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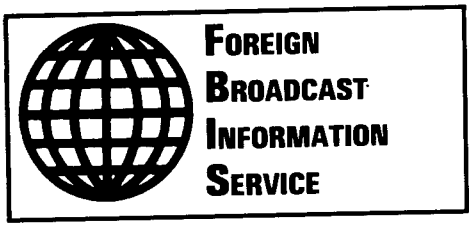

JPRS Report

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Dutch Technical Ceramics Initiatives Overviewed

AN890165 Brussels INDUSTRIE in Dutch May 89 p 91

[Article: "Technical Ceramics in the Netherlands"]

[Text] The Netherlands is developing several initiatives in the field of technical ceramics, the most important of which are:

1. Innovation-Oriented Research Program (IOP) for Technical Ceramics

An IOP is a medium-term, application-oriented research program conducted by state-subsidized universities and research institutes. IOP-Technical Ceramics covers two research fields: production, on the one hand, and application and use of ceramics, on the other. The production category is subdivided into three research areas: powder technology, production methods, and ceramics with special properties. The application and use category covers four research areas: ceramic coatings, bonding technology, design and construction techniques, and nondestructive research.

2. Platform for Technical Ceramics in the Netherlands (TKN)

This platform was established in November 1988 and involves 20 participating companies. The TKN platform attempts to draw the government's attention to applications and development of technical ceramics. It aims to ensure that the Netherlands has a say in international standardization negotiations and will promote the application of technical ceramics.

3. National Ceramics Workshop (NKA) in Petten

With government support, a department was set up in the Netherlands Energy Research Center (ECN) in Petten for the development and production of technical ceramics-based molds. Established in 1985, the NKA plays a central role in supporting technical ceramics research, development, and production activities throughout the Netherlands. The workshop operates for universities, research centers, and industry. It also carries out projects of its own in the field of powder technology, molding, heat treatment, and characterization of ceramic materials.

4. Others

The institutes of higher learning in Alkmaar and Eindhoven have also included technical ceramics in their curriculum. In cooperation with the ECN, the Alkmaar Institute also offers courses on technical ceramics for industry.

Max Planck Institute for Polymer Research Opens in Mainz

36980238b Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 3 May 89 p 8

[Article by Arno Noeldechen: "Mainz Max Planck Institute Explores Polymer Properties"]

[Text] Solvents Sound Like "Big Ben." Worries About Availability of Research Reactors.

Mainz—The currently most modern research facility of the Federal Republic has been erected on the grounds of the University of Mainz at a cost of more than DM45 million. But it is hoped that this stiff price will be worth the trouble, as was now explained to a small group of journalists prior to the official inauguration on 8 May 1989. The around 240 staff members of the Mainz Max Planck Institute of Polymer Research (Ackermannweg 10, 6500 Mainz) are exclusively concerned with exploring the polymers under the direction of Professor Dr. Gerhard Wegner, the institute's executive director; polymers are artificial materials consisting of organic molecules. These highly-complicated compounds are intended to enable industry to keep up in international competition and to attain leading positions in some fields. Only those who have a very exact knowledge of the fundamentals and characteristic ways of behavior as well as the properties of polymers still have a real chance of making sales in international competition, it was noted.

The Mainz Max Planck Institute is typical of the close connection between various research fields. The still largely unexplored field of artificial substances can be mastered only through close cooperation between chemists, physicists, and engineers. The institute's organization is also subdivided into these three sectors. As in all Max Planck institutes, the approximately 150 scientists and PhD candidates in Mainz are exclusively concerned with basic research. At this time, there are 25 visiting scientists working in Mainz and they are matched by 33 German scientists.

The on-going research projects, which were presented on the occasion of a press seminar, document the high level of scientific work which is aimed at finding and developing efficient and advantageous artificial materials. For example, in a joint project with the synthetic materials industry and a series of universities, work is being done on the entire complex of so-called ultrathin films. They play a great role technically in connection with surfaces, glues, or also in the case of optically active polymers, all the way to reasonably priced polymers as light wave conductors in telecommunications and communications technology.

Another project involves body parts for automobiles with a highly complicated structure; these parts must be assembled from entirely different artificial substances, depending on the required stresses, in order to combine

hardness with elasticity so as to cope with mechanical forces. Such properties can be attained only by means of complicated combinations of various artificial substances. Novel and unconventional physical measurement techniques play an outstanding role here, in particular. They extend all the way to the atomic and molecular structures of artificial substances and—something that requires a tremendous effort—all the way into the exploration of their reaction modes and mechanical, chemical, as well as physical behaviors.

Polymer scientists describe this behavior simply as "dynamics." This can explain why an artificial substance assumes a state ranging from glassy- soft all the way to crystalline-hard as the temperature rises. This goes so far that it is possible today, by means of mathematical models, exactly to measure molecular movements which in the past were considered to be inexplicable "accidents." For example, artificial substances, which after all consist of very long-chain carbon compounds, have internal movement possibilities given by nature. This involves axial rotations all the way to "jumps" of individual atoms from one position to another.

Something which, for example, can be observed directly in the highly- modern raster tunnel electronmicroscope can also be registered with highly-sensitive magnetic processes, such as "magnetic core resonance," or they can be properly measured spectroscopically with neutrons or x-rays. Here it was, for example, particularly impressive to listen to the sound signals which Dr. Bernhard Bluemich presented for various organic substances: a mixture of various solvents sounds like "Big Ben" bell gongs. Constituents, such as kumarin, cholesterine, or toluene, produce quite characteristic and distinguishable sound signals.

But acoustic signals are not sufficiently refined for analysis in polymer chemistry. Here one prefers to fall back on two-dimensional and three- dimensional graphic illustrations which have been and are being perfected especially in Mainz. They make it possible to investigate polyoxymethylenes (trade name: Hostaform), in terms of its various forms so as to look into the existing atomic and molecular "movements." These movements, which go back to the internal structure of the molecules, are responsible for the elasticity, hardness, as well as temperature- resistance or impact resistance.

Here, polymer scientists are working with an on-going feedback process: "One is dealing here with a 'macroscopic' property which must first of all be clarified microscopically," explains Professor Dr. Erhard W. Fischer, one of the three directors of the MPI [Max Planck Institute]. "If one then has an exact knowledge of the structure in microscopic terms, then one can 'build it up' in a target-oriented fashion via chemical synthesis processes in order in the end to attain the properties which one intended to get." This pertains, for example, also to electrical and optical properties of artificial substances which can conduct electrical current almost as well as metallic copper. But we still have a long way to go from the laboratory to the marketable product, as shown by the "artificial substance battery" which was displayed already 2 years ago. That battery is not yet commercially available.

The difficulties piling up in connection with the so-called light wave conductors made of polymers are no less manifold. The people in Mainz are devoting much attention to this research field. Here the goal is "to develop materials which will 'switch' optical signals with the speed of light," according to physicist Anke Kaltbeitzel in commenting on her research work. Of course, the experimental work here today is still done with conventional lasers but she and her colleague, Dr. Hans Bubeck, are trying to develop the sensitivity of optically 'nonlinear' structural components to such a point that they can be made into switches with cheap laser diodes.

For this kind of development work it is, for example, necessary exactly to measure less than paper-thin films amounting to just a few nanometers and also to be able to record surface roughness. For this purpose, one uses the neutron reflection measurement method, for example. Of course, this method cannot be employed in Mainz due to lack of adequately clustered neutron radiation sources. As in other radiation investigation techniques, the Research Institute is cooperating with the Juelich Nuclear Research Center or with Grenoble or wherever there are analytically usable radiation sources available in Europe.

Professor Fischer of course did deplore the fact that the aversion toward nuclear research is causing increasing concern. He feels that it will be very difficult in the future to employ the physical advantages of radioactivity if no further new research reactors were to be built and were then to be available to the fundamental sciences.

The Research Institute devoted specifically to polymers was conceived at the end of the 1970's. At that time, the German artificial materials industry had suffered a considerable market decline particularly in comparison to Japan; countless items of basic knowledge were missing for the development of new artificial materials in order to enable raw- material-poor Germany to hold on to its earlier leadership role. In the meantime, this danger has been eliminated completely. On the contrary, scientists from the Far East or also from the United States today prefer to come to Mainz to "learn" here. The researchers in Mainz are able to provide information on economic successes with novel artificial substances only in rough outline. Their working and effectiveness radius extends only to common basic patents with industry but not to individual products or artificial substance combinations. The chemical industry, to be sure, is the most important partner of the Max Planck Institute but what industry in the end makes and produces out of all that is beyond the purview of the Institute in Mainz.

