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CONTENTS

COMPUTERS

ENERGY, ENVIRONMENT

FACTORY AUTOMATION, ROBOTICS

LASERS, SENSORS, OPTICS

MICROELECTRONICS

NUCLEAR R&D

TELECOMMUNICATIONS

EAST EUROPE

AEROSPACE

COMPUTERS

TELECOMMUNICATIONS

ADVANCED MATERIALS

Sweden: 11 Materials Research Consortia Established

91AN0518 Paris VTS BULLETIN in French Jul 91 p 17

[Article: "Multidiscipline Swedish Consortia for Materials Research"]

[Text] In 1988, the Swedish National Office for Technological Development and the Swedish National Research Council invited Swedish research workers to suggest topics for research within the scope of consortia in the area of materials science and technology. The emphasis in this initiative was placed on the following points in particular: a multidisciplinary approach, strong management, industrial impact, and international cooperation.

Eleven consortia have now been created in the following fields:

- Materials with unique functional properties;
- Thin films (manufacturing processes for thin films, monitoring of substrate/film interfaces, and preparation of diamond films);
- Thin-film growth (epitaxial growth, growth at low temperatures, etc.);
- Nanometer-level structures;
- Metal-oxide surface structures (high-temperature corrosion, liquid/oxide interfaces, doped oxides, oxidic membranes, and adherence to substrates);
- Clusters and ultrafine particles (successive accumulations of materials consisting of atoms and di- or triatomic molecules into large clusters and ultrafine particles);
- Interface interactions in polymer-based systems;
- Biomaterials;
- Theory-based expert systems for materials design;
- Computer-assisted development of materials and processes;
- High-temperature superconductor materials.

Teams from the Royal Institute of Technology, Chalmers University, the University of Lund, the University of Uppsala, and the University of Linkoeping are participating in these research consortia.

Each consortium will exist for at least five years. The aim of this long-term approach is to impregnate universities with a powerful aspiration to acquire knowledge in the strategic sectors of materials science and to make this knowledge available for industrial development.

AEROSPACE

Multinational Effort To Pursue Hypersonic Technology Development

91P6O287 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Sep 91 p 8

[Text] The development of critical components for the coming generation of hypersonic aircraft slips past the public, largely unnoticed. A short time ago, Japanese firms also linked up with ongoing R&D projects in the United States and Europe and agreed to international cooperation. At the moment, that cooperation is impacting upon the development of propulsion systems, with which the newly constituted industry group in Japan—called the "New Energy Development Organization"—is currently involved, at the prompting of the Japanese Ministry of International Trade and Industry (MITI). As partners, they have available to them Rolls-Royce, General Electric, Pratt & Whitney, and the European SNECMA [National Aircraft Engine Research and Manufacturing Company] group, in which German, Italian, and French propulsion system manufacturers are definitively participating. By means of this international cooperation, it should be possible within a few years, perhaps by 1996, to produce powerful and cost-effective propulsion systems for transcontinental aerosystems.

These types of powerplants must be able to cope with extreme flight conditions—so as to be able to function in the stratosphere with practically no oxygen and to withstand dynamic airflow pressure at speeds-up to Mach 5, in the lower atmospheric layers. So, the propulsion system manufacturers cited conceived a composite powerplant embodying jet and turbine propulsion and, owing to the manifold design difficulties, have divided up the development effort among themselves. Rolls-Royce will develop a combustion system producing the least amount of pollution; General Electric will develop the atmospheric jet propulsion system; Pratt & Whitney will develop the corresponding stratospheric system, and SNECMA will develop the air intakes and various nozzle systems. From their new Japanese partners, the consortium hopes to garner assistance in the development of the most suitable metallic or ceramic materials needed for individual components, as well as automated manufacturing procedures.

Development costs are in the hundreds of millions of dollars. At the project's current state of development, their financing is assured. But, at the present state of development of the aerosystems to be implemented, there often arise questions as to which system will be carried through, so that, only after 1996 can it be decided which conceptualization will be implemented via international cooperation.

AETHERS-l Supercomputer To Process ERS-l Satellite Data

92P6O003 Heidelberg NET—NACHRICHTEN ELEKTRONIK + TELEMATIK in German Jul-Aug 91 p 314

[Text] In order to be able to perform real-time processing of the enormous quantity of data anticipated from the European earth observation satellite, ERS-1 (Earth remote sensing), as it overflies the fifth continent, British Aerospace Australia has developed the smallest continent's most powerful computer. Its specifications are: 200 million instructions per second ((MIPS) and 500

million floating point operations per second (MFLOPS), corresponding to the operating capacity of nearly 2,000 personal computers (PCs). The data recovered by the ground station at Alice Springs will be transmitted to the Data Processing Facility in Canberra and recorded on high-density magnetic tapes. After the planned installation of a high-speed datalink, the supercomputer—dubbed AETHERS-1—should be capable of generating, within a second, high-resolution images of the 60 square kilometers of scanned land and water surfaces. For this purpose, it has successfully undergone acceptance tests with the ERS-1 data acquisition system at the Data Acquisition Facility of the Australian Centre for Remote Sensing in Alice Springs.

The ERS-l's onboard instruments ascertain predominantly oceanographic and geophysical data. Among other things, through solid cloud cover, they can "see" the Earth's mantle of vegetation; detect ice floes, ocean currents and polar ice; and even measure the surface temperature of the seas and the velocity and direction of winds. As an example, the synthetic aperture radar (SAR) alone transmits data regarding the geological environment and oceanographic processes, at the unusually high transmission rate of 105 MBits per second. The launch date for ERS-1, originally set for December 1990, had to be postponed, first until May 1991 and then again until 17 July 1991. A mission duration of at least two years is planned. Thus, in April 1994, the ERS-2 which is presently under construction should continue this mission.

French, Soviet Microgravity Cooperation Agreement Concluded

91WS0422B Paris LE MONDE in French 4 Jul 91 p 12

[Text] The National Center for Space Studies (CNES), its Soviet equivalent Glavcosmos, and the Soviet technical center Splav have just wrapped up a 10-year agreement on the fabrication of materials under weightless conditions. The experiments of this joint program will be conducted on Soviet Photon-type recoverable capsules (500 kilos of payload in orbit for a maximum of 30 days) and later, when they have been put into service, on the future Nika-T capsules. The first of these experiments (Gezon) should take place in April of 1993. It will be concerned with studying the effect of magnetic fields on the growth of germanium crystals at zero gravity. The agreement bears comparison with the one signed recently in Bourget by Novespace, the French company specializing in technological transfers and services using space capabilities. Glavcosmos has just awarded Novespace the contract for marketing its Photon and Ressource recoverable capsules to member countries of the European Space Agency.

German-Italian Aerospace Cooperation Reviewed

92WS0013A Bonn LUFT- UND RAUMFAHRT in German Jul-Aug 91 pp 20-29

[Article by Antonio O. Ciampi: "Germany-Italy Cooperation"; first paragraph is LUFT- UND RAUMFAHRT introduction]

[Text] The aerospace industries of Italy and Germany have cooperated closely for many years. This cooperation is to be intensified through a group of new programs for civil and military aircraft as well as in space.

The Alenia group, created at the beginning of this year through the merger of the former companies Aeritalia and Selenia, is cooperating very closely with the German industry as the largest group in the Italian aerospace industry. The history of this cooperation also reflects the development which has occurred in Europe since the 1960's, i.e., in the direction of increasingly interconnected joint ventures and partnerships.

Fighter Planes

After a few licensed construction projects, in which the two countries cooperated very closely, it is possible to view the Panavia Tornado project, carried out by the three countries of Germany, the United Kingdom, and Italy, as the starting point of a much closer cooperation. The industrial distribution of labor is 42.5 percent with MBB [Messerschmitt-Bolkow-Blohm] and British Aerospace, whereas Alenia's (formerly Aeritalia) participation is 15 percent. This project led to an extremely productive exchange of data, technologies, and experience.

The two-engine, all-weather fighter developed and produced by the Panavia consortium is being constructed in three versions (IDS, ADV, and ECR) and is without doubt the most significant project in European military aircraft engineering. The Alenia share in this project consists basically of the production of the wings for the Tornado.

The success of the Tornado has become the foundation for the structuring of another cooperative project, which now also includes the Spanish firm Casa: The European Fighter Aircraft (EFA) should meet the requirements of the four national air forces for a modern aircraft to assure air superiority. The development agreement was signed in 1988 between the participating companies Alenia, British Aerospace, Casa, and MBB/Dornier (now Dasa), and the Munich-based joint venture company Eurofighter-Jagdflugzeug GmbH was established by these four companies to manage the project.

Alenia took on a 21-percent share in this project. The Italian component consists essentially of the right wing made of carbon fiber and of cooperation with Casa on the aft section of the fuselage. The P01 prototype will take off on its maiden flight in March 1992 at MBB in Manching; the second machine P02 a few months later at British Aerospace. The new EJ200 engines planned for the series are being incorporated into the third prototype P03, whose final assembly and maiden flight are being handled by Alenia.

Commuter Planes

A new cooperative project between German and Italy has begun in the area of commuter planes. To that end,

Aermacchi and Dornier Luftfahrt GmbH agreed on 6 April 1989 to cooperate in the development and production of the 30-seat Dornier 328 commuter plane. Aermacchi has a 15-percent share in this project and its responsibilities include development and construction of the cockpit as well as the assembly of the entire pressurized fuselage. The fuselage shells are being supplied to Aermacchi by the South Korean company Daewook Heavy Industries of Seoul. The first pressurized fuselage for the Dornier 328 assembled at Aermacchi was delivered on 30 May 1991.

After the beginning of series production, Aermacchi will initially assemble two fuselages per month; the capacity of the hall built at the Venegono plant specifically for this project is four units per month.

The first Dornier 328 is already being built as a series aircraft. However, this required a deviation from the standard procedure for prototype construction. Thus, Aermacchi built an engineering mockup (EMU) with the same drawings and materials as the first plane, of which it was therefore a virtual structural equivalent. Using the EMU, it was thus possible to test the production drawings for geometric compatibility, to specify the assembly and integration conditions for structural components, and to verify the designs for accessibility and serviceability much earlier.

Aermacchi's participation in this project marks the reentry of this Italian company into the civil market, after Aermacchi had concentrated for many years exclusively on development and construction of military aircraft (e.g., the jet trainers MB.326, MB.339, and the Italian-Brazilian fighter AMX). However, this project is also a very important milestone on the road to an even closer cooperation with the German aerospace industry.

It is possible that there will also be cooperation on the 19-seat Dornier 228. As a matter of fact, the Italian Army plans to purchase eight DO228's for VIP, ambulance, freight, and parachute use. Dornier, Alenia, and Piaggio have announced their intent to conclude a marketing agreement for this plane in which the Piaggio P.180 Avanti private business plane could be included on a reciprocal basis.

The path already paved with the Dornier 328 is now to be continued with even more extensive cooperation in the area of commuter planes. In March 1991, the companies Alenia, Aerospatiale, and Dasa signed an agreement for the foundation of two joint venture companies. First, a group is to be formed for the development of a new 80-to-130-seat commuter plane called the DAA 92 and the DAA 122, and second, a trilateral company is planned for marketing of all commuter planes from these three partners (ranging from the Dornier 228 and 328 to the ATR42 and the ATR72 and finally to the DAA 92/122).

The shares in the project company are to be 50 percent for Dasa and 25 percent each for Alenia and Aerospatiale, with Dasa responsible for system management, including final assembly of the aircraft in Germany. What shares of this project will be awarded to outside partners has not yet been decided.

The definition work on the DAA 92/122 is already in progress based on the German-Chinese research project MPC-75. The go-ahead for development is expected for the end of 1991, so that the maiden flight would be about 1996/97. The question still remains open concerning the extent to which the governments will fund this project under the restrictions of the GATT regulations.

Development costs for the DAA 92/122 are estimated at from 2.3 to 2.5 billion US dollars, and Alenia estimates the market potential for this aircraft class at approximately 1,400 planes through the year 2010.

The still-to-be-established marketing company will be shared by all three partners at 33 percent each. The company is to be headquartered in France and is to be responsible for coordination of the marketing strategies for all commuter planes of the consortium in the classes from 20-to-130 seats.

The cooperation between the German and the Italian aerospace industries has also been extended to the Airbus project. Alenia is constructing the part of the A321 fuselage in front of the wings. Final assembly of this extended version of the A320 with a fuselage stretched to a capacity of approximately 180 seats will, in contrast to the current Airbus types, take place at Deutsche Airbus GmbH in Hamburg rather than at Aerospatiale in Toulouse. The first A321 will make its maiden flight in the spring of 1993.

Trainers

Close cooperation is on the horizon in another area as well. Aermacchi and Dornier began joint concept studies for the definition of a training system for the 21st century. MBB also joined this consortium in the spring of 1991. This reflects the new organization within the Dasa group as MBB's area of business within Dasa includes aviation and the product area of military aircraft.

This project now continuing jointly under the name PTS-2000 (Pilot Training System 2000) involves not only the development of an advanced jet trainer AT-2000 but also a new training philosophy with multiple elements.

Amphibian Project AAA

For a few years Alenia and Dornier have been working together on research for the Advanced Amphibian Aircraft (AAA). Both companies have a great deal of experience in the area of environmental monitoring and amphibious aircraft and intend to jointly put this know-how to use for the obviously increasing market for such special aircraft.

The AAA could be used not only for missions of fighting forest fires and environmental monitoring on the high

seas but also for the monitoring of the exclusive costal economic zones as well as for the search for resources within these zones. In addition, the AAA could also perform life saving missions in the evacuation of people during natural disasters.

Within the framework of the European Eureka program, important key technologies were already defined from April 1988 through March 1990. The next two-year phase with continuing demonstrations of technology began on 1 June 1990. The total cost of this second phase is reported to be 12.7 million European currency units [ECU], and it includes work in the areas of aerodynamics and hydrodynamics, structures and materials, anticorrosion techniques, and the innovative boat configuration for operation under rough sea conditions as well as advanced equipment systems, including avionics, for improvement of fitness for use and safety.

Within the framework of an industrial agreement concluded on 3 September 1990, the companies Hellenic Aerospace Industry, Per-Udsen (Denmark), and Soko (Yugoslavia) joined this AAA research team as additional partners. There is also interest in France and Portugal so that this program seems to be assuming a European dimension.

Alenia believes that the development phase could begin in the spring of 1992 so that the maiden flight of the AAA could take place in mid-1995, with approval and initial deliveries possible by the end of 1997.

Preliminary market research and contacts with potential buyers have shown that approximately 200 orders would be placed by the year 2000.

In Alenia's opinion this estimate could be considered "pessimistic" considering the multipurpose features of the AAA and also the increasing significance of environmental protection on the seas. As an amphibian, the AAA could also be used in regions with weak infrastructures or with difficult geographical conditions, not to mention the potential markets in Eastern Europe. In fact, Alenia estimates the European market share for the AAA at 35 percent, followed by the Far East with 33 percent.

Transport Planes

As the successor to the military transport aircraft types C-160 Transall, C-130 Hercules, and G-222, a new advanced aircraft is to be developed in Europe. On the occasion of the 1991 Paris Air Show, five European companies founded the joint venture company Euroflag (European Future Large Aircraft Group), to which the companies Deutsche Airbus, Aerospatiale, Alenia, British Aerospace, and Casa belong. Preparations for a feasibility study should soon be underway.

Helicopters

In the area of helicopters as well, the Italian industry is linked with the German industry. At the beginning of July 1991, Italy signed the declaration of intent for the development phase of the NH-90 project, as the fourth country after France, Germany, and the Netherlands. This NATO helicopter is to be constructed in a land-based version TTH (Tactical Transport Helicopter) and a naval version NFH (NATO Frigate Helicopter).

The signatory countries have also agreed to the foundation of the management company NAHEMA (NATO Helicopter Management Agency), which will serve as the public purchaser. The prime contractor will be the NH Industries SARL, a joint subsidiary of the participating companies Aerospatiale, Agusta, Fokker, and MBB. Their shares correspond to the participation of the individual countries in the NH-90 project: France holds 42.4 percent, Italy 26.9 percent, Germany 24 percent, and the Netherlands 6.7 percent.

Aix-en-Provence in France has been selected as the headquarters of the two institutions. The industry expects the signing of the contract for the major development phase toward the end of this year. The four partner countries have stated a need for 726 NH-90's. According to current plans, the maiden flight should take place in 1994, enabling deliveries to begin in 1998.

In the spring of 1991, Aerospatiale and MBB agreed to conduct their helicopter activities within the framework of the joint company Eurocopter. As both companies stress, the door is open to additional partners. Everyone is waiting to see whether Agusta will join this new cooperative program.

Military Engines

In the area of jet engines, the Italian and German industries have already been cooperating closely for a long time. The first large project was the RB.199 for the Tornado fighter. FiatAvio cooperated in the development and production within the framework of the Turbo-Union joint venture with Rolls Royce and MTU [Motoren-und Turbinen-Union]. By now, more than 2,000 RB.199's have been delivered in several versions for various air forces.

A similar project has been underway for a few years for the EJ200, the engine for the EFA/Fighter 90. The joint firm Eurojet Turbo was founded for this by FiatAvio, MTU, Rolls Royce, and the Spanish company Industria des Turbopropulsores, while project coordination and management is handled by the international management company NEFMA, also responsible for the plane itself.

Within the Eurojet consortium, the tasks are distributed as follows. FiatAvio is basically responsible for the low pressure turbines, the low pressure shaft, the afterburner, the gears, and the oil supply system.

MTU is responsible for the high and low pressure compressor, is also participating in the high pressure turbine, and has developmental responsibility for the FADEC digital control system.

Industria Turbopropulsores has taken on the convergent/divergent nozzles, the exhaust pipe, the diffuser, and the by-pass channel. Rolls Royce is responsible for the combustion chamber, the high pressure turbines, and the intermediate housing and is also involved in the two compressors, the low pressure turbine, the afterburner, and the nozzles.

The participating partner companies see a significant future potential for the EJ200. Based on its design, the engine is suitable for an increased thrust of at least 15 percent to be able to match the anticipated developmental potentials of the EFA/Fighter 90, which will be in use for at least 25 years.

The configuration of the EJ200 permits this increased thrust through future higher pressure ratios, turbine intake temperatures, and mass by-pass without increasing the basic dimensions. Eurojet is convinced that in addition to the primary application in the EFA/Fighter 90, the EJ200 can be used to retrofit existing fighters, for future lightweight fighters, or, in versions without the afterburner, even for subsonic fighters and trainers.

With Snecma, FiatAvio, and Rolls Royce, MTU is also participating in a technology project for engines for the next generation of fighter planes. This could be the first step toward comprehensive European cooperation in the area of military engines.

In the area of shaft turbines for helicopters, Piaggio has been working since 1986 with Rolls Royce and Turbomeca and has a share of 10 percent in the RTM 322 engine, which is planned as the drive unit for the Italian-British helicopter EH-101. Just a few weeks ago, MTU also joined this cooperative project with a share of 15 percent.

Civil Engines

FiatAvio also has large share in a group of civil engine projects, in which MTU is participating on the German side.

This is true, for example, of the General Electric CF6-80C2, E1, and E2. Here FiatAvio has a share of 5 percent whereas MTU is involved in the various CF6 projects at the rate of from 8 to 12 percent.

This extremely successful engine has already been used for many years in the wide-body Airbus A300 and A310 as well as in the Boeing 747 and 767, also flies in the MD-11, and will also be used in the A330. FiatAvio builds the complete auxiliary power unit and is involved at the rate of 50 percent in the disks and stators for the low pressure turbine.

FiatAvio is involved in the competing Pratt & Whitney PW4000 engine project with a share of 3 percent, and MTU signed a comprehensive cooperative agreement with Pratt & Whitney in March 1991 which provides for a 12.5-percent share in the continued development of the PW4084 engine.

For the PW4000 FiatAvio is building, among other things, the auxiliary power unit and the oil tank. By the year 2001, the market for this engine is estimated at approximately 2,800 units.

Again in the PW2000 engine, which is used to power the Boeing 757 and for the new McDonnell Douglas C-17 military transport plane, FiatAvio's share is 4 percent whereas MTU has taken on 11.2 percent. For this engine as well, FiatAvio is building the auxiliary power unit and the oil tank.

Within the framework of the five nation V2500 project, FiatAvio is participating at the rate of 3.5 percent in the joint venture company International Aero Engines (IAE), while MTU has a share of 11 percent. The other partners are Pratt & Whitney and Rolls Royce with 30 percent each as well as Japanese Aero Engines with 23 percent. Again for the V2500 FiatAvio has taken on a role in the work similar to that in the other civil projects with the auxiliary power unit, the oil tank, and the oil pump.

The V2500 is already used in the Airbus A320 and is also planned for the A321 and the McDonnell Douglas MD-90. By the year 2001, production of approximately 2,500 engines is anticipated.

A few months ago, FiatAvio and MTU joined the team of Rolls Royce and Snecma already working since 1989 to participate in joint research for future power units for supersonic commercial aircraft. The four companies have formed a steering committee which will coordinate the various research teams active in this project.

Space

Relations between the German and Italian industries are particularly close in space. The most outstanding milestone in this cooperation was the development and construction of the European Spacelab which has already flown successfully several times.

Alenia is now represented in the largest ESA [European Space Agency] projects, including the Ariane launcher, the Hermes space shuttle, the Columbus space station, and the Eureca platform as well as the scientific satellites Hipparcos or Olympus.

The earth reconnaissance satellite ERS-1, developed and built under the leadership of Dornier and launched on 16 July 1991, is one of the current satellite projects. Alenia Spazio was responsible as the prime contractor for development and construction of the radar altimeter within the framework of a consortium, to which the companies FIAR, Ame, Etca, Schrack, Casa, and EMS belong. Laben (a Ferranti Italia company which now belongs to the Alenia group) is responsible for the IDHT, with which the data collected on board the ERS-1 is

collected, stored, and transmitted to earth stations, and leads an industrial team to which Odetics, Btm, Spar, FIAR, and Itl also belong.

The contract has now been let for the successor satellite ERS-2, likewise under Dornier leadership. Alenia Spazio and Laben are participating with the same subsystems, but also with the new payload GOME (Global Ozone Monitoring Equipment), which is to measure the deterioration of the ozone layer over the polar regions. Laben has already carried out the research phase for the GOME's data handling subsystem.

The first European polar platform POEM-M1 is to be launched in 1997, and for it Alenia Spazio is developing the radar altimeter while Laben is responsible for the data management computer and the data handling subsystem of the MERIS experiment (Medium Resolution Imaging Spectrometer).

Among the other projects and programs in which German and Italian companies (in some cases along with other European or American partners) are participating are the X-SAR (a synthetic aperture radar), Artemis, and DRS.

Several Italian companies are involved in the Ariane project. SNIA BPD (Fiat Group) is supplying the fuel for the solid booster, and FiatAvio the turbopumps for the Ariane 5's Vulcain engine.

BPD is also developing and producing two-fuel rocket engines for position control and the interorbit transfer of satellites. Potential applications also exist for the position control and for orbit maneuvers of the Hermes shuttle, for Columbus, and for communications and environmental satellites.

FiatAvio is working along with Rolls Royce and MTU on feasibility studies for hypersonic drives for future reusable space transport systems, such as the Saenger concept proposed by Germany. FiatAvio can contribute significant experience with air-breathing boosters.

The German-Italian cooperation in aviation and space can look back on a long history. For the future, there are even greater opportunities for much closer cooperation.

[box, p 28]

German-Italian Partnership With a Long Tradition

When German aircraft engineering was looking for partners during the reconstruction in the 1950's, the Italian industry was among them. From the very beginning, very close, trusting, and ever expanding cooperation developed.

At that time, for selection and basic training, the German Air Force purchased the Piaggio P.149 trainer which was able to prevail against strong competitors such as the Beech T-34 Mentor and the Saab 91 Safir. Seventy-five planes were bought from Piaggio, and an additional 190 of the P.149D version developed to German specifications were constructed under license at Focke-Wulf. Nine planes were acquired by Lufthansa's commercial pilot school in Bremen. With more than 30 years of service, the P.149D is among the Luftwaffe's oldest aircraft.

The Luftwaffe's light fighter bomber squadrons were equipped beginning in 1961 with the Fiat G.91 ground combat and reconnaissance planes; more than 300 of these planes were built under license by Dornier in cooperation with Messerschmitt and Heinkel.

The Italian industry also belongs with the German industry to the group of European companies which built the Lockheed F-104G under license during the 1960's.

The VAK 191 B subsonic vertical takeoff plane was developed beginning in 1964 jointly by the Vereinigten Flugtechnischen Werken, Bremen, and by Fiat as a successor to the Fiat G.91. However, this project was discontinued after the successful testing of the prototypes at the beginning of the 1970's.

Even today both Alenia (as successor to Fiat and Aeritalia), in the Tornado and EFA/Fighter 90 project and possibly also in the new commuter plane DAA 92/122, and Aermacchi, in the Dornier 328, are among the closest partners of the German aircraft manufacturers.

BMW, Rolls Royce Design Domestic Jet Engine

91WS0512A Hamburg DER SPIEGEL in German 5 Aug 91 pp 102-103

[Article: "Much Too Small for Two"]

[Text] Eberhard von Kuenheim was always to be found at the international automobile shows in Geneva, Frankfurt, or Tokyo. Appearing in the glittering world of new models was always a duty and a pleasure to the head of the Bavarian Motor Works. This year he appeared for the first time at the Paris Air Show.

But it was obviously just routine for him. Von Kuenheim looked at the exhibition booths at Le Bourget, chatted with representatives of the manufacturers and dined with the heads of the aeronautics and space industry. He raved about the "future opportunities" for the industry.

Von Kuenheim also wants to utilize these opportunities. Last year BMW bought KHD Luftfahrttechnik in Oberursel for 100 million German marks [DM] and entered it in a joint venture with British engine manufacturer Rolls Royce. On top of that, the Germans paid a few hundred deutschemarks for Rolls Royce to transfer know-how and manufacturing orders to the new company. The Bavarian Motor Works, whose company emblem shows a rotating propeller, began in 1916 as an aircraft engine pioneer and in 1944 built the first series of jet engines. With the help of the British, von Kuenheim now wants to return to the glorious times. The BMW Rolls Royce AeroEngines company is to become the "leading European manufacturer" of engines for commercial aircraft.

Britons and Germans want to develop a new generation of engines which are particularly quiet, clean, and efficient. The planned BR 700 family will replace Rolls Royce's obsolete Tay program, which marketed engines with a thrust of 14,000 to 20,000 pounds. This engine size powers commercial aircraft such as the Fokker 100 or business jets such as the Gulfstream.

At the BMW development center in Lohnhof in Bavaria, 80 engineers are already busy developing the central part of the system. Development chief Guenter Kapple hired some of the engine specialists away from his neighbors—from MTU, which belongs to Daimler-Benz—and others came from Rolls Royce.

The engine is to be started up on the test bench in two years. That will not be at Lohnhof, however, but in a new factory to be built in Dahlewitz near Berlin. About 1,000 technicians will produce the first engines of the new series there after 1996. At Dahlewitz, formerly in the GDR, BMW managers anticipate investment subsidies and tax benefits.

Von Kuenheim's people are pushing for an acceleration of the pace: The engine should be ready when the approximately 100-seat regional jets planned by various manufacturers come on the market. Albert Schneider, head of the German-British joint company, expects that between 1996 and 2003 alone about 1,300 aircraft of this type will have to be equipped with engines.

To be sure, the former BMW manager also knows that his company is not the only supplier of suitable systems. The toughest competitor is MTU [Motoren-und Turbinen-Union] of Munich, which also has started preliminary work on a new engine, called the RTF 180. For the first time U.S. partner Pratt & Whitney will leave management of the system to the Germans.

However, this is not the only reason why the MTU engineers are particularly motivated. The Munich engine builders are also making a special effort because the largest customer for the RTF 180 is likely to be the regional jet planned by Daimler holding company DASA [German Aerospace]—that is to say an aircraft from their own group. This will not make the business any easier for von Kuenheim. But the BMW chief had clearly recognized that the pact with the British was the last chance for his company to return, after a more than 20-year absence, to the business of aircraft engines.

The cost of developing engines is so high that only a few international consortia are capable of keeping up with the hotly contested markets. The two leaders in the market already have firm partners, however; the U.S. company General Electric has allied itself with French Snecma, and Pratt & Whitney with German MTU. Only Rolls-Royce, third in the industry, was still looking for a companion. The British needed money in order to develop their top product Trent, a power plant for long-range aircraft. In return, they provide BMW with an entry into the market for smaller engines, which Rolls-Royce dominates with 75 percent of the market.

Industry experts are skeptical as to whether von Kuenheim's calculations will pay off. The aircraft engine business is extremely risky. The manufacturers are dependent on the success or failure of the aircraft model for which they design their engines. Only if the aircraft is a best seller does the engine supplier recoup his costs.

Furthermore, in Rolls-Royce BMW has found a partner who had been struggling with difficulties for some time. The engine company, which no longer has anything to do with the automobile manufacturer of the same name, must let at least 6,000 people go; Rolls-Royce wanted to implement a wage freeze for the 34,000 employees. "Who is Rolls-Royce?" Daimler's managers ask smugly, when the participation policy of their competitor BMW is brought up.

It is also an open question whether BMW has enough financial reserves for its new enterprise. The auto company will have to put a total of about DM2 billion into the engine company, but it could take 15 years until the break-even point is reached.

Daimler space manager Juergen Schrempp, as head of DASA in charge of MTU as well, also believes that the market is much too small for two producers in the class up to 20,000 pounds thrust. BMW-Rolls- Royce chief Schneider is of the same opinion.

This joint recognition has not yet led to a final conclusion: So far, neither of the two is ready to give up its plans.

Former East German Space Research Institute To Be Retained, Renamed

91WS0443A Duesseldorf VDI NACHRICHTEN in German No 27, 5 Jul 91 p 12

[Article by Manfred Ronzheimer: "A Bridge To Eastern European Space Travel: Experiences With Soviet Interkosmos Program Pay Off"]

[Text] VDI, Berlin, 5 July 1991—The Institute for Space Research of the former Academy of Sciences of the GDR in Berlin—Adlershof is to made into an institute for long-range planetary scanning within the German Research Institute for Air and Space Flight (DLR). This is the recommendation of the Scientific Council, which acknowledges the rich experience of the East Berlin space installation, gained in cooperative projects with the USSR and in the context of the Interkosmos program.

According to the results of the Scientific Council's evaluation, the Institute for Space Research (IKF) in general has "good technical potential." The Council notes that some work groups have made "significant contributions to research," as in the case of instrument development in the field of long-range scanning and in their cooperation with the Soviet space effort. This is the recommendation of the Scientific Council: "The gap in the area of planetary research which now exists in Germany ought

to be closed with the help of qualified colleagues." At this point, the East Berlin Institute for Space Research, together with its satellite tracking station in Neustrelitz (Mecklenburg—Western Pomerania), has 406 employees, including 174 scientists.

