made in the last year with the selling of hotel and airplane reservations and the sale of insurance via the NMB Postbank.

EC HDTV Program Delayed as Discussion Continues

92BR0548 Antwerp DE FINANCIEEL-EKONOMISCHE TIJD in Dutch, 9 Jun 92 p 40

[Article: "Memorandum of Understanding Becomes Mere Declaration of Intent; EC Action Plan for HDTV Delayed"]

[Text] Luxembourg (ANP/REUTER/TIJD)—Great Britain severely criticized the EC Commission's plan to appropriate ECU850 million for the promotion of high-definition television (HDTV). Some other member countries also think that the proposed budget is too high.

The EC Commission has a proposal for an action plan aimed at developing the market for advanced HDTV services via satellite or cable. These services have to be based on the European intermediate D2-MAC standard, which means that they have to be compatible with the 16:9 screen format. The Commission would like to allocate ECU850 million to this action plan, which is expected eventually to speed up the introduction of the European HD-MAC HDTV standard. Yesterday, this issue was discussed by the EC telecommunications ministers.

According to the British Minister for Technology Edward Leigh, it was not at all sure that there is consumer interest for the much more expensive HDTV system. Leigh could not be convinced by the Commission plan. Italy and Denmark endorsed the British position that it is too early to decide on a budget for the development of HDTV services. Thus, the Luxembourg meeting of the 12 ministers only resulted in an agreement that discussions of the action plan be resumed later this year.

For quite some time now, Spain has requested that HDTV support be linked to the approval of the Delors II package, which contains the Commission's proposals regarding the structure of the EC budget for the years to come. The Delors II package calls for extending the money flow to poorer EC countries, including Spain.

Germany is still not very thrilled by the EC's D2-MAC broadcasting standard and will not approve any HDTV aid until its exact distribution and employment is known. Indeed, not only industry will have to invest large amounts in the development of new equipment; the broadcasting corporations, production companies, and cable operators, too, will be faced with additional expenses.

The European Commission has as yet been unsuccessful at having its memorandum of understanding (MOU)

signed by broadcasting corporations, satellite broadcasters, program makers, and screen manufacturers. It has already become clear that the MOU will be no more than a nonbinding declaration of intent. The German broadcasting stations refuse to sign the declaration as long as it contains a reference to the intermediate D2-MAC HDTV standard. The EC Commission is now considering the possibility of concluding bilateral agreements with each of the parties concerned.

Philips Offers Full Range of SDH Equipment

92BR0554 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 11 Jun 92 p 27

[Article by Lucien de Salagnac: "Future Transmission Standards: Philips Ready To Get To Work"]

[Text] As SDH [Synchronous Digital Hierarchy], which allows speeds of 2.5 Gbit/s on long-distance telecommunications networks, is leaving the laboratory stage. Philips, which boasts several pilot sites, is all set to play a leading role.

Philips is getting ready to enter the market for 2.5-Gbit/s long-distance transmission. Through its pilot projects, it could already show its expertise in SDH, the new synchronous hierarchy standard adopted in 1988 by the CCITT [Consultative Committee on International Telegraph and Telephone] for multiplexing and very high-speed transmission (at 155 Mbit/s or more) of digital signals along telecommunications networks. (155.52 Mbit/s is the speed of the first SDH level. The higher levels are obtained by the synchronous byte multiplexing of first-level signals. The higher speeds are then integral multiples of the speed at the first level: 622.08 Mbit/s, then 2.488 Gbit/s, etc.) Derived from the American SONET standard and compatible with current American and European standards, SDH will make it possible to build a worldwide, standardized transmission network with modifiable network topologies, allowing the best use of available transmission capacities. Its other characteristic is that it allows the insertion or extraction of individual digital signal channels from a multiplex of a superior hierarchy without having to demultiplex the whole of the signal; the multiplex is reorganized using patchers [brasseurs].

First Step Toward Equipping the Spanish Network

Unlike its main competitors, Philips—through its Nuremberg-based Philips Network Systems division, which belongs to PKI [Philips Communications Industry]—is perfectly capable of producing all the elements needed to build and implement an optical transmission network based on the SDH standard. In particular, SLE-4 and SLE-16 synchronous line equipment and power amplifiers. The SLE-4 (four input interfaces at 155 Mbit/s) comprises a synchronous line multiplexer operating at wavelengths of 1,300 and 1,550 nanometers and the corresponding line amplifiers. Moreover, Philips has developed an optical power amplifier derived from the SLE-16 line equipment which can transmit signals at a rate of 2.5 Gbit/s over a distance of more than 200 km without signal amplification. This amplifier, the product of a cooperation between the Nuremberg laboratories and the Eindhoven laser production unit, features a power gain of more than 12 dBm.

