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EAST EUROPE

AEROSPACE, CIVIL AVIATION

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AEROSPACE, CIVIL AVIATION

Airbus Industrie's New Structure Described

*MI890224 Rome AIR PRESS in Italian
29 Mar 89 p 576*

[Text] According to a press release dated 21 March, the statutes governing the restructuring of Airbus Industrie will become effective on 1 April. This is consistent with the policy suggested in the "report of the four advisors" that was submitted to the governments concerned last year and approved by the companies forming the group.

The group will retain its status as a GIE (economic interest group), but will be substantially restructured at the decision-making and operational levels. The main innovations are designed to streamline the structure and to improve cost controls. Innovations also include the composition and size of the supervisory council, the senior management structure, and the establishment of an executive board.

The supervisory council will retain its function as the primary tool for maintaining overall control of Airbus Industrie policy. As such it is responsible for all strategic decisions and for all current and future programs, but the number of its members will be reduced to five. These are: President Hans Friderichs, Vice President Henri Martre (Chairman and chief executive officer of Aerospatiale), ordinary members Hans-Arnt Vogels (chairman and chief executive officer of MBB [Messerschmidt-Boelkow-Blohm]), Sir Raymond Lygo (chief executive officer of British Aerospace) and Javier Alvarez Vara (chairman of CASA [Spanish aerospace firm]).

The management is to be directed by a managing director/general manager with broader responsibilities for integrating the commercial requirements of Airbus Industrie with the economic and industrial capabilities of its four partners. This task has been assigned to the group's outgoing president, Jean Pierson. The role of vice president and general manager has been replaced with a chief operating officer, assigned to Heribert Flosdorff, who will be responsible for the daily management of the company. The other newly-established position of financial management officer will be held by Robert Smith, whose task is to guarantee an open accounting system throughout the group. This will provide full access to data showing the costs incurred by each individual partner in the Airbus operations. According to AIR PRESS this may be the most significant innovation of the new statutes.

Finally, the board will have full control over all the group's activities within the limits established by the supervisory council. The board will consist of a chairman, Jean Pierson, and will include six other members: Heribert Flosdorff, Robert Smith, Jacques Plenier (general manager of Aerospatiale's aircraft division), Hartmut Mehdorn (general manager of MBB's transport

aircraft group), Sydney Gillibrand (President of British Aerospace's commercial aircraft division), and Alberto Fernandez (general manager of CASA's aircraft division).

FRG: Dornier Restructuring Described

*MI890269 Friedrichshafen DORNIER POST in English
No 1/89, pp 6-7*

[Text] In order to adapt itself to the growing internationalization and the increasing requirements for cooperation—along with the restructuring of the German aerospace industry—the Dornier company at the beginning of 1989 has streamlined its organization and activities into a new three-group structure. With this structure approved by the shareholders meeting in December 1988, identical and associated tasks of the old group of companies have been concentrated and oriented to the operational requirements within the Deutsche Aerospace AG.

Dornier as of 1 January 1989

The new company structure consists of Dornier GmbH, Friedrichshafen, and the subsidiaries Dornier Luftfahrt GmbH, Oberpfaffenhofen, and Dornier Medizintechnik GmbH, Munich. As of January 1989 the total number of employees of approximately 9,800 is divided into 4,500 at Dornier GmbH, 4,600 at Dornier Luftfahrt GmbH, and 500 at Dornier Medizintechnik GmbH. Approximately 200 other people are employed with foreign subsidiaries. For the current year, a personnel increase to approximately 10,500 is envisioned.

By this restructuring, all aviation activities of the company were incorporated into the former Dornier Reparaturwerft GmbH, Oberpfaffenhofen which as of 1 January 1989 was renamed Dornier Luftfahrt GmbH. The activities of Dornier System GmbH were transferred to Dornier GmbH, its name was abandoned. Activities and staff were fully taken over by the new company groups.

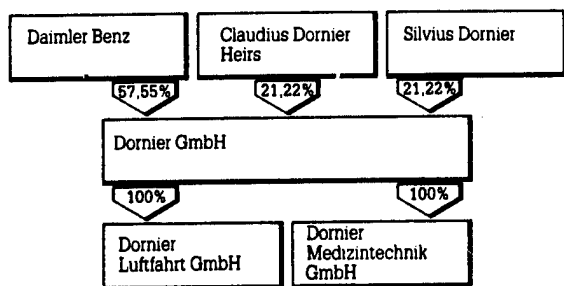
Increase of the share capital

With the introduction of this new organization the share capital has also been increased. Accordingly the parent company has a capital of DM150 million (previously DM100 million), Dornier Luftfahrt GmbH has a capital of DM44 million which will be increased to DM50 million in the near future. Dornier Medizintechnik GmbH will be endowed with DM10 million as before.

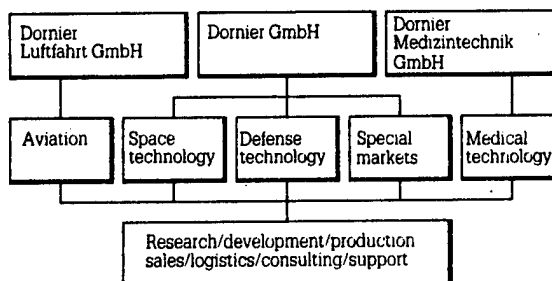
Business forecast

For the business year 1988 total sales will amount to DM1,9 billion, while for the current year 1989 total sales of DM2,4 billion are estimated. After investing DM170 million in 1988, another DM168 million in investments are planned for 1989. Major items of these expenditures

**Structure of Ownership
of Dornier GmbH
and its subsidiaries**



**Area of business
of the Dornier Group**



include the new aircraft assembly plant at Oberpfaffenhofen and the electronics center and the aerospace production facility at Friedrichshafen where the first employees can take up their work in the near future.

Fields of activities and responsibilities

In accordance of the reallocation of the fields of activities into the five business areas of aviation, space systems, defense technology, medical technology, and special markets, the individual tasks are assigned at Dornier as follows: Dornier GmbH at Friedrichshafen is assigned the space systems, defense technology, electronics and informatics, new technologies, and planning consulting areas.

Dornier Luftfahrt GmbH is responsible for commercial and military aircraft programs, systems integration, training, and ground support equipment. This includes all tasks of development, production, and modification in the aviation area.

Dornier Medizintechnik GmbH in Munich is responsible for the production and marketing of the non-invasive kidney disintegration system, which is already introduced worldwide, and the gallstone disintegration

system developed from the kidney lithotripter. In addition it is responsible for the development of additional medical therapy equipment.

Management responsibilities

As of 1 January 1989, the Board of Directors and the management are constituted by: The members of the Board of Directors of Dornier GmbH—Dr Johann Schaeffler (chairman), Eng Guntram Bartscherer (personnel), Dr Karl-Wilhelm Schaefer (economy and finance), and Dr Helmut Ulke (R&D, engineering). Eng Hans Ambos will take over a new activity in the future Deutsche Aerospace AG and until that time continues to be a member of the board of directors of Dornier GmbH.

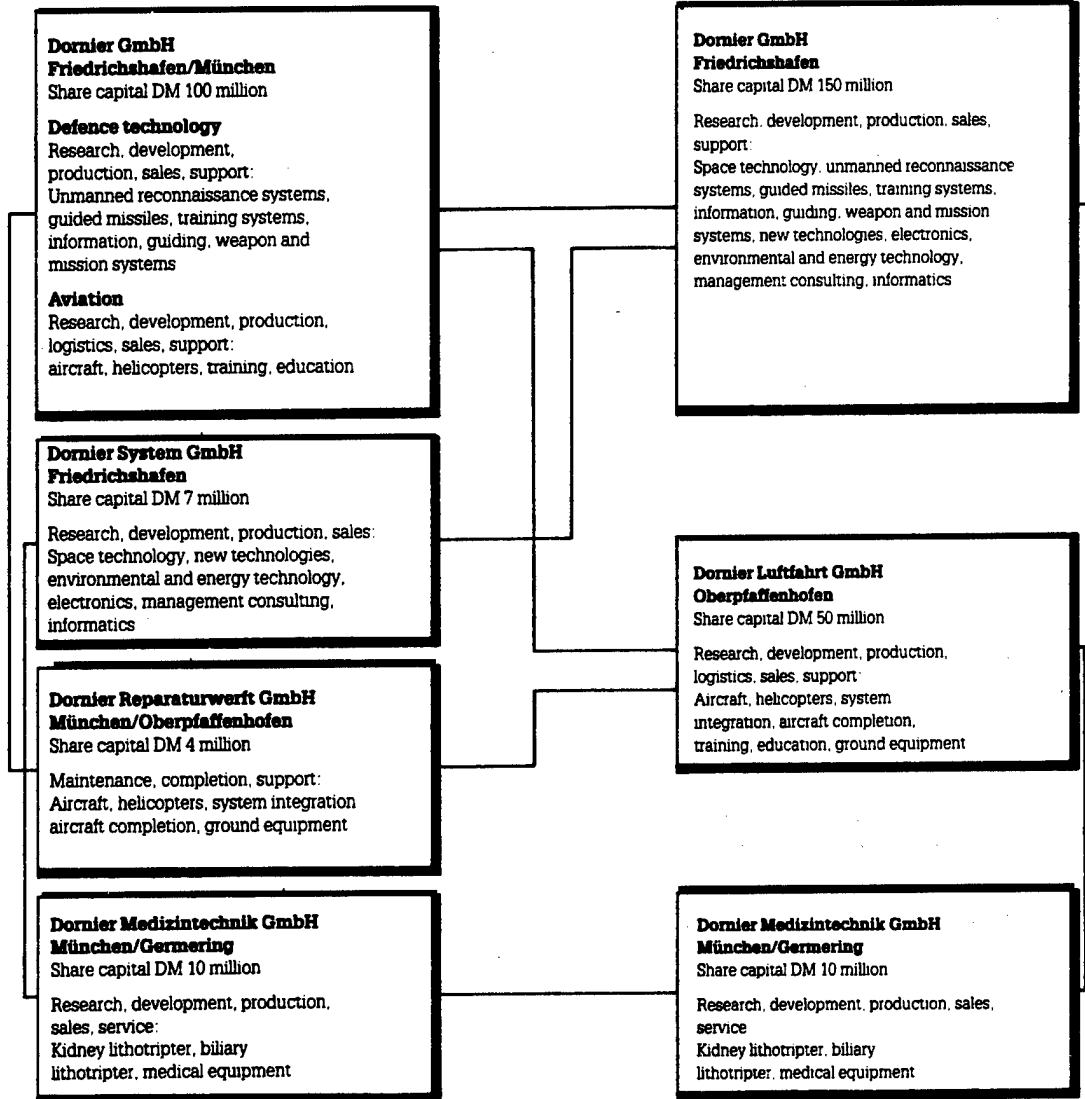
The Board of Management of Dornier Luftfahrt GmbH—Dr Hans Blume (economy, finance, and spokesman), Eng Hans-Dieter Abt (production), Eng Guntram Bartscherer (personnel), Eng Klaus Neuhaus (marketing and sales), and Dr Bernd Straeter (design and development).

Dornier Medizintechnik GmbH is headed by Eng Juer-gen H. Schmudlach (Commercial Managing Director) and Eng Eugen K. Watter (Technical Managing Director).

Restructuring of the Dornier group

Structure till December 31, 1988

Structure since January 1, 1989



FRG: Dornier Develops Data Systems for Space Experiments
MI890271 Friedrichshafen DORNIER POST in English No 1/89 pp 48-50

[Article by Guenter Murr, Johannes Rogg: "Data Systems for Scientific Space Experiments"]

[Text] For basic research under zero gravity conditions more and more precise and therefore more informative results are desired. This requires correspondingly more complex and more ambitious scientific experiments

which are carried out within the scope of manned and unmanned space missions.

For this, each experimental system requires a decentralized autonomous data system. This is based on a powerful on-board computer which performs the necessary control and regulation functions and collects and processes the scientifically relevant data and transmits them for further processing.

The conception and realization of such data systems have a long tradition at Dornier. Such data systems have been used at first in the MEDEA (Material Sciences Experiment Double Rack for Experimental Modules and Systems), a double rack containing the GFQ (Gradient

Furnace with Quenching Device) and ELLI (Single Ellipsoid Mirror Furnace) which successfully performed their experimental processes during the first German Spacelab mission (D1 mission).

The GFQ is a resistance-type heater furnace for melting and drawing metal samples while ELLI is a mirror furnace for the processing of semiconductor materials. The required energy for heating is obtained by focussing the light radiating from a halogen lamp onto the sample.

For the follow-on model of ELLI, the Automatic Mirror Furnace (AMF), a data system operating under vacuum conditions, has been realized to control the experimental system mounted on the Eureka carrier system.

For the GFQ follow-on model AGHF (Advanced Gradient Heating Facility), a data system is currently being realized and the Medea electronic data systems having successfully operated during the D1 mission are being modified for reuse during the D2 mission. An important modification is the possibility of changing the process parameters by programming from ground or on board during the mission.

Dornier also develops concepts for the future application of data systems to scientific space experiments. Currently, a data system for the universal Zone Melting Furnace (ZMF) for crystal growing purposes is in the conceptual phase; this system has to meet more stringent requirements as to processing performance and accuracy than the electronic systems already realized. Within the scope of a national study, a data processing concept for scientific experiments for use in the planned Columbus space station has been developed.

Design of Existing Data Systems

The typical hardware design criteria of data systems for scientific space experiments are as follows:

- Microprocessor control for experiment monitoring and control
- Separate bus systems for the computer system and input-output operations
- Additional safety electronics with watch dog (monitor circuit for microprocessors) and monitor circuitries for safety-critical signals.

For the design of these data systems, standardized data processing and input/output modules are available which can be configured according to the requirements of the experimental systems.

To solve the various control and regulation problems of such experimental systems, an efficient real-time software system is required. It is important that the operation system effectively supports the real-time requirements. The following distribution of tasks can be considered typical for the existing problems:

- Initialization of the entire system with self-testing
- Data collection, preliminary processing and check
- Process control
- Data output with preceding data formatting
- Data exchange through the interface of the space vehicle.

To support the software development, efficient tools are available at Dornier from the beginning of the definition phase.

Future Data System Developments

In connection with the ZMF, more efficient data systems will soon be required to perform the control and regulation tasks for the heating equipment at a clock rate of 10 Hz and 16 bit resolution. For this purpose, a computer system based on a 32 bit microprocessor will be designed. In doing so, data systems will already be initiated for the planned Columbus space project for which the introduction of hardware standards (buses, network interface, etc.) and software standards (protocols, operating systems, languages) can already be foreseen.

In view of future projects with higher demands on component qualification standards, computer systems based on transputers (new computer architecture) and based on the MIL [expansion not provided] Standard 1750 are being developed.

For Columbus experimental systems, flexible and universally usable data systems have been defined within the scope of a study.

