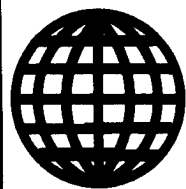


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AEROSPACE

Aerospatiale Invests in New Production Site

92WS0737C Paris *TECHNIQUES ET
EQUIPEMENTS DE PRODUCTION* in French Jun 92
p 20

[Article entitled: "Aerospatiale Spinoff on the Foix Highway"]

[Text] Aerospatiale has opted to separate its production of spare parts for planes that are no longer being built for the Airbus 300 from its main factories. The company has transferred the work to a facility created for that purpose, dubbed Recaero. The 3,000-square-meter plant will be constructed between Foix and Pamiers in the south Delta technology park. Aerospatiale's gross investment will be 17 million French francs [Fr], Fr10 million of which will go to leasing contracts for the buildings and Fr7 million to production equipment. Recaero is a spinoff, that is, a substantial portion of the new resources from the parent company. The three managers, for instance—Thierry Pobeau (Recaero's CEO), Alain Ostric (head of production), and Christian Aim (administrative director)—are Aerospatiale "kids." So are the new company's 10 other employees.

Small Runs and Tight Flows

"Aerospatiale's initial objective," remarks Thierry Pobeau, "is to minimize series production costs to become competitive, especially with Boeing. We are creating a new industrial tool by concentrating spare parts production in the new plant. Production conditions are optimized, subcontractor responsiveness improves, and costs fall." Orders to make spare parts within deadlines that often fluctuate between 24 hours and a week will no longer trigger panics. The key words of the new operation are small runs, tight flows, flexibility, production management, versatility, and specifically-adapted equipment. Thirty-five percent of the spare parts produced by the new plant will be for Caravelle, Concorde, Fouga, Nord 262, and Corvette planes, and 65 percent for first-generation Airbuses. "We will subcontract out about 30 to 40 percent of the demand. That is, anything above and beyond our current load." Recaero aims to double its production within five years.

Germany: Airbus 321 Final Assembly Said to Reflect Increased Cooperation Among Partners

92WS0748A Duesseldorf *VDI NACHRICHTEN*
in German 3 Jul 92 p 25

[Article by Franz Fedler: "Countdown for New Airbus in Hamburg"]

[Text]

Final Assembly of First A321 Short-Range and Medium-Range Aircraft Running at Top Speed

Rollout and Maiden Flight Set for 15 March 1993

With the start of airfoil assembly, the hottest phase of final assembly of the first A321 Airbus began in Hamburg on 2 July. This is a new chapter in the history of European aircraft building for Deutsche Airbus. The integrated final assembly line not only makes the Airbus program more economical. It also is an expression of the increasing cooperation between Airbus partners. This was explained by Hartmut Mehdorn, chairman of the board.

It was a coincidence that the final assembly of the A321 Airbus began in Hamburg precisely on 15 July. This was the day that the International Air and Space Exhibit 92 opened its doors in Berlin. It is a demonstration of perfect planning, however, when work begins precisely on the date set more than two years ago.

The starting gun went off unspectacularly at Deutsche Airbus. There was no champagne nor a brass band when the bulky Super Guppy transporter airplane landed in Hamburg-Finkenwerder a few days ago. On board were the two first airfoils coming from British Aerospace in England. The A321 is the first Airbus model to be assembled and delivered in Germany. Previously, all components were flown to Toulouse and assembled there.

A new chapter is beginning for civilian aircraft construction in Europe with this first Airbus. Hartmut Mehdorn is chairman of the board of Deutsche Airbus. He emphasized, "The integrated final assembly line for the A321 in Hamburg not only makes the Airbus program more economical but is also an expression of the visible, increasing cooperation among the partners."

Airbus Industrie, the consortium of companies, decided to introduce the integrated final assembly line in March 1990. Until now, all Airbus models were assembled in France. Next, as so-called "green aircraft," they were flown unpainted to Hamburg. Interior equipment was added here. Then, the aircraft went back to Toulouse where they were painted and delivered to the airlines. This complicated procedure was changed for the A321.

The integrated final assembly line concept for the A321 means that final assembly and the interior equipment are done in future for all new members of the Airbus aircraft family in one location. Consequently, while the airfoils are still being attached on the outside, the seats can be installed inside. The advantage of the parallel operation is obvious. Put into numbers, the processing time per aircraft is reduced by up to 30 percent. In addition, the Deutsche Airbus can expand its capabilities and capacities. As a countermove, the long-range jumbo jets of the A330/A340 series will receive their interior equipment in Toulouse in the future.

Nothing will change for the international cooperation in manufacturing the components. Deutsche Airbus remains responsible for, among other items, the major portion of the fuselage, the wing flaps, the rudder unit made of carbon-fiber-reinforced plastic, the complete set of interior equipment according to customer wishes, and the hydraulic system. Aerospatiale of France supplies the cockpit, the front fuselage, the wing central casing, and the engine suspension units. British Aerospace supplies, among other items, the wing casings, a central fuselage segment, and the ailerons. Casa of Spain delivers the elevator unit and wing skins for the rear section of the fuselage. The associate Airbus partner, Belairbus, is constructing the slats in Belgium while the section of the fuselage in front of the wings comes from Alenia in Italy. In turn, these companies let subcontracts to companies in other countries. Consequently, Kawasaki in Japan is producing fuselage shells that are attached at British Aerospace and assembled at Deutsche Airbus into finished fuselage sections.

Before starting final assembly in Hamburg, comprehensive interior work and expansions were done in Finkenwerder. The largest visible sign was the newly constructed, 3140 m long Otto Lilienthal Hall. Eleven A321s can be accommodated at one time in an area of 29,872 m². The pilots of airlines from all over the world will accept their A321s in the new trial-flight building. In addition, there is space for employees of Airbus Industrie and the supply companies.

Soon, Special A300s Will Function as Jumbo Transporters on the Take-Off and Landing Runway at the Factory

After the maiden flight, the aircraft go to a new painting hall. About 600 kg of paint per A321 provide the final visual appearance. The environmentally designed static test facility for the engines and a compass base used to set the emergency compass systems of the aircraft are also new. The take-off and landing runway of the factory was extended by 400 m to 2328 m. This not only provides additional safety for the A321 factory flights. As the Super Guppy is to be retired from service in the coming years, Airbus Industrie is developing its own jumbo transporter from the A300 model. This plane also will have sufficient space on the new runway.

New assembly and working methods, some of which are unique, provide not only for rational work in the future. Under the direction of the assembly leader, Dipl.-Ing. Helmut Pohley, impressive preparations have already been made in the past months. For example, the hall, which is not yet finished, was already sealed provisionally four months ago. Only then could the gigantic space be heated to a constant 18°C. This was necessary because the automatic assembly equipment that operates with an accuracy of a fraction of a millimeter needed adjustment. Thermal expansion later would have resulted in inaccuracies during assembly.

Considerable attention was paid to safety matters. For the first time, the aircraft will be filled with fuel during assembly—thus while still in a closed space—to check for possible leaks. The customary JP 1 kerosene will not be used for this purpose. It has a flash point of 55°C. In place of this, the engineers will pump Garosolve into the tanks. This does not ignite until 102°C. In spite of this, comprehensive measures were taken in the event of possible fire accidents.

The aircraft moves through the final assembly hall on automatically controlled air cushions in seven assembly stations. One assembly phase is finished every four days. Consequently, the pure assembly time is 28 days per Airbus. A total of 46 days passes until delivery, at least in the initial phase.

Three aircraft will be built this year. By 1995, the manufacturing rate will increase to five planes per month. At this time, there are firm orders for 144 jets from 10 airlines. The upcoming milestones are set with the same precision as the beginning of the final assembly. The A321 should take off on its maiden flight on 15 March 1993. The design should be approved in December 1993. The German Lufthansa, as the first customer, can place the new Airbus into service in January 1994.

The first pressure test of the aircraft fuselage is one of the computer-controlled tests performed during assembly. This compressed-air test checks whether the airframe is airtight.

Today, there are 8,800 employees of Deutsche Airbus in Hamburg. The new final assembly line will not create additional jobs. This is because the work on the interior equipment will be moved to Toulouse as compensation. However, it can be seen even today that Finkenwerder is becoming a long-term, more reliable location for the employees. The decision was made only one month ago to assemble the shortened A319 Airbus having 124 seats also in Hamburg. A stretched A322 version is also feasible.

The surrounding area will profit from the changed Airbus concept. Directly adjacent to the factory of Deutsche Airbus, an area of about 12 hectares in size has been set aside as an industrial park for the suppliers delivering their components just-in-time. The Rohr Company that produces engine suspension units has already started new construction. The Dassell Company, responsible for aircraft toilets, is already located on site. A new hotel is being planned.

Numbers from 1991 demonstrate the significance of the assembly line for the suppliers. Over 6,000 suppliers work under contract to Deutsche Airbus. The 223,622 orders in that time went mostly to small and medium-sized companies. The order volume was 2,832 billion German marks.

The A321 Airbus

The two-engine A321 now being assembled in Hamburg is a version of the A320 extended by 6.9 m. The A320 has 150 seats and has been used by the airlines since March 1988. The A321 is also equipped with the electrical fly-by-wire flight control system. In the typical three-class layout, the A321 has a range of about 4350 km carrying 186 passengers. The aircraft, designed for short and medium range with increased passenger capacity, provides an additional advantage for the airlines. With a length of 44.5 m, it has 40 percent more cargo space than the A320.

EC Space Programs Internationalize

General Review

92WS0753A Paris LE MONDE in French 28 Jul 92
pp 1, 8

[Article by Jean-Paul Dufour: "Europeans in Space"—first paragraph is LE MONDE introduction]

[Text] After Michel Tognini, now on his way to the Mir station, a Swiss and an Italian will fly on board Atlantis.

On Monday 27 July at 8:08 (Paris time), the French astronaut Michel Tognini, took off from the Baykonur (Kazakhstan) space center, for a 13-day mission—named Antares—on the Russian orbital station Mir. His departure marked the start of a two-week period particularly favorable for European space programs. That is because, on Friday 31 July, at 2:30 (French time), it will be the turn of the Swiss Claude Nicollier and the Italian Franco Malerba to take off, from Cape Canaveral (Florida) for an eight-day flight on the Atlantis shuttle.

Eventually, whereas only eight western Europeans followed the Frenchman Jean-Loup Chretien in space after his first flight in June 1982, six astronauts from the Old Continent should go on orbit during the first eight months of 1992.

That should somewhat hearten officials at the European Space Agency (ESA) and the French CNES [National Center for Space Studies], as well as their German and Italian counterparts, at a time when prestigious European projects—the Hermes shuttle and the Columbus space station—appear to founder little by little, the victims of budget restrictions which also affect the future American station, Freedom, and jeopardize the future development of Mir.

After leaving Baykonur on board the Soyuz TM-15, Michel Tognini and two Russian cosmonauts, Anatoly Soloviev and Sergei Avdeiev, will join Alexander Vik-torenko and Alexander Kaleri on Wednesday 29 July; the latter two have manned the Mir station since 19 March. Before his return, scheduled for 10 August, Michel Tognini will remain 13 days in orbit (including 12 days on Mir); together with his Russian colleagues, he will perform 10 scientific experiments dealing with

man's adaptation to weightlessness and with the life sciences (six experiments) or the behavior of materials in space.

On board Atlantis, starting Friday 31 July, Claude Nicollier and Franco Malerba will have a dual mission: Nicollier will deploy the ESA Eureca platform, and Malerba will launch the Italian TSS (tethered satellite system). The precursor of a future European space station, Eureca is a large reusable 4.5-ton satellite carrying scientific experiments which should be recovered during another American shuttle flight, in April 1993. The TSS is the first tethered satellite in space history. Looking like a large yo-yo attached to the shuttle by a 20-km long cable, it opens the way to many new applications which are beyond the scope of "traditional" satellites.

For the moment, only one additional flight is scheduled; Claude Nicollier will fly again in eight months to recover Eureca. But Mr. Jean-Marie Luton, the ESA general director, is confident: "In the next three years, the Europeans will take part in microgravity life-science missions on the shuttle, on flights preparatory to the Freedom station. Besides, even though no dates have been set yet, there will be other Eureca flights."

Dreams Cut Short by the Crisis

For their part, the French and the Germans are negotiating new flights with the Russians for whom the "ticket" paid by the Europeans represents the means to save their station (the CNES who, as a privileged partner of the Russians, was paying for the first time, paid 73.2 million French francs [Fr] for the Antares mission). Jean-Pierre Haignere, Michel Tognini's "stand-in" for the Antares mission, might go on Mir as early as 1994; he would be followed by Claudie Andre-Deshays, who would thus become the first Frenchwoman in space. These two missions (out of four scheduled to take place before the end of the century) might be the subject of a draft agreement in the next few days.

These projections show, if need be, that, despite criticism from many scientists, officials in the space sector remain convinced of the advisability of sending men into space. They see the exploration of the Moon or Mars as the expression of the human species' inherent desire to conquer. "This is not something that one justifies solely with scientific arguments," Mr. Jean-Daniel Levi, the CNES general director, readily acknowledged. "But although the end of the Cold War has somewhat slowed down the Soviet-American power struggle in this field, competition remains keen between the United States, Russia, Europe, and Japan." Beautiful dreams which, in recent years, have been seriously cut short by the economic crisis.

The U.S. Congress clips the wings of the future Freedom station a little more every year, and the Russian space effort is obviously affected by the country's economic collapse. As for the European program, it seems to be quite in bad shape on the eve of next November's Granada conference, during which the ministers will

decide, as they do every year, on the direction to give to a program that has already cost them some Fr7 billion.

The ESA general director, Mr. Jean-Marie Luton, recently proposed a somewhat reduced program to meet the European governments' desire to save money (LE MONDE, 28 May). Meeting on 15-16 July, representatives of the ESA Council member states certainly reaffirmed their desire to build the Hermes shuttle and the Columbus station, but they could not agree on the financing of the "Luton plan," which they still find too costly. A last meeting is scheduled for September, before the Granada summit.

A new fact causes observers to be pessimistic as to the issue of these negotiations. Until now, France would fight tooth and nail for Hermes, managing to counter to some extent Germany's need to save money as it faces the high cost of reunification. But in recent weeks, Mr. Hubert Curien, the French minister of research and space, has seemed to agree with his German counterpart. Waiting for a research budget that he expects will be very tight, he asked for an additional 10 percent cut on the ESA's long-term program as a whole.

This new demand might well end for good the European shuttle project in its present form, we were told by an expert who added that, "Mr. Curien always maintained that Hermes would make sense only if we shared its use with the Russians or the Americans" to serve Mir or Freedom.

Program Internationalization

Actually, from now on, an ever more thorough internationalization of space programs is a must. The Hermes project could be rescued by cooperation with NASA. The Americans have approached the Europeans and the Russians for the development of the ACRV [assured crew return vehicle], a rescue spacecraft with an eight-astronaut capacity, designed to evacuate the future Freedom space station. The studies already completed for the Hermes project could perfectly serve as a basis for the development of the ACRV by the ESA. True, negotiations are already under way between NASA and the Russian firm NPO Energiya, whose Soyuz (which can carry only three cosmonauts) might be chosen as an interim vehicle. But European officials are not much worried by these negotiations. "We have an enormous advantage over the Russians in that we are able to participate in the project financing," one of them exclaimed.

The Europeans are also considering a closer collaboration with the Russians in order to save their manned-flight program. The ESA already signed a first series of 30 small contracts with the space industry of the former USSR, and Mr. Hubert Curien—who went to Baykonur for Michel Tognini's takeoff—will meet in Moscow with top officials in the Russian space sector.

All the same, these fall-back solutions cannot have a tangible effect on the European space budget for at least

one or two years. Meanwhile, the ESA must run a tight ship and control damages in order to save what has already been achieved and to avoid the dispersal of teams who already tend to lose interest. Weather the storm and wait for a sunny spell in the crisis.

Franco-Russian Space Flight

92WS0753B Paris LE MONDE in French 30 Jul 92
p 22

[Article by Jean-Paul Dufour: "After Reaching the Mir Station, Michel Tognini and the Russian Cosmonauts Will Perform 10 Scientific Experiments"—first paragraph is LE MONDE introduction]

[Text] The French astronaut Michel Tognini and his two Russian colleagues, Anatoly Soloviev (chief pilot) and Sergei Avdeiev (flight engineer), have reached the Mir station on Wednesday 29 July. Forty-eight hours after its launching (LE MONDE, 28 July), their Soyuz TM-15 spacecraft docked to the Russian "space train" at 9:49 (Paris time). There, the three men found Alexander Viktorenko and Alexander Kaleri, who have been in orbit since 19 March and will come back to earth with Michel Tognini on 10 August. Before starting to work on the 10 scientific experiments of the Antares mission, the French astronaut will "teleconference" with President Francois Mitterrand, who will be in the Elysee television studio together with the minister of research and space, Mr. Hubert Curien.

Four hundred kilograms of equipment, brought there by an unmanned Progress spacecraft on 4 July, are awaiting Michel Tognini and his Russian colleagues on the Mir station. This means 12 days of work for the five men who will have to perform 10 scientific experiments prepared for them by the CNES and several French organizations and laboratories.¹ Four experiments deal with the behavior of materials in space. For the others, dealing with the life sciences and man's adaptation to weightlessness, crew members have learned to study themselves.

Indeed, you cannot leave our planet with impunity. Gravity, which keeps our feet on the earth, also regulates many of our vital functions without our knowing. In orbit, weightlessness affects man in many hidden and sometimes fearsome ways.

For instance, being no longer attracted toward the feet, the blood tends to flow toward the head and chest. The volume of heart cavities and cervical veins increases. In addition, the body loses all gravity-related bearings and this perturbs mental images. This may account in part for the famous space sickness, but it can also cause visual inversion illusions. Worse: physicians have found that space flights considerably disturb the immune system according to an apparently complex process affecting several types of immunocompetent cells. Finally, cosmic rays are far more intense in space than on earth where,

even at high altitudes, the atmosphere still acts somewhat as a filter. They may have still little-known effects on living cells (and therefore on man), and also on some electronic components.

Preparation of Long-Duration Missions

Nearly all experiments put on board for the Antares mission are designed to observe and measure these still little-known phenomena,² in an attempt to identify their mechanisms and develop remedies or protections. They are of obvious interest in preparing long-duration manned flights—to explore and develop the Moon or Mars, for instance—which officials believe will take place in the more or less distant future, during the next century. But their “civil” spinoffs could also be important. Especially in medicine, where the study of the immune and cardiovascular systems in disturbed conditions can only help researchers.

“Microgravity” research, on which some 100 French scientific teams are now working, was started by the CNES, working together with the former USSR, as early as 1978. The first three French trips into space (Jean-Loup Chretien on board the Saliut station in June 1988, and on board Mir from 26 November to 21 December 1988; Patrick Baudry on the American shuttle Discovery in June 1985) marked a new stage.

The European unmanned platform Eureka (European Retrievable Carrier)—to be placed on orbit by Atlantis on Saturday, 1 August and recovered eight months later—will constitute a choice tool, at least for experiments involving materials or simple biological samples.

[Box, p 22]

Four New French-Russian Flights

After Michel Tognini boarded the Mir station, Mr. Jacques-Louis Lions, the CNES president, and Mr. Yuri Semynov, general director of NPO Energiya (which operates the Mir station), signed a draft agreement spelling out the terms and conditions for the future stays of French astronauts on Mir.

Four joint French-Russian flights will take place in 1994, 1996, 1998, and 2000. The “ticket” price should be on the same order as that paid by the CNES for the Antares mission (Fr73.2 million). The CNES hopes to move the first flight forward to 1993 in order to reuse the equipment that is already on Mir. Although that is not mentioned in the agreement, the 1996 flight might be a longer one (four weeks).

On the other hand, Mr. Hubert Curien, minister of research and space, and Mr. Boris Saltykov, his Russian counterpart, renewed the two countries’ framework agreement on scientific cooperation (in all fields). A joint commission will now “prepare a first material list of cooperation themes and scientific priorities offering the most promising possibilities,” Mr. Curien indicated.

Footnotes

1. Six biomedical experiments: Orthostatism (INSERM [National Health and Medical Research Institute]-Tours and Lyon faculties of medicine), Viminal (Paris Neurosensory Physiology Laboratory), Illusions (Aix-Marseille University and CNRS [National Center for Scientific Research] in cooperation with the Moscow Motor Control Laboratory), Biodose (CEA [Atomic Energy Commission] in Grenoble and Fontenay-aux-Roses), Nausea (CEA-IPSN) Immunology (INSERM in Toulouse). Two experiments on “fluids and materials”: Alice (CEA in Saclay, CNRS at Paris-North University), Superconductor (CEA in Saclay). Two technological experiments: Exeq (ONERA [National Office for Aerospace Studies and Research] in Toulouse, and Microaccelerometer (CNES in Toulouse).

2. With the exception of the experiments on “fluids and materials,” which involve basic research on fluid dynamics (Alice) or aim to manufacture giant crystals of better quality than those made on earth (Superconductor).

Aerospatiale Delivers Hermes Nose to Dassault

92WS0754B Paris AFP SCIENCES in French 16 Jul 92 pp 5, 6

[Article: “Delivery of First Hermes Nose”]

[Text] Paris—Despite the uncertainties that continue to weigh on the Hermes project calendar, Aerospatiale announced on 9 July its first delivery, to Dassault-Aviation, of the European space plane’s nose, for tests that are to be carried out at Germany’s Munich test center, then in Spain’s solar oven at Almeria.

The nose, the forward projection of the plane, is made of carbon-carbon. It, and the leading edges of the wings, is the part subjected to the highest temperatures when the craft develops a speed of Mach 25 during the 30 minutes of its reentry through the progressively denser layers of the atmosphere, before landing. At the hottest point of the reentry, these parts reach a temperature of 1,600°C.

Built of a carbon-carbon fabric protected against oxidation by a silicon-carbide-based coating, the Hermes nose is the largest part to have been built to date made of these materials. Developed at Aerospatiale’s Aquitaine plant, these materials constituted for Europe one of its biggest stakes in the Hermes project. What is more, the materials used were tested by means of a Simoun aerothermodynamics test facility developed specifically by Aerospatiale.

While the French group is the project’s prime contractor, Dassault-Avion was awarded specific responsibility for all the plane’s aerodynamics and avionics. Hence, the delivery of the nose, and the tests that are to follow.

On 26 May, ESA’s director general, Mr. Jean-Marie Luton, announced that an Hermes “unmanned demonstrator” is scheduled to fly, under the temporary name of

X-2000, in the year 2000. He then explained that, for financial reasons, ESA expected to abandon the idea of a manned flight of the Hermes space plane by 2002-2003, and that such a flight would undoubtedly not take place before 2005.

The ESA General Directorate's latest proposals regarding Hermes and the other programs planned for the year 2000 are expected to be submitted for approval to the ESA's board of directors on 15 and 16 July. They will then be submitted to the Council of Space Ministers, which has the sole decision-making power, and which is to meet in Spain in November.

ERS-1 Successes Reported

92WS0754C Paris AFP SCIENCES in French 16 Jul 92 pp 7, 8

[Article: "ERS-1: One Year in Orbit and Very Satisfactory Results"]

[Text] Paris—Launched on 17 July 1992, at 0146 GMT, by an Ariane rocket, the European earth observation satellite ERS-1 continues to function satisfactorily. At the hour of its launching, one year later, it will have circled the earth 5,243 times, at an altitude of 800 kilometers, and sent 160,000 images of earth, according to the European Space Agency [ESA].

The 275 scientific teams participating in the use of the torrents of data it is transmitting have since been joined by those who are managing some 30 additional projects centered on future applications of the satellite and its twin brother ERS-2, which is to take over from ERS-1 in 1994. All cite the precision and quality of the radar images they are receiving.