The main Philips pilot site in Spain comprises three links: Madrid-Seville, Madrid-Saragossa-Barcelona, and Madrid-Valencia-Barcelona. Set up for the World Exhibition and the Olympic Games, this arrangement is the first step in equipping the Spanish network with SDH. However, Philips' ambitions go further than this. The Dutch group has already left its marks in Australia and Germany.

SCIENCE & TECHNOLOGY POLICY

Hungary: Effects of Drastic R&D Financing Cuts Forecast

92WS0653C Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 26 May 92 p 6

[Article by Sandor Mester: "Development Without Foundation"]

[Text] On the ides of May the daily press reported that the financial authorities had drastically reduced the assets of the fund available to the National Technical Development Committee [OMFB]. As we know, according to this year's budget, this fund was to have received the 13.4 billion forints planned for this year from the entrepreneurial profit tax being paid in. The budget adopted by the House counted on receipt of 85 billion forints in entrepreneurial profit taxes for 1992, but so far the firms have remitted only 8 billion. According to some estimates at most 40 billion will reach the state coffers under this heading this year.

The Hungarian Innovation Chamber appealed to the government and to the responsible representatives of the National Assembly. This manifesto of despair, formulated in three points, tries to get the addressees to review the situation which has developed. One can read in the third point: "The government should prepare a concept (guiding principles) applying to science and to research and development as a whole, and should submit its proposals to Parliament in the form of a uniform draft law (law package)."

What this says is that the government has no idea about how to take care that our country should join the developed (technical-scientific) intellectual world.

I understand that extraordinary measures are needed in an extraordinary situation. Consistency is a great virtue, but we must review what dangers accompany the decision.

As we went to press it was still not known whether the minister of finance might find a few billion in some hidden corner of the budget and if so whether he would be inclined to turn it to the support of R&D. Let us presume that Mr. Kupa stands his ground and that only 2.7 billion remain for the fund. What consequences might accompany this decision?

According to some sources there are 17,000 people in our country engaged in research, more precisely are active in this area, and 3,000 of them work permanently abroad, in the leading research institutes of the world. It is probable that these 3,000 researchers represent the best of Hungarian intellectual life, so their absence causes a shortage more significant than would follow from their ratio. Surely we would be close to the truth if we said that the decision of the government, made in the middle of May, will not encourage the return home of researchers working abroad. Indeed, the white collar workers may be leaving Hungary in new waves.

The danger exists that research institutes will start dying and that the gray remnant staffs (those who remain here) will seek their bread in the jungle of business life, unknown to them—as mock managers, merchants or, in a better case, as adapters of some product belonging to their area of expertise. (As a matter of fact, the overwhelming majority of Hungarian research institutes still functioning are ready to renew themselves and adapt themselves to the new requirements of the age. But this cannot be imagined without a government level concept and state support.)

There has long been a concern about what will happen to us (what will happen to small countries in general, which do not have and cannot have anything more than their cultivated human heads) if we do not keep up with the outside world in basic research. This question arises again in connection with the present crisis of R&D. As I see it the nations which grow ignorant will have a user role, and be subject to others accordingly. Of course, there will be intelligent user peoples who keep up with technical-scientific development. To put it in professional jargon, they will be capable of using in an interactive way that which the great developing countries put before them.

Our journal hesitates to comment on daily political events, but in this case we are talking about a question which concerns our profession. Throughout the world the information industry is the motor of development, it uses the majority of the developmental achievements, for a long time still its intellectual potential will determine the economic chances of the individual states.

We know what R&D projects the OMFB would support in 1992. We also understand that the financing concept for R&D needs renewal. Still, cutting back support for developments by 70 percent gives no chance for survival—in more than one sense.

TELECOMMUNICATIONS

Hungary: MATAV's Sat-Net Satellite Service Described

92WS0653A Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 2 Jun 92 p 5

[Article by Huba Bruckner: "Boundless Possibilities"]

[Text] Sat-Net Satellite Service Ltd., owned by the Hungarian Telecommunications Enterprise [MATAV], and PLEASE Ltd. have the primary goal of satisfying data transmission needs. With the aid of satellite communications Sat-Net undertakes to perform data transmission independent of the status of an earth network. It provides a link between the new communications system and existing public networks. Thanks to its close link with MATAV it provides its services to its customers on

the basis of the principle "everything from one place." Naturally this also applies to setting up international connections.

The SAT-STAR service of MATAV offers a most modern, high reliability data communication network primarily to those who want to realize efficient bidirectional data transmission between their scattered sites and their central computers. The availability of SAT-STAR exceeds 99 percent.