In comparison with the previous Spacelab missions, new aspects play an essential role for Columbus. The payloads are to be integrated step by step in the orbit. Because of the long life of the space segments, parts of the payloads (hardware and software) or complete payload elements have to be exchanged and reconfigured. In addition, time per payload available to the payload specialist is much shorter than that for Spacelab. Finally, a more extensive offer of data management services will be made available to the payloads, which will simplify processing and documentation.

Therefore, the Columbus data management system for payloads is centered on the following focal points:

- Operation of autonomous payloads
- Offer of central services
- Introduction of standards, takeover of commercial standards and elements such as operating system, software engineering environment, programming languages, interfaces, processors, data buses
- Introduction of an open system architecture
- Realization of distributed data processing systems.

The most important aspect of a payload data processing system for future missions of this kind is a flexible, failsafe, and efficient hardware system. This contains a standardized microprocessor system with redundancy, specialized input-output processors with flexible modules, and a network interface with the Columbus data management system.

Another aspect is the modularized software systems which are to include experiment control and monitoring, safety monitoring, data processing and exchange, reprogramming of system parameters, and built-in test with fault location and elimination (for example, for redundant systems). The corresponding software architecture reflects these requirements.

Finally, mention should be made of the realization of an efficient man-machine interface with standardized user display and user guidance, preliminary data processing and ergonomic presentation of system data, graphic system presentation, decision-making tools such as intervention in experiments, fault diagnosis, reconfiguration aids, and instructions for repair.

Outlook

Apart from the aforementioned activities, Dornier has also wide experience in the fields of on-board satellite systems, data processing systems for experiments (remote sensing, earth exploration, robotics, biomedicine), fast digital data processing systems with the required software and processor architectures, and electrical ground system test facilities. This is the basis on which efficient data processing systems for future experiments under zero gravity can be offered. For the Columbus project in particular, new computer architectures and software structures are needed to ensure the required computer performance (e.g., for multizone furnaces). This architecture includes the use of "artificial intelligence" tools, for example, for diagnosis systems or efficient interactive graphic user displays.

Aeritalia To Buy 50 Percent of Two Ferranti Companies

*MI890225 Rome AIR PRESS in Italian
29 Mar 89 p 568*

[Text] Aeritalia, the Italian aerospace company (IRI-Finmeccanica group), has reached an agreement with Ferranti International Signal to acquire 50% of two companies controlled by Ferranti, Elmer SpA of Pomezia and Laben SpA of Vimodrone (Milan), by underwriting new shares for 50 billion lire. As of 31 March 1988, Elmer and Laben's combined annual sales were 172 billion lire.

Elmer is a leading company in the planning, development, and production of advanced radiocommunications, radio navigation, and electronic defense systems. Laben is one of the best known companies in Europe in

the field of space electronics. It specializes in the development of data processing equipment installed in satellites with corresponding ground support systems as well as in the integration of scientific payloads. Both companies are members of the ISC (Space and Communications Industry SpA) European Technologies Group, which is located in Florence and which is under ISC management. Aeritalia and Ferranti have collaborated on several projects over many years. Both companies are involved in avionics, space and defense, and have recently signed a cooperation agreement for the development of the TIALD (Thermal Imaging and Laser Designating) system designed by Ferranti Defence Systems of Edinburgh. In 1988 Aeritalia and Ferranti established Elettronica Aerospaziale Europea SpA in southern Italy through Elmer to seize new opportunities in the design and production of high quality electronic systems and equipment. According to a company report, the new agreement will increase the resources and development potential of the two companies by establishing a link between Elmer and Laben and one of Europe's leading space companies. Aeritalia and Ferranti International consider this agreement to be yet another step toward closer cooperation in the area of European high technology.

Cereti: Alliance Development Policy

Eng Fausto Cereti, vice president and managing director of Aeritalia commented on the agreement: "The agreement signed by Aeritalia is part of its policy of developing national and international alliances to be carried out by the most important Italian aerospace firm and reinforced by a share in companies which are of interest to Aeritalia and its partners. The introduction of the new European market regulations in 1992 makes the need for talks between the leading European groups all the more pressing. This agreement confirms the validity of Aeritalia's alliance with a group such as Ferranti, which possesses extremely advanced technologies. The share in Laben, Italy's third company in the space sector, consolidates Aeritalia's leading position in Italian aerospace and contributes to its increasing importance at the European and the international level. The shareholding in Elmer reinforces Aeritalia's position in the on-board communications sector and enables the company, which is part of the IRI-Finmeccanica Group, to increase its competitiveness in the production of 'intelligent systems' for defense purposes."

Matra, GEC-Marconi, Daimler-Benz Agreement Signed

*MI890223 Rome AIR PRESS in Italian
23 Mar 89 pp 533-534*

[Text] AIR PRESS reports that the objective of an agreement signed by Matra (France), GEC-Marconi (UK), and Deutsche Aerospace (the new company which carries out Daimler-Benz's aerospace activities) is to create an "exclusive pole" in Europe for the defense and space sectors. The agreement should become operational

by midyear. The three companies have decided to turn their respective defense and space divisions into separately managed subsidiaries. As a result there will be approximately 20% cross participation.

Matra, which became a private company last year, is the only major private French company operating in the two sectors. In 1988 its profits were about FR 330 million with total sales amounting to Fr 19.6 billion (about Fr 6 billion of which came from the defense and space sectors which employ 6,000 people). Though highly qualified from the technological point of view, the company is relatively small compared to the competing public companies, Aerospatiale and Thomson-CSF. The company therefore views a forthcoming reorganization of France's defense industry with some concern. GEC-Marconi sees the three-party agreement as a satisfactory alternative to its original plan to join forces with Siemens to take over its rival company Plessey. The plan seems to have been stifled following objections made by the British Ministry of Defense and the Monopolies and Mergers Commission. According to the president of Daimler-Benz, Edzard Reuter, who confirmed the announcement of the agreement made by Matra's president, Jean-Luc Lagardere, Deutsche Aerospace considers the agreement to be interesting primarily because of the impulse it will give to the company's space activities.

Both Reuter and Lagardere emphasized the significance of this agreement for the promotion of private industry and the development of European cooperation in the defense and space sectors. Lagardere used this occasion to recall the "preferential relationship" between Matra and FIAT, specifically their joint venture in the automobile industry. He also stated that the agreement shows the "strongly European" desire of the companies involved to create a large industrial unit "free of the restrictions on cooperation among national companies that have prevailed in the defense sector. The restructuring of the sector only has meaning if it is carried out at the European level."

AIR PRESS points out that Daimler-Benz and GEC-Marconi are already among Matra's shareholders. When the company became privately owned, each of them purchased 5% of the company's shares. They have indicated that no increase in that percentage is planned by either company for the time being. Another 2% is owned by the Swedish group Wallenberg. Two years ago Matra signed a joint venture agreement with Ericsson, a Swedish company operating in the telecommunications and radar industries. The objective was to gain control over the French telecommunications group CGCT [expansion not provided] when it was privatized and beat the competition from AT&T to acquire CGCT. The Matra group also operates in the automobile, automated urban transport, publishing, and communications sectors (press, Hachette publishing group, "Europe 1" radio station), as well as in the banking sector. In 1989 total sales are expected to be FR 50 billion. Despite the cross participation, Matra intends to maintain full control of

the subsidiary, which will combine defense and space activities: "We want to remain masters in our own home," Lagardere remarked, "even though we are well aware that when European-wide legislation is introduced, supranational companies will inevitably be formed. It is an irreversible trend."

Italy: FIAT To Acquire State Aerospace Company
MI890250 Rome AIR PRESS in Italian 7 Apr 89 p 637

[Text] Government shareholdings will not completely cease to be part of Alfa Avio's capital in the event that it is transferred to FIAT in exchange for the Savigliano plant. "A position within the company with the right to participate in strategy will be maintained." This statement was made by Minister Carlo Fracanzani on 6 April at the Bicameral Commission for Government Shareholders. He disclosed the stand he will take at CIPI [Interministerial Committee for the Coordination of Industrial Policy] when the interministerial committee will examine the hypothetical privatization of the aircraft engine company controlled by IRI [Institute for the Reconstruction of Industry]-Finmeccanica.

The eventual transfer of Alfa-Avio "does not mean a possible withdrawal of government shareholdings from the aircraft engine sector." Apart from maintaining the minority share held by the government, the objective of the negotiation with FIAT will be to obtain "guarantees of preemption in case of transfer to third parties and guarantees of protection for companies with government-held shares that are purchasing products." Alfa Avio's public customers include Alitalia, with a share of 34.4 billion lire out of the total 207 billion lire in sales. Aeritalia accounts for 200 million lire of sales and Agusta for 300 million. According to data provided by Fracanzani, the remainder is divided between FIAT (101.2 billion) and third parties (71.5 billion).

Italy: Telespazio's Role in 'Olympus' Described
MI890246 Rome AIR PRESS in Italian 11 Apr 89 p 686

[Text] Telespazio's role in the "Olympus" satellite program was illustrated at an international conference held in Vienna on 12-14 April to discuss the operations of this major European telecommunications satellite.

Telespazio will be responsible for the in-orbit control of "Olympus" during its 5 year operational period under the terms of a contract with the ESA (European Space Agency). A control center has been installed at the Fucino Space Center for this purpose. The control center, which is the first and most complete center entirely created by Italian industry, will perform telemetering services and will control and locate "Olympus." The center will also provide assistance in the phase when the satellite is launched and carried into orbit. Telespazio

will provide specialized personnel to operate the satellite from the ESOC [expansion unknown] Space Center during the initial phase of the mission.

One of the main tasks of "Olympus" is to supply two television channels for direct television broadcasting in Europe. The signal can be received by users who have small antennae (approximately 60/90 cm in diameter) installed directly in their homes. One of the channels will be used by RAI [Italian Radio Broadcasting and Television Company] in Italy. RAI will use the antenna Telespazio is currently developing and which will be ready for use in the second half of the year.

Finally, Telespazio will be responsible for the control of an earth station system, based on an agreement with ASST (State Telephone Services Agency) and ISPT (Higher Institute of Post and Telecommunications). The system will be used to carry out telecommunication and propagation experiments with the participation of many other national research institutes. The telecommunication experiments include: video-conferencing connections between various places, the inclusion of the satellite in a mobile radio network, and the use of very small stations for telecommunications systems with business applications.

AUTOMOTIVE INDUSTRY

France's Citroen Introduces New Line

Design Innovations

36980225a Paris *INDUSTRIES ET TECHNIQUES*
in French 25 Apr 89 pp 55-59

[Article by Jean-Louis Toumit: "XM: Citroen Upstages the Conformists"]

[Text] To attack the market of upper-range cars marked by classicism, while remaining true to its innovating image, Citroen has gone all-out with technologies. From its "revolutionary" suspension that adapts to the road to the new Diesel engines, along with the comfort and finishing quality, the vehicle strives to be out of the ordinary. The production tool does not lag behind. While innovations are burgeoning at all the sites, the Rennes plant stands out for two striking advances: use of "clean rooms" for lacquering, and off-line preparation of subassemblies for the final assembly.

Major Innovation: A Real Active Suspension

A suspension that adapts to the road and the driving, engines "equal to the task," a well-modified modern style, and upper-range finishing: for the XM, Citroen has blended safety and quality.

"It is a Citroen!" The profile of the body line is enough. The streamlined front and the squat rear confirm it. The XM, new upper-range model of the twin-chevron company, cannot deny its origins. By wedding sport and

comfort, combining nonconformism and classicism, Citroen has played it cautious in the demanding market of the "fast and comfortable grand touring cars." With, as the major trump, technology, concentrated more than ever on active safety.

Because the XM is a Citroen above all because of its suspension. Introduced at the last "Mondial" auto exhibition on the Activa research prototype, the "hydroactive" suspension will prompt as much discussion as did the DS 19 in its time. By combining hydraulic and electrical, the specialists in contact with the ground have designed a system that automatically adapts to the road and to the desires of the driver. "The eternal compromise between comfort and road behavior disappears," explained Pascal Lefebvre, responsible for the integral vehicle. To achieve good comfort, one needs a suspension with high flexibility and low damping; while the opposite is needed for good road behavior. "With the hydractive suspension, for the first time the damping and flexibility are instantaneously variable, with a constant height.

Soft or Firm Suspension Condition

The vehicle does not lean, and remains stable in turns. "Everything happens as if there were two complete suspensions, one firm and the other soft." The change of condition is controlled by a computer that constantly compares the data from five sensors with memorized instructions. "Three years of work and many experiments on the way were required to develop the system's logic, particularly that of the automatic control," stressed Pascal Lefebvre. Depending on the variation observed, the computer selects the setting and gives its instructions to the hydraulic system. "With the hydractive suspension, each axle has not just two cylinders and two absorbers, but three cylinders and four absorbers. In response to the computer instructions, a regulator operated by an electrovalve activates or disconnects the third cylinder with its two absorbers to provide a soft or firm suspension." The driver does not feel the change in setting because the total response time is less than five one-hundredths of a second, and the dynamic reaction of the vehicle is always anticipated by the system through the selected information provided by the sensors. Several parameters are thus taken into account by the computer. The angle and angular rate of the steering wheel are measured by an opto-electronic sensor mounted on the steering column. Braking is registered by a pressure switch connected to the front brake circuit. The rate of depression or release of the accelerator pedal is measured by a potentiometer. The chassis movement is registered by a sealed, enclosed optical sensor that measures the rotation of the front anti-roll bar. Finally, the vehicle's speed is registered by a sensor on the gearbox.

Constant-Assistance Hydraulic Control

"The conversion to firm condition is instructed either when the angle or the angular rate of the steering wheel reaches a value dependent on the speed of the vehicle, or

when the brake pressure switch detects pressure greater than a specified level, or when the amplitude of leaning of the chassis reaches a degree of compression or expansion. As for the "speed" data, it is used to adjust the instructions for conversion to firm condition." The installation of a hydractive suspension was studied as a whole, and the axles were subject to modifications such as redesign of the suspension diagram and reduction of the anti-lifting angle of the arms, in order to achieve better comfort and tracking. Logically, the steering was adapted to the behavior of the axles. Unfortunately, all the models do not have production hydraulic steering with stiffening and thus variable effort as a function of speed. The first completions will thus have to settle for hydraulic steering with constant assist. This "Spartan" equipment policy also applies to the hydractive suspension and the third generation Bendix wheel anti-locking system, which are in series production only on the XM V6 and the 2-liter injection models and 2.1-liter diesel third-stage turbos.