Received by five stations in Europe and Canada, and processed in four specialized centers in Germany, France, Italy, and the United Kingdom, the data being sent by ERS-1 are also being received and processed, insofar as concerns radar images, at 12 other stations distributed around the globe. All these data are furnished to the operational users of the system, such as the world's weather services, within three hours after being collected. This attests to the importance—from the meteorological, oceanographic, climatic, etc... viewpoints—of this 2,380-kg satellite, a very complex one from the standpoint of equipment, built by Europe and injected into orbit by the 44th Ariane.

One of ERS-1's several successes was the almost real-time observation, around the end of 1991 and beginning of 1992, of the climatic phenomena engendered by the famous El Nino current in the South Pacific, which, reversing its direction every three to seven years, generates effects of major magnitude on Indonesia, Australia, Chile, indeed on the world's climate, and on the distribution of fishing banks and the crops of southern regions.

Thanks to ERS-1, scientists now also have at their disposal the best topographical map ever made of the Antarctic continent. Under the TREES program being carried out jointly by the ESA and the EEC, and based on radar images being obtained day and night, they are tracking the surveying of the world's current tropical forests. They are updating maps of the ice formations, tracking currents, measuring wave heights, wind velocities, etc... An ERS-1 scientific balance sheet is to be drawn up at Cannes between 4 and 6 November of this year.

To the ERS-1's exploits, ERS-2 will add, beginning in 1994, and by means of its GOME [Global Ozone Monitoring Equipment], very precise measurements of atmospheric ozone, on a planetary scale.

Riesenhuber: Even Unmanned Hermes Unaffordable

92WS0766A Duesseldorf HANDELSBLATT in German 7-8 Aug 92 p 5

[Article by B.A.G.: "Space: Europeans Back Medium-Term Cooperation With CIS States; Riesenhuber: Even Unmanned Hermes Space Orbiter Can Scarcely Be Financed"]

[Text] Bonn, Thursday, 8 Jun 92 (HANDELSBLATT)—In Minister of Research Heinz Riesenhuber's (CDU [Christian Democratic Union]) opinion, construction of the Hermes manned space orbiter will be unaffordable for the next 10 years. He said that he also has "considerable doubt" about the ability to finance an unmanned Hermes X-2000. But Germany will probably run into opposition to it in the European space organization, ESA [European Space Agency], especially from France.

In the minister's opinion, alternatives to Hermes will have to be submitted at the next ESA conference of ministers in Granada in November.

Heat Shield Technology From Russians

The majority of the 13 members of ESA, with France in the lead, are striving to master all key space technologies themselves within the framework that has existed up to now while at the same time strengthening international cooperation. They estimate that international cooperation on space will not be meaningful before 1996.

The European space industry has also declared itself to be in favor of this strategy. It fears that jobs and opportunities for development will be jeopardized if there is short-term cooperation with Russia. He said that the German industry is proposing, among other things, that a further developed Mir station be built and operated jointly with the Russians after 1996 instead of the "man-tended free flyer" in the Columbus program.

Riesenhuber, on the other hand, supports cooperation with Russia and Kazakhstan as quickly as possible. He

said that the Soviet transporter technology and operation of the Mir space station are of particular interest. He is to go to Moscow for talks next week. He expects it to be settled on the spot whether the Soviet heat shield technology, among other things, can be adopted.

Riesenhuber has made DM20 million available to help the former USSR to retain its experts. ESA is expected to contribute an additional DM50 million annually. In view of the uncertainties involved in Russian space-industry planning and the considerable structural differences from those of the West, however, they could only cooperate after "difficult negotiations."

He said that, aside from the decision on Hermes, a new orientation of the long-term ESA strategy will be on the agenda in Granada. Instead of the long-term plan in effect up until now, a step-by-step plan extending from 15 to 20 years is to be decided on. Binding objectives would have to be established for each phase—the first phase will run from 1992 to 1998.

Smaller Outlay Than China or Italy

Riesenhuber emphasized that he could not release any funds from the Research Ministry's other budget for the financing of space programs. As of 1993, the annual increase in the German contribution to ESA will remain at a nominal 2.5 percent. In the draft budget for 1993, DM1.232 billion of the total DM1.8 billion allocated for space are earmarked for the ESA alone, which means an increase of DM100 million. In an international comparison of expenditures for space, the Germans would occupy seventh place with these allocations—behind countries like China and Italy.

DASA's Mehdorn on Airbus Production, Fokker, EFA

*92WS0770A Stuttgart FLUG REVUE in German
Aug 92 pp 56-57*

[Interview with Hartmut Mehdorn, the new DASA managing director for aviation, by Goetz Wange; place and date not given: "We Can Build More Than Just Tin Cans"—first paragraph is FLUG REVUE introduction]

[Text] With the Airbus A321, the assembly of another big commercial aircraft will be completed at German Airbus in Hamburg. Thanks to stubborn negotiations by Hartmut Mehdorn. The head of German Airbus must now also organize the aviation division of the parent company, German Aerospace (DASA). The negotiations with Fokker on regional jets and the consequences of the decisions reached in Bonn on the European fighter aircraft, EFA, (Fighter 90) are still open.

[FLUG REVUE] What is the significance of the final assembly of the Airbus A321 in Hamburg for the German aviation industry, apart from the importance to its [international] standing?

[Mehdorn] Germany has always played a critical role in the production of the Airbus. We've always defended ourselves when it is claimed that the Germans make the tin cans and the French make the quality equipment. From a purely visual standpoint, it's always looked as though we were worse off. But during the initial phase there was no way we could start moving at a slower pace. With the increase in business activities, the thing to do is simply to set up a narrow-body division and a wide-body division within this Airbus-assembly cycle. This is not only an opportunity to gain prestige, but also a matter of cost-effectiveness.

[FLUG REVUE] In order for it to be a narrow-body center for Airbus, to be consistent the A320 final assembly operation would also have to be transferred from Toulouse to Hamburg.

[Mehdorn] Up to now, we haven't even attempted to get the A320 to Hamburg. since we said that the new final assembly operations would almost be given the status of being integrated final assembly operations. We will, however, at first leave the current final assembly operations the way they are. This applies to the A320 just as it does to the A300 and the A310. Naturally, we'll think it over just the same. Perhaps some day—after discussion as partners with Aerospatiale—the opportunity for an exchange will present itself. I could imagine Aerospatiale saying: If less than three or four A320s a month are on the assembly line, take the final assembly operation to Hamburg. As a countermove, we could turn over to them the outfitting of the interior for the A300 and the A310.

[FLUG REVUE] On 1 August you will be assuming the directorship of the DASA aviation division. New orientation has not been a national concern for a long time now. By way of example, DASA is negotiating with Fokker with respect to the takeover of a majority share of the company in order to assume a leading position in the regional jet sector in Europe. What, in your opinion, do you think the final solution will be in this sector of the industry?

[Mehdorn] We're talking about four market segments: the 15- to 50-seat propeller aircraft sector, the 60- to 130-seat regional aircraft market, the Airbus family for 130-400 passengers, and above them the market for large-capacity aircraft with 500-800 seats. DASA is of the opinion that these are four different markets, each of which it has to tackle differently in terms of marketing as well. We've already come a long way with Airbus and we may suppose that we'll be doing exactly the same thing with the regional aircraft market. And we'll be using Fokker instead of Airbus Industry to gain access to that market. Also on a European basis again, not only with Fokker alone, but with Aerospatiale and Alenia. And, as we will be in the lowest market segment, we may naturally suppose that Dornier products will be put on the market jointly with the French and the Italians via the ATR [Regional Transport Aircraft].

[FLUG REVUE] Is that really realistic? The ATR family claims that it is successful on the market; and there are sectors in which Dornier products will more likely interfere with partners' activities.

[Mehdorn] The technology is really making rapid advances, much more rapid than we manufacturers sometimes really want it to. We would, of course, prefer to develop something and then market it for as many years as possible. But this is unfortunately not the case. The Dornier 328 is the most up-to-date aircraft in its class. If we succeed in embedding the aircraft in a strong marketing organization and bringing production costs down to a level at which there's still a mark or two [in profits] left over, the Dornier 328 will have a real chance of making it.

[FLUG REVUE] Do you support development of a long-bodied version of the 328 on the DASA board of directors?

[Mehdorn] The 328 needs a long-bodied version, as does every other aircraft too, actually. But with the 328-S the question arises as to whether we'll lead the way on our own or with which European partners. This is something that we want to no longer decide on alone, but along with other Europeans.

[FLUG REVUE] Are you already discussing this in concrete terms with your partners, Aerospatiale and Alenia?

[Mehdorn] We're rather just thinking about it at the present time.

[FLUG REVUE] DASA was originally aiming for the systems management of the regional jet. But now there's talk of industrial management in the negotiations with Fokker. Has DASA given up its demand in so doing?

[Mehdorn] No. We've only put up another nameplate on the door. Since Fokker will then be German Aerospace—if that's what it wants. DASA will be managing the aircraft production and using the Fokker Company for its access to the market. Therefore, there will be a program manager at DASA for the 65- to 130-seat Regioliner jets segment and this manager will be referred to as Fokker.

[FLUG REVUE] In the event that this is agreed on, will it also still be valid for the Regioliner?

[Mehdorn] If we take the joint venture route with Fokker, we assume that the Fokker 100 and the new Fokker 70 derived from it will be kept on the market for a while longer to keep production at full capacity for as long as possible. But these models will at some point be replaced by new aircraft of the Regioliner family. Up to now, we were working on the assumption that we would go into operation in 1997-1998, but, if we reach agreement with Fokker, it will be more like the year 2000.

[FLUG REVUE] You haven't mentioned the Fokker 130 at all, an aircraft that has also been introduced into the talks as a version by the Dutch.

[Mehdorn] Fokker has in fact presented it as a project, but we've never seriously talked about it. The Fokker 130 has scarcely anything to do with the Fokker 100; rather it is a completely new aircraft. A new wing would be needed and the systems would also have to be very greatly modified. So we might as well go right ahead and design a new aircraft.

[FLUG REVUE] The current problem child, Fighter 90, belongs in its class in its new function. Do you at present already have an idea as to what a Fighter 2000 or a light fighter—cheaper versions about which there is speculation in Bonn—might look like? Can a fighter plane be put together almost completely with various building blocks from a construction kit?

[Mehdorn] Well, in principle it will work. We'll have to think separately about whether this is the right way to go. Naturally, it's conceivable if all the essential elements contained in the Fighter 90 program are retained. As examples, I'd like to cite the structure and basic equipment of the systems. Consequently, if they say: I'll do without certain things, it might work—as long as we can agree with our partners on it. We might not tease the last bit of power out of the engines, do without the latest form of the newest materials, or equip the fighter with a less powerful radar.

[FLUG REVUE] Will it also work if you switch from a twin-engine fighter to one with only one engine?

[Mehdorn] Then it would be a new airplane. Then we would have to start to develop it all over again, or we would have to see how we would in general go on from there. There are still, of course, the French Rafale and the Swedish Gripen. But if I rightly understand the decision reached in Bonn, a purchase is ruled out as a solution. In principle the need for a new fighter aircraft was endorsed. Therefore, our first option would be to trim enough fat off the Fighter 90 for it to simply become substantially cheaper. But we're not the operating authority. The one who has to deal with the fighter will have to say what he wants and can afford. Then we'll tell him whether and how it can be done and how much it will cost.

[FLUG REVUE] There's been talk of cooperation with the French. But the Rafale has already been fully developed. What more can be done with it?

[Mehdorn] Well, the Eurofighter and the Rafale cannot be combined as such. But the chancellor still wants to enter into talks with the French. These will not only be very difficult, but they will in any case lead to enormous additional costs and costs for development. It should also not be forgotten that we're European partners in the Eurofighter program. As partners, we have to reach agreement on it and make compromises. Now if some of us here suddenly wake up and say that we need some

other aircraft, that may not necessarily be the case with the other party to the program. But a trimmed-down Fighter 90 is conceivable, in which case the English would get a good version, the Italians and Spaniards a fairly good one, and we Germans a worse one.

France's SEP Develops High-Power Ceramic Engine

92WS0773B Paris NEWS FROM PROSPACE
in English Jul 92 pp 4-5

[Article: "High-Power Ceramics"; first paragraph is NEWS FROM PROSPACE introduction]

[Text] Over 20 years of advanced R&D at SEP's Villaroche plant has resulted in the design and production of a range of storable propellant thrust chambers, developing from 20 newtons to 20 kilonewtons (4.5 to 4,500 lb) of thrust. One of the prime research projects is an advanced technology 8-kN engine, incorporating ceramic composite parts, for orbital maneuvering or terminal stage propulsion.

SEP has been working on this 8-kN engine since 1988. Initial studies aimed at developing an injector which would ensure highly efficient combustion over a thrust range from 6 to 8 kN. Subsequent firing tests on experimental engines have demonstrated the validity of a ceramic matrix composite (CMC) combustion chamber adapted to this injector—resulting in an 8-kN (1,800-lb-thrust) engine combining high performance and low weight.

The Engine

The 8-kN engine is a liquid bipropellant engine fuelled by nitrogen tetroxide (N2O4) and monomethyl hydrazine (MMH) from pressurized tanks.

Compared to other propellants, such as UDMH and hydrazine, these propellants offer a good tradeoff between performance and combustion stability. They are also hypergolic, meaning they ignite spontaneously when mixed, so the engine can be started by simply opening a dual valve on the injector.

Engine thrust is vectored by a gimbal mechanism.

Electrovalve Control

A light, compact electrically-controlled dual valve, which includes a hydraulic power stage, controls propellant injection and therefore the engine's operating regime.

To ensure operating safety and security, the main valve is spring-loaded in the closed position. An electrical signal is sent to a pilot valve to open the main valve.

The Key to Combustion

The injector is a flat plate with 89 uniformly distributed injection elements, located at one end of the combustion chamber.

These elements are "pentad" units, with one central fuel injection hole surrounded by four oxidizer injection orifices. The streams from these holes intersect at a single point to ensure good propellant mixing.

Engineers at Villaroche have used this injection configuration on many experimental engines over the past 20 years. It provides extremely rapid propellant mixing, for higher combustion efficiency than coaxial injectors; in the latter, phenomena related to reactive stream separation are likely to disturb combustion.

A ring of 32 doublet elements along the edge of the injector sprays a fuel-rich film of propellants against the chamber walls. This provides a low-temperature, low-oxidizing gaseous layer which protects the chamber walls with a minimum loss of performance.

Propellants are fed through the 509 injection holes (89 pentad and 32 doublet elements) by a network of channels drilled through the injector plate.

CMC Combustion Chamber and Exit Cone

Both the combustion chamber and exit cone on this engine are made of a carbon/silicon carbide (C/SiC) ceramic matrix composite. This material is composed of a "preform" of Novolox three-dimensional carbon (C) fibers in a silicon carbide (SiC) matrix. Matrix deposition uses the chemical vapor infiltration (CVI) method.

Components made of C/SiC offer a design life of 1,000 seconds, which covers the application range for an 8-kN engine. In addition, thanks to their low density of 2.5, they provide major weight savings compared to metallic chambers of Niobium, which has a density of 9.

Development Status

The first test cycle verified margins for the engine's operating envelope, whereas the second focused on demonstrating combustion stability.

Next, the engine's ability to meet specifications was checked through endurance and performance tests on a short-nozzle version of the combustion chamber. Its ability to restart in space was verified in a vacuum chamber.

All of these tests used the existing test facilities at Villaroche, which include a vertical test rig for ground testing, a vacuum chamber for ignition testing and a vertical test stand for the endurance tests under space-simulation conditions.

The 8-kN version of this engine was derived from an earlier 6-kN version by increasing propellant supply pressure and extending the exit cone. It consumes about 2.5 kg of propellant a second, and can be reignited in space as required.

The combination of a CMC combustion chamber and an advanced injector provides higher specific impulse and longer life, while reducing engine weight.

An engine of this type could be used for either orbital maneuvering of space vehicles or the propulsion of the terminal stage of a small satellite launcher. Although the market for orbital maneuvering systems is limited, the latter market seems destined for significant growth by the turn of the century. SEP's innovative 8-kN engine, by combining high performance and low cost, will be one of the most competitive products in this booming market.

8-kN engine characteristics:

thrust—8 kN (1,800 lb);

propellants—N204-MMH;

propellant feed pressure—202 MPa (320 psia);

combustion pressure—105 MPa (217 psia);

mixture ratio—1.65;

nozzle expansion ratio—150;

specific impulse—320 sec.;

startup/shutdown delay—0.1 sec.;

burn time—1,000 sec.;

overall length—1.5 m (5 ft);

weight (excluding actuators)—20 kg (44 lb);

space restartable—yes;

gimballed—yes

Aerospatiale Increases Ariane's Payload Capacity

92WS0773C Paris *NEWS FROM PROSPACE*
in English Jul 92 pp 53-54

[Article: "Two Aerospatiale Innovations Improve Ariane Payload Capacity"; first paragraph is *NEWS FROM PROSPACE* introduction]

[Text] Aerospatiale, industrial architect and stage integrator for the Ariane launch vehicle, introduced two innovations on two recent flights that improve Ariane 4 payload capacity by nearly 130 kilograms.

Thanks to this improved performance, Arianespace enjoys a better position in the commercial launch market. The trend towards larger satellites means that customers frequently require greater capacity than Ariane 4's maximum nominal capacity of 4.2 metric tons into geostationary transfer orbit (GTO). The combination of these two launcher upgrades raises payload launch capacity to 4.45 metric tons.

A New Third Stage

For flight 50, Aerospatiale introduced a new third stage designated H10+, working in close collaboration with L'Air Liquide (see Issue No. 33, page 11). This new stage incorporates a propellant tank which is 32 cm longer than the original, but weighs 26 kg less, thanks to the use

of special cylindrical panels manufactured by Aerospatiale's Les Mureaux facility. The improved tank increases liquid hydrogen and oxygen carrying capacity by 340 kg, thus increasing burn time by 20 seconds and payload capacity by 110 kg.

New Helium Tanks for Ariane 4

Flight 49 marked the first use of lighter helium tanks on the second stage, for weight savings of 78 kg, and an added 18 kg of payload capacity. Made of Kevlar fiber wound around a thin titanium liner, these spherical tanks are designed, developed and fabricated by Aerospatiale's Aquitaine facility.

Each second stage is equipped with three of these tanks, developed at the request of Arianespace to lighten the launcher. Used to store pressurized helium gas in the second stage propulsion system, they replace the current metallic tanks.

Aerospatiale's lightweight concept allies two advanced materials, a very thin 1.4 mm leakproof liner of titanium, and a composite envelope of wound Kevlar fiber which provides strength under pressure. The tank was qualified by the Aquitaine facility. Qualification tests of the pressurization system integrated in the stage were carried out by the Bremen-based MBB/Erno.

ENERGY, ENVIRONMENT

Germany: Process To Convert Plastic Waste to Oil

92WS0766C Duesseldorf *HANDELSBLATT* in German
7-8 Aug 92 p 5

[Article by E.R.: "Chemistry: Utilization Cycle Closed; Technical Breakthrough in Recycling of Plastic"]

[Text] Duesseldorf, 6 Aug 92 (*HANDELSBLATT*)—The Federal Association of Chemical Industry Employers has described a major experiment successfully concluded in Bottrop in early May 1992 as a technical breakthrough in the chemical utilization of plastic waste. For the first time, 60 tons of used plastic were brought to an existing hydrogenation plant for crude oil residues and reprocessed by hydrogenation. They were in this way reconverted into synthetic crude oil. In its latest newsletter for executive personnel, the Federal Association of Chemical Industry Employers writes that with this technology it is therefore possible to, in principle, chemically completely utilize the plastic collected through the "dual system."

In effect since 1991, the packaging decree stipulates the recycling of waste packaging materials. With the development of the private sector waste disposal system, "German Dual System, Ltd., industry, commerce, and the private waste disposal industry have begun to see to it that regular collection of used commercial packaging

materials is guaranteed. In the household sector packaging marked with a green dot is collected and picked up separately."

The effectiveness of this system and the "green dot" itself were recently severely criticized. The newsletter for executive personnel says that, particularly as concerns plastic waste, it is falsely assumed that the recycling of plastic mixtures that come from households is in large part technically not possible.

It says that a turning point was reached with the big experiment in Bottrop through the hydrogenation of plastic materials. The materials employed come from the "dual system" and corresponded in composition and pollutant content to the anticipated appearance of all types of plastic used in packaging. The oils recovered were of excellent quality. The utilization cycle could be completely closed by processing them into chemical raw materials in the production of plastics—such as, for example, naphtha and diesel oil.

By as early as the summer of 1993, they expect to recycle up to 40,000 tons of plastic waste a year in this manner. There may be a further increase in the volume of recycled plastic in additional plants. A total of about 2 million tons of plastic waste a year would be obtained from industry and households in the Federal Republic. Of this, the "dual system" is expected to account for about 1 million tons of waste packaging.

In comparison with other materials, which can only be recycled a limited number of times because the quality of the materials becomes increasingly poorer, plastic can become the ideal material for recycling. The Federal Association of Chemical Industry Employers asserts that, by completely reconverting the waste to the source material, crude oil, the various types of plastic could be reproduced again and again with the highest quality. This chemical recycling would also have a positive effect on the raw material balance. While only about 4 percent of the annually extracted amount of petroleum is consumed worldwide by the chemical industry for the production of plastics—the remainder is mainly used in [auto] traffic and for heating—it is likely that a considerable reduction of this portion of oil consumption will be achieved through the rigorous chemical recycling of plastics.

Germany: Bayer Recycles Novodur Thermoplastics
92WS0767C *Paris COMPOSITES ET NOUVEAUX MATERIAUX* in French 3 Aug 92 p 3

[Text] For the last several months Bayer AG and Volkswagen AG have been working together to show that Novodur, an ABS-base technical thermoplastic manufactured by Bayer and used to make radiator grilles, can be recycled. In a pilot auto reclamation plant in Leer in western Frise, Volkswagen is taking apart VW and Audi vehicles to study how certain parts might be recycled. The Novodur radiator grilles are crushed, cleaned, and then retreated to make new grilles.

Initial tests have shown that the product's qualities are entirely satisfactory for an industrial application. The recycled Novodur is made by adding new material to the crushed remains of the salvaged grilles. Its optical performance is good, it continues to hold paint well, and it retains mechanical properties that are very close in quality to those of the original Novodur.

In any event, the recycled Novodur meets requirements for automobile construction materials. What is important to Bayer is essentially to show that recycled materials can be used in major, and not just minor, applications, if adequately sorted. Rens: Bayer AGD-5090 Leverkusen, Bayernwerk; Telephone: (0124) 301; Fax: (0214) 30 89 23.

Swiss Company Invents Easily Recyclable Plastic
92WS0774B *Stuttgart BILD DER WISSENSCHAFT* in German Aug 92 pp 94-95

[Article by Burghard Boendel: "Here Today, But Not Gone Tomorrow"; first paragraph is BILD DER WISSENSCHAFT introduction]

[Text] It is a fountain of youth for used plastics. A Swiss chemical company intends to get control of its plastic waste with aqueous solutions. With the new process, polymers can then be recombined into a high quality plastic.

Roland Belz could not let go of the idea with the sugar cube. The little object, according to the flash of inspiration of the inventive businessman, sparkles with an excellent recycling property. It is possible to transform a dirty sugar cube into a clean one without any problems: Simply dissolve it in water, purify it, dry it, and reshape it. Belz thought it should be possible to recycle plastic using this same principle.