The mission of the proposed DLR Institute for "Long-Range Planetary Scanning" would be to continue the cooperative projects already under way with the USSR, using previous research results in the IKF areas of spectrometric long-range scanning, optoelectronics and extraterrestrial physics (planetary research), as well as to develop instruments and provide long-range scanning data for a "wide circle of national and international users." The East German researchers have been able to demonstrate their capacity for "very good image processing" on the basis of photographs taken during the Soviet mission to Phobos, one of the moons of Mars, and to Saturn's moon, and equally excellent results were obtained with the development of a modular optical scanner (MOS—a long-range scanning camera for the Soviet space station module Priroda. In fact, in the opinion of the Scientific Council, the capabilities of the East German scanner are potentially even greater than those of the DLR's rival device, MEOSS, "since it includes calibration."

To enable the IKF research projects in extraterrestrial astronomy and cosmic plasma physics to continue, the Council recommends the formation of two Max Planck work groups, one with 15 researchers and one with 7, to be situated at a nearby university.

The satellite tracking station at Neustrelitz, which gave the evaluators the impression of an "intellectually lively setup," is to be converted to an independent establishment. The decision of the Scientific Council is that a tracking station with the number of employees reduced from 60 to 40 could "play an important role in Mecklenburg-Western Pomerania as well as forming a bridge to the Eastern European countries in the field of space research and in utilizing their results." The central tasks for Neustrelitz would be functioning as a regional center for long-range scanning data, particularly for ecological questions, functioning as an East German reference point for the network of geodesic and navigational satellites of the GPS and Glonass type, and carrying out continued atmospheric and ionospheric research.No matter how positive the outcome of the Council's deliberations was for the researchers at Adlershof in terms of scientific substance, the institute's director, Professor Herbert Jahn, looks to the immediate future with mixed feelings. He claims that for the three main projects of the future planetary institute (the MOS scanner for the Priroda module to be launched next spring and two special cameras for the Soviet "Mars 94" mission) the 80 colleagues proposed will not be enough. "We need an additional 40 to 50 positions financed by the projects," Jahn explained. "Otherwise, in our view the completion of these projects is not possible." Corresponding project proposals have already been submitted to the Federal Research Ministry by the DLR. The selection of colleagues presents a further problem. The Council has voted that only 142 of a total of 406 IKF positions are to be preserved under the new arrangement.

Italy Focuses on Small Satellite Programs

91MI0465 Rome AIR PRESS in Italian 17 Jul 91 pp 1570-1571

[Text] Programs for "small" satellites was the theme of a conference organized in Rome by the Italian Institute of Navigation, which included speakers from Italspazio. The principal topic of discussion—as noted by Italspazio President Antonio Teofilatto, falls within the current operating context, with the European industry in full expansion to meet the demands of the Columbus/Hermes program.

In this new dimension, "activities for the production of small satellites are seen as applications of the technology and instruments resulting from the larger projects." Arianespace is initiating projects to make the launching of medium-small satellites on Ariane-4 more accessible. Teofilatto stated that Italy is attempting to begin a program for a small-capacity launcher, such as the Small-ELV. For this reason, a national initiative in the sector of medium-small satellites could integrate program for a national launcher along two lines: small launchers, small satellites. In these two sectors the Italian space industry, according to Italspazio, would be in a good position, above all considering the leading role of telecommunications in the promotion of space activities. The initiatives for programs for small satellites should also benefit from the support of this new dimension in which the Minister of Post and Telecommunications intends to be involved. In this specific sector, their participation is of fundamental importance, above all for the difficulties connected with the distribution of appropriate operating frequencies.

The "small" satellite initiatives should be seen within the framework of large-scale production to keep costs at a minimum and thus facilitate the access to space of various scientific initiatives and applications that otherwise would be difficult to achieve.

During his presentation, Teofilatto also provided an indication of the market value of the small satellites, which is calculated in relation to launch costs on the order of $20,000 to $30,000 per kilogram per launch in low orbits. The cost of outfitting the flight is generally equivalent to the cost of the launch. Space systems in low orbit have a shorter average life than the large geostationary satellites and thus parts must be replaced more frequently than for the geostationary systems. "All of which is not dramatic, since the fundamental parameter, the cost of the service provided, takes account of these factors."

If the same or a similar service were to be contemplated with geostationary satellites, the costs would be much higher, certainly above the commitment limit of the

organizations interested in promoting the service. The European experience has already seen the meagre market success of these "large" mechanisms.

Lucio Caporicci and Claudio Soddu, both engineers, discussed the possible applications of small satellites in assisting civil air navigation. Italspazio's experience in the sector of air navigation via a satellite network dates back to 1983 when the ESA (European Space Agency) granted it various contracts for the creation of civil air navigation system called NAVSAT, based on a "constellation" of satellites in elliptical and geostationary orbit with these requirements: 1) continuous global coverage; 2) signal integrity; 3) high-precision measurements; 4) communications support, and 5) simplicity and the low cost of the user equipment. These requirements were not completely satisfied by the GPS/NAVSTAR and GLONASS systems, whose networks are currently being completed. In addition, both the GPS [Global Positioning System] as well as the GLONASS are managed by military entities and do not, therefore, completely reflect the needs of civil aviation. Following the first NAVSAT experience, Italspazio performed additional studies for the ESA, the Independent Flight Assistance Company, and the ASI (Italian Space Agency). The results of Italspazio's studies show the advantage of using, at least temporarily, the GPS navigation system proposed by Italspazio is compatible with the GPS receivers currently available on the market and is designed to satisfy the needs of aeronautic, maritime, land- and space-based users. It will also be able to perform communications and surveillance functions at all latitudes. This will be through a planned expansion obtained with the various regional "constellations," each of which will be capable of guaranteeing the service over the areas selected as a function of traffic density.

The minimum number of satellites required to carry out area services is five satellites in geostationary and elliptical orbit. Another aspect of the "navigation" system studied by Italspazio concerns small satellites in low orbits, for which the use of GPS is anticipated for a number of fundamental on-board functions. Italspazio carried out a study on behalf of ESA of a mission of voice and data mobile communications that included identifying the on-board functions that could be facilitated using a GPS receiver: 1) orbital position; 2) altitude position; 3) synchronization of on-board clocks, and 4) calibration of the on-board oscillators.

Italspazio is currently involved in various other studies, including a project involving the definition of a "constellation" for a navigation service in the Mediterranean area on behalf of the ASI, and another to prepare for the experiment of absolute and relative navigation of satellites in low orbit called ERODE/ANTARES on behalf of ESA and ASI.

Italy's Role in ERS-1 Satellite Project Described

91MI0464 Rome AIR PRESS in Italian 24 Jul 91 pp 1617-1618

[Text] The first European remote sensing satellite, ERS-1, is finally in orbit. After the delays that so disappointed the international scientific community, the launch went smoothly in full compliance with all the established parameters. The launch was the 44th for the European Ariane launcher, the 16th for the Ariane-4 version and the second for Ariane-40's configuration (without boosters). Lift-off from the ELA-2 launch complex at the equatorial base of Kourou (French Guyana) took place at 22.46.31 hours on 16 July, corresponding to 03.46.31 hours, 17 July in Italy; 17 minutes and 43 seconds later, injection into orbit and the separation of the satellite occurred, followed after little more than two minutes by the separation of four mini-satellites which made up the "auxiliary payload" of this mission.

ERS-1 was placed in provisional polar orbit at an altitude of 785 km. The telemetric data started arriving at the ESA's [European Space Agency] ESOC (European Satellite Operations Center) in Darmstadt, Germany) a few minutes prior to the separation of the satellite, and showed that ERS-1 was in good shape. ESOC gave the orders for the first, critical maneuvers of the first two orbits, in particular for the opening of the panels for the solar generators and of the various antennas, including the AMI (active microwave instrumentation) complex, which constitutes the functional nucleus of the payload. Under the general supervision of ESOC, seven ground stations around the globe were actively involved in this initial orbiting phase, starting with the Fairbanks, Alaska station which initially had some difficulty following the vehicle. In the two weeks following the placing in orbit of the satellite, ESOC will proceed to gradually activate the various instruments, after which the first images recorded by ERS-1 will begin to flow to Earth.

At Kourou, many political, industrial, and scientific personalities from Europe attended the launch. Among these were the Ministers Quiles (France) and Andriensen (Netherlands) and the Swedish under secretary Ljung. Another 300 people were able to watch the event live thanks to a video link from Kourou to ESOC and from the ESOC to various ESA sites. In Italy, this site was ESRIN [European Space Research Institute] at Frascati (Rome), from which the director General of the ASI (Italian Space Agency), Professor Carlo Buongiorno, watched the event. ESRIN will have a crucial role in the collection and worldwide distribution of data from ERS-1. It is here, in fact, that the "raw" data arriving from space (at a rate that for only the radar data will be equal to 6,600 pages of written text every second) will be processed, evaluated, and packaged for distribution to the various users. In Italy, Telespazio (which guarantees the reception of the data through its Fucino-based installation together with those of Kiruna in Sweden, Gatineau in Canada, and Maspalomas in the Canary Islands) and the national meteorological service have

already been set up for their assignments, while the CNR (National Research Council) is completing a scientific installation at Matera that is also connected with the processing of the mass of data from ERS-1.

ERS-1 is the only satellite the ESA planned to place in orbit this year. This makes the success of its launch all the more important (and justified the caution that led to the three postponements). It is also important given the proximity, only four months from now, of the next ESA ministerial conference (at Munich in November). Launch weight 2.384 Kg, 11.8 meters high, solar panels measuring 2.4 meters with an 11.7-meter span and a radar antenna with a 10-meter diameter, ERS-1 required 10 years of research and the equivalent of 900 billion lire (11.32 percent of which provided by Italy, which in exchange obtained a share of work significantly greater than this contribution, approximately 122 billion lire). It is, in fact, the most complex satellite ever constructed in Europe. It is also one of the world's most advanced ecological satellites, since it is the most powerful, in addition to being equipped with "anytime" capabilities, previously lacking on similar American and Soviet satellites. ERS-2 will have similar capabilities and will be placed in orbit in 1994 (ERS-1 will have a service life of three years). Superior capabilities are expected only from the two polar platforms that will be part of the Columbus system, and that will use technology including Italian technology developed for the ERS satellites.

For the realization of ERS-1, several major aerospace industries established a consortium led by Dornier together with Matra Marconi Espace. Matra Marconi Espace has a 55 percent share since it supplied the platform — essentially the one used for the SPOT [Probational Earth Observation Satellite] satellites, and also suited for Helios, the French-Italian-Spanish military observation satellite) and important elements of the payload. It is the chief contractor for the AMI and produces ATSRM (Along Track Scanning Radiometer and Microwave Sounder). The Italian commitment in ERS-1 covers an area of great importance from the industrial perspective. The major contributors included Alenia Spazio and Laben that were responsible for the development and construction of the radar altimeter,— to measure the height of waves with a deviation of 4 cm as opposed to the 10 required in the specifications, a record of precision that will provide unprecedented accuracy in the studies of the great sea currents, the speed of winds, and the movements of ice—as well as the data management and transmission system, with contracts valued at 72 and 50 billion lire respectively. Both systems have been confirmed by ESA for ERS-2. In addition, Fiar supplied the power generating system.

The difference between the load-carrying capabilities of Ariane 40, 2,700 Kg, and the weight of ERS-1 permitted the addition of a secondary payload. This required, for the second time in European space rocket's active life, the use of the ASAP (Ariane Structure for Auxiliary Payload) to host, together with the large satellite constituting the primary objective of the mission, another four satellites of minimal bulk and weight. These satellites include: French SARA (Radio Astronomy Aerospace Satellite), weighing 26.6 Kg, was developed by the students of the Ecole Superieure d'Ingenieurs en Electronique (ESIEESPACE) who will use it in cooperation with the Meudon astronomic observatory. The Orbcomm-X, an American satellite weighing 22.8 Kg, developed by OSC (Orbital Science Corporation) of Boulder, Colorado) to test technologies to be used for the future Orbcomm network of 20 telecommunications satellites for mobile units and rescue. The German TUBSET, weighing 38 Kg, developed and constructed by the Technical University of Berlin for a series of telecommunications experiments including the possibility of following animal migrations. The British UOSAT F, the largest of the four at 50 Kg, part of a series of minisatellites developed by the University of Surrey for a wide range of scientific and technological experiments.

Italy: Pirelli To Develop Cable for Space Shuttle

91MI0463 Milan FATTI E NOTIZIE in Italian Jul 91 p 11

[Excerpt] A few years from now when a small scientific satellite is "lowered" approximately 80 km from the hold of the American space shuttle, the strong "tether" keeping it attached to the shuttle will probably be produced by a Pirelli group company. This is the objective of ACS's (Special Cable Company) research activities and feasibility studies on the very special types of cable needed for this application.

"We are currently in the final stages of a feasibility project commissioned by Alenia Spazio on behalf of the ESA (European Space Agency)," explained Sergio Beretta, head of ACS Engineering. Alenia Spazio is the company resulting from the merger of Selenia and Aeritalia's space activities.

"We are working on a study," continued Beretta, "involving three kinds of 'tethers': a purely mechanical cable used solely to keep the satellite connected to the space shuttle, a complex mechanical and electrical cable which might even conduct the electricity needed for the satellite's instruments, and finally a complex, trifunctional cable capable of transmitting data on optical fibers." This is why for some time now, there has also been parallel experimental activity aimed at gathering information about the behaviour of optical fibers in space.

"In particular we are trying to discover," Beretta explained, "the effects of prolonged exposure to radiation on the transmission capacity of optical fibers. We currently have results from experiments using simulated radiation carried out by Pirelli-Bicocca research, that permitted us to make a first selection of the most promising optical fibers. Next year we will start experimenting under real conditions, installing pieces of optical fibers on the European EUREKA [European Retrievable Carrier] research platform which will be launched with the shuttle and remain in space for six

months." Even for these experimental studies, ACS is working through a contract with Alenia Spazio which is the prime contractor of the ASI's (Italian Space Agency) "tethered satellite" project. [passage omitted]

Norway: Cesar Computer System To Process ERS-1 Data

91WS0454A Oslo AFTENPOSTEN in Norwegian 13 Jul 91 p 3

[Article by Olav Trygge Storvik: "Here Is How Norway Sees Everything On The Ocean In The North"]

[Text] Norwegian authorities can now watch the ocean expanses in the north and carefully follow the activities of the Soviet Union. This breakthrough results from the technological efforts of the Defense Research Institute [FFI]. This technology can also be used for civilian purposes.

The European radar satellite ERS-1 and the CESAR computer will make this possible. One goal of the new satellite is to keep a close watch on the environment and climate of large land and sea areas. Despite its name, CESAR is far removed from the Roman commander. It is simply and unobtrusive little box on the floor in the corner of a room at the Defense Research Institute. But, its modest appearance is highly deceptive. In reality, CESAR is a powerhouse with unique abilities. It is Europe's fastest computer, developed by researchers at FFI.

In eight minutes CESAR processes 64 megabytes of data, i.e. 20,000 standard-sized pages of text. In that time, it processes a picture of an ocean area covering 100 by 100 kilometers and photograph interpreters can immediately begin their detailed studies.

It is the ERS-1, the European radar satellite, scheduled to be launched from French Guyana on 17 July, that will feed CESAR with data. The satellite will send a continuous stream of information to CESAR by way of the Tromso Satellite Station. This is possible because the satellite has a type of radar, a "synthetic aperture radar," as the experts explain, that allows it to see small objects even at great distances. The satellite will move in an orbit 800 kilometers above Earth and it will be able to "see" just as well at night as during the day. It can penetrate fog and clouds. It will record everything on the surface of the sea. Now it will no longer be possible to conceal large-scale threatening operations involving warships off the coast of Norway. The government will be informed of everything that happens, so that it can take steps in time.

Clear Pictures

Director Erik Klippenberg of FFI and research chief H. K. Johansen, who is in charge of the Electronics Division, point proudly to the machine. "Look here," Klippenberg said. "Here is an example of what we can do. This is a picture of the Oslo Fjord and we can clearly see Hurum-landet, Drobak, Jeloya, Bastoy, and Drammensfjorden. On the east side of Jeloya we see three laid-up tankers. We see commercial vessels on their way in and out of the fjord and we can chart their position, course, speed, and classification, i.e., what type of ships they are. We can also see the waves and currents on the surface. We can also tell if a ship is polluting the environment by releasing oil and, in many cases, we can prove it," Klippenberg said.

Surveillance

Klippenberg believes that surveillance of large ocean areas in the north will be extremely important for dealing with future crises. "The best way to deal with a crisis is to have correct information about the other side and satellite surveillance makes this possible. In this way, we can base our decisions on a higher degree of certainty than would otherwise be possible," he said. But the new surveillance system will not only be important in crises. "We can watch fishing vessels in our economic zone and more effectively send coast guard ships where they are needed. This will save money by making their operation more efficient than it is today. In addition, under most conditions we can also detect ships that release oil and foul the environment. We can also detect wave and current conditions on the ocean surface."

Research chief H. K. Johansen said that FFI had won a development contract from the European Space Agency, ESA, for future observation satellites. Work on the CESAR project started as long ago as 1978 and it is just one more example of how FFI researchers are on the cutting edge of developments. It is possible that we are looking at a new branch of industry that will have great economic importance to Norway. There are plans to manufacture the CESAR computer in Norway and it will be much less expensive than foreign alternatives, according to the FFI researchers.

AUTOMOTIVE INDUSTRY

Advances in Car Sensor Technology Reviewed

92AN0012 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 26 Sep 91 p 16

[Article by Jacques Marouani: "Sensors for the Car: A Demanding Market—Its Success Depends on a Careful Alliance Policy"]

[Text] Silicon sensors will play an increasingly important role in cars. However, their production requires huge investments, whereas their marketing demands low prices.

According to the Bis Mackintosh study bureau, the European car sensor market will reach $1.035 billion in 1995, compared to $489 million in 1989. Such an increase will inevitably attract many companies with a high level of technological expertise in the product. However, price restraints and necessary investments for

the introduction of mass production will considerably reduce the real number of suppliers.

From an industrial point of view, a manufacturer must spend 300-400 million French francs [Fr] on studies and research and Fr400-500 million on production, if he wants to offer the full range of sensors currently installed in cars. This is a difficult market, even inaccessible for modest-sized companies relying on their own resources.

Following the example of the Finnish company Vaisala and the American United Technologies, who have recently signed a joint venture agreement, alliances between manufacturers or between manufacturers and equipment suppliers are imperative. Whether they are called consolidations, take-overs, or partnerships, these operations not only provide additional financial means, but also allow cooperation at the technological level.

The sensor must be able to be integrated perfectly into an overall electronic system. It is therefore supplied either by the equipment supplier himself (Bosch, for instance, produces the majority of its sensors), or by a manufacturer who is sufficiently close to the system designer, or even by powerful companies such as Motorola, Delco, Philips, or Analog Devices, who have proven themselves over a number of years.

Reduce Price, Expand Range

The first well-known buying criterion of the car industry is price. "A micromachined sensor on silicon that turns out to be twice as expensive as a product from the previous generation using a winding system will not be adopted," stresses Mr. Warenghem, who is in charge of the technology and sensors department at Renault. Therefore, in spite of its complexity, an accelerometer should normally not cost more than Fr200 each when supplied in large quantities (500,000 units or more). Thus, even though very difficult, the market of accelerometers is one of the more promising.

Another essential condition for success is diversification and thus a constant flow of new ideas, rather than concentration on one single type of sensor. Over the short term, applications for the major markets are linked to environmental protection, because the antipollution standards which will be applicable in 1993 cannot be turned backwards. However, several electronic security systems will greatly expand. "There is a real need for sensors in active suspension systems. The sensor for the steering wheel must also be enhanced. As systems improve, they must be equipped with sensors of increasingly higher performance," explains Gerard Vassal, responsible for electronic research and systems at PSA (Peugeot). Functions linked to the anti-block system (ABS), suspension, or gearbox case, currently installed in top-of-the-line vehicles, will be progressively installed in the majority of the models. For instance, a version of the Renault Clio, a vehicle with a price that is affordable to the public at large, is equipped with ABS.

Over the longer term, new security plans, such as the detection of obstacles, will also be developed in order to reduce the number of accidents with bodily harm. PSA has performed tests on a Citroen XM equipped with a laser telemetry system. The principle of this device is to oblige the driver to maintain a minimum distance from the vehicle in front or to stop automatically before an obstacle. Only after extensive use of environment and security sensors will luxury requirements be considered. Thus, rain sensors, adapting the movements of the wiper to the intensity of the rain, and sun sensors, allowing distinguishing various air-conditioning zones in a single vehicle depending on the position of the sun, have been tested in prototypes, but are still far from being installed in large quantities.

To save space, it is necessary to place the sensor as close as possible to the parameter to be measured: in ball bearings, close to a wheel, or close to the engine. In certain places, the temperature may be close to 150 degrees Celsius, and the component must be able to withstand this.

Progress has been made in this area, for example in the field of Hall-effect sensors. Thus, Allegro Semiconductor (former division of Sprague), subsidiary of the Japanese group Sanken, proposes models that can function permanently at a temperature of 150 degrees Celsius and support peaks of 170-180 degrees. The magnetoresistant sensor advocated by Philips and direct competitor of the Hall-effect sensor withstands a temperature of 200 degrees.

In the future, downsizing will be mainly achieved through multiplexing. In Europe, mass-produced vehicles will be equipped with a multiplex bus within the next five years, most car manufacturers expect.

[Box, p 16]

Advanced Technology

Other than the price of the sensor, it is reliability which is most important. As in all new products, the integrated accelerometer recently introduced by Analog Devices responds to the first requirement, but still has to earn its merits as to the second. It is indeed the company's goal to use systems with a life expectancy equivalent to that of the car. The manufacturer therefore prefers to take all necessary precautions before adopting a new technology. It is for this reason that nonlinear resistors often still score higher than silicon temperature sensors, or that sensors using a winding system and a spring are far from being overtaken by Hall-effect sensors and magnetoresistant sensors. In general, silicon models are only very slowly being introduced. "When we have mastered a technology well and we have established its reliability, it must be fully exploited," an equipment supplier stresses. The sensor manufacturer often appears to be ahead of the needs of industry. An average head start of five years, which allows him to launch it at the right moment...

Czech-Swiss Electric Car To Be Launched

91WS0534A Paris AFP SCIENCES in French 22 Aug 91 p 35

[Article: "An Electric Skoda Favorit for Switzerland"]

[Text] Prague—Work will soon begin in Czechoslovakia on production of an electric car destined for the Swiss market. The manufacturers of the car, which is modeled on the "Skoda Favorit," will benefit from the know-how of the Swiss firm Fridez Solar AG.

Skoda Pilsen's subsidiary in Ejpovice (West Bohemia) will produce the first series of about 100 electric Favorits before the end of the year. The cars will be marketed in Switzerland, along with another 1,000 scheduled for production in 1992, according to Mr. Karel Kleinmond, manager of the Ejpovice factory.

The automotive bodies and other mechanical parts for the electric Favorits are provided by the Skoda automobile factory at Mlada Boleslav (50 km northeast of Prague). The 12-kilowatt electromotors as well as the electronic control systems will come from various Western countries, including Switzerland, the manager said.

The electric Favorit is a two-door sedan, 3.8 meters long, with enough room inside to seat five; it can reach a speed of 80 kilometers per hour and can go about 100 kilometers without a recharge. Planned offerings for 1992 include a more powerful model to be equipped with a new Czechoslovak electromotor, and a two-seater pick-up truck version with extended wheel base.

Siemens Develops Highly Sensitive Exhaust Sensor

91WS0467C Toddington NEW MATERIALS INTERNATIONAL in English Jul 91 p 4

[Article: "Exhaust Sensor Response Time Cut Tenfold"]

[Text] Siemens has developed a vehicle exhaust sensor made of thin ceramic film which is claimed to achieve response time of less than 10ms and to operate at temperatures of up to 1,000°C. allowing individual control of the combustion process in each cylinder of a car engine.

The sensor was developed at Siemens' research laboratories in Munich. It allows the engine control system to reduce the proportion of polluting gases such as C_xH_y, CO_x and NO_x.

The response time compares with the 100ms of the lambda probe made of zirconium dioxide which is normally used to measure the composition of the exhaust gases in vehicles with three-way catalytic converters. The engine control system sets the mixture composition according to this delayed response, and therefore cannot optimise the combustion process in each cylinder.

The short response time of the new sensors is a result of the reduced thickness of the sensor film consisting of a semi-conducting metal oxide. The sensors are about three-thousand times thinner than conventional lambda sensors.

Interconnections made of noble metals and located on the sensor film act as heating elements or temperature sensors and keep the sensor at a constant temperature of approximately 1,000°C.

Germany: Research Directions in Engine Fuel Use Explored

91WS0504B Duesseldorf VDI NACHRICHTEN in German No 31, 2 Aug 91 p 1

[Article by Mario Cikanek: "Smaller Displacement Instead of More Power"]

[Text] Graz, 2 Aug 91, VDI N—Otto engines have a potential for reducing fuel consumption by up to 25 percent as compared with the best existing developments," declared Karl Wojik. Last week at the Motor and Environment symposium in Graz, the automobile engineer from AVL List GmbH criticized the fact that only a very small proportion of today's vehicle fleets is equipped with the most up-to-date motor technology.

In Germany, for example, only three percent of the passenger vehicles now manufactured operate with multi-valve engines: "Simply by means of consumer-oriented use of the four-valve technology in renewing the fleet, it would be possible distinctly to lower average consumption," according to Wojik. Additional cuts in consumption can be achieved by increasing combustion speed with fully variable control in the gas exchange, he says. AVL— according to its own information the world's largest independent research and development center for engines—has developed the CBR method (Controlled Burn Rate) for this purpose and thus achieved consumption improvements in the test cycle of about 5 to 10 percent—"without therefore losing any operational capability," as the AVL engineer emphasized.

In Wojik's opinion, new technologies should not be used to increase performance but to reduce the swept volume. Advantages such as lower losses through friction and gas exchange should also be reflected in the fuel consumption. And even if the swept volume is altered, it would be recommended to "abandon the previous extreme short-stroke version and to construct oversquare engines," the Austrian engine developer concluded.

According to Wojik, "impressive" fuel consumption savings and emission reductions can be expected from creating an internal mixture, just as in a diesel motor. Since the tests with direct gasoline injection "repeatedly" showed "certain weaknesses," AVL is now working on a "very promising" concept of direct mixture injection (DMI). In this process a fuel-air mixture at

temperatures between 150 and 400°C and a pressure of 10 to 40 bar is blown into the cylinder.

Altogether, the new technologies for the Otto engine, combined with measures involving vehicle technology, make it possible to anticipate fuel consumption of 5 liters of Euromix per 100 kilometers, with average vehicle weights of 1,200 to 1,300 kilograms—"without any reduction in road safety and driving comfort," Wojik added.

Regarding the discussion about alternative fuel systems, the automobile engineer stated at the Graz symposium that a breakthrough could only be expected for renewable energies. For large-scale industrial use of solar energy one has to think in terms of 40 to 50 years, according to the present state of knowledge. Even then, the internal combustion engine could retain its attractiveness, after having proven as early as today how well it could be operated with hydrogen—which can also be obtained with solar energy.

VW, Swatch Cooperate in Electric Car Development

Developments Reviewed

91WS0513A Hamburg DER SPIEGEL in German 8 Jul 91 pp 86-88

[Article: "Is the Eco-Car Coming?"]

[Text] Ulrich Seiffert gazes gloomily into the auditorium of Zurich Technical University. "Clogged cities, increasing traffic jams," complains the member of VW development board, the car is threatened by a "total loss of acceptance." Only a "global and concerted action by all involved" could stop this sheetmetal hydra. In a confidential circle he was even more bewildered: "What is an ecological car, really?"

He may soon have found the answer. Together with Swiss businessman Nicholas Hayek, who turned the Swatch watch into a success, Volkswagen wants to develop a small and ecological vehicle, the Swatch car. A corresponding agreement was approved last week by the supervisory board of VW.

On the one hand the tinkerer and marketing strategist, and on the other the big, bureaucratic group—the connection is unusual. But the automobile industry must also think of some unusual things. Its product has become discredited; all over the world new laws are prepared against the environmentally harmful automobile. Like no other product the car is threatening our environment: It is noisy, it causes accidents, it poisons the air. And cars emit carbon dioxide—the material which shares responsibility for the climatic catastrophe.

So far, business in the industry has not been hurt by the poor reputation of its products. The German auto industry, in particular, has some prosperous years behind it, and German unity further helped the boom. Last year Volkswagen was able to increase its domestic turnover by 52 percent.

The industry therefore has not expended too much effort on developing a more nonpolluting alternative. For decades the manufacturers have listlessly tinkered with concept cars, snappy little eco-cars and hybrid vehicles; they are experimenting with hydrogen, electric power, or ramie as a new fuel.

The VW group alone has developed about 300 eco-prototypes in the last 20 years. The U.S. General Motors group has declared for two decades that it wants to built electric cars in large-scale series. This time the car is called the Impact (160 km/h speed, range 200 kilometers), and it is to roll off the assembly line after 1994.

Instead of more compact and more economical, cars have become larger and thirstier since the last oil crisis. Despite better engines and more aerodynamic shapes, the gas consumption of the German fleet has been growing steadily since 1986.

Even the catalytic converter is of little help. The carbon dioxide greenhouse gas is not prevented from passing through the exhaust filter and lays itself as a heat trap around the globe. Diesel engines release cancer-causing soot particles, and high ozone concentrations in the inner cities attack the bronchial tubes, heart, and circulation.

Until now the automobile industry has not been prepared to halt this development voluntarily. But draconian laws are now threatening, which have revived the issue of an ecological car.

The Californians take a particularly rigorous approach. By the year 2003 electric cars are to reach a share of 10 percent of the total number of cars. This example could set a precedent. Automobile companies which want to continue exporting to the United States will have to aim for this development.

But even in this country there is a threatening danger. In the year 2005 cars may not use more than 5 liters per 100 kilometer, in Environment Minister Klaus Toepfer's opinion—on the average. Manufacturers could be ordered to maintain this average for their fleets.

The auto makers also fear that the inner cities will be completely closed to their products. They have assured the chancellor that they will reduce the CO_2 emissions of their products by 25 percent in the next 15 years.

Just how this is to be carried out is unclear. Neither methanol nor ethanol measurably diminish the problems. Methanol releases toxic formaldehyde during combustion. Fuel extracted from rape oil would result in a reorientation of agriculture.

Hydrogen as fuel also has disadvantages. The liquid gas is at minus 252°C. How is it to be transported and pumped? Further, hydrogen could only contribute to a

reduction of the burden on the atmosphere if the electrolytic facilities to produce it are operated with solar energy.

Even the electric car trails exhaust gas behind it. As long as the photovoltaic paddles at solar filling stations throw more shade than they produce power, fossil-fueled power plants will have to produce the necessary energy.

But electric cars are certainly more beneficial to the environment: Converted, the electric motor emits 17 percent less carbon monoxide than the gasoline engine; oxides of nitrogen and hydrocarbons are hardly produced at all. Only with sulfur dioxide, the cause of acid rain, do combustion engines fare better.

The electric cars could bring noticeable relief to the fogged-in inner cities. Nearly all manufacturers are working on the development of electrically driven passenger cars. But everywhere there is a lack of impetus to push ahead with the development. At BMW 10 engineers are occupied with alternative electric motors. On the other hand, 800 men are struggling with the construction of high-horsepower engines.