While innovation in suspensions is a Citroen specialty, originality in body construction and style has always been a mark of the manufacturer. "The big problem was to distinguish the XM from its competitors, which are classic in shape, without displaying excessive modernism," Pascal Lefebvre confided. The result, based on a Bertone design developed by the Citroen styling center, is "a sporting line and a comfortable shape characterized by a coefficient of 0.28 (lift coefficient=0.60), and high visibility and comfort." Weight (1,280 to 1,420 kilograms depending on the model) is about the same as that of the CX, however, "the customers for upper-range vehicles are less concerned about weight and speed and more about quality and finishing touches." That is why the sheet thickness of the door and hood panels is eight-tenths, while seven-tenths was "adequate." That is also why tightness of the sealing doors is ensured by three different types of stripping: a main stripping attached to the door, a finishing stripping on the body against noise, and a third "drip" stripping protecting from both water and noise. While weight and reduced fuel consumption were not a major objective, "a lot of work was nevertheless done on the structures to lighten and strengthen," Pascal Lefebvre said. "The XM is the first vehicle in the group entirely planned by structure calculations right up to the running model (planning of the preprototype, grid creation of the first shape, then the prototype)." The structure is composed of a cage in the front with two shafts strengthened by attachment to a cradle. At the rear, the shafts are assembled to the plate, the floor, and the chassis base members. Rigidity of the forward cage is provided by a forward-facing shield, a large part made of thermohardening polyester that is very precise (to the one-tenth), serving as frame for the lights (which have a complex surface), the front shield (made of PP with color full thickness), the grill front (thermohardening polyester), and the hood. "The latter, as well as the rear lid, were designed for synthetic material. But, finally, both are made of sheet metal."

The hood, in order to avoid vibrations (reduction of body impedance in the openings). The lid, because the lateral members made of plastic would have been too thick for visibility and unesthetic. Only the trim is made of PP, with the glass of the lid enclosed by a trim made of PVC.

132 Kilograms of Synthetic Materials

Other parts, structural or not, are also made of plastic: body trim made of PP, wheel disks of PC-PET alloy polyamide, wheel well of linear PE, fuel tank of PE, and middle jack points of ABS-PC alloy. A total of 132 kilograms of synthetic materials in a vehicle with average weight of 1,300 kilograms.

To drive the XM, what was needed was engines up to the task, combining power and flexibility. Citroen chose to install transversely 6cylinders in V with 90 degrees of PRV mounted and 3 liters cylinder capacity to compensate for the presence of a trifunctional catalytic chamber of Europe standard 15.05 and U.S. 83. Developing 170 horsepower (123 kilowatts) at 5,600 revolutions per minute, with substantial torque (24.5 meter-kilograms at 4,600 revolutions per minute), this V-6 has a crankshaft with crankpins offset 30 degrees to improve the engine's smoothness. "To correct gallop and pitching caused by this offsetting of crankpins, the engine is equipped with a balancing shaft driven by chain and turning at engine speed." It is also equipped with a Bendix control system operating with the Fenix 3B computer that controls injection and ignition: engine control, injection time, calculation of advance, regulation of idling and mixture richness, detection of pinking, as well as producing injection after sending of a secret code (coded antistart-ing). Along with the V-6, the XM can rely on two other gasoline engines, but four-cylinder. One 115-horsepower with carburetor, and especially a 130-horsepower with injection. Particular effort was made to make them compact, with a crankcase-cylinder cast-iron monoblock with thin walls, which makes it possible to enlarge the cylinder without increasing the dimensions. Diesel power has not been forgotten for the XM with two new, indirect injection engines, one atmospheric (2.13 liters, 83 horsepower at 4,600 r.p.m.), the other supercharged (2.08 liters, 110 horsepower at 4,300 r.p.m., maximum torque 25.3 meter-kilograms). There has been innovation on these two engines to improve power and torque: a head including three valves per cylinder (two for intake, one for exhaust). "The problem of diesel is shortage of oxygen. Particular attention has been devoted to the lower part of the head to improve fuel supply." Air enters through an aluminum manifold with eight entries, connected to an air box made of polyamide. The same material, reinforced or not reinforced, is used for the radiator, the hydraulic fluid reservoir, and the Turbo feed tubes, while the battery tray and air filter are made of reinforced PP and the head cover of unsaturated PE.

Sporting and comfortable, powerful and safe, the XM also conveys, under the top, the "luxury, quiet, and pleasure" side of any upper-range vehicle. In addition to the substantial spaciousness—with dimensions clearly superior to those of the CX—there is also a large window surface (3.25 square meters) tinted green against ultraviolet rays. A window separates the passenger compartment from the outside when the rear lid is open. On his velvet seat, electrically adjustable, the driver can see the information of the on-board computer (outside temperature, present consumption, average consumption and average speed), as well as 24 messages of safety or nonsafety, preceded by a sound blip. There is no computer voice in the XM, a feature "very ill-regarded by drivers." On the other hand, there is a much better directed and automatically-controlled air-conditioning. "It was necessary to make some advances over the CX, and the air-conditioning influenced the design of the vehicle," Pascal Lefebvre emphasized. To regulate the output (up to 550 cubic meters per hour) and the temperature of the delivered air, three sensors report to an electronic control module. They monitor the temperature in the passenger compartment, the outside temperature, and the temperature of the blown air. Based on preset criteria for temperature comfort, the control instructions are sent to motor regulators controlling vents. On several models the air-conditioning is distributed to the rear seats by an enclosed channel through the doors, and there is also a recirculating function that makes it possible to have heating during a traffic jam without being bothered by exhaust gas.

Auto Body Production

36980225a Paris INDUSTRIES ET TECHNIQUES
in French 25 Apr 88 pp 61-63

[Article by Michel Alberganti: "Clean Room Chassis-Building"]

[Text] The Rennes plant has taken a decisive step in anticorrosion protection by resorting to "clean rooms" in the lacquering shop. Objective: to reduce as far as possible the rate of retouching using sanding, which destroys the preprotection of the sheets.

A long line of cabinets. On the floor, a red bench divides the room in half: the tile floor is gray on one side and white on the other. All symbolic. It is there that one dons the immaculate coveralls that an attendant in sky-blue uniform had handed out on entry. "Excuse me, please put on your suit." Even in the hallway separating the two clean rooms 190 meters long, the staff are insistent. Yet, it is not satellites or microprocessors that are being manufactured behind the windows. Among the BX bodies, the first XM's are emerging from their painting room. Beginning in September 1989, the lacquering shop will be handling 1,500 cars per day (of which 450 will be XM's at the end of 1989). This represents the bulk of the 1.2 billion francs invested by Citroen in the painting installation of the Rennes plant. With a first: the application to the automobile of "clean room" techniques,

previously reserved for production of electronic components. On the face of it, such a display of care is surprising. "It is like using a bulldozer to close a door," confirmed Denis Duchesne, in charge of systems at Rennes, with a touch of humor. This excess affects both ends. In the building, which is 400 meters long by 29 meters wide, each of the two parallel lines is equipped with ventilation of 1.5 million cubic meters of air per hour, kept at 22 degrees Centigrade. Underground, down to 6 meters, the water is treated over a length of 200 meters. All the command compartments are lined up on the upper floor, which is 290 meters long. Result: the lacquering is carried out in a class 100,000 clean room. This means that a cubic foot of the chamber contains less than 100,000 particles larger than 0.5 microns. To better illustrate this level of cleanliness, Christian Morisson, manager for painting on the Rennes methods staff, explained that one would have to combine 200 particles of 0.5-micron size to achieve the thickness of a human hair. This classification also requires that there be no more than 700 particles larger than 7 microns per cubic foot. Yet Denis Duchesne admits that only particles larger than 10 microns can produce a visible defect on automobile bodies. Simple economic logic would thus call for limiting the effort to this category. The Rennes Methods Staff explains that there are really no half-measures in this matter. "One cannot do things halfway." Nevertheless, Citroen has concrete objectives to justify the 200 million francs invested in the clean rooms alone. These are to reduce body retouching by a factor of two to three, and by five the number of appearance complaints by customers on reparable defects. However, that is doubtless not enough to make the investment profitable. Denis Duchesne stated: "For us, the 'clean painting' is part of a strategic move." He explained that even if this technology had produced a 40-percent increase in the painting installation, Citroen would have done it. The Rennes plant thus remains in the forefront of the PSA [expansion unknown] in combatting corrosion. The high-equivalent cataphoresis (30 to 35 microns) began there in 1987 before Aulnay in 1988 and Sochaux, which is getting its new workshop underway at this time. In fact, the clean room appears as the ultimate weapon that should finally bury the French cars' reputation of "letting everything through." The criticisms often focus on the proportion of preprotected sheet metal (zinc or electrozinc) used in building the bodies.

Citroen has not neglected this factor, having on the XM a record 76 percent of preprotected sheet metal, on the way to reaching the 100 percent of the Audi. However, in addition to the fact that the very principle of this protection is still argued (Volkswagen is still at 0 percent), it appears as quite inadequate. Denis Duchesne gives the key to the problem: "Half of the appearances of corrosion during the guarantee period (6 years for the XM) are the result of retouching."

Shop Designed for Future Robotization

These corrosion appearances, when they involve serious defects, lead to a sanding and then repainting. Even if the defect is repaired before assembly, and the body can be recycled through the painting hall, the sheet metal has lost the foundation of its anticorrosion protection: the cataphoresis and the zincking. Hence the launching at Rennes of a retouching facility using a two-component polyurethane paint intended to reduce this shortcoming. However, this solution does not eliminate all the risks of corrosion. Only having no retouching guarantees the nominal reliability of the protection. This, then, is the justification for the clean room lacquering. With the old facilities, the rate of recycling after resanding reached 20 percent. With the new workshop, the overall retouching rate will fall to 10 percent, and the recycling rate to only 3 percent, with the rest involving details corrected by hand. In the view of Denis Duchesne, it would be better to sell cars such as the 3 percent with defects rather than recycling them and always exposing them to the same risk of degradation of the protection. "We have too much technical pride; the Japanese are much more pragmatic: they never recycle their cars." Thus, even Citroen is deliberating, with its legendary reputation as artist of the automobile. The Japanese breath of realism has reached Rennes. "We still regard the automobile as a special product that includes a strong dose of emotional response," Denis Duchesne continued. "That prompts us to high-fashion-type approaches even though we are producing ready-made."

Citroen's perfectionism in regard to concern for appearance and protection quality does, of course, have its repercussions on the productivity side. With 1.2 billion francs invested in renovation of the painting facility, the manufacturer has an installation without any robots. A surprising situation, considering that Peugeot, at Sochaux, has adopted the opposite strategy by entirely robotizing its painting operations for body interior. At Rennes, they say in defense: "There are no visible painted parts inside the XM because it is 100-percent covered." Indeed, all that is left is the door entries. However, the Rennes shop is also going to process the BX bodies, which will in fact be two-thirds of its operation. The real explanation is financial. Initially, Citroen has had to sacrifice the robots.

Conversion to Hydrosolubles Painting Planned

However, all is anticipated for installing robots, and almost everything is decided in regard to their purchase. As at Sochaux, they will be electric robots mounted on a seventh dorsal axis in order to avoid the clogging problems of horizontal rails. Two models are in competition: the P150 of GMF chosen by Peugeot, and the TR 5000 of Asea-Trallfa. A total of 26 robots at 2 million francs apiece will perform lacquering of the interiors, assisted by 22 manipulators to open the doors, and complemented by 26 robots applying the sealing products to the body underside. The total bill will reach 200 million

francs for the robotization alone. As much again for the lacquering clean rooms. "We knew that we could not make the complete investment at the outset, and we designed the shop so it could adapt to the evolutions without extra cost," explained Christian Morisson. In addition to the place reserved for the robots, the new Rennes shop anticipates conversion to hydrosolubles painting, which appears inevitable with the application in 1990 of the new antipollution regulations on wastes. The main difficulty in applying this procedure is lengthening of the painting shop. Between the application of the base coat and application of the gloss, a "matting" chamber is required to insure evaporation of the water in the paint using hot air ventilation. Thus, at Rennes no less than 42 meters of hall is allocated for this operation. The duration of this operation will also cause a lengthening of total processing time. In all, the length of the processing line will increase from 80 to 190 meters for use of hydrosoluble paints.

At present, 20 persons per team are working on each of the two lacquering lines. "One of the main advantages of robotization will be to eliminate any human presence in the chambers, which will optimize work time, particularly at the end of the day," Christian Morisson explained. The robots will, in fact, only complement, for the interior, the automation already existing for the outside of the bodies. There, however, the solutions are simpler and call for painting machines and minibowls. Thus, 18 electrostatic bowls handle application of 40 microns of varnish in two coats.

Although invisible at first glance, the cleaning installations, essential components of the armada for cleanliness, are no less impressive. In the corridor that separates the two lines, every 10 to 12 meters there is a branch connection for the vacuum system, and every 20 meters a 700-bar water connection to supply the rotating sprays cleaning the walkways. The floors are made of resin. The horizontal surfaces have been entirely eliminated. All the related equipment is concealed inside carefully closed pillar cabinets. The paint setting and reticulation oven is made entirely of stainless steel. In order to further reduce the penetration of dust into the work areas, called ZEC (controlled dust area), these are all kept at higher pressure than the rest of the shop.

Everything is ready to handle the regular rate of 55 vehicles per hour. This royal treatment backed by the prestige of the XM will benefit the BX and even some AX. In the control room, out of the clean area, three screens will enable control and constant watch of each line (temperature, hygrometry, dust level). And in the shop, when the robots are installed, the bodies will move along in deserted chambers. [Box, p 63]

A total of 7.5 billion francs invested for the launching of the new Citroen: 1.2 billion for design; 1.9 billion at Metz and Tremery for the engines and gearboxes; and 1.4 billion for Caen (ground contact), Charleville (foundry), and Asnieres (hydractive suspension). And

above all, 3 billion at Rennes, the main plant that performs the stamping (400 million francs), body assembly (650 million), painting (1.2 billion), wiring (70 million), and final assembly (600 million). A profusion of innovations everywhere. Use of the lost-foam technique for molding casings, flexible shaping of six types of casings, flexible assembly line for the new XU10 engines, ionic nitridation of crankshafts, and TIG [tungsten-inert gas welding] on camshafts. However, it is Rennes that has the lion's role. Even the smaller workshops have been given special attention: an ultramodern wiring shop and an upholstery shop that supply the assembly line with direct flow, thanks to a Lectra Systems laser cutting machine. For stamping, robots are gradually replacing the rigid automatic systems for interpress transfer. Six Comau robots are already in operation. By the end of the year there will be 20. For body assembly and fitting, 109 robots (40 Kuka and 69 Acma X58) perform 2,437 welding points out of the 3,949 on the XM. The remainder are performed by a more rigid mechanization. However, 100 percent of the welding is automatic. Yet all that is nothing compared with the new lacquering and final assembly shops. [End boxed item]

Automated Assembly

36980225a Paris *INDUSTRIES ET TECHNIQUES*
in French 25 Apr 89 pp 64-65

[Article by Michel Alberganti: "Men Prepare, Robots Assemble"]

[Text] In the Rennes final assembly shop, the selection is carried out in manual assembly offline of seven subassemblies that robots then mount on the XM body. The subassemblies are all tested before final mounting, which is made very simple.