Ten years have passed since this observation. First with the Battelle Institute and finally in his own company, Belland AG, with headquarters in Biberist near Solothurn in Switzerland, Belz worked on a technique based on this notion which is now ready for application. It includes not merely a single, new material but a whole family with one common property: During polymerization, carboxyl groups (COOH) are docked on the primary chain.

Whereas the primary chain determines the properties of the plastic, the carboxyl group enables specific water solubility. Belz explains the chemistry: "COOH is smuggled in, so to speak, as a predetermined breaking point in the polymer."

When the newly developed plastics come into contact with aqueous caustic solutions such as soda lye (NaOH), the sodium is released from the lye, the hydrogen is displaced on the COOH group, and reacts with the radical to form COONa. As a result of this regrouping, the thermoplastic plastic becomes a polymer salt which dissolves in water. Here, the individual polymer chains

which normally are firmly entwined in a ball and only slightly relaxed by warming for processing, swim freely side by side. Fortunately, health threatening monomers, i.e., the starting components of the polymer, are not formed.

With a second dip into the bag of tricks, the plastics are then recovered. If the basic polymer soup is neutralized, for example, with sulfuric acid (H_2SO_4), hydrogen displaces the sodium from the $COONa$ compound so that the original condition is restored in the carboxyl group. Sodium and the remaining sulfate (SO_4) combine to form (Na_2SO_4), and the plastic precipitates. That is the functional principle: Belz will not divulge the specific lyes and acids: "That is our black box."

The dissolving and precipitation do no damage to the plastic: "This transformation can be repeated umpteen times without changing the quality at all," Belz determined in countless series of tests.

Thus, the Belland process provides three basic advantages:

- While the plastic is in use, it does not differ from other polymers. It has a precise profile of properties.
- Sorting is automatic based on the dissolution property. From a dirty, mixed plastic cocktail, the lye dissolves out only Belland material, which is then available as a contaminant-free type.
- The plastic is purified down to the polymer chain. Any contamination which has worked its way in is eliminated. At the end of the recycling process, there is a hygienically problem-free material which can be used in any way. However, to make recycling simple and economical, the actual palette of plastics is designed according to the modular principle. The foundations for this are three basic polymers:—An acrylate copolymer with a rubberlike, soft consistency;—A styrol acrylate copolymer for hardness and temperature resistance;—An adhesive component.

All products made of Belland plastics such as films, coatings, injection molded parts, fibers, or adhesives are composed of these three components. For each product the applications engineers specify the exact mixture of the individual components to provide the required set of properties.

This requires great precision. Because the plastics of the Belland trademark do not have the broad spectrum of properties that the standard polymers polypropylene and polyethylene have. The reason for this is the carboxyl groups. They make the material brittle and amorphous. "Consequently, we have to know whether the material is to go to the refrigerator sector or to end up as a swizzle stick for coffee," says Belz.

The composition is defined based on the intended use. A bubble pack such as that used for tablets consists of 10 percent styrol acrylate, 88 percent acrylate, and 2 percent adhesive. Consequently, according to Belz, marketing and applications engineering cooperate very closely.

The first recycling step occurs at the plastics sorting facility: From there the filtered mixture, in which only water soluble impurities are still found, moves in tank cars to the central recycling facility. This is currently being built on grounds of the BUNA AG in Schkopau, Sachsen stop. The polymer precipitation performed there is preceded by water purification, which begins with fine filtration, passes through the anaerobic stage, and ends with sterilization.

The only problem after that is that the three basic polymers precipitate out together. "Of course, we could separate the three basic components by technical means," says Belland manager Belz. However, that would be extremely expensive and illogical, since they have to be remixed later anyway.

Consequently, they take a different tack. New product is used to adjust the ratio of the basic polymers as well as their molecular weight required for the specific application. In a process not disclosed by Belz, old and new plastic are combined and precipitated together. "Thus we obtain an extremely homogeneous material," boasts Belz. With compounding, i.e., mixing of melts, this would not be possible.

Currently, the Belland people are working on refinements and on the construction of the production and recycling structure. Recently, the necessary additives have also arrived in the loop. The remaining brine is run through an electrolysis-like process for separation into acids and bases. The acid is then reused for plastic precipitation in the recycling facility; the clean caustic solution returns in the tank cars to the sorting operation to dissolve the Belland plastics there.

Such solid arguments will be needed by Belz to find additional business partners. Thus far, at prices of about 5 German marks [DM] per kilo, the Belland material has been not only significantly more expensive than standard plastics. The recycling is also not currently calculated in. However, cost-effectiveness is only a matter of time for Belz. In 1993 BUNA—currently the only raw material supplier—is supposed to deliver at least 30,000 metric tons of new material. Ten thousand metric tons are supposed to be added from the recycling facility. If all goes as planned, the economic break-even point should be reached by the end of the year. After acquiring a market share of 10 percent, i.e., approximately 40,000 metric tons per year, Belz believes he will be able to inspire fear in the competition in Germany.

To boost business, the managers of the Swiss company are currently on a tour of Germany with presentations primarily with plastics processors.

It is a good thing for them that there is virtually no change for the producers of plastic packaging. The Belland material is just as easy to process with conventional injection molding machines and with automatic film and deep drawing machines. The uniqueness of the Belland

technique, summaries Belz, does not lie in a revolutionary invention but in a new consciousness: "We have simply turned production around."

France: PSA, Renault in Joint Recycling Effort

92WS0777B Paris AFP SCIENCES in French 23 Jul 92
p 39

[Text] Paris—PSA Peugeot-Citroen and Renault announced plans to jointly develop concepts for processing outworn vehicles on 16 July, to expand the recycling of automobile materials.

Until now, the two groups had conducted pilot experiments on dismantling obsolete vehicles separately. Peugeot-Citroen, for instance, had teamed up with the French Scrap Iron Company and Ciments Vicat to process 16 vehicles a day, which were 95-percent recycled, at Saint-Pierre de Chandieu in the Lyon suburbs.

Renault conducted an experiment at its Flins plant, and is preparing to open a joint experimental site to salvage crushed automobile remains with the Galloo-Cibie crushing center in Lille.

The two groups will now participate in a first industrial center, which the French Scrap Iron Company created in Athis-Mons, near Orly. Each will bring with it the results of the pilot experiments it conducted. The new center should be able to rapidly process 200 vehicles a day. The two groups will also work together to devise the concepts facilitating the processing of their obsolete cars, and will jointly prepare the corresponding specifications sheets.

Finally, they will study the organization of a common system for collecting the scrap (notably plastic bumpers) that is generated by the shops of their commercial outlets. The two firms indicate that all these joint endeavors will gradually be opened up to all of Europe's other carmakers.

ABB Works With Japanese Partner on Sodium/Sulfur Batteries

92WS0782C Duesseldorf HANDELSBLATT in German
19 Aug 92 p 18

[Article by hsn: "Storage Power Stations Could Compensate for Fluctuating Energy Loads"]

[Text]

Batteries/ABB Continues Development on Sodium-Sulfur Battery With Japanese Partner

The need for battery-backed storage power stations is particularly great in Japan because of the economic, infrastructural, and geological conditions. The power-station capacities are not generously designed there. If the stations are to be used efficiently, fluctuating energy loads, among others, must be compensated and peak

demands cushioned. Such demands occur, for example, during summer days when every air conditioning system is operating at top speed.

Storage power stations are used to compensate for such peak loads. They produce electric power when it is needed most and store it at favorable rates during times of weak demand.

Building pump-fed storage power stations such as those in Europe is only possible in Japan with restrictions. This is because of the constant danger of earthquakes. New construction of power stations is also to be avoided. On the one hand, this is because of the immense costs of such a project, on the other hand, because of the lack of space in the densely populated islands. For these reasons, smaller, compact battery storage systems fit in particularly well with the energy supply concept of the islands.

The First Test System Has Proven Long-Term Capability

For this reason, ABB Hochenergiebatterie GmbH of Heidelberg is now working together with the Japanese company NGK Insulators Ltd. on the further development of sodium-sulfur battery technology. The Japanese joint venture Nastech Co. was founded for this purpose. "The energy storage media being used are a further development of the sodium-sulfur battery developed and manufactured by ABB," says Dieter Hasenauer. He is the responsible individual for the joint venture in Japan for the battery manufacturer in Heidelberg. This battery was adapted by Japanese engineers to the particular conditions in Japan. An initial 10 kW test system (stored energy: 80 kWh) proved its long-term capability this past September. This was following a one-year trial period in the Kawasaki substation of the Tokyo Electric Power Corporation (Tepco).

A more powerful 100 kW system must now pass a two-year operational test that started in November. The test system has been further developed and has available 400 kWh of stored electrical energy. There are 25 compact modules supplying 4 kW of power each. Each of these modules contains 270 cells. This is a total of 6,750 cells connected together. To maintain the operating temperature of about 300°C, the cells are installed in vacuum thermal insulation. The modules are housed in an "outdoor package" to save space and costs.

Tepco is investing about 9.1 million German marks [DM] for this large-scale test. This test will serve to solidify the system technology and design for a later larger series. "If this test series is also successful, then only a 1 MW system with a storage capacity of 8 MWh will have to undergo test operation before the large series," says Hasenauer.

The sodium-sulfur cells underwent various modifications for stationary use. For example, the cells and the battery primarily differ from the German batteries in size and energy capacity. The German batteries weigh 180 kg, have an energy capacity of 20 kWh and regularly

serve in various electric vehicles. The heart of the sodium-sulfur battery is an ion-conducting ceramic. This ceramic serves as a solid electrolyte separating the two reactants sodium and sulfur. The two liquid reactants are enclosed in gas-tight chambers. The desired voltages or capacities are achieved by appropriate parallel or series connections.

The NaS battery exceeds the energy density of conventional lead batteries by four times. The sodium-sulfur battery has a theoretical energy density of 795 Wh/kg and an achieved energy density of about 100 Wh/kg. The advantage here is that the battery storage units can be implemented in a very compact manner. Hasenauer says, "As decentralized locations, substations or systems can be placed directly at the large consumers. The expenditure for transmitting power is reduced. Overland lines can be put to more efficient use."

Sodium-Sulfur Had To Be Modified

Two hundred substations in the metropolitan area of Tokyo alone would be suitable for the installation of compact energy storage systems. Tepco plans are extensive. Once the various test runs have been successfully completed, large-scale series manufacture will start in 1997-1998. Every year then, up to 20 10 MW systems (energy capacity: 80 MWh each) could be implemented in the Tokyo area.

The idea for the German-Japanese joint venture came about in 1985-1986. The Japanese partner, Insulators Ltd., is known worldwide as a supplier of ceramic insulators and catalyst carriers. The joint venture, Nas-tech Corporation, was founded in 1987. NGK owns 60 percent of the joint venture and ABB owns 40 percent. The 100 employees currently are developing sodium-sulfur batteries especially for applications in storage power stations for series production.

"There are opportunities for the use of stationary, battery-supported storage systems even outside Japan," believe the experts from ABB. For example, these systems could serve as buffer storage systems for quick charging electric vehicles. The systems would be charged using power at night which is cheaper.

Germany: Use of Coextrusion To Recycle Plastics Examined

92WS0792D Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 23 Jul 92 p 8

[Article by sel.: "Coextrusion Also Offers a Way to Reprocess Synthetics"]

[Text] Aachen—The coextrusion technique for reprocessing plastics is advantageous inasmuch as it offers the possibility of coating recycled core material with layers of new material. In this manner it is possible to achieve a flawless surface. Even so, in order to improve the recyclability of coextrusion waste products, raw material

changes or additives, respectively, will be needed in the future which improve the miscibility of such material compounds. This was recently pointed out during the 16th Plastics Technology Colloquium, which took place in Aachen under the leadership of Prof. Walter Michaeli.

However, reprocessing by means of coextrusion is problematic due to the additional developments necessary in the field of foils. The reasons for this are greater strengths with less material use, the necessary impermeability to gas as well as better seal formation through the application of thin protective coatings to the core material.

Coextrusion leads to new problems when the polymers used in multilayer compounds are not compatible. When mixing these polymers, a system of deliberate separation of the individual phases is created. The quality of the foil could be influenced by increased optical refraction and by deterioration of the mechanical properties.

As was further explained, the production of packaging from plastics and the semifinished materials necessary for it represents one of the largest marketing sectors for plastics products within the field of extrusion. The feasibility and cost of reprocessing such waste depends primarily on the type of waste and how dirty it is and on the requirements which the product to be manufactured must meet.

Sorting the waste according to semifinished material and raw material results in production of high-quality products, if it is possible to assure the purity of the corresponding kinds of material. It was also stressed in Aachen, however, that used plastics waste from mass plastics such as polyolefins, which represent by far the largest portion of packaging, often cannot be economically reprocessed, since already the personnel and energy costs needed for sorting and reprocessing exceed the material price for new goods.

The immediate return of production waste has been successfully undertaken in most plastics-processing companies. Here, the processing utilizes the knowledge about the composition and quantity ratios of the waste and is able to assure a high-quality product. In every company that manufactures foils or semifinished products waste accumulates during production which must be continuously added to the process. Among those mentioned here are edge strips and pressed grids as well as rejected goods from conversion processes, which are being returned for economic and ecological reasons.

This waste is type-pure and largely free of dirt. When grinding it up, sufficient settled apparent density and granular flotation of the ground product must be taken into account. If these requirements can be fulfilled, the ground product can be directly mixed with new material and be processed through the extruder. In order to avoid segregation phenomena and output fluctuations, the ground material can be compacted, agglomerated or granulated with little apparent density.

Another alternative to even out the feed fluctuations could be the use of a gear-type melting pump. The connected extruder supplies the pump with melted and homogenized material. The pump produces a constant output, whereby the extruder must assure sufficient filling on the intake side.

In sum, it was determined in Aachen that in various fields it is already possible to obtain good secondary raw materials through reprocessing techniques so that primary raw materials may be saved. It thus becomes possible no longer to begin a material flow with the raw material, as before, and to end it by way of the one-time intermediate state of the product and depositing it in dumps or burning it. Instead, it is possible to realize a certain duration through the material cycles and thus achieve more varied utilization.

This is all the more important since Germany, after the United States and Japan, is the third largest producer of plastics in the world. The annual production amounts to 9.1 million tons, in which more than 5 million tons of plastics products are processed in the FRG. Due to the diversity of their material and form, the plastics can be found in the most diverse product branches. It is correspondingly important to create suitable reprocessing methods.

The creation of cycles on the way from raw material to working material, product to waste product, can be implemented at various points along this path. Different cycles are possible for this. In the primary cycle, production waste is transferred back into usable working materials. This is generally described as internal company reprocessing. In the secondary cycle, potential waste is utilized by means of recycling as a new or different product.

The tertiary cycle, material recycling, includes the stages of production, product use, by means of reprocessing of waste and reuse as secondary raw material. Chemical preparation of plastics waste and reutilization as secondary raw material represents the fourth reprocessing cycle, the so-called conversion cycle.

In reprocessing the material the molecular structure is largely preserved, while in other recycling possibilities the molecular structure is deliberately altered. The objective of reprocessing the material is to achieve reclamation of the working material, so that the resulting secondary plastics can flow back into the process of manufacture. The objective of thermal or chemical decomposition, on the other hand, is to acquire secondary raw materials or thermal energy, respectively.

Swedish Hot Steel Bath Method to Destroy Freon
92WS0805C Stockholm NY TEKNIK in Swedish
20 Aug 92 pp 20-21

[Article by Kerstin Osterberg: "Swedish Steel Bath for Freon"—first two paragraphs are NY TEKNIK introduction]

[Text] Freon and halogen can be gasified and destroyed under high pressure in a hot steel bath. This entirely Swedish destruction method could be put into use within six months.

But Swedish and international combustion experts still recommend burning.

MEFOS, the Metallurgical Research Station in Lulea, already has a facility that can handle the entire Nordic region's freon and halogen waste and destroy it for 10 years.

That claim is made by Gunnar Fredriksson, president of the consulting firm Interproject Service, Inc.

P-CIG is its name, a gas-tight high temperature 15 MW reactor built 10 years ago. P-CIG stands for pressurized coal iron gasification and the facility, a test plant, actually came into being for an entirely different purpose: to use coal energy in an environmentally compatible way.

Coal dust and oxygen are injected into an iron melt at 1,400-1,500°C, the result is carbon monoxide and hydrogen gas. The gas can then be converted to electric power.

Interproject has a patent on the method which can also be used for iron ore reduction. (NY TEKNIK described the method in January 1987.)

Fredriksson now thinks P-CIG would be just as useful for destroying freon and halogen. Laboratory tests in a small 150 kg furnace showed this when halogen was destroyed a few years ago.

The principle is about the same as for coal gasification.

Freon and halogen are injected directly into the iron melt along with oxygen. In the heat the freon and halogen are fragmented, "cracked," and the carbon content bonds with the iron. The residue forms corrosive salts, hydrochloric acid, hydrofluoric acid, iron bromide and iron fluoride.

Water-Cooled

The waste gases are burned in an afterburner at 1,200°C and cooled with water to 80°C in a conventional wet scrubber. No dangerous dioxin formations containing bromine or chlorine would emerge, they would be burned up in the stack gas combustion, promised Karl-Lennart Axelsson, who participated in the P-CIG project as scientific adviser.

Auxiliary Fuel

The coal dust that is fed in is there only as auxiliary energy for the energy-deficient freons and halogens. If they are not mixed with a solvent or with oil they contain no energy at all.

Other possible auxiliary fuels are waste oil or propane gas.

"But," Fredriksson pointed out, "a combination of freon destruction and coal gasification is conceivable. Then the combustible gas could run a gas turbine, a steam turbine, and provide heat for a district heating network."

The P-CIG plant could be ready to receive freon and halogen within six months, according to Fredriksson and Axelsson. However minor adjustments in the purification equipment would have to be made, among other things it must be lined with an internal rubber lining that provides protection against the corrosive material in the waste gases.

A recently issued UN report recommends six different methods for destroying freon and halogen. All are based on combustion.

Neither the plasma method (developed by Sweden's SKF, among others) nor the P-CIG method is recommended. They are included among the solutions that are "under way, but have not yet been tested commercially."

Some 20 experts stand behind the report, including Swedish combustion expert Jan Bergstrom of the MKS consulting firm in Studsvik. Among other things he has served as the state-appointed supervisor of Sweden's hazardous waste plant, SAKAB, outside Kumla.

Most Suitable

Bergstrom thinks the SAKAB plant is best suited for Swedish freon/halogen destruction.

"It would be sufficient to build a preliminary treatment plant, a reactor that destroys 99.9 percent of the freon, sending the waste gases through a single scrubber so the purification level is 99.5 percent. What is left can then be transferred to the big rotary furnace's afterburner. It would be an economically and technically justifiable procedure," Bergstrom said.

P-CIG can certainly handle the Nordic region's freon/halogen waste if enough millions are invested, Bergstrom said.

"But the question is whether it is smart to begin the whole process with a 6-ton bloom of steel in a pressurized process. There are other systems that appeal more to my sense of safety."

Germany: Recycling Legislation Reviewed

Goals, Implementation Outlined

93WS0005A Duesseldorf VDI NACHRICHTEN
in German 4 Sep 92 pp 1, 8

[[Article by cf: "Scrapped Cars Being Recycled"]]

[Text] For many the surprise came in the middle of the summer hiatus: A few days ago, Environment Minister Klaus Toepfer sent off the new Old Car Ordinance. As of the middle of next year, motor vehicle manufacturers will presumably have to take back old cars for disposal

from the last owner at no cost. As a second goal, the ordinance stipulates that motor vehicles have to be designed so that they can easily be dismantled and their material recycled.

Almost all the major German automobile manufacturers are now using pilot facilities to test the possibilities of complete recycling. A number of technical questions have not yet been solved; reusing synthetics, glass and tires, for instance, is still creating difficulties. Even so, according to the result of a new industry report by the market research company AIK in Krefeld, it is possible to make a profit from a scrapped car which covers the costs of disposal without the recyclers having to charge a scrappage fee from the car owner.

The people in charge at the Kloeckner group in Duisburg believe that a nationwide return system for scrapped cars with subsequent reprocessing could be lucrative. The first pilot plant is scheduled to begin operation in Hamburg as early as next year.

Draft Bill to Recycle Old Cars

Beginning with the middle of next year the Ordinance on Avoiding, Reducing and Recycling Waste From Motor Vehicle Disposal, abbreviated as Old Car V, will take effect. This is approximately how long it will take until the draft bill presented by Federal Environment Minister Klaus Toepfer on 18 August has been approved by the cabinet and published in the Federal Gazette. Three months after this publication the ordinance will then take effect. The following are some excerpts from the draft:

Article 1. Waste Management Goals

Waste from the disposal of motor vehicles must be avoided and reduced through these measures:

1. Motor vehicles and their components, spare parts and replacement parts as well as accessories will be developed, designed and manufactured in such a way that they can achieve the longest possible useful life, be easily disassembled and, as far as is technically feasible, their components may be reused or their material recycled;
2. In manufacturing motor vehicles, individual components, replacement and spare parts, as well as accessories, materials will be used which facilitate reuse of the material, have standard characteristics and in other ways enable environmental disposal;
3. After completed dismantling, recyclable components will, if possible, be reused in automobile construction or as replacement parts, and non-reusable components will primarily be recycled for their material, whereby the recycled materials obtained will—as far as is technically feasible—be used in automobile manufacture

Article 2. Application Area

The regulations in this ordinance apply to anyone who professionally or on the basis of a business enterprise or public facility within the scope of the Waste Law

1. Manufactures or imports motor vehicles or replacement and spare parts, accessories and other components which serve to operate an already registered motor vehicle (producers);

2. Markets replacement and spare parts, accessories and other components which serve to operate an already registered motor vehicle, regardless of which marketing stage (marketers).

The regulations of this ordinance further apply to the owner of a motor vehicle (last owner).

Article 3. Definitions

1. Motor vehicles in the sense of this ordinance are passenger cars, mobile homes and campers, and commercial motor vehicles.

2. Old cars in the sense of this ordinance are motor vehicles, which have been irrevocably immobilized or after a period of one year following temporary immobilization have been declared irrevocably withdrawn from traffic.

3. An end user in the sense of this ordinance is anyone who does not further sell the replacement or spare parts, accessories and other components in the form sold to him.

Article 4. Obligation to Take Back

1. The manufacturer of motor vehicles is obligated to take back old cars from the last owner. This obligation is limited to old cars of his manufacture.

2. The return as stated under Item 1 must be assured by means of appropriate return systems. Return locations must be set up at least in the denser areas of the distribution network. If a corporation responsible for disposal has a region in which there is no sales outlet for the make of car in question, either a return location or a pickup system must be set up, through which the old cars can be fetched from the last owner.

3. The return as stated under Items 1 and 2 must basically take place free of charge for the last owner. Exceptions to the free return are, for example:

- stripped old cars, meaning old cars which have had parts necessary for operation removed;
- old cars, which are equipped or contaminated with parts, solid substances or liquids which for that reason influence recycling or disposal of the material;
- vehicles damaged in accidents, when disassembly is technically impossible;
- motor vehicles registered before this ordinance takes effect, if the disposal costs exceed the profit from the

resulting materials and for which the manufacturer has published the model, year of manufacture and cost of disposal.

4. Sellers of replacement and spare parts, accessories and other components which serve to operate an already registered motor vehicle are required, when selling such a component, to take back a similar, used component from the end user to the sales outlets. If a used component is not available in connection with the purchase of a similar component, the seller is obligated to issue the purchaser a credit slip for the later return, free of charge, of a similar, used component and to accept such a component against the credit slip.