At the present time the battery for a mobile electric technology is creating problems. In order to store the energy of one liter of fuel, a 100-kilo lead battery is needed. The Golf Citystromer (price: DM 70,000), 40 of which were released in June, hauls a 480-kilo rechargeable battery around. After 56 kilometers of city driving, the lead box is empty. "The car has nothing but drawbacks for the owner," VW freely admits.

Nickel-cadmium batteries, with which Opel has outfitted some experimental Kadetts, weigh less (300 kilos) and have greater storage capacity. Even more powerful are the new sodium-sulfur accumulators from the Asea Brown Boveri company, which achieve up to four times greater storage capability than the old lead-acid batteries. Mercedes and its AEG subsidiary are equally betting on sodium-nickel chloride batteries, which were tested in the 190 models for the first time.

But power storage is not only heavy, it is also expensive. The battery of the electric BMW 325 costs DM 42,000 and works at an operating temperature of about 300°C. The new high- capacity reserves must be extensively insulated externally, have much too short a lifetime and can self-discharge when standing for a long time. Furthermore, the manufacturers are frightened off by the fact that electric cars are not suitable for longer distances.

VW has taken a different approach with its hybrid Golf. The car has been undergoing extensive testing in Switzerland since last month. A small electric motor under the hood powers the car through the city with little toxic emission. When the gas pedal is fully depressed, the catalytic converter-equipped diesel engine starts up. When driven economically, the fuel consumption of this hybrid vehicle is below three liters. The disadvantage of the technology: Two power systems cost a lot of money. But fuel consumption can be cut even with conventional motors. Diesel engines with direct fuel injection can lower diesel oil consumption by 35 percent.

Meanwhile, the greatest savings potential is contained in the weight of the car. The "compact car" developed by VW is 3.2 meters long, weighs 785 kilos, and has room for two adults and two children. Using a gasoline engine (800 cubic centimeter displacement), it is said to use about 3.5 liters [per 100 kilometers]. The third model with a hybrid engine, according to VW developer Seiffert, would be "suitable for both city and long-distance traffic" as well as extremely economical.

That is the VW version of the future Swatch car. Swatch inventor Hayek has also developed a model. "Now we will combine the two," says Seiffert. "Then things will start happening."

Executives Interviewed

91WS0513B Hamburg DER SPIEGEL in German 8 Jul 91 pp 88-90

[Interview with Swatch manufacturer Nicholas Hayek and VW developer Ulrich Seiffert, by editors Dietmar Hawranek and Wolfgang Kaden: "We Will Dare to Do Something"; first two paragraphs are DER SPIEGEL introduction]

[Text] **Ulrich Seiffert** has already occupied himself several times with future models for the auto industry. For the VW group, he developed research vehicles such as the VW Scooter, a car with three wheels. Seiffert, 50, has been responsible for research and development on VW's executive board since 1988.

Nicholas G. Hayek advises firms such as Siemens, Thyssen, and AEG. At the same time he is the head and largest shareholder of Schweizer Uhrenholding SMH (brands: Swatch, Omega, Tissot, and others). Hayek, 63, turned the Swatch into a worldwide success and saved the watch industry of the Alpine nation.

SPIEGEL: Mr. Seiffert, how did Volkswagen actually get the idea of developing a new car together with a Swiss watch company?

Seiffert: We have long had contact with the Hayek firm and with Uhrenholding SMH, which does not produce just the Swatch. It makes, for example, small stepping motors, which we might be able to put into tachometers. And Mr. Hayek has a watch production in which we are very interested. Not because we want to make watches, but because it involves a highly rational form of mass production.

SPIEGEL: You surely have business contacts of this kind with many people. But now you want to build a new car together with a watch manufacturer.

Hayek: Here I have to cut in. Why are you calling me a watch manufacturer? SMH makes consumer goods which cause emotions. And it specializes in electrical

and electronic goods. It is as if I were to say that you write letters. You also write articles, and you are editors.

Seiffert: If you are a little open to the world, if you have a good idea presented to you, if a partner comes to you, with whom you can realize that idea—why shouldn't you then do it?

SPIEGEL: You have about 6,000 developers in Wolfsburg. Don't you have to agree with the accusation that Mr. Hayek, with a small troop of engineers, is showing the big conglomerate how to do things?

Seiffert: We have brought very successful products to market with our developers, and the next one, the new Golf, can soon be admired and purchased. Further, automobile development does not mean sitting in Wolfsburg and thinking clever thoughts. Today, as much as 25 percent of the development capacity of the group is located outside Germany. For example, we have founded a design center with a central team of five people in California. It could certainly happen that they have a brilliant idea, and we are happy to adopt it.

Hayek: I must already congratulate Mr. Seiffert on how relaxed he answers your question of whether he shouldn't be ashamed of his 6,000 people. If we were to think like that, we could never undertake cooperations in Europe, the way the Japanese are doing. They feel no shame at all in cooperating with a one- or two-man enterprise.

SPIEGEL: What will the cooperation look like?

Seiffert: First, VW and SMH will found a joint enterprise, in which both companies will have equal participation. This company, located in Switzerland, will initially work out a feasibility study. In a business such as this one you have to make money, after all, and not just spend money. Development must end in products which can be built and sold. And not until after this study will we decide: Should we develop and build the Swatch car?

SPIEGEL: Some VW developers say that this project is nonsense.

Seiffert: I don't know anyone who says that sort of thing. It could be, of course, that the employees don't dare tell me that. But the project already cannot be nonsense since we are working on a similar study ourselves and will present it at the IAA [International Automobile Show] in the fall. It involves a short, compact car, exactly 3.15 meters long, that is to say almost one meter shorter than a Golf. In the past we presented similar studies, for example the Scooter, a sport coupe with three wheels.

SPIEGEL: Mr. Hayek, you are less well-known as an excellent technician. You are said to be an excellent salesman. One could get the idea that the car project is only a wonderful campaign to stimulate sales of the watch.

Hayek: Yes, you could, and you should, until you get the car pushed under your nose, and you are happy that it is a first-class car. That will be such a big surprise that people will open their wallets and immediately buy a car.

SPIEGEL: A watch and a car do not exactly have a lot in common. What can you and your people offer the VW developers?

Hayek: We have been working for a year together with the engineering school in Biel. That is one of the best schools for automobile design—not for ordinary cars, but for electric and solar-powered vehicles. In addition we are working on this vehicle with our own people, who in part come from the automobile industry. And, finally, many subcontractors for the auto industry have undertaken preliminary developments for us.

SPIEGEL: Mr. Seiffert, what do you expect from this cooperation?

Seiffert: For us the excitement of working with Hayek or SMH lies partly in being able to exercise limitation in this project. When you develop such a car in a major company, it also begins very gently, but then right away it goes: Actually, the car also needs air conditioning and power steering and then this and then that. Perhaps one reason for the success of the Beetle was that it only came in one version: the same switches, the same equipment, only the color was different. There are parallels with that in our new project.

SPIEGEL: Almost everyone knows the Swatch watch. It is made of plastic, is cheap and ticks really loud. What will the Swatch car look like?

Hayek: Our watches are not made only of plastic. They are also not cheap. They are a good value. The Swatch message is: a lot of quality, zest for life, and provocation for little money. Over a period of eight years 84 million people bought a Swatch. We thus have 80 times more customers than SPIEGEL. And we have asked many passers-by in many cities: What do you think of a Swatch car? Ninety-five percent did not answer like a SPIEGEL editor, who always questions everything. They said: That's a great idea; if it's a Swatch car it will be a good value and good-looking, and it will be of high quality.

SPIEGEL: But the doubting SPIEGEL editors still cannot envision what the car will look like.

Hayek: There must be room for two persons. Even a two-meter-tall man or one with my circumference must feel comfortable in it. And then there should also be room for two crates of beer or mineral water.

Seiffert: It must still be determined in the feasibility study whether it will be a two-seater. One has to ask oneself if it really makes sense to build a car for only two persons. If it only becomes the third or fourth car in the family, we haven't achieved anything, because that could lead to even more cars driving the roads transporting the same number of people. It could even increase the traffic problems.

Hayek: In the long lines of cars which snake into the cities in the morning, there is often only a single person in a huge car. For that reason it may perhaps make more sense to build a two- seater. You see, we are still in the middle of a strategy discussion here. But it is clear that the Swatch car must have a range of 200 kilometers and the speed of a normal car. And it must be a car which does not harm the environment.

SPIEGEL: An eco-car? Could such a thing even exist?

Hayek: There are no ecological cars, of course. But in the future there must be cars which burden the environment significantly less than the ones offered up to now.

SPIEGEL: Is car developer Seiffert also of the opinion that there are no ecological cars?

Seiffert: To begin with: Even the human being is not ecological. Without the human we would have a wonderful ecological balance on earth. He is the one who destroys nature. What Mr. Hayek wanted to indicate is what we also believe: A car is today a compromise between ecology, safety, consumption, cost, and other things. We want to develop a car which uses little energy. And one alternative should be an engine which, if possible, does not need fossil fuels such as gasoline. Because burning those creates carbon dioxide, and that is partly responsible for the greenhouse effect. A car with a purely electric motor or a hybrid vehicle would be conceivable, in which one would have the choice of driving with either gasoline or electric power.

SPIEGEL: An electric car cannot be environmentally safe, because the power with which the batteries are charged is produced in coal-based power plants, which pollute the air.

Seiffert: Switzerland produces about 60 percent of its power from nuclear power plants. Here one could conceive of an electric car or a hybrid vehicle. These cars run alternately on electric current or diesel fuel. At this time we are carrying out a major experiment in Zurich with 20 such hybrid vehicles. When the car moves around the city, the electric motor automatically takes over the driving. And when the driver then steps on the gas pedal a little harder, because he wants to go faster than 50 kilometers an hour, the diesel engine takes over.

SPIEGEL: The Swatch car is to be relatively light, in order to use little energy. Until now, developers have always said: Cars should always get heavier, so that they offer better protection against accidents. A light Swatch car would hence be a dangerous vehicle.

Seiffert: I still don't know just how light it will be. We will find that out during the course of the development. With respect to crash safety we must meet certain demands, and so we will. Furthermore, we will certainly plan an air bag for this car.

SPIEGEL: It is going to be a wonder car: It will be safe, very nonpolluting and simultaneously quite cheap. Safety and low pollution usually cost money, however. A hybrid motor is much more expensive than a simple gasoline engine.

Seiffert: Ecology costs money, we must realize that. But Mr. Hayek has already said that the car will not be cheap, but value for the money. And that means that for your francs or deutschemarks you get the optimum value.

SPIEGEL: Then how much will the car cost?

Hayek: We have set a clear price goal for the car which we are developing. It is a very competitive price.

SPIEGEL: Until now, new cars have always been getting larger, heavier, and faster. Is the Swatch car a symbol of a turnaround in this trend?

Seiffert: Cars got heavier because of the greater safety requirements and faster often because of lower air resistance, not so much because of stronger motors. Our buyers often decided in favor of more powerful engines because of the good acceleration. The basic question is: Do we need another car for certain driving? We don't know how large the group of interested people is.

SPIEGEL: So far the customers have always demanded more horsepower. Can a company educate its customers? Can it cause them to switch to smaller, more nonpolluting vehicles?

Seiffert: Personally, I have two different sentiments. If I only had a car such as the Swatch car in the program, I would probably be chased in disgrace from the company after five years, because it would be financially broke. We cannot do that, of course. But we have to realize that at present the car has acceptance problems. And being the largest manufacturer in Europe, we must have the courage, even the responsibility, of offering something else. We want to dare to do something here.

SPIEGEL: Is the Swatch car also an attempt at an example of the way the VW group can develop a car with little investment, in a shorter time?

Seiffert: I think so. We can do it much faster with a small, external partner than internally, because we are equipped for large-scale series everywhere. I regard it as one of the principal goals to develop a car with the lowest possible investment.

SPIEGEL: Do you intend to build a factory just for the car, in some low-wage country?

Hayek: That has not yet been determined. But the wages will not be the main problem. We showed with the Swatch watch that it is possible to make an inexpensive, high-quality product in a country with high wages. A large number of parts can be acquired from suppliers, and then the wage costs just for the assembly no longer play such a major role, because it is highly automated.

SPIEGEL: We have heard that the minister-president of Lower Saxony, Gerhard Schroeder, has advocated to the

VW supervisory board that this factory should be located in his Land, if possible in structurally weak Wilhelmshaven.

Hayek: I don't know anything about that. But in the contract between VW and SMH it says that we will select or construct the factory which can produce the best quality and which is internationally competitive. We really cannot pick a Land or even a city already now.

SPIEGEL: When can the first customers buy a Swatch car?

Seiffert: It will take about a year until we have finished prototypes. Then, at the point just after the final styling decision, we need about 28 months until production, even if we initiate a crash program.

SPIEGEL: So in three and a half years we can meet for a test drive in the Swatch car?

Seiffert: That would be the earliest point in time. A realistic time concept from my point of view would instead be in four years.

SPIEGEL: Mr. Hayek, Mr. Seiffert, we thank you for this conversation.

Mercedes-Benz Develops Microprocessor-Controlled Exhaust Recycling System

91WS0476A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 10 Jul 91 p 8

[Article: "80,000 km Endurance Test Confirms Low Particulate Emissions: "Mercedes-Benz— First Turbo-Diesel Personal Automobile With Microprocessor-Controlled Exhaust Gas Recycling"]

[Text] Mercedes Benz has announced that all of their personal automobiles with aspirating engines are now equipped with the special feature "exhaust cleaning system," which enables them to more than meet the strict particulate limit of 0.08 gram/km. The exhaust cleaning system consists of an oxidizing catalytic converter and exhaust gas recirculation (EGR). The exhaust emissions of vehicles equipped with this system are 40 percent lower than the maximum allowed by the strict standards currently in effect in the United States. Consequently, they fall under the December 29, 1990 law authorizing tax breaks for ultra low emission diesel automobiles. Mercedes-Benz states that the source of these figures is their 80,000 km endurance test.

The only thing new in the technical procedure by which this was accomplished is the combination of various basic automotive systems with known components. Mercedes has announced that the exhaust cleaning system has resulted in improvements over the D-89 Engine Concept, which already falls under the low emission vehicle (LEV) category (distinguished by a 40 percent reduction in particulate emissions as a result of internal features such as indirect injection). Exhaust gas recirculation has reduced nitrogen oxide (NO_x) emissions by one third, hydrocarbon emissions by two thirds, and particulate emissions by 20 percent.

The cost of the time-consuming endurance test at the required driving cycle, with its many intermediate tests and the considerable maintenance work involved, is estimated by Mercedes at 1 million German marks. Favorable results from the endurance test for the similarly-equipped turbo diesel engine are also expected soon. At that point, nearly all Mercedes diesel engines will be recognized in Germany as "ultra low emission vehicles."

According to Manfred Fortnagel, chief of the Mercedes Benz program for the development of diesel automobiles, "Exceeding the extremely strict particulate standards was a very demanding task, in terms of both automotive development and measuring techniques." Fortnagel feels that another tax break should be established such as the one for Otto engines with three-way catalytic converters, considering that the cost of the exhaust cleaning system is comparable. He hopes that now that the particulate emissions objective has been achieved, German emission and tax legislation will no longer discriminate against diesel automobiles.

The Mercedes diesel engine, with its precombustion chamber carefully optimized via indirect ignition, has remained essentially the same. The addition of the oxidizing catalytic converter has not adversely affected the internal workings of the engine. The vehicle is still economical and consistent where emissions are concerned.

Carefully selected elements of Mercedes diesel technology made important contributions to the low emission output. All Mercedes diesels come standard-equipped with an altitude-sensitive regulator, which adjusts the amount of fuel injected to reduced air pressure, even in the highest mountains, thereby reducing visible smoke.

In order to match the ERG-altered combustion process, further improvements have been made in those parameters that affect combustion, such as the method and timing of injection. In contrast to the three-way-catalytic converter used in Otto engines, the catalytic converter used in diesels functions as a pure oxidizing catalytic converter. Although it is able to oxidize hydrocarbons and carbon monoxide into water and carbon dioxide, it is unable to convert NO_x.

However, as Mercedes Benz points out, in oxidizing catalytic converters, the particulate mass ("soot") is measurably reduced by catalytic aftertreatment. This means that the amount of hydrocarbons added to carbon will be considerably reduced during postoxidation. From the outside, the catalytic converter used in the diesel engines does not appear much different from the three-way catalytic converter used in otto engines. However,

the individual cells have large open cross-sections which reduce the likelihood of the converter becoming clogged by particulates.

Consequently, the loss of power associated with the oxidizing catalytic converter is correspondingly low. The active surface of the catalytic converter is at least the size of a soccer field. One gram of precious metal, consisting of a platinum-palladium blend, is applied to the so-called wash coat, one of the highly porous intermediate layers which increase the surface of the catalytic converter by a factor of 15,000. The catalytic convertor shows very little wear during its use in the diesel engine.

Due to the large oxygen surplus, the catalytic aftertreatment in the diesel oxidizing catalytic converter is unable to promote a chemical reducing reaction. Consequently, the NO_x emission levels remain the same, and must be reduced via EGR. During this process, part of the exhaust gases is diverted from the exhaust manifold and redirected back through an EGR valve into the bottom of the air filter.

A specially designed cylinder serves to ensure a homogeneous mixture of exhaust and fresh intake air. At part load, the Mercedes Benz diesel engine can operate with more than 25 percent exhaust in the intake air. This leads to a significantly lower NO_x emission. In order to avoid problems, the EGR is sealed off when the vehicle is operating full load. In engines equipped with EGR, the ratio between fresh air and added exhaust must be adjusted to the engine operating point.

In aspirating engines, the intake air is choked via a pressure control valve in the air filter housing which is mechanically controlled by the gas pedal. The operation of the EGR valve is coordinated with engine load. During this procedure, an electronic control device analyzes those engine parameters that are important to EGR, such as engine temperature, revolutions per minute, and load. EGR for the Mercedes turbo diesel is more expensive. Mercedes claims that it is the first diesel engine in the world with a microprocessor-controlled EGR in a closed feedback loop.

Thus, both boost pressure and EGR can be programmed for all engine performance levels. This fuel-air management permits the optimum adjustment of the EGR valve to all engine operating states. At the same time, the pressure control on the turbo supercharger ("waste gate"), the induction valve, and the EGR system are all electronically controlled. On the subject of progress in the development of an exhaust particulate filter, Mercedes-Benz stated that tests begun in the United States in 1985 had to be discontinued in 1987. During reliability tests, extreme thermal stress had resulted in failures during regeneration of sintered ceramic filter elements.

Filters made of windings, sintered metal, and oxide ceramics have shown promising results in endurance tests. During these tests, permanent and intermittently operating regeneration aids are being studied. Doping the diesel fuel with ferriferous additives (approximately 7 gram iron per 1,000 liters fuel) to drastically reduce the ignition temperature of the soot particulates collected in the exhaust particulate filter also shows considerable promise. It remains to be seen whether the authorities will approve the necessary additive. For logistical reasons, on-board systems have been developed and tested whereby the additive would be exactly and automatically doped into the fuel.

BMW To Air El Electric Concept Car

91P60251 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 8 Aug 91 p 8

[Text] This September in Frankfurt, at the International Auto Exposition, Bavarian Motor Works (BMW) AG in Munich will introduce the El, its first electric-powered automobile. [It will be exhibited] as a readyto-drive concept car. According to BMW, the El is a "nimble vehicle seating up to four persons."

With its 45 horsepower electric motor, the 900-kg vehicle can reportedly accelerate to 50 kilometers per hour in six seconds. Its top speed is 120 kilometers per hour and its [unrecharged] range is over 250 kilometers. Then, the 200-kg battery must be recharged over a period of six to eight hours. The vehicle measures 3.40 meters long by 1.60 meters wide by 1.50 meters high. The vehicle was specially equipped for operation in urban areas, has an aluminum undercarriage and an outer skin made of plastic.

The El concept car will demonstrate how a vehicle would have to be conceived "so as to permit its utilization within a few years." Prior to serial production of an electric vehicle, BMW still foresees numerous, extensive unresolved problems in the field of propulsion and energy storage. As its point of reference, BMW is harking back to California legislation wherein, from 1998 onward, 2 percent of the [vehicles] licensed there may have to be so-called "zero-emission vehicles."

Germany: Sodium/Sulfur Battery With Ceramic Electrolyte

91WS05528A Berlin ING DIGEST in German Aug 91 p 13

[Article by RTL: "Battery With Ceramics Lighter and More Efficient"]

[Text] There is no question that energy storage is a key technology, important for the economical utilization of renewable energies such as sun and wind, for meeting peak demand for power in conventional power plants, and for using electric vehicles. The Federal Ministry for Research and Technology (BMFT) has spent 170 million German marks [DM] on research since the mid-1970's.

One of the supported projects is development of the sodium/sulfur high-energy battery. This project uses the

electrochemical system of sodium and sulfur in combination with a specially developed solid state electrolyte of ceramic (β-aluminum). The ceramic forms the core and because of its conductivity for sodium ions makes the unique conditions of this battery possible: They consist of a very high energy density with high efficency and freedom from maintenance. In comparison with the lead battery, for the same energy content one-fourth of the weight is needed and half the construction volume.

This results in new opportunities particularly in the mobile application field. Electric cars are given more acceptable range and power. In the central cities, in particular, the use of electric cars, battery-operated busses and transport vehicles would lead to a noticeable reduction in emissions and noise. Operation of electric commuter systems would be possible without overhead lines. Electrically operated fork trucks could also be capable of greater efficiency and achieve longer operating times with the new battery. That would make it possible also to use them for emission-free transportation of heavy loads in closed spaces. Finally, use of the battery in electric boats would represent an interesting application designed to protect the waters.

Intermediate-size passenger cars powered by such a high-energy battery, according to their design can reach (as tested by the BMFT's willingness to drive them in daily operation), a maximum speed of 120 km/h with a range of 150 to 200 kilometers. Acceleration from 0 to 50 km/h, that is to say the normal maximum speed permitted in city traffic, is 7 seconds. Over a driving distance of 100 km, a medium-sized passenger car needs an average of about 25 kilowatt-hours of energy, which, depending on the rate, cost about DM5 per hour. Charging an empty battery at a household outlet takes up to eight hours. For quick charges the loading time can be cut to 90 minutes. The battery can be recharged approximately 1,000 times. This corresponds with a driving distance of 150,000 km. Discarding such a battery at the end of its lifetime has also been solved: 97 percent of the battery materials can be reused. At present, work is under way on large-scale production of the new battery by the mid-1990's.

The Federal Ministry for Research and Technology has already become a participant as a funding source for the development of a ZEBRA battery and has supported the heat storage project. It has produced the concept of earth and aquifer storage cells, which are charged through solar collectors in spring and summer. During the heating period, the stored heat is used by means of heat pumps in order to heat rooms. Proportions of 50 to 70 percent solar heat of the total heating requirement are technically possible for buildings in the FRG. Stuttgart University has acquired special merits in this development. Work on high-energy batteries is also under way abroad, for example in the United States, in Japan and England. In the United States, for example, three vehicle manufacturers have established a research consortium.

Germany: AEG Produces New High-Output Battery

91P6O283 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 13 Sep 9l p 8

[Text] At IAA 91, AEG is introducing an improved version of the sodium/nickel chloride high-output battery whose power was increased by over 20 percent relative to the latest generation of batteries. This improves the outlook for the application of electric powerplants for vehicles, a field in which AEG currently believes ranges well in excess of 200 kilometers are possible. Models of the new battery version should be available beginning in 1992. According to AEG, the high-output sodium/nickel chloride-based battery, jointly developed by AEG and Anglo American Corporation has an energy density around four times as high as conventional lead batteries and is particularly suitable as an : environmentally friendly energy storage device for automotive powerplants. The developers have now succeeded in boosting the battery's energy content from 30 to 36 kilowatt-hours. This leads to a significant increase in energy and power density. The useful life of the battery is set at over 1,0O0 cycles. This represents a mileage of 150,000 kilometers.

BIOTECHNOLOGY

Rhone-Poulenc Launches Major Biochemical Research Project

91WS0502A Paris LES ECHOS in French 12 Aug 91 p 5

[Article by Denis Cosnard and Philippe Escande: "Research: Rhone-Poulenc Betting More Than 1 Billion on Biochemistry"; first paragraph is LES ECHOS introduction]

[Text] In order to become one of the premier international pharmaceutical and agrochemical groups in 10 years, the French firm plans to launch a major biochemical research program. Like Thomson and Bull, it will receive government assistance.

By the year 2000, Rhone-Poulenc will be one of the world's five leading chemical firms—that is, if it meets the strategic objective officially set by Jean-Rene Fourtou, the nationalized group's president and chief executive officer. How will it do so? After having emphasized major acquisitions—Union Carbide's agrochemicals, Monsanto's analgesics, part of Stauffer, Connaught, Rorer, etc.—Rhone-Poulenc now intends to make research top priority.

Bio-Avenir, the biochemical research program the group is preparing for public launch this fall, is a symbol of this new phase. Concocted in the greatest secrecy over an approximately two-year period, this vast project should lead to cooperation between the leading French chemical firm and CNRS [National Center for Scientific

Research], the National Agronomic Research Institute (INRA), and the National Health and Medical Research Institute (INSERM). Like the major technological program on the clean engine undertaken by PSA and Renault, it will receive generous financial support from the state.

Bio-Avenir should cost a total of between 1 and 2 billion francs [Fr] over a five-year period. The figure will not be finalized until the public authorities set the exact amount of their participation. Theoretically, public funding will cover 30 to 50 percent of the total investment, or Fr60 to Fr200 million (probably close to Fr100 million), to be drawn from the budgets of the Ministries of Research and Industry. This arrangement is possible because of the increase in the 1992 industrial and technological research budget. The final decision is expected from Edith Cresson sometime in September.

The extent of cooperation with government research centers also remains to be determined. How many joint research teams will be put together? With whom? "The form this cooperation will take has not yet been determined," Rhone-Poulenc Scientific Director Claude Helene said.

Strengthening Upstream Research

There is no question of other companies being involved in the project, in contrast with the major programs on the clean car and the follow-on TGV [High-Speed Train], which are jointly run by several companies. However, the government does plan to open certain parts of Bio-Avenir to other European groups in the context of the Eureka [European Research Coordinating Agency] project. This is a way of warding off possible criticism by the European Commission for disguised subsidies. Two years ago, this issue caused Brussels to delay startup of the clean car program for almost a year.

The amount of assistance provided by the state will determine the exact content of the program, which has already been technically evaluated by the public authorities. As envisaged by Rhone-Poulenc, Bio-Avenir would cover "everything on the frontier between chemistry and the living." Specifically, it would deal with the way in which chemicals cross membranes, the structures and functions of macromolecules, cellular regulation, certain fields of genetics, and so forth. Relatively speaking, these research fields are upstream from Rhone-Poulenc's usual work.

Since the results will apply to humans, animals, and plants, they could interest both the group's pharmaceutical and veterinary branch (Rhone-Poulenc-Rorer, Merieux) and its agrochemical branch. "Behind each research axis, there is an underlying future medicine or phytosanitary product. For example, if we are working on the immune response, it is in order to try and find something to combat AIDS."

For the French chemical firm, the stakes are clear. Since 1985, Rhone-Poulenc's acquisitions have moved it from 12th to seventh place among international chemical firms. It has gotten a good foothold in the United States and has abandoned many sectors in which it considered itself too weak. To continue to move ahead, it is pinning all its hopes on research. In both the pharmaceutical and the agrochemical industry, innovation is the key to success. According to Jean-Rene Fourtou, these tws, and its scientific activities have been reorganized several times. With Bio-Avenir, the group intends to alleviate these deficiencies by improving its ties with government laboratories and strengthening its upstream research.

New French Propagation Technique Promises Higher Coconut Oil Yields

91P60250 Paris L'USINE NOUVELLE in English 18 Jul 91 p 25

[Article: "After the Oil Palm, the Coconut Palm"

[Text] Two French teams have succeeded in producing coconut palms through in vitro propagation. This technique, which involves producing a very large number of identical specimens (clones) through cell culture in the laboratory, has been perfected in the case of the oil palm by the Center for International Cooperation in Agronomic Research for Development in collaboration with Orstom.

Applied to the coconut palm, the technique may provide a 25 percent higher yield of coconut meat. It interests the leaders of countries such as Indonesia and the Phillipines, and countries in the Pacific, which derive up to 80 percent of their GNP from the coconut palm.

German Researchers Develop Cell Culturing Technique

91P6O279 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 Aug 91 p 8

[Text] With the aid of a new cell culturing system, University of Regensburg scientists hope to facilitate the application of cell cultures in pharmaceutical and biomedical research. Prof-Dr Will Minuth and his colleagues from the Institute of Anatomy developed the system, called "Minusheet".

According to Minuth, contemporary cell culturing methods leave something to be desired. Using conventional techniques, it is quite difficult to achieve cell culturing conditions wherein the cells behave as intact tissue or organs would behave. This is of great importance for pharmaceutical research as well as for basic medical and biological research.

For example, among the problems arising in conventional cell culture techniques, there is the fact that the culture medium is not replaced over periods of several days. This can precipitate the buildup of metabolic products that damage cells. Furthermore, using contemporary techniques, the cells are surrounded everywhere

by the same culture medium. These relationships do not correspond to those in organ tissue. All this can cause the cells to lose their specific properties.

However, for many studies, cell-specific properties are indispensable. Thus, Minuth developed the Minusheets for eliminating these drawbacks. Minusheets are film-like, ultrathin disks having a concentric retainer. This makes possible the application of a variety of different biocompatible substrates as bases for cells. So, for each cell type, an individual base can be selected upon which the cells grow. The Minusheets can be used in stacked fashion in a perfusion chamber. In this chamber, the adhesive cells are continually fed fresh nutritive medium and are thus quite easily absorbed.

In order to create the most natural conditions for cell culturing, the Regensburg scientists also developed a gradient perfusion chamber. With the aid of this chamber, the Minusheets can be provided with cells from the top and with entirely different culturing media from below. The natural relationships in tissue are thus simulated. Moreover, in this fashion, the effect of hormones and pharmaceuticals upon the cells can be precisely checked.

At present, Minuth is developing a method permitting electronic measurements within the chamber. By means of such measurements whereby, for example, a change in a culture medium's conductivity can be determined, changes in cellular metabolism subsequent to the addition of a pharmaceutical can be detected. Here, Minuth's aim is on-line measurement of cellular reaction to substances. Up to now, the Regensburg scientists have logged positive results in culturing kidney cells. Minuth expects further success with his system in cultivating liver cells and cells from the inner walls of blood vessels as well as in simulating the blood cerebrospinal barrier, which latter is of great importance in pharmaceutical research.

Italy: Biotechnology Center Director on Research Programs

91MI0479 Brescia BIOTEC in Italian Jul-Aug 91 p 64

[Interview with Prof. Francisco Baralle, director of the International Center for Genetic Engineering and Biotechnology, in Trieste: "Trieste: A City Devoted to Science"; first paragraph is BIOTEC introduction]

[Text] Professor Francisco Baralle was born in Buenos Aires in 1943, holds degrees in Chemistry and Medicine, and is currently the director of the Trieste branch of the International Center for Genetic Engineering and Biotechnology.