AEROSPACE, CIVIL AVIATION

New European Commercial Aircraft Project Described

MI890332 Rome AIR PRESS in Italian
14 Jun 89 p 1182

[Text] An agreement for the joint study of a 80-100 seater high technology aircraft was signed last December by Aeritalia, Aerospatiale, and CASA [Contrucciones Aeronauticas S.A.]. The companies are currently proceeding with this project for the manufacture of a new commercial airplane which could fill the gap between presently existing jets and turboprop aircraft. The aircraft may be used for long- and medium-range flights, a factor which the three companies are currently evaluating by using the experience acquired in the ATR (Aeritalia and Aerospatiale) and the CN-235 (CASA) programs. The study is being carried out jointly by three different teams (design, marketing, and cost analysis). Various alternative structures are also being examined, including turbojets, propfans, and high speed turboprop propulsion systems. The structures under study also include high technology for aerodynamics, systems, and materials. Special emphasis is being given to reliability, comfort, low operating costs, operational versatility (for network development), ground maneuverability, flexibility of cabin equipment, and automatic maintenance procedures. The most interesting structures will be presented to aircraft companies in the last quarter of this year. Main events in the future should include the start of the program's actual development in 1991, with entry into service in 1995.

European Participation in Hermes Project Described

MI890329 Rome AIR PRESS in Italian
30 May 89 p 1061

[Text] "This is an important moment for the European space industry," said Jean-Marie Luton, managing director of CNES, the French National Center for Space Studies, as he commented on the contract for the final study of the European space shuttle, Hermes. The contract amounts to ECU 415 million, the equivalent of Fr 3 billion. CNES, under the authority of ESA (European Space Agency), has awarded the contract to Aerospatiale, prime industrial contractor for the whole project, Avions Marcel Dassault, prime contractor for aeronautics, and to the other European industries involved in this project, which is estimated at ECU 4.3 billion ($4.6 billion). The work covered by the contract, which also includes work carried out to date, will take 3 years to complete and will result in the final design of Hermes, the selection of the technologies to be used, and the placing of the interface with the Ariane 5 carrier rocket and the European space station Columbus. In addition, established budgets and deadlines will be confirmed.

Aeritalia is responsible for the internal thermal control, part of the outer skin, the wings, and the forward section of the fuselage for the Hermes project.

Austrian, Soviet Space Mission Announced for 1991

MI890353 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German
No 505, 15 Jun 89 p 12

[Text] Preparations are underway at Graz Technical University and at the Physics Institute of the Austrian Research Center in Seibersdorf for two physical experiments that are to be carried out aboard the Soviet Mir space station as part of the Austrian-Soviet space mission planned for 1991.

Known as LOGION, liquid metal field ion emitters will be tested for serviceability and operating characteristics under microgravity conditions. UV radiation by solar electrons produces the photoelectric effect by which a spacecraft in near-earth orbit takes on a charge relative to interplanetary plasma. This alters the electromagnetic field in its environment.

The charging process may interfere with earth communications, cause voltage breakdowns in the power-supply system, and, in the case of research satellites, distort or impede the measurement of low-energy particles in the plasma.

To offset this undesirable effect, the spacecraft beams positive particles—ions—into space by means of an extremely light ion source. With a minimum of wattage the source must produce its protective effect for several thousand hours. Since the Seibersdorf research center has many years' experience with liquid-metal ion sources, it has been invited to develop a "space" version.

The emitters are also used in the ESA [European Space Agency] INTERBOL and CLUSTER missions. Industrial application may be expected in potential compensation for telecommunications satellites.

MIGMAS-A stands for the development of the primary-ion gun for a materials analysis station to be used in space. Special microanalysis is required for analyzing materials smelted under microgravity on board a spacecraft or for studying interstellar comet matter. The Austrian involvement in the Mir mission consists of developing the ion gun, which constitutes the main module for analysis equipment of this kind, and testing it under microgravity. It is scheduled for concrete use in cooperation with the NASA project CRAF (Competary Rendezvous and Asteroid Flyby) project. During a 2-week rendezvous with a comet, the composition of comet-dust will be studied. The scientists will be particularly interested in protoorganic molecules. They are expected to provide clues as to how the preliminary stages of organic matter originate.

Malfunction of 'Astra' Satellite Tubes Reported

AN890277 Alton (UK) INTERSPACE in English12 Jul 89 pp 6-7

[Report: "Tube Problems on Astra"]

[Text] It appears that there are now three troubled travelling wave tube amplifiers on the Astra satellite. The channels involved are that transponders 1 (Screen Sport), 10 (vacant, allocated to Germany), and 16 (Sky Movies) are affected ; it is not known which, if any, of the others is suffering problems [sentence as published].

SES confirmed this week that it had switched in back-up tubes for the troubled transponders but, naturally, played down the problem. This is understood to be for transponder 16, which is using the back-up tube shared with transponder 10. There is also an absence of transponder noise on the currently vacant channel 10.

Channel 15, carrying MTV, was noted over this weekend to have suffered from interruptions of service.

There is documentary evidence available that all GE Astro-Space manufactured Ku-band spacecraft are prone to deterioration of their tubes, but problems have appeared with Astra 1a more quickly than expected. Indeed, for some years Interspace has been receiving reports of rumoured problems with the Satcom K1 and K2 satellites.

Lloyds underwriters are understood to have been informed about the technical problems with Astra 1a. There is concern that Astra's problems may get worse when all the transponders are fired up.

There are three main implications from the tube problems (apart from the obvious one of the possibility of a company losing its capacity):

- As back-up amplifiers are brought into use, SES will be forced to reduce the level of preemptibility on the transponders which share the back-up tubes. For example, channel 10 has lost its back-up to channel 16, so SES will have greater problems in marketing channel 10 to Germany. It is also likely to get a lower lease price.
- It is uncertain if the tubes affected can be brought back into service. The tubes have been spontaneously shutting down, apparently in response to electromagnetic discharges. However, the tubes may become damaged by the spontaneous shut-downs themselves.
- It gives TV channel providers the opportunity to negotiate or renegotiate cheaper terms for their leases, impacting on SES's revenue. One engineer following the problems on Astra told us that it looked like "a very sick bird."

However, some argue that spontaneous shut-down is relatively common occurrence and that the vast majority of tubes affected are recovered. That is also the official position of SES. It told us this week (and has, apparently, told other publications) that some 22 percent of Ku-band transponders (it is not clear if it means all 300 Ku-band transponders in orbit or just 45-watt transponders) have experienced spontaneous shut-offs, but about 90 percent of these have been recovered. Only 1.8 percent of all amplifiers that have suffered spontaneous shut-off have not been recovered.

The company says that it is not worried about the problem (which probably means that it is). It says that the problem is common in the running-in phase of the satellite, which it expects to last about a year. However, it appears that the company is still undergoing tests to find out what precisely is causing the problem.

The latest status report on the Eutelsat I series suggests this as well. During 1988, Eutelsat I F1 suffered one spurious switch-off of channel 6, but it was fired up again within 3 minutes. Eutelsat I F2 suffered similar switch-offs of channels 2X and 6X. It is understood that there were no spurious shut-offs on F4 or F5.

However, there is a significant technical difference between the European manufactured Ku-band spacecraft and the GE Astro Space Ku-band birds. The European satellites have, built into them, the capability of automatically firing up a tube after a spontaneous shut-off. They can be fired up within 15 seconds. The U.S. satellites have no such capability, we are told. One engineering source suggested to us that if the problem on Astra becomes frequent, the only solution may be to write a software programme to allow automatic restarting.

FRG: BMFT Subsidizes Microgravity Experiments

MI890352 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 505, 15 Jun 89 pp 11-12

[Excerpts] On 9 May, the MIKROBA gravity capsule had its first test flight from the ESRANGE launch pad in northern Sweden. It is interesting that this flight system was developed and built exclusively by small and medium-sized firms, together with the Bremen University, with the Bremen firm OHB System proposed as prime contractor.

MIKROBA is a gravity capsule program financed by the FRG Ministry of Research and Technology that makes it possible to conduct experiments under microgravity conditions in a free fall from a height of 40 km. This experiment time is sufficient for tests, material and biological experiments, and component trials. In particular, the physical processes involved in combustion, the hardening of alloys, and the phenomena of fluid physics, for which short microgravity times are sufficient, can be studied at an equipment cost comparable with laboratory standards.