5. Manufacturers and sellers of replacement and spare parts, accessories and other components serving to operate an already registered motor vehicle are required to take back free of charge the components returned by the seller in accordance with Item 4. Article 4, Item 4, paragraph 2 applies correspondingly.

Article 5. Recycling Obligations

1. Manufacturer and seller are obligated to submit the old cars, replacement or spare parts, accessories and other components received back in accordance with Article 4, insofar as technically feasible, for reprocessing or primarily recycling of the material.

2. In order to assure extensive recycling, after taking back the old car from the last owner, all fuels and other parts which affect recycling of the material must be removed and transferred to separate, nonpolluting disposal. Reusable materials and components which can be recycled must, insofar as is technically feasible, be removed.

Article 6. Recycling Goals

Based on the recycling obligations under Article 5, reuse or recycling of the individual materials to at least the following extent must be attempted:

Material	Reprocessing and Recycling of Material in Percent by Weight	
	1996	2000
Steel	approx. 100	approx 100
Nonferrous metals	85	90
Synthetics	20	50
Tires	40	50
Misc.		
Elastomers	20	30
Glass	30	50

Article 7. Commissioning a Third Party

Manufacturer and seller may make use of a third party to meet the obligations determined in this ordinance.

Article 8. Accountability of Manufacturer and Seller

Manufacturer and seller must show proof of recycled materials and of other disposal of received materials.

Article 9. Obligations of the Last Owner

The last owner of an old car must, after using it, leave it with the manufacturer, a third party commissioned by the manufacturer or other recycling operation in such a way that environmentally harmless disposal is assured.

Article 10. Violations

A violation in the sense of Article 18, Item 1, No 11 of the Waste Disposal Law is committed by anyone who deliberately or negligently:

1. In violation of Article 4, Item 1, does not take back old cars from the last owner,
2. In violation of Article 4, Item 2, does not assure that they are returned by means of an appropriate return system,
3. In violation of Article 4, Item 3, paragraph 1, does not take back the old cars without charge from the last owner,
4. In violation of Article 4, Item 4, does not take back replacement parts, spare parts and accessories without charge,
5. [omitted in original]
6. Does not cause the old cars returned in accordance with Article 4 either to be reused or have their material recycled,
7. Does not remove the fuels and other parts which affect recycling of the material and does not have them disposed of in a separate, nonpolluting process.

Proof of the last ownership for fulfillment of the obligations under Item 1 may be given by presenting a corresponding certificate to the motor vehicle registration office.

[Photo caption; photo not included] When the old car ordinance, as proposed by Federal Environment Minister Toepfer, takes effect, the scrap heap will no longer be the end of the line but the beginning of a chain of recycling.

Implications, Costs Discussed

93WS0005B Duesseldorf VDI NACHRICHTEN
in German 4 Sep 92 p 7

[Article by Hartmut Kowsky-Kawelke: "The Second Life of a Car"]

[Text] The auto industry appears speechless, the scrap association is deliberating and even the ADAC [General German Automobile Club] must "first take a closer look at" the new draft bill from the Federal Environment Ministry. In August, in the middle of the summer hiatus,

the federal environment minister sent down his new old car ordinance. The most controversial item in it is the issue of cost.

At present, according to the Federal Motor Vehicle Office in Flensburg, 36 million cars are driving on German roads. About 2.6 million vehicles are scrapped each year, says the Federal Environment Ministry (BMU). But only 10 percent of the accumulating old cars, according to the BMU, have their old parts partially reused. Only for the metals steel and aluminum is there any significant reprocessing even today.

The BMU stipulates in the new ordinance "on the avoidance, reduction and recycling of waste from motor vehicle disposal" that the manufacturer must take back and largely reprocess the motor vehicles. Further, motor vehicles and motor vehicle parts must be so designed that they can easily be dismantled, reused as components or have their materials recycled. Also, the components and materials used in the manufacture of motor vehicles must be identified, in order to simplify type-pure disposal.

The old car ordinance stipulates that an old car will be recycled by the manufacturer or by disposal companies authorized by the producer. Several recycling projects by various auto makers have shown over the past year what that looks like in practice. First, the scrapped car must be drained; operating fluids, gasoline and brake fluid are removed and reserved. In a second step all the reusable parts are dismantled and separately kept.

The obligation to take back cars applies initially to the manufacturer and also contains the establishment of a nationwide return system. The return is to be free of charge for the last owner of the motor vehicle. However, this does not apply to already stripped vehicles and to accident-damaged vehicles, for which dismantling would be very expensive.

The new ordinance—analogueous to the packaging ordinance—formulates parameters for the recycling rates for the various materials (see also page 8 [previous article]). According to the ratios mentioned, all the steel is to be reused as early as 1996. The ratio of synthetic parts will be 20 percent in 1996 and 50 percent in 2000. For tires the ratios are 40 percent in 1996 and 50 percent in 2000.

Along with the old car ordinance, in the future the Federal Environment Ministry will regulate the handling of so-called shredded light waste. At present about 450,000 tons of residue annually results from grinding up scrapped cars in the shredder, residue which in part is contaminated with pollutants and is usually deposited in dumps. Because of the high proportion of organic materials, in the future this light refuse will no longer be dumped but almost exclusively burned. The increasing proportion of plastics in the car—in 1979 not quite 3 percent synthetics was used in the passenger cars, in

1991 it was 13 percent—will also contribute to the further growth of shredded light refuse mountains in the future.

Although the affected trade associations showed themselves surprised by the old car ordinance, the environment minister's drive is not a lightning bolt from a clear sky: Klaus Toepfer announced as early as the fall of 1990 that the auto industry would be required to take back its product. Since then those involved have primarily been fighting about who would bear the cost. The auto industry has frequently stressed in the past: "Disposing of millions of vehicles cannot be done for free."

According to calculations by the ADAC auto club, disposal of a passenger car costs between 190 and 245 German marks [DM]. At BMW the pilot projects showed that a vehicle of this make costs about DM200. VW and Opel, on the other hand, state amounts between DM300 to DM400. The disposers are able to offset the profit from the various useful materials against these costs.

At the International Auto Expo in September 1991, VW and Opel in a surprise move supplied a return guarantee for all vehicles of the Golf III and Astra models after the 1992 year of manufacture. Ford and Mercedes also declared themselves ready to take back the new models without charge.

At the time Toepfer reacted with violent criticism. He pointed out that solutions for the already registered passenger cars had to be found. A series of auto makers such as BMW afterwards extended their willingness to accept cars to include older model years.

Meanwhile, nearly all auto makers have begun to develop pilot projects and disposal concepts for taking back passenger cars. The Ford works in Cologne, for example, began operating a pilot plant to dismantle old vehicles in 1991. Ford's first "licensed car recycler in southern Germany," the Gross company in Koengen near Stuttgart, has now begun operating. "It is ecologically and economically sensible," stresses Ford CEO John Hardiman, "to utilize the know-how of the recycling industry in the vicinity of the customer."

Despite the long preparation time, the manufacturers are refraining from commenting on the old car ordinance. VW executive board member Ulrich Steger welcomes it that in the draft the return of already registered cars is not free for auto owners. To be sure, the ordinance allows for the possibility that the auto maker may be released from taking back for free all vehicles registered before the ordinance takes effect, if he proves that the recycling costs of the vehicle exceed the profits from the usable materials. "With that the environment minister once again waffles on the cost issue," in the opinion of Ulrich Leuning, head of the Auto Disassembly Section of the German Scrap Recycling and Disposal Association in Bonn.

At the Federal Environment Ministry the intent is to use this passage to touch off a competition between the auto

makers: The producer who offers the car owner the cheapest disposal will receive access to the old car market faster. In fact, however, with this Toepfer distances himself from the focus of the old car ordinance, that the return of the car should be free for the last owner.

The last word has not yet been said. On 23 October trade associations, institutions and interest groups will present their positions and bring up proposals for changes at a hearing on the draft ordinance. The schedule provides for the ordinance presumably to take effect in April 1993. Vehicles registered after that must be taken back free of charge by the auto makers. But the industry does not agree to that and has already announced its desire to talk with the environment minister in a small group.

Synthetic Materials, Glass

93WS0005C Duesseldorf VDI NACHRICHTEN
in German 4 Sep 92 p 7

[Article by cf: "Scrapped Cars Are Worth Money"]

[Text] How quickly can the old car ordinance be put into practice? Many technical problems have not yet been solved. Even so, it is possible, according to a new study by the AIK consulting company in Krefeld, to make enough profit from a scrapped car to cover the disposal costs even without a scrappage charge. In the following, AIK business manager Edgar Kohlhaas supplies an overview of the present recycling possibilities.

Almost all the major German auto makers are today testing in pilot plants the possibilities of total recycling. Common to the concepts is that the first step is to drain the vehicle, after which follows disassembly, and the last step is the shredder. It is important to find a concept for reuse which functions for various makes.

The auto industry has declared itself ready to assist the further development of the recycling industry which has become necessary through the old car ordinance. A structural analysis of this is being undertaken at present. Meanwhile, it has also been clarified that the raw material industries are willing to take back their products such as oils and operating fluids, synthetics, glass and tires.

Even with the most modern plants a scrapped car cannot be completely recycled, however. Shredders, scrap recyclers and dump operators have problems with rubber, glass, textiles, paints and toxic fluids. Residual shredded waste, which at about DM100 per ton could still be relatively cheaply dumped, always remains behind. But in the future the legislator wants to declare shredded waste as special waste, which allows disposal costs to climb to at least DM600 per ton.

The new ordinance will change the range of materials in the car. The auto industry predicts that by the mid-1990s the proportion of synthetics in a mid-size car will be 18 percent, the proportion of steel and iron 63 percent and

the aluminum share 6 percent. Substituting steel and iron for synthetics will slow down, contrary to earlier expectations. Longer-term prognoses up to the year 2000 foresee the proportion of steel and iron dropping to 60 percent, synthetics growing to 20 percent and aluminum to 10 percent.

The auto and steel industries agree that by the end of the 1990s the car will contain up to 15 percent aluminum. The chances for growth in the synthetics field vary. The polycarbonates, polyamides as well as polyethylene terephthalate are predicted to grow sharply, while the share of PVC in the car will drop. The auto makers are further planning a completely halogen-free vehicle, which would mean giving up PVC.

Recycling the individual materials and components has progressed at varying speed. Steel and aluminum pose no problem, since their recycling ratio is 100 to 98 percent—this covers 75 percent of a car. It becomes more problematic when recycling the remaining 25 percent shredded waste, which until now has resulted from scrapping. One-third of this shredded waste consists of mixed synthetics; collecting it in a manner that separates the types is the key to success.

More than 30 percent of the shredded synthetics is rubber. Until today it has not been possible economically to extract a secondary raw material from it. Glass represents about 15 percent of the shredded waste; the high demands on auto glass makes recycling difficult, if not impossible, here as well. For brake and cooling fluids a method was developed by the Association for Environmental Technology in Eppingen, with which glycol-containing operating fluids can be reprocessed. In recycling catalytic converters the industry is still awaiting an upswing.

Recycling synthetics is not yet satisfactory today, and the many varieties and material combinations complicate their reuse. Based on about 3 million new registrations a year in 1990, in the future about 300,000 tons of old synthetics will accumulate annually from cars in the old laender.

Despite all the technical difficulties and unclarified questions, the summary must be that a scrapped car is nevertheless worth money. The proportion of its steel and nonferrous metals alone yields about DM345 right now. If today's 5-percent aluminum share were to increase to 25 percent, the scrapped car would then be worth more than DM900—more than enough to cover the costs of disposal even without charging the much-discussed scrapping fee.

BMW Official Interviewed

93WS0005D Duesseldorf VDI NACHRICHTEN
in German 4 Sep 92 p 9

[Interview with Klaus Vornberger, head of BMW's disassembly pilot plant, by CF [VDI NACHRICHTEN],

date and place not given: "The Market Should Determine the Price for Auto Recycling"]

[Text] In order that the most economical and nonpolluting recycling and disposal may be assured, according to Klaus Vornberger, head of the disassembly pilot plant at BMW, the entire recycling chain should be controlled by the vehicle manufacturer. Thus, even the continued technological development of the vehicles could be monitored and controlled in the sense of creating genuine material cycles.

[VDI NACHRICHTEN] The new return ordinance provides for the auto industry to take back without charge those cars which are registered after the ordinance takes effect. What will happen to the 36 million cars which are already rolling on our streets?

[Vornberger] Our company is not the only one, but some other car makers have also, to some extent, been occupied—independent of the legislation—with environmentally safe recycling of old vehicles. The result is the comprehensive concept for the future return and recycling of old cars worked out in cooperation with the other German car makers, as well as partners involved in the supply and raw material industries. The most significant points of this concept have now not only been accepted and adapted all over Europe, but in the United States and Japan as well.

[VDI NACHRICHTEN] The perpetrator principle is one of the core requirements of the German environmental policy. Why has not the German automobile industry focused on this for a long time?

[Vornberger] On the occasion of the presentation on 18 October 1991 of the first recycling operation designated by an auto maker and operating according to its guidelines, BMW announced that all models built by us will be taken back. This is done according to the basic market-economic mechanisms of free pricing between the last owner of the old car and the recycling operation. In the meantime, additional enterprises in Germany, as well as in Austria, Switzerland and the United States are being selected and designated. The building of a nationwide recycling network will be pursued.

[VDI NACHRICHTEN] The undersecretary of the Federal Environment Ministry recently complained that the auto industry could not possibly be allowed to wait to make recycling available until the year 2005. He demands solutions which take effect much sooner. Is this realistic?

[Vornberger] With the establishment of a nationwide recycling network and the recycling certificate we require, comprehensive recycling or disposal of old vehicles can already take place significantly sooner (about five years).

[VDI NACHRICHTEN] Right now 450,000 tons of shredded light waste is being deposited in dumps. Does

the industry have any proposals ready for environmentally compatible reprocessing or recycling?

[Vornberger] In order for shredded residue not to occur, it is our principal goal to close as many material cycles as possible before the shredding process by means of technically and economically optimal dismantling. Where this course does not appear sensible for financial reasons, a combined process of chemical recycling (such as pyrolysis) with energy utilization (thermal post-treatment), as is demonstrated by KWU's [Kraftwerk-Union] so-called low-temperature carbonization method, could be used. This could be used to provide maximum recycling of shredded residue material.

[VDI NACHRICHTEN] How do you evaluate the technical opportunities available right now for reusing individual materials from old cars?

[Vornberger] Not everything that is technically feasible is ecologically as well as economically sensible. The material ratios required ("to be attempted") within the framework of the recycling goals of the old car ordinance are to some extent impossible to achieve in the medium term, both as regards adherence to and checking and verification of them. This applies less to steel and nonferrous metals, but particularly to "other elastomers" and "old tires."

[VDI NACHRICHTEN] Are the automobiles now on the market at all recycling-friendly? Does the same apply to imported cars (Japan)?

[Vornberger] Some. For example, in its approach the current 3-series BMW has been developed and produced in environmentally compatible and recycling-friendly ways, which is primarily shown by a recycling ratio of more than 80 percent by weight (empty weight of the vehicle without special equipment). For future vehicles we attempt increasingly higher recycling ratios (overall vehicles). The "top of the flag pole," in our view, lies at 90 to 95 percent recycling of material for large-series vehicles.

[VDI NACHRICHTEN] How much will Toepfer's demands affect the design of future models?

[Vornberger] The goal of developing and producing qualitatively high-grade products in an environmentally compatible way is already being pursued by everybody! What has been added now is the achievement of a maximum degree of recyclability of the entire vehicle. To this end we are studying environmentally clean design/construction of current and future vehicle generations in the pilot dismantling plant we have operated since 1990.

[VDI NACHRICHTEN] Will there soon be an easily dismantled passenger car with modular construction?

[Vornberger] Easy disassembly design is an elementary component of vehicle design suitable for recycling.

[VDI NACHRICHTEN] Who will have to pay the costs of the "old car return ordinance"?

[Vornberger] We are still convinced that free pricing between the last owner and the recycling operation is the more sensible way to go.

It may be assumed that for future old vehicles German manufacturer will cover the recycling costs with profits from the materials and a residual value will be left over for the last owner.

[VDI NACHRICHTEN] What support does the car industry expect from the politicians/legislators in order to be able to put into effect the most promising recycling concept both ecologically and financially from today's aspect?

[Vornberger] Shortening the licensing procedures and providing help in processing the applications. The necessary acceptance by the population must be created for this reprocessing and its facilities.

Realistic material utilization ratios must be set.

Prices must be allowed to develop freely—even for new vehicles—at the interfaces between the last owner of the old car and the one who takes it back and all recyclers and reprocessors involved.

PRAVDA

The BMW, Ford, Mercedes-Benz, Opel, Porsche and VW companies have joined together in the Project Team Recycling of Old Vehicles of the Association of German Automobile Manufacturers (PRAVDA) in order jointly to develop concepts for recycling old cars.

Local Company Discusses Efforts

93WS0005E Duesseldorf VDI NACHRICHTEN
in German 4 Sep 92 p 10

[Article by Rudolf Schulze: "Old Cars Become a Source of Useful Materials"]

[Text] The Duisburg group Kloeckner & Co. is entering the market with a concept that already corresponds with the old car ordinance presented by Federal Minister Klaus Toepfer. The first pilot plant for motor vehicle recycling will begin operation in Hamburg as early as next year.

In the future motor vehicle manufacturers will have to take back and dispose of cars from the last owner free of charge. This is required by the "Ordinance on Avoiding, Reducing and Recycling Waste from Motor Vehicle Disposal," abbreviated as Old Car V, presented by Federal Environment Minister Klaus Toepfer on 18 August 1992. With an annual accumulation in the FRG of about 2.6 million old cars that had to be disposed of already in 1991, this is not an easy logistics task.

This creates new business fields, which, although they are able to reach back to proven techniques in some fields, must produce pioneering services particularly in recycling synthetics.

"On the one hand we regard the old car as a source of raw and useful materials, but on the other hand a future supplier to the auto industry must also be capable of offering recycled products," is graduate engineer Karl-Heinz Doerenkamp's comment on the development. As early as 1990 he was delegated by the executive boards of the Kloeckner & Co. Trading Company and the Kloeckner Works to deal with recycling concepts within the group: "Kloeckner & Co. has been active for several decades in the secondary raw material extraction field. Today five modern shredder operations are processing the old car bodies delivered to them."

After an investment plan to be presented even this year, together with partners the group intends to have a nationwide network for auto recycling set up in 1996. "Then car owners can deliver their old car to about 150 return centers," as Thomas Kraemer describes the outlook. Previously Kraemer worked as a sales director for tire reprocessor Vergoelst; today he is responsible for automobile recycling at Kloeckner & Co.

But auto recycling costs a lot of money to start with. The owner will have to pay up to DM300 for disposal of his vehicle if it was bought before the old car ordinance takes effect; later, the auto companies will assume these costs. "This amount can only serve as an approximate guide at this time," according to Kraemer, because in practice these costs can be offset against the salvage value of the cars—if the engine can be resold, for example.

Kloeckner & Co. is looking for a partnership with regional auto recyclers, for example as a return location. These old car return locations will not look like scrap heaps, but here is where services are to be rendered ranging from pickup, deregistration and loading to recycling the motor vehicle. Ideally, according to Kraemer's information, the people working in such a field will be experts who estimate the value of the car, decide which parts can be resold and which car is ready to be scrapped and directly recycled as a source of useful materials. After that these vehicles will "relatively quickly"—according to Kraemer—be shipped to the intermediate recycler. A network of about 80 to 100 of these intermediate recyclers will accept old vehicles in the FRG.

The intermediate recycler drains the vehicle, meaning he removes all fluids from the vehicle, dismantles tires, glass panes, seats and larger synthetic parts and sorts them, insofar as identifiable, into types. "When dismantling parts we can proceed according to the handbooks which were made available by the car makers. They also provide the addresses of companies which accept the resulting raw materials, if we cannot reprocess them in our own group," Kraemer describes the process.

Doerenkamp allocates DM10 to 12 million to the establishment of an intermediate recycler if built from scratch. This amount includes the investments for sealing the ground against seepage from fluids, storage spaces, disassembly halls and high rack storage.

In order for these investments to be profitable, when completed about 20,000 to 25,000 old cars will have to flow through such a factory per year. For the first pilot facility in Hamburg, to be built jointly with the Kiesow company, Doerenkamp calculates that in 1993, 6,000 vehicles a year will be drained and disassembled there.

But the accumulating synthetics differ considerably in their composition. "Even ABS, depending on the manufacturer, is not identical to the ABS from another manufacturer," Kraemer analyzes. While type-pure synthetics can be sorted according to vehicle manufacturer and product type and delivered ground up for recycling to companies, ways must be found to recycle synthetic compounds and the subsequent synthetic residue from the shredder facilities.

The vehicles begin their last journey from the intermediate recycler to the shredder facility pressed flat. The result here, after the comminution, is sorted magnetically, by means of eddy currents or the sink-float process according to iron, nonferrous metal, aluminum or—in the future—synthetic waste. This reduces the amount of pure waste considerably.

The 30 to 50 percent by weight synthetics in the shredded waste results in a mixture with a caloric value similar to brown coal. But whether the stuff will also be burned is something only the future will tell. Doerenkamp believes that a way to recycle will open up here as well, because the parameters of old combustion facilities of 20 years ago cannot be compared to those in future thermal or power plants.

Another way to recycle has been found by the company's subsidiary Er-We-Pa in Erkrath, in cooperation with Kloeckner group subsidiaries and higher education researchers, for the mixed synthetic product that results. In the extrusion process a "synthetic oil" is produced, which, for example, could be used in blast furnaces as a reducing agent, Doerenkamp hopes.

Doerenkamp mentions the following to prove that the entire recycling chain balances out: During shredder operation the costs of disposing of the shredded residue drop, since about 40 percent are removed as synthetics and transferred to the extrusion recycler. The latter again gets revenue from selling his end product, for example as a heavy oil replacement, to blast furnace operators. They, in turn, could be motivated to use the "synthetic oil" with a price that is lower than that of heavy oil.

Sources of income for old motor vehicle return locations and intermediate recyclers are the amounts they charge the car owner or car makers for the obligatory disposal as well as profits earned from selling parts or—later on—raw materials.

The concept will also be profitable for Kloeckner & Co. Not only can its subsidiaries sell their recycling technology, but they can make a closed recycling chain available to their own auto supply companies. But they must anticipate competition, both Doerenberg and Kraemer are realistic about that. Exclusive contracts with car makers regarding the return of cars have not been done before.

The entire concept of old car return locations would be greeted by the auto makers, one hears. What Kraemer does not mention but can be heard in the industry is: The car sales outlets do not want to destroy the noble impression of their establishments by the delivery and parking of scrapped cars.

The planned old car ordinance can become an economic program for those enterprises which at an early stage get involved in solving the problems of recycling.

FACTORY AUTOMATION, ROBOTICS

Citroen Tests YAG Laser Robotized Cell

92WS0737A Paris *TECHNIQUES ET EQUIPEMENTS DE PRODUCTION* in French Jun 92 pp 48-49

[Article by Michel Defaux: "Cutting Technology: The YAG Arrives"; first paragraph is *TECHNIQUES ET EQUIPEMENTS DE PRODUCTION*]

[Text] Peugeot Citroen is now testing a robotized YAG laser cutting cell at the Citroen Aulnay plant. The first of its kind, the device incorporates standard robots, a pulsed YAG source, and a fiber optic hookup. Results will be out in a few months.

"This is the first time a YAG laser has been used in production," immediately stresses Emile Leberichel, the head of Peugeot's Technology and Robot Research Unit (CERA). The pilot installation for cutting out the rear wheel humps on AX Sport bodies has been set up in Citroen's Aulnay-sous-Bois factory, and is operating to the satisfaction of all the corporate partners.