Transmission takes place via satellite between small earth stations (VSAT) at the user site and the central station of the system (HUB). The SAT-STAR VSAT microterminal put into operation at the user site uses the most developed signal processing technology available today. It meets the strictest reliability prescriptions and represents an outstanding technical level. The SAT-STAR VSAT microterminal can be installed quickly thanks to the inside unit and the small diameter (1.2 to 1.8 meter) antenna. The VSAT system operates completely automatically, without supervision, while making possible remote diagnosis, remote monitoring and remote resetting of the parameters of the terminals. The network can be expanded with additional VSAT terminals in a short time, without interrupting traffic, and if the user changes sites the terminals can be moved easily. The connections meet the CCITT standards (V.24-V.35).

Typical applications possibilities for the service are: bidirectional, conversational point-multipoint data networks; dedicated point-point data connections with adjustable transmission speeds; unidirectional data broadcasting networks; unidirectional video broadcasting networks; unidirectional audio broadcasting networks; bidirectional speech transmission networks with different topologies; and bidirectional video conference networks.

Sat-Net Ltd. offers the possibility of linking into the public packet switching data network.

Current, Future Hungarian Electronic Network Infrastructure

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[Article by Gy. S.: "Networkshop '92; Information Exchange by Electronic Means"]

[Text] For three days the Miskolc International Trade Center was home to the first national conference of the Information Infrastructure Development Program Federation (IIFP). More than 500 domestic researchers and users, representing the 350 institutions from higher education, industry and agriculture gathered in the IIFP, participated in the seminar organized by the Janos Neumann Computer Sciences Society. The dozen lectures gave an account of the status of the program and discussed in detail the developmental theses for the second phase of the IIFP.

It is today natural for the researchers of the world to maintain contact with their foreign colleagues via electronic mail, or to obtain the data needed for their work from databases in a distant country. In our country this process began in 1986 with the initiation of the IIF program and the first stage was completed in 1988. By that time they had built a network consisting of 200 PCs and six mainframe computers. By the end of 1988 the ELLA correspondence system was widespread and today it is already connected with the large international systems as well. In the meantime the PETRA data transmission program has been prepared, as has the ELF electronic bulletin board, which makes possible the publicizing of programs and messages. TRILLA, which will integrate these three systems, will soon begin operation within the IIF framework.

As Laszlo Csaba, chairman of the IIF technical council, said, between 1986 and 1990 it was not possible to obtain modern telecommunications equipment because of the COCOM restrictions. So with the support of the program they developed the national X.25 packet switched network. The goal of the second phase of the IIF is creation of European level network and information services, which must be based on tools proven throughout the world, and adapted to domestic conditions. A stable domestic network with good international connections must be the foundation for the services, one in which the following elements and the services based on them constitute a harmonic unity:

—CCITT proposals X.25 and X.3, X.28, X.29 (XXX) (the IIF architecture, 1986),

—NJE (EARN protocol) with EARN services,

—TCP/IP with Internet services, and

—ISO/OSI (X.400, X.500, FTRAM).

The most important services are: electronic mail, interactive processing, file transmission and processing, electronic conferences, electronic bulletin boards and electronic name list.

According to the basic principle of a decentralized structure for network systems the internal traffic (institute, university, region) remains inside the territorial unit or appears as direct traffic between units, thus the role of centralization is limited to the following cases:

—conduct of international traffic,

—domestic transit service between territorial systems incapable of direct contact, and

—domestic transit service if conversion is needed.

As for the period just ahead, a public packet switched data network, expanding in its services, power and extent, for a broad sphere of IIF institutions, and virtually private network service for the HUNGARNET community represent the basis for extensive network links. This will also serve as a background for building up the IIF private data network.

The private basic network of the IIF will use a multiprotocol solution for direct digital connections (in a higher speed class later) and for a public packet network; after service begins it will be expanded on the basis of IP technology, later OSI/CLNS, and then possibly with a high speed X.25 solution. The FDDI based regional systems and the terminal systems of the independent regional discipline centers will be connected to the basic network. The basic network will be connected to an international multiprotocol basic network which will appear in the near future; even in the initial period there will be at least two 64 kB/s connections.

At present electronic mail is the most general service of the IIF, and they are counting on an additional fast spread of it. Decentralization is victorious in this area also; the ability to put through various types of correspondence systems awaits realization. It is expected that in the near future the following solutions will be spreading: ELLA, BSMTP/NJE, SMTP (the mail system of Internet), X.400, MAIL 11, and Novell based mail systems with SMTP external connections.

Expansion of the IIF system presumes raising database services to a higher level. Going beyond this they regard as a fundamental task the quantitative and qualitative development of international network connections for the R&D community.