The second performance for the XM: the final assembly at Rennes. About a dozen operations are automated, of which 10 use the 29 Kuka robots installed in the shop. However, the main originality lies in the preparation phases of the subassemblies, which represent 50 percent of the assembly work. This preparation is performed manually, off the central line. The XM has been split into seven main subassemblies: engines and motors on axle, driver's position, front facade, rear lid, right door and left door. An assembly area, called preparation area, is assigned to each of these components, located close to the position on the central line where the final assembly will be carried out. Thus, the shop has a spinal column supplied at seven points. This is a general practice in automobile factories. It derives from the conclusion that nothing is more difficult than assembly directly on the body. Hence the progressive reduction in magnitude of this task, which at Rennes now represents only half of the assembly work.

Citroen has pursued this line of thinking very far. The most striking example is certainly the front facade. It constitutes a complete unit, including the engine fan group and all the lighting equipment. For this purpose, a

special structural part made of composite material was developed. Result: the front facade has become an independent subassembly to which Citroen can apply its principle of complete testing before assembly. In fact, each major component of this type is not only assembled off-line, but also tested before assembly in respect to mechanical and, above all, electrical operation. This principle applies to the driver's position, which weighs 45 kilograms and includes a bundle of 350 electric wires. The same for the doors, with their automation of remote closing and operation of the windows. Thus, the risks of operation failure are removed from the central line to the preparation areas, where repairs are much easier to carry out. Such an assembly system involves two patterns. Components such as the engine, driver's position or front facade arrive directly at the preparation areas. On the other hand, the elements that are an integral part of the body on arrival at the shop (doors, rear lid) have to be unmounted, prepared, and then remounted. All that remains is the simple parts (roof, windshield, wheels) that do not require preparation and can be mounted directly on the central line. And then, the automation choices have to be made.

"Our first priority was the most profitable points, that is, the most difficult, because that is where one has to assign more workers. Then we exploited the consistency of robots' work as synonymous with quality." Denis Duchesne reminded that a man never works at 100-percent of his abilities. On the other hand, "when an automated position is optimized, the problem is solved permanently." In fact, the mechanization level is surprising: it is only 7.5 percent for the vehicle assembly as a whole, and 15 percent on the central line. Denis Duchesne believes that the profitability is provided less by reductions in personnel, along with costs of upkeep and robots maintenance, than by gains in quality.

In the shop, a certain harmony prevails between operators and robots. A symbolic image: the subassembly mounters work directly on wire-guided trolleys that transport at the same time, for example, the door structure and all the parts needed for its assembly off line. These trolleys are one of the principal innovations of the Rennes shop.

Ultrasonic Sensors for Measurements

Built by CRT, there are no less than 320 trolleys circulating continuously. The trolleys and the automated hammocks that handle the bodies are the two main handling systems.

Citroen has opted for homogeneity: all the preparation of the subassemblies is carried out on these trolleys. They also receive the doors that the two robots have unmounted, carry them into the preparation area and then return to the central line where other robots remount them on the body. The assembly structure appears in all its precision. On the central line: the final

assembly on the chassis. The robots execute the delivery and remounting of the subassemblies that the trolleys have transported and the operators have prepared.

Though apparently simple, this system only works as a result of substantial effort in developing the robotized points. One major difficulty: location of the body in space. "Our approach was aimed at simplification and sturdiness," explained Denis Duchesne. At the outset, Citroen identified six tasks requiring vision systems. Hence the considerable work carried out with Edixia manufacturer to develop systems adapted to automobile requirements. However, the research made it possible to confine the need to two points: remounting of the rear lid and mounting the wheels. As for the rest, location involves detection by fiber optics and measurement by ultrasonic sensors. In this way, the installation of the driver's position, although complicated, saves vision system. The first robot grips the column from its trolley and measures its angle to the chassis by ultrasound at three points. It transmits the measurement to the second robot, which, after positioning the column, can screw it on. Likewise for the difficult installation of the windshield. In that case, seven ultrasonic measurements plus a gauging achieve the fit. Laser beams and multiple cameras have been avoided. However, one does find them used in mounting the wheels. A first camera locates the position of the holes on the wheel. The robot then grips the rear wheel as well as the mounting lug. A second camera detects the holes in the hub as well as the position of the centering pin. For the front wheels, the problem is even more complicated because the middle is not fixed while in rotation. A camera detects its angle position using the marking by a laser beam.

How should we describe the benefits achieved through this application of technology? In addition to the overall quality of the car, Denis Duchesne cites an objective consideration concerning the electrical circuit. "We will try to go below the line of one defect per 100,000 connections in a year of operation." There are 1,200 to 2,000 connections per vehicle. This gives an idea of the degree of reliability that the automobile industry is aiming at today.

COMPUTERS

Development of TROPICS Supercomputer Announced

AN890163 Paris *ELECTRONIQUE HEBDO* in French
13 Apr 89 p 2

[Article: "Europeans Join Forces in Supercomputer Project"]

[Text] Eventually, Europe will have its own supercomputer. The pan-European project TROPICS [Transparent Object-Oriented Parallel Computing System] has indeed been initiated. It is led by the Netherlands company Philips, in cooperation with Thomson-CSF

(France), Olivetti (Italy), Nixdorf (FRG), and several universities and research institutes. The machine should be capable of handling more than 1 billion operations per second.

The end product will integrate several hundred processors operating in parallel. It will be used as a server for complex applications in local area networks.

ENERGY

EC Commission's 'Re-Examined' Proposal on JOULE

AN890162 Luxembourg *OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES* in English
No C117, 11 Apr 89 pp 8-13

[EC Commission act: "Re-examined Proposal for a Council Decision Adopting a Specific Research and Technological Development Programme in the Field of Energy—Non-nuclear Energy and Rational Use of Energy (1989 to 1992)—Part 1: JOULE [Joint Opportunities for Unconventional or Long-term Energy supply] (COM(89) 93 final—SYN 143), submitted by the Commission pursuant to Article 149 (2)(d) of the EEC Treaty on 22 February 1989]

[Text] The Council of the European Communities,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 130q(2) thereof,

Having regard to the proposal from the Commission,

In cooperation with the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas Article 130k of the Treaty states that the Framework Programme is to be implemented by specific programmes developed under each heading;

Whereas, by Decision 87/516/Euratom, EEC, the Council adopted a Community Framework Programme of Research and Technological Development (1987 to 1991) defining energy projects on non-nuclear energies and the rational use of energy;

Whereas that Decision provides that a particular aim of Community research shall be to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at the international level and that Community action is justified where research contributes *inter alia* to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while

being consistent with the pursuit of scientific and technical quality; whereas it is intended that the JOULE programme should contribute to the achievement of these objectives;

Whereas on 16 September 1986 the Council adopted a resolution concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States;

Whereas the implementation of an energy strategy for the Community calls for the strengthening of research, development and demonstration projects at Community level;

Whereas the energy, research and development programmes adopted by Council Decisions 75/510/EEC, 79/785/EEC and 85/198/EEC gave favourable results and opened up promising prospects as regards the objectives pursued;

Whereas the research and development projects covered by this Decision appear necessary and are a suitable means of continuing the activities undertaken and of launching new ones to achieve the objectives pursued;

Whereas a large number of small and medium-sized enterprises (SMEs) are involved in research and development into non-nuclear energy, particularly in the field of renewable energies;

Whereas Council Regulation (EEC) No 3640/85 provides for the granting of financial support to demonstration projects in the exploitation of alternative energy sources, energy saving and the substitution of hydrocarbons and to industrial pilot projects and demonstration projects in the field of solid fuels liquefaction and gasification; whereas such support should be granted only to projects based on completed research and development work;

Whereas Council Regulation (EEC) No 3639/85 provides for the granting of financial support for Community technological development projects in the hydrocarbons sector; whereas such support is granted only to projects for which the research stage is completed;

Whereas on 26 November 1986 the Council adopted a resolution on a Community orientation to develop new and renewable energy sources;

Whereas on 19 October 1987 the Council adopted a resolution on the continuation and implementation of a Community policy and action programme on the environment (1987 to 1992);

Whereas the protection of the environment should play a major role in the definition of energy research programmes;

Whereas the implementation of the environment policy involves the development of clean technologies, especially for particularly polluting energy sources, amongst other things by suitable research programmes;

Whereas the Scientific and Technical Research Committee (CREST) has expressed its opinion on the Commission proposal,

Has adopted this decision:

Article 1

A specific research and technological development programme for the European Economic Community in the field of energy—non-nuclear energies and rational use of energy—as defined in Annexes I and II is hereby adopted for a period of three years and three months from 1 January 1989.

Article 2

The funds estimated as necessary for the execution of the programme amount to ECU 122 million, including expenditure on a staff of 34.

The indicative allocation of these funds is set out in Annex II.

Article 3

Detailed rules for the implementation of the programme and the rate of the Community's financial participation are set out in Annex III.

Article 4

During the second year of implementation, the Commission shall review the programme and send a report on the results of its review to the Council and the European Parliament. This report shall be accompanied where necessary by proposals for the amendment or extension of the programme.

At the end of the programme, an evaluation of the results achieved shall be conducted by the Commission which shall report thereon to the Council and the European Parliament.

The abovementioned reports will be carried out having regard to the objectives set out in Annex I to this Decision and in accordance with the provisions of Article 2 (2) of the Framework Programme set out in Decision 87/516/Euratom, EEC.

Article 5

The Commission shall be responsible for the execution of the programme.

The Commission shall be assisted by a committee of an advisory nature, hereinafter referred to as "the committee" composed of the representatives of the Member States and chaired by the representative of the Commission.

Contracts concluded by the Commission shall govern the rights and obligations of each party, in particular arrangements for the dissemination, protection and exploitation of research results.

Article 6

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

2. The opinion shall be recorded in the minutes of the committee; in addition, each Member State shall have the right to have its opinion recorded in the minutes.

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

Article 7

1. Where framework agreements for scientific and technical cooperation between non-Community European countries and the European Communities have been concluded, organizations and enterprises established in those countries may, under conditions to be laid down in accordance with the procedures set out in Article 6 and on the basis of the criterion of mutual advantage, become partners in a project undertaken within the programme.

2. No contractor based outside the Community and participating as a partner in a project undertaken under the programme may benefit from the Community financing of the programme. The contractor shall contribute to the general administration costs.

Article 8

This Decision is addressed to the Member States.

ANNEX I

Programme Objectives

The objective of developing energy technologies is directly linked to the Community's energy strategy, the aim of which is to increase security of supply in the long term and to reduce energy imports to a reasonable cost, bearing in mind the environment. As far as the technologies involved are concerned, this objective requires the contribution of solid fossil fuels and new and renewable sources of energy to be increased in the medium and long term and energy efficiency and the rational use of energy to be greatly improved.

This primary objective must be accompanied by a research effort to reduce significantly the nuisance and pollution caused by the production and use of energy.

The development of advanced energy technologies should stimulate and improve industrial competitiveness, including that of small and medium-sized enterprises in the Community, and, as a consequence, help to enhance the economic and social cohesion of the Community.

These objectives can be achieved through progress in the development and availability of techniques, processes and products allowing the rational use of energy, in the non-polluting use of solid fuels and hydrocarbons, in the efficient and economic use of renewable energy sources and on the development of models for energy and the environment.

ANNEX II

Programme Contents and Indicative Internal Allocation of Funds

	Funds Estimated As Necessary for the Execution of the Subprogramme (in million ECU)
1. Models for Energy and Environment	6
2. Rational Use of Energy	35
2.1. Conservation in end-use sectors	
2.1.1. Buildings	
a. Energy conservation	
b. Solar energy applications	
2.1.2. Combustion technology	
2.1.3. Industry	
2.2. Energy conservation and storage	

institutes carrying out projects, the Community may bear up to 100 percent of the additional expenditure involved.

EC Promotes Exploitation of Solid-State Battery
AN890160 Luxembourg INNOVATION AND TECHNOLOGY TRANSFER in English No 2,89, May 89 p 13

[Unattributed report under the rubric "Community R&D Results": "Joint Venture Opportunity for European Firms for Licensing Production and Marketing of a New All Solid-State Battery"]

[Text] The Commission (DG XIII/C/2) is currently taking new measures to improve the level of exploitation of Community RTD [research and technologies development] activities. One such is assisting contractors in finding the appropriate industrial and financial partners who can fully exploit research results in the interests of the Community. In this context and in cooperation with the regional authorities of the Province of Hainaut (Belgium), an information meeting was organized at the Site du Grand-Hornu to present a new all solid-state battery developed under the energy conservation research programme implemented by DG XII-E.

The meeting was chaired by Claude Durieux, Hainaut representative, Vicente Parajon Collada, deputy director-general of DG XIII; E. Deworme, the Belgian state secretary for energy; and Mr Dorsimont, representing Robert Urbain, Belgian minister of foreign trade.

Dr Joergen Lundsgaard of H&L Engineering A/S presented this new invention. His company, involved basically in RTD work, has decided to license production and marketing to an industrial company or consortium with sufficient technical and marketing expertise, and financial resources, to achieve maximum market penetration for this product.

This new battery has several advantages:

- Its cell configuration, a multilayer cell of 100 μm thick, enables total design freedom. Any size and shape can be obtained just by cutting foils;
- High energy density;
- High power density due to high electrode surface area;
- Safety: no negative environmental impact, and it is non-explosive;
- Continuous manufacturing that allows low-cost production. New coating and lamination techniques have produced the following advantages: no leakage, high voltage, long shelf life, and wide operating temperature range: from -40 to 150 degrees Celsius.

In relation to competitive technologies, this new battery has up to five times the energy density of an NiCd battery, the same power density, and a much longer shelf life, apart from other advantages such as no negative environmental effects, no leakage, etc. The market looks

most promising. Applications such as portable radios, tape recorders, electronic toys, portable computers, portable tools, and many others are waiting for new, low-cost, primary or rechargeable, high-power safe batteries such as the H&L invention. The invention, as well as its production technologies, is fully protected by a large number of worldwide patents.

DG XIII/C/2 will continue promoting the exploitation of Community RTD results under the Value programme, a specific programme for the dissemination and utilization of results from scientific and technological research. The Commission is also continuing to support research on advanced solid-state batteries under the JOULE [Joint Opportunities for Unconventional or Long-Term Energy Supply] programme.

MICROELECTRONICS

European Company for Custom Ion Implantation Set Up
AN890167 Paris FRENCH TECHNOLOGY SURVEY in English Apr 89 pp 1-2

[Article: "Customized Ion Implantation"] [Text] The Ion Beam Services (IBS) company, which specializes in surface treatment R&D, has just set up Europe's first customized ion implantation service.

The technique of ion implantation is used for locally doping materials by bombarding silicon slices with different kinds of ions. It is used in electronic component manufacturing technology.

The implantation process consists in ionizing, accelerating, and projecting atoms of the doping agent. It is carried out in an ion implantation unit, a machine whose design integrates a number of advanced technologies, such as high vacuum technology, gas ionization, mass spectrometry, particle acceleration, and electronic scanning and control.

Ion implantation is increasingly used instead of diffusion doping, because it produces precise doping profiles with little lateral diffusion and it allows self-alignment at different levels of the device.