From the standpoint of automakers, using lasers to cut auto bodies is highly recommended. Options such as radio antennas, windshield wipers, or left-sided driver controls can be added at the last possible minute, freeing manufacturers from managing large stocks of different parts or checking quality (precise cutting of body holes).

The idea for the pilot YAG laser project came from Peugeot/Citroen's Research and Scientific Affairs Division, which wanted to validate the process industrially after completing laboratory work. "Big-company bosses shy away from industrial risks," adds Alain Corbet of the robot research unit in Peugeot's Research and Scientific Affairs Division. Renault Automation with its robotics department and Cheval Freres with its YAG lasers had the same intentions. "We got the chance to work together."

Around the same time, the Ministry of Industry and Foreign Trade (MICE) kicked off the "industrial lasers" campaign, whose theme was the integration of industrial lasers into manufacturing. The all-French YAG project was selected and granted a government subsidy covering 28 percent of its cost.

Peugeot's Methods Division then selected the application and found people interested in getting involved in the pilot operation. They chose the Aulnay plant, where there was enough space in the rimming shop, manual backup in case of breakdown, and no disruption of the overall production cycle.

The operation consists of a making an arc-shaped cutout in plain bodies (sheet thickness = 0.7 mm) to allow the insertion of rear wheels to within +/- 0.5 mm. The task had previously been done using manual plasma cutting, followed by a disk insertion step that took three to four minutes per vehicle.

The YAG laser cutting cycle is now as follows: The body (one car every two minutes) arrives at the laser enclosure on the conveyer belt and is positioned on the jog table. One of the two polyjointed Acma SR 400 robots first feels (mechanical sensor) the body in three places to precisely define the vehicle's position and sends the information to the robot's command rack for trajectory adjustment. The actual cutting can then begin. The Cheval Freres 400-W pulsed Yag laser has a mirror that alternates sending the beam to one of the two optical fibers mounted on the armtips of the two Acma SR400 standard robots.

Easy Beam Manipulation

One of the two robots then commences cutting at the rate of three meters/minute, while its counterpart on the other side of the body begins covered-cycle measurement. On the cutting head, a capacitive sensor adjusts nozzle height to the sheet (a distance of 0.5 mm +/- 0.3 mm). "Without the sensor, the check site was brought to a standstill," says Didier Cheval, the marketing director of Cheval Freres. "We designed it in six weeks. For a small company like ours, which has a laser department staff of 25, a project life that is equal to six person-years." The sheet-metal piece is cut out in 30 seconds, using several clever tricks dreamed up by the methods department. The machines are programmed to shift burn defects onto the scrap piece, for instance, and to cut it out in two movements to balance it.

There are many advantages to using the YAG. CO₂ laser cutting has so far proved extremely expensive, notably due to loss of mirror adjustment, and the YAG is reportedly cheaper. "The cost of operating a laser depends on the life of its flash lamps," explains Didier Cheval. "Before, they had to be changed after four to five million impulses; today they last 10 times longer." The ease of manipulating the YAG is another point in its favor. CO₂ lasers require gantries that cost about 3 million French francs [Fr] (the beam travels through the arm) and are still at the prototype stage. Optical fibers

enable users to employ standard robots that cost Fr500,000 apiece. "Laser cutting is the most demanding process for the robot," says Michel Fayolle, head of the products department in Renault Automation's Robotics and Automated Assembly Division. "It involves precise accuracy and speed requirements. We had to install new functions in the control cabinet, which had to be more adaptable. Those of us responsible for integration worked the equivalent of 10 person-years."

Another important feature of a laser installation is safety. Until the results of EUREKA research are in and future standards have been written, users are trying to protect everyone against radiation. In Aulnay, this means a closed vault enveloping a second area that houses the laser and is accessible to the laser specialist, glass shielding windows that attenuate radiation, and safety instructions.

First Results Out in September, 1992

"The YAG has a safety advantage," says Didier Cheval, "since the collimated beam cannot leave the vault. There is beam spread, and the energy is scattered over a large surface area, but it is still dangerous to the eyes (operators must wear protective glasses). Moreover, our laser heads are equipped with an energy detector that compares the number of joules at emission and arrival of the beam. If there is a loss, the laser shuts down automatically."

Initial results on the laser's reliability, operating costs, and profitability are expected for the fall of 1992. "It looks encouraging so far," concedes Emile Leberichel. "We have not had any hitches and we have produced several hundred cars. The YAG pilot project puts Renault Automation and Cheval Freres right up with the best in the international market, that is, the Germans and Japanese." There are two potential markets for the YAG device. In the very short term, it could be used to cut sheet-metal prototype parts, where it should be able to compete with the CO₂. In the longer term, it could customize vehicles as in Aulnay. Indeed, to make good use of the new laser tool, engineers must take it into account while the vehicle is still on the drawing board. There is now a four-year lead time between the start of research and the industrialization of a new vehicle.

France: Rapid Increase in CAD/CAM Systems

92WS0737B Paris *TECHNIQUES ET EQUIPEMENTS DE PRODUCTION* in French Jun 92 p 20

[Article entitled: "CAD/CAM Use Jumps 65 Percent in Two Years"; first paragraph is *TECHNIQUES ET EQUIPEMENTS DE PRODUCTION* introduction]

[Text] According to Mithec Research, the number of CAD/CAM stations installed in France jumped from 41,400 in 1989 to 68,400 in 1991. Yet this sharp increase has not benefited suppliers, who are embroiled in a price war.

One trend can hide another. According to Mithec Research, the growth in the value of the French CAD/CAM market collapsed like a fallen soufflé in 1991. On the other hand, the number of installed stations continues to shoot upward at a nice clip. While the CAD/CAM market has only grown a few points, "between zero and 5 percent depending on how you measure it" says Mithec, but far from the double-digit growth of previous years, the number of CAD/CAM software users continues to swell. The total number of installed CAD/CAM stations jumped from 41,400 at the end of 1989, to 54,400 the following year, and 68,400 in late 1991. That is an increase in volume of just over 65 percent in two years.

These data are more indicative of qualitative than quantitative changes in the market. In 1991, French companies invested just over 5 billion francs [Fr] in CAD/CAM hardware and software, or about the same as the year before. On the hardware end, terminals—which still account for 16 percent of the market—continue to slowly give way to microcomputers (52 percent of installed systems) and especially work stations (32 percent in late 1991 compared to 29 percent at the end of 1990).

And as it did last year, the machine industry has captured the lion's share, with 60 percent of the market. That compares to 18.2 percent for electronics, and 14.8 percent for construction engineering applications. "IBM Cadam-Catia" has pulled ahead of the pack a bit with 18.5 percent of the market, and has captured the place of Computervision, which lost more than two points (16.1 percent compared to 18.3 in 1990). IBM reportedly got a boost from the introduction of its RS 6000 work station, while Computervision was late in bringing out its Cadds 5.

Running a distant third, Intergraph has seen its market share increase in the space of a year through its takeover of Dazix. Matra Datavision and Mentor Graphics have hardly budged. These five companies' cumulative sales account for 50 percent of the total market.

The almost unchanged value of the CAD/CAM market has gone hand in hand with sharp increases in the number of licenses sold by suppliers, and camouflages a secret battle to hold on to market shares. "Discounting has become automatic, and 'customer-tailored' prices are the rule.... Settling for a 10-percent rebate must seem pretty naive," writes Mithec in its introduction. Software suppliers say they are getting out of hardware sales—the price of work stations has dropped 20 to 30 percent in one year—in order to hang on to the still-lucrative market of maintenance contracts for software upgrades.

But for how long? "The survivors will be those smart enough to position themselves as quickly as possible in the new environment," predicts the research firm. Only 3 percent of the 400 CAD/CAM suppliers rake in 60 percent of the industry's revenue. Fewer than 10 companies make over Fr100 million in sales.

The good health of the CAD/CAM sector seems to be based on still-fragile foundations. In 1991 users took advantage of the situation to push down prices. Tomorrow, we can expect a shakedown, willing or forced, of suppliers.

France's TS Builds 10-Cubic-Meter VPD Chamber

92WS0739B Paris L'USINE NOUVELLE
TECHNOLOGIES in French 16 Jul 92 p 12

[Article by Jean-Yves Catherin: "Revolution in VPD Deposition"]

[Text] Thanks to modifications brought by Techniques Surfaces (TS), the VPD deposition technique developed for microelectronics is being applied to thick layers and is broadening its range of applications.

Used almost exclusively in microelectronics, VPD has been widely studied but has resulted in few industrial applications. Jean-Marc Poirson, in charge of industrial development at Techniques Surfaces (HEF group), confirms this: "It is difficult to increase cathode sizes, to move on to thick layers, and to turn a process labeled as high-tech into a routine VPD process."

Without any spectacular innovations, TS has nevertheless mastered these three problems. Specialized in friction, wear, and surface processing, midway between basic research and industrial applications, the Saint-Etienne company has concentrated on this technology, which makes it possible to produce a large number of coatings with a wide range of materials. On glass, Marie-Brizard uses it to lay down nickel-chromium designs; on aluminum, an American sensor manufacturer uses it to deposit gold circuitry; it enabled Aerospatiale Cannes to build the PM 2200, a one-of-a-kind 10 cubic-meter VPD chamber to process the sun shield mounted on the cryogenic telescope of the future ISO satellite. This conical device, 2 meters in diameter, will have an inside surface of 99.99 percent pure gold in a 1000 Å +/- 10 percent layer. Moreover, and even more exceptionally, the PM 2200 and other production chambers are housed in a class 1000 clean room! The fabrication of this sun shield illustrates the difficulties that have to be resolved: even deposits (achieved through relative device/cathode motion), construction of giant cathodes, and a precise and calculated polarization of the part, normally at a floating potential. "Concerning thicknesses, there is unquestionably a trend to use VPD" for wear-resistant coatings, such as those on cutting tools, chrome-based coatings, valve pushrods, rocker arm pads, injection molds or extrusion screws. Research? Not at all: TS can already mass produce thicknesses up to of 10 microns.

SNECMA Develops Continuous-Wear Detector

92WS0739C Paris L'USINE NOUVELLE
TECHNOLOGIES in French 16 Jul 92 p 14

[Article by Marc Chabreuil: "Early Wear Detection With Protons"]

[Text] Now at the service of industry, surface activation combines precision, speed, and low cost.

Detection of the first signs of wear in a ball bearing 30 minutes before the vibration level increases, continuous measurement of the amount of spalling to within 0.2 mg... these performances are the result of a collaboration between Snecma, in Villaroche, and IDS [Industrial Diagnosis Services], a Belgian PMI [small and medium-size enterprise], offering the only industrial service of its kind in Europe: the use of surface activation for continuous measurement of wear.

To study the degradation of a ball bearing intended for a SNECMA turboreactor, the outer ring was "activated" to a depth of 80 microns by a low energy proton beam. Thus the atomic mass (an infinitesimal proportion of Fe 56 is transformed into Co 56 that emits gamma rays) and the mechanical properties of the material remain unaltered. At the test stand, the "radioactive" wear fragments carried by the lubricant are tracked by a radiation detector and high speed electronics, and they are then captured by a filter carrying a magnet. The first signs of spalling were detected 72 hours after the beginning of the test. One half-hour later, the vibrations went from 6 to 9 g. Thierry Delvigne, the IDS project leader who expects to reach a sensitivity of 10 microgram (a 0.0013 millimeter cube filing!) said that at the conclusion of this test, "we found that 8 percent of the particles had been captured. During the next cycle next year, optimization of measurement parameters will improve these results."

Except for plastics, this method applies to all materials including ceramics. Adopted by some German car manufacturers, it should, under IDS's control, widen its field of applications. For the development and stress testing of mechanical components, activation offers multiple advantages: verification of inaccessible parts and precise location and quantification of wear under actual operating conditions, all of it with high speed and low cost.

Eastern German Manufacturing Research Center Described

92WS0769A Berlin FERTIGUNGSTECHNIK UND
BETRIEB in German Jun 92 pp 277-278

[Article by FB3391: "FZM Machine-Building Research Center"]

[Text] The FZM Machine-Building Research Center, Inc., does research, development, and engineering work for the machine-building and finishing industry. Emerging from the former Machine-Tool-Building Research Center, the GERFEMA parent company, that is, Company for Rationalization, Research, and Development in Machine-Building, Inc., so far has been handling mostly orders from western German and western European industry. In some fields, this share amounts to around 80 percent. The enterprise, which was privatized last spring, racked up a sales volume of DM30 million in 1991 with 400 employees in its central division. One of the fields of business activity of FZM involves the

development of software for design and production planning (work planning, CNC workpiece program, TOOL management).

Some results will be described below.

CASOFT-PRO Work Planning System

The FZM, Chemnitz, developed the CASOFT-PRO work planning system as an open, modular program system for:

- drafting,
- changing,
- storing,
- and managing work plans.

It is designed for IBM-compatible PC computer technology in the MS-DOS operating system. The employment of standard or comparative work plans is supported in a user-friendly fashion.

Work-cycle calculation building blocks are available to determine interface and time values, for example, for operations that involve turning, milling (Figure 1 [not required]), outside and inside cylindrical grinding, and gearing. The building blocks are based on standard cutting and chip removal values established by reputable machine-tool makers and thus offer secured specifications for a production effort in keeping with quality requirements at reasonable cost. When necessary, it is possible to print out work instructions/sample time calculations that provide all production-engineering and planning data for the particular work cycle in a clear form. The work cycle calculation building blocks can also be used autonomously.

An interface connection makes it possible to add other program building blocks, such as, in-house developments by the users for special production processes, as well as assembly and testing methods. Other interfaces make it possible to tie in a PPS system, to connect up to the CAD systems, to fuel and power resources management, as well as to CNC programming systems. ASCII data files ensure smooth data transfer without any problems.

Tool Management

The FZM, Chemnitz, developed a fuel and power management and information system for tool management. The CASOFT-BM-VIS software package, which comprises 70 individual programs, can be used on PC computer equipment within the MS-DOS operating system (Figure 2 [not required]).

It makes it possible to solve the following problems in a computer-assisted manner:

- fuel and power inventory monitoring, inventory data acquisition,
- fuel and power resources ordering,
- recording of cost-item-related consumption,
- compilation of complete tools for CNC processing, development of the tool setting sheet,

- tool numbering,
- issue of fuel and power resources list in relation to specific enterprise,
- image screen information on fuel and power resources,
- data transfer between CASOFT-BM-VIS and work planning or CNC programming system, for example, CASOFT-PRO, CASOFT-BOFR.

Its use is effective in all divisions that work with fuel and power resources data, regardless of the size of the enterprise involved.

Program packages, tailored to specific customer requirements, are put together as a function of user objectives.

CNC Workpiece Program With CASOFT-BOFR/DR and CASOFT-HFS

The FZM also works with new systems for CNC workpiece programming. With the designation CASOFT-BFR/DR, it is offering improved versions of the following processes: drilling, milling, turning as well as punching, nibbling, autogenous cutting, laser cutting, and eroding (Figure 3 [not required]). Practical requirements regarding complexity, integrated production know-how, and simple handling were given special consideration in the design of this system. At this time, 155 companies are already availing themselves of these advantages. This high level of production-engineering output capacity is characterized by the following:

- various profile cutting distributions during turning, specification of variants for drilling and milling tasks;
- determination or specification of startups and overruns in different variants;
- automatic interface calculation, operationally adaptable, as well as time determination;
- torque and output testing for each cut [profile], interface value reduction during overwrite of performance boundary values from machine to tool;
- automatic selection of required collection value storage;
- consideration of powered tools in lathes, as well as machines with two supports (2 x 2 axes possible);
- output of highly informative technological evidence and documents.

The user can conduct the user-friendly input dialogue in German or in other languages. With the help of the geometry input, it is possible graphically to illustrate both the data that were put in and the results of programming as such.

Tools, clamping devices, and mechanisms are displayed together with the startup and work movements on the image screen (two-dimensional, three-dimensional illustration, with or without zooming).

Besides, the programs offer a possibility of processing practically-tested technological cycles (backward countersinking, cutting chip breaking) and to circumvent

obstacles. In this way, the user can determine effective and no-collision work procedures. This is all the more advantageous, the more complicated the processing happens to be, for example, during multilateral processing.

The CASOFT-HFS (contour line milling of sliding surfaces) program was developed for programming NC machines with three simultaneously movable axes. It permits an easily learned, dialogue-directed programming of sliding, adjusting, and simple three-dimensional surfaces and can accomplish processing simulation in four views (Figure 4 [not required]).

The CASOFT-TRN program has turned out to be a useful aid in programming, with its help, one can meaningfully separate extremely long control programs according to various criteria. So far, the FZM has developed around 100 control programs for 15 different enterprises. This opportunity is used primarily by small and medium-sized companies in the mold and tool-building industry that did not have any facilities of their own for 3- to 5-axes program.

Determination of Temperatures in Structural Components

A numerical process was developed for the mathematical determination of the temperature distribution in resting and moved machine parts. It makes it possible to determine the temperatures on the surface and inside bodies, for example, tools, workpieces, machine-tools, pumps, condensers, turbines, refrigeration machines, combustion engines, electric motors and generators, electronic subassemblies, apparatus, etc. In another step, one can calculate tensions and deformations on that basis. Consideration is given to heat sources, such as friction, metal-cutting, process heat, electric power losses, as well as heat transfer of ambient or cooling air, lubricating liquids, pipelines for compressed oil, compressed air, or electric power and auxiliary power packs.

In the course of the calculation, the heat transfer and heat conductivity coefficients and the temperature distribution are determined in the modeled structural components. In that way, components with a critical temperature can often be developed in a shorter time and without the need for building and testing prototypes.

The calculation process programs a series of standard functions, additional conditions can be specified by means of externally determined parameters. Input data are dimensions, working or raw materials, rpm's or speed, output, ambient temperatures, temperature and speed of heating agent or coolant, as well as power loss. Friction in bearings, seals, revolving parts in air, water, etc., is calculated internally. The output consists of drawings with curve clusters of the temperature after reaching the equilibrium state or at certain points in time. The programs can be run on personal computers or work stations with color-graphic image screen. A standard version of the program package can be supplied; special functions can be programmed and inserted as desired.

In addition to this computation method, the Machine-Building Research Center also has voluminous systems available for measurements on subassemblies, machines, and apparatus. In that way, one can determine thermal behavior at modern measurement stations.

Consideration was given in the computation process to lessons learned from measurements on machine tools. It is possible to combine experimental investigations and theoretical calculations and thus to improve the process further.

Structure, Problems of Italian Aerospace Industry *92WS0769B Bonn WEHRTECHNIK in German* *Jun 92 pp 51-52*

[Article by Andrea Nativi: "Where Does the Italian Aviation and Space Industry Stand?"]

[Text] The Italian aviation and space industry has been a partner of German industry for more than 20 years, for example, with respect to the G.91, F-104G, Piaggio 146, TORNADO, and European Fighter Aircraft programs. Nevertheless, little is known in Germany about the Italian aviation and space industry. Dr. Nativi, our contributor in Genoa, in his article describes the difficulties entailed in the reorganization of industry which essentially is concentrated in two government holding companies controlled by different parties.

Today, the Italian aviation and space industry is having a rough time. In a time of complex reorganization, external factors and purely home-made problems have caused a trend toward a recession.

In the big exporting countries, the political leadership supports local industry directly and financial institutions are available in order to provide financing for exports; the armed forces also support export efforts by means of demonstrations and visits to the military command echelons of potential customers.

Obstruction of Exports

In Italy, the exports of the armament, aviation, and space industry (both civilian and military) came to barely 1,000 billion lire in 1991, compared to almost 4,000 billion lire in 1984. This decline cannot be blamed on a decreasing demand; instead, it is caused by a complex bureaucracy that trips over itself, as well as by long-winded, laborious procedures.

Some of the negative examples, as to how Italian authorities handle sensitive cases involving arms exports, include the Iraqi Navy contract. Such failures do not help boost Italy's reputation as a reliable supplier of arms.

Last year, Parliament approved new regulations that can be considered satisfactory in terms of arms exports. Now the difficulties spring from the slow working style of the government authorities. Besides, subordinate sectors often act more Catholic than the Pope himself. For

example, there was a paradoxical situation where spare parts shipments to other NATO member countries were delayed for many months. In some cases, distribution of brochures was even forbidden, not to mention a ban on the demonstration of hardware.

Attendance at aviation and space fairs is possible only after lengthy and difficult discussions as to the why's and wherefore's, if one intends to show more than just a few pictures plus a video. All of this, naturally, only makes the foreign competition very happy.

This attitude of disinterest and aversion against the armament, aviation, and space industry is utterly incomprehensible because this industry has for decades belonged to the state itself. The state, as a political entity, hamstringing itself as regards its industry entrepreneur function.

The Structure of Industry

IRI [Industrial Reconstruction Institute]

Here, Italy's industry is in practice controlled by the two big financial holding companies, the IRI and the EFIM [Manufacturing Industry Holding and Financial Company]. That forces private industry into a secondary role as regards size and sales volume. The IRI operates either directly or through the holding company called Finmeccanica [Mechanical Engineering Finance Corporation]. It controls the aviation and space industry. Alenia is the leader here. Compared to the other European conglomerates, it is a mini-giant that resulted from the merger of Aeritalia and Selenia. Its products include military and civilian aircraft, electronic systems, engines, and regulating and monitoring systems, as well as partnerships in many Italian and foreign enterprises.

Alenia is also influenced by the general situation on the world market. In 1991, Alenia SpA—not including its affiliates—achieved a sales volume of 3,866 billion lire, as against 3,221 billion lire the year before. For the concern as a whole, the sales volume comes to 4,800 billion lire and the profit is 600 billion lire. The armament share out of the total sales volume is just a little bit below 60 percent. At Alenia Aerospace, the export share comes to 60 percent whereas at Alenia Defense Systems, it is only 30 percent. In spite of the unsatisfactory financial results, investments for research and development still amount to 1,000 billion lire per year.

Alenia is subdivided into three divisions: aviation, defense systems, and civilian systems, with Alenia Spatio as 100 percent affiliate.

By the end of 1992, the company will have to let about 3,000 people go (about 10 percent of the total personnel force); this will be the result of early retirements or "unemployment benefits." At the end of 1990, it employed around 30,500 workers.

EFIM

The situation at IRI looks difficult but it is downright dramatic in the EFIM group. The most important holding company of EFIM, FINBRED (Ernesto Breda Finance Company), holds the capital of Officine Galileo and SMA [Naval and Air Signaling] and controls OTO Melara and Breda Meccanica via OTOFIN. Results for 1990 show a net profit of 2.1 billion lire with a total sales volume of 1,151 billion, earned mostly in the armament sector. As of 31 December 1991, the enterprise employed 7,000 persons. Layoffs are unavoidable; they have already been announced by OTO Melara and Breda will follow suit.

EFIM also controls the Agusta Group via AVIOFER Breda. In spite of a sales volume of 1,056 billion lire and an order portfolio of 3,342 billion, the enterprise ran in the red in 1990. It employs 9,400 workers presently.

EFIM announced recently that the electronics and component divisions have to be reorganized. A new subholding company, EFIM Sistemi, will be set up in order to control both OMI and Agusta Sistemi (it will be taken out of the Agusta Group), as well as Officine Galileo and SMA. The new group will employ 2,500 persons and will achieve an output volume of 500 billion lire but here again one can expect layoffs.

Agusta SpA, which belongs to the EFIM state holding company, had to report a loss of 1.9 billion lire in 1990. In the future, the enterprise reportedly will confine itself to the helicopter division; that means concentrating on EH-101, NH-90, A-129, and A-109. Talks are currently in progress to merge SIAI Marchetti with Aeromacchi. Alenia has a partnership share in the latter amounting to 26 percent; the Foresio Family holds the majority but it reportedly is to dispose of its shares.