The MIKROBA capsule can load 200 kilograms of scientific equipment for experiments. It is taken up to a

height of about 40 km in about 4 hours with a stratospheric balloon and then freed by remote control.

Microgravity is then achieved in the ensuing free fall for about one minute. As the capsule falls and consequently gathers speed, the aerodynamic resistance of the atmosphere increases and, unless countermeasures are taken, leads to a deterioration in microgravity. This resistance is therefore offset by the extra thrust provided by a newly-developed cold gas motor. After a controlled, trouble-free flight, the three-stage parachute recovery system is opened automatically and the capsule makes a soft landing.

The recent successfully completed mission was used for technical tests and trials on this experimentation system. Special attention was paid to the functioning of the regulation system and the cold gas motor, which was built by Bremen University as part of this joint project.

The next MIKROBA flight, which will involve in-flight scientific experiments and will mark its entry into operation, is scheduled for the fall of 1989, also in northern Sweden. An additional flight is planned for 1990, in cooperation with the People's Republic of China. Following the operational trials, the industrial firms participating in the joint venture have declared that they are ready to offer this cost-effective experimentation facility to users in research and industry. This facility fills the gap for research and testing between the gravity tower, where use is limited to a few seconds, and the altogether more costly research rocket flight designed for experiments lasting several minutes. [passage omitted]

FRG Develops 'Plastic' Helicopter

36980249b Paris AFP SCIENCES in French 25 May 89 p 25

[Article: "MBB Develops a 'Plastic' Helicopter"]

[Text] Ottobrunn—An experimental synthetic-fiber helicopter developed by the FRG aircraft manufacturer Messerschmitt-Bolkow-Blohm (MBB) had its first flight at the end of April. This multipurpose, experimental, type BK 117 craft, with a synthetic fiber body, was developed and built as part of a Federal Defense Ministry technical program. The results of this research will be incorporated into the new PAH-2 and NH90 helicopter programs.

The PAH-2, a second generation defense helicopter, will be developed concurrently by FRG and France, and its first flight is scheduled for 1991. The NH90, a NATO transport helicopter planned for 1990, developed by FRG, France, Great Britain, Italy, and the Netherlands, should be operational at the end of 1990. Early in 1960, MBB had already produced a helicopter whose rotor blades were made of synthetic fibers.

FRG: Earth Observation Satellite To Study Ozone Layer

36980249c Paris AFP SCIENCES in French 15 Jun 89 p 16

[Article: "FRG: A Satellite To Study the Hole in the Ozone Layer"]

[Text] Bonn—It was announced on 12 June in Bonn that an FRG satellite project designed to study the hole in the ozone layer and changes in climate data, is being developed by a group composed of government and industrial representatives. Jurgen Ruttgers, speaking for the right-center parliamentary coalition CDU-CSU-FDP, indicated that the satellite, which will be called Atmos, could be launched in 1994 as part of a European cooperation program for earth observation.

Last March, the FRG Research Ministry had already given a green light for the CRISTA (Atmosphere Observation Telescope and Infrared Cryogenic Spectrometer) system, to be carried by the FRG satellite ASTRO-SPAS, which is expected to be launched in 1993. CRISTA should allow measurements of changes in the ozone layer.

BMFT Funds MBB/MTU Ramjet Engine Development Project

36980239b Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 May 89 p 8

[Text] Many countries are trying to find better ways to put equipment into space as economically as possible. In the United States, the National Aerospace Program is intended to usher in the development of a hypersonic aircraft. France is working on studies involving the hypersonic concept which is called the High-Speed Aircraft. Great Britain has been working on plans for a single-stage space transport system called Hotol. Japan is promoting the Hope space transport vehicle, while last year, in the German Federal Republic, work was begun on the hypersonic technology conveying concept that is to work out the fundamentals for the Saenger Concept proposed by Messerschmitt- Boelkow-Blohm GmbH (MBB), Ottobrunn.

In the context of this conveying concept of the Federal Research Ministry, MBB among other things was charged with managing the concept definition work and the development of the technology for the liquid-hydrogen ramjet engine. This engine will be a component system of the hypersonic engine needed during the first stage which reveals characteristics of both turbo-airjet and ramjet engines. In this development effort, MBB and the Motor and Turbine Union (MTU) enterprise are cooperating closely.

When it comes to the joint development of engine technologies, MTU contributes experience with turbomachines, high-performance heat exchangers, and material questions, while MBB has a command of the technique involved in a liquid-hydrogen rocket engine, plus experience with ramjet engines; from its work on the Tornado aircraft and from missile development, it also has knowhow on supersonic air intakes. This is why MTU will above all contribute developments for turboengines which extend up to about Mach 3.5, while MBB reportedly took over the development of the liquid-hydrogen ramjet engine as well as the analysis of its functional effectiveness and suitability.

MBB has efficient test stands for the development and testing of ramjet engines. Today, these systems can maintain a maximum air throughput of 120 kg/sec with an air temperature of around 800o C for about 100 sec; this is said to simulate conditions that are encountered at high altitudes and at speeds of around Mach 4.7.

It was said that one test stand has been rebuilt in the meantime for the development of an engine for the Saenger Project. This involves a prototype engine on a small scale (subscale) with a diameter of 35 cm. The final engine will have a diameter of about 1.6 m. Initial tests are already under way. At first, gaseous hydrogen was used as fuel. With the development of the hydrogen ramjet engine, MBB reportedly managed to be the first in Europe to get into this technology field—or so the enterprise says.

The supercharging, which occurs under flight conditions, is being simulated with the help of compressed-air tanks and air heaters. In the combustion chamber, energy is then supplied through the combustion of the injected hydrogen and the temperature of the air current is greatly increased. In a subsequent thrust nozzle, the condensed and heated air current is then released, as a result of which the exhaust speed—which is greatly increased compared to the influx speed—is generated. Along with current modifications for performance optimization, the diameter of the combustion chamber is being gradually increased to 80 cm. A ramjet engine, cooled regeneratively with liquid hydrogen, is to be on the test stand at the end of 1989. The first trial runs with an 80-cm engine are scheduled for early 1991.

MBB, Matra Establish 'Eurodrone' Venture

AN890256 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1491-3, 22 Jun 89 p 1

[Text] On the occasion of the 38th Le Bourget Air Show, Dr Hans-Arnt Vogels, president and chief executive officer of Messerschmitt-Boelkow-Blohm (MBB) (FRG), and Noel Forgeard, Matra senior vice president (France), met on Tuesday, 13 June 1989 to announce a joint venture called Eurodrone, to be in charge of commercial and industrial prime contracting within the Brevel drone program. The event took place subsequent to the decision of the ministers of France and the FRG, in April of this year, to start joint development of a drone for artillery target location. The main task of the Brevel systems is real-time battlefield surveillance for identification and location of targets. The program is based on a common specification and a technically balanced work distribution between France and the FRG. Production is scheduled to start in 1995.

France-FRG To Build Drone

36980249d Paris AFP SCIENCES in French 15 Jun 89 p 30

[Article: "Drone: Matra and Messerschmitt Agreement]

[Text] Matra and MBB (Messerschmitt-Bolkow-Blohm) announced on 14 June the creation of an economic interest group (GIE) to produce a pilotless spy-plane (drone). At the Bourget Air Show, the two companies indicated that the group, named Eurodrone, will develop this plane, the Brevel, whose construction had been decided by the French and FRG governments in April. The GIE will be responsible for "providing the industrial and commercial supervision for the program" associated with this observation plane, they added.

The primary task of this plane is to observe a battlearea, identify and locate artillery targets, and immediately communicate this information. Mass production is slated to begin in 1995, and Matra believes that Eurodrone could ultimately include other European countries, and even the United States.

Thomson, Aerospatiale To Form New Avionics Company

36980249a Paris AFP SCIENCES in French 8 Jun 89 p 20

[Article: "Sextant Avionique: Thomson-Aerospatiale Joint Company"]

[Text] Paris—The joint flight electronics company being established by Aerospatiale and Thomson CSF will be called Sextant Avionique, indicated on 6 June Henri Martre, Aerospatiale president. The company will bring together three Aerospatiale subsidiaries (SFENA, EAS, and Crouzet) and Thomson's General Avionics Division (AVG). A special general meeting of the company will be held on 12 June to ratify this merger, added Mr Martre.