BIOTEC: You are certainly the person who can best describe the favorable situation that the city of Trieste currently enjoys in the science arena.

Baralle: Is is, in fact, a privileged situation, that dates back to 1978, when parliament passed a bill to set up a hitherto unknown institution in Italy: the Research Area; a scientific park designed to be a nation-wide reference point for the promotion of research in high technology sectors. Managed by a consortium comprising local administration agencies, universities in the region, leading research centers and organizations (such as inter-university associations and the CNR [National Research Council]), the park has a multidisciplinary approach, its goal being to promote basic research and also to offer researchers new employment opportunities.

The Trieste Research Area hosts 14 research centers. The best known is undoubtedly the center in which researchers are working toward the construction of the synchrotron light machine under Professor Carlo Rubbia. However, equal importance is attached to all the other projects, to include CIB (Interuniversity Consortium for Biotechnologies), LBT (Technological Biopolymer Laboratory), ICC (International Center for Pure and Applied Chemistry), and ICGEB (International Center for Genetic Engineering and Biotechnology) in which I am actively involved.

BIOTEC: What is the atmoshpere of such a context?

Baralle: Extremely exciting. Working in a center with a steady turnover of research staff is undoubtedly crucial for research itself. Moreover, the feeling that politicians are willing to give scientists the opportunity to enhance the quality of the facilities where they work builds up confidence and contributes to mitigating the normally precarious nature of work.

BIOTEC: Let us focus our discussion on the International Center for Genetic Engineering and Biotechnology: How is it structured and which lines of research are planned?

Baralle: In 1981, UNIDO (United Nations Industrial Development Organizations) assembled a group of scientists from different disciplines to address the problem of expanding the use of new technologies in developing countries. After several years of negotiations it was decided to establish two ICGEB centers, one in Trieste, the other in New Delhi, according to a joint research plan. Trieste began operating in 1987, under the direction of Professor Arturo Falaschi. In 1989 Falaschi took charge of the center's general management, and I was appointed director of the Trieste laboratory. Through its two laboratories in Trieste and New Delhi and its network of 14 affiliated centers, the center is committed to the application of genetic engineering and biotechnology techniques to resolve some of the most serious problems affecting the developing countries.

The program currently covers four main research areas: agrobiology (with special emphasis on crop improvement); health (development of new vaccines); biomass conversion (ligno-cellulose degradation); and basic research. The Trieste center, which will cover an area of 6,000 square meters and is staffed by some 100 researchers, is divided into five research teams, each headed by a senior scientist assisted by three to six junior

scientists, in addition to several trainees and technicians. In accordance with a five-year scientific program launched in 1989, these teams have selected lines of research that include virology, molecular and cell biology, immunology, pharmacology, protein structure and engineering, and microbiology.

BIOTEC: The lines of research are many, and all of considerable interest. However, space is running short, so we must ask you to confine your remarks to a single topic: HPV [human papillomaviruses].

Baralle: The human papillomaviruses fall within a group of more than 30 viruses which are responsible for a wide range of diseases, from warts to brain cancer. Epidemiological studies have shown that four viruses of this group are responsible for most, if not all, of the cases of brain cancer associated with this infection. Moreover, HPV cancer is the most common form of malignant cancer found among women in the developing countries, due mainly to poor health care. The structure of the virus resembles closely that of the polyomaviruses, among which the SV40, which are therefore used as a reference model in the study. The goal of the Trieste researchers is to understand the mechanism by which these viruses penetrate into the cells, multiply, and engender the tumor. Finally, a number of researchers are concentrating their efforts on a set of biotechnological strategies, including the development of DNA probes to be used in HPV infection diagnosis, and vaccines and drugs that may be capable of fighting its effects.

BIOTEC: If we were to meet again in five years' time, which results would you like to present to our readers?

Baralle: I would be glad to report positive results in the development of new vaccines and parasiticidal proteins. However, apart from the achievement of any single important result, the real goal would be having succeeded in preserving throughout the period the spirit of cooperation and exchange that best embodies this center today, as well as enhancing its level of excellence.

Dutch Scientists Test Gene Therapy Against Immunodeficiency

91MI0482 Bonn DIE WELT in German 28 Aug 91 p 19

[Article by R. Latusseck and H. Hetzel: "Mouse Viruses Used To Fight Fatal Immunodeficiency"]

[Text] At the beginning of next year, a group of Dutch scientists led by the molecular biologist Dr. Dinko Valerio of the Institute of Applied Radiobiology and Immunology in Rijswijk, will carry out gene therapy on humans for the first time in Europe. Valerio wants to use the experiment, which is being performed under the control of the TNO [Netherlands Central Organization for Applied Scientific Research] to combat an extremely rare form of immunodeficiency.

"We are expecting to receive authorization next year," Dr. Valerio told DIE WELT. If the supervisory authorities accept the application submitted two weeks ago, then gene therapy on human beings will take a big step forward. "However, the existing laws render permission absolutely unnecessary in principle, because we are only working with cells. Since the concept has already been approved by two committees we assume that there will be no problems," he explained.

The goal of the Dutch project is to replace a defective gene in the bone marrow cells of severely affected children with a healthy gene. Such gene transplants would cure the patients of their inherited adenosine-deaminase [ADA] deficiency.

According to Valerio, there are still an estimated "few dozen cases of this form of immunodeficiency" in Europe. The project differs in one essential point from the procedures adopted by American scientists, who performed the world's first experiment in gene therapy on human patients a year ago. In the United States, white blood corpuscles (T cells) are taken from the patients. The cells are then reproduced in culture dishes and returned to the blood after a healthy ADA gene has been inserted with the aid of a mouse virus.

The procedure has to be repeated more or less every month, because lymphocytes have only a limited life span. The Dutch method circumvents this disadvantage. Here the sound gene is transplanted into the parent cells [Stammzellen] of the bone marrow. These cells retain their ability to divide throughout their lifetime, and continuously produce offspring, some of which become T cells.

All the blood corpuscles are then in a position to synthesize the missing enzyme. The American researchers headed by R. Michael Blaese had also tried to transfer the "healthy" ADA gene into the parent cells of the bone marrow. However, they failed because a mouse virus, which was to serve as a "gene ferry," was unable to transplant its cargo on arrival into the genetic make-up of the parent cells.

"Our cells just sat there and nothing happened. The virus, however, needs an active cell that produces the genetic substance DNA." This is how Blaese recently explained why his team is concentrating on T cell manipulation instead.

The Dutch have been more successful with their experiments. Gene transfer into the parent cells has been tested on a total of 15 rhesus monkeys. The precise method, which could now be used with humans (and for which a patent application is currently being filed) was used successfully on three animals. However, Valerio cannot fully explain why the researchers from Rijswijk were successful whereas the American experiments failed. "We don't know precisely why it works," confessed the biologist.

"In part it may have something to do with the fact that we added specific growth factors to the cells. Moreover, the cell line in which the virus responsible for the gene transfer is reproduced appears to play a role." Victor van Beusechem, who developed this cell line, could hardly conceal his satisfaction. He views the future with optimism and has christened the cells "POC-1," meaning "Producer of the Century."

In the view of critics, however, fundamental risks are inherent in both of these gene therapy techniques. The new gene is inserted permanently into the existing chromosomes in the cell at any point, although nobody can predict where. In the majority of cases it is a chromosome segment that is of no current importance to the cells. It is also conceivable that this could activate cancer genes, thus triggering proliferation of the treated cells.

Is such a risk ethically justifiable? In the view of specialists, including Professor Wilhelm Friedrich of the Childrens' Clinic in Ulm, there is no categorical answer to this question. Friedrich will probably take part in the Dutch project if a child who could be helped by a gene transplant is brought to Ulm. "There are no more than a handful of ADA patients each year, and in each individual case we have to consider whether the illness appears so serious that the chances of recovery justify the risk involved in treatment."

There are less serious forms of ADA deficiency in which the missing enzyme can be given as medication, although it is an expensive form of treatment requiring daily medication throughout the patient's whole life. In severe forms, the chosen therapy is still a bone marrow transplant, although suitable, compatible donor marrow is often unavailable. And at this point the question arises whether gene therapy with its attendant risks should be used, or whether the patient should be abandoned to his fatal illness.

Whichever way the decision goes, the responsibility for it has to be borne.

COMPUTERS

French Expert System Generator Developed

91WS0469B Paris L'USINE NOUVELLE in French 11 Jul 91 p 41

[Article by Oliver Lauvige: "An Expert System That Writes Its Own Rules"; first paragraph is L'USINE NOUVELLE introduction]

[Text] It can model the know-how of a specialist better than a human being. Sixty-seven percent of the expert's predictions were correct, compared to 82 percent of the machine's.

It is easier to describe examples than write rules. Using this observation as a starting point, researchers at the Solid Mechanics Laboratory of the Polytechnical School have just developed, under the guidance of Joseph Zarka, research director at the CNRS (National Center for Scientific Research), a learning-based generator of expert systems (SEA). The system's novel feature? It automatically creates rules of behavior based on the description of significant cases.

In making a diagnosis, classic expert systems use a certain number of rules that model the know-how of a specialist. Formulating these rules is a key problem in artificial intelligence. "It is even one of the principal causes of failure," specifies Joseph Zarka. For although experts are able to discern the correct diagnosis, they do not always know what principle they used to do so. Although they supply rules, they do not know the limitations of their application. With greater reason, then, if they do not agree among themselves, it becomes impossible to construct an expert system.

Experimentally More Effective

The generator developed by the Polytechnical team overcomes this difficulty. Any specialist will be able to build his system using learning. With this method, the expert gathers or invents examples for which he knows the diagnosis. These representative cases are then described to the generator through the intermediary of alphanumerical data, called descriptors. The software program then automatically writes rules able to solve problems whose results are not known.

The procedure was validated in the field of fracture mechanics for the diagnosis of leaks in pressurized rooms. The learning-generated rules proved experimentally more effective than those determined by the expert using classic methods (67 percent correct predictions for man, 82 percent for the machine).

Small and Medium Businesses Could Also Benefit

"Despite its origin, this software program could be applied to many other fields," points out Joseph Zarka. "It could be used not only by researchers trying to deal with modeling problems, but by small and medium businesses and industries that want to make direct use of their experience from a wide range of problems encountered." In production management, for instance, SEA will estimate the cost of a part on the basis of descriptors (mechanical, technological, morphological, etc.) for existing products. In recruiting, the expert-system generator will assist the human resources director in filling a vacancy based on descriptors (experience, training, profile...) of the job's previous employees. Maintenance departments will also benefit from this artifical-intelligence application program, which will be able to predict an imminent breakdown by analyzing known symptoms.

Peugeot and Giat have already acquired the tool, but are keeping news about how they are using it to themselves. A Paris hospital is also employing it to process the results of blood tests for AIDS research.

"But watch out!" warns Joseph Zarka. "SEA is not the miracle solution. Indeed, the quality and choice of examples is still primordial. They depend above all on the specialist, his skills, and his motivations. Expert systems cannot yet get along without experts...."

Germany: Aachen Firm Profits From Parallel Computer Research

91WS0497A Duesseldorf VDI NACHRICHTEN in German 19 Jul 91 p 13

[Article by Bernhard Rose under the rubric "Industry": "Supercomputing Apparently Without Bounds: German Firm Sharing the Lead in Small Circle of Potential Sellers"; first paragraph is introduction]

[Text] The future belongs to the massive parallel supercomputers. Then only hundreds or thousands of concurrently working processors will achieve the unimaginable powers such as those required for model calculations of complex problems—forecasts of the world climate, for example.

Munich, 19 Jul 91 (VDI-N)—Today's supercomputers are often like horse- drawn carriages: hopelessly overtaxed in the solution of complex problems. Examples of such challenges are the calculation of climate changes and marine currents, the behavior of turbulent flows, the quest for the structure of a gene or the simulation of superconductivity.

Even a supercomputer like a Cray-2 labors heavily for months when it winds off its model calculations for the menacing greenhouse effect of the earth at the German Climate Computing Center in Hamburg. The superlarge computer is occupied for over 6000 hours round the clock in order to calculate only a single scenario of the menacing catastrophe for 70 years. "Nine months of pure computing time is far too long," says the Hamburg computing center's EDP [electronic data processing] head Wolfgang Sell in lamenting the lack of computing power.

All the same, scientists are dreaming of from hundred- to thousandfold higher computer power. But the Cray-2 already belongs to the top team of the number crunchers with its around two billion floating point operations per second (2G flops). The two frontrunners introduced only a few weeks ago by the Intel Corporation of Santa Clara, U.S., and the Thinking Machines Corporation domiciled in Cambridge, U.S.—the Touchstone Delta and CM-200 with 8.6G and 9G flops, respectively—also are still rather like toys with such wishes.

"No one seriously harbors the illusion of still being able to master the complex flow computations of the coming years with classical array processors," says Managing Director Falk Kübler of the Aachen Parsytec firm in observing a change taking place. Moreover, scientists like Regensburg computer science professor Dr. Wolfgang Gentzsch agree with Kübler: Salvation lies in the massive parallel processing of computer programs.

While classical supercomputers process their application programs mostly on a single sophisticated special-purpose processor (also four or eight of them in the interim) at the technical frontier, a multitude of like computer chips splits up this task in parallel computers.

The Aachen Parsytec firm has also for years been successfully putting its stake on parallel technology. In this connection the just six-year-old firm is concentrating solely on the manufacture of parallel computer systems with commercially available transputer processors, a chip development of the British manufacturer Inmos.

Unlike the abortive Suprenum German mainframe project, Parsytec required no support from public funds. As early as two years after being founded, the Aachen firm was operating at a profit and had sold worldwide to date according to its own accounts 200 computer systems of various sizes. Then at the end of last year Dutch Shell bought a mainframe having 400 processors. And quite recently two similar computers having 256 and later 512 processors went into operation at the Aachen RWTH [School of Technologies for Manufacturing Processes] computer center and the Center for Parallel Computing in Paderborn.

The 120-employee firm will achieve the breakthrough beyond supercomputing, as Managing Director Falk Kübler calls it, with its new Parsytec GC product family. The conceptual formulation is so designed, they say, that a practically unlimited number of sophisticated transputer processors of the Inmos T9000 type can extend the computer system's power upwards as much as one likes.

Having begun with the smallest system having 64 processors and 1.6G flops, the for the present largest planned configuration level of the GC series has over 16,000 processors with a total power of 400G flops.

The high 50-percent growth rate in the world market—with a current volume of around $200 million—among other things, shows that massive parallel computer systems will be the answer to the yawning power gap and the enormously high costs. In contrast to that, the market for classical array-processor supercomputers (around $1.1 billion) is showing strongly flat growth of a scarcely worth mentioning two percent.

ENERGY, ENVIRONMENT

German Researchers Identify Protein Molecules for Water Purification

91P60271 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 28 Aug 91 p 8

[Text] By applying genetic engineering, researchers in Karlsruhe hope to make drinking water in Third World countries more palatable and healthier. Scientists at the Federal Institute for Nutrition have identified a substance, derived from the seeds of a plant which is

indigenous to the Sudan, which acts as a flocculent. They are now entertaining the notion of genetically engineering the substance.

For day-to-day use, many people in Third World countries draw water from rivers, ponds or from wells dug by hand. This often rather cloudy water exhibits a high solid content which can be as high as 50 grams per liter of water. Moreover, the water, polluted by human and animal fecal matter, is highly contaminated with pathogens, particularly bacteria.

For millenia, people relying on this water for life have had traditions for the purification of water, at least to the point where it appears largely clear. The methods range from the admixture of earth from termite mounds, to the use of the mucous membranes of certain fishes to sap from plant stems and seeds. The use of the crushed seeds of the horseradish plant, Moringa oleifera, used by the people of the Sudan for purifying water, was of particular interest to the researchers from Karlsruhe.

Even the Arabic name "the clarifying tree" is indicative of the application of this prodigiously blossoming plant. Even two or three moringa seeds in a small cloth sack, placed into a vesel for water purification, suffice to clarify four liters of cloudy well water and to convert it into tasteless drinking water. The freshly purified water not only looks more appetizing but is also hygienically purer than the murky well water, since, flocculation removes up to 90 percent of the germs in the unprocessed water.

U. Gassenschmidt and his colleagues from the Federal Institute for Nutrition Research identified that substance, from the seed of the moringa plant, responsible for the flocculation. It is a small protein molecule consisting of a chain of 60 amino acids. The good flocculative behavior of the protein often depends upon the charge density in the molecule. For purifying drinking water, altogether larger quantities of the purified material must be added.

Recovery of the requisite quantities from moringa seeds is time-consuming and costly. Thus, the Karlsruhe researchers wish to identify the gene for the flocculent protein, culture it in E. coli bacteria and then use the resultant cells for producing the desired material. In this way, they hope to economize on flocculents recovered using less favorable techniques, i.e., aluminum compounds or polyacrylamide polymers, which are today used for simple drinking water processing.

Growth of German Wind Energy Program Reported

91WS0455B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 17 Jul 91 p 8

[Article: "Interest in Wind Power Grows"]

[Text] FRANKFURT, 16 July. The use of wind power has notably increased since the beginning of the year. The new power conservation law has provided an additional incentive and mobilized more interested parties. Already about 2,500 applications for a total volume of more than 500 megawatts have been filed with the Federal Ministry of Research's wind promotion program, which has been increased to 250 megawatts; the new Federal States account for the high number of applications. A significant development toward larger plants can also be noted in the wind power program.

Against the background of the measures taken by the Federal Government to reduce carbon dioxide, various institutes in Germany have occupied themselves with the potential of regenerative power-carriers. In order to reduce carbon dioxide emissions by 25 percent by the year 2005, already existing techniques to utilize renewable energy sources will have to be introduced more vigorously into the general power supply. At the present time, renewable power sources regrettably account for only about 2 percent of Germany's power supply, of which water power takes the largest share. The German Research Center for Air and Space Travel (DLR) and the Association of German Engineers (VDI) have—independently of each other—prepared potential studies on the use of regenerative power sources on the 1990 data base, limiting themselves in their investigations to the boundaries of the old Federal Republic.

The useable potentials obtained do not simply represent technical possibilities, but rather are realistic calculations that already take into account the constraints introduced by ecological and structural requirements. By using available techniques and production facilities, 20-25 percent of the primary power demand can be met by regenerative power forms, the authors believe. This share could be increased much higher if intensive efforts were undertaken for efficient use. The DLR study examines two possible cases. In the first case, in which nuclear power is not taken into account, the share of regenerative power sources climbs to 70 percent of total supply by the middle of the next century. In the second case, in which the use of nuclear power is assumed to continue, renewable power sources would account for 45 percent of the total power supply .

German Renewable Energy Research Status, Prospects Reported

91MI0511 Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German 26 Aug 91 pp 5-8

[Text] In recent years, renewable energies have received a significant boost in the Federal Republic, shown both in the public's positive perception of them, and in the increased financial support they have received.

While the Federal Ministry of Research and Technology (BMFT) spent a total of 244.5 million German marks [DM] during 1990 on renewable energies and rational

energy utilization, a total of DM318 million are earmarked for this purpose for 1991, representing a rise of over DM70 million or around 30 percent. To these figures are added some DM30 million spent annually by the major research institutes in recent years on renewable energies and rational energy utilization. The laender have also increased their funding for these areas in recent years, and the Federal Republic of Germany, with the U.S. and Japan, is one of the top countries that have expressly committed themselves to the further development of renewable energies.

The Federal Government's target is to increase significantly the contribution made by renewable energies to meeting primary energy needs from its current level of approximately 2.5 percent during the coming years and decades. Studies predict that by the year 2010 the contribution made by renewable energies to meeting primary energy needs could be increased to 10 percent—which means, however, that 90 percent of energy needs would still have to be met in other ways. The increased use of renewable energies in place of fossil fuels will assist in reducing CO_2 emissions, which are largely responsible for the greenhouse effect and for environmental pollution. In November 1990 the Federal Government decided that CO_2 emissions should be reduced by 25 to 30 percent by the year 2010, a target to which renewable energies are expected to make a significant contribution.

Renewable energies have gained an equally firm foothold in the new laender. The measures taken by the former GDR were confined largely to the fields of geothermics and biomass; in recent months, however, success has been achieved in gradually extending activities in the new laender to include the whole field of renewable energies and rational energy utilization.

Geothermics

Unification gave geothermics a new dimension. Hitherto, the main thrust both in the Federal Republic of Germany and internationally had been the hot dry rock process, which seeks to utilize heated water at depths of 5000 to 6000 meters at surface temperatures in excess of 180° C to generate electricity. An attempt is being made to set up a pilot plant, which might be based either in Bad Urach (Germany), Soultz-Sous-Forets (France), or Cornwall (great Britain). The three sites are presently being investigated by a consortium of European firms with funding from the European Community.

Three geothermal heating plants were set up in the former GDR, not only to generate electricity, which requires high temperatures, but also for supplying hot water at temperatures between 60 and 80° C, at Waren (5 MW(Th)[megawatt thermal]) in 1984, and at Prenzlau (7 MW(Th)) and Neubrandenburg (10 MW(Th)) in 1988. A number of sites were also investigated, and some boreholes were sunk.

Immediately after unification a series of studies were undertaken, supported by expenditure of over DM3 million primarily at Neubrandenburg Geothermics GmbH, with the aim of devising basic procedures for modernizing obsolete plants and setting up a new plant. The BMFT has agreed in principle to support the modernization of an obsolete plant and the establishment of a new one, provided a sponsor who is willing and able to operate the plants on the long term can be found. The studies of obsolete plants will shortly reach their conclusion, to be followed without delay by their evaluation.

Solar Energy

Most financial support goes towards the development of photovoltaics, accounting for some DM100 million annually. There is scarcely any type of photoelectric cell that is not receiving BMFT support. The efficiency of most types of photoelectric cell has been substantially improved, with European laboratory records set for gallium arsenide cells (22.3 percent) and, a few weeks ago, for monocrystalline silicon cells (20.3 percent) at the Institute of Solar Energy Systems at Freiburg. Further improvements in efficiency are still required however, in order to make photoelectric cells more economically viable. To achieve this, demonstration projects are especially important, with the plants at Pellworm, Fehmarn, Kobern-Gondurf, and Neunburg vorm Wald enjoying a reputation that extends far beyond specialist circles. At Korkwitz- Ribnitz-Damgarten, near Rostock, a photovoltaic, wind, and biogas plant is to be set up to supply the electricity requirements of a sewage plant at Fehmarn.

The range of applications for photovoltaics is growing steadily, ranging from pocket calculators, radios, and TV's, to photovoltaic water pumps and lights, to solar-powered automobiles. The victory achieved by a solar-powered vehicle equipped with German solar cells at the World Solar Challenge 1990 in Australia on 15 November 1990 may be considered a particular success for German solar technology, with the solar automobile passing the finishing post at the end of the 3,000-km course with a lead of several hundred kilometers.

A further interesting development is the "Solist" solar-powered boat funded by the BMFT with a DM200,000 subsidy, which is designed to carry a maximum of four persons and is propelled solely by solar power, i.e., without auxiliary mains or aggregate charging. Except during the winter months, it can run on its batteries for up to four hours a day. Water pollution of any kind is ruled out by the use of a completely oil- and grease-free rudder propeller. Among the solar-powered boat's special features are its quietness, lack of exhaust fumes, and smooth ride, while embankments and, consequently, flora and fauna are not exposed to excess wash.

One of the BMFT demonstration programs that has attracted particular attention is the "Federal Government/Laender 1,000-Roof Photovoltaic Program," which was initiated on 23 september 1990, and has been extended to the new laender since 1 July 1991. Each new land is receiving an allocation of 150 plants, with a 60

percent BMFT subsidy, as opposed to 50 percent in the older laender. The fact that all 16 are active participants in the program is particularly gratifying. A total of 2,250 photovoltaic units, each having an output of 1 to 5 kW, are being installed mainly on the roofs of one- and two-family houses, 1,500 of which are in the old and 750 in the new laender.

In addition, and specifically in the new laender, another two photovoltaic demonstration units, with high levels of efficiency in widely varying fields of application, are being funded; applications will be considered and selections made at the end of September.

Wind Energy

In addition to the photovoltaic field, wind energy has aroused a great deal of public interest, and is presently being funded by the BMFT to the tune of DM30 million annually. After hydraulic power, wind energy comes the closest among renewable energies to being economically viable. Electricity generation costs of 20 pfennigs per KwH can already be achieved with medium-sized plants (100 to 300 kW) sited at windy locations on the coast or offshore islands.

The 100-MW wind program initiated on 4 June 1989, and expanded into 1 250-MW program from 1 March 1991, has proved particularly successful. Despite its expansion, the project has not been able to keep pace with the large number of applications still being submitted. No further expansion is planned for the foreseeable future. It is gratifying that the great interest in wind energy extends to the new laender; Mecklenburg-Vorpommern is in third place behind Schleswig-Holstein and Lower Saxony in the capacity for which it has applied, and in fourth place in the number of applications made.

Hydrogen

Hydrogen has the long-term potential to make an important contribution to energy management, and more than DM20 million are earmarked for this field this year. As confirmed recently at the Eight World Hydrogen Conference in Hawaii, the Federal Republic of Germany is the world leader in the field. The best-known projects are the Solar-Hydrogen Bavaria GmbH solar hydrogen plant at Neunburg vorm Wald, the German-Saudi Arabian HYSOLAR solar-hydrogen project, and the hydrogen project forming part of the Euro-Quebec Study.

Water electrolysis is of special importance, being at present the only practicable large-scale process for converting electrical energy into hydrogen. The BMFT has for some years been supporting this sector, from Hot Elly (high temperature electrolysis of steam) to advanced electrolysis systems. In August 1988 the Munich-based Company for High-Capacity Electrolyzers for Hydrogen Generation Ltd. was set up by MBB, Line AG, and HEW with the sole aim of developing this sector, initially by developing a kilowatt-range prototype and subsequently by designing a demonstration plant in the megawatt range.

Fuel Cells and Energy Storage

In 10 to 15 years, fuel cells will already have been developed to the stage where they can make a substantial contribution to reducing CO_2. Fuel calls with their substantially higher efficiency as compared with thermal combustion, enable hydrogen, natural gas, and coal gas to be converted into electricity. The greatest potential lies in high-temperature fuel cells, i.e., oxide ceramic and fused carbonate fuel cells.

The development of energy storage systems is very important for the future of renewable energies. The BMFT has for some 10 years been funding the development of NaS (sodium-sulphur) accumulators, which are already been tested in prototype vehicles and will be utilized in electric cars and electric boats in the next few years.

International Cooperation

On a European level, numerous projects for developing renewable energy sources have received joint funding from the EC and the BMFT, ranging from the two 1.2-MW wind energy sister plants in northwest Spain and on Heligoland to the photovoltaic and wind plant at Pellworm. Further joint projects are in preparation, as the expression of continual close cooperation between the Federal Republic of Germany and the European Community.

The BMFT attaches particular importance to close cooperation with the third world. Since 1974, some DM850 million have been spent on projects of direct or indirect benefit to third-world countries, including some DM250 million for solar power stations and for photovoltaic, wind energy, and hydrogen projects, solar village projects, etc.

Of particular importance in this connection is the German-Spanish solar center at Almeria (Spain), which is primarily the site for medium- and high-temperature solar heating projects.

Germany: Environmental Impact of Electric Cars Estimated

91MI0512 Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German 26 Aug 91 pp 8-9

[Text] What will be the effect on road transport of electric vehicles, and to what extent can solar (photovoltaic) energy be used for their energy supply? Using the example of road traffic in the Cologne urban area, the Rhineland TUV [Technical Monitoring Department], acting on behalf of the BMFT [Federal Ministry of Research and Technology], investigated the extent to which the use of electric cars influenced emissions of airborne noxious substances such as carbon dioxide,

carbon monoxide, hydrocarbons, or nitrogen oxide. Various development scenarios were used to test the effects of the use of electric cars in future road transport.

One scenario assumes that journeys of a single distance up to 15 km are made using electric vehicles. In a second scenario it is assumed that only electric vehicles are used as private automobiles. In the first variant, up to 38 percent of all kilometers covered in automobiles take place using electric vehicles; the second variant assumes 85 percent.

Using these premises, the study reaches the following conclusions:

- The use of electric vehicles has a favorable effect on emissions of the above airborne noxious substances only if the electrical energy for the vehicles derives from energy sources which do not emit such substances.
- If the energy for electric vehicles in Germany were to be derived entirely from the main electrical network, then the calculations of the Rhineland TUV reach a remarkable conclusion: Owing to the high proportion of fossil fuel-driven power stations used in the generation of electricity, the total emissions of carbon dioxide and sulphur dioxide would rise in comparison to the scenarios without electric vehicles.
- The limited use of electric vehicles in so-called "niche usage," eg for transport and service journeys within a close vicinity, would however assist in improving the situation regarding localized emissions. The energy derived from the main electrical supply for niche usage would have hardly any effect on related power station emissions. Vehicles suitable for these purposes already exist.

The findings of the Rhineland TUV concerning the contribution of solar energy to electric vehicle propulsion are as follows: Independent solar vehicles, which derive their propulsive energy only from solar cells mounted on the vehicle itself, are not suited to the daily usage forming the basis of the study. The surfaces usable for solar cells are not large enough on conventional vehicles to provide sufficient energy for propulsion. Electric vehicles are suitable for daily operation in road transport only if they derive their energy from an on-board battery which is charged at a charging station. Such electric vehicles are available today in a number of models.

If the intention were to supply the charging stations the whole year round entirely on house roofs, then according to the calculations of the Rhineland TUV, the roof surface within the Cologne conurbation would be nowhere near adequate for this purpose. Energy from the public main supply would have to be used in addition to drive the electric vehicles.

A possible combined usage of main electricity and solar energy would involve the use of main-connected photovoltaic equipment, as tried out in the "Federal Laender 1,000 Roof Photovoltaic Program" for example. The charging stations of the electric automobiles could draw their energy from the main electricity, which would be generating at least a small part of its energy from solar plants. The main would thus be fulfilling a buffer function and evening out the solar rays' daily and yearly rhythm. The solar electricity stored in the main can naturally be utilized for any application. Solar energy plants connected to the main supply therefore do not need to be the subject of any special investigation relative specifically to electric automobiles.

The BMFT is concentrating its support for electric vehicles particularly on overcoming their hitherto still considerable disadvantages, namely the greater weight caused by the batteries and their comparatively low range. Its funding is being concentrated especially on the development of high-energy batteries, particularly sodium sulphur and sodium nickel chloride batteries, capable of extending the vehicles' cruising range and thus their range of applications.

Further information may be obtained from Dr. Wessels at the Rhineland TUV e.V., Institute for Environmental Protection and Energy Technology, Am Grauen Stein 5000 Cologne 91; tel 0221 806 2476 2477.

FACTORY AUTOMATION, ROBOTICS

France: Nonconventional Welding Techniques Reported

91WS0470 Paris L'USINE NOUVELLE/ TECHNOLOGIES in French July 91 pp 46-52

[Article by Michel Vilnat: "Successful Applications of Fusionless Welding"; first paragraph is L'USINE NOUVELLE/TECHNOLOGIES introduction]

[Text] Recrystallization is eliminated, operations are fast, and assemblies that could not be made otherwise become possible: Despite their high cost and long setting-up times, friction welding, diffusion bonding, and explosion welding have won over the automobile, aircraft and shipbuilding industries.