EFIM's main problems, as a whole, add up to heavy borrowing, negative financial results, and an empty order portfolio. These problems are made worse by the government's refusal to inject fresh capital and, on the other hand, to assume the debts of the EFIM firms or to pay them with long delays. The firms therefore must get the necessary capital on the market and that only increases their borrowing.

Fiat Group

The Fiat Group is the third factor on the Italian aviation and space industry scene. The armament division is currently being reorganized. According to the current organizational setup, Gilardini is the leading company in the group for the component division and also controls most activities via the SDS [Defense and Space Systems] Grouping that belongs jointly to Gilardini and SNIA [National Company for Utilization] (50:50). SDS has four divisions, to wit:

- defense (with BPD [Bombrini Parodi-Delfino], Borletti, Marelli Avio, SEPA and Whitehead);
- space (with BPD and Regulus);

- miscellaneous activities (with BPD, Simmel, SIPE [Italian Explosives Company]-Nobel);
- energy.

There are indications that SDS, in the new organizational setup, will become the group leader with a name change to read: Fiat CIEI [Components and Systems for Energy and Industry]. Fiat CIEI will in succession absorb the following enterprises: SEPA, Marelli-Avio, Borletti, and, later on, Whitehead and all other enterprises. In contrast to SDS, Fiat CIEI will be organized in the form of a matrix structure. In 1990, SDS had a sales volume of 758 billion lire, with 574 billion being accounted for by armament activities. The loss came to 29.7 billion and 109 billion were invested in research and development. In addition to the Gilardini Group, Fiat also has aviation and space interests through some other affiliates, or joint ventures, such as Fiat Avio, IVECO, Astra, IVECO-Magirus, and COMAO.

The economic recession has also hit the vehicle market and the Fiat Group as a whole is now getting to feel that situation. The armament division has its own problems. Cost-reducing measures will thus be unavoidable.

Apart from these three big blocks, that is, IRI, EFIM, and Fiat, there are only smaller enterprises which, for the most part, are still tied up with the big ones via production cooperation agreements or capital partnership shares.

Piaggio, with 1,800 employees, 400 of whom are considered superfluous, is still controlled to the extent of 69 percent by the Piaggio family; the remaining 31 percent are already in Alenia's hands. Elettronica, one of the most capable and modern armament firms in Italy, belongs to private investors to the extent of 53 percent; the other 47 percent are in the hands of Finmeccanica. Something similar also applies to Aeronautica Macchi with 3,300 employees and a sales volume of 400 billion lire, in which Alenia also already shares to the extent of 26 percent. Magnaghi also has a share in Alenia with 35 percent and MICHl holds 5 percent.

Here we might also mention Italtel [Italian Telephone Company] (80 percent capital share held by STET [Telephone Finance Corporation]), Microtechnica (United Technologies), Oerlikon Italiana, and Contraves Italiana (Oerlikon-Buehrle), Marconi Italiana and Litton Italiana. The French Alcatel group controls Alcatel Italia, a diversified firm with a sales volume of 3,000 billion lire and more than 18,000 employees who also work in the armament as well as aviation and space divisions. These activities are combined in Alcatel Telettra. Telettra was taken over by Fiat FIAR [Italian Radioelectric Apparatus Factory] which used to belong to Setemer Ericsson and which is now under government control. Finmeccanica and Finoreda already hold 40 percent of the share capital and want to acquire another 27 percent over the next five years. It is expected that 5,000 out of the 41,500 employees in the Italian aviation and space industry, as per the year 1990, will have to be let go as a part of the

efficiency and streamlining effort. It appears unavoidable that—if Alenia is “fully operational”—the question of a single aviation and space firm will come up again. EFIM's bad situation seems to be heading for such a solution. On the one hand, it seems to make sense to combine Agusta and Alenia; but financial and political circles are discussing a number of other solutions as regards armament-oriented companies and the computer/electronic nucleus. One may assume that all of these capacities are to fall under the control of Alenia whereby the Sistemi Difesa Division is to be expanded perhaps all the way to a relatively independent 100-percent affiliate.

On the other hand, one must not forget that the Fiat Group is very much interested in taking over a part of the capacities of EFIM, especially OTO Melara.

Of course, one cannot establish a huge enterprise, such as DASA, BAe, or Aerospatiale south of the Alps; but while MTU [Machine and Turbine Union] in Germany, Rolls-Royce in Great Britain, and SNECMA [National Association for Research and Construction of Aircraft Engines] in France dominate the engine sector, Italy allows itself the luxury of three different, independent firms, that is, Fiat Avio, Alfa Avio, and Piaggio. The uncertainty about the future of the Italian firms also prevents the formation of long-term strategic alliances with European partners. Whenever companies with differing financial and technological resources team up, the weaker one winds up in a minority role. This is why Italian firms traditionally always entered into ad-hoc agreements on special programs or sectors, sometimes through joint ventures or economic interest groups. Examples of these trends are ATR [Regional Transport Aircraft], and EURO SAM, followed by the agreement between Alenia Spazio with Alcatel and Aerospatiale concerning the takeover of 49 percent of Loral Space Systems, then the Alenia-Matra Agreement in the missile sector plus the joint venture Gilardini SAGEM [French Industrial Corporation for the General Application of Electricity and Mechanics] for inertial systems (ESI), SAT (telecommunications company) Galileo in optronics, etc. The project calling for a strategic alliance between Matra and the EFIM group has been initiated but then it was blocked.

Effect of Common Market on European Aerospace Industry

92WS0769C Bonn WEHRTECHNIK in German
Jun 92 p 13

[Article by Fausto Cereti: “The European Aviation and Space Industry and the Coming Common Market”]

[Text] It seems rather paradoxical but on the eve of the Common Market, looking at the situation from the viewpoint of the aviation and space industry, one can see a shrinkage of this market rather than an increase. After all, the aviation and space industry market is globe-girdling and has been such for many years, practically

since the end of World War II. For the active participants in this market, this means that the technology, the models, and the performance figures, both technically and economically, were practically the same in the western world as a whole, especially in the commercial sector. This kind of situation takes shape regardless of the fact that the United States and its overpowering industry—which, in the past, sprang from the war effort—worked as unifying factors.

But, while the market was already global as regards technology, the industry remained stubbornly national, mostly for reasons of national security. However, as regards the people and nations, the exchange of reciprocal knowledge and mutual confidence was open and comprehensive. On the industrial level, though, each national industry was allocated a restricted field of activity for production and commercial activities.

This situation appeared entirely acceptable—at least for the majority of the market participants—as long as military activities were dominant.

But to the extent that commercial activities were added, the imbalance of this model emerged into the light of day and the system began to be changed toward a multipolar world of national and regional industrial subsystems that were competing with each other.

Such change became even more striking in the field of civil aviation with the impressive development of the Airbus family in Europe, the dominance of European and countries on the fringe of the Soviet orbit as producers of regional aircraft plus the unstable situation that developed in the general aviation field. But, even on the military market, there were many programs that were not completely integrated into the technology that had been derived from American technology.

Regardless of this rather odd development, one can consider the aviation and space market as one of the most global sectors of the world market for industrial products; there is stiff competition here, both directly and indirectly, regarding both commercial and military products. Now we have the European Common Market for aviation and space products. In the commercial field, this is a consequence of the Rome Treaty as well as the subsequent developments, whereas, in the military field, this is a consequence of an independent and timely decision by the European defense ministers.

This development is being welcomed by European aviation and space industry which, as we saw, moves in a mostly global market and thrives there. But there is one condition and that is that government support for industry, which in the past was granted magnanimously worldwide, either as direct support for research and development as well as the start of new programs or as indirect support by means of huge military and space programs, will not be terminated with a reference to the rules of the free market, especially when these rules relate only to the newly-created common market.

The long-drawn-out discussion on the GATT level concerning restrictions on startup aid and the attendant indirect support will explain the problems which were caused by this problem on both sides of the Atlantic and with regard to the aviation and space industry.

If this affair, as it looks now, can be resolved satisfactorily, then this will result in a business sector offering equal opportunity and chances for the global market.

Another problematical point in this connection consists of the possible changes in the rates of currency conversion. This does not involve sound commercial reasons but rather a political manipulation of interest rates as a result of which industrial competition could become unfair.

Global and identical rules of the game must prevail on the world market, all over the world. As we now look somewhat more deeply into the Common Market, we must devote maximum attention to the rules that the authorities of the Common Market will force upon us so as to protect competition.

As we have seen, the aviation and space industry is global, now and in the future. Therefore, the guardians of competition must take into consideration this special feature of the aviation and space industry and must view the world market as a reference level when it comes to the application of principles and rules.

If too much attention is devoted to the rules within the common interior market, without considering the needs of the European industry as a whole, in other words, that it must be competitive against global competitors, then serious damage could occur.

One should follow two ideological approaches to get to the processes that must be developed so as to foster the competitive capacity of European industry:

According to one approach, it is possible to employ European high-performance sources with support from domestic sources as well as sources from the Community as a whole in order to concentrate all available power on the struggle against outside competitors.

According to another approach, it would be better to implement the competition within the Common Market in order to strengthen the muscles for the coming fight with the above-mentioned outside competitors.

Both methods have their advantages but a thorough analysis of the economic and social costs required to support many of the performers in the fight for the world market must be weighed carefully against the overall benefit to be derived from the share in the world market that is to be attained. Competitive capacity indeed is a healthy thing and should also be basically encouraged. But competition should not be viewed as a goal in itself, especially in a sector in which the program launching costs can amount to as much as one-third of the total program costs.

The problems and the attendant worries are even greater in the military aviation and space field because the pressure toward a common armament market is reduced by the need for protecting national security and industrial needs, packaged to form the really well-defined concept of the "fair return," such as it was drafted by the defense ministers of the European countries.

Military and industrial experts from the countries involved are now addressing these problems and we have no reason to doubt that an effective solution will be found, as pointed up also by the existence and success of so many European production cooperation programs in the field of military aviation and space.

Attempting to find the bottom line, it is my impression that the approach of the Common Market essentially offers a favorable opportunity for us in the European aviation and space industry, that is, an opportunity to look more closely at the road by which we approach the global market in the light of the growing realization of our regional identity as Europeans and in the firmly-rooted certainty that our activity is truly global.

Thyssen Develops Laser Production Technology

92WS0792B Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 22 Jul 92 p 8

[Article by Erika Pomsel: "Laser Beam Method Makes Numerous Processes Efficient and Economical"]

[Text] Aachen—Thyssen wants to use laser technology as a basis for the company's future strategies. For this reason it is a major goal for Thyssen Laser-Technik GmbH to integrate laser technology into the manufacture of the Thyssen companies and their customers. This was indicated by Dr. Reinhart Poprawe, managing director of Thyssen Laser-Technik GmbH in Aachen.

The five points of emphasis for the company and its machine-building capacity cover all the steps toward the integration of laser processing or laser test procedures, respectively, in production. The company recently started up a new manufacturing plant in the vicinity of the Fraunhofer Institute for Laser Technology in Aachen.

In addition to the firm's own equipment, within the framework of a coproduction contract Thyssen Laser-Technik also has available to it the Fraunhofer Institute's plant engineering. This refers to special test facilities such as excimer lasers and carbon dioxide lasers in the 25-kilowatt performance range.

Among the studies which the company undertakes for the group is also testing the technical feasibility. In this respect it was possible, for example, to undertake in the space of a few days a comparison between two welding methods with neodymium-yttrium-aluminum-garnet lasers on the one hand and carbon-dioxide lasers on the other for processing plastic-laminated, thin, packaging

metal. These tests yielded the appropriate beam source and the factors of process speed and processing costs.

In the field of process development, processing methods such as welding, cutting, drilling and inscribing are largely known. But methods such as soldering and surface treatment still have a high development potential for the future, in Poprawe's opinion. In process development, parallel optimization of process parameters, component geometry and materials are important in the sense of "simultaneous development."

Plant engineering represents another focal point in Thyssen Laser-Technik's program. It also includes the drafting and assembly of pilot plants. One example is the construction of a mobile laser cutting machine. It was used in processing brake discs for the Bundesbahn's ICE high-speed train. By placing 12 relief slits on the periphery of the brake disc receptacle, it was possible to effect a significant increase in the life of the discs, Poprawe reports.

Since the discs are built centrally into each power unit, the removal of the discs could not be justified for reasons of process technology and cost. The company therefore developed and built a complete mobile facility with a 1.7-kilowatt carbon dioxide laser and a five-axis robot with integrated beam control for working on three-dimensional contours. The stability and reproducibility of the facility has been designed so that by now it has been possible to carry out the cutting process on the built-in brake discs 3,000 times without error.

After the successful technical development of a method and proof of its profitability, test series or preliminary series are often necessary. Not until after processing 100 or 1,000 parts with the tolerances of large-scale operation is it possible to obtain information about process reliability and reproducibility. Thus, when welding on the top or underside of a part with internal plastic parts, the process must be monitored on both sides within narrow limits of tolerance. Based on the results of the process development, it is then possible to produce a tolerance series, report on the economically optimized process parameters and design the production facility.

As examples of work on a level above individual companies the combination of various materials such as special steel, copper or new materials combinations, as well as energy savings, must be pointed out. A high-performance carbon dioxide laser with an output of six kilowatts was thus connected with a partly cartesian robot with integrated beam control. Having a very short set-up time, this system also permits processing of complex, three-dimensional geometries. Another example is a carbon dioxide laser with 2.5 kilowatt output, which is connected to a cartesian three-axis table. This system is used for cutting sheetmetal as thick as approximately 30 millimeters. Attempts are being made to process thick sheetmetals up to 50 millimeters and more in this manner.

It has been possible to process three-dimensional components in the thin sheetmetal sector with a bending-arm robot by using a 500-watt solid state laser, it was further said. Significant application areas for this include the coachbuilding sector, but joining, cutting and drilling tasks in the field of coated thin and very thin sheetmetals could also come into question. This Q-switch-modulated solid state laser could be used in microprocessing of steel, thin sheetmetals, ceramics and other materials as well as in steel analysis.

Beam control is undertaken with scanner mirrors and permits deflection speeds of up to 500 meters per minute. In addition, the system is also used for known methods such as marking, inscribing and surface structuring.

The factory equipment at Thyssen Laser-Technik permits rapid and efficient manufacture of the parts needed with high flexibility, Poprawe says. The spectrum for this ranges from mechanical mountings to compete optoelectronic components such as focusing heads, beam switching equipment, process monitoring systems and complete measuring systems for any application.

TELECOMMUNICATIONS

Siemens To Install Norwegian GSM Network

92WS0746A Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 20 Jul 92 p 3

[Text] Siemens has been awarded a contract worth DM90 million to plan, install and commission a GSM digital cellular mobile telephone network for the NetCom consortium which received its licence to set up Norway's second GSM system in November 1991.

NetCom's GSM network will cover almost 90 percent of Norway's population. The first phase will involve the construction of about 100 transmitter stations, the installation of which has been subcontracted to Motorola, and an operation and maintenance centre. Initially, towns and main roads in the south of the country will be equipped, including Lillehammer, where the 1994 Winter Olympic Games will take place.

According to Siemens, the network will be completed within two years and handed over as a turnkey project.

The partners in NetCom are Orkla, the Norwegian food and drinks group, and Comvik International, the Swedish mobile phone network operator owned by Kinnevik AS (see ITI Issue 316).

NetCom will compete with the state-owned Televerket in the provision of GSM services.

After Comvik in Sweden and Radiolinja in Finland, NetCom is Scandinavia's third network operator to ask

Siemens to install its mobile communications infrastructure. So far, 12 network operators in 11 European countries have elected to use mobile communications systems from Siemens.

Philips Inaugurates First Phase of Trial Rural Network in Russia

92WS0746B Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 20 Jul 92 p 4

[Text] Philips Kommunikations Industrie (PKI), based in Nuenburg, Germany, recently put into service its first digital switching system as part of a pilot rural telecommunications network in the Rayon Mozhalsk region, 100 km west of Moscow. It is the result of a contract signed in October 1990 between PKI and the LONIIS Institute in St. Petersburg, for the trial installation of Philips's telecommunication switching systems (TSS) in Mozhalsk, Uvarovka and Poreche, linked by DRL 8001 microwave radio systems. The individual exchanges will be provided with 1,000, 700 and 500 telephone lines, respectively.

The installation of the systems, which PKI said had to be adapted to the Russian telecommunications network, commenced at the beginning of March 1992. The first switch to be connected to the public network was that in Mozhalsk, in May 1992. Work on the installation of the other two tss systems and of the two microwave radio paths is in progress. The microwave links run between the Mozhalsk and Poreche exchanges and the Poreche and Uvarovka exchanges.

PKI said the object of the field trial is firstly to procure product certification from the Ministry of Posts and Telecommunications of the Russian Federation for the equipment supplied. These certificates are a prerequisite for delivery to the other states of the CIS.

Secondly, the company claims that the project will illustrate the fact that even rural areas can be equipped cost-effectively with a modern telecommunications infrastructure by using modular switching systems adapted to meet the local requirements.

Philips has invested DM7 million in development, training and system technology with the aim of providing TSS technology with certification from the MPT for network operators in the CIS. Philips estimates the CIS's requirements could entail the provision of approximately 100,000 subscriber connections per annum.

European High-Definition Television Criticized

92WS0766D Duesseldorf HANDELSBLATT in German
7-8 Aug 92 p 13

[Article by Georg Weishaupt: "High-Definition Television for the Museum"]

[Text] It must have been the Bonn Federal Art Gallery! The sophisticated ambiance with sculptures by Niki de

Saint Phalle was just good enough for Philips and the DBP's [Federal German Postal Service] Telekom [Telecommunications Office] to extol the advantages of the European high-definition television system (HDTV). With direct telecasts from Barcelona displayed with a projector and a television set with a giant picture tube, the Eurostrategists wanted to prove that they—despite all the criticism—have a good grasp of the HDTV technology and that HDTV is coming, and very soon in fact.

It is, however, doubted that what the industry at present has on display in 80 showrooms throughout Germany "will be coming into consumers' private living rooms in about two years," as Philips manager Hans-Joachim Kamp announced in Bonn. So the industry is going to have to think up something before the television equipment market takes off. The bulky, heavy new television sets can scarcely be accommodated in the average two-room apartment without a lot of rearranging. Television sets with flat screens offered at correspondingly lower prices would certainly be more acceptable to consumers.

But still other obstacles lead us to suppose that the new HDTV world will not materialize so quickly in Europe. Up to now the HDTV strategists have not yet succeeded in clearing all the obstacles out of the way to getting the transitional standard, the D2-MAC, which makes it possible to telecast in a wide-picture format, accepted.

There is, of course, complete agreement among the industry, the transmitting facilities, and the film companies that films will be telecast in wide-picture format in the future. But only the industry sees the need for this to necessarily be effected in the European transitional norm for HDTV, the D2-MAC. And even with respect to this, the number of skeptics is growing, as is demonstrated by the latest statement by a Nokia manager who described the European HDTV system as a "dead duck."

The suppliers of public television programs in particular are in an awkward position. They have in fact already signed two German memoranda of understanding and another European memorandum in June. So far, however, aside from ceremonial manifestations, these memoranda have not yet produced any results. This is why the television equipment industry is now clingy to the European Commission's announcement that it will make ECU850 million in tax money available to program suppliers for the production of programs in D2-MAC and wide-picture format. But the EC Council of Ministers has not yet given them the green light. The British Government in particular has rejected the program.

In the event the funds are not released in November, none of the big channels will actually lose this subsidy. Not even Philips adviser Alfred Lambeck believes that the directors of the ARD [Working Association of the Public Broadcasting Corporations of the Federal Republic of Germany] and the ZDF [Second German Television] will become ardent admirers of the D2-MAC norm because of the money. "The program suppliers will

not really begin to telecast wide-picture television programs" before 1995 if the current television norm is further developed with PalPlus. Because by then viewers will be able to receive programs in movie theater format via an ordinary home antenna, not as with the D2-MAC via satellite dish and receiver or via cable connection.

So, perhaps the unloved European HDTV technology will once again find its way into the Federal Art Gallery—but then forever.

Netherlands: Philips Unveils New Public ISDN Telephones

*92WS0773A Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 3 Aug 92 pp 4-5*

[Text] Hilversum-based Philips Business Communications has launched a new range of digital telephone sets which can be connected to the public ISDN network. The new terminals, known as the N-range, will be made available in selected countries in Europe over the coming months and later in most other countries where its SOPHO-S range of ISPBXs are approved, said the company.

Philips says the new telephone sets comply with the European protocol ETSI and supplementary services standards. They offer improved call efficiency through such features as calling name/number identification, on-hook dialing/listen-in, call logging and speed dialing. Also available is a version with a built-in data interface providing easy access to ISDN-based data services and simultaneous voice/data communication. Voice and data calls can also be initiated from a PC equipped with an ISDN PC-card, such as the Philips PConnect. All models have a clear liquid crystal display for such information as off-line number preparation and calling name/number identification.

Philips N-range of terminals offers the same comprehensive features and functionality as the private ISDN P-range, introduced earlier this year (see ITI Issue 335).

The new line of public ISDN phones is the result of on-going ISDN pilot tests with PTTs in Belgium, Denmark, Portugal and the Netherlands, said Philips.

Enhancements for High Range PBXs...

Philips also announced a number of major enhancements to its SOPHO-S1025 and SOPHO-S2500 Integrated Services PBXs which primarily focus on users in an ISDN or DPNSS environment. Known as PR735.10, the enhancement package offers facilities and improvements with PBX configurations above 500 extensions, particularly in multi-node networking.

The enhancements include:

- Increased capacity—these adaptations offer a higher traffic performance and easier implementation of new

facilities in the future. One of the major improvements is the increase in the number of simultaneous calls from 300 to 570.

- **Queuing on Paging**—the SOPHO-S PBX can automatically send the caller's identity to pagers equipped with a display, and the paged number can be displayed on a SOPHO-SET feature phone. A number of other new paging features have also been added.
- **Full break-in by Operator**—a unique feature which enables the operator to reach a user even when the Camp-on-Bus queue is full.
- **Open ISDN Interface**—PR735.10 offers a solution for accessing ISDN applications and connecting feature-rich SOPHO-SET telephone terminals to the SOPHO-S ISPBX through only one extension interface. Known as the S₀ Combi-Bus, the interface combines the benefits of ISDN and telephony without additional costs. In addition, the new PNT1 Private Network Termination extends the connection distance of such terminals by up to 2 km and can also be used where existing 2-wire cabling does not allow for the connection of 4-wire terminals.
- **DPNSS Enhancements**—including Centralised Operator, Charge Reporting and Loop Avoidance.
- **VN2 Type Approval in France**—In addition to 1 TR6 in Germany and DASS II in the UK, SOPHO-S ISPBXs can also be connected to the ISDN in France by supporting the VN2 protocol. This, claims Philips, makes the SOPHO-S range of ISPBXs the first to provide connectivity to the three commercial ISDNs available in Europe.

Nokia Official Doubts Future of HD-MAC

92WS0779B Paris AFP SCIENCES in French 6 Aug 92 p 17

[Unattributed article: "Europeans Will Not Have HDTV [High-Definition Television] Before 2005, a Nokia Official Predicts"]

[Text] Amsterdam—Europeans will be unable to get HDTV at home before 2005 because of a lack of high-definition programs, an official of the Finnish firm Nokia (the third leading European producer of color television sets) stated during an interview with the Dutch economic daily FINANCIEELE DAGBLAD published on 4 August.