At first, Thomson-Aerospatiale will each own 50 percent of a holding company named ATEV (Aerospatiale Thomson Flight Electronics), which in turn will control 52 or 54 percent of Sextant Avionique. The public will have access to 31-35 percent of the new company's shares, and Aerospatiale will directly hold the remaining 10 percent.

Crouzet is currently the only one of the companies quoted monthly on the Paris stock exchange; Aerospatiale holds 41.5 percent and the remainder is public.

First Ceramic Composites in Mirage 2000 Engine Reported

36980249e Paris AFP SCIENCES in French
15 Jun 89 p 30

[Article: "First Ceramic Composites in a Mirage 2000 Engine"]

[Text] Le Bourget—For the first time ever, a Mirage 2000 whose engine contains ceramic composite parts, was shown on 9 June at le Bourget. Tested beforehand on a Mirage at Istres and developed by the European Propulsion Company (SEP), these ceramic-matrix composite (CMC, combining carbon or ceramic fibers and a silicon carbide matrix) jet flaps "are an important landmark for the use of these new materials in engines," SEP has indicated.

Withstanding a temperature of 1850 degrees, and oxidation resistant, CMC integrates the mechanical performance of composite materials and the thermal behavior of ceramics. Developed by SEP for the past 10 years, CMC will lower maintenance costs and "will be found in about 5 percent of the jet engines in 1995" in Europe and the United States.

Italy: Aeritalia's Role After EC92 Described

MI890343 Rome AIR PRESS in Italian
9 Jun 89 p 1125

[AIR PRESS interview with Eng Fausto Cereti, vice president and managing director of Aeritalia; first paragraph is AIR PRESS introduction]

[Text] Aeritalia is fully prepared for a comparison with other aerospace groups when the European markets become integrated in 1992. If everyone plays by the rules of the game, this should lead to an integration of these projects and programs that must not be jeopardized. This was the opinion expressed by Aeritalia's vice president and managing director in an interview with AIR PRESS, after having stated that Italian participation in the Le Bourget and Farnborough airshows is not justified, either in terms of company image or commercial spin-offs.

[AIR PRESS] Italy has "opted out" of the Farnborough and Le Bourget airshows. Do you think that this is going to be a regular policy? Also, Engineer Cereti, is the cost of attending a show of this kind really justified for a company like Aeritalia?

[CERETI] The decision for Italian industry not to take part in the latest Farnborough and Le Bourget airshows was made at The Hague, and was intended as a firm and explicit warning to the organizers of these shows. The enormous and ever increasing costs of taking part in these two airshows each year is not justified in terms of returns on either commercial or company image. We have asked the appropriate parties to consider the possibility of holding these airshows less frequently. In the meantime, we are examining the possibility of a different form of participation that is less traditional, more modern, and more in line with the structure and needs of the aeronautics industry today.

[AIR PRESS] Paris leads to the subject of Europe and, obviously, the single European market. Engineer Cereti, what can the Italian aerospace industry expect (in both positive and negative terms) from this long awaited, but worrying event?

[CERETI] We have nothing to fear from 1992. On the contrary, European market integration represents another opportunity to develop our policy of international collaboration, to become more competitive, and to make strategic use of the industrial synergies available. European unity means technological capabilities, company size, production levels, and efficiency that are in line with the competitive challenge represented by this unity. This will benefit the more competitive companies and, in the final analysis, society as a whole.

[AIR PRESS] Europe after 1992 will inevitably bring a direct comparison with other aerospace groups. What are Aeritalia's strengths in a comparison of this kind? And what are its weaknesses?

[CERETI] Aeritalia is ready for this comparison. The company's technological capabilities and systems know-how have now reached such a level that we are not afraid of the impact of 1992. Our commitment to research and development means that we are now in a leading position in technologies for the use of composite materials, avionics, space systems, processing, and control systems, to mention only a few sectors. That is not all; we have transformed our weaknesses into strong points (the fact that the company size is not optimal and that, unlike our competitors, we are unable to exploit all the industrial synergies in our sector). This has been achieved through joint ventures and the development of links with, and a participation in, major companies such as Dee Howard in the United States. The weakness that still characterizes the Italian aerospace industry, however, is that unlike other countries in Europe, government does not provide the support of a strong industrial and promotional policy.

[AIR PRESS] It is well known that the United States is worried—really worried—about Europe after 1992. We must therefore expect an onslaught of competition that may well be even more aggressive than in the past. Do you not think, Engineer Cereti, that an even closer integration of European aerospace industries could be extremely beneficial in view of the U.S. reaction? That is, a form of integration that would go beyond the creation of consortiums (such as the Panavia consortium, for example) perhaps taking the form of a supranational industry, a "European Aerospace," for example.

[CERETI] We are not alone in having always opposed the idea of Europe as a closed entity barricaded behind a hostile and protected economy. I am convinced that the true pivots of economic progress in Europe will be

represented by international collaboration and by considering national frontiers as a means of mutual exchange rather than as a form of protectionism. In this context, we hope for a greater integration of European projects and programs, something we have always firmly supported, as our presence in numerous European consortiums and collaborative programs demonstrates.

[AIR PRESS] We have been discussing the United States, but there is also Japan to be considered. Does the aerospace industry have its own "yellow peril," Engineer Cereti?

[CERETI] There should be no dangers in this rapidly growing market if we all follow the rules of the game, if no company receives more support and help than others, and if there is no unfair trading or diktats. I am all in favor of new manufacturers if they help to give greater vitality to the market and to distribute specialization, expertise, and technology in ways which benefit the needs of the international free market.

Italy: Aeritalia's Role in EUREKA Projects Described

MI890374 Rome AIR PRESS in Italian 21 Jun 89 pp 1246-1247

[Text] Aeritalia is taking part in several EUREKA [European Research Coordination Agency] projects, in addition to the AAA (Amphibious Advanced Aircraft) project. Eng Maurizio Mura, responsible for Aeritalia's activities in EUREKA, pointed this out to the AIR PRESS correspondent at the EUREKA ministerial conference in Vienna, and at "World Tech Vienna," the international science and technology exhibition held at Vienna's Austria Center. Aeritalia is also participating in the EUROPARI project for factory automation, an "umbrella" project that now includes the PARADIS [expansion not provided] project. The goal is to study flexible systems for the manufacture of products that are of great interest to the aerospace industry such as composites and structural and electrical assemblies. The first definition stage has been completed at a cost of approximately ECU 4 million. The goal is now to submit a complete project to EUREKA totaling ECU 80 million that will include Aerospatiale, British Aerospace, MBB [Messerschmitt-Boelkow-Blohm], CASA [Construcciones Aeronauticas S.A.], and possibly other partners such as Fokker. For the major environmental project EUROMAR, Aeritalia is participating in the SEASTAR [expansion not provided] subsystem which deals with advanced airborne sensors for environmental monitoring activities. Engineer Mura stated: "This idea might integrate well with the AAA."

Aeritalia is involved in the APEX program together with the partners mentioned above. The program involves hardware and software systems for real-time information exchanges among aeronautical companies which may, however, be used by other industries as well. A working team set up in France is now laying down the program specifications. The APEX program will cost ECU 30 million and the Italian share will be 15 percent. AIMS is a project for the construction of an automated software plant using expert systems. The project specifications are still being defined and the expected cost is ECU 65 million, 20 percent of which will be paid by Italy. Aeritalia is participating in the EUROMAT-CERASEP project (at a cost of Fr 80 million, with the Italian share totaling about 6 billion lire) through Alfa Romeo Avio, and together with SEP [European Propulsion Society], SNECMA [National Company for the Study and Development of Aviation Motors], MAN, and Volvo. The project concerns ceramic composites for aircraft motors and is based on SEP studies regarding their use to raise temperature levels in aeronautical propellers. Alfa Avio, in particular, is working on a component for the first stage of the gas turbine. EUROMAT-CERASEP, which is in its initial stage, aims at developing materials and technologies for the construction of an engine made entirely of ceramic composites. FAMOS-FACAI (Flexible Assembly Cell for the Aircraft Industry) is one of the new EUREKA projects announced at the Vienna ministerial conference on 19 June. In this project, Aeritalia will supply an aircraft structure formulation to Jobs of Piacenza. Jobs is the Italian company involved in this project, which is carried out together with France. The expected duration is 48 months, at a cost of ECU 6 million.

Fiat-SAGEM Venture on Inertial Navigation Systems

AN890227 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1491-2, 15 Jun 89 p 3

[Article: "SAGEM: Creation of the Company ISI"]

[Text] ISI (Italian Inertial Systems Company) was founded on 1 June 1989, in accordance with an agreement between the Italian Group Fiat and the French firm SAGEM (Company for General Electricity and Mechanics Applications).