Products making use of ion implantation include:

- VLSI MOS [very-large-scale integration metal oxide semiconductors] circuits;
- Linear circuits;
- Discrete circuits.

Implantation is also used for new developments such as GaAs microelectronics, the production of "silicon on insulator" substrates, and integrated optical electronics.

With ion implantation it is possible to introduce any kind of impurity into any kind of matrix, regardless of the laws of thermodynamics. As a result, a number of

other applications, such as magnetic components, guided optics, conducting plastics, and surface treatment of materials for protection against wear and corrosion, are now being developed in the laboratory.

SCIENCE & TECHNOLOGY POLICY

EC Council Decides on SPRINT Program
AN890158 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English No L112, 25 Apr 89 pp 12-17

[EC Council decision: "On the Implementation at Community Level of the Main Phase of the Strategic Programme for Innovation and Technology Transfer for the Period 1989 to 1993 (SPRINT Programme)"]

[Text] The Council of the European Communities,

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

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas, pursuant to Article 2 of the Treaty, the Community has as its task, *inter alia*, to promote a harmonious development of economic activities and a continuous and balanced expansion throughout the Community; whereas, pursuant to Article 130a of the Treaty, in order to promote its overall harmonious development, the Community is to develop and pursue its actions leading to the strengthening of its economic and social cohesion;

Whereas the Community's aim is to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at international level; whereas the attainment of that objective involves, in particular, a determined effort to promote innovation and technology transfer;

Whereas the application of the strategic programme for innovation and technology transfer (SPRINT)—1983 to 1988—has established the need for additional measures in the context of a Community policy for innovation and technology transfer, particularly with a view to achieving the internal market by the end of 1992;

Whereas the Community must adopt appropriate measures to stimulate companies' innovative capacity and to promote the rapid application of new technologies as soon as they become available;

Whereas many recent technologies have yet to achieve their full potential for dissemination in certain traditional industrial sectors or in certain regions of lagging development or industrial decline; whereas their rapid adoption could permit those sectors and regions to make up some of the leeway, thus strengthening their competitive position;

Whereas the Member States have developed specialized services for the support of innovation, technology transfer and consultancy in innovation management, financing and industrial cooperation; whereas these infrastructures have a significant multiplier effect in promoting innovation and technological development in companies, especially smaller ones, while the institution of transnational liaison, cooperation, training and transfer mechanisms complement those national efforts;

Whereas the Community itself, as a complement to the action of the Member States, has also promoted initiatives to support innovation and technology transfer as important elements in the implementation of other Community policies;

Whereas it is appropriate to maximize those initiatives in order to reinforce their effectiveness and coherence;

Whereas, in this principal phase of the programme it is necessary to meet the needs of undertakings and their organisations and to strengthen the role of finance companies, specialized consultants and the professional personnel involved;

Whereas in view of the importance of technology transfer and innovation for small and medium-sized enterprises (SMEs) it is appropriate to coordinate the actions in this area with the policy in favour of SMEs developed by the Commission within the framework of its action programme;

Whereas it is essential to have access to instruments providing a better understanding of the innovation and technology transfer process, in order to identify more clearly the obstacles and to evaluate the impact of instruments and policies;

Whereas reciprocal information flows, the exchange of experience and concertation between the Member States and the Commission with regard to innovation policies are essential to enhance their own effectiveness and the cohesion of the entire Community;

Whereas there is a need to increase access to technologies, capital and markets in order to stimulate innovation;

Whereas Community action appears necessary in these fields; whereas the Treaty does not provide, for the action concerned, powers other than those of Article 235,

Has adopted this decision:

Article 1

The main phase of the strategic programme for the promotion of innovation and technology transfer, hereinafter referred to as the "SPRINT programme," is hereby adopted for a period of five years from 1 January 1989.

Article 2

The aims of the programme shall be as follows:

1. To strengthen the innovative capacity of European producers of goods and services, with a view to the 1993 [as published] single market;
2. To promote rapid penetration by new technologies and the dissemination of innovation throughout the economic fabric of the Community, thus strengthening the Community's economic and social cohesion in the field of innovation and technology transfer;
3. To enhance the effectiveness and coherence of existing instruments and policies, whether regional, national or Community, in the field of innovation and technology transfer.

Article 3

With a view to achieving the aims set out in Article 2, the following actions shall be undertaken, taking careful account of initiatives already under way, as provided for in Article 5: —strengthening of the innovation services infrastructure in the Community by the consolidation of existing transnational networks and by the formation of further networks, while requiring their long-term financial self-sufficiency, paying particular attention to those regions of the Community where a suitable framework does not yet exist or is inadequate, and building upon existing organisations in the regions, —supporting specific projects of Community interest for intra-Community innovation transfers, —improving the innovation environment through a better understanding of the processes involved and increased concertation between the Member States and the Commission.

These actions are described in detail in Annex I.

Article 4

The funds estimated as necessary for the execution of the programme amount to ECU 90 million.

Annex II provides an indicative breakdown of expenditure for the various actions set out in Article 3.

Article 5

1. The Commission shall be responsible for implementing the SPRINT programme.

2. The Commission shall be assisted by a Committee on Innovation and the Transfer of Technology, hereinafter known as the "committee", composed of representatives of the Member States and chaired by the Commission representative.

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

The Commission shall adopt measures which shall apply immediately. However, if these measures are not in accordance with the opinion of the committee, they shall be communicated by the Commission to the Council forthwith. In that event, the Commission shall defer application of the measures which it has decided for a period of not more than two months from the date of such communication.

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

3. With respect to the implementation of the programme, the procedure referred to in paragraph 2 shall apply in particular to the following cases:

- the priorities of the programme,
- the content, timetable and estimated budgetary appropriation for calls for proposals,
- the assessment of proposed projects, including those which are not the subject of calls for proposals,
- derogations from the general rules (50 percent co-financing and Article 6 (2)),
- the assessment of any proposed specific innovation transfer projects involving an individual Community contribution in excess of ECU 300,000,
- the assessment of the programme for the purposes of preparing the reports provided for in Article 8.

4. The Commission shall ensure close coordination between the SPRINT programme and related or complementary Community initiatives, whether under way or in preparation, in order to avoid any overlapping, particularly with the Value programme.

5. In implementing the programme, the specific needs and characteristics of the regions of lagging development of industrial decline shall be taken into consideration.

Article 6

1. The Community's financial contribution shall be adapted to the characteristics of the specific case. It may take the form of a direct or indirect subsidy, an advance on own capital or any other appropriate form.

2. The Commission shall, as a general rule, implement the SPRINT programme by way of calls for proposals, published where appropriate in the *Official Journal of the European Communities*.

3. In implementing the programme, the Commission shall also make use of the instruments and bodies promoted by it within the framework of other Community policies, in particular regional policy, in order to reinforce the efficiency of the programme and overall coherence.

4. The Commission's co-contractors must, as a general rule, except in the case of studies and services provided for the Commission, bear the major share of financing, and at least 50 percent of the total cost. However, in exceptional cases, and in accordance with the procedure in Article 5, a Community contribution in excess of that percentage shall not be excluded, in particular for the purposes of taking account of the specific difficulties encountered by regions of lagging development or in industrial decline in participating in transnational activities.

Projects eligible, other than studies and services, must involve the participation of at least two participants from different Member States.

Article 7

In accordance with a procedure to be defined within the Committee, the Member States and the Commission shall conduct regular exchanges of all useful information on the achievement of the aims of the programme referred to in this decision.

Article 8

After 30 months of the programme's implementation, and in accordance with the procedure in Article 5, the Commission shall submit a report assessing the result achieved to the European Parliament, the Council, and the Economic and Social Committee. That report may be accompanied by proposals for modifying the programme, should that appear necessary in the light of the results.

On completion of the programme, and in accordance with the procedure in Article 5, the Commission shall submit to the European Parliament, the Council, and the Economic and Social Committee a report on the programme's execution and results.

Article 9

The Commission shall, in collaboration with the Committee and by the most appropriate means, disseminate throughout the Community information on the actions taken in accordance with the present decision and their results.

Article 10

This decision is addressed to the Member States.

Done at Luxembourg, 17 April 1989.

For the Council The President C. Romero Herrera

ANNEX I

Lines of Action (SPRINT Programme 1989 to 1993)

A. Strengthening the European Infrastructure for Innovation Services by the Establishment of Intra-Community Networks While Requiring Their Long-Term Self-Sufficiency

In particular, this involves:

1. The strengthening of intra-Community networks for innovation:

a. Consolidation and development of existing networks, particularly involving:

- technology and innovation management consultants,
- sectoral collective research centers,
- innovation financing institutions;

b. Formation of new networks, particularly between:

- contract-research organisations,
- engineering consultants,
- quality and value-analysis specialists, etc.;

c. Strengthening intra-Community cooperation between:

- research/industry and university/industry interfaces,
- technopoles and science parks;

d. Introduction of linkage mechanisms between the various networks such as to promote innovation and technology transfer.

2. Network support measures:

a. Actions of information, awareness, promotion and the transfer of know-how in innovation management and related measures:

- exchanges of experience between Member States and

across national frontiers, between regions of the various Member States, in particular through support for studies, specialist seminars and the formation of networks of experts in relevant management disciplines (quality, value analysis, marketing, etc.),

- dissemination of these management techniques by appropriate promotional activities (conferences, exhibitions, European prizes, "success stories", etc.),
- actions of information, awareness and the transfer of know-how, of a transnational character or purpose, for the publics involved in the dissemination and transfer of technology and in innovation management—these actions to be developed in close liaison with the COMETT [Community Program for Education and Teaching in the Field of Technology] programme;

b. Specific instruments to enhance the effectiveness of networks, involving particularly:

- bringing together future network participants (for example by means of visits and professional exchanges, introductory seminars, etc.),
- exchanges of technology opportunities, especially through measures aimed at:
 - enhancing the transnational impact of technology exhibitions and fairs (cooperation between organizers in different regions, visits by manufacturers from other regions, etc.),
 - developing means of communicating these technology opportunities and appropriate use thereof (catalogues, exhibitions, study grants, data banks, conferences and seminars, video conferences, etc.),
- identifying "best practice" with respect to technology transfer,
- specific measures to ensure that those regions of the Community with a less well-developed service infrastructure for innovation can participate more fully in the various intra-Community networks;

c. The launching of innovations emerging from networks by improving the dialogue between sources of funding, technical experts and innovators identified by the networks (for example, through a data bank of projects, intra-Community investment forums and brokerage meetings).

B. Supporting Specific Projects for Intra-Community Innovation Transfer, Particularly By Means of:—support for specific projects of transnational character, emphasizing industrial cooperation and, in particular, involving the application of generic technologies to target industrial sectors in regions of lagging development or in industrial decline in the Community, —accompanying measures to heighten awareness of these technologies and to train companies adopting them, emphasizing the transnational dimension (e.g. visits to companies, exhibitions, information seminars, production of brochures

or audio-visual material, etc.), —the provision of technical support for companies and especially to SMEs potentially able to use these technologies, in particular by employing specialized technology transfer networks and advanced-technology centers, —support for the effective execution of projects, particularly by mobilizing available funding from the public and private sectors.

Twin approaches can be followed:

- one of these identifies available technologies with a cost-benefit ratio suiting them for widespread adoption by companies in regions of lagging development or in industrial decline, and is therefore designed to promote the use of these technologies in the sectors concerned,
- the other is based on identifying a need, common to a group of companies in a given sector or region, where the companies are prepared to finance the solution. It encourages the identification and possible adaptation of available technologies to deal with the problem detected.

The planned projects shall act as a catalyst in the development of the sectors and the use of the technologies concerned. They must also meet, wholly or in part, the following criteria:

- be model projects in that they employ a "systemic" overall approach to the introduction of technological change, not only in purely technical terms but also with regard to such aspects as company organisation, the training and motivation of personnel and the use of such management methods as value analysis or industrial design and also the assessment of market potential,
- provide an optimum combination of skills through forms of cooperation between several Member States or between regions of different Member States of the Community and, wherever possible, between partners of differing specialist skills,
- involve industrial sectors or technologies chosen to guarantee a significant economic impact,
- make an active contribution to reducing regional disparities in the availability of—and access to—technologies,
- be based as far as possible on existing infrastructures and enhance the use made of these,
- include follow-up and evaluation provisions, based in particular on stated and readily verifiable quantitative aims,
- ensure feedback of the experience gained, preferably directly by the companies benefiting from the scheme, in order to maximize the multiplier effect.

C. Improving the Innovation Environment Through a Better Understanding of the Processes Involved and Increased Concertation Between the Member States and the Commission 1. Monitoring of innovation in Europe (European Innovation Monitoring System) and evaluation of support measures;

2. Strengthening concertation and the exchange of experience between the Member States and the Commission in the field of innovation policy and technology transfer, in particular with the aim of establishing a regulatory, legal, economic and fiscal environment favourable to innovation and technology transfer.

ANNEX II

Indicative Internal Breakdown of Appropriations (SPRINT Programme 1989 to 1993)

Million ECU

A. European innovation services infrastructure	
1. Strengthening networks:	35
a. networks of innovation and technology transfer consultants	
b. networks of sectoral collective research centers	
c. new networks (contract-research organisations/research or university-industry interfaces/ engineering consultants/technopoles/financing bodies, etc.)	
d. linkage of innovation and technology transfer networks	
2. Accompanying measures:	15
a. transnational training in innovation management, networks of experts (design, quality, value analysis, marketing of new products, etc.), and associated promotional activities (conferences, European prizes, publications, exhibitions)	
b. instruments for the support of networks (technology fairs, instruments for opportunity exchanges, etc.)	
c. launching innovations emerging from the networks (investment forums, brokerage meetings)	
B. Specific projects for intra-Community innovation transfer	30
C. Monitoring innovation and concertation between the Member States and the Commission	10
1. European Innovation Monitoring System	
2. Concertation and exchanges of experience	
Total	90

EC Approves Italian Role in EUREKA Projects

AN890157 Brussels EC PRESS RELEASE in English
No IP(89) 220, 5 Apr 89 pp 1-2

[Unattributed report: "Commission Approves Aid to Italian Participation in Three EUREKA Projects"]

[Text] The [EC] Commission has approved national aid for Italian participation in three EUREKA projects. The projects concerned are as follows:

1. Study and development of integrated circuit non-volatile memories (EPROM) having a storage capacity of 4 and 16 Mbit. The project cost relative to the participation of SGS Microelectronica S.p.A. amounts to 172,500 billion lire (ECU 115 million), and an amount not exceeding 59,020 billion lire (ECU 38.4 million) will be awarded under the form of a grant equivalent to 34.2

percent. The project involves both basic (30 percent) and applied (70 percent) R&D. It is an important international and collaborative project with a high European interest.

Furthermore, the Commission considers that a particular effort has to be made in the field of semiconductors, since they determine the direction of development in the rate of innovation of the whole industry. In this context, the project represents a significant step to create a competitive European supply for advanced EPROM memories.