Friction, diffusion, explosion: Three welding methods used to assemble metals below their melting points. A definite advantage if you want to eliminate all recrystallization problems, which will often cause cracks—the welder's bete noire! At the same time, you can pair some metals notoriously impossible to weld by traditional methods. Another advantage: These methods will also improve productivity.

Friction welding is not a new process; recently, however, it has enjoyed renewed interest, thanks to new developments in machine technology. Renault, for instance, just acquired four friction-welding machines for its Le Mans

plant. They are used to assemble drivetrains for cars with small and intermediate displacements, such as the Clio and the R19. "These machines have enabled us to simplify manufacturing: We use only two parts instead of the three used in the past. It also eliminates the need for an expensive swaging operation, and the risk of grease leaks. Plus, it is exceptionally reliable," we were told by Edgard Delord, business executive at Renault's sheetmetal-bodywork setup office. In addition, a preliminary degreasing operation is no longer necessary; with traditional welding methods, it would be indispensable.

Renault chose this method for its rapidity and, above all, for its reliability. Thus, at Le Mans, the parts do not undergo any subsequent inspection. "Besides, nondestructive inspection can never guarantee that the weld is good. At best, it will disclose certain defects," Edgard Delord pointed out. Actually, the weld is inspected in real time by an SMC-600 computer which records the various parameters: rotation speed, pressure, material consumption. During the final stage, the part gets shorter and a weld upset is formed perpendicular to the weld, the dimensions of which are perfectly well defined. A series of destructive tests were performed to determine the permissible tolerance beyond which the parts are considered defective. The rejection rate has now fallen from 3 percent to 0.4 percent. The four machines, the first of which was set into service late in 1988, were designed and manufactured by SMFI, the only French manufacturer. The total capacity of the assembly line has now reached 16,000 drive shafts per day, i.e., four times as many as with the former swaging system.

The principle of this assembly method is extremely simple. When two parts are to be welded together, the heavier is held in a fixed clamp, the other one in a revolving chuck. Then, they are brought into contact. Within a few seconds, friction causes the temperature to rise considerably. When the metal reaches paste consistency, the rotation is stopped and a very high pressure (several tens of tonnes) is applied to the two parts, which instantaneously welds them together. "Metallurgically speaking, this method of assembly is very similar to the method formerly used by smiths with their hammers and anvils," Daniel Carpentier, manager of the machine division of SMF International, at Cosne-sur-Loire, commented.

Friction Can Be Used To Assemble Metals That Could Not Be Assembled Otherwise

This method offers many advantages. In addition to being rapid (it does not take much longer to weld a valve than to weld an oil-drilling pipe), it also makes it possible to pair metals that could not be welded together by traditional methods. For instance mild steel and high-grade steel. This application is of considerable interest to drill manufacturers. And the nuclear industry uses it to make exchangers, for instance by pairing aluminium and copper, titanium and stainless steel, etc.

Friction welding, however, does have a few drawbacks. First, the cost of the facilities: "A friction-welding machine is as sophisticated as a large numerical-control lathe and requires quite a lot of power hydraulics. For it to pay off, you need a large production volume," Daniel Carpentier explained. Besides, for the moment, friction welding can be used only for revolution parts. This could change, in particular thanks to research performed at the British Welding Institute. Actually, the British researchers have developed a machine that can weld parts of all shapes by generating a low-amplitude linear friction. The first tests were made using titanium alloy bars with a cross-section of 240 mm^2, a frequency of 25 hertz [Hz] and a pressure of 110 Newton [N] per mm. With the same machine, the British engineers also managed to weld steel on stainless steel. In this case, the operating frequency reached 50 Hz. Some believe that it will remain a laboratory curiosity. Others, like Aerospatiale, believe that this technology could compete with electric-discharge machining in making blind-hole parts. The "holes" would be made by a traditional method, and the hole bottoms could be added by linear-friction welding.

In one respect, however, friction welding has made considerable progress: precision. The out-of-round used to exceed 1 mm. Nowadays, it is getting down to almost 0.1 mm. At Renault, it is consistently under 0.4 mm. But SMFI is already designing precision machines that ambition to achieve 0.01 mm! Similarly, it is possible to index two parts at a given angle. "With tubing, we manage one-half degree, and one tenth of a degree with solid parts. But that's only an average; it may vary depending on the type and nature of the parts to be assembled," Daniel Carpentier indicated.

The automobile industry is not the only one using it. The oil sector uses it frequently. To begin with SMFI, as its special-machinery department represents only a small part of the company's activities. This company, the world's second largest producer of drill pipes, has designed its own machinery to weld threaded ends onto the pipes. At the core is a friction-welding machine with a thrust of several hundred tonnes. The aircraft industry is the only other industry to possess machines of comparable capacity.

Inertia Welding: Record Productivity for Smaller Parts

For its part, SNECMA [National Company for Aircraft Engine Study and Manufacturing] has chosen a slightly different technology: inertia welding. The method used to drive the mobile part is different. A flywheel does it, and the rotation is not stopped when the pressure is applied: the part stops on its own as it gets welded. As a result, the metal fibers are oriented along a spiral instead of along a radius. However, tests have failed to disclose differences in the mechanical strength of parts made by the two methods. For parts with a diameter below 20 mm, inertia welding offers unequalled productivity, but the machinery is more expensive. In its Corbeil plant, SNECMA uses its brand new machine (an MTI with 400

tonnes of thrust) to weld M88 engine housings made out of titanium alloys, or turbine shafts.

This method is quite suitable for powder metallurgy, which is increasingly used in the aircraft industry. Actually, these new materials are quite susceptible to recrystallization problems. But it takes a certain type of customers to afford such an investment. SNECMA's MTI cost a paltry 16 million francs [Fr]! The record in this respect, however, is held by General Electric: It just ordered from MTI a setup that will develop a thrust of 1,600 tonnes.

Recently, the aircraft industry has been using another method hardly out of the laboratories: diffusion bonding. Until now, diffusion bonding was considered expensive and reserved to a few very specific applications. This is about to change due to the increasing use of titanium and especially its most widespread alloy, TA6V, which could make a strong comeback thanks to SPF DB. This acronym covers two closely related technologies: superplastic forming and diffusion bonding. In fact, as Bertrand Miguet, engineer at Aerospatiale in Saint-Eloi, explained: "This new technique brings the cost of titanium down to that of stainless steel."

Advantages of Diffusion Bonding: Absolutely Perfect Welds

Superplasticity is a characteristic that TA6V acquires when it is subjected to a temperature of about 920xC. In that case, its strain coefficient may reach 800 percent with no grain-size alteration. As for diffusion bonding, it is the dream of all metallurgists because it makes it possible to assemble metals while in the solid phase. To achieve it, "all you have to do" is to bring two metal plates in very close contact (using a press providing a pressure of 10 to 20 bars) and keep them at a temperature equal to half their melting point. This causes the atoms of each plate to diffuse into the other plate. While the method may seem simple, its implementation used to be quite difficult. To prevent oxidation, you had to work in a vacuum. However, after much research, the Aerospatiale engineers and technicians have managed to perfect a hot-loading technique. This consists in heating the press to 500xC, and then loading the parts, already placed on a frame. To prevent oxidation, the inside of the press is swept by an inert gas.

These two technologies will be used to make the doors of the future Airbus A340. Two titanium plates will be placed one on top of the other after the places that are not to be bonded have been coated with boron nitride. When diffusion bonding is completed, an inert gas will be injected between the two plates at the places coated with boron nitride. Because TA6V is superplastic at this temperature, it will inflate, forming stiffening ribs. Until now, the rib profile was obtained by means of a mold on which the superplastic titanium was applied. But recently the engineers in Toulouse have managed to control the inflation of the ribs by regulating the pressure differential between the inside and the outside, thus eliminating the mold that was both costly and difficult to make.

The success of the operation lies to a large extent in the preparation of the plates before their assembly. "To achieve it, you must reduce to a minimum the time between the scouring and the bonding of the plates," Bertrand Miguet explained. As in the case of friction welding, controlling the welding parameters is the surest way to ensure quality work. An ultrasonic check is performed to detect any local defects. However, the best test remains the final appearance: If the plates are not properly bonded, the inflating gas will separate them.

Aerospatiale is already thinking ahead: It is working on three-plate diffusion bonding. Between two plates, a third one is inserted; it will act as a stiffener after inflation. This reinforcement plate unfolds in a zigzag, being bonded alternately to one wall and to the other. This stiffening method is being developed for the cantilevers and rear shrouds of engine pylons. In this case, the weight gain is considerable, and only half as much time is required, compared with similar parts made out of riveted stainless steel. However, although this is a very sophisticated technique, it does not require huge financial resources. For instance, the cost of the Saint-Eloi press, which was designed in part at Aerospatiale, was about Fr2 million.

Complex Conditions That Still Hinder Industrialization

This technology will also be ideal to make aircraft electric boxes that will be light, simple, and perfectly tight. The pioneers in this technique are the British companies Rolls Royce and British Aerospace. However, diffusion bonding is not limited to the aircraft industry. The ACB [Brittany Workshops and Yards], too, possess a press on which they manufacture, among other things, two-dimensional printed circuits for the distribution of pneumatic and hydraulic fluids.

Laboratory tests are also being made on light alloys. Experts at the Nantes School of Mechanics have managed to weld A2017 aluminum. Diffusion bonding will eliminate hot-cracking problems, but although the quality of the welded joint is close to that of the base metal, huge precautions still have to be taken. The parts must be perfectly plane and smooth (Ra [mean arithmetic deviation] = 2), with cross striations, and the operation must be performed in hard vacuum. All this does not promote industrialization for the time being.

Contrary to diffusion bonding, explosion welding is performed in the open. The explosion of several hundred kilos of powder cannot be contained in a chamber! The process is used only to make two-metal or three-metal plates. For this reason, professionals prefer calling it explosion cladding. Anyhow, the method is enjoying considerable development with the construction of large cruising ships like the Sovereign of the Seas. In order to reduce the weight of the upper works of the ship, the upper decks, the funnel, etc. are made out of aluminum.

With traditional methods like arc-welding, it is impossible to pair aluminum and steel.

Shipbuilding yards then have two choices: Either they bolt the two parts together after inserting a seal, or they use three-metal plates (steel, pure aluminum, aluminum alloy) obtained by explosion cladding. For large ships, the latter solution is the one chosen. It provides perfect tightness as well as excellent resistance to corrosion. The only precaution that is required is not to overheat the plate during subsequent welding operations. Contrary to diffusion bonding and friction welding, explosion cladding must be subcontracted to specialized companies (in France, Nobel, a subsidiary of SNPE [National Explosives Company], has a department specialized in this method).

In this field, technology transfers are difficult, as the entire success of the operation depends on the knowhow of the pyrotechnists. For the time being, they use empirical methods and all hinges on expertise and tests.

Explosion Cladding: An Essentially Mechanical Bonding

Of all assembly methods, cladding is the fastest to perform: It takes a few thousandths of a second. But it requires a long and painstaking preparation. First, the plates must be sanded and cleaned. When this is done, the plates are painstakingly positioned with respect to one another. The space between them varies (from 5 to 40 mm) depending on the thickness and nature of the metal cladding. The explosion spreads through the metal plate to be welded, deforming it as it progresses, at an angle of 15 to 20 degrees. Although extremely rapid (2,400 meters [m] per second [s] to 3,500 m/s), the detonation is nevertheless progressive. And the resulting plating force (exceeding 3,000 kg/cm) moves from one end of the plate to the other end.

The layer of powder varies, depending on the thickness of the cladding metal (32 mm is the record to date). In extreme cases, it approaches 100 kg/m^2. On the other hand, it is possible to work with 1-mm thick silver or tantalum foil. The nature of the powder, and therefore its combustion rate, is of decisive importance. If the combustion rate is too slow, the metallic elements will bounce against one another. If it is too fast, fusion may occur, destroying the plates.

The bonding principle is not clearly understood. If you were to exert an equivalent force with a press, the bonding phenomenon would not occur! According to Jean-Pierre Winsky, engineer at the Nobelclad department, "it is essentially mechanical. Diffusion between the two metals is practically nonexistent. This is an advantage, as some intermetallic compounds are brittle." Bonding is all the stronger as a series of regular ripples is formed.

Under the effect of detonation, the metal behaves somewhat like a liquid, although no changes occur as far as crystallization is concerned. In addition, the air trapped between the two plates is expelled at supersonic speed, which erodes the internal sides of the plates. As this eliminates any oxides, it also improves bonding. Compared with materials that are laminated together, shear strength is nearly twice greater (40 to 45 kg/mm). And if there is a defect (each plate systematically undergoes ultrasonic testing), it is often possible to repair it. Either by building it up, using traditional welding methods, or by localized explosion welding!

LASERS, SENSORS, OPTICS

Italy: Results of National Electro-Optics Program Discussed

91MI0462 Turin MEDIA DUEMILA in Italian
Jul-Aug 91 pp 50-53

[Article by Marosa Conforti: "Laser Culture"]

[Text] When the laser was discovered, it was realized that by pointing its focused beam on a material, the material either heated, melted, or evaporated. The laser and its fatal beam thus opened new frontiers in material processing even though the early uses—based on lasers with a low energy impulse and power—were limited to microprocessing in the field of microelectronics. With the perfection of medium power lasers in the 1970's this use was extended to light and heavy mechanical processing jobs, mainly cutting and welding applications.

And today? Laser system technology currently commands great respect. This was recently discussed at the Rome headquarters of the CNR (National Research Council) at a conference entitled: "Laser Systems for Industry, the Environment, and Medicine." The objective was to give an account of research and the results of an adventurous project that has been under way at the CNR since 1989 in collaboration with 15 university departments in Italy and another 24 industries and public boards. Rather than a project, whose correct title is CNR Targeted Project "Electro-optical Technologies," it would be better to speak of a mega-project, which expected to last 5 years, and involve 89 operational units (23 at CNR departments, 25 at universities, and 41 in industry and other organizations) with 52,952 billion lire in funding. Given the complexity of the goals, it was necessary to break the project down into five subprojects, each of which is subdivided into themes.

In addition to spreading electro-optical culture among industrial operators by promoting the training of highly qualified personnel and collaboration between researchers from public institutes and industrial laboratories, a specific goal—according to project director, Anna Maria Verga Scheggi,—was to develop prototypes of innovative systems, with a wide range of applications, thus providing Italian industry with this new and sophisticated technology.

Undoubtedly the most interesting results, such as the development of industrial prototypes, are those achieved

under subprojects 1 and 3, which will be examined in detail. Please excuse the rigid style of the explanation, but this was required due to the complexity and vastness of the subjects handled.

Subproject 1: Systems for Industrial Processing and Diagnostics.

Smart-3 5.25 L, a new conceptlaser robot, that is unique in the world. This was the first creature born from the coordinated efforts of units working on the second subtopic of the first subproject directed by the Engineer Luciano Pera of the Fiat Research Center in Orbassano. Produced by Comau (Fiat) and currently at the EMO exposition in Paris, Smart-3 5.25 L is the first anthropomorphic robot with an CO_2 laser with variable power up to 5,000 Watts. Designed to meet a great variety of market needs, from small to large industries, it is particularly appropriate for the metallurgical and mechanical sector and for cutting, welding, and surface treatment.

After the rigid systems of the 1970's (simple geometrics, few optical elements, medium power sources) and the flexible systems of the 1980's, Luciano Pera explained how they came to understand that path flexibility combined with high mechanical rigidity made the anthropomorphic solution preferable to others. This was combined with the ambition of integrating the robot with a CO_2 laser since an integrated system is more compact, takes up less space in the manufacturing area, ensures more constant alignment over time, permits rapid transfer from one work site to another, and above all, is less expensive than current laser production methods.

In general, there are two ways of integrating a laser beam and an articulated machine. The first consists of a robot with an on-board laser, and was conceived for the 400-1,000 Watt power range. This is more suitable for cutting processes, as in the case of Smart-3 5.25 L. The second consists of a robot with a laser source in its base for higher power levels (2,000-5,000 Watts), and more appropriate welding and thermal surface treatments. Work is being done on this second version with the "Deltax" prototype. Only the upper part is ready and is being manufactured industrially. This will be placed on the market even before the base is created.

Subproject 1 has two more goals. The first is linked to processing systems for the electronics industry, involving the University of Palermo, the Bari Laser Center, the CISE (Center for Data, Studies, and Experimentation) in Milan, and Pluritec in Turin to create molded supports and ever higher density connections, following the miniaturization of chips and the need to reduce signal transmission times. Another goal is electro-optical sensors, a study involving the Universities of Brescia, Rome, L'Aquila, Ancona, the National Optics Institute of Florence and the Cybernetic Institute of Naples. Industrial spin-offs are, however, destined for the near future.

Subproject 2: Systems for Computers, the Environment, and Defense.

Despite approval from the CIPE [Interministerial Committee for Economic Planning], research on this subproject directed by Sergio Martelluci of the Mechanical Engineering Department of the second University of Rome, had to be limited to the environment. In fact, there was no response to the CNR's public call for bids in the area of computers and defense. "A shame," stated Martelluci, "because electro-optical computational technology in applied computer science is considered one of the most promising in overcoming the principal limitations of data processing and in transferring the performance of the optical computers in research laboratories to the computers of the future."

Researchers in subproject 2 have been working on two categories of systems for the environment: the CARS and DIAL (Differential Absorption Lidar) system for detecting and analyzing gasses, and systems for the analysis of obstacles and the intermediary tool. Industrial interest is concentrated on the latter systems.

The idea of operating a radar by using a light beam (laser) and not a microwave beam is an old one. Early research in Antarctica on the ozone in the atmosphere using optical radars (the so-called lidar) dates to the mid-seventies. The goal of subproject 2 was therefore to obtain vertical profiles of the ozone up to 50 km with a precision and resolution that was not possible with the surveying techniques available in the year the project began. As a result, an advanced technology DIAL system was developed to improve the methodology of data interpretation. This system was developed in collaboration with the French CNRS' (National Center for Scientific Research) aeronomy department, and was completed in July 1990. After a brief testing period at the High Provence observatory, it was installed at the French Dumont d'Urville base in Antarctica, where a measurement campaign began at the end of February this year. Another DIAL system is being prepared in collaboration with the aeronomy department once again, and will be used in the next Arctic winter campaign.

Lidar applications are, however, numerous, because apart from the mobile Lidar systems already in circulation for detecting environmental pollution, a Lidar system is being developed for use on helicopters to overcome the obstacles that are the more difficult to detect. This sector in which Alenia, Galileo, Agusta, CISE, and Fiar are working is full of future results.

Subprojects 3 and 4: Active and Passive Electro-Optical Components.

The activities of these two subprojects are handled respectively by Professor Rinaldo Cubeddu of the Milan Polytechnic and Professor Stefano Riva Sanseverino of the Electronic Engineering Department of Palermo. They are mainly connected to activities in subproject 1, since the compact laser sources suitable for robolasers will use the innovative high reflection, light optical systems dealt with in this subproject. Indeed, as Cubeddu pointed out, the development of laser sources

is a decisive element in the market prospects for the systems themselves. Current market needs are moving toward a decrease in laser weight and size, in addition to greater reliability and efficiency, to cut back on the costs of the source, systems, and operation. For this reason two powerful lasers are envisaged, a CO_2 source (CO_2 is the type used in Smart-3 5.25 L) and a neodymium source.

A CO_2 source can be placed either at the robot's base, or inside its arm, or on its wrist. A three-kilowatt CO_2 source to be integrated at the robot's base is currently being developed, and a 1.5-kilowatt CO_2 source to be integrated into the arm is planned for 1993.

But another gem has emerged from the targeted project is in the field of neodymium lasers: solid state, high power lasers with a high quality beam.

A few years ago after the United States Department of Defense had reevaluated the potential of solid state lasers, stated Angelo Ferrario of "Quanta System," there was a race between industry, research laboratories, and agencies to invest in this field, resulting in the discovery of new materials to use, new resonators, and new pumping systems. Now "Quanta System" is presenting a neodymium laser for industrial and medical applications which uses a 400-Watt neodymium source and a system for moving and focusing the four-optical-fiber beam. This laser will enter the market next year and is unique because it provides for better performance without increased costs. "In fact," states Ferrario, "the lasers currently on the market with more than 200 Watt normally have beams with a divergence of between 20 to 50 times the diffraction limit. In industrial applications, however, especially in drilling and cutting, it is very important to use a low divergence, high average power laser. We have developed a laser which triples performance; for example when cutting metals, it can cut three meters a minute against the previous meter a minute, and can drill holes three to four times smaller than those obtained so far."

Subproject 5: Biological Structures and Systems for Biomedical Applications.

The subproject was launched early this year under the direction of Professor Riccardo Pratesi of the Physics Department of the University of Florence. It has 11 operational units working on laser systems for biomedical applications and electro-optical systems for diagnosis and therapy. Of particular interest is the activity of Professor Mario Corti of the University of Pavia, who is working on a special type of chromatographic detector, a machine used to read macromolecules under special conditions. If it is developed within one year as announced, it will be unique in the world, better than the current American and Japanese chromatographic detectors which are not that sensitive.

Italy is also getting ready to catch up with the UK and Japan, with the CNR's Institute of Quantum Electronics in Florence which has created an engineered prototype of a retinal photoagulator. This prototype, whose marketing is worrying the CSO (Construction of Opthamological Instruments) of Florence, will have the characteristics of a semiconductor diode laser instead of an argon laser (which instead is currently on the market), making it more compact.

Finally, new developments are expected in diagnostic techniques for tumors, based on tissue autofluorescence after fluorescence has been induced with the laser. The problem is finding standards for reference, something currently complicated since each situation and subject are different.

MICROELECTRONICS

GEC, SGS Thomson To Develop ASICs

91WS0491J Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 15 Jul 91 p 1

[Text] Two of Europe's leading semiconductor firms have agreed to pool their resources for the development of advanced designs for telecommunications and digital signal processing chips. GEC Plessey Semiconductors Ltd of Swindon, Wiltshire in the UK and SGS Thomson Microelectronics of Agrate, Italy and Paris, France, announced last week that they intend to combine their libraries of standard cells for the design of application specific integrated circuits (ASIC).

The idea is that a customer needing purpose-designed VLSI [very large scale integration] chips will be able to use the two firms' design tools and semiconductor fabrication processes on a completely interchangeable basis. Such circuits are designed by almost literally assembling a series of pre-designed functional circuit blocks, or cells, to form a complete circuit. Often these very complex chips can be designed to carry out all the functions of a piece of equipment—for example the complete speech processing system for a digital telephone.

GEC Plessey Technical Director, John Brothers, told *ITI* [Intervention Technique Informatique] that from the first quarter of 1992, each company will make a library of 80 standard cells available to the other. "The Plessey-designed cells are physically very small and are characterised for low power but very complex applications where the key is to get as many transistors as possible per square millimetre. On the other hand, SGS Thomson has concentrated on designing cells that can handle relatively high power and are fast."

Brothers says that by intermixing the two types of cell, virtually any telecommunications or computing application becomes feasible.

Siemens Develops Superconductive Microwave Components

91AN0507 Paris ELECTRONIQUE INTERNATIONAL HEBDO in French 27 Jun 91 p 18

[Article signed E.F.: "Microwave Components Gain in Superconductivity"]

[Text] A deposition technology for superconductive thin films, which is used to make zero-resistive interconnections in a microwave resonator, makes it possible to obtain a resonance factor of 12,000 at 10 gigahertz, i.e., 40 times that obtained using a conventional copper-based technology. This technology has just been developed by the Siemens research laboratory at Erlangen (North Bavaria). The results obtained foreshadow the possibility of very densely integrating passive components in a microwave circuit, which was impossible until now because of signal attenuation due to ohmic losses. The line resonator developed experimentally by Siemens uses a coplanar technology, whereby a wave can be produced by reflection at the short-circuited terminations.

The epitaxial growth process for depositing ultrathin monocrystalline superconductive films with the help of a laser has been developed by Siemens in cooperation with the Californian company Semiconductor Technologies. The yttrium/barium/copper oxide deposited on an aluminum/lanthanum compound substrate becomes superconductive during the cooling phase in an oxygenated atmosphere. The thin films can be patterned by conventional photolithographic and chemical etching technologies.

German Expert Reviews JESSI Status, Prospects

91WS0455A Stuttgart BILD DER WISSENSCHAFT in German Jul 91 pp 98-101

[Interview with Prof. Ingolf Ruge, a specialist in integrated circuits at the Munich Technical University and director of the Munich Fraunhofer Institute for Solid Body Technology, and Juergen Knorr, a member of the board and head of the semiconductor departmentof of Siemens AG and the head of the management team of this project, by Wolfgang Hess: "Is the European Microelectronics Project JESSI a Flop ?"; first paragraph is BILD DER WISSENSCHAFT introduction]

[Text] Japan is further advanced in microelectronics than all of Europe. Project JESSI was supposed to change that. However, two full years after its start, the ambitious program seems to be bogged down in the bureaucratic jungle.

BILD DER WISSENSCHAFT: It has been a good two years since West Europe's Program JESSI (Joint European Submicron Silicon Initiative) was removed from its baptismal waters. The ambitious goal of the program, which has been subsidized to the tune of 4 billion German marks [DM], was that the Europeans would catch up to Japan by the mid 1990s. You, Professor Ruge, are warning, as you have before, that the E uropeans are being too lackadaisical about the matter. Is JESSI a flop?

Ruge: One cannot yet say whether it will be a flop. As far as its intended goal is concerned, a program like JESSI is an absolute necessity for Europe. As far as it s realization is concerned, I have my doubts. Politicians, especially German politicians, still do not understand the evolution and essentials of a modern economy. I even see the danger that we will become even more dependent in microelectronics than we already are.

BILD DER WISSENSCHAFT: Even more dependent ?

Ruge: The Japanese are behaving like clever monopolists. They are using their lead in the field to create competitive advantages.

BILD DER WISSENSCHAFT: Can you give us some examples of this ?

Ruge: During my last visit to Siemens' 4-MB chip plant in Regensburg, I discovered that the Japanese were deliberately withholding the marketing of production facilities, which can be bought nowhere else in the world, for this chip generation with the "neat" excuse that the authorities had not yet released them for export.

These delaying tactics, which will soon have lasted a year, is a perfect indication to me that the Japanese are now beginning to play off their dominant strength in the production, and quite massively in the equipment needed to produce them as well, against the competition.

Knorr: As far as Siemens is concerned, we have eliminated our technological backwardness with respect to the production of memory chips by virtue of the Mega-project, which got underway jointly with Philips in 1984. Technologically speaking, we have become equally matched.

What we Europeans did not succeed in doing was equalizing the backwardness in production capability. For that reason JESSI was called into being. It is not just simply a matter of producing highly integrated memory and logic circuits, the infrastructure to do it must also be present.

It begins with the production of wafers, moves to etching chemicals and production equipment, right up to designing capability. And it is in this regard that both the Europeans as well as the Americans, who a decade ago dominated the market, dropped the ball.

BILD DER WISSENSCHAFT: And now the European taxpayer is expected to make up this failure of the industry ?

Knorr: You have succumbed to a widespread misconception. Divided over a period of eight years, JESSI costs

DM8 billion, or about a billion marks a year. The public sector is to provide only 50 percent of that, or DM500 million.

It is divided among Italy, France, Holland, and Germany. That comes to DM125 million yearly for each country. It i s distributed further, at the discretion of the individual governments, to universities and institutes, semiconductor producers and semiconductor users. Often each receives only about DM30 million in support each year.

So really, one cannot honestly speak of massive public subsidies for this project. The big three of the European semiconductor industry—Philips of Holland, the Italian-French company SGS-Thomson, and Siemens have disproportionately higher expenditures.

BILD DER WISSENSCHAFT: Aside from the public contribution, the bureaucratic structure of JESSI causes concern. Are the Europeans really in a position to pursue such a complicated program successfully in a few years ?

Ruge: There are scientists, who must be taken seriously, who consider JESSI a microelectronic obstacle course. I can understand that view very well. If an institu te of one country wants to participate in the program, it has to find partners from the two other countries. That requires an infinite amount of coordination.

For one thing, clear national approvals have been canceled. When I see how much time my colleagues have spent in this regard in the past two years, it is a shame. Two years wasted, and at a time when the basic research was supposed to have developed very quickly.

The better working groups in Europe, too, could doubtlessly do much in this field if the bureaucratic apparatus, which kills the desire of every institute specialist to participate, were not in the way .

Knorr: How else would you want the resources to be distributed than through an administrative structure ? We on the JESSI board have set up an office in Munich with just 20 employees, and it does its work in a very unbureaucratic fashion .

I think that the operation in Italy, France, and Germany has so far proceeded relatively smoothly. It is not a simple matter to bring divergent interests into accord. Our problem is that after a positive decision has been taken by the national governments, the officials of the EG want to decide the matter all over again. That is the reason why many projects in the JESSI program have stagnated momentarily. The EG has not yet given its financial approval.

Ruge: The German Ministry of Research has stopped its support of the microelectronics institutes. Bonn seems no longer interested in the work done on this topic, although it is near the application stage. And that attitude has been taken at precisely the time when our work has become decisive for the industry's needs for quite a few years.

BILD DER WISSENSCHAFT: Is cooperation with the industry at least in order ?

Ruge: Even that leaves something to be desired. We have asked countless times for in dustry to tell us more exactly just what specific basic research it expected from the participating institutes.

Unlike Stanford and Berkeley universities in the United States, which to the present continue to provide guidance, German university professors have been dawdling for a decade in the matter of ascertaining the really important directions for microelectronics to follow in future.

To be sure, in many instances the Ministry of Research in Bonn has only itself to blame because it holds the pistol to the heads of the academics. Either you do what we want or we are not interested. But that goes too far. Neither an expert nor an official can say what will be important in the future.

BILD DER WISSENSCHAFT: In the JESSI affair, then, it is mostly a matter of memory devices or the production of same. And in microprocessors, arithmetic elements, the Eur opeans are not much better off. The Americans are far superior to us. Must not the Europeans also master these specialties?

Knorr: I see no reason why we should not rely on U.S. processors in future. We are not being manipulated there. **BILD DER WISSENSCHAFT:** Even though two companies—Intel and Motorola—dominate the market ?

Knorr: There are a few other producers. Our problem is really only with Japan. We Germans have become the world's greatest exporters be cause we have been able to further perfect the technologies our fathers and forefathers developed. If we examine our balance of trade with Japan in electronics, we have run up our biggest deficit ever—over 35 billion dollars.

BILD DER WISSENSCHAFT: This argument is quite well known. But it is still about time that JESSI yielded its first results. When can we expect the quantum leap?

Knorr: You simply cannot expect a quantum, leap from companies that have just entered into a project.

BILD DER WISSENSCHAFT: The approval phase for the projects has obviously already lasted far too long.

Knorr: Don't believe for a minute that the companies are just waiting for the money to come in. Only the institutes are doing that. The companies have trustingly come to grips with their projects on the basis of the original approval of the governments and the EG, but, unfortunately, without a firm commitment on subsidies.

Ruge: Your company, Herr Knorr, very much underestimated microelectronics and acted as though they were screws that could be picked up anywhere.

Other companies, too, had completely erroneous notions. In the early 1980s, Herr Nixdorf, was still going about sneering that it would be idiotic to make the chips ourselves, because the things could be gotten dirt cheap.