According to Mr. Schepers, who said he was speaking only for himself, the HD-MAC [high-definition/multiplexed analog component] standard developed jointly by Philips, Thomson, and Nokia, is doomed. "HD-MAC is technically feasible, but not commercially viable," Mr. Schepers added; the future, he said, lies in digital television. According to Mr. Schepers, the investments required to produce programs in D2-MAC and then in HD-MAC will be too costly, and he therefore recommends a large screen/Pal [phase alternate line] Plus combination.

Nokia also strongly denied these statements. Nokia's Research and Development vice-president, Mr. Helmut Stein, first indicated that Mr. Schepers was the head of a Nokia Research and Development center near Stuttgart and had "nothing to do with HDTV," and he added: "Nokia has steered the same course for five years. We are still developing D2-MAC and HD-MAC systems."

In June 1991, Nokia announced that it had chosen 16/9 TV screens, the first stage toward HDTV. The Finnish firm had indicated that it expected to introduce some 15 models in this format in the next 10 months; these models could comply with the PAL-SECAM [sequential memory color] standard as well as with the D2-MAC standard, the transition stage toward HDTV.

France Telecom Presents Enhanced HD-MAC Coding

92WS0779C Paris AFP SCIENCES in French 30 Jul 92 pp 16, 17

[Unattributed article: "France Telecom Presents a New Image of HDTV [high-definition television]"]

[Text] Paris—On 22 July, two days before the opening of the Barcelona Olympic Games, France Telecom introduced an improvement of the HD-MAC [high-definition/multiplexed analog component] coding systems that will enable households to receive HDTV with a small-diameter parabolic antenna.

Mr. Jean-Claude Delmas, in charge of HDTV at France Telecom, also presented the satellite network around the Telecom-2A satellite, which will rebroadcast the Olympic events in five languages to 700 European HDTV demonstration sites, every day from 10 a.m. to 1 p.m. The signal improvement was obtained by increasing the transmission power of the Telecom-2A satellite; this was achieved by altering a transmission parameter in the multiplexed system that composes the HD-MAC signal.

In Europe, France Telecom acts as a pilot when it comes to HDTV, thanks to its experience with the "Savoie 1,250" program during the Albertville Olympic Games, which were broadcast in high-definition television to 50 European sites. This is why the Telecom-2A satellite is at the heart of the European broadcasting network for the "Barcelona 1,250" program.

This network, which is fully redundant for added safety, includes five other satellites: TDF-1 and TDF-2 (France), TV SAT-2 (Germany), Olympus (European Space Agency [ESA]), and Eutelsat-II-F3 (European Satellite Communication Organization). France also makes its high-definition equipment (cameras, coders, decoders, etc.) available to its European partners.

From Albertville to Barcelona, the technology was appreciably improved, especially to give households direct access via satellite to images in D2-MAC, the current coding standard which is compatible with the

future HD-MAC standard. For the moment 16/9-format TV sets equipped with a D2-MAC decoder are relatively expensive (from 12,000 French francs [Fr] to about Fr30,000 for the Thomson Space System-90 set), and small-size parabolic antennas do not always pick-up the entire signal.

Altering the transmission of the HD-MAC signal made it possible to increase the transmission power of the Telecom-2A satellite, and therefore to reduce the diameter of the receiving antenna: the demonstration made by France Telecom showed equally good reception with a 75-cm antenna and a 60-cm antenna. With the present technology, France Telecom advises households to use a 75-cm antenna, which is large enough for proper reception of the Barcelona Games by transparency, via the Antenne-2 channel, and small enough not to suffer interference from Telecom-2A neighbor satellites.

Post-Olympics Assessment of European HDTV

92WS0794A Duesseldorf VDI NACHRICHTEN
in German 7 Aug 92 p 3

[Article by Regine Boensch: "TV of the Future With Beauty Marks"]

[Text] Duesseldorf—The developers of Europe's high-resolution television are proud of themselves. The big test during the Olympic Games brought a whiff of the TV of the future. But the large masses of viewers will still be able to receive the next Olympics in Atlanta with conventional technology. A number of obstacles must still be overcome in order to market HDTV.

The rows of viewers in the Montjuic Olympic stadium are filled to overflowing. There is a group of Canadian fans, in the center of the picture a Japanese couple and at far right the woman with the green hat is changing her seat. Anyone who during the last few days did not follow the track and field competition on his domestic 'boob tube' but in the display seats for the future television standard HDTV, was able to recognize details unimaginable until now.

"It works," was also Wolf Kaehler's sparse comment. The technical moderator on the stage of German HDTV is entirely satisfied with Europe's high-resolution television. At the initiative of the Research Ministry, the equipment and chip industry, broadcast facilities and Telekom joined together on this stage in order jointly with their European partners to plan the introduction strategy for the television of the future. Barcelona was declared the big test for it: More than 100 hours of high-resolution signals were sent from the Catalan metropolis.

And Kaehler knows how hard one was still working on details before the gigantic spectacle: "Details—from the cameras to the broadcast technology to the decoders—were improved." And if now—as happened frequently in the last few days—the image breaks up or the camera abruptly dips into the crowd, the protagonists in this new

technology have an excuse ready for that as well. "That is a just test broadcast," declares Hans Engelkamp from Finnish Nokia.

About 1,000 experts are using the Olympic Games in order to study HDTV [High Definition Television] more thoroughly. They repeatedly meet with the same problem in their analyses: The high-resolution images must be transmitted without overtaxing the valuable property of the frequencies. In this country high-resolution TV has only been allocated a 6 to 7-MHz bandwidth.

A fact which forced the developers to compress the streams of data. And this is why still portions of the image are recorded as seldom as possible and moving ones as often as necessary. A technical compromise, which also brings up unsharp effects—as with the picture of a swimmer, who grabs the edge of the pool surprisingly quickly for the camera. And with some hockey players with red socks it appears as if they were painted over afterwards with a red brush stroke.

Effects which, in the opinion of the HDTV protagonists only, stand out to the trained eye. The non-expert watches television quite differently. Whether this is true will become clear after the Olympic Games. Because for the first time, at 800 locations scattered across all of Europe, John and Mary Consumer were able to enjoy this new technology, which will stage its entry into the market no earlier than the mid-1990s.

In the midst of other television sets, the Schossau company in Duesseldorf also has a particularly large test set, surrounded by the mirror of medals and the five Olympic rings. "Reactions to this HDTV display are quite varied," relates department head Guenther Roth. "Some stand there fascinated, some don't even notice the difference between it and the other sets." But Roth already has interested buyers, whom he has to put off until 1994-95.

"Seeing salmon and only being able to buy imitation salmon," says an annoyed, disappointed female customer in another store. She refers to the European transitional standard D2-MAC. Since most HDTV experts like to report on their high-resolution successes during the Olympics, they prefer to be silent when talking about D2-MAC.

The Europeans wanted to use this transitional standard to take an "evolutionary" approach toward HDTV. The consumer can adjust to the new technology slowly, it was said up until a year ago in advertising brochures. And thus "D2-MAC-capable" receivers can already be found in television stores today and occasionally show satellite programs from ARD [Group of Nonprofit Broadcast Stations of the FRG] and ZDF [Second German TV channel] in this standard.

D2-MAC sends the signal in the same way as its high-resolution successor. This standard is also based on the large movie format. It also sends only 626 lines and is

therefore just as far removed from high-resolution as today's regular Pal standard. Olympia has now delivered a number of large-format pictures over the Einsplus satellite channel. And, owners of D2-MAC television sets were promised, its decoder chip understands the high-resolution signals.

But while the HDTV pictures on the test sets were brilliant, on the approximately 40,000 D2-MAC sets in the FRG they were disappointing. "Squiggly," Leo Danilenko calls the D2-MAC picture. And the chief engineer of WDR [West German Broadcasting] also has an explanation for this. The individual pictures are always produced through a multitude of blocks containing 16 x 16 pixels. With a still picture one-fourth of the block is transmitted every 2 ms. These interlinked picture contents must then be put back together again. In the high-resolution variant the four cycles are first stored and then put together, but D2-MAC has no picture storage.

"So D2-MAC is not HDTV-compatible," Danilenko concludes. And Michael Bobrowski, an electronics expert from the Group of Consumer Unions, expresses himself even more clearly: "D2-MAC is obsolete technology for me." So is this an end to the gradual approach for Europe to the television of the future?

One thing is clear even today to chief engineer Danilenko: "The wide screen will catch on." In the future increasingly more television sets will thus tempt people with movie format screens. Says Danilenko: "For a long time these will be multistandard sets, however, which understand everything that is broadcast." In the future the viewers will then decide not only the program but also the standard by pushing a button.

But the developers of even today's multistandard sets have made it hard for people to enjoy them. "I face my television the way I do my PC," groans a D2-MAC pioneer referring to the many buttons on this remote control. What is just a new game to technically advanced people is torture for untrained viewers. The special dealers are opening up a new, lucrative field of service in this respect.

Operating comfort, along with inexpensive image reproduction at home, is among the technological bottlenecks which must be overcome, according to Research Minister Riesenhuber, before the future high-resolution TV technology can dare enter the mass market. Not until then can the enormous development costs for high-resolution television be recovered. At any rate, the technical HDTV adventure in Europe will have cost 1.25 billion German marks [DM] by the end of this year.

German Telecommunications Minister Wants Joint Ventures With CIS, Eastern Europe

*92WS0794B Duesseldorf VDI NACHRICHTEN
in German 21 Aug 92 pp 1,4*

[Interview with Christian Schwarz-Schilling by Regine Boensch and Susanne Fiederer, date and place not given: "Telekom Needs the Business in the East"]

[Text]

The New Markets in the East Force Us to Undertake Second Postal Reform

Bonn—The German Bundespost Telekom is to become a Telekom corporation as quickly as possible. This is the wish of the Minister for Post and Telecommunication. As Christian Schwarz-Schilling explains in a conversation with VDI NACHRICHTEN, two reasons, above all, necessitate a reform of the only three-year-old postal reform. "Telecommunication has developed much faster worldwide than we were able to imagine at that time," the minister relates. But primarily the new markets in the East, in his opinion, require that "the German Bundespost Telekom plays along in this game." Because "now we have to divide up this cake, and it would be careless and irresponsible if we did not deal with this until the middle of the 1990s."

In this respect Schwarz-Schilling is not interested in a rapid dissolution of the network monopoly. "We simply still have too many infrastructure tasks to fulfill." The monopolies should be kept on for the next five to 10 years.

If the planned schedule is adhered to, the proposed legislation for reform of the reform will still be introduced in the cabinet and Bundestag even this year, because the German Bundespost Telekom is to achieve a new status as early as 1994. In the event the corporation model fails in the Bundestag, Schwarz-Schilling threatens to do without the second postal reform completely. Telekom could then, as he confirmed in the conversation with VDI NACHRICHTEN, be broken up into several independent subsidiaries.

[VDI NACHRICHTEN] In your opinion, what will the German Bundespost look like in the future?

[Schwarz-Schilling] The goal must be to make the post office's enterprises flexible and competitive as compared to the domestic and international competitors. For this reason it must also be possible, for example, to enter into global joint ventures.

[VDI NACHRICHTEN] You advocate the organizational form of a corporation. What are the advantages?

[Schwarz-Schilling] First of all, a corporation solves the problem of acquiring capital. The share is an attractive instrument all over the world. Issuing beneficiary rights, such as for a public institution—as proposed by the union and the SPD [Social Democratic Party]—until now has only been known in a very limited form. Furthermore, the international capital market must be opened up. Telekom wants to undertake investments for 200 billion German marks [DM] over the next six years alone.

[VDI NACHRICHTEN] And second?

[Schwarz-Schilling] A public institution continues to maintain its civil service status in the future as well. In

my opinion it is not suitable as a basic form for the optimal structure of a company. And, third, a public institution is totally unknown in the international business world among competitors and partners.

[VDI NACHRICHTEN] But WestLB is living quite well with this status!

[Schwarz-Schilling] There are different opinions about that. I do not know any institution which in a long conversation between four eyes does not talk about actually wishing it had another form... The corporation law gives the partners the security of knowing the laws and obligations under which one will cooperate.

[VDI NACHRICHTEN] Who will be the first to be a part of the postal company? Do you think there will actually be public Telekom shares or perhaps more like AT&T industrial stocks?

[Schwarz-Schilling] No, I think that there will be a healthy mixture. Since telecommunication is an important growth sector, these Telekom securities will surely be suitable for very widely spread shareholding. At the same time such a company must also be in a position to offer an exchange of shares in joint ventures. The legislators must take care, however, that certain limits are not exceeded and a foreign company, for example, could become a majority owner of Telekom.

[VDI NACHRICHTEN] What is the percentage foreign companies should be able to own of Telekom?

[Schwarz-Schilling] The upper limit should be about 5 to 10 percent or so.

[VDI NACHRICHTEN] Would you yourself buy a Telekom share?

[Schwarz-Schilling] Yes, but after I am no longer postal minister and thus no longer have a conflict of interest.

[VDI NACHRICHTEN] Aren't you rationalizing yourself away with this planned Postal Reform II?

[Schwarz-Schilling] This question will only become relevant at a time when I am surely no longer postal minister.

[VDI NACHRICHTEN] All right, but there will not be a successor...

[Schwarz-Schilling] That may be. But I think that there is often total underestimation here, that deregulating a market—from monopoly to the competitive market—is only that one thing. What is much more important is to regulate a deregulated market. Until the first reform in 1989 you needed very little administrative funding. The Bundespost decided what was to be done. The innovations, the creativity of thousands of companies always had to go through this eye of the needle. With a deregulated market it looks totally different. This situation

needs traffic rules, so that the innovative forces of the market can develop in an orderly fashion. Then you need a minister.

[VDI NACHRICHTEN] But supervisory authorities, such as Oftel in Great Britain or the FCC in the United States, do not have a minister at the top either.

[Schwarz-Schilling] Even so, it turns out that the task of deregulation does not become superfluous. I used to have entirely different tasks. I was simply head of the Bundespost. Now I am some kind of hybrid. On the one hand I see the post office as an object of regulation, on the other hand I am the owner. I still consider it important that a minister sits at European and worldwide conference tables. That is not possible when it is taken over by Subsection XY of the Economics Ministry.

[VDI NACHRICHTEN] You speak so ardently of the second postal reform. Have all the possibilities of the first one really been exhausted?

[Schwarz-Schilling] Certainly not, the time was too short for that. We have only been implementing the postal reform since 1990, and I said at that time that in the mid-1990s it must be reviewed. There are two reasons for the fact that a reform of the reform is already on the table. First, telecommunication has developed much faster worldwide than we were able to conceive of at that time. And, second, the political situation has totally changed. Now the Baltic states and the CIS states come and ask if we can build a network for them, too, not operate a network. Now we must divide up this cake, and it would be careless and irresponsible if we did not deal with it until the mid-1990s. That is when the decisions were made—whether with or without Telekom.

I wish that the German Bundespost Telekom would play in this game, because it would almost be insanity if the financially strongest country in Europe were to limit the opportunities of its main carrier as much as is now the case, while Swedish Ericsson, British Telecom, Japanese NTT and the U.S. Bell companies are hustling in the East.

[VDI NACHRICHTEN] According to the first postal structural law, your ministry is obligated to establish the monopoly and obligatory services of a company such as Telekom. Where is this decision?

[Schwarz-Schilling] We are in the process of clearing up these matters. I would even say that there is no country which is as systematic in undertaking clarification between the monopoly and the competitive field.

[VDI NACHRICHTEN] But certain obligatory services must be anchored in law.

[Schwarz-Schilling] You are always on the safest ground when there are several suppliers for one service. Then not only is the service available, but it is quite varied as well.

[VDI NACHRICHTEN] Can I still be sure under such conditions that in the Bavarian forest I will still get my cheap telephone connection?

[Schwarz-Schilling] That is certainly part of the infrastructure provisions which will have to be assured in a sovereign manner. These are regulations which a postal minister must undertake vis-a-vis the big operators.

[VDI NACHRICHTEN] But does a private company have any interest at all in these infrastructure tasks? After all, it wants primarily to earn money with the most lucrative things.

[Schwarz-Schilling] The art of a company in this field is to earn money on the one hand and to service an infrastructure assignment on the other. For example, in a licensing agreement with cellular phone supplier Mannesmann we have determined area coverage as an infrastructure condition.

[VDI NACHRICHTEN] In the future will there still be a network monopoly, a monopoly for voice transmission? Or will it be broken up?

[Schwarz-Schilling] In the long run that is entirely conceivable. The intentions of some Brussels' committees point in that direction. Personally, I am not interested in dissolving the network monopoly so fast, because we simply have many too many infrastructure tasks to fulfill: rebuilding in the East, digitization of the network in the West. The next five to 10 years should be reserved for the monopolies. But technology does not stand still. In the future it will be difficult to distinguish between what is voice and data.

So we are well advised to shape our enterprise form in such a way that we can live in the world of tomorrow and not start too late to adapt to it. A strong company such as Telekom, which has all the services available, will thus continue to be an object of deregulation. And I am sure that breaking up the network monopoly will not mean the death of Telekom. Experience all over the world argues against that. The Japanese NTT did not reduce its tasks, and British Telekom is thriving better than ever.

[VDI NACHRICHTEN] What does your idea look like if you do not receive the necessary two-thirds parliamentary majority for the corporation model? You once threatened to transform Telekom into several independent subsidiaries.

[Schwarz-Schilling] Just let it stand like that.

[VDI NACHRICHTEN] How many subsidiaries of Telekom will there then be?

[Schwarz-Schilling] I am now concentrating on the constructive solution. If we are really forced, due to a lack of agreement from the opposition, not to get a change in the Basic Law, I would do without Postal Reform II. This also applies if in the liberalization a slowdown is started

or conditions are introduced which mean going backward with respect to the first reform. This includes, for example, combining the duties or personnel from the three companies.

Postal Reform II

In mid-1989 the Postal Structural Law took effect, according to which the post office was divided into three independently working companies—Telekom, the Postal Service and the Postal Bank. Now, after only three years of working, a reform of the reform is imminent. Just what this Postal Reform II should look like is a subject of conflict among politicians, businessmen, union people and economists. Everyone advocates a different form of business organization—above all for Telekom. But while the German Postal Union and parts of the SPD argue in favor of a "public institution," FDP [Free Democrats] and CDU/CSU [Christian Democratic Union/Christian Social Union] circles call for a "corporation." In order to organize the postal enterprises as private law entities, Article 27 of the Basic Law has to be changed. A parliamentary majority of two-thirds is needed for that.

France: Thomson, Philips Criticize Government's Ruling Against D2 MAC Standard

92WS0802A Paris LE MONDE in French 9 Sep 92
p 19

[Article by Pierre-Angel Gay: "Electronic Manufacturers On the Defensive"; first paragraph is LE MONDE introduction]

[Text] Consumer electronics makers had awaited the government's ruling in favor of Canal Plus for several weeks. The decision stipulates that the Telecom 2A satellite will simultaneously rebroadcast seven stations in SECAM and only four in D2-MAC (see LE MONDE, 8 Sept). The presentation of the agreement on Monday, 7 September did nothing to dispel manufacturers' reservations.

The defeat was expected, but was no less cruel for all that. Cruel for Thomson Consumer Electronics (TCE), and especially for Philips Consumer Electronics, whose CEO, Francois Mauduit, stuck out his neck to oppose the option advocated by Canal Plus of a "patchwork" of SECAM 4/3 and D2-MAC 16/9 channels on the Telecom 2A satellite. "Deserted" by the minister of industry Dominique Strauss-Kahn, who is hostile to the "D2-MAC ideology" despite the opinions of his departments, the manufacturers had known for several weeks that the government would not rule in their favor.

So, officially, Europe's consumer electronics giants are putting the best face they can on it. "The uncertainty had to be ended," say TCE staff, stressing their "satisfaction that the 16/9 [big screen] was selected as the format of the future—one in which we believe and in which we have invested a great deal." The new sets appeared on retailers' shelves last winter, and new, more "affordable" ones (under 15,000 French francs [Fr]) have since been

marketed. "The new D2-MAC pictures broadcast on Telecom 2 should help our retailers with their demonstrations," adds the public group. Indeed, starting in mid-1993, the satellite is scheduled to broadcast nearly 20 hours of programs in D2-MAC 16/9.

All the same, the government's decision to set aside seven channels for the current SECAM 4/3 standard, against only four that will gradually shift to the D2-MAC 16/9, will not make it any easier for the new norm to penetrate the French market. First, because any "standards war" worries consumers and delays the production of equipment.

"A Jungle of Cords and Boxes"

Second, because manufacturers are afraid of the technical consequences of the government's choice. As the president of SIMAVELEC (Union of Electronic Audio-visual Hardware Industries), Mr. Mauduit had emphasized in advance the difficulties in store for new channel subscribers who want to receive and tape programs encoded in both SECAM and D2-MAC. One specialist describes the resulting scene as a "veritable jungle of cords and boxes." It will also involve hefty additional costs in the long run, when manufacturers market multistandard devices.

These handicaps are especially harmful as there is still uncertainty on more than one score about how attractive future D2-MAC programs will really be. Besides simply duplicating the programs of Canal Plus, Cinecinema, and France-2, the government has announced the creation of a "fourth" programming station, to be made wholly in D2-MAC 16/9.

Canal Plus has agreed to cover one-third of the new channel's expected shortfall, with the remainder to be raised within the Community and among...manufacturers. The latter, which did not sign the agreement between Canal Plus and the government, do not feel any obligation whatsoever.

"It is never a good thing when station operators get involved in manufacturing. Or the other way round," is the joke at Philips, which does not, for now, give the future channel much chance of actually being born.

Status of Polish Telecommunications Outlined

92WS08071 Maidenhead TELEFACTS in English
Aug 92 pp 7-13

[Article by Clare McCarthy, Datapro International:
"The PTT Today"]

[Text] Since 1987, telecommunications in Poland has been in a state of transition. Originally, the Polish Post, Telephone and Telegraph (PPTT) was part of the Ministry of Post and Telecommunications. Between 1987 and 1989, telecommunications activities were managed by the Ministry of Transport and Maritime Economy. After the new government was elected, in late 1989, the

Ministry of Post and Telecommunications again became the administrative and regulatory body responsible for supervising and coordinating the PPTT's domestic and international telecommunications activities.

In the post-1989 European environment, however, monopolies, government control, and heavy state regulation have not only become unpopular, but also scorned as inefficient and unprofitable ways of doing business. Eager to encourage privatization and entrepreneurial initiatives, in early 1990, the Polish government submitted draft legislation to Parliament aimed at amending the existing statutes on telecommunications.

Subsequently, a completely new Posts and Telecommunications Act was submitted on 23 November 1990, and came into force on 16 January 1991; this effectively ended the state monopoly of telecommunications services. Domestic and foreign investment and operation of basic local telephone services and networks in Poland is now permitted, provided the investor/operator has obtained a license from the Ministry of Post and Telecommunications. Foreign investment in long-distance telecommunications links and networks is limited to 49 percent, but foreign investors are not permitted to operate international telecommunications links and connections of any kind.

At the end of 1991, the PPTT's activities were separated from state control and the PPTT formally ceased to exist. On 1 January 1992, postal activities were separated from the telecommunications activities. The largely unprofitable postal operations are now controlled by public service enterprise Poczta Polska, while telecommunications are the domain of the Telekomunikacja Polska—Spolka Akcyjna, or Polish Telecom SA (PTSA).

Telecommunications activities have always been very profitable for the government. In 1990, telecommunications activities generated a profit of Zlotys (Zl) 1,663,000 million on sales of Zl4,938,000 million (\$1 = Zl 14,000 Source: Polish Telephones Foundation, May 1992). This compares with the postal services sales Zl1,900,000 million and a loss of Zl416,000 million in 1990. Postal services have been taking a loss for the last 10 years.