The new firm will have its head offices at Turin and is a joint venture uniting SAGEM, a European leader in inertial navigation and guiding systems, and SEPA (Electronics For Automation Company), a subsidiary of Gilardini (Fiat Group), specialized in electronic systems for defence.

The aim of the new firm is to produce and market SAGEM inertial navigation and guidance systems in Italy. It will act as national supplier offering a wide line of highly specialized and high qualification products embodying the facilities and experience of each partner.

Italy is the major shareholder in ISI. In the future, participation could be made available to other qualified Italian firms. This is a significant step in the industrial collaboration preparing the way for the future unified European market.

BIOTECHNOLOGY

EC Funds Joint Yeast Cell Research

36980238a Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 12 May 89 p 8

[Text] Frankfurt. Five German universities (Giessen, Munich, Darmstadt, Duesseldorf, and Konstanz) along with another 29 institutes in 10 countries want to study the composition of the yeast gene as part of a joint project. Mankind has been using yeast for more than 5,000 years for baking and brewing; today, yeast is the source of an entire series of products that are important in terms of biotechnology. Molecular biologists have now discovered that yeast is helpful in their research and that one could conceive of other uses in industrial processes. Yeast is one of the simplest but genetically and biochemically most thoroughly characterized organisms. It offers an excellent experimental system for the study of nucleus-containing cells.

The project's goal is to put together the entire sequence of the yeast genome, amounting to around 320,000 base pairs and to determine the gene functions contained therein. Work has already begun in the individual laboratories. An information center, where the data are collected, has been set up in Munich. The European Community is financing 50 percent of the project's total costs which come to DM4.4 million. The individual countries are taking care of the residual financing for their shares, in other words, that would be the Federal Research Ministry for the Federal Republic. It is expected that the decoding of the genotype of yeast will yield important economic effects because yeast plays a significant role in many industry branches, for example, in beer breweries.

The yeast cell is equipped for all metabolism processes just like an animal cell and these processes are regulated according to the same basic principles. It has been possible to show that individual protein components from yeast are almost identical to those from human cells and that they even function in the particular other cell type when exchanged. Compared to animal cells, yeast however offers essential advantages as a study object. First of all, it has a genome which is 200 times smaller and the genes are packed tightly together in its chromosomes. Second, one can alter individual genes in a specifically target-oriented manner (mutated), so that one can investigate the effects of these alterations on the living cell. Scientists expect that this will be one way to decode the function of as yet unknown genes.

COMPUTERS

ESPRIT Advanced Computer Project Launched

AN890238 Amsterdam COMPUTERWORLD in Dutch 27 Jun 89 p 4

[Text] The University of Twente (UT) has concluded a 3-year contract with the EC for the development of a remote computing project within the framework of ESPRIT II (European Strategic Program for Research in Information Technology).

The project, named Lotosphere, will be led by UT. Its aim is to develop advanced industrial production methods to manufacture reliable soft- and hardware for complex computer and computer communications systems.

The overall project cost will amount to 26 million guilders, of which the EC is to contribute 11.67 million; UT will receive 1.72 million.

Edinburgh Supercomputer Project Described

AN890274 Edinburgh UNIVERSITY COMPUTING SERVICE NEWSLETTER in English May 89

[Article: "The Edinburgh Concurrent Supercomputer Project"]

[Text]

Introduction

The Edinburgh Concurrent Supercomputer Project was established to construct a massively parallel computer, of supercomputer performance, from transputers. The machine is being built by Meiko Limited of Bristol, using INMOS' new T800 floating point transputer. The project is being funded incrementally by the Department of Trade and Industry, the Science and Engineering Research Council (SERC), the Universities Computer Board, Meiko, UK industry and Edinburgh University.

Funding to date stands at over 1.5 million pounds.

The machine, comprising in excess of 1,024 T800s with 4 Gigabytes of RAM [Random Access Memory], will be used for scientific simulation, the development of parallel algorithms, and as a demonstrator to UK industry of the use of massively parallel computers such as the Computing Surface.

The Transputer

The T800 floating point transputer is a computer on a chip. It has its own processor, floating-point unit, memory, and inter-processor communications links. It executes micro-instructions at 20 MHz, fielding a floating-point performance of over 1 MFLOP. In addition there is an external memory interface accessing 4 Megabytes of 200ns local memory. It is important to appreciate that one such processing element provides performance equivalent to that of a DEC VAX 8600 when executing a standard Fortran 77 application program—and the Edinburgh Supercomputer will contain 1,024 such elements when complete.

Transputers are intended as components from which to build high-power parallel machines. They are joined

together by their communications links to form a processor network. The topology of this network is electronically configurable under software control to allow the construction of precisely the architecture required. The infrastructure of the machine is controlled by a supervisor bus, which is used to control the switching circuits (Meiko custom chips which provide a "telephone exchange" for the transputer links), as well as giving centralised handling for hardware and runtime software failures. The supervisor bus also provides a communications medium which is totally separate from the transputer links, a feature which is used for software diagnostic and performance monitoring functions.

The Computing Surface

Originally the Computing Surface was a single user machine, reflecting the software available. The operating system of the Edinburgh Concurrent Supercomputer (ECS) removes this restriction. A Computing Surface can now be viewed as a number of smaller logically independent Computing Surfaces—called *domains*. Several users may "space share" the machine's computing resource: each is allocated a domain, an independent parallel machine configured for the user's program. Access to the computing resource is controlled by compute servers which allocate processors to the task and configure them appropriately.

User login to the machine is via a multi-user development environment connected to the local Edinburgh network (EDNET) and to the UK academic network (JANET) by X25 PAD and ethernet. This development environment is implemented as a network of "workstations" or *user-seats* (actually just more processing elements within the Computing Surface, one element per logged in user) running a distributed UNIX-like operating system. These user-seats share access to compute, disk, and network servers. Some of them will have their own private networks of T800s for program development.

Applications codes for the machine can currently be written in Occam 2, C, Fortran 77, Pascal, or BCPL. The system code is written in a mixture of C (for the shell, kernel, and filing system, etc.) and Occam (for interprocessor networking functions). In addition, several parallel programming paradigms have emerged as useful structures in which application tasks may be embedded. These "harnesses" are written in Occam, and take the form of topology description and data routing functions—the simplest of which, a vector of processors, forms the basis of Meiko's Fortran Farm.

Hardware

The entire machine occupies seven M60 Computing Surface modules. One module, the management module, houses the network servers, user-seat processors and high-performance graphics subsystems; the other six contain the computational resource and file servers. Each module has its own supervisor bus, and is managed by a dedicated (Local Host) processor. The local hosts of each module are connected in a chain using their transputer links, giving the logical impression of a single supervisor bus running through the entire machine.

The management module contains four octal line-driver boards which execute the network servers. These are interactive user ports, connected directly to terminals or via reverse X25 PADs into EDNET and the UK academic community beyond. There is a pool of 32 user-seat processors, each with 3 Mbytes of RAM. Two file servers execute on MK021 Mass Store processors, each with a T414 transputer, 8 Mbytes of RAM for file caching, and an SCSI interface to a 570-Mbyte disk drive and industry-standard 1/2-inch tape drive. Four high-performance colour display devices are supported by MK015 display processors.

Running between these various resources is a packet switched network, the Computing Surface Network—CSN, which executes on some 24 transputers, each with 256 Kbytes of RAM. The CSN joins the user-seats to the servers. Inter-cabinet link boards star-connect the management module to computational resource modules. Each computational resource module houses up to 32 MK047 quad computing element boards: that is, 128 T800 processors each with 4 Mbytes of RAM. The communication links from all of these processors are connected into the electronic configuration logic which is used to establish the appropriate topology when an application is loaded. The Local Host processor executes the compute server function. Additionally a Mass Store board provides a file server using a 570-Mbyte disk drive.

Inter-cabinet link boards are used to harden the transputer links (using differential ECL) and provide the connectivity between modules. Each inter-cabinet link board provides 16 buffered 20-Mbit/s bidirectional links and is interfaced into the electronic configuration logic of the module, thus allowing the software control of the connections between transputer links within the module and those in other modules.