In all fairness one has to admit that subsequently things took a turn for the better. Siemens, too, came to realize that substantial investments had to be made in the production technology.

The results can now be seen. I believe that there is no other plant besides Siemens in the entire Western world whose memory device profits so nearly approximate those of the Japanese.

BILD DER WISSENSCHAFT: Just how high are your profits, Herr Knorr?

Knorr: Professor Ruge just told you.

BILD DER WISSENSCHAFT: Professor Ruge mentioned 80 percent in the case of a 1-MB chip and 50 percent in the case of a 4-MB chip.

Knorr: Herr Ruge also has knowledge of what is happening in Japan. That should be sufficient.

BILD DER WISSENSCHAFT: Japan , Japan. Just how much does that oft cited ministry of industry MITI (Japanese Ministry of International Trade and Industry) still involve itself in the development of microelectronics ?

Ruge: Billions were invested only at the onset of silicon technology. Today Miti ensures its influence by means of a master plan. The ministry makes certain that all of the companies and institutes plan and take the measures necessary to have the required gases, fluids, chemicals, and instruments ready when needed.

Then the authorities ensure that no one sits on his hands, all participants are kept working together. We in Europe totally lack this forward strategy

BILD DER WISSENSCHAFT: But the knowledge that we here have to become stronger if we want to compete has spread throughout the industry....

Ruge: Not everywhere. Again and again I hear from industry: Of what interest is the 0.35-micrometer technology to me ? And more: Most of the medium-sized companies are in a rage when they here that JESSI is concerned about this pattern size. It is not what they now need.

I can only warn against this "anti" attitude. In five to ten years, the medium-level processors will also require this tiny pattern width.

Even Daimler-Benz is apparently not interested in this small pattern. I believe that the people there really ought to take a closer look at the evolution of microelectronics.

Knorr: Actually, there are still too few in industry who are aware of the fact that in order to be in a position to have all the products in this field in five years, arrangements must begin to day.

BILD DER WISSENSCHAFT: If that is the case, it seems that a European controlled project like the JESSI Board settled for too little authority. It should have the same executive power that Miti has.

Knorr: We are implementing a plan that has been worked out between the EG commission and the national governments. Divergences, related to national differences, occur.

We ourselves do not know whether Great Britain will participate in the program or not. British industry representatives always participate in the coordination processes, but I still do not know much as regards specific projects. We are a meadow and not a tended lawn. Various flowers bloom in the meadow. Moreover, we are not a single market, as is the case in the United States and Japan.

I admit that the so-called technology-business management controlling of the projects is not yet optimal. I likewise concede that the public is still too poorly informed on the progress.

BILD DER WIRTSCHAFT: Due to Philips' unexpected and spectacular withdrawal, the further development of fast, static memory devices has been buried in Europe. That seriously damaged JESSI's reputation.

Knorr: That was certainly a miserable milestone in the history of European microelectronics. But Philips did not withdraw because JESSI left the starting gate somewhat slower than anticipated. Let me clarify a widespread misconception. The development of the chip is not the major concern in microelectr onics.

Professor Ruge's doctoral candidates can even do that. What they cannot do, however, is to produce these products at competitive prices. It is not simply a matter of making them.

Ruge: Bonn has absolutely no group and Brussels has only a few circles in which one can speak of future planning with respect to microelectronics, which is an abiding future is sue.

Take a look at the European data processing scene to see what the result is: Philips is groggy, Olivetti is up for sale , Bull is suffering losses, SGS-Thomson is in trouble.

BILD DER WISSENSCHAFT: Is then a great European amalgamati on the only thing left in view of this catastrophic situation? Will that impart the required thrust for the final spurt ?

Ruge: You mean that an alliance of blind men and cripples creates strength ?

Knorr: I do not yet believe that the catastrophe has already hit us. There is still enough room for negotiations and time for companies to band together and arrange for cooperative ventures abroad.

One Far East island will not provide most of the microelectronics forever.

BILD DER WISSENSCHAFT: Are you optimistic ?

Knorr: At least I am not so pessimistic.

Ruge: I am not very hopeful at all. Microelectronics will continue to be too little supported in Germany. Many of those who are responsible for what comes—in industry as well—do not yet understand the consequences that will ensue if this backwardness continues. JESSI is a platform, but by itself in no way is capable of ensuring Europe's economic future.

Germany: Electrical Voltage Causes Silicon to Luminesce

91P60275 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 Aug 91 p 8

[Text] By applying an electrical voltage to it, a group of researchers at the Fraunhofer Institute for Solid State Technology, in Munich, caused silicon to luminesce. The breakthrough in semiconductor research came after British scientists from the Defence Research Agency in Malvern had already discovered last September that silicon stimulated by ultraviolet light luminesces (see BLICK DURCH DIE WIRTSCHAFT, 26 Jun 91). "That let us know that, in principle, silicon can luminesce and that this must also be possible via the application of an electrical voltage," explained a spokesman for the institute.

Of course, the efficiency is low: While silicon wafers irradiated with ultraviolet light luminesce with intense colors ranging from lemon yellow to dark red, the effect produced upon the application of electrical voltage is rather weak. Institute head Professor Ingolf Ruge seeks to further expand this branch of research because the integration of optics and electronics on silicon could give silicon technology a considerable boost and open up totally new dimensions for the computer world. It is hoped that, if light sources could be mounted directly on silicon chips, the manifold conducting paths among microchips could essentially be replaced by considerably faster optical connectors. According to researchers at the Fraunhofer Institute, data transfer within a chip could also be accelerated by many times. The manufacture of flat displays and video screens in conjunction with silicon-based integrated circuits might be feasible. The discovery is also significant with regard to computer architectures and the concept of an optical computer, upon which latter concept the Japanese in particular are working intensively.

The basis for the discovery is an etching technique using hydrofluoric acid which, up to now, has been used in semiconductor technology only in peripheral areas such as the manufacture of dense silicon oxide. During the etching process, small pores are introduced into the silicon wafer. On the wafer, there is left a dense intertwining of tiny branched silicon needles. The tiny silicon needles—about ten atoms thick and several microns long—give rise to the luminescence. In order to get silicon to luminesce upon the application of an electrical voltage, the researchers also provided a translucent contact layer, made of gold, on the already etched wafer.

German Research Society Focuses R&D on Nanoelectronics

91MI0491 Bonn DIE WELT in German 10 Aug 91 p 20

[Text] The development of and research into nano-sized electronic components is the objective of a new special research project initiated last month in Munich by the German Research and Development Authority (DFG). One of the things which the 40 scientists from a total of nine faculties are attempting to do there in the years ahead is to discover the fundamentally new physical principles according to which electronic components such as transistors could operate on a nano scale. At such minute dimensions, events will largely be determined by the laws of quantum physics. We can already say today that a transistor made according to these principles would not only be far quicker, but at the same time it would also use far less energy.

The Munich researchers are also looking to find the first technical applications during the initial three-year period of their financial support, for which the DFG has made six million German marks available. In the first instance they are thinking of new microwave components and high frequency transistors.

Apart from the electrical properties, working in nanotechnology also enables the optical properties of materials to be influenced in a specific way. Thus, the Munich researchers also have the development of fast optical switches and amplifiers, tunable light sources, and sensitive detectors on their agenda.

An important aspect of the search for the nanoelectronics of the future is that it in fact gives Europe a fresh opportunity to catch up on the enormous lead which the Japanese have in present-day microelectronics. Nanoelectronics is still so much in its infancy and is so fundamentally different from microelectronics that at the moment everyone has virtually the same chances of successfully developing and applying this new technology. And it certainly helps that the Federal Research Ministry has decided that "nanotechnology" should be a main focus of its support.

But it is only electronics and optoelectronics that could be revolutionized by nanotechnology. It will also have an

important part to play in many other high-tech applications. For example, it is conceivable that atomic structures (such as holes in surfaces) might be used as data stores. In theory, the storage density could be increased by a factor of around 100,000 as compared with today's optical and magnetic information carriers. The information units could perhaps be the holes punched in a surface with a scanning tunnel microscope (STM).

For example, scientists at BASF in Ludwigshafen are conducting experiments which might one day lead to a nano data store. Using an STM needle, they have succeeded in producing nano-sized structures on a surface made of the semiconductor material tungslen selenide. They were able to make these not only in a vacuum, but also in air and they remained stable for up to two days. The STM needle used to "write" the structures ("data") can also be used to "read" them out again. They were also able to "delete" the structures by heading them. However, there is at all events still a long way to go before it will be technically possible to make a data store based on these mechanisms.

One fundamental problem of such a nano-data store would be the very slow speed at which an STM needle could write and read data. The time available for accessing the enormous quantities of data would be totally insufficient.

But it might one day be possible to use a whole "pin cushion" of STM points arranged in parallel to form an array. Such multipoints could also be a very important tool in nanoelectronics. In the end it might be possible to use them to shovel large quantities of the nano-building material "atoms" from one place to another at one time and in that way to produce particular structures of components.

If the objects are to become smaller and smaller, the tools must shrink as well, scientists at Cornell University U.S. thought, and they set themselves the task of miniaturizing scanning tunnel microscopes. Although scanning tunnel microscopes will already fit into a briefcase today, the Cornell researchers headed by Noel MacDonald want to achieve something that sounds utterly utopian: to build an STM system that could comfortably rest on the cut end of a human hair!

NUCLEAR R&D

Poland Joins CERN Nuclear Research Center

91AN0517 Paris SCIENCES & AVENIR in French Aug 91 p 8

[Text] The European Nuclear Research Center (CERN) has just welcomed its 16th member state, Poland. While negotiations are under way with Czechoslovakia, Hungary, and Yugoslavia, Poland becomes the first Central European country to join this organization, which is the world leader in particle physics. Poland will pay dues—1 million Swiss francs per year until 1995, then 1 percent of the total budget in the year 2000—which, although modest, will be welcome. In spite of its scientific success, CERN is having difficulty getting its accelerator project, the Large Hadron Collider (LHC), accepted by its member states. For the Polish physicists, membership will lead to the intensification of an already strong cooperative effort—80 of them already work at CERN.

TELECOMMUNICATIONS

RACE Director on Communications Program

91AN0532 Brussels XIII MAGAZINE in French Jul 91 pp 6-8

[Article by Roland Hueber, director of the EC's RACE program: "RACE: The 1995 Goal"]

[Excerpts] Since the mid-1980's, the Research and Development in Advanced Communications Technology in Europe (RACE) program has become a synonym for Europe's efforts to develop and implement integrated broadband communications (IBC) in Europe.

The question that immediately comes to mind is: Why is the European Community, and more specifically the Commission, involved in these matters at all? IBC is, after all, a technologist's term. It is not even a fully defined technology yet; it is rather a generic concept which covers still unclear choices between various possible technical solutions for an integrated digital telecommunications system. Many companies, official bodies, and working parties are involved in the exploration and definition of this concept, in Europe and elsewhere. But while the Commission has no single policy on technology, it has always stood in favor of network innovation and harmonization of standards among member states.

The basic justification for EC action is the need to promote the development of Europe's infrastructure. But there is a long-term commitment to a strategic goal. This goal is the single European market, with the free movement of goods, services, and people throughout the Community. Free and open communication access, provided by telecommunications infrastructure, is an essential adjunct to this. A key contributor to this aim is the RACE program, which gives support to a wide variety of telecommunications projects and provides a permanent forum for the exchange of research findings. [passage omitted]

Since the objective of RACE was first defined, a much clearer appreciation of its implications has emerged, particularly:

- The heavy drain on cash resources necessary to finance the construction of the new infrastructure;
- The natural reluctance among telecommunications operators to make big investments before a clear demand for new services has developed;
- The impact of present or future deregulation affecting the investment risks as seen by established operators;

- The differences in national market conditions, leading to a phasing in the timing of introduction of IBC throughout Europe.

This is taking place against a background of important changes in the economic structure of industry as a whole:

- The increasing capital intensity of network operation;
- Rapidly decreasing transmission costs, after the introduction of high-capacity fiber links;
- The change in telecommunications equipment markets, away from switching and toward transmission, network management, and customer premises equipment.

A very important consideration is that many of the pioneer users of broadband will be found among larger companies. It is among the major corporations that one finds the telecommunications expertise and financial resources necessary to exploit an innovative technology. But by definition such large companies operate on at least a European, and often a world-wide scale. Therefore, strictly national initiatives and policies toward broadband communications will not be good enough.

All these factors mean that there is a clear need for a robust multinational implementation strategy which will evolve with the market well into the next century, and which will be based on a strategy developed jointly and agreed to between network operators, industry, and users. The major milestones of such a strategy are expected to be as follows.

In the first phase, roughly from now to 1993, one can expect the introduction of early applications, mostly in the business and professional field, and of advanced communications experiments to test emerging new services. They will be based on existing networks and possibly also on early versions of broadband-ISDN equipment, for example metropolitan area networks (MANs) and the first asynchronous transfer mode (ATM) prototypes. At this point also the major investment and procurement decisions will be made. This requires the completion of the related major standards at this time.

This will subsequently progress to the linking up of all the capitals of the Community and some neighboring countries, based on existing or presently planned fiber-optic trunk networks, supporting all kinds of voice, data, and image traffic. This may be either in a separated or an integrated mode.

Thus, by 1995 the initial IBC implementation and completion of customer access for businesses in major centers of economic activity throughout the Community can be expected. At this point also, field trials to test a representative range of broadband services, including residential customers, with two-way video and possibly digital HDTV using commercially available broadband equipment, could be foreseen.

The middle of this decade will be the critical period. By 1996-97, the offer to business locations in towns of more than half a million inhabitants of a range of basic broadband services, allowing fast inter-LAN [local area network] data transmission, desktop video conferencing, and sophisticated CAD-CAM [computer-aided design and manufacturing] facilities, is likely to become reality. At the same time, widespread fiber-to-the-home deployment carrying a full range of services to the residential customer is due to start.

Depending on local conditions, existing and planned broadband islands will progressively link up via long-distance optical fiber networks, offering increasingly universal access to services. In the long term, a 50-percent penetration of Community-wide broadband access availability is targeted for the years 2005-2010.

This scenario demands broadly-based collaboration in three areas:

- Network strategies and planning for IBC implementation;
- Development of the technologies necessary for IBC;
- Functional integration, including the carrying out of application pilot projects.

The structure of the RACE program has been designed to cover work in these three areas.

Pilot applications are real-world tests of prototype communications applications which, when fully developed, will require the use of or will benefit from the introduction of IBC. That is, they have a potential or direct need for high bit-rate transmission, large data volumes, or complex multimedia interaction which only the advent of IBC would make economic. These pilot projects are being run in manufacturing industry, finance, transportation, health care, media and publishing, and other key industry sectors.

All of the individual pilot applications share the same general objectives. These are:

- To confirm the results of initial analyses of market segmentations and needs;
- To advance the understanding of the characteristics of user needs by gathering real-world experience;
- To provide feedback on applications and thus on service and system specifications;
- To provide an input to the industry sector's standardization process, paving the way for the widespread adoption of the applications by the users.

It is a very important strategic goal to try to reduce uncertainty for manufacturers and network operators in equipment and service design, and to improve business' and industry's understanding of IBC's potential. This is because the cost of developing and offering integrated broadband communications in Europe is evidently considerable. Telecommunications administrations will be reluctant to make this investment unless a clear user demand can be shown. But the majority of users will not

be aware of what can be done with broadband services until they are offered and can be tried in action. Accordingly, there is a certain danger of vicious circle, where lack of supply leads to lack of demand which in turn seems to justify the lack of supply.

The role of RACE and especially the pilot applications is to help break out of this vicious circle. By showing that there is a demand, and by realizing it in an actual functioning application, the program hopes to promote a procedure where increasing demand will produce economies of scale which in turn produce lower prices, which reinforce demand, and so on.

The Community's current Framework Program for Research and Technological Development will expire in 1991. A new, third framework program was approved in April 1990, covering the years 1990-1994. Specific programs within this third framework program are currently going through the necessary approval procedures, and they include one which is devoted to advanced communications technologies.

The Commission's proposal for this specific program identifies eight areas of future action:

- IBC research and development;
- Intelligence in networks/flexible communications resource management;
- Mobile and personal communications;
- Image and data communications;
- Service engineering technologies;
- Information security technologies;
- Advanced communications experiments;
- Test infrastructures and interworking (horizontal R&D area supporting the other priority areas).

To carry out future projects in these areas, 484 million European currency units [ECU] has been earmarked by the Community .

At the strategic level, the emphasis of future action is likely to shift from the previous phase of "exploring options" to a more concrete phase of "preparing for implementation." It may also become necessary to fine-tune the role of public involvement as implementation approaches and competitive and market forces gain importance.

To summarize, RACE is not technology in a vacuum. It is a planned program of research and development, managed in a businesslike way, with the objective of producing the right technology at the right time at the right price for well-specified applications. The overriding goal is in the end to provide the user with a greater variety of telecommunications services, of a better quality and at a lower cost, giving Europe the full internal and external benefit of a strong telecommunications sector.

German Communications Consortium for Eastern Europe Founded

91MI0515 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 4 Sep 91 pp 7-8

[Text] Three firms in the communications sector have now formed EuroDATA GmbH in Berlin; the three firms, each with a one-third stake, are BB-DATA GmbH, a subsidiary of Berliner Bank AG, DETECON Deutsche Telepost Consulting GmbH, an affiliate of Deutsche Bundespost TELECOM in Bonn, and Deutsche Aerospace AG in Munich. The purpose of this "satellite communications and securities services company" is to set up and market efficient communications networks on the western and eastern European markets, providing both data transmission and special voice services.

Following the unification of the two German laender, it quickly became clear that one of the major obstacles to building up the economy in the five new laender was the inadequate flow of communications. Satellite communications will now provide a prompt remedy; the new firm has already received a large number of orders to this end. Since its formation, the EuroDATA project team had already installed over 50 satellite ground stations, mainly in the five new laender and eastern Europe, including Moscow and Prague. Very small aperture terminal (VSAT) technology, which operates with small satellite ground stations is used. The receiver dish is normally 1.8 meters in diameter.

Second Phase of TEDIS Program Established

91WS0491Q Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English 30 Jul 91 pp 66-68

[Article: "Council Decision"]

[Text] Council Decision of 22 July 1991 establishing the second phase of the Tedis programme (Trade electronic data interchange systems) (91/385/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof,

Having regard to the proposal from the Commission (OJ No C 311, 12. 12. 1990, p. 6),

Having regard to the opinion of the European Parliament (OJ No C 106, 22. 4. 1991, p. 167),

Having regard to the opinion of the Economic and Social Committee (OJ No C 102, 18. 4. 1991, p. 13),

Whereas one of the Community's tasks is, by establishing a common market and gradually reducing the gap between the economic policies of the Member States, to promote the harmonious development of economic

activities throughout the Community and closer relations between its constituent States;

Whereas the Commission White Paper on the completion of the internal market stresses the importance of the future development of new transfrontier services and the contribution made by telecommunications networks based on common standards towards the creation of a market free of barriers at Community level;

Whereas the exchange of computerized data (EDI) can contribute increasingly towards the competitiveness of European undertakings in the production and services sectors;

Whereas there is rapid growth at present in public and private initiatives for putting into service within a company or group of companies or sector of activity, at national and international level, electronic data interchange systems which are not compatible;

Whereas, as regards electronic data interchange, the diversity and fragmentation of initiatives taken at national level or more generally by a company, group of companies or sector of activity may lead to the creation of incompatible and non-communicating systems and to preventing suppliers of equipment and services, and users, from deriving maximum benefit from the advantages created by the growth in electronic data interchange;

Whereas, in line with the Council Resolution of 22 January 1990 on trans-European networks (OJ No C 27, 6. 2. 1990, p. 8) and the conclusions of the Strasbourg and Dublin European Councils, the smooth running of the internal market depends on undertakings and authorities involved in it being able to exchange data as part of their activities by making use of compatible systems which enable genuine pan-European data interchange networks to be developed;

Whereas Tedis needs in particular to be dovetailed with the specific programme of research and technological development in communications technology (1990 to 1994), the specific programme of research and technological development in the field of telematics systems of general interest (1990 to 1994) and the specific programme for information technology (1990 to 1994) which are part of the Community's third framework research programme;

Whereas the work already initiated in the field of electronic data interchange (EDI) during the first phase of the Tedis programme (1988 to 1989) established by Decision 87/499/EEC (OJ No L 285, 8. 10. 1987, p. 35) makes it possible to envisage the establishment of such pan-European networks, provided that this work is continued and expanded by instituting a second phase to the programme;

Whereas a programme lasting three years is called for;

Whereas an amount of 25 million European currency units [ECU] is estimated as necessary to implement this multi-annual programme; whereas, for the period 1991 to 1992, in the framework of the current financial perspective, the funds estimated as necessary are ECU10 million;

Whereas the amounts to be committed for the financing of the programme for the period after the budget year 1992 will have to fall within the Community financial framework in force;

Whereas, by Decision 89/241/EEC (OJ No L 97, 11. 4. 1989, p. 46), the Council amended the initial Decision on the Tedis programme to allow non-member countries, in particular Member States of the European Free Trade Association (EFTA), to be associated with the Tedis programme and, in accordance with Article 228 of the Treaty, authorized the Commission to negotiate agreements with the EFTA Member States;

Whereas, by Decision 89/689/EEC (OJ No L 400, 30. 12. 1989, p. 1), 89/690/EEC (OJ No L 400, 30. 12. 1989, p. 6), 89/691/EEC (OJ No L 400, 30. 12. 1989, p. 11), 89/692/EEC (OJ No L 400, 30. 12. 1989, p. 16), 89/693/EEC (OJ No L 400, 30. 12. 1989, p. 21) and 89/694/EEC (OJ No L, 400, 30. 12. 1989, p. 26), the Council approved the agreements on systems for the electronic transfer of data for commercial use concluded between the European Economic Community and, respectively, Austria, Finland, Iceland, Norway, Sweden and Switzerland;

Whereas the Treaty does not provide, for the adoption of this Decision, powers of action other than those of Article 235,

HAS DECIDED AS FOLLOWS:

Article 1

1. A second phase of the Tedis (Trade electronic data interchange systems) Community programme concerning the exchange of electronic data (EDI) in trade, industry and administration, hereinafter called the 'programme', is hereby set up.

The programme shall last three years.

2. The Community financial resources estimated as necessary for its implementation amount to ECU25 million, of which ECU10 million is for the period 1991 to 1992 in the framework of the 1988 to 1992 financial perspective.

For the subsequent period of implementation of the programme, the amount shall fall within the Community financial framework in force.

3. The budget authority shall determine the appropriations available for each financial year, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 2

The objectives of the programme are to ensure that electronic data interchange systems are established to the best effect, in view of the socio-economic importance of such systems, and to mobilize the necessary resources to achieve this end at Community level.

Article 3

In order to achieve the objectives defined in Article 2, measures will be taken and continued in the following areas:

— standardization of EDI messages,
— specific EDI needs as regards telecommunications, legal aspects of EDI,
— security of EDI messages,
— multi-sector and Europe-wide projects,
— analysis of the impact of EDI on company management,
— information campaigns.

A list of the proposed measures is given in Annex I. These measures shall be implemented under the procedures provided for in Articles 6 and 7.

Article 4

The implementation of the programme shall be coordinated with existing or planned Community policies and activities concerning telecommunications particularly in respect, where necessary, of initiatives under the Open Network Provision Framework Directive (90/387/EEC (OJ No L 192, 24. 7. 1990, p. 1)), the information market (Impact programme), security of information systems and standardization, and in particular with the Caddia programme and the CD project, so as to ensure the necessary interaction with the specific requirements of the exchange of electronic data.

Article 5

Contracts arising from the programme shall be concluded with undertakings, including small and medium-sized enterprises, research establishments, national administrations and other bodies established in the Community, in the member countries of the European Free Trade Association or in a third country with which the Community has concluded an agreement associating that country with the programme.

Article 6

1. The Commission shall be responsible for implementing the programme. The Commission shall be assisted by a Committee of an advisory nature composed of the representatives of the Member States and chaired by the representative of the Commission.

2. The representative of the Commission shall submit to the Committee a draft of the measures to be taken. The Committee shall deliver its opinion on the draft, within a time limit which the Chairman may lay down according to the urgency of the matter, if necessary by taking a vote.

3. The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes.

4. The Commission shall take the utmost account of the opinion delivered by the Committee. It shall inform the Committee of the manner in which its opinion has been taken into account.

Article 7

1. Notwithstanding the provisions of Article 6, the following procedure shall apply in drawing up the work programme as set out in Annex I, the breakdown of the relevant budgetary expenditure and the assessment of projects and actions provided for in that Annex of a total value of above ECU200 000, and the estimated amount of the Community's contribution to them.

2. The representative of the Commission shall submit to the Committee a draft of the measures to be taken. The Committee shall deliver its opinion on the draft within a time limit which the Chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the Committee shall be weighted in the manner set out in that Article. The Chairman shall not vote.

3. The Commission shall adopt measures which shall apply immediately. However, if these measures are not in accordance with the opinion of the Committee, they shall be communicated by the Commission to the Council forthwith.

4. In that event, the Commission shall defer application of the measures which it has decided for a period of three months from the date of communication.

The Council, acting by a qualified majority, may take a different decision within the time limit referred to in the foregoing subparagraph.

Article 8

At the end of the Tedis programme, the Commission shall present to the European Parliament, the Council and the Economic and Social Committee a final report containing an assessment by independent experts of the progress made towards each of the objectives set under the programme on the basis of the criteria and indicators as set out in Annex II to this Decision.

Article 9

This Decision shall take effect on 1 July 1991.

Done at Brussels, 22 July 1991.

For the Council

The President

P. DANKERT

ETSI Approves Mobile Phone Standard

91WS0491M Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 1 Jul 91 p 1

[Article: "ETSI Gives DECT a Push"]

[Text] The European Telecommunications Standards Institute (ETSI) has now accepted the Digital European Cordless Telecommunications (DECT) Common Interface as a draft European Telecommunications Standard (ETS).

A meeting of the ETSI Radio Equipment and Systems (RES) Technical Committee (TC) approved the interface as a draft standard at its fifth meeting at its headquarters in Sophia Antipolis on June 17th-21st.

The RES TC also approved the DECT Test Approval Specification as an approved Interim-European Telecommunications Standard (I-ETS). The specification is designed to ensure safety to users, networks and equipment. It is also intended to preserve efficient use of the radio spectrum and to ensure interoperability between DECT equipment for public access (telepoint-type applications). The adoption of the specification is an interim measure to allow the specification to meet what ETSI calls "Immediate demand for Approval Test Specification" and the specification is expected to attain full ETS within 12 months.

The next moves in the approvals process for both the Common Interface and Test Approval Specification will be ETSI to submit them for Public Enquiry, a process which usually takes 17 to 21 weeks during which time national standards organisations have an opportunity to make comments.

An ETSI Technical Report will be published later this Summer which indicates formal acceptance of the DECT Services and Functions Requirements Specification. This specification contains provisions for residential, business and public access (ie Telepoint) applications of DECT and its evolutionary applications. ETSI stressed that the acceptance is designed to aid the specification of DECT and not to define specific products or equipment.

European High-Definition Television Developments Reported

91WS0471C Paris L'USINE NOUVELLE/ TECHNOLOGIES in French Jun 91 pp 60-66

[Article and interview with Eureka HDTV Project Vice President Michel Hareng by Thierry Lucas: "HDTV: The Final Technical Nuts and Bolts"; first paragraph is L'USINE NOUVELLE/TECHNOLOGIES introduction]

[Text] Having entered the HDTV race long after the Japanese, the Europeans are moving quickly. Their technological choices could enable them to take the lead. Michel Hareng, vice president of the Eureka HDTV project EU95, outlines the evolution of HDTV for the next 10 years.

Ever since the idea was first mentioned, there was always a doubt as to whether it would ever happen. Nevertheless, high-definition television's (HDTV) arrival on the market, with its large wide screen, its "cinema" quality picture, all enhanced by digital sound (like that of the compact disk) is now actually scheduled.

If all goes as planned, the new television will make its official consumer debut in 1995-1997. Most of the HDTV chain should be ready by then (i.e., in commercial production), particularly with the launching of HDTV sets at an "acceptable" price and with the broadcasting of programs less restricted than the demonstrations offered to date.

A single figure should suffice to give some idea of just how much is at stake: More than 700 million conventional TV sets are installed throughout the world, and, consequently, likely to be replaced.... If you add the VCR's, cameras, video cameras, and all the studio and broadcasting equipment, you can see why the future video standard has generated enormous research and development efforts by the major manufacturers of consumer entertainment electronics in Japan, the United States, and Europe.

First off the block, in 1972, the Japanese (with powerful NHK leading the pack) developed the Muse HDTV system, and Sony, Matsushita, Hitachi, Toshiba... are concentrating on producing hardware at "competitive" prices. The television receivers recently launched by these companies sold at a price of approximately 150,000 French francs [Fr], including the Muse converter.

In 1986, the Europeans entered the competition with the Eureka EU95 project and managed to "deliver", in 4 years, a complete HDTV standard. This has the peculiar capability of permitting "smooth" evolution toward the new television, passing through two generations of mutually compatible systems. Currently, the major partners, particularly Philips and Thomson (who signed an R&D cooperation agreement), are beginning to apply the results of EU95. Thus, Thomson decided to invest massively in HDTV development: Fr9 billion through 1995, including Fr3 billion in government assistance.

Last February, Thomson presented the first compatible consumer high-definition Pal/Secam monitor with a wide 16/9 screen. Marketed at the price of Fr35,000 (the D2-Mac [Multiplied Analogue Components] converter and the antenna are sold separately), this receiver is not yet "high-definition," but it has improved definition and a line doubler, making it possible to convert today's 625-line images into 1250-line images which will be the standard for European HDTV.

Likewise, next summer at the international expo in Berlin (IFA) Philips will introduce its own 16/9 receiver and D2-Mac, also based on studies conducted jointly within EU95.

In the United States, the situation remains uncertain, because several new television projects are in competition. These include that developed jointly by Zenith and AT&T, which is concentrating on fully digital HDTV, that of the Japanese NHK, a "super-NTSC" project (improved television at slightly higher cost), and a tow-stage project for evolution toward high-definition. The FCC (Federal Communication Commission), the federal regulatory agency for audiovisual and telecommunications systems, is supposed to make a definitive ruling in 1993.

All these projects, to be successful, must be supported by innovations which involve the entire HDTV chain: cameras, studios, recorders, broadcasting systems (cable or satellite), and receivers. With a major part of the development devoted, of course, to the electronics. An HDTV receiver will probably contain more semiconductors than today's microcomputer!

But what differentiates these competing projects?

First, it should be pointed out that three television standards currently exist: PAL [Phase Alternation Line] (of German origin), SECAM [Sequential Color and Memory] (of French origin), and NTSC [National Television Standard Code] (used especially in Japan and the United States). Although incompatible, these three processes do share a family resemblance. The height-width ratio of the picture is 4:3, and each is made up of 625 lines, at a rate of 700 pixels per line. In HDTV, the number of lines per image is doubled (1,250), and each line has 1,000 pixels.

The conventional TV systems are also coded identically. The picture (divided into luminance and chrominance signals) and the sound are transmitted simultaneously, which causes interference—for example, clouds when luminance is detected as chrominance.