2. Development of a new robotized drilling system capable of reducing by half the cost per meter drilled. The project cost relative to the participation of J. Massarenti S.p.A. amounts to 11,000 million lire (ECU 7.2 million), and of that an aid not higher than 3,613 million lire (ECU 2.4 million) will be awarded under the form of

a grant of up to 32.9 percent. This project involves applied research and will help to ensure the energy independence of the Community.

3. This project, to be undertaken by three Fiat subsidiaries, represents Italian participation in Prometheus, intended to develop an efficient road traffic system not detrimental to the environment and which should guarantee an unprecedented degree of safety. The project will be a wide public benefit.

Although the project research is scheduled to last until 1994, the Italian authorities intend to award only part of the aid and to review the situation at the end of 1990.

The Italian share of the project (first part) amounts to 28,689 million lire (ECU 18.7 million) and a maximum aid of 9,044 million lire to Centro Ricerche Fiat (CRF) [Fiat Research Center], of 599 million lire Telettra-Telefonia Elettronica e Radio S.p.A., and of 3,025 million lire to Veglia Borletti s.r.l. will be awarded amounting to 44.1 percent. The project involves basic research.

Italy: Major Investments in Research Programs Approved

MI890247 Rome AIR PRESS in Italian 7 Apr 89 p 606

[Text] IRI [Institute for the Reconstruction of Industry] and the Ministry for Southern Italy will stipulate a contract-investment program for advanced technology in southern Italy. This will result in investments amounting to almost 1.6 billion lire and 9,000 job opportunities. Approval has been given by the Interministerial Committee for the Coordination of Industrial Policy (CIPI) which met under the presidency of Budget Minister Fanfani. The program covers electronics, computer science, telecommunications, telematics, automation, and product innovation. CIPI has also granted low-interest loans for other industrial initiatives and has given the go-ahead for a substantial package of investments for the government-subsidized Wage Supplement Fund. This had been expected for some time and involved 462 companies and 57,761 workers at a cost of 924 billion lire. The IRI program involves the transfer of a substantial portion of the group's industrial research activity from northern to southern Italy. This will increase southern Italy's share in IRI research activities from 27 to 45%.

The projected investments include 1,073 billion lire for research, 448 billion lire for industrial investment, and 39 billion lire for training. The Ministry for Southern Italy will provide approximately 1,134 billion lire of the total investment. Twenty-one new initiatives will be established with 754.4 billion lire for electronics, 96.6 billion lire for computer science, 303 billion for telematics and telecommunications, 140 billion lire for the automation of industrial processes, and 265 billion for product innovation. The program will generate 1,573 new job opportunities, mostly for researchers, the "consolidation" of 4,369 jobs which are otherwise destined to

disappear, as well as approximately 3,000 related jobs. These investments will also benefit the balance of payments, given that the program will generate a positive trade balance of more than 130 billion lire once it is fully operational.

Italy: Major Science Center Activities Described *MI890229 Milan SCIENZA DUEMILA in Italian* *Apr 89 pp 61-63*

[Article by Ferruccio Kiner: "Trieste: The Science City"]

[Text] A great scientific center is about to be created in our country. State-of-the-art laboratories will study the secrets of life and materials.

Italy will soon—if not already—have its own science city just like Tsukuba in Japan.

In recent years Trieste has been rapidly changing into a meeting point for various distinguished experts working in the field of physics, biology, and chemistry. Organizers hope that these experts will soon become a "crucial mass." The meeting of many high level scientists should set off a process of rapid growth in scientific knowledge (and industrial patents) which is a characteristic of major scientific centers such as MIT, Berkeley, or Stanford.

The chances of success in this venture are excellent. The project began many years ago as a result of the intuition of scientists such as Paolo Budinich and Abdus Salam, Nobel Prize winners for physics in 1979.

We will begin with what is happening now.

The synchrotron light machine is unquestionably a symbol of the great concentration of scientific knowledge taking place in Trieste. This is a large X-ray microscope which biologists, physicists, and chemists use to view phenomena and things that were previously invisible.

This machine, called "Elettra," will consist of a large 260-meter ring, the length of a soccer stadium with electrons. The president of the Synchrotron company which will construct the project, is Nobel Prize winner Carlo Rubbia. Elettra will strongly resemble the particle accelerators at CERN [European Nuclear Research Center] and Fermilab. The Trieste synchrotron will exploit a phenomenon considered to be a highly troublesome defect at CERN and Fermilab. Electrons and particles in general must pass through curved sections during their high-speed run. The particles tend to go straight ahead, but strong magnets force them to "turn." As they go through the curves, particles lose energy in the form of electromagnetic waves. This is synchrotron light.

The particles will emit infrared, visible, ultraviolet, or X-ray waves, according to their speed and energy. Elettra, the Trieste synchrotron, will reach a 2-GeV (2 billion

electron volt energy) energy level and will emit soft X-rays (X-rays with wider wavelengths) with special characteristics of brightness and monochromacity. This will make Elettra unique when it starts working in 1992.

Among the new features introduced in this third-generation synchrotron are the "wave formers," or special magnets placed in a sequence which cause the particles to go around obstacles even in the straight sections of the machine. Therefore, in addition to emitting light in the curves, Elettra will radiate even in straight sections.

Briefly, Elettra will provide scientists with an extraordinary instrument for studying the molecular structure of living organisms and inorganic materials. This is because the light's coherent and monochromatic properties will make it closely resemble a laser. It is necessary to point out that X-ray lasers do not yet exist and X-ray spectroscopy may still hold many surprises.

What are the main areas of research that will be carried out with Elettra? One of the more fascinating areas of research concerns living organisms.

While the electron microscope observes biological samples which have been killed following treatments such as coloring, the synchrotron can scan the smallest cellular organs while they are alive. In fact, since water is transparent to soft X-rays, the samples to be observed can remain in an appropriate solution for maintaining life. It will even be possible to film a cell during its physiological processes with a resolution of just a few nanometers. The technique will also allow for the study of elements necessary to the cell such as potassium or calcium, as well as toxic compounds such as those containing mercury.

New horizons will be opened in microscopy with the potential for making new and fundamental discoveries. Elettra will also make it possible to study viruses (defined as those elusive fragments of genetic material responsible for serious diseases such as AIDS), one atom at a time. Michael Rossman, an American researcher from Cornell University, succeeded in drawing the atomic map of the virus responsible for the common cold (HRV 14), by using a less efficient light than Elettra. There are good prospects that this highly refined analysis can be conducted on the AIDS virus to discover the molecular mechanisms of the infection through a knowledge of its exact atomic structure.

Some idea of the quantum leap in quality this type of analysis will provide is possible if we remember that the decoding of the hemoglobin molecule, atom by atom, took researchers over 10 years. By using Elettra today, it would take only a few minutes.

Even chemical reactions will be seen "live" with the Trieste Synchrotron. At present, only the initial and final stages of certain reactions are known. Elettra will make it possible to view the various intermediary stages; as a result, more efficient reactions may be planned that are less polluting.

Some studies in this area are already underway using other machines, for example on sulphur dioxide emitted by thermoelectric power plants and on automobile exhaust gas.

Hopes are that Elettra may even be able to solve the mystery of high temperature superconductors. By using synchrotron light, it will be possible to view the reorganization of atoms second by second when a material becomes a superconductor at a certain temperature.

It would be impossible to list all the uses that the Trieste light will have. It is sufficient to state that initially a good 22 laboratories will be placed around the large ring. The number will rise to 50 when the machine is fully functional. Each of these laboratories will have its own beams. Industries such as Zanussi, FIAT, Pirelli, ENI [National Hydrocarbons Corporation], Galileo, and institutions such as ENEA [Italian Committee for Research and Development of Nuclear and Alternative Energies], and the U.S. Department of Energy have already requested a line for experiments.

With its wideranging, interdisciplinary applications, Elettra is the symbol of the Trieste Research Area's philosophy.

Prestigious centers and institutes in various areas of study are in fact located there.

The International Center of Genetic Engineering and Biotechnology is another important presence in the area. This institute (and its twin in New Delhi) are part of an intergovernmental organization of 40 countries under the auspices of UNIDO (United Nations Industrial Development Organization). Directed by Prof Arturo Falaschi, the Center in Trieste carries out research in the replication of DNA in the papilloma virus and in enzyme decay in lignin. The papilloma virus is responsible for serious infections of the genital tract in tropical countries. It is therefore of fundamental importance to discover its working mechanism and a therapy to eliminate this virus. Even research on enzymes and other molecular instruments capable of digesting lignin (a widespread substance in the plant world, also present in waste such as straw, sawdust, and wood shavings) may supply a means for the economical and nonpolluting use of an enormous mass of biological material. Today, this is a difficult problem due to the unprofitable costs.

In addition to the Genetic Engineering Center, there are other institutes such as TASC (Laboratory for Technology Applied to Surfaces and Catalysis). Here, the idea of synchrotron light for furthering the study of the solid

state was born. There are other laboratories such as the Computer Laboratory (which handles programs for public administration) for biotechnological polymers (Poly-Bios), and a center for the certification of biomedical equipment (for the creation of appropriate standards). Finally, the Center for Appropriate Technology determines appropriate technology for developing countries in conjunction with the University of Trieste.

Other laboratories will be set up, such as the one collaborating with the Galileo workshops for the construction of space optics. The Inter-University Consortium for the Physics of Matter, which combines 32 Italian universities, has created a structure for the expansion of high technology research in the field of superconductors, ultra-fast transistors, and infrared detectors for television cameras.

Two hundred sixty people are currently working in this area, and the figure will reach six hundred in a few years when the Elettra synchrotron will be working at full capacity. Of course, a large "force" will be created near the area, consisting of factories and laboratories attracted by the technological products and services that the scientific establishment will supply. It should not be forgotten that this area has been created with the goal of developing high technology to improve the competitiveness of national industries.

The area is only one of the scientific magnets in Trieste. The other is the well-known Center for Theoretical Physics directed by Nobel Prize winner Abdus Salam. One could even go further to say that the idea of turning Trieste into a science city came from the Center of Theoretical Physics and its deputy director, the physicist Paolo Budinich.

Success of initiatives such as the Center for Theoretical Physics has brought ideas for other institutes. SISSA (School of Advanced Studies) presently directed by Prof. D. Amati, was founded by Paolo Budinich in 1978. It is the only Italian postgraduate scientific institution that trains researchers.

The academic curriculum provides a Master of Science degree after 3 years of study and examinations. There is a Ph.D., the equivalent of an Italian doctorate in science, after 4 years. Approximately 100 students from all over the world, two-thirds of whom are Italian, are currently taking courses in physics and mathematics.

Courses in molecular genetics and biotechnology will be held this year. The name of the famous English cosmologist Dennis Sciama stands out among the lecturers.

SUPERCONDUCTIVITY

FRG: Dornier Develops New Superconductor Syntheses

MI890270 *Friedrichshafen DORNIER POST in English*
No 1/89 pp 8-9

[Excerpts]

New Methods of Powder Production

In connection with material developments for the high-temperature electrolysis of water vapor (Hot Elly project), Dornier has developed and studied mixed-oxide ceramics with perovskite structure as electrode and conductor material for applications at approximately 1000° C. A Dornier-developed synthesis process, the reaction-spray process (RSV), proved to be particularly helpful. The components desired to be present in the powder are mixed in a common aqueous solution which is sprayed into the hot reaction chamber with a nozzle. The tiny water drops evaporate immediately, leaving back a powder particle. The fast evaporation ensures that the homogeneous distribution of the components in the solution is largely transferred to the powder particles. This process thus allows the repeatable production of ultra-pure and homogenous ceramic powders. The vast experience gained with perovskites and the advanced RSV development are now being used for the synthesis of these promising superconductors.

Results

Several lots of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ powders have been produced with the aim of synthesizing ultra-pure ceramic powders for high-temperature superconductors which can be manufactured into compact components with optimum current load capacity. It was thereby shown that the complex superconductivity phase can be obtained in a single step with the reaction spray process. The powder consists of spherical particles which are composed of many small crystallites with approximately 0.1 micrometers diameter. Superconductivity was demonstrated by resistive and inductive measurements and by microwave reflection. After sintering, the structure has a grain size between 2 and 4 micrometers. With approximately 900 A/cm² at 77 Kelvin, such sinter components reach a relatively high current load capacity. This is only a little reduced in weak magnetic fields, another indication of high phase purity even on the grain surface.

AEROSPACE, CIVIL AVIATION

Hungarian Space Research Reviewed *25020248 Budapest MAGYAR ELEKTRONIKA in Hungarian No 4, 1989 p 62*

[Article by Eva Krasznai: "Developments With OMFB Support; The Present and Future of Our Space Research"]

[Text] Our country participates in space research primarily within the framework of the Interkozmos program. A good deal of Hungarian equipment has been launched already in the course of rocket experiments on board artificial satellites made in Interkozmos cooperation and in the VEGA program.

An MTA-OMFB intergroup program has been prepared relying on the resources of the MTA [Hungarian Academy of Sciences], the MTA IKT and the OMFB [National Technical Development Committee]. Supported by the results achieved by Hungarian experts in space research this program has as its goal an expansion of scientific and technical knowledge, a more intensive participation in international scientific life and economic utilization of the technical-scientific information obtained.

The KFKI [Central Physics Research Institute] has achieved significant results in the development of on-board computers and their memory units. They were the first to develop the on-board computer (BUSZI) for the lander of the Phobos probe (see *MAGYAR ELEKTRONIKA*, No 8 and No 9, 1988). This was followed by a general purpose on-board computer which will be used in the "MARS 94" space experiment. They solved the on-board computation and control tasks needed for the units of the space experiment—for the orbiter and for the space robot called the "Mars-moon"—and they created a central computer for the small scale space laboratories. In the future they will use a 16 bit processor in place of the earlier 8 bit one.

The purpose of the modern on-board data collector and transmitter developed at the BME [Budapest Technical University] is to create the telemetry system needed for a new generation of artificial satellites in Earth orbit being prepared in Interkozmos cooperation. The first one will be used on the "AKTIV" probe; it has a modular construction and in addition to having small consumption it has great reliability. Within the system the Hungarians have undertaken development of the central on-board computer, the ODCS, the 460 MHz transmitter and the power supply.

The charged particle analyzer, the "VEGA PLAZMAG" equipment and the "TUNDE" [ethereal] equipment, also made at the KFKI, launched in 1984 to study interplanetary space and the region around Mars passed the test well. The measurement complex called "ESTER" will serve to identify small and medium

energy charged particles on the orbital units of the Phobos probes launched in July 1988. An evaluation of the measurement data coming from space is already under way; the actual physical data processing is a task for the near future. The plans include development of similar equipment, being prepared with international cooperation, for the "MARS 94" program and for a small scale cosmic laboratory.

The BME is developing the "SAS" [eagle] for the "AKTIV" satellite of the Soviet Interkozmos. Its purpose is creation of on-board equipment which will study the region around Earth—especially the inner magnetosphere—and perform experiments in the wave range playing a role in the solution of a number of theoretical and practical problems of electric wave propagation.