The PTSA is now a joint stock company which is wholly owned by the State Treasury. Although the government foresees privatization, the structure will not be in place for at least another two years, and sources inside Poland do not envisage privatization within the next five years. A major privatization of this nature could have dramatic repercussions on the embryonic market economy in Poland. Shares will be floated on the Warsaw Stock exchange and will be available to foreign and domestic applicants. Figure 1 [not reproduced] demonstrates the planned structure of the PTSA as of May 1992; however, since the dismissal of Minister Wilk, who was developing the organizational structure, nothing has been ratified.

Although the government still guarantees foreign loans, the PTSA is now financially independent. The PTSA does, however, pay 40 percent corporate tax to the government, and all salaries are subject to tax. It is now solely responsible for local and international tariffs with the exception that the Ministry of Posts and Telecommunications has the right to impose maximum tariffs for voice and telex services, as long as they are agreed by the Ministry of Finance. Tariffs for VANS are fixed by the service provider and the user, while the Ministry of Post and Telecommunications is responsible for the control of type approval of equipment connected to the PSTN.

Two new executives of the regulatory bodies were created in 1991. At present, they are both linked to the Ministry, but according to Mr. Jerzy Babski, Director of International Cooperation at the Ministry of Posts and Telecommunications, they will evolve to become independent bodies.

- The Polish Telecommunications Inspectorate (PTI) is the telecommunications watchdog which should evolve as an OfTel-type organization;
- The Polish Radiocommunications Agency (PRA) manages frequency allocation of the radio spectrum.

The Telephone Network

The telephone network is organized into three structured levels:

- Local and Regional;
- Intercity;
- International

As its first priority, the PTSA concentrates on modernizing international, intercity, and urban connections rather than simply increasing subscriber numbers, because new connections without modernization would further construct existing bottlenecks.

Local and Regional

According to the Ministry of Posts and Telecommunications, in May 1992 there were 22 operational local/regional exchanges, with a further 12 planned to be operational by the end of 1992. The PTSA has implemented a special program to modernize the aged network and equipment in Warsaw. Alcatel SESA of Spain is manufacturing eight new digital transit exchanges, fiber optic transmission equipment, microwave-radio-relay interconnection equipment, and 120,000 network nodes. The 140M bps network, which is due for completion in 1993, should serve 2 million subscribers.

Local digital exchanges for the network will be implemented in two phases.

- In the first phase (1992 to 1993), 200,000 lines will be implemented, about half of which will replace obsolete equipment;
- The second phase, encompassing up to 2 million lines, will be completed by the end of the century, though the investment program is still not definite because of uncertainties over financing.

Intercity

According to Ministry figures, in May 1992 there were 34 intercity exchanges operating in Poland. Another 20 will be implemented by the end of 1992. Plans are now underway, though not yet complete, to install 10 new exchanges before 1995 as part of the nationwide digital backbone network.

International

Until mid-1990, Poland had just 1,160 international lines provided by one locally-made E10 international switch and some smaller crossbar exchanges. Automatic direct dialing from Poland to Europe was available only through this one switch, and waiting times of several hours, or even a day, were required for other destinations.

By the start of 1991, the E10 Warsaw exchange had been replaced with a new international gateway. There are now three international digital exchanges in Poland:

The AT&T 5ESS exchange, located in the capital city Warsaw, has a capacity of 3,500 international lines. In April 1992, it was agreed that the capacity should be increased to 7,000 lines; this should be achieved by the end of August 1992.

A Siemens EWSD exchange is currently under construction. Located in Southern Poland at Katowice, it will have 1,500 international circuits.

An Alcatel CIT E10B exchange is also under construction. It will be located mid-way between Warsaw and Berlin at Poznan. It also has 1,500 international circuits.

The PTSA is therefore confident that by the end of 1992, Poland will have 10,000 international lines.

In September 1990, the Komertel digital-overlay business-telephone network was installed in Warsaw, providing a minimum capacity of 2,000 lines. Direct access is limited to banks, hotels, international businesses, and foreign diplomatic missions. This is due in part to expensive connection rates of \$1,000. However, once connected the subscriber pays the same charge as for using PSTN services. By May 1992, Komertel was handling 72 international lines and was used by 1,655 subscribers. Initially seen as a three year interim measure while the PSTN is being upgraded, Komertel will continue to provide automatic international connections.

In September 1991, the Polish trunk telephone network was predominantly analog, based on:

- Coaxial cable for domestically manufactured 300-, 960-, and 2,700-channel systems;
- 960 and 1800 channel-VHF analog microwave links manufactured by NEC of Japan.

In 1990, the old PPTT connected 171,672 new telephone subscribers, around 37,039 of which were in rural areas.

According to the Ministry, in 1991, 270,000 subscribers were connected to the PSTN; the PTSA estimates that another 400,000 will be connected by the end of 1992. There are now over 3 million telephone subscribers throughout Poland; a further 2 million have submitted applications, but at present rates, they will have to wait around 12 years before a line is installed. Telephone penetration stands at 9.3 per 100 population, way below the European average of 34 per 100 population.

Following the changes in the telecommunications sector, the government confidently predicts that in the next 10 years the number of subscribers will increase to 12 million, penetration will increase to 25 per 100, and waiting time for a connection will decrease to one year. Table 1 summarizes the key statistics for the telecommunications activities of the former PPTT. Figures are not yet available for the PTSA since its separation from State control.

Table 1. Expansion of Telecommunication Systems

	1989	1990	% Change
Number of Automatic Exchanges Lines	3,147,300	3,350,800	6.5
Number of Telephone Lines (km pairs)	7,187,500	8,673,500	20.6
Telephone Sets (thousands)	3,121	3,298	5.7
Telephone Sets per 100 Inhabitants	13.3	13.7	3
Number of Telephone Subscribers	3,124,400	3,293,000	5.5
Telephones Subscribers per 100 Inhabitants	8.28	8.62	4.1
Telephones Installed	168,000	171,700	2.2
Applications for Installation (thousands)	2,340	2,361	0.9
Number of Telephone Calls (millions)	1,529.6	1,532.7	0.2
Number of International Connections	1,650	1,678	1.7
Automatic Telephone Traffic (%)	91.1	91.27	0.19
Telegraph Automatic Exchanges Lines	50,672	50,672	0.0
Telegraph Circuits (PCS)	45,648	50,556	10.8
Number of Telex Subscriber Lines	35,950	38,409	6.8
Fax Machine Subscriber Lines	(Not specified)	5,824	—

According to the Ministry of Posts and Telecommunications, there are around 6,000 exchanges in Poland, of which the majority are still manual. Although over 60 percent of traffic is now switched automatically (around 55 percent in rural areas), the exchanges are invariably analog—step-by-step, Stowger, crossbar, and Pentacosta systems. The existing national network is still underdeveloped and technologically outdated:

- 15% of the exchanges are over 30 years old;
- 20% are between 20 and 30 years old;
- 65% of the exchanges are up to 20 years old.

At the end of 1991, only 7 percent of the total number of exchanges connected to the PSTN were digital. However, under the Telecommunications Act 1990, any new switching or transmission equipment attached to the network must be digital. Plans for the future development of ISDN for Poland is being debated by the PTSA, but until the network is digitalized, these discussions will remain hypothetical.

To promote the modernization of the network, the PTSA is following a Program of Modernization and Development of Telecommunications, 1991-1992, originally drawn up by the PPTT under the guidance of the Ministry. One of the key points states that the Polish telephone network—whether based on optical fiber,

microwave, or satellite transmission—must use modern digital exchanges employing CCITT SS#7. Digital transmission equipment must offer a minimum capacity of 140M bps. As a result, by the end of 1991, the following milestones had been achieved:

- An AT&T 5ESS switch with the capacity of 3,500 trunks was installed in Warsaw.
- A 140M, bps submarine fiber-optic cable was installed to connect the Danish island of Bornholm to the Baltic port of Koszalin, Poland now has access to optical connections to Scandinavia, North Western Europe, and on to North America.
- A microwave radio link between Warsaw and Koszalin, via Gdansk, was inaugurated as an extension to the link from Denmark. This new link provides access to an additional 3,500 international circuits.
- International exchanges are now being constructed in the regional centers of Katowice and Poznan. Equipment will be supplied by Siemens and Alcatel CIT, respectively.
- The Intelsat system at the Psary satellite ground station was digitalized.

Towards the end of the program, the PTSA hopes to offer satellite telex and fax services. VSAT services should also be available in Poland by the end of 1993 via

Vesatel, a joint venture between Televerket of Sweden and PTT Telecom of the Netherlands.

Poland's telephone network will benefit from regional initiatives aimed at improving the general standard of telecommunications in Eastern Europe (see Figure 2) [not reproduced].

- One fiber-optic cable will run from Denmark to Hungary. It will pass through Gdansk, Warsaw, Kielce, Krakow, and Katowice.
- An agreement has also been signed for the construction of TEL (Trans-Europe Line). Initiated by the Deutsche Bundespost Telekom, TEL is a 2,000 km fiber-optic cable that will link Frankfurt-am-Main to Dresden, where it will diverge into two spurs. One spur goes on to Gorlitz, Zgorzelec, Wroclaw, Warsaw, and eventually Moscow, and the other goes on to Prague, Brno, Bratislava, and Budapest. The link should be operational in 1993.

The network has many transmission bottlenecks, especially in Warsaw. Surprisingly, unlike many capital cities, Warsaw does not enjoy the most efficient network in the country; around 60 percent of the equipment should be replaced because of breakdowns by the existing switches and the poor quality of the cable. Warsaw is only now approaching the national average of 7 percent network digitalization, while in the Poznan province between 60 percent to 70 percent of the network is digital. (The reason given by Polish sources is that Alcatel digital switches are produced under license in Poznan.) The first digital exchange in Warsaw, with an initial capacity of 3,500 lines, only came into operation in late 1990.

Equipment Manufacturers

The modernization and development of the Polish network is dependent on the introduction of digital switches and transmission equipment. Although a number of switches are made locally, many foreign-made switches are currently marketed and sold through joint ventures established in Poland. Some of these intend to begin manufacturing in the near future.

Western European companies have been quick off the mark, with France Telecom, Alcatel, and Siemens investing heavily in their "back yard." North American companies have also been quick to capitalize on Polish eagerness to import their technology since the relaxing of COCOM restrictions.

- Alcatel CIT Polska is a joint stock company between Alcatel CIT (France) and Poznan switch manufacturer Teletra. The company already manufactures Alcatel's Pentacosta switches under license, and hopes to produce over 250,000 lines of E10/OCB 283 digital exchanges per year in the near future. Alcatel CIT has signed an agreement with the government to provide 314,000 network nodes of the E10B system. It will also install exchanges in Poznan, Legnica, and Czestochowa.

- SETEL is another joint stock company involving Alcatel. Alcatel SESA (Standard Electrica SA) of Spain and PZT (National Transmission Plant) of Warsaw will manufacture and distribute System 12 exchanges. Alcatel SESA is also manufacturing eight new transit exchanges and 12,000 network nodes for Warsaw.
- CEWIS is a joint stock company comprising Warsaw-based PXB manufacturer ZWUT [Telephone Equipment Production Plant], and Siemens AG. CEWIS will produce Siemens's EWSD switches and transmission equipment. It will provide 170,000 network nodes for the exchange under construction in Katowice, and in the Goclaw district of Warsaw it will introduce a pilot exchange. ZWUT also has supply agreements with Italtel and Samsung.
- TS-ZWUT, a joint venture between ZWUT and U.S. investors Arnica, has been established to manufacture and sell PBXs designed by Cortelco/ITT.
- Italtel plans to modernize the whole Przemysl province. However, plans to manufacture PBXs for 100, 200, 400, and 800 lines with Telmont of Warsaw have failed.
- Samsung of Korea has already begun modernizing the Opole province and has been commissioned to supply 29 telephone exchanges and 113,000 subscriber connections.
- Telrad of Israel is working with Era to manufacture PBXs.
- Northern Telecom Elwro is a joint venture between Northern Telecom U.K. and Wroclaw-based information technology company Elwro. Announced in February 1992, the new company will manufacture key systems and DSM-10 central office switches, and up to 50,000 lines in a year. Northern Telecom is already undertaking a Z1125,000 million upgrade of Elwro's facilities. Kapsch, Northern Telecom's Austrian licensee, is also collaborating with Elwro to produce ADS-100 exchanges.

AT&T also has a presence in Poland. At the beginning of 1991, AT&T Network Systems International (AT&T-NSI), based in the Netherlands, won a contract to supply SESS digital switching systems for the provincial capitals of Szczecin, Polck, Siedlce, and Wloclawek. AT&T-NSI will also provide transmission equipment including digital host exchanges, intercity exchanges, subscriber lines, remote switching modules, fiber-optic transmission equipment, and digital radio links between Szczecin and Kozalin.

AT&T-NSI has already installed an international digital gateway switching system, and plans for an international radio link have been mooted. One of AT&T-NSI's greatest successes in Poland to date has been the switch it has supplied for the Komertel overlay business telephone network. In April 1992, AT&T announced that it would be introducing an ISDN overlay to Komertel, which would offer primary service by the end of May 1992. Sources inside Poland are, however, skeptical that the company will be able to achieve this target so rapidly.

Mobile Communications

Mobile communications have been in existence in Poland for the last 25 years, although in the civil sector, these have been limited to dispatcher networks and emergency services. In the last four years, mobile radio subscribers have had access to a manual/semi-automatic public mobile radio network operating at 160MHz and covering the cities of Warsaw, Katowice, Lodz, and Gdansk-Gdynia. It has the capacity for up to 10,000 subscribers, but at the end of 1991, there were just over 1,000 subscribers.

In April 1991, the former PPTT began to receive bids to build and operate the first Polish cellular mobile radio network. No formal tender was announced, but by June 1991, the PPTT had received some 25 bids and decided to award the contract to a partnership between France Telecom (24.5 percent) and U.S. RBOC Ameritech (24.5 percent). Under the new Telecommunications Act of 1990, the group is entitled to hold 49 percent of the joint venture company, with the PTSA retaining the controlling 51 percent share. The consortium, called Polish Cellular Telephones, will use Nokia switches to build and operate an NMT 450MHz network for Warsaw and later for national coverage. Polish Cellular Telephones estimates that in five years the network will have 50,000 subscribers.

Like most eastern European countries, Poland does not yet have the technology or capital available to invest in GSM. Moreover, the 900MHz frequency used by GSM has not yet been freed by the Soviet military for civilian use. Poland is nevertheless wisely laying a solid foundation of analog cellular mobile communications, and allowing the more affluent western European countries to deal with the expensive teething problems associated with GSM, before it draws up its own GSM schedule.

Satellite Communications

The PTSA has a satellite station located at Psary. At the end of 1991, it was using three systems:

- Inmarsat—used for communications with ships via satellites fixed over the Atlantic and Indian Oceans.
- Intelsat—provides direct digital connections from Poland to the U.S.A. (100 digital channels), Canada (90 digital channels), Australia (transition to digital in the Indian Ocean region), Israel (FDM/FM system), Singapore, Japan, Saudi Arabia, and the United Arab Emirates. This system at Psary is being upgraded to extend the direct links with China, Taiwan, and India.
- Intersputnik—used for telephone and TV transmission within the former Eastern Bloc; it requires modernization. A Soviet satellite above the Atlantic is used for communication with East Africa and North, Central, and South America.

Poland has been a member of Eutelsat since November 1990, and a Eutelsat system should be installed at Psary by 1995.

Paging

In March 1991, the old PPTT opened Poland's first radio paging facilities. Based on the existing VHF FM national radio network in the 66-73MHz band, the PTSA hopes to offer total national coverage by the end of 1992, and to have 100,000 subscribers by the end of 1993. Paging receivers are manufactured by Nokia and currently imported from Finland. There are plans to manufacture the receivers locally.

Polpager, a private company offering nationwide paging, has failed to make a significant impact on the Polish market, due to the lack of promotion and possibly high pricing.

Data Communications

Polish data-transmission facilities operate at rates of 2.4K bps and 4.8K bps for leased-line connections. International leased-line transmission is available at up to 64K bps. By the end of 1991, there were approximately 900 leased data lines in Poland.

Since February 1991, the PTSA has been operating packet-switched public data network called POLPAK. Modelled on France Telecom's Transpac X.25 network, the network uses Alcatel CIT switches. It has 18 nodes, a total capacity of 1,300 terminals, and 1,200 ports for applications such as electronic mail and EDI. Available in Warsaw, Katowice, Krakow, Poznan, Wroclaw, Gdansk, Szczecin, and Lublin, access is via X.25 terminals, from modems connected to the PSTN, and from the telex network.

Some of this equipment is used by the Polish National Bank's private Telebank 2M bps data transmission network. It connects the bank's main branches, and will be extended to include other banks by 1995.

Text Services

The Polish telex network is fully automatic, with equipment supplied by local manufacturers. Exchanges are digital and fully electronic. They are also fitted with stored program control. At the end of 1991, the telex network had a total capacity of 47,000 lines and approximately 38,500 subscribers, with another 2,000 on a waiting list. Growth in telex traffic is expected to continue for about two years, until digitalization of the network will allow fax communications to replace telex as the more popular medium.

Since July 1990, a national Minitel service has been available. Minitel consists of a transportable unit which can send messages via the telephone network to electronic mailboxes at Minitel exchanges in Gdansk or Warsaw. Messages can be checked by phone at intervals and collected electronically, or sent to the telex network. A national teletex service also exists in Poland, which is based on the UK Oracle standard.

In 1990, there were 5,824 fax machines in Poland; this figure has been increasing rapidly, due to the fact that

permission is no longer required to connect fax machines to the network. The user must merely inform the PTSA that the machine is being connected. If, however, the user then intends to offer fax services, a license must be obtained from the Ministry of Posts and Telecommunications. In 1992, there were 40 approved fax types, with the most important criteria being error-correction capabilities. Fax machines are invariably of foreign make, with Panasonic being the most popular one.

Value-Added Network Services

Value-Added Network Services (VANS) have emerged in Poland only since the abolition of COCOM restrictions.

Electronic mail is provided over POLPAK by two Polish companies, the PTSA and the privately-owned TESA. The PTSA has 5,000 subscribers to its telex and teletex electronic mail service known as POLKOM. TESA Communications has based its service on the Geomail system operating in Germany; it will provide an international fax gateway to 10 countries. TESA will work in conjunction with POLPRO, the national body which will promote the Edifact standard for EDI.

The Future

The PTSA has already set itself some ambitious targets for the year 2000. Although Poland aims to achieve in 20 years what most western European countries achieved in 40 years, it has the advantage of being able to learn from past mistakes and thus save valuable time, money, and resources.

By the year 2000, the PTSA expects:

- The number of subscribers to increase to 12 million;
- Line density to increase to 25 per 100 population;
- Waiting time for a connection to decrease to one year by 1995, and just two weeks by the year 2000.

The PTSA also plans to have 100,000 terminals connected to switched data network and/or ISDN islands; the latter will be available in business and regional administrative centers.

To capitalize on the equipment and expertise available, Poland must continue to attract foreign investment and encourage its own entrepreneurs through such devices as government grants and "tax holidays" (waiving of tax during the crucial early years of development of a new company). However, as with much of Eastern Europe, it needs a reasonably efficient telecommunications infrastructure before it can stimulate interest and investment.

Poland has benefited from large communities of Polish emigrants abroad (especially in the U.S., Canada, UK, and Australia), who are lobbying for investment and development in their homeland. For example, Ameritech, now a member of the cellular mobile network consortium, is based in Chicago, which has a high proportion of Polish immigrants. Ameritech apparently plans to help Chicago Poles buy and send cellular phones

to relatives in Poland. This will go some way to achieving the PTSA's target of 100,000 subscribers by 2000 and increase telephone penetration in Poland.

Beyond the PTSA, Poland is taking its future very seriously. Within Europe, Poland has proposed establishing a free-trade zone with CSFR and Hungary, preceding EC memberships. The country is also emerging as a regional adviser for the new Baltic and Balkan States, and it is developing as an East-West trade center. Poland has already established links with the former Soviet territories, and Polish business executives—with their knowledge of the market, and the ability of the majority of them to speak Russian, English, and French—will have a headstart building contacts in the East.

Nevertheless, Poland still faces an uphill struggle in modernizing its telecommunications sector, developing its market economy, attracting foreign investment, and installing all the governmental, legal, and corporate structures required to support the telecommunications infrastructure into the next century.

UK Firm Develops First X.400-Compatible EDI Software Package

92WS0807J *Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE*
in English 24 Aug 92 p 4

[Article: "United Kingdom: First X.400-Compliant EDI Software Package Developed"]

[Text] The London-based telecommunications and software house, Telesmart Developments Limited, claims to have developed the UK's first electronic data interchange (EDI) software package to be compatible with the latest P.7 version of the X.400 international communications protocol.

The new addition to Telesmart's ATLAS EDI product, ATLAS EDI X.400, will allow transmission of EDI messages over X.400 telecommunications networks. It was created, the company says, by combining Telesmart's ATLAS EDI software with the X.400 Remote User Agent (RUA) software developed by Alprange Communications Limited.

Telesmart believes that the X.400 standard will now take off after years of "wait-and-see" by the major IT vendors and users.

As its use spreads, X.400 should eventually put an end to the problem of incompatibility between systems. It will allow users of any product, whether PC, mini or mainframe, regardless of operating system (DOS, UNIX, VMS, PICK, etc.) to send and receive from any other system anywhere in the world, any sort of data, whether it be invoices, electronic mail, speech or images.

It is likely that Value Added Networks (VANs) will take on X.400 and will be forced to communicate with each

other, thus allowing users, who have previously been tied exclusively to a single VAN, to reach the users of any other VAN worldwide.

Telesmart's Chairman Cyril Block explained: "ATLAS EDI X.400 will make users X.400-compliant while still giving them immediate access to all the major UK Value Added Networks via standard methods. Acceptance of

Open Systems Integration standards is growing. The financial telecommunications networks will soon start to use X.400 for electronic funds transfers and the use of standards such as EDIFACT will further facilitate this. It is also likely that X.400 will be used for funds transfers between the European automated clearing houses such as the UK's own BACS [Bankers' Automated Clearing Service]."

SCIENCE & TECHNOLOGY POLICY

Hungary: Government Approved Additional R&D Funds Questioned

92WS0781B Budapest FIGYELO in Hungarian
18 Jun 92 p 4

[Article by "-ler": "R&D, But From What?"]

[Text] At its session last week the government approved 1.5 billion forints additional money for the central technical development fund and undertook to guarantee an additional 3 billion for coming years, according to a statement by Minister Erno Pungor, chairman of the OMFB [National Technical Development Committee], at a press conference last week. What is the background to this announcement? As is well known they originally planned to put 6.5 billion forints into the central technical development fund. The source of the fund is payments by the enterprises, set for them as a percentage of their profits. According to the optimistic calculations

of the Finance Ministry they could thus count on 13.5 billion forints of which the government would take 2 billion off the top to support higher education, subtracting an additional fixed sum for research sites maintained from budgetary supports, so finally the above mentioned 6.5 billion would remain to support research and development—within the framework of development competitions submitted to the OMFB.

But the profit of the enterprises fell far below what was planned, so after distributing the first 2 billion in the first quarter the OMFB was forced to stop evaluating the competitions. (Naturally it continued and continues to accept competition entries.) So the 1.5 billion forints offered out of the budget by the government will make possible the evaluation and financing of additional projects to this limit with the understanding that the future part of these projects will not exceed 3 billion forints next year and the year after. That is, the government undertakes to finance R&D in the coming years to a limit of 3 billion forints.