With the new European Mac standard for cable or satellite broadcast, the three signals are transmitted separately (they share a duration of 64 µs per scan line), and, furthermore, the sound is handled digitally. This is the intermediate standard, called "improved television," still 625 lines, but which can be received by a new 16/9 monitor or by a conventional 4/3 set equipped with a Mac converter.

For "true" high-definition, it will be necessary to wait for the HD-Mac standard (planned for 1995), which, this time, will have all the desired characteristics: 1,250 lines in 16/9 format, 1,000 pixels per line, and digital sound. Compatibility with the intermediate standard will be guaranteed. All that will be necessary is to connect the receiver to an HD-Mac converter.

On the strength of this concept of compatibility (which also seems to be essential in the United States), the Europeans feel they have a "lead of several years" on the Japanese Muse system which is completely incompatible with current market standards. The competitors will also be separated by their capability of rapidly manufacturing equipment at competitive prices. And there, the battle is essentially technological and industrial.

Michel Hareng: "Our Trump: Compatibility"

L'USINE NOUVELLE: How far along is the European high-definition television project?

Hareng: The first phase of the European HDTV project, EU95, which began at the end of 1986, had as its objective to propose standards for production, transmission, and reception of high-definition images. In May 1990, the European standards resulting from this first phase were recorded by the International Radio Broadcasting Consultative Committee (CCIR) as a proposal for an international HDTV standard, on the same level as the Japanese project. These results were also embodied at the time of the IFA international expo which took place in Berlin in 1989, where a complete HDTV prototype chain was successfully introduced. From cameras to receivers, via an HD-Mac [High-Definition Multiplexed Analog Component] satellite link, the entire system met the standards defined in EU95.

This success also resulted in the evolution of the position of certain manufacturers and countries relative to this project which had begun in the midst of rather extensive incredulity.... The program has now entered a second phase, which is to end in December 1992. Its objective is to finalize the European project with a view to launching HDTV on the consumer market beginning in 1995-1997.

L'USINE NOUVELLE: More specifically, what are the objectives of this second phase of the project?

Hareng: CCIR work on HDTV is not finished. The EU95 project is supposed to contribute to it and to parallel it. In particular, the number of lines to visualize and the image frequency remain to be defined by the CCIR. These are, of course, important parameters.

On the other hand, certain equipment is not yet standardized. For example, the studio standard which we initially proposed is analog, whereas everyone currently agrees that the HDTV production standard will be digital.

However, phase two of EU95 includes an additional aspect. It proposes to promote the European HDTV system at the time of international events. High-definition rebroadcasts of the 1992 Winter and Summer Olympic Games which will be held in France and in Spain will be part of the pilot applications of the project. Naturally, this presupposes having passed to a more

advanced level of equipment development. In particular, some one thousand HD-Mac receivers will be manufactured for this purpose.

L'USINE NOUVELLE: What is, right now, the major obstacle to launching HDTV on the consumer market?

Hareng: In my opinion, it is the visualization of the images which currently constitutes the bottleneck in the HDTV chain. In fact, to completely appreciate the change to high-definition, it will be necessary to have a large screen: at least 1.2 or 1.3 m diagonal. The whole problem is to manufacture a receiver of this size, in a form and at a price suited to the consumer market.

Right now, with cathode ray tubes, it is possible to obtain approximately 1 meter diagonal. Thus, the HDTV compatible receiver placed on the market last February by Thomson has a 36" tube (93 cm diagonal) in the wide 16/9 format, which is very close to the current limits.

To go any further, it will be necessary to use a rear projection system. Externally, this is a conventional TV, however, it contains three tubes, one for each basic color, with the three "subimages" projected on the screen. The major partners in EU95 are developing such receivers with a 1.2- or 1.3-m screen. Another possibility involves front projection: HDTV then actually becomes a home cinema. However, I am skeptical about the success with consumers of a solution which presupposes reserving a whole room for this use.

L'USINE NOUVELLE: And flat screens?

Hareng: To resolve the problem of size, the ideal solution would be flat liquid crystal screens. Unfortunately, the LCD screens that we currently are able to manufacture are far from having the dimensions required for HDTV. In fact, these screens will not be available in series production for some fifteen years. But we are not going to wait until the year 2005 for HDTV.

On the other hand, I believe strongly in a projection or rear projection system using small liquid crystal valves—from 5 to 10 cm in diameter—which act as light modulators. This technology seems much more feasible in the short term than the 1 meter square flat screen.

L'USINE NOUVELLE: What are the technical problems posed by high-definition cathode tubes?

Hareng: The change to the 16/9 format, replacing the current 4/3, creates many problems in tube design. When tube size increases, it is essential to use increasing thicknesses of glass, so that it can "hold" the vacuum. But one of the major difficulties encountered in the development of a 16/9 tube involves the mask. This is a perforated metal part located on the inside surface of the screen, whose role is to channel the electrons emitted by the three guns—one per basic color—toward the corresponding points on the screen.

Well, the mask, which absorbs more than 80 percent of the power of the flow of the electrons, heats up and risks becoming deformed. In a receiver of the 4/3 format, in almost square in shape, this deformation is virtually isotropic. For a 16/9 screen, i.e., rectangular, the expansions are anisotropic. Furthermore, because the perforations which let the electrons pass are smaller in a high-definition mask, the power absorbed locally is greater. That is why several solutions based on materials resistant to temperature variations, especially Invar, are being studied within Eureka.

L'USINE NOUVELLE: Will the production of the electron beam also have to undergo modifications?

Hareng: Yes, because although the tube definition is linked to the distance between the perforations in the mask, it also depends on the diameter of the electron beam. Thomson developed electron optics which permitted halving the beam diameter.

Also, to obtain luminosity equal to that of conventional tubes, it is necessary to increase the flow of electrons without jeopardizing the service life of the cathode. We are also studying phosphors (the fluorescent substances which receive the electron beam) which are better suited to the constraints of HDTV.

L'USINE NOUVELLE: What is the role of electronics in the development of HDTV?

Hareng: All the high-definition TV equipment must be able to perform complex signal processing functions in real time. Quantitatively speaking, one should know that a high-definition image in the 16/9 format represents five times more data than a conventional image, and that it still must all be processed in 1/50 of a second.

Also, the very principles adopted for HDTV require components capable of performing more complex processes than in conventional TV. Take for example the case of the HD-Mac converter included in the receiver: It must reconstruct the starting image, which is produced in 1,250 lines, from a signal transmitted in 625 lines, and digital assistance data transmitted in parallel which permit it to perform this reconstruction.

This transmission on only 625 lines, made necessary by the limited pass band of the transmission channels—approximately 10 MHz—also permits reception of the image by a Mac receiver with conventional definition. In this case, the digital data is ignored and, of course, the image is not in high-definition.

L'USINE NOUVELLE: What is the technological level of HDTV?

Hareng: If we want to arrive at prices which really suit the consumer market, it will be necessary to produce components with 0.5 micron engraving, a technology which should be operational by 1995-1997. Because the price of circuits depends basically on the surface area of the semiconductor used to implement a function and not on the complexity of the function.

L'USINE NOUVELLE: What role are the European microelectronics research projects playing in this development?

Hareng: In the Jessi project, there is a section devoted to applications which permits validation of the results obtained by the basic programs. One of these applications, in which Siemens, Philips, and Thomson are cooperating, is a set of integrated circuits for reception of the HD-Mac signal.

L'USINE NOUVELLE: Will we have to wait for this new generation of circui HD-Mac decoder will include about fifty ASIC circuits. That is relatively few compared with the Japanese Muse converter which has more than a hundred, but it is too many if the goal is an acceptable price for the consumer market. Ultimately, the objectits before industrial production can begin?

Hareng: A demonstration product, even one manufactured in a small series, must not be confused with a truly commercial product. For example, for the pilot application of the next Olympic Games, theve is to end up with a converter operating with only 5 to 10 circuits.

L'USINE NOUVELLE: How far along are the high-definition cameras?

Hareng: Right now, most HDTV cameras have tubes. All programs filmed in high-definition have been filmed with this type of equipment. However, it is obvious that all producers of conventional television (625 lines) are currently using CCD cameras, much lighter and much easier to use. The basic difficulty, in transposing this technique to high-definition, is to obtain an acceptable production yield on 1,920 x 1,250 pixel matrices. However, the HDTV camera of the future will of necessity be of the CCD [charge coupled device] type, and the HDTV videocameras are already in preparation...for the 21st century.

L'USINE NOUVELLE: How are recording techniques going to evolve to adapt to the new television standard?

Hareng: As for video recorders, a distinction will have to be made. For studio equipment, full definition magnetic recording will require a new design for heads, tapes, and micromechanics of the camera.

In effect, this will involve recording five times more data than with conventional video. This will be accomplished, on the one hand, by reducing the width of each track on the tape, and, on the other, by increasing the speed of the magnetic head on the tape.

For the consumer market, there will be two stages, exactly as occurred with conventional video with VHS and super VHS. This means that there will first be "improved" definition video recorders, with twice the current definition. But it will probably be necessary to wait until the end of the decade for video recorders that will reproduce full high-definition. These video recorders will most likely be digital.

L'USINE NOUVELLE: Will the optical disk have a place in the HDTV chain?

Hareng: It is also a possible medium. Philips is, in fact, developing a video disk for the HD-Mac standard. Also, there is the erasable-writable optical disk which could provide competition for the video recorder. But there is significant obstacle to its use: the recording length. Now, a conventional optical disk contains approximately 45 minutes of programming. In high-definition, this would only be about 15 minutes.... Of course, there are ways to increase data density on disks. For example, use of a laser with a shorter wavelength, a blue laser, is under consideration.

L'USINE NOUVELLE: How is the switch to mass production of the equipment going to be handled?

Hareng: The key is in production techniques. Production methods enabling achievement of the performances defined by EU95, at a reasonable cost, must be developed.

For example, we know that we will need multilayer printed circuits. This technology is conventional in professional electronics, but it does not currently exist in consumer electronics because it is too expensive. The same problem arises for the SMC's [surface mounted circuits], hybrid circuits, etc.

L'USINE NOUVELLE: What are the advantages of the European HDTV standard in international competition?

Hareng: The real question is: Given the investments which it represents, is it conceivable to broadcast high-definition programming to a nonexistent audience? Only NHK can permit itself that luxury! The idea of compatibility with existing television, which we adopted from the very beginning, in contrast with the Japanese Muse project, is an essential advantage for launching HDTV. Furthermore, Japanese broadcasters are beginning to demand a compatible approach....

European HDTV Standard Still Debated

91MI0481 Bonn DIE WELT in German 29 Aug 91 p 10

[Article by Heinz Stuwe: "Television Standard on the Test-Bench"]

[Text] Federal Minister of Posts, Christian Schwarz-Schilling (CDU [Christian Democratic Union]), is continuing to fight for the D2-Mac television standard, said to give subscribers a trouble-free transition to HDTV [high-definition television] in the future. He will be meeting the two EC Commissioners Filippo Maria Pandolfi and Jean Dondelinger today on the fringe of a Broadcasting Exhibition. Also present will be representatives of broadcasting corporations, Telekom, and the entertainment electronics industry. D2-Mac has more than once been given up for dead. Of course, programs have long been transmitted in D2-Mac (by the French

TDF satellite and Telekom's TV-Sat), so that better picture quality and multi-channel sound of CD quality would really be possible even now, but reasonably priced receivers are not available. Neither manufacturers nor broadcasting corporations have seen any reason to grasp the marketing initiative for D2-Mac.

Schwarz-Schilling achieved an initial success last September: Broadcasting corporations, industry, Telekom, and the ministers signed a memorandum of understanding on the television standard, in which ARD [Association of German Public Broadcasting Companies] and ZDF [Second German Television Channel] undertook to broadcast a proportion of their programs in the new 16x9 wide-screen format of the Broadcasting Exhibition onwards. Sat 1 and RTL [Radio- Television Luxembourg]-Plus intend to follow. The cinema experience in the living room, which only becomes possible with D2-Mac, is expected to create the market for 16x9 television sets. The manufacturers promised to present sets of this type at the Exhibition. "The undertakings are being maintained," says Peter Kahl, head of the Federal Ministry of Posts department concerned. "The more quickly we get the new format, the earlier the innovation cycle will get under way."

Schwarz-Schilling has failed to achieve one objective: He wanted to put through a change regarding the federal laender in the state Broadcasting Agreement committing ARD and ZDF to broadcasting their main channels in D2-Mac via TV-Sat. Thus far they are only represented by their less attractive satellite channels, Eins-Plus and 3Sat. "Copyright problems could stand in the way of an amendment," says Kahl. The public broadcasting corporations are reluctant to back a TV standard that can only be used via satellite (or fed into cable networks). They favor the further development of the PAL [phase alternation line] system into PAL-Plus, with which, by the mid-nineties, programs in the new picture format, using normal antennas will be receivable from earthbound transmitters as well. The private corporations have no time for programs that virtually nobody can see. Both fear the high costs of the technical changeover from the conventional 4 x 3 format to 16 x 9.

Is D2-Mac thus to be denied its breakthrough? For the European electronics entertainment industry, the issue is not merely a technical standard: The European market is at stake. The Japanese competition is steering straight for HDTV with its own standard. The EC Commission intends to use its power to keep the EC manufacturers on course. At the end of June it adopted a draft directive designed to impose D2-Mac that was so radical that it took even the industry by surprise.

In the view of the Federation of Consumer Associations (AgV), the consumer's right to self-determination in purchasing decisions will be endangered if the directive is passed in its present form because it would make the D2-Mac decoder compulsory for all TV receivers with a screen diagonal exceeding 55 cm purchased from 1993 onwards. Representatives of industry regard it as more reasonable to stipulate D2-Mac equipment only for sets with a satellite receiver. The AgV is calling upon the Federal Government to take action in Brussels to avoid subscribers and taxpayers being burdened with unnecessary costs: A billion German marks [DM] in EC subsidies to the industry, broadcasting corporations, satellite and cable network operators would not be acceptable.

Aid for industry aimed at creating reception potential for the new TV standard are being justified by the Ministry of Posts. Kahl stresses however that the draft directive requires amendment. The obligation for new satellite channels to broadcast solely programs in D2-Mac from the beginning of 1992 "would be the death of any new corporation." After all, the number of households with D2-Mac TV receivers in 16x9 format, which will cost DM8,000 to 9,000 will still be small in 1992. This is why the corporations must be allowed to broadcast in the conventional PAL standard, in parallel with D2-Mac.

Brussels is thinking in the same direction, as has been informally indicated to the Ministry of Posts. Brussels is also ready to compromise over deadlines for receivers. Commissioner Filippo Maria Pandolfi will give Minister Schwarz-Schilling details at the Broadcasting Exhibition.

Proposed Compromise for EC HDTV Standard Criticized

91MI0499 Duesseldorf HANDELSBLATT in German 30-31 Aug 91 p 15

[Text] The two European Community Commissioners, Filippo Pandolfi from Italy and Jean Dondelinger from Luxembourg, with Federal Post Minister Christian Schwarz-Schilling, have attempted to reach a new compromise in Berlin with the industry and suppliers of TV programs over the disputed MAC guideline.

The new draft of a proposed MAC guideline to cover the introduction of the new D2-MAC TV standard meets the needs of program suppliers and satellite operators in two respects. TV programs first transmitted by satellite after 1 January 1992 do not have to be transmitted entirely in D2-MAC. From the start of 1992 until the end of 1993, these programs may also be transmitted in Pal [Phase Alternation Line], provided there is a simultaneous D2-MAC transmission.

Also, according to the new proposal, existing TV services may be transmitted in the Pal standard for an unlimited period; from 1994, however, these program suppliers will be obliged to provide parallel transmissions in D2-MAC. After 1 January 1993 manufacturers of TV receivers will be obliged to equip equipment capable of receiving satellite and cable transmissions (the majority of the TV receiver market) with D2-MAC decoders.

To encourage both industry and program suppliers to cooperate, simulcast transmission will receive a sweetener in the form of a financial injection of between 500 million and 1 billion European currency units [ECU]. The final decision on the MAC directive will be taken by

the Council of Ministers by the end of 1991, Dondelinger announced, with further discussion among those involved continuing during the coming months.

Public and private providers have however rejected even the new proposal. They continue to view any EC guideline as an authoritarian, legally inadmissible, and consumer-unfriendly interference in what has hitherto been a free market for satellite reception in Europe. In this connection, Schwarz-Schilling has however warned against proceeding along a legislative path in the discussion over MAC.

Availability of HDTV to Consumers Questioned

91WS0547A Duesseldorf VDI NACHRICHTEN in German 30 Aug 91 p 4

[Article by R. Boensch: "HDTV Strategists Wander in the Standards Jungle"]

[Text] VDI-N, Duesseldorf, 30 Aug 91—Colorful and sparkling is the way the International Radio and Television Show presents itself every two years in Berlin. When the doors of the Radio and Television Tower open this week, the variety of media will allow the visitor to submerge himself in standards, shapes and equipment. But one thing is becoming clear even to a layman: The age of wide-screen television has dawned.

The compact screens of TV equipment in the 4:3 format are blown up to Cinemascope format. The magic marketing formula for the boob tubes in the exhibition halls is called "16:9." And they have all arrived in the new capital with their brand new products: Nokia, Philips, Thomson and Grundig, all are showing 16:9 equipment. There is great interest in buying, stated the Finnish company even last week. And this format is also useful for the consumers, according to Nokia, since many movies on cable and satellite television are transmitted in wide-screen format.

On the side, there were some fine points to make life sweeter for industry observers. Thus, the first Philips sets were still equipped with tubes from Thomson, while German Grundig was based on Philips tubes from the outset. But consumers do not notice any of that. Instead, they are much more interested in the cost, at present still around 9,000 German marks [DM], of the television set which weighs approximately 70 kilos.

To the member of the executive board of Grundig, Cees van der Wiel, the success of the 16:9 equipment will depend largely on two factors: "First, a decisive criterion will be how fast the picture tube prices adapt to the price level of the present 4:3 tubes and, second, whether the transmission institutions will offer the consumers a wide range of 16:9 broadcasts as soon as possible."

The first seems to become reality fairly soon, because the big players in the industry are already announcing smaller equipment at prices around DM 3,500. This is also the way the Society For Entertainment and Communications Electronics (GFU) stated the industry's position: "The 16:9 screen, originally just a feature of the planned high-definition television, will now benefit all television viewers."

The format, once planned as a fixed component of the future high-definition television, has thus become independent at a premature stage. Years before actual commercial broadcasts in HDTV—they will start no sooner than 1995—the wide-format equipment is becoming a prestige object for FRG living rooms. On the presumption that the consumers take high prices and a lack of program content into account.

At the radio and television show, television viewers can already see what awaits them in the next few years on their screens. This is where the official starting shot for the transmission of a European transitional standard for the ultimate HDTV, D2-Mac, will be fired. RTL Plus, SAT 1, 3Sat and EinsPlus transmit their programs from TV-Sat in D2-Mac.

High-definition signals which are also being generated at the fairgrounds in Berlin permit a glimpse of the distant future. Primarily the newest HDTV productions are being played, but live productions are also planned. The prerequisite for this is that technically skilled HDTV specialists from the transmission institutions, who were actually only going to be used during the Olympic winter games in Albertville, are on hand in the transmission trailer, for example.

Berlin shows programs for which the television viewer will still have to wait a long time. Because although the television world will present a harmonious appearance over the next few days, in the background there is trench warfare. The clearer the structures of the introductions strategy of HDTV become, the more violently the European development comes under criticism.

"Two fronts have formed," notes television director Hans-Joachim Herbst laconically. "On the one hand are the technicians, who are excited about the new norms, and on the other side the programming people, who say no to HDTV." Only a few of them recognize the need for HDTV, which entails considerable costs on the part of the program producers.

A directive from the EC Commission is creating additional turbulence at this time. At the suggestion of some European companies in the entertainment industry, a guideline was developed in Brussels to introduce the transitional norm D2-Mac, which even goes a bit too far for the producers.

Mainly one clause seems paradoxical to the industry, according to which they have to furnish all equipment over a certain size with a D2-Mac decoder. But there is no talk about a necessary satellite tuner, without which reception of D2-Mac—except for cable households—is not possible.

And so commission member Schwarz-Schilling must make his tour of the show in the anticipation of criticism. "We will speak to the Minister of the Post Office once more at the Radio and Television Show," says the Central Association for the Electrical and Electronics Industry. "You cannot direct things from the green table in Brussels; in the final analysis, the market will decide," lectures Manfred Dannemeyer, managing director of the National HDTV platform in Germany.

The Luxembourg satellite operating association SES, known from its Astra satellites, goes even further. After all, the D2-Mac norm as an intermediate solution for high-definition television only serves to "bleed the customer." And the Luxembourgers are not alone in their harsh criticism of the Mac standard. Many people from the ranks of program suppliers and consumers increasingly recognize that the "evolutionary" road for Europe to high-definition television is not all that "evolutionary." Each jump from one norm to another requires additional decoders in order to be able to receive the signals and new sets—will the viewer really be getting a huge step up in quality along with the step up in standard?

Alcatel Develops Analog-Digital Fiber-Optic Technology

91WS0491L Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 15 Jul 91 p 3

[Article: "Alcatel Makes Breakthrough in Fibre-Optics/CATV Demonstration"]

[Text] Researchers at the Alcatel SEL Research Centre in Stuttgart recently made a breakthrough in the study of fibre-optic networks in the future.

The experiment involved the transmission of analogue cable television (CATV) [community antenna television] signals and digital (HDTV) [high-definition television] signals simultaneously over a network with optical amplifiers. The standard analogue CATV signal was transmitted over 1550nm wavelength, while a wavelength of 1536nm was used for the digital signal (2,488Gbit/s, STM-16). Both channels were amplified with erbium-doped optical amplifiers. No intermodulation or crosstalk was observed, and no degradation of bit-error rate of the signal-to-noise ratio was measured.

The experiment concluded that fibre-optic analogue TV distribution networks with erbium-doped optical amplifiers can easily be upgraded with digital multi-gigabit/s channels because no changes in the network or its components are required. This ensures that smooth evolution from today's needs to the high quality services of the future is possible, says Alcatel.

Germany: PC-Based ISDN Telecommunications Device Developed

91P60276 Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 28 Aug 91 p 8

[Text] Personal computers can form the basis for ISDN (Integrated Services Digital Network) telecommunications devices. Graduate engineer Andreas Kanbach of the Institute for Telecommunications Engineering at the Technical University Berlin has developed a model of just such a device. The goal of ISDN is to combine the transmission of diverse types of information, such as voice, text, data and graphics via a digital telecommunications network which should also be suitable for the development of new types of services.

There, personal computers (PCs) could be used as universal networks, owing to their increasing level of performance. As Kanbach reports, there are surely ISDN telecommunications devices being offered already by various firms. However, these are relatively expensive. Thus, the goal of the scientists was to develop a small telecommunications device exhibiting a cost-to-performance ratio more favorable than that of commercially available devices.

Here, Kanbach reverted to an ISDN-specific expansion card for PCs and used IBM AT-class PCs. The device functions with a special operating system based upon MS-DOS. It can accommodate up to eight line terminations. At the outset, the device was designed primarily for in-home communications.

Kanbach sees application possibilities for his system in firms already having small conventional telecommunications systems and desiring the advantages of digital transmission of information. This includes, for instance, small trade establishments, insurance agencies, legal and tax consultation firms as well as architectural firms. The device is also suitable for use in elementary and advanced training in the field of ISDN, at vocational schools and universities. It also makes possible the realization of customer-oriented concepts.

Germany: SEL Reports Status of Projects in Eastern Laender

91MI0492 Duesseldorf HANDELSBLATT in German 14 Aug 91 p 15

[Text] Stuttgart—Work is fully underway to improve the totally inadequate communications infrastructure in the new laender. The Deutsche Bundespost Telekom has placed orders with the German telecommunications industry for more than 100 exchanges; 87 of these will be built as part of the turnkey investment program for the construction of complete switching systems. 1991 will see the provision of a total of 500,000 new lines. By 1997 the telecommunications network is to be brought up to the present standard in the old laender.

Standard Elektrik Lorenz AG (SEL Alcatel), Stuttgart, gives a positive interim report of its work. At the half-way stage of 30 June, the Stuttgart firm had completed on schedule 13 of the 27 projects which it was awarded as part of the turnkey project in Thuringia, Saxony, and Saxony Anhalt. Apart from its sister company Kabelmetal Electro of Hanover and its Berlin subsidiary RFT, SEL has around 80 building and other firms from the new laender working for it as subcontractors on the project.

As a prerequisite for the turnkey exchanges coming on stream, four main exchanges using System 12 digital technology were first connected to the system in Berlin, Erfurt, Leipzig, and Magdeburg "in record time." Meanwhile, SEL is already working flat out on the construction projects for the second half of the year. The photograph shows an SEL radio relay tower of the Kuhberg near Netzschkau in Saxony. [Photograph not reproduced]

Siemens Reports Activities in New Laender, USSR

91MI0477 Duesseldorf HANDELSBLATT in German 23-24 Aug 91 p 11

[Text] Siemens AG of Berlin and Munich, the largest private investor in Germany's new laender, dominates the electronics market in Mecklenburg-Vorpommern. Thanks to the new political atmosphere of detente, Siemens managers can also hope for an expansion of business into the Soviet Union.

Karlheinz Kaske, the chairman of the board, set out last week on his first visit to the new laender. The purpose of his visit is stated to be that of gaining an overview of the range of the company's activities; he also plans to discuss with the management of the 16 sectors any problems which may be arising, in order to push ahead with expansion in the eastern German electronics market.

"We wish to achieve the same market position in the five new laender as in West Germany as quickly as possible" Kaske told the HANDELSBLATT. "However, it is difficult at present to anticipate how the electronics market in eastern Germany will develop, in view of events in the Soviet Union."

The head of Siemens said he was pleased with the present state of business in eastern Germany. The company was already showing good rates of increase in revenues in telecommunications and transport technology; energy production and distribution, which represented a significant part of the eastern German infrastructure, were also expected to show substantial growth in the near future. Kaske stated that, "our short term aim is to achieve a turnover in the new laender of around 5 billion German marks [DM]."

Siemens' eastern German sectors were pinning their hopes on new orders from the Soviet Union. "During the coming year we expect to increase our production volume by 30 percent through new business with the Soviet Union," stated Hartmut Pratschke, managing director of Siemens Communications Systems GmbH, Greifswald.

Projected revenues of the company, which produces systems for digital communication, was expected to rise next year to DM200 (180) million. Pratschke remarked that, "for the medium term we are assuming a very high level of demand for communications systems for developing the Soviet telephone network."

Pratschke did not anticipate any problems in gaining orders from the Soviet Union during the current year. "The contracts with the Soviets are all covered by Hermes guarantees. We will encounter problems only if we encounter unforeseen political restrictions."

The eastern German managers have devoted a great deal of time in recent months to rebuilding trade with the COMECON [Council for Mutual Economic Assistance] countries." The administrative effects of the rapid political changes in the Soviet Union should not be underestimated. It is difficult to find suitable negotiating partners, as they are often out of touch with business practice," stated the manager.

No reduction in the 1,000-person workforce is planned, as the company is a contractor to the Deutsche Bundes Post (DBP). By the end of this year 4,000 communications systems are to be supplied to the new federal states.

High-Tension Cable Turnover To Be Doubled

Nor does Siemens Plant Engineering and Energy Distribution Rostock GmbH have any cause to worry about the economic situation in the Soviet Union. "At present the company does not have any significant existing or new contracts with the Soviet Union," reports Wolfgang Salzmann, the future chairman of the supervisory board of both eastern German companies. "Existing contracts with eastern German firms amount to only DM100 million and we expect to have completed these by 1994."

Similarly, sales of high-tension cables will not present any problems for Siemens Cables Schwerin GmhB of Schwerin. Even before the opening of the wall, the company had been unscathed by the Soviet Union's financing problems, since its main export markets were Scandinavia and southern Europe. "The installation cables we are now producing are mainly for the older laender. The remainder will continue to be sold in the company's traditional export markets," states Dietrich Stolmacker, the managing director.

The Schwerin company expects substantial orders for the high-tension cables produced in five of the seven sheds of the 600,000 square meter plant. "We plan to double our revenues to DM300 million by 1994 with these cables," the managing director states.

The company expects additional revenues from sales of communication cables, for which investment of DM25

million has just financed one of the most modern production plants. According to Wolfgang Buchholz, a member of the sector board for Public Communication Networks in Munich, Siemens already has an order from DBP Telekom for the supply of 600,000 dual wire kilometers of communication cables for the new laender.

According to Buchholz, "the federal post office has contracted us to provide local telephone networks in a total of 55 eastern German towns and cities, rather less than half of which are located in Mecklenburg-Vorpommern." Around half of the lines had been connected by the beginning of July.

The fact that the communication cable could not be supplied purely from the older federal states is primarily due to lack of capacity. "The decision to build a production center for communication cables in the new states was inevitable right from the start," Buchholz adds. "The need to develop the telephone network in the new states required additional production capacity which we do not have at our factory at Neustadt bei Coburg."

The work will also make jobs safe at the Schwerin factory. "The production center will enable us to take on an additional 60 workers at our site," adds Stolmacker, who puts the workforce at around 1,550, not including 350 part-time workers.

Construction Contracts Going Partially to Eastern German Companies

The electronics company is also indirectly ensuring employment in eastern Germany. For example, Siemens has passed the bulk of its construction contracts for the new production at Schwerin to eastern German companies. "Some DM10 million of the investment went to companies in the new laender. Installation of the machinery was also carried out by eastern German craftsmen," Stolmacker points out. This is confirmed by Wolfgang Salzmann, director of Siemens' Energy Supply and Distribution management sector, who comments that "it is our stated aim to involve as many eastern German workers as possible in the company's expansion in the new laender."

The fact that, eighteen months after the changes, Siemens already has a completely new production plant for communication cables at Schwerin is largely due to the electronics company's good contacts with the former DDR. Stolmacker points out that "even before the opening of the wall, the Schwerin cable factory, which was part of the former VEB [people's own business] combine of Overspree, Berlin, was producing wiring for Siemens as part of a customer order."

Thus, the eastern German company was a prime candidate for takeover. First however it had to leave the Berlin cable combine, which consisted of 13 cable factories; only then could the factory be sold as quickly as possible to Siemens. "This was one of the most important steps towards safeguarding the company's future," states Stolmacker.

Netherlands: ISDN Introduction Plans Outlined

91WS0491R Bath ISDN NEWSLETTER in English 17 Jul 91 p 3

[Article: "Netherlands Will Introduce Narrow Band ISDN"]

[Text] After a spokesman for Dutch operator, PTT [Post, Telegraph, and Telecommunications] Telecom Netherlands claimed that his country was to bypass Narrowband ISDN [Integrated Services Digital Network] in favour of Broadband ISDN services, PTT Telecom Netherland's ISDN Programme Manager, has given more details on service implementation.

He said PTT Telecom will commence full ISDN service (Basic and Primary Rate access) at the end of 1991 in Amsterdam, Rotterdam, The Hague and Utrecht. This ISDN service will be based on German standards as is PTT Telecom's ISDN pilot launched 1989 in Rotterdam. PTT Telecom however plans to introduce ISDN in 1993 to standards laid down by ETSI, the European Telecommunications Standards Institute in 1993. It hopes for nationwide coverage by 1996. International ISDN service will be started at the end of the year.