The KFKI is participating in the so-called phantom experiments in order to get qualitatively new data in the area of cosmic dosimetry. In this area it is developing an on-board dosimetry system for the "MYR" space station; it will contain thermoluminescent dosimeters, one outside the phantom and one inside the phantom, a GM or proportional detector, Pille type equipment according to expanded specifications and a central data collection and storage unit.

At the Heavy Industry Technical University in Miskolc experiments on space materials technology are under way in three directions. They are studying the crystallization laws of ternary alloys and crystallization taking place in an increased gravitational field and they are working on development of a high temperature multizone space furnace.

The Spektr-X-Gamma experiment—developing the central on-board computer—began at the KFKI in 1988. According to the preliminary plans the space craft will be launched in 1993; it will have the task of astronomical observations above the atmosphere, primarily in the previously less studied X-ray and infra-red ranges. In this area the task of the KFKI, the ELTE [Lorand Eotvos Science University] and the Astronomical Research Institute will be development of the entire central on-board computer for the probe, development of its earth monitoring system and analysis of the measurement data obtained.

In regard to utilization of the results of space research the following has happened, among other things. The KFKI and the Interinvest Bank have formed a subsidiary enterprise called AVIATRONIC to design and make aerospace equipment. AVIATRONIC has signed a contract with MALEV [Hungarian Airlines] for manufacture and use of aircraft engine diagnostic systems developed on the basis of the results achieved in the area of on-board computers. There is a similar agreement with the KFKI for the development of special purpose engine diagnostic systems. A foreign trade contract has been

signed with the Soviet Space Research Institute for development of the 16 bit computers which can be used generally on a new generation of Soviet space craft.

COMPUTERS

Hungarians Develop Microprocessor Cross Development System
25020250 Budapest MAGYAR ELEKTRONIKA
in Hungarian No 5, 1989 pp 9-19

[Article by Csaba Ratz, Balazs Bago and Janos Hainzmann, of the Instrument and Measurement Technology Faculty (MMT) of the Budapest Technical University: "A PC Based Microprocessor Development System Family"]

[Excerpts] In the first part of the article we review the types of microprocessor development systems and their more important properties. In the second part we describe a family of microprocessor development systems based on IBM PC or compatible professional personal computers. The development system contains a process emulator, an EPROM burner and emulator, a 32/64 channel logic analyzer and software elements for machine code and high level (Pascal, C) program development. [passage omitted]

When developing the XDS (cross development system) development workstation we considered the following factors, in addition to good technical parameters, to be important:

- the system should have a modular construction; the user need buy only those elements actually needed by him, those best suiting the given developmental task;
- its operation should be simple and user-friendly; the control syntax for the various modules of the workstation should be identical;
- the price should be favorable.

A large amount of high quality software support and a capability for simple operation require appropriate computing capacity. This, and the necessary background memory and input and output peripherals, can be realized most economically with an IBM compatible XT/AT computer (PC). Accordingly, the XDS workstation is based on an IBM PC/XT or AT and the hardware elements needed to realize various emulators and measurement tools can be found in separate modules. [passage omitted]

The separate modules are connected to the standard asynchronous serial interface signal (RS 232) of the personal computer via a serial loop. Every module has its own power supply, memory and microprocessor control, the last of which also manages the serial line. To avoid interference every module is galvanically isolated from

the serial loop, and thus from the computer. The galvanic isolation also protects the computer from overvoltages which could arise from a faulty system under development. [passage omitted]

So far the following software and hardware modules have been prepared for the microprocessor development workstation:

- machine code, Pascal and C compilers;
- a circuit processor emulator module for Z80 and I8085 processors;
- an EPROM emulator and programmer;
- a logic state analyzer with universal (UNIPOD, CMOSPOD) and special adapters (MMTPOD, Z80POD, 185POD, IBMPOD, 186POD, etc.). (POD means Pin On Device). [passage omitted]

At present there are adapters for the processor emulator center suitable for emulation of a Z80 or I8085 CPU; NSC800 and HD64180 adapters which can be connected to the central unit are under development. [passage omitted]

The EEP EPROM emulator and programming module is a separate microprocessor unit which connects to the developmental system through a special serial interface. The programmer was made to program EPROM's with 16 to 512 kbit capacity and an Intel or JEDEC pin arrangement. The programmable types are: 2716, 2732, 2732A, 2764, 2764A, 27128, 27128A, 27256 and 27512. [passage omitted]

Hungarians Provide Multifunction Interface for Dubna Researchers
25020247a Budapest MAGYAR ELEKTRONIKA
in Hungarian No 4, 1989 pp 9-12

[Article by Gyorgy Rubin, Geza Farkas and A. B. Tulayev: "MULTI—A Multifunction Interface Unit for IBM PC XT/AT Computers"]

[Excerpts] In the course of neutron physics measurements a need arose for control of a CAMAC system involving a direct connection with IBM PC XT/AT type computers. The programmable input/output interface card developed is also suitable for solving other similar problems which often arise in measurement technology. [passage omitted]

Various firms do offer 32 bit I/O units (the Data-Translation DT 2817) or modularly expandable intelligent interfaces (the SORCUS Multi-LAB or the MODULAR-4) but these are either too slow, since they are capable only of programmed data transmission, or it is difficult to use already existing equipment (such as a CAMAC system) with them. [passage omitted]

The basic task of the MULTI interface unit, connected to the 8 bit bus system of IBM PC's (or compatible machines) is to provide fast, bidirectional data traffic between the PC and external electronic systems.

We selected the 8 bit bus system because of compatibility with XT category computers. Control of bidirectional data transmission is by means of a simple, two-line handshake system (READY-BUSY signals). There is a 32 bit input/output register, and the transmitter-receiver circuits serving it, and a control unit, designed for broad scale use. These also play the role of the so-called carrier board. "Baby" cards can be connected, by the "piggy back" method, to the carrier card to solve special user tasks. The electronics built onto this can use the 32 bit input/output register and the 8 bit data bus of the computer.

The interface unit is capable of handling parallel transmission of 8, 16, 24 or 32 bit data. The word length of the data to be transmitted can be selected by programming. Word length is adjusted to the byte organization so one can select 1, 2, 3 or 4 byte word lengths. The transmitter-receiver circuits match the 32 I/O data lines connected to the external units; the direction of their operation can be set byte per byte. Setting the byte with the smallest place value also determines whether the interface unit is operating as an output or input register from the viewpoint of the signals controlling data transmission (READY-BUSY). The interface unit has two independent 32 bit registers for transmitting or receiving data. The bidirectional data transmission can be programmed or can take place through the first or third DMA channel of the computer, depending on which is free in the given computer. In both data transmission modes (programmed and DMA) the interface unit has a self-testing possibility; in the test mode the data written to the output register can be read back via the input register. In the case of data transmission via the DMA channel one can select "single transfer" or "demand request" modes.

The interface unit has four independent interrupt sources; we assigned two of these to the programmed data transmission mode and one to the DMA data transmission mode. One interrupt source is a reserve for the electronics to be built onto the "baby" card. We use the IRQ 2 line (in the case of an XT computer) to request a program interrupt. The interface unit has so-called distributed interrupt logic; that is, a number of interface units can use the same IRQ line simultaneously.

The basic electronics of the interface unit are on a full length PC expansion card. The maximum size of the "baby" card which can be attached corresponds to the size of the carrier card. The design of the basic card is such that the data driving and receiving circuits are in a socket; by changing them one can simply get transmission and reception of negative logic data (74LS245 and 74LS640 integrated circuits). If we do not put these transmitter-receiver circuits into the socket the connections of the "baby" card can be plugged in in their place;

thus by using a "baby" card we can easily solve such problems as galvanic separation of data lines with optocouplers or use of transmitting-receiving circuits using voltage levels in accordance with the RS-232 standard. It could be a special advantage that the connection going to the external unit does not change when various "baby" cards are exchanged. Depending on the needs of the user the connection going to the external unit can be the well known 37 point D-SUB or a 40 point ribbon cable connector (KONTAKTA DS 665).

An important factor in selecting the parts for the interface unit was that they should be obtainable from socialist countries in-so-far as possible. (passage omitted)

The "baby" cards already developed, under development or planned for the MULTI interface unit are:

A UNIBUS adapter (already developed; An ADC (under development); A time analyzer (planned); A Q-BUS adapter (planned); and A stepping motor control (planned).

We developed the UNIBUS adapter in the neutron physics laboratory of the Dubna Unified Atomic Research Institute. In the concrete application the already working measurement system serves the modules of a CAMAC data collector. (passage omitted)

We are using a fast (a conversion time briefer than 10 microseconds) 12 bit ADC on the "baby" card containing an analog-digital converter. We intend this unit also primarily for nuclear measurement technology applications.

Most Important Technical Characteristics

It has a bidirectional, programmed data transmission mode; It has bidirectional data transmission via the DMA channel in "single transfer" and "demand request" modes; It has a test mode; and The word length can be set by programming to 1, 2, 3 or 4 bytes.

A maximum of two MULTI interface units can be connected to one computer simultaneously. (passage omitted)

Autobiographic Notes

Geza Farkas. I graduated from the Electrical Engineering School of the BME [Budapest Technical University] in 1970. From 1970 to 1973 I worked at the Electric Automatics Institute. From 1973 to 1988 I worked in the technical main department of the Particle and Nuclear Physics Research Institute of the KFKI [Central Physics Research Institute] where my task was primarily automation of high energy physics measurement equipment. From 1976 to 1978 I worked on this theme in Zeuthen, near Berlin, in the High Energy Physics Institute of the Scientific Academy of the GDR. Since August 1988 I have been developmental engineer for the DATACOOP

Computer Technology Small Cooperative where I participated in, among other things, development and starting manufacture of the MULTI interface unit.

Gyorgy Rubin. I graduated from the Electrical Engineering School of the BME in 1967 and since then have worked in the laser applications department of the Solid Body Physics Institute of the KFKI. My chief task is development of electronic devices for laser physics measurements and laser applications systems. From 1975 to 1979 and again between 1986 and 1988 I worked in the neutron physics laboratory of the Dubna Unified Atomic Research Institute on the further development of automatic measurement systems for correlation and polarization neutron spectrometers. In connection with needs which arose there we developed, together with Soviet colleagues, the MULTI interface unit described in this article.

Hungarian Multichannel Analyzer for Nuclear Research

*25020247b Budapest MAGYAR ELEKTRONIKA
in Hungarian No 4, 1989 pp 25-28*

[Article by Andras Balazs, Imre Barczi, et al.: "A Multichannel Analyzer Card for an IBM PC"]

[Excerpts] In industrial and laboratory nuclear measurement technology the work is done with multichannel analyzers as expensive special purpose instruments. The solution recommended in this article expands an IBM PC with one card, thus developing a multichannel analyzer from a computer. This solution is not only cheaper than a special purpose instrument it is also much more flexible. The computer is also suitable for evaluating and displaying the measurement results.

The IBM-MCA unit is a card which can be put into an IBM PC XT or AT. With its aid the IBM PC or compatible personal computers which today can be found in very many shops can be used as multichannel analyzers under the supervision of the MCA-SP program package.

The chief reason for its development was that with a personal computer it offers the same capabilities as the traditional multichannel analyzers made as independent units. Another advantage is that the IBM PC, with relatively great computing capacity, can also be used well to evaluate the spectrums collected by the IBM-MCA. And its price is low.

The IBM-MCA consists of two printed circuit cards attached to one another in piggy back fashion, so it occupies a two-card location in the computer. One contains the analog-digital converter (ADC) with supplemental analog and digital circuits while the other contains the analyzer memory, the control circuits and the circuits providing an interface to the computer.

Four IBM-MCA units can be put into one computer simultaneously; in this way one can perform four measurements independent of one another at one time. The several modules perform data collection independently while the computer can be used for display and evaluation of the spectrums or for other purposes. [passage omitted]

The MCA-SP program package runs in a Microsoft DOS environment and can handle four IBM-MCA modules at one time. Thanks to its menu system its use is simple even for users inexperienced in programming. The measurement parameters and the data collected during a measurement can be preserved on floppy or hard disk background stores and can be retrieved therefrom. The results can be displayed on the screen and can be drawn with the aid of a printer. This provides display simultaneous with the measurement and also makes possible an evaluation of the spectrums, either in their own environment or in an offline analysis form in the MS-DOS environment. The program offers the following possibilities:

Display

Vertical scaling—linear and logarithmic vertical scaling, automatically or manually.

Horizontal scaling—with binary increments from 128 to 4096 channels.

ROI (range of interest) designation—can be designated by the user with a marker or with numbers.

Channel identification—with moveable marker, at the same time the content of the channel designated by the marker is displayed on the screen.

Magnification—magnification of individual details of the spectrum depicted on the screen (e.g. a study of peaks).

Overlapping—simultaneous display of non-interdependent ranges for purpose of visual comparison.

Analysis

Energy calibration—with units determined by the user (eV, keV, MeV).

Integral—computes and displays the number of counts in the current range or in the ROI.

Net count number—gives the complete count number in various ranges taking the background noise into consideration.

Peak analysis—gives the precise location of the current peak and information pertaining to its spread.

Smoothing—three or five point smoothing within the designated range.

Transfer—transfer of ranges.

Printing—alphanumeric and graphic printing on the supported printers.

Storage—stores measurement parameters and data on floppy or hard disk stores.

Autobiographic Notes

Andras Balazs. I graduated in communications engineering from the Electrical Engineering School of the BME [Budapest Technical University] in 1981. Since then I have been working in the technical main department of the Particle and Nuclear Physics Research Institute of the KFKI [Central Physics Research Institute]. I participated in the VEGA program helping to design on-board digital hardware. In 1986 I received the silver degree of the Labor Medal for my activity. In addition I have participated in solving a number of earth tasks. Beginning in 1985 I worked in hardware and software design for the ESTER on-board equipment for the Phobos program and for the earth monitoring equipment for the Phobos lander.

Imre Barcsi. I was born in Siofok in 1967. I completed my secondary school studies at the Mihaly Fazekas Gymnasium, in the mathematics branch. At present I am an informatics student in the Electrical Engineering School of the BME. I have been writing PC software for two years. My favorite themes are computer graphics and simulation.

Istvan Hernyes. I graduated from the Precision Engineering and Electronics School of the LITMO Technical University in Leningrad in 1969. I worked as a research engineer in the radio laboratory of a developmental institute for 4 years. Since 1973 I have continued my activity in the area of space research and nuclear measurement technology at the KFKI. My tasks in the VEGA program involved development and organization of the central data collector and TV system.

Aladar Zarandy. I obtained my electrical engineering degree in the weak current section of the Electrical Engineering School of the BME in 1964. I have worked at the KFKI since that time. At present I am chief of the analog instrument development group of the technical main department. In the course of my professional activity I have dealt primarily with nuclear measurement technology and with the development of nuclear instruments.