Software

Development Environment: Each of the user-seats runs a Unix-like kernel and shell, the kernel making file I/O requests of the servers via the CSN. The Occam Programming System (OPS) may be run as an application on these seats, as may more conventional editors, compilers, and utilities. Codes can be generated either for one processor or for a network of processors. Access to the kernel (and thus the servers) is via standard Unix V-compatible system calls from C, with the equivalent for Occam. This operating system is only necessary in the development environment: Processors in the compute boxes communicate without the overhead of a software kernel.

Programs can be downloaded and run interactively from seats with private networks. Batch jobs are queued and spooled on to the computational resource modules as soon as possible.

The CSN protects users from each other: An errant program can only crash its own domain. File security is maintained via the standard Unix protection mechanisms; access is controlled by user identification numbers and passwords.

Compute Environment: System software controls access to the main computational resource, allocates processors and configures them to the network required. A link-independent debug channel is provided via the supervisor bus, allowing the routing of messages to the standard output device from any processor.

Utilities: Meiko is providing its C, Fortran 77, BCPL, and Pascal compilers and the INMOS Occam software. Inter-processor communication is a fundamental part of the Occam language, and is added to the standard serial language by procedure call. The Edinburgh University Computing Service is currently porting standard public domain Unix utilities to the system.

Applications Under Development

Applications currently under development at Edinburgh include:

- Neural network simulations
- Fluid flow, using traditional and cellular automata approaches
- Lattice gauge theory and statistical mechanics
- Real-time graphics
- Weather simulation
- Molecular dynamics
- VLSI circuit simulation
- Oil reservoir modelling
- DNA sequencing
- NMR data processing
- Chess and go playing

This work is going on within the university and in collaboration with its industrial partners.

ENERGY

EUREKA Project for Thermoelectric Power Plant Described

MI890305 Paris LA TECHNIQUE MODERNE in French Jan-Feb 89 pp 45-46

[Text] Alsthom and its European partners are putting the final touches to the EUREKA [European Research Coordination Agency] 300 MW project. The three goals are to construct a thermoelectric power plant that is more flexible, more compact, and produces less pollution.

In many countries, basic electricity production is guaranteed by steam generating thermoelectric power plants that burn fossil fuels, primarily coal. These power plants, which often produce pollution, particularly when low quality fuels are used, also occupy a lot of space and at times lack operating flexibility.

The EUREKA 300 MW project for a power plant that integrates the latest technical and technological advances could radically alter the market and overcome these difficulties. This development is based on three major technological innovations for the main components of the plant: a circulating fluidized bed stream generator, a compact axial flow steam turbine in which the final section of the low-pressure unit is equipped with a titanium blade, and an alternator control with a cryogenic superconducting coil (RASC). In addition, a high-capacity data processing system is provided for the operation and control of all equipment in the power plant.

Multiple Objectives

The EUREKA project has a number of objectives. First, with 1992 on the horizon, it makes an increase in industrial cooperation between France and the FRG possible. Second, it offers French industry an additional opportunity by helping it to acquire a leading position in developed (the EC and OECD in general) and developing countries.

Last, and this is not the least of its advantages, this new type of power plant produces far less pollution. The operating principle greatly limits the release of nitrogen and suplhur oxides. It can be regarded as the European equivalent of the "U.S. Clean Coal Program" that is being strongly supported at present by the U.S. Department of Energy.

The EUREKA project is the concrete result of close collaboration between French and German industry, with Alsthom and MAN working together on the steam turbine, and Stein Industrie and Lurgi on the boiler. Alsthom will develop the RASC control and will act as technical leader for the project, which is divided into three phases: R&D, construction of a prototype power plant in one of the EC countries, and marketing.

Ambitious Characteristics

The technical characteristics of the EUREKA 300 MW power plant are extremely ambitious and provide the plant with unique capabilities. Combustion in a circulating fluidized bed represents an elegant solution to problems of pollution from nitrogen and sulphur oxides. In this type of combustion, the SO_2 produced by the oxidation of the sulphur contained in the fuel is removed on the spot, and the formation of nitrogen oxide is limited thanks to a relatively low temperature (approximately 859° C) at the burner, thus complying with European regulations. To satisfy these requirements today, the exhaust circuit of conventional power plants must be fitted with expensive and complex equipment which is difficult to set up and has high operating costs.

For all that, combustion in a circulating fluidized bed makes it possible to burn low quality, and consequently inexpensive, coal which is more difficult to use in conventional boilers.

The work of the infrastructures is minimized by monoblocks combining both the HP [high pressure] and MP [manifold pressure] turbines, a single flow BP [low pressure] unit, and axial flow of the steam to the condenser. Today, the size of the final BP blades of steam turbines is limited. Their size can be increased by the use of titanium. Another considerable advantage is that this new turbine occupies much less space than its conventional counterpart, with a consequent reduction in the amount of space and the civil engineering involved. The superconducting speed and voltage regulator (RASC) uses a superconducting coil capable of absorbing a certain amount of electricity, which is used as a flywheel between the power plant and the electric network. By using this regulating system, the performance and operating flexibility of the power plant will be improved substantially.

Reduced Cost

The improvements introduced by RASC also lengthen the life of the power plant, whose principal units are subjected to less stress than conventional power plants. The EUREKA project can be adapted to different situations. In its present form, it is set up for standard design conditions, but allows for an operating margin on these nominal values. Further studies of the variables that will make it possible for the project to be adapted to specific conditions are also planned.

In particular, the project is designed for a 50 MHz frequency; further studies are to be carried out for a 60 MHz frequency.

From the financial point of view, the objective is to reach within a very short space of time an investment per installed kW that is approximately 15 percent lower than that of conventional power plants using powdered coal and equipped with gas cleaning systems. It is still too soon to evaluate operating and maintenance costs with any accuracy. These costs, however, are not expected to be any higher than those of conventional plants with the same power, and may even be slightly lower when maintenance of treatment systems for the removal of sulphur and nitrogen from the gases is taken into consideration.

There is a large potential market for this new power plant. There are several reasons why the 300 MW size has been adopted. First, it constitutes a reasonable limit within the framework of the established objectives. Morever, 300 MW power corresponds to a technical level now being reached by a large number of developing countries. It will also interest those countries concerned with the technical performance of a nonpolluting power station.

A substantial potential market is represented by industrialized nations that have either abandoned or ruled out nuclear programs because of environmental problems. Industrialized nations clearly represent a short-term market for this EUREKA project. In the medium term (1996-2000), countries now in the process of industrialization will become potential customers. Finally, looking beyond the year 2000, demand will also come from other countries.

This project is not only a commercial proposition. The fact that it is based on major innovations means that there will also be spin-offs in numerous fields of technology, offering a rich source of knowledge for years to come.

FACTORY AUTOMATION, ROBOTICS

ESPRIT: University of Valenciennes Launches Into Robotics

36980250 Barcelona REVISTA DE ROBOTICA in Spanish Apr 89 p 18

[Text] At the University of Valenciennes, the prototype of a system in Ada language for the off-line programming of roboticized cells has been completed. It is part of the European ESPRIT program, in a project combining that university and Karlsruhe University with the Renault Automation and Kuka firms, as well as the IPK Institute in Berlin, and Ensam in Paris. It allows for the programming of cells with various robots, using information originating in different sensors. This prototype will soon be provided with a system capable of automatically modifying the programming, depending on the type of robot.

INDUSTRIAL TECHNOLOGY

French Company To Build Wind Tunnel in Sweden

AN890229 Paris LA LETTRE HEBDOMADAIRE in English No 1491-1, 8 Jun 89 p 2

[Article: "SESSIA Builds a Wind Tunnel in Sweden"]

[Text] SESSIA (Research Company for Building and Servicing Wind Tunnels and Aerothermodynamic Installations) has just been awarded a development and building contract for a research wind tunnel to be used by the Royal Technological Institute of Stockholm. The tunnel will be used for studying laminar flow under controlled low speed conditions but at very high Reynolds values. Considering the noise and vortex levels involved for attaining this goal, the tunnel is sure to be the first of its kind in the world.

METALLURGICAL INDUSTRIES

FRG Firms Display Advances in Automation

36980239a Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFTinGerman16 May 89 p 8

[Text]Degree of automation continues to grow also in metallurgy. Process control systems for the raw materials industry—peek at Metec, Thermoprozess, Gifa (Part 1).