The implementation of ISDN in the Netherlands will be fully in line with the European Memorandum of Understanding. Existing specifications will be updated when the relevant ETSI standards are available. The aim is to have at least "minimum-set" of services available from 1993, according to European standards.

PTT Telecom's Rotterdam ISDN pilot has a direct link to Germany's ISDN network. User-network interfaces meet Deutsche Bundespost Telekom specifications. It was conceived as an environment for ISDN application development and testing under international business conditions. Alongside the Rotterdam pilot, other projects highlight ISDN's potential for networking, business site and desktop level applications. As an interim solution for customers needing digital connections where ISDN is not yet available, PTT Telecom is offering switched end-to-end 64 kbit/s connections, as reported in TIN Volume 3, Issue 5.

British Telecom's ISDN Strategy Explained

91WS0491H Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 15 Jul 91 pp 6-7

[Article: "Basic Rate ISDN Ready When You Are"]

[Text] "ISDN [Integrated Services Digital Network] basic rate access connections are now available in the UK on demand," according to Les Lowin, ISDN Marketing Manager for BT. On average, a basic rate connection can be provided within five to six working days where a customer is connected to one of the first batch of 600 digital exchanges that BT is equipping with digital multiplex units. Now Lowin is faced with the double task of educating a wider spread of users and getting them

supplied with suitable terminal equipment. Lowin told *ITI* [Intervention Technique Informatique] last week that in the six months since its official launch in February around 1,500 "real" customers have signed up.

He admits that the number of ISDN-2 subscribers is relatively low. "But I'm not disappointed with that," he said, explaining, "a lot of our customers are taking just a few lines to evaluate the service and to determine just what they can do with it in terms of applications."

Most of the 1,500 are "intra-company" users who are exploring the benefits of using ISDN as a means of transferring data within their own organisation. "But we are gradually beginning to find discrete, sector specific applications where the immediate benefits of ISDN are becoming obvious," he said. "For example, some manufacturers and their suppliers are beginning to work together."

"We are now entering the logistic phase of ISDN-2," Lowin said, referring to both provision of exchange equipment and the supply of terminal equipment. He comments, "To date, growth has been limited by the availability of terminal equipment rather than lack of interest."

In July 1991 there are just 15 terminals of various types approved for connection to the UK network for basic rate access. "The problem we are addressing now is one of compatibility," says Lowin, hastening to add that he does not mean compatibility with the network, but compatibility between terminals at the application level.

That is an issue that BT is attempting to resolve, offering manufacturers a free test bed facility at its Martlesham Heath Research and Engineering Laboratories. At the same time, Lowin and his marketing team are applying a little gentle persuasion to terminal equipment vendors some of whom have, in the past, practiced marketing strategies based on proprietary standards designed to enforce customer loyalty.

"We have to persuade them that it is in their best interests to ensure that their equipment will interwork," Lowin comments. "We are maintaining a matrix of products, matching them against each other for compatibility," he says.

In a totally liberalised environment, BT is no longer able to apply regulatory force to terminal equipment suppliers. However it does maintain a catalogue of products that it sells under its own brand name. So to force the pace a little, Lowin plans to build a portfolio of BT-branded ISDN user equipment.

The first item to be included is a terminal adapter that allows non ISDN equipment to be interconnected to the ISDN. "It is a dual port unit," Lowin says, "that allows automatic dialled back-up of a digital leased line." At the same time, using both B channels it can be used to provide access for a variety of local area network, multiplexer, facsimile and videoconferencing equipment to the ISDN. Next will be a personal computer adapter card, followed by a video coder-decoder unit for videoconferencing, and then a group IV facsimile terminal that Lowin says will be in the catalogue by the end of the year.

But Lowin's long term view of basic rate ISDN is that it should become the norm, rather than a special service - the "plain ordinary telephone service" of the future. Achievement of that ambition will require the availability of a suitable "plain ordinary telephone". Here BT is preparing to apply its financial muscle and its buying power.

Choosing words carefully, Lowin told *ITI* that he has initiated a plan to stimulate the development of a low cost, multi-function digital telephone. He declines to admit that BT is called for tenders for a suitable design or that such a development will be directly funded. "We are not a manufacturing organisation," he asserts. Nevertheless, he is confident that such a telephone will be available "over the counter" in BT's retail PhoneShops during the Summer of 1992.

In the meantime, installation of multiplexers in digital local exchanges is running according to the original schedule set by BT a year ago. That plan called for the purchase of sufficient multiplexers to provide 90,000 basic rate lines. Sourced from Northern Telecom Europe (formerly STC Telecommunications), each multiplex unit provides 30 basic rate connections. So that works out at a total of 3,000 units - one for each of the digital exchanges currently installed by BT.

Installing equipment on the basis of just 30 lines per exchange is spreading the resource too thinly. So a first tranche of 600 exchanges serving major business centres around the UK has been identified to receive the bulk of the multiplex units. The initial installations have been restricted to exchanges equipped with System X switches. BT's second digital switch, the Ericsson AXE-10, following modification to its software, will be fitted out for ISDN from October 1st.

Not all 3,000 multiplexers will be installed in these identifiable business exchanges. "It is my intention to respond to market demand," Lowin said. And he has found that sometimes customer demand can come from unexpected quarters. "We have had requests for service from companies connected to very small rural exchanges - the very last place one would have dreamed of installing ISDN exchange equipment," he comments. As a result, he has developed a policy of maintaining a reserve of exchange multiplex equipment that can be rapidly deployed to meet the needs of previously unidentified users.

"They only have to ask, and we will install the necessary equipment," he states. He adds that for customers connected to one of the initial 600 exchanges, ISDN-2 service can be provided in the same time as for a normal phone connection - within five or six working days from receipt of order," he says. Where an exchange is not

already equipped providing the connection may take a little longer - "about a month" Lowin reckons.

One major dividend from that flexible policy is the identification of previously unforeseen applications for ISDN. One such is the provision of high quality audio feeds for local radio stations. Lowin explains, "Local radio stations need to provide live commentaries on sporting events - especially soccer matches - but they cannot afford to pay for a dedicated broadcast quality link that they may only use for two hours a week." A basic rate ISDN link has proved to be able to carry FM quality stereo audio signals at a bandwidth of up to 15KHz on demand. Now Lowin says BT is fitting out most of the major soccer stadia around the UK.

For the longer term, Lowin confirms that BT Business Communications is sponsoring the development of a higher rate ISDN technology, first reported in *ITI Issue 292*. The work is being carried out at the Martlesham Heath Research Laboratories, and will provide up to 12 x 64Kbit/s channels over an existing copper pair local line. Lowin, however, says that he would be content with a six channel system - "for a vast majority of potential ISDN users, basic rate with just two B channels is not enough, while 30 channels at primary rate is too much," Lowin comments. He reckons that six channels will be just about right. "That would provide a total bandwidth of 384Kbit/s which is eminently suitable for high quality video," he says.

Lowin believes it should be practical to complete his ISDN product package with the addition of an intermediate rate facility by 1993.

AEROSPACE

German Research Minister on Soviet, European Space Programs

91MI0527 Bonn DIE WELT in German 9 Sep 91 p 9

[Text] According to Federal Research Minister Heinz Riesenhuber (CDU [Christian Democratic Union]), the problem of lack of financial support for European space projects cannot be solved by a takeover of Soviet space technology. "The value of a carrier rocket, for example, does not lie in its several tonnes of steel, but in the team of scientists and engineers that control the system," Riesenhuber told DIE WELT. Riesenhuber wants to stand by the concept of the European space organization, ESA: "The independent technological competence of the Europeans is at stake. We must not give this up."

Following recent press reports that the Soviet space station "Mir" was for sale for 1.2 billion German marks [DM], the SPD [German Socialist Party] spokesman on research, Josef Vosen, demanded that Western Europe should utilize the Soviet space capabilities and give up "striving for autonomy" in space matters. Since then, Moscow has issued an outright denial of the rumored sales offer. Vladimir P. Nikitski, head of the NPO Energiya space enterprise's research center, described the report as a "canard" and "absolute nonsense." No buyer could operate the Mir space station without the complete infrastructure, which could not be sold with it.

Meanwhile there is only conjecture in Bonn on the future space plans of the Soviet Union or the republics. According to the research ministry, the program will be continued, albeit in a more modest form. A withdrawal from particular sectors cannot be ruled out. It is not certain whether the Soviet technology, which is regarded as sound, has sufficient future potential to make ready with close cooperation for the next and next plus one technological steps forward.

Riesenhuber felt that, as the Europeans must decide by the end of this year on their space program until the year 2000, whereas no new decision-making structure had been established in Moscow, the ESA should adhere to its agreed concept and see later what links can be established. He vehemently rejected any prospect of a withdrawal from space projects. "When the space station opens up a new dimension in 10 or 15 years time, for example, it will be too late then for those who have not participated to climb aboard."

First, however, Riesenhuber has to worry about the "limited entrance fee": As host and chairman of the ESA ministers' meeting scheduled for 18/19 November 1991, Riesenhuber is involved in discussions whose main purpose is to achieve consensus on the ESA program. The main issue will be the Hermes space shuttle, which the French, as system managers, do not want to see abandoned, but which has exceeded its budget by 30 percent. Riesenhuber said that the "expressions of concern" over Hermes by informed coalition and opposition politicians were well-founded. He is pressing to have Hermes converted into a technology program allowing three or four years to develop the components, which would then "presumably result in a cheaper and better unit."

Riesenhuber said that the ESA partners should interpret the DM150 million increase to DM1.73 billion in the 1992 budget as a signal that the Germans are serious in their demands for economies, but do not intend to withdraw. Of DM25 billion space expenditure envisaged up to 1995, only DM20.2 billion are covered by the federal finance plan.

COMPUTERS

Activities of Hungary's Makrotrend Reported

91WS0521A Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 11 Jul 91 pp 20-21

[Interview with Andras Hubicsak and Andras Gasparetz, by Marton Vargha: "Makrotrend: From Lantech to the KAO"]

[Text] An elegant, clinker brick office building on Angol utca in Zuglo. At one time the computer center of the National Plan Office was here; now private undertakings inhabit it. One of these is Makrotrend, the offices of which are on the ground floor, perhaps where the great computer hall was, or in a once teeming area. Here we were received by president Andras Hubicsak and software director Andras Gasparetz. The story unfolding from their conversation would apply to most of the large computer technology undertakings.

"We began five years ago. We undertook only to manufacture network elements, not for the end users but rather for other companies. We shipped to Videoton, Microsystem, Cobra, and the others," the president said. "We kept developing the products but after a time we felt that if we wanted to stay on our feet we would have to broaden our activities. Since 1988, we have been undertaking to plan and install data transmission networks, and in 1989 we began to seek Far East contacts.

"In 1990, toward the end of the year, we began to deal with everything having to do with computer technology. Today we will undertake design, delivery, and installation of turnkey systems. The cause for the expansion is primarily that manufacture began to become uneconomical as a result of the liberalization of trade. We could not compete with the Far Eastern dumping prices, especially due to the uncertainties of parts acquisition and the unrealistically high nature of parts prices. In vain were the quality and reliability of our products so much better.

"So we farmed out manufacture to a mixed enterprise, Makrolan, 60 percent of which is ours, 35 percent belongs to the Taiwan company Lantech, and 5 percent

is a German interest. The German owner is the vendor, which means market security for us. Lantech is a developmental undertaking which sells technologies for finished, developed products; this ensures for us not only continual product renewal but also parts supply. They pay attention to demand in Hungary and through them it is becoming possible to manufacture products which for the time being are unknown here."

"We get the parts in unit packages," Andras Gasparetz added. "We only have to assemble them here. But because of the differing, higher, requirements there is one part of the Lantech equipment which we make ourselves, because we found the parameters of the original unit to be weak. So the mixed enterprise is going on the market with products of European quality, better than the Far Eastern."

"In the present confused situation there are very many poor products on the Hungarian market which do not meet the domestic standards and prescriptions." The president took up the conversation. "There are lots of problems with power units especially, so that is why we are building in a power unit of our own design."

"What is the ratio now between manufacture and the other activities?"

"The ratio of manufacture, in the receipts of the small cooperative, fell from the original 90 percent to 60 percent in 1989. We are planning only 20 percent for 1991. But this 20 percent will represent a threefold growth in volume, the sales prices are rising so steeply. And overhead—for example, wages and transportation costs—has increased 10 times in the past two years."

"Do you have links to other foreign firms as well?"

"Although Lantech is the most important," Andras Gasparetz said, "we have other cooperation contracts worthy of mention. For example, we are talking with Alloyd Telesis, which will be making 1,000 special elements for Ethernet networks, about delivering to us those cards which it is not worth while manufacturing here at home because demand for them is so small. In the future we would like to be the Hungarian wholesaler for these products.

"We have good references for the BEST trademark uninterrupted power sources sold with representative rights; for example, such equipment has been working for more than a year and a half at the BM [Ministry of the Interior] and the State Insurance Office. The unique feature of the uninterrupted power source is that it stabilizes the voltage in continuous operation, even in the case of a 20 percent voltage drop; there is very great need for this in Hungary.

"Talks are now under way with the Post Office for the import of fax cards bearing the Comware trademark. The product is sold worldwide under the name Faxnet in a Novell package. When programmed, it can send 300,000 faxes per week. The British army uses this card too. We will get it more cheaply than the world market price and supply it with Hungarian language software. To get Postal authorization Comware made a shop card in Switzerland on which one can change with software very many of the parameters usually set in a fixed way. So the Post Office can experiment with it to determine what prescriptions to set down for authorization of the fax cards. Even with a manually switching telephone exchange in the line the card can create a connection with the station called."

"Do the turnkey deliveries include software?"

"Yes. We deliver primarily Novell network software, as retailers. We sell the 2.2 and the newer 3.11 versions with no waiting time. But we attach much greater hopes to a product other than Novell; this is the Power. In our opinion it has a future despite the fact that the Novotrade PC salon, with which we began to deal with it, is now getting out of the business. Power is a modular, DOS based network system which exploits the possibilities of the ARCnet card right up to the limit.

"There is a Novell speed test which we tried out on the same hardware, on the same network, and while we attained a transmission speed of 50 kilobits per second with Novell we got 1,400 kilobits per second with Power. This difference seems unrealistic, but it can be checked at any time. This experiment does not mean that the speed can be increased 20 times for every application, but still it is an interesting finding.

"Power is suitable not only for realizing a star network—a network of computers tied to a serving computer—it can also be used to create a real distributed database. It is capable of reflecting two separate hard disks together or of reflecting two parts of one disk on separate smaller disks. The disk 'volume' is defined logically; the physical location of the data can even be on several computers."

"Are they working with this network system anywhere in Hungary already?"

"Yes," the president answered. "It is already being used in the Epidemiology Office of the National Public Health Institute. But let me mention a failure of ours which we suffered in connection with the NEXOS software of the American DSC Local Area Networks firm. This is a 32 bit operating system the development of which unfortunately got hung up and the version put on the market has many errors. Fortunately we were more cautious than those Western European vendors with whom we talked in Hannover. In contrast to them we did not sell a single copy."

"We deal not only with network software," added Andras Gasparetz. "We are retailers for the Borland products and Novotrade is not our wholesaler, rather an American firm is. In recent months retailers similar to us which belong to this wholesaler sold 99 percent of the turnover in Hungary, so we have given life to the domestic Borland market. The Turbo amnesty action belonged to the end of the Ifabo. We have strictly

instructional packages so we can sell the products more cheaply, thanks to Borland, to schools and universities."

"We have close contacts," Andras Hubicsak added more concretely, "with the Budapest Technical University and the Enterprise Management and Organization Institute of Veszprem University. They do the research and help us and we give them tested programs and equipment which has become surplus, or we sell them to them at a favorable price.

"The Veszprem link is especially important because Makrotrend has grown suddenly and has been restructured several times. This is difficult for the leaders, they need the advice of organizational experts. Now, for example, they and the 14 leaders of Makrotrend are reviewing organizational questions at a three day group conversation."

"For the Borland business we had to build up a commercial chain in three weeks," said the software director.

"Makrotrend is also importer of the KAO disks. Have you been able to get on the market with these?"

"Yes," nodded the president. "We are the exclusive wholesalers in Hungary. The giant KAO-Didak Japanese-Canadian firm is the largest in the world with a production of 270 million units per year. We estimate that 10 percent of the Hungarian market was ours in 1990. We deliver every size and I mention as a matter of interest that we have already sold even the 2 inch disks here at home. At the Ifabo we exhibited the 3.5 inch 4 megabyte product. Of the former socialist countries we deliver floppy disks to the Czech and Slovak Republic and we are talking with Romanian and Soviet firms as well."

"You do not export your own products?"

"Yes we do, we are trying to get on the Western market through Elektromodul, naturally not counting the products being made in the Lantech cooperation, which we sell through the German firm which is joint owner."

"Firms which are growing suddenly and dealing with so many things do not always concern themselves with service, with guaranteed repairs. To what extent is Makrotrend reliable from this viewpoint?"

"We have a central service network starting out of Budapest, and we have contracts with companies and cooperatives throughout the country. In practice we can send a man anywhere, even on Friday afternoon. What we cannot repair in tho hours we will replace. As for our own products there is one failure for every thousand units or cards sold. The truth is that we are suppliers for the Ministry of the Interior and for the National Labor Affairs Center so we must take care of providing precise service."

[A table accompanying the article provides the following information on Makrotrend's turnover. Makrotrend has 18 members and 52 employees. The figures for 1989 and 1990 respectively are, turnover in thousands of forints: own manufacture, 83,388 and 28,405; computer assembly, 26,701 and 51,489; network systems, 22,451 and 17,786; materials and tools sold, 21,802 and 28,980; BEST uninterrupted power units, 11,622 and 30,866; KAO disks, 4,791 and 19,726; Novell products, 749 and 10,237; other activities, 2,153 and 3,108; total receipts, 173,653 and 190,597; profit, 34,456 and 5,692.]

TELECOMMUNICATIONS

Telecommunications Developments in Eastern Europe Analyzed

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[Article by Eva Ehrlich: "Telecommunications in Eastern Europe"]

[Text] When will the telecommunications organizations finally compete for consumers in Eastern Central Europe as well? Even today in this part of Europe those desiring to make use of telephone, telex, telefax, telematic, and data transmission technology are forced to beg, not sparing their material assets, for the favors of all those who can provide these tools to them. How did this situation come to pass? What are the causes of the shortages? Are there special conditions in this part of Europe? What must be done for a radical transformation of the present situation and the creation of a supply market?

Even looking back at the period before the Second World War we find that, compared to the per capita national income at that time, Bulgaria, Czechoslovakia, Yugoslavia, and Romania, of the countries of Eastern Central Europe (hereinafter Eastern Europe), had a lower telephone density than other countries with a similar level of economic development. Supply in Poland corresponded to its level of development at that time, and telephone density in Hungary was about 20 percent greater than the international norm according to level of economic development. Perhaps it can be regarded as a historical antecedent that barely four years after Graham Bell's invention was patented, that is in 1880, the first telephone exchange in Eastern Europe was established in Budapest. At the end of the last century and the beginning of this Hungary quickly caught up with the then developed world in telephone density. The telephone density of Budapest at the beginning of the 1930's significantly surpassed that of Amsterdam, Rome, Madrid, Prague, Tokyo, and other world cities at the time. Even in the years of the world economic crisis very great care was turned in Hungary to the development of the telephone system, recognizing the significance of telecommunications. It should be noted that even then supply in the provinces lagged far behind that in Budapest; it is an illustration of the unevenness in density—as it was of a general tendency in all of the Eastern European countries—that while 13 percent of the population lived in the capital 70 percent of the telephone

main lines were concentrated on Budapest, giving a Budapest to provinces density ratio of 12 to one.

In the Soviet Union (1937), in the only country conducting a central planned economy, there was a very significant backwardness in telephone density (more than 30 percent) compared to countries conducting a market economy and with a similar level of development.

At that time there were two groups of countries on the periphery of Europe—the three in Southern Europe (Greece, Spain, and Portugal) and the already mentioned small countries of Eastern Europe.

The average telephone density of the three Southern European countries exceeded the average international norm at that time by 5 to 8 percent—in contrast to the group of Eastern European countries. To put it differently, while the telephone density of the three Southern European countries came to 21 percent of the total European average at that time the telephone density of the Eeastern European region, then still more developed economically, came to only 17 percent.

The Inheritance

After the Second World War also there was a close interdependence between the per capita GDP and telephone main line density. [Graph representing interdependence not reproduced.]

An obvious thing to do would be to study how and to what degree the link between main line density and economic development changed in the 1980's.

It can be seen from the graph [not reproduced] that a higher main line density level belonged to a given level of economic development in 1987 than it had seven years earlier. The degree of change in the international norm is very significant primarily for those with lower economic development. The international norm in 1987 at the low development level is 2.2 times larger than it was in 1980. The difference is smaller (two times) with medium development and is relatively slight (1.25 times) at the high economic development level. The reason is obvious, a certain saturation appears with high economic development and main line supply.

The change over time in the regression lines provides a good illustration of a phenomenon which made its appearance at the beginning of the 1970's, that the role of telecommunications has increased in the new industrialization strategies. The telecommunications sector is raised out of the traditional growth model, and its development is accelerated with the aid of foreign capital. This also manifests itself in the fact that in successfully industrializing countries (primarily in Southern Europe and in the Southeast Asian region) main line density is a good bit greater than the international norm.

The trend in the Eastern European region is the opposite: There is no trace of the stressed development of the telecommunications sector. Indeed, Eastern Europe was not even able to keep up with the change in the average international norms. At both times studied the main line density of the Eastern European countries was substantially lower than that of countries conducting market economies which had the same level of development.

It is worthy of note that in the 1980s the backwardness in main line density from the average international norms increased significantly in every country of Eastern Europe with the exception of Yugoslavia. In 1980, this backwardness came to 48 percent, and in 1987 it came to 58 percent. The greatest deterioration took place in Romania, Bulgaria, and the Soviet Union. Development in Yugoslavia, on the other hand, was swift. As a result the relative position of the country improved between 1980 and 1987. The backwardness of Yugoslavia decreased, and it began to catch up, if the trend had continued. In 1987, the degree of backwardness from the international standard was greatest in the GDR. The spokesman for German Telecom, in DER SPIEGEL, compared the telephone situation in the GDR to one coming from the West, "The autobahn suddenly ends, and we arrive on a dirt road."

The three countries of Southern Europe (four counting Turkey) realized an accelerated, catch-up type development in main line density as did the "little tigers" of the Far East such as South Korea. Thus, in the decade of the 1980s, the Eastern European region became the most backward part of Europe in regard to main line density, and its main line supply slipped to the level of the developing countries.

Similar trends characterize the specific supply of telexes and changes therein in the Eastern European region.

We can see from the table [not reproduced] that between 1980 and 1987 the supply of telexes for all European market economies increased 1.4 times; within this that of the three Southern European countries doubled. And although the group of Eastern European countries achieved significant progress in the pace of development, its backwardness compared to the other countries still increased.

The available data pertaining to other telecommunications tools (telefax, videotex, minitex, etc.) suggest that essentially the countries of Eastern Europe were left out of that revolutionary change which took place in the developed world following the 1970s. Modern telecommunications networks and services really do not yet function in the majority of the Eastern European countries.

In a great number of Hungarian villages the telephone provides a link with the outside world only in the daylight hours (this leaves out the telephones for calling for aid). In Poland there are 7,000 communities where there is no telephone at all. We must hypothesize that differences similar to those in Hungary will be found within the country in all the other Eastern European countries, with the possible exception of the Czech

Republic, and in Bulgaria and Romania the differences are probably a good bit greater.

"Quasi" Telephones

One cause of the differences is technical backwardness. It is a good illustration of the regional supply in the country that 78 percent of the 2,024 main exchanges operating in Hungary at the end of 1988, for example, were manually operated exchanges representing 50 year old technology (which can be considered museum quality). In the majority of cases manual switching also means that the service can be used only between 0800 and 1600 hours on a weekday; 78 percent of the locations in Hungary are not connected to long-distance dialing, 60 percent of the cities in Hungary are not connected to domestic long-distance dialing and 80 percent are not connected to international long-distance dialing. Obsolete, manually operated exchanges work in 40 percent of the cities.

The telephone network in Eastern European countries can be used only with difficulty due to the obsolete technology. There are too many extension phones and many misconnections. Due to the generally characteristic great overloading of the networks there are only "quasi telephones" in a few countries (for example in Bulgaria) because either there are no lines or one must wait a long time for one or one gets a wrong number, so the telephone is unsuitable for continual use. Not even to speak of the fact that getting a telephone in these countries amounts to a privilege. In Hungary, for example, a citizen has had to wait an average of 12 years, in the past two decades, to get a telephone. In 1987 there were 1,853,000 people waiting for a main line in Poland, 265,000 in Czechoslovakia, 607,000 in Yugoslavia, 553,000 in Hungary (in 1989), and 657,000 in the GDR, in 1981—there are no more recent data. But the real telephone needs are greater than this (about twice as great in Hungary for example) if we consider the latent demand as well.

Productivity

According to international experience they generally turn 0.3 percent of the GDP to development of telecommunications in the most economically developed countries, 0.5 to 1 percent in the market economies of Western Europe (an average of 0.62 percent in the European Economic Community and 0.66 percent in the countries of the EFTA) and 1 to 2 percent in the quickly and successfully industrializing countries.

In the Eastern European countries—excepting only Hungary—they turned an average of only 0.38 percent of the GDP to this purpose, despite the extraordinarily low level of supply.

Telecommunications Investments Measured in Percent of the GDP

Country	Year	Percent
Romania	1986	0.18
Czechoslovakia	1987	0.29
Yugoslavia	1986	0.34
Bulgaria	1986	0.34
Poland	1987	0.38
GDR	1987	0.43
Hungary	1989	0.77

Beginning in the second half of the 1980s telecommunications received developmental priority in Hungary. As a result the ratio of telecommunications investments jumped beginning in 1987 and the increase in the number of main lines doubled in 1988-89. But when evaluating this welcome tendency one must remember that a significant part of the investment went to the already indispensable reconstruction of the existing obsolete network, thus to maintaining operability, and to putting into operation the first digital exchange in Hungary and covering the associated expenses—which does offer some hope in regard to the future. In the other Eastern European countries, despite the low level of supply and the obsolete networks, one cannot yet see a worthy change in the ratios of telecommunications investment.

In the majority of the Eastern European countries the post office and telecommunications are still concentrated in a state enterprise endowed with authority rights. (The post office and telecommunications were separated in Hungary in 1990. In Czechoslovakia, Poland, and Romania such a separation will probably take place in 1991.) Prices were undervalued compared to costs so it is virtually impossible to determine, for example, how much a main line really costs.

Especially worthy of attention is an international comparison of the Eastern European development of the ratio of main line use in telecommunications, as relevant to the productivity level of telecommunications.

The telecommunications productivity of the four Eastern European countries is extraordinarily low. The telecommunications productivity of all the European market economies and of the three Southern European countries is 2.2 to 2.3 times greater, and even for the four Southern European countries (including Turkey) it is 1.7 times greater than the average productivity of the four Eastern European countries. One must note that the productivity of the countries which have been developing most swiftly in recent years, realizing developments based on digital technology, such as Spain and South Korea, is 2.9 and 2.8 times, respectively, the average for the four Eastern European countries.

The number of main lines per employee shows that telecommunications "productivity" is extraordinarily

low in the Eastern European countries. This can be explained in part by the low technical level of the tools used and in part by the backwardness of the technology used.

Broadcasting

Broadcasting is the only area of telecommunications where there are no special quantitative deficiencies or unsatisfied needs in the majority of the Eastern European countries. This is the sphere where the government organs led by the party state considered mass communications developments to be a question of political importance and gave special treatment to the development of broadcasting and a gradual improvement of accessibility (possibilities of reception). Here also, of course, we do not have to go next door to find problems. The reception possibilities, or their quality, for radio, but especially for TV, are uneven within the countries. The technical equipment for both state radio and state TV is obsolete and used up physically; replacing and modernizing it is an urgent task everywhere.

In the past year or two the spread of foreign TV transmissions, with the aid of artificial satellites, has begun, for the time being in three of the Eastern European countries (Hungary, Poland, and Czechoslovakia), but here with great speed. In Hungary, for example, 600,000 households had cable TV in 1990.

For the time being private radio and TV do not operate anywhere in Eastern Europe.

The Backwardness

A shortage of telephone networks and tools, and information and telecommunications networks and tools in general, the technical obsolescence and the low quality of service have become the customary thing in the Eastern European countries for long decades. Today all this is causing many billions in economic damage, and we must outline briefly to what more important causes this serious material damage can be attributed.

We have seen that even before the Second World War the communications telephone network of the Eastern European countries was backward compared to other countries with similar development. So the negative inheritance of the past also caused the conservation of backwardness.

The backwardness was strengthened by the fact that after the Second World War the war damage done to the chief exchanges was repaired not to a post-war but rather to a pre-war technical level.

For long decades trends cutting us off from the world or from the world economy (including the neighboring European market economies), and strengthening and making permanent the exclusion, were realized in politics and accordingly in economic policy. This in itself devalued communcations and its significance. In addition the deliberate curtailing of information and communication demand also contributed to the lasting isolation of these economies and peoples from the outside world.

The primacy of material production was realized in a centrally planned economic development and industrialization model feeding from fundamentally political and ideological roots. The incomes generated in the national economy were concentrated in the budget and redistributed by the state. The industrial producing sectors (and primarily heavy and war industry, basic materials and energy production), as sectors "producing value," received priority in the redistribution of income. The other sectors of the economy, such as infrastructures and services, even if they operated with high profit (as did the telephone service in general), were developed only according to the "remnant principle," receiving resources for maintenance, to ensure their operability and for certain developments. In addition, political goals (for example the obligatory development and operation of a communications system created on the basis of the Warsaw Pact) limited the free use of the resources made available.

Due to the realization of the "remnant principle" the telecommunications network deteriorated year by year; modernization of the basic networks, technical renewal, and expansion were postponed year after year. In most cases there was a development of the larger central telephone capacity—even then lagging far behind the needs—only when and where this was made absolutely necessary by the workings of nationalized or newly created industrial enterprises.

To bridge over the increasing shortages so-called closed purpose networks (special lines for the defense and interior ministries, the government, and central offices, etc.) developed and spread quickly in each of the Eastern European countries, wasting the available resources, in such a way as to satisfy the telephone needs (including the residential telephone needs of leaders working here) absolutely necessary for centrally directed management. The proliferation of closed purpose networks also muddled the basic networks.

The manpower needed for the forcibly accelerated industrial growth was transplanted from agriculture to the cities (by economic constraints). Housing for them was provided by the large apartment buildings built in the industrial regions. With the housing construction in the entirely new areas (the so-called green zones) the populace fell outside the information—including telephone—centers and basic networks which existed. And in the new housing developments they did not build new telephone exchanges, citing a shortage of funds. So the housing developments remained virtually without residential telephones. As a consequence of this the telephone needs of the urban population grew by leaps and bounds in the past 20-25 years in every Eastern European country.

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2

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