Hungarian Computer Company Announces New Products

25020249a Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 6 May 89 p 1

[Article by Gitta Takacs: "The SZKI Response"]

[Text] A billion forints in sales receipts, 5 million dollars in convertible accounting export, export to socialist countries worth 60 million forints and a profit of 50 million forints—these are the figures used by director Pal Nemeth to characterize 1988 at the SZKI [Computer Technology Research Institute and Innovation Center] at a press conference held on the occasion of the MIPEL exhibition.

They have sold on the world market more than 2,000 copies of the ingenious hit product of the SZKI, the Recognita optical character recognition program. At present they are selling version 1.3 but they promise to have ready by May a newer version capable of recognizing and automatically handling non-text elements—such as underlining. They are planning to sell 4,000 copies in 1989—at a price 18 percent lower. They are working on adapting the PRIMA image processing system to the VME bus, and on using it in realtime industrial applications. The MPROLOG system has been installed in more than 1,500 places in the world and in the recent past there appeared for the first time an MPROLOG compiler prepared for Intel 80386 based machines, combining in it such user friendly PC traits as windows, menus and graphics and the memory management of the mainframe version, including virtual memory management. The first elements of an MPROLOG toolkit for the development of expert systems have appeared—MPROLOG Dialog for the "organization" of intelligent conversations and the MPROLOG E-Shell to aid in giving explanations and answers, so-called "query the user" services. It is already possible to link MPROLOG and database managers with an SQL surface.

This year for the first time the SZKI had its own stand at the CeBIT exhibition in Hannover and the leaders of the firm consider the exhibit very successful. According to foreign trade director Benedek Tallay the increase in trade this year which can be directly attributed to this exhibit may approach 3 million West German marks. (Last year, also in connection with CeBIT, they predicted 1 million marks trade, and 1.5 million was attained.) As of March Siemens is also one of the world vendors of Recognita; they are selling the Hungarian software with the Highscan scanner.

Citing the sharp competition, only oblique references were made at the press conference to new contracts signed with two world firms involved with computerized office technology. We learned only that the products involved will appear at the System'89 exhibit in Munich in the fall and at the American Comdex.

But what is not a secret is that the SZKI Computer Media Company has signed a vendor's contract for Hungarian sale of the high resolution black and white and color monitors of the Belgian ETAP Information Technology firm. Another item affecting domestic buyers is that the SZKI and the Telephone Factory have reached a license agreement according to which the Telephone Factory will make the motherboard for the Proper 132 in the future.

FACTORY AUTOMATION, ROBOTICS

**Hungarian Machine Tool Enterprise Moves
Toward Peak Technology**
*25020252b Budapest GEP in Hungarian
May 1989 pp 181-185*

[Article by Dr Otto Jakkel, Dr Imre Dorka, Laszlo Kovacs, Peter Kralovanszky and Karoly Szabo, of the Machine Tool Industry Works: "Peak Technology Development Achievements at the SZIM"]

[Excerpts] The Machine Tool Industry Works (SZIM) consists of five factories and one developmental institute and employs roughly 4,600 people. (passage omitted)

After this introduction let us deal in more detail with the machine tools realizing peak technology.

In the present sense it is possible, in principle, to build cells out of machine tools belonging to any technological branch. Because of their significance we place the emphasis now on manufacturing cells which can be built up out of lathes, but the findings are valid in principle to other producing machines or cells as well.

It is the task of a manufacturing cell to perform automatically on the workpiece those operations of which the processing machine is capable, including automated movement of part and tool, handling the chips, checking and monitoring the process. The cell is an autonomous module and so it can be organized into integrated manufacturing systems. Satisfying the requirements system has a number of aspects. (passage omitted)

The cell control is a high performance 16/32 bit computer which is suitable for maintaining the operator (man-machine) contact, for connection to the plant network, for operating the cell network (for example Mini-MAP), for receiving the signals of sensors outside the cell control equipment and for operating the peripherals. The machine and the control technology together presume very high reliability and this is what makes it a peak technology solution. (passage omitted)

VILATI [the Electric Automation Institute] manufactures the simultaneous multi-axis path control. MTA SZTAKI [the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences], the NME [Heavy Industry Technical University] and the BME GTT [machine technology faculty of the

Budapest Technical University] also participated in the development. Support from central sources was offered by the OMF [National Technical Development Committee] and the Ministry of Industry, with partial assumption of the significant costs. A typical solution is the two turntable version of the MC 401 5D which makes possible the machining of small parts.

Another characteristic solution is the MF 800/2500 5D vertical milling machine with a tilting table and a main spindle adapter which can be tilted plus or minus 35 degrees.

The MZP 2800/8000 5D portal machining center, with a main spindle which can be turned and tilted, is suitable for machining very large parts.

In addition to the 5D machines mentioned a number of other solutions—already realized—prove that the SZIM is capable of cultivating this peak technology.

Market demand justifies and the technological solution makes possible delivery by the SZIM of machining centers connected to a laser. Of the material cutting procedures working with great energy density (laser, electron, plasma, ion, water and abrasive ray devices) we introduced first of all the manufacture of machines using a laser ray sheet cutting technology.

There is no way for us to describe the physical characteristics of the laser, nor is there any need to do so. We use a 500 W carbon dioxide laser developed by Tung-sram but we have also already sold a machine with a Rofin Sinar 1200 W laser.

The LMC 250 laser sheet processing center is a combined machine equipped with Hunor 726 CNC controls made by the EMG [Electronic Measuring Instruments Factory]. It has mechanical tooling and a laser cutting head. The control guides the automatic tool selection, optimization of the revolver head turning direction, positioning of the sheet and the path control. The machine can also drill taps and mill small surfaces.

This equipment is one of the new machines of the second product structure change at the SZIM and it realizes peak technology because not only its control but also the laser, as a very valuable "tool," meet the peak technology requirements originally posed.

With the technical level described the SZIM is in a good situation today. We are trying to maintain this position with further development, so another product structure change is being prepared.

CNC machines are increasingly used in large series and mass manufacture as well. Because of the more expensive manpower a further increase in productivity is justified, so automated cells and systems working with reduced human supervision are spreading. It will be possible to put new scientific achievements to use. New

morphological principles may be realized in "human independent" production and software development will have ever greater significance.

We have faith that in the future also the SZIM will be able to satisfy the requirements of technical progress, at least in part with peak technology equipment suitable to the age.

Machine Tool Development at Hungarian Heavy Industry University

*25020252a Budapest GEP in Hungarian
May 1989 pp 162-170*

[Article by Dr Jozsef Tajnafoi, Heavy Industry Technical University: "Machine Tool Development and Research at the Heavy Industry Technical University"]

[Excerpts] The mechanical engineering school of our university is an organic part of the mechanical research base of our country and, therefore, of its machine tool industry as well. We participate in the major research programs and through our research and development themes we can affect the chief domestic efforts. (passage omitted)

The instructors and researchers of the machine tool faculty contributed significantly to the development of two machines shown at the 1988 Budapest International Fair. One was the basic machine and tool serving system of the MC 403 multispindle machining center of the Machine Tool Industry Works and the other was the ten-pallet pallet-store and store manipulator of the MKC 500 machining center at the stand of the Csepel Machine Tool Factory. (passage omitted)

I must stress the activity of the dean of our school, Academician Dr Istvan Paczel, who in addition to developing and applying the finite element method is also chief mover of the united effort of the school and its participation in national programs. (passage omitted)

In our currently on-going research, together with the mechanics faculty and Comporgan, we are putting the morphological arrangement of frames for machining centers into a computer and the finite element studies of the frames will be based on this. A CNC controlled laser sheet processing center is being developed at the Karcag factory of the SZIM [Machine Tool Industry Works]. The frame for this was designed by the mechanics and machine elements faculties, where the strength and dynamics studies were done. (passage omitted)

The machine tools faculty and the mechanics faculty cooperated in studying the distribution of stresses in the course of computer aided design of hybrid conduits, doing finite element calculations in this area also. There was also close cooperation between the two faculties in solving the dynamics problems.

There is frequent cooperation between the machine elements and machine tools faculties in the design area. They worked together in recent years on two larger developments. Special cycloid surface machining machines were being developed by the machine tools faculty for the Rolling Bearings Works (MGM), and the drives were designed by the machine elements faculty. The machine tools faculty prepared the chief design drawings for the 6-, 8- and 10-pallet pallet-store and exchange system for the MKC-500 machining center of the Csepel Machine Tools Factory, and instructors from the machine elements faculty cooperated in their construction.

The largest developmental tasks are done within the framework of the G/6 program of the OKKFT [National Medium-Range Research and Development Plan]. This is also the greatest link in the cooperation of the machine manufacturing technology faculty, the transport equipment faculty and the machine tools faculty. In the manufacturing automation sub-program, part of the educational sub-program, they jointly undertook, as a first step, the installation and operation of cell level elements of a flexible manufacturing system. The nucleus of the manufacturing system consists of one two-machine and one one-machine body of rotation processor, one billet machining manufacturing cell, a measurement cell and a material movement and storage cell. Later we want to move up from the cell level to the system level by building informatics and material movement systems.

Robots are tied by many strands to machine tools and manufacturing systems and the school program, in which several faculties participate, includes research on them. The industrial management faculty deals with organizational and applications problems, the transport equipment faculty with their material movement tasks, the mechanics faculty with mechanical and dynamics questions, the machine elements faculty with drive problems, the mechanical technology faculty with their plastic forming and welding applications and the machine tools faculty with control technology, hydraulic and structural problems. Robotized training systems exist partly within the already mentioned metal cutting cells and partly separately, as in material movement and robot welding sample systems.

Sample systems are also built for supplemental automation of machine tools, in connection with both metal cutting and plastic forming machines.

The machine manufacturing technology, machine tools, physics and electrotechnology faculties of the university also cooperate in the area of mechatronics research in the areas of submicron manufacture, conduit research, laser measurement technology and computerized data collection and processing.

A laser hologram device has been prepared in the machine manufacturing technology faculty; its novel structural arrangement is a university invention.

The richest developmental work, and united school effort, has been in the area of computer aided design and manufacture (CAD/CAM). All of the faculties mentioned above participate in this. Mention must be made of the software development work being done in the mechanics, transport equipment, machine manufacturing technology, mechanical technology, descriptive geometry, machine elements and machine tools faculties; and, naturally, this area is being cultivated actively in areas falling even farther from our spheres of interest. Developments at the faculties mentioned embrace a broad sphere extending from mechanical tasks (e.g. the finite element method) to material movement simulation for integrated manufacturing systems, from metal cutting and plastic forming technologies to descriptive and machine design tasks. For example, one project of the transport equipment faculty was simulation of material flow in a manufacturing system and the determination of the storage capacities. They developed a service strategy for stochastic material flow.

The research and development work of our faculties is tied by many strands to other sub-programs of the G/6 program, to OMFB [National Technical Development Committee] programs (OMFB 6 and OMFB 7) and to ministerial programs T12 and T15. This includes development and applications research in connection with high precision machine tools (the machine tools and machine manufacturing technology faculties), tool supply for integrated flexible manufacturing systems and cooling and chip handling systems for them (the machine manufacturing technology faculty), research on material movement systems, simulation of these systems and the chief parameters and requirements for them (the transport equipment faculty), development of automatic chucks, status monitoring research and problems of electronic kinetic chains (the machine tools faculty).

In part the research themes of the machine tools faculty reflect that broad spectrum of subsystems used in machine tools and in part great emphasis is also placed on working out principles of complex machine and system construction and their practical application. Both design and experimental development take place in the area of subassemblies for machining centers, manufacturing cells and robots. The faculty has prepared designs for complete machining centers, pallet stores, special tool stores (e.g. for a multispindle machine), tool changing manipulators, etc., and as a result of joint development with machine tool manufacturers these have already figured at virtually every more significant machine tool exhibit in Europe.

In the course of research on and construction of subassemblies there has been development of jointless worm gears for the turntables of 5D path control machining centers, development of complete turntables, development of and experiments with changing mode roller screws, a study of the dynamics of belt drives, research on precision drives and conduit research. The conduit testing laboratory contains much specially developed

testing equipment. Our other great research area is research and development connected with manufacturing systems, cells, CNC and robot control functions and status monitoring systems. As part of this we are developing lathes, cells, robot controls and controls for flexible manufacturing equipment, emphasizing two themes—automatic status monitoring and electronic kinetic chains, the development of swift status regulators. Our third research theme is computer aided design of machine tools and structural units. In this area there are dynamic studies of machine tool main spindles and main drives with special regard to precision drives, the dimensioning of machine tool stands and use of CAD methods to design machine tool subassemblies and mechanisms. These methods are increasingly spreading to all our research areas from belt drives to conduits, from nodular mechanisms to simulation of status control cycles and mechanisms for plastic forming machines, and in some places we have already solved computer aided manufacture. Our fourth theme is research and development connected with hydraulic and pneumatic automation subassemblies. In addition to designing hydraulic elements and cycles a special area is the development of alternating current hydraulic drives.

In what follows I would like to mention two theoretical nuclei of our first theme group. These were born in the machine tools faculty and form a basis for much of our developmental and creative work and in their generality they are suitable for the united effort of broad areas. These are generalized movement information mapping principles and principles for function reduction. (passage omitted)

TECHNOLOGY TRANSFER

Hungarian Universities Receive Gift of Mainframe Computers

*25020249b Budapest COMPUTERWORLD/
SZAMITASTECHNIKA in Hungarian 6 May 89 p 5*

[Article by Tamas Kolossa: "A Mainframe As a Gift"]

[Text] The computer experts at the Heavy Industry Technical University in Miskolc waited nervously for long months before the rumor became reality—the long awaited Siemens 7.760 mainframe computer arrived.

The system, scraping the limit of COCOM authorization and worth about 60 million forints, is thanks to the generosity of the technical university in Darmstadt. Indeed, it is reported that their generosity is twice as great for the Veszprem Chemical Industry University also has received the same configuration from them free of charge. (The chief data are: 3 megabytes RAM, 1.2 MIPS, 800 megabytes background storage, BS 2000 operating system, virtual organization and 256 work stations or PC interface possibilities.)

This gift is of determining significance not only for the university. It is intended as a regional resource in the national IIF net [the national research and development network]; a regional center must be developed at the university to provide scientific information to North Hungary. That is, if there are enough postal lines. So there is a coat already, they just have to sew enough buttons on it....

Until then they are also working on building a university information network. By using the 25 terminals donated by Szamszov [Computer Technology Small Cooperative] a leaders' information system is being

based on a development of the management and business system. Even today a number of databases can be accessed through the faculty computer centers. A number of large research plans have been started; they are developing simulation models, for example to study the underground flow of liquids, for pump planning and for vibration damping experiments. Within the next 6 months students also will have access to one of the largest educational databases. At the festivities when the computer was being handed over Helmuth Bohme, president of the technical university in Darmstadt, said the following, among other things: "Study and research—these are the guarantors of our future. We have faith in further cooperation and in the future of the university." So be it.