Frankfurt. The continuation of automation of production facilities, combined with ever more energy-saving methods, is more urgent and necessary than ever before in the raw materials industry today, both in economic

and in technical terms. The reasons for this are the more rational use of raw materials that are getting to be increasingly in short supply, the optimum use of more and more expensive energies, and the more economical utilization of the capital-intensive large-scale industrial plants. Besides, in the case of finished products, it is necessary to guarantee the same quality as for tight tolerances. Other reasons are the constant flow of information on production and processes as well as the attempt to minimize environmental contamination.

In addition to that we have the fact that, considering the size and complexity of modern industrial plants, the personnel alone are hardly in a position to get a clear view of the production facilities, to monitor the process, and to run production economically. The wealth of information deriving from the process as such can be put to use only by means of process control computers. The pertinent systems and methods from the fields of metal processing and refining can be viewed at the Gifa, Metec, and Thermoprozess fairs held in Duesseldorf between 20 and 26 May. Several of the enterprises which have gotten together in the Thermal Process Technique Association in the VDMA [Association of German Machine-Building and System Construction] are presenting their new developments in an advance report.

At this fair triad, for example, AEG [General Electric Company] will present the concept of a steel degassing system which it equipped electrically and which it automated; it delivered it to Thyssen Stahl AG [Inc.] in Duisburg. This new 250-t system for degassing and alloying is used in treating liquid steel prior to casting on the slab continuous casting unit. It is designed for an output of 150,000 t per month; the entire process takes place automatically. A hierarchically structured multilevel automation system is used for this purpose. At the process control level, the operating and control tasks are accomplished by a double-process-control system with the MC 8016 computers supplied by Modular Computer GmbH [limited liability company], in Konstanz, as well as the Logistat B 500 color video system.

The heat-treatment automats exhibited by the Aichelin enterprise in Korntal is a new design which is to be suitable for heat treatment as well as gas recarburization, carbonitriding, nitriding, annealing, tempering, interstage tempering, hardening, and age-hardening of individual pieces and parts in smaller series. The electrically-heated system is designed for a working temperature of up to a maximum of 1,100o C. Quenching and washing baths can be added in any desired combinations according to the building block principle so that quenching can be done, as desired, in oil, salt, water, or under nitrogen. A high degree of automation, short shaping times, low energy requirement, and great flexibility are the characteristic features of this fiber-insulated system.

For the heat treatment of coin blanks, Bak Maschinen- und Anlagen GmbH, Karlsruhe, is displaying a system by means of which one can achieve a uniform structure and thus uniform hardness. Coin blanks, which come from the punching press, are fed to the system via coin transport carts. A lifting and tilting takes over the arriving carts with the coin blanks and empties them into a storage bin. During the emptying process, it is important to make sure that the carts are emptied completely to avoid any mixing with subsequent charges.

The coin blanks are continually extracted and are moved to a drum scale via a thyristor-controlled vibration chute attached below the storage bin. From the scale, they are then moved, by portions, to the annealing furnace via a rotating lock. The annealing furnace is a double-drum furnace with two conveyor drums with counter-rotating, firmly welded-in transport screw conveyors. The parts are moved into the annealing area via the inner drum; from there, they are moved into the outer conveyor drum and they run in the opposite direction via a cooling distance to the outlet. This type of transportation makes it possible to achieve uniformity in the desired hardness which otherwise cannot be achieved in any other type of furnace, according to the enterprise. Reportedly, efficiencies of up to 80 percent can be achieved. Depending on the coin quality, the operation is run at temperatures between 700 and 950o C.

Bloom Engineering GmbH, Duesseldorf, is showing nitrous-oxide-poor burners. The new nozzle system makes it possible to maintain or go below the specified noxious substance emission values for nitrous oxide in heating furnaces, as prescribed by the environmental protection requirements in TA-Luft [Technical Guidelines for Air]. The controlled combustion required here is achieved as a result of the design of the burner geometry and the relative speeds of the burning media; the goal here is to achieve the most uniform possible combustion temperature and to avoid flame temperature peaks.

This is helped along by a free recirculation of the flue gases in the burner stone, caused by the suction effect of the escaping gases. Bloom Engineering is also showing a burner with a controllable pulse in Duesseldorf; according to data supplied by Bloom, this burner can guarantee the flame and its temperature as well as the heat yield for every burner output. As a result of this, it is possible in each case to achieve the desired temperature distribution in the furnace. The flame pulse is controlled by changing the air volume. This burner is preferably used as side-wall burner in very wide heating furnaces in broad strip mills.

Degussa AG, Frankfurt, is showing a vacuum furnace for gas overpressure sintering. The system is so designed that compacting and sintering can be accomplished in a combined cycle. This sintering furnace is a horizontal furnace prepared with graphite with allaround heating elements and three heating circuits that can be controlled independently of each other. The temperature range extends up to 1,600o C (60 bar), and in the case of ceramics it goes all the way to 2,200o C (100 bar). This

furnace design, together with graphite insulation, reportedly makes for good temperature uniformity at differing pressures and charge weights.

For heating slabs, blocks, billets, and thin slabs or continuous-cast strips to the required processing temperature, Didier Engineering GmbH, Essen, is showing two new furnace designs which have been labelled hearth-cart throughpush furnaces (HD furnaces) and roller-hoist-hearth furnaces (RHH furnaces). The hearth-cart throughpush furnace is suitable mostly for the continuous heating of slabs with lengths between 900 and 3,000 mm and blocks with lengths of between 900 and 9,000 mm. The material to be heated is conveyed through the furnace by means of specially designed hearth carts. The material can be heated from all sides by depositing it on ceramic benches.

The roller-hoist-hearth furnace can keep thin slabs or continuous-cast rough strips warm and it can equalize them or heat them up through temperature control. The material to be heated is conveyed through the furnace by means of transport rollers without water cooling. In the heating zone, the material to be heated rests on ceramic benches during the heating time. This relieves the burden on the transport rollers and they can thus assume the waiting position outside the hot furnace compartment until shortly before the end of the heat-up time. Because of the vertical lifting distance of the ceramic benches, the roller-hoist- hearth furnace is capable of storing several thin slabs or sheets. Heating material widths of up to 3,000 mm and heating material lengths of up to about 80,000 mm can be charged into the roller-hoist-hearth furnace.

MICROELECTRONICS

Europe Sets Conditions for JESSI Participation

AN890172 Amsterdam COMPUTABLE in Dutch 12 May 89 pp 3, 17

[Article by COMPUTABLE correspondent: "IBM Wants To Participate in JESSI Project; Europe Demands Participation in Sematech"]

[Text] IBM is interested in participating in the Joint European Submicron Silicon Initiative (JESSI). This week in Munich a spokesman for JESSI confirmed that serious talks were being held with IBM. A precondition for IBM's participation is that U.S. subsidiaries of European firms be allowed to participate in the American Sematech project.

The initiative originates with IBM Germany. Current discussions are of an exploratory nature. A JESSI spokesman in Munich announced that admission of European firms to the American Sematech project is an absolute condition for IBM's participation in JESSI. A chip manufacturer such as Signetics, the (U.S.) subsidiary of Philips, should be given unconditional access to Sematech, which is currently not possible. An additional condition is that U.S. firms actually perform research and development activities in Europe.

"If these conditions are met, then I see no reason to oppose IBM's participation. The more participants, the better," says Dr Th. Holtwijk, JESSI representative of Philips Components in Eindhoven, expressing his personal views. He stresses that potential U.S. participants must have an integrated presence in Europe, i.e., manufacturing, development, and research, with research being a sine qua non.

Philips' official spokesman, too, stated that U.S. participation can only be allowed on a reciprocal basis. He does not know to what extent European governments as major subsidizers will allow the United States to benefit from JESSI. Although IBM's participation will be restricted to its European subsidiaries, it remains to be seen whether IBM Europe will be considered a European company.

Dr Le Pair, chairman of the Dutch Foundation for Technical Sciences and a key participant in the Netherlands' JESSI activities, favors IBM's joining JESSI. "From the research angle, this would be a positive development that would greatly enhance the importance of the project," he said. Le Pair confirms that serious discussions are being held with IBM, which appears to be particularly interested in specific parts of the project. (JESSI is divided into four parts: chip technology, manufacturing equipment and materials, applications, and long-term research.)

The problem is that the organizational aspects of JESSI have not yet been completed. The appointments to the JESSI board and the nomination of a general director are expected soon. According to Dr Cand. P. May, chairman of the Planning Commission for Innovation-Oriented Research Programs (IOP), progress has been too slow. The JESSI planning group has been busy for 1 and ½ to 2 years. At the beginning of the year, a "Green Paper" was published listing the main goals for the coming years. It was agreed that a "Blue Paper" providing further details would soon be published, but it now appears that details will only be available for specific items. In principle, May does not oppose discussions with IBM, provided that the integration of a new partner does not affect the program's fundamentals, as happened last year when SGS-Thomson joined.

Philips Lab Develops New GaAs IC

AN890237 Paris ELECTRONIQUE HEBDO in French 25 May 89 p 22

[Text] The Philips Laboratory of Electronics and Applied Physics (LEP) in France has successfully produced a negative transconductance regime in a GaAs/GaAlAs-heterojunction MISFET (metal insulator semiconductor field-effect transistor). The study was conducted in cooperation with the hyperfrequency center of the University of Lille and sponsored by the French Ministry of Research and Technology. This

achievement paves the way for a new generation of both logical and analog GaAs ICs with a level of complexity much lower than that of the currently used MESFETs (metal semiconductor FET), which have a high integration density. One MISFET linked to some passive elements will indeed be sufficient to obtain a specific function. Thus, a logical OR gate can be created simply by combining a MISFET, a resistive load, and two resistors, whereas a conventional FET needs eight MESFETs and five loads to perform the same function.

Another transistor type currently being studied in many laboratories produces the same effect: the resonance-tuneling hot-electron transistor (RHET). The MISFET, though, would offer the advantage of having a simple structure with only one heterojunction, while the RHET requires several alternating GaAs and GaAlAs layers each 50 angstroms thick. In addition, it would also have an real negative resistance instead of a characteristic discontinuity, which is of particular importance for analog applications such as frequency multiplication. The research results still have to be confirmed, however, before industrial applications can be considered.

Thomson Develops GaAs-on-Silicon Technology

AN890197 Paris ELECTRONIQUE HEBDO in French 8 Jun 89 p 17

[Article by P.A.: "GaAs-on-Silicon Transistors Reach 1 Watt at 10 Gigahertz"]

[Text] Thomson's Central Research Laboratory at Corbeville has just developed a gallium arsenide-(GaAs)-on-silicon substrate hyperfrequency power transistor emitting 1 Watt at 10 Gigahertz. Its performance is comparable to that of power transistors made only of GaAs; its advantage lies in its much simpler technology and markedly lower cost.

Industry has been interested in GaAs-on-silicon technology for some time, especially U.S. (Texas Instruments, Ford Microelectronics, etc.) and Japanese (Fujitsu, NEC, etc.) companies. In France, Thomson is assiduously researching this type of component. One of silicon's important properties is its good thermal conductivity. GaAs, however, does not excel in this respect. Thus, during the manufacture of GaAs power transistors on GaAs substrates, it is necessary to replace this material from the rear side with gold, which acts as a heat sink; the semiconductor is preserved only where it is needed.

This delicate procedure, mastered by only a few manufacturers, results in a poor return.

Combining Signal Processing and Hyperfrequency Functions

GaAs-on-silicon epitaxy is not without its own problems because of the different lattice structure of the two materials: The atomic distance of GaAs is 4 percent greater than that of Si, which causes interface mismatches. In order to prevent these structural defects from propagating into the active parts of the epitaxial layer where the electronic functions take place, multilayered strain structures "imprisoning" these defects are placed near the interface. Mastery of this technology has enabled Thomson's research teams to achieve results ahead of other laboratories: a GaInAsP/InP continuous-wave laser on silicon emitting at 1.3 micrometers, detectors with the same wavelength, and now a GaAs-on-silicon hyperfrequency field-effect transistor [FET] whose performance greatly exceeds that of other devices (which has reached 3 gigahertz).

Thomson's Deputy Director General M. E. Spitz expects that this type of component will soon find applications in devices in which it is necessary to combine signal processing and hyperfrequency or optical functions on a single chip, such as active radar antennas, high-definition TV reception, electronic circuits communicating through optical transmission, etc. Thomson also strongly believes in so-called "quantum well" components—stacks of alternating semiconductor layers of the GaAs/GaAlAs type, several hundred angstroms thick—for both their relative ease of integration and their important nonlinear properties. The different widths of forbidden GaAs and GaAlAs bands cause carriers to be confined within the layers with the narrowest forbidden band, which thus form a kind of "well." These wells are called quantum wells, because in 100-angstrom layers the carriers no longer exhibit a continuous energy state but a set of discrete portions of energy with a specific value. Under these conditions, the electron-hole pairs form "excitons," and a so-called "excitonic" line appears in the absorption spectrum of multiple quantum-well structures. Thus, the generation of excitons through electrical or optical effects induces a variation in the absorption coefficient (and hence in the material's refractive index). Therefore, these structures can be used for nonlinear processing of optical signals.

In Thomson's opinion, the medium-term prospects for quantum components are most promising in the area of optical integrated circuits, particularly in applications of cascading optical memories and reconfigurable logical-function pixels. The Thomson laboratory has created a 4 x 4 electroluminescent matrix (operated electrically) for the parallel processing of 16 beams.

The latest breakthrough to date is the doubling of frequencies in the infrared. Using an asymmetrical quantum well, Thomson researchers have created a kind of giant asymmetrical "molecule" several hundred angstroms long, whose measured nonlinear coefficients are approximately 300 times greater than those of standard crystals or molecules (allowing the use of a lower incident light intensity to produce the desired effect). The experiment is currently being conducted with a 5-watt continuous carbon-dioxide laser with a wavelength of 10.6 microns.

Netherlands Stimulates IC Development Projects

AN890173 Amsterdam COMPUTABLE in Dutch 12 May 89 p 7

[Article by COMPUTABLE correspondent: "IOP Supports Self-Testing Chips Project: Closer Cooperation Between Universities and Industry"]

[Text] The Hague—Netherlands universities are to cooperate with industry in developing self-testing chips. This advanced technology will lead to considerable reductions in testing times, and consequently, costs. The program was initiated by the University of Twente, the Technical University of Eindhoven, and the electronics firm Peijnenburg in Sint Michielsgestel.

The launch of the project was announced by Dr Cand. Peter May, chairman of the Planning Commission for Innovation-Oriented Research Programs (IOPs), IC technology division, following the presentation of the "Strategic Research Networks" report. This report discusses current results of IOPs conducted within the scope of the technology policy of the Ministry of Economic Affairs.

The self-testing chip project is part of IOP-IC technology. At present, each chip is subjected to thorough testing procedures after manufacturing. This is done by placing pins on the chips. To check the chip's correct operation, it is placed in a special testing machine. According to May, "the new method simulates a chip and determines its accuracy before manufacturing." It is important to know beforehand where faults are likely to occur during manufacturing.

Imbalance

Up to early 1992, about 27.4 million guilders will be available to gear university research on integrated circuits to industry. In the IOP-IC technology project, five universities, the Institute for Basic Materials Research (FOM), the Netherlands Central Organization for Applied Research (TNO), and the Center for Mathematics and Information Science are cooperating with industry. An additional program focusing on optoelectronics was launched recently. Outgoing Minister of Economic Affairs Dr R.W. de Korte has allocated an additional 4.5 million guilders for this project until the end of 1990.

According to May, if the Netherlands is to play a major role in chip technology in the future, it is essential that industry be supported by Dutch universities, through the supply of new talent, among other things. In this report, "Networks for Strategic Research," May says that the Netherlands IC industry is poorly structured. "Philips is our only major chip manufacturer; we also have the medium-sized company Advanced Semiconductor Materials (ASM), which mainly manufactures equipment for chip production. Finally, we have a large number of relatively small companies." In May's opinion, these small firms cannot afford to wait for research results. "They often expect results after 6 months, so they are not likely to develop the know-how for tomorrow's technology all by themselves," May says.

Subareas

The IOP-IC technology research program is mainly oriented toward three subareas: wafer processing, design and evaluation, and manufacturing techniques. Wafer processing focuses on material deposition and etching techniques on a silicon substrate. Layer deposition is done in a reactor and is usually a costly process.

Cooperative research is now being conducted into the use of a single-wafer reactor for the entire tungsten deposition process. This venture, named "Stewpot," will require 10 million guilders for basic research. It will also study circuit packaging and encapsulation. The plastic encapsulant must protect the IC from humidity and other damaging ambient influences.

Two projects are underway in the design area. The first, "CAD for Analog ICs," is related to the development of methods and tools for computer-aided design of analog integrated circuits. As technology is becoming increasingly complex, there is a greater need for development methods and equipment that allow a reduction in the development periods. The second project, called "Sea of Gates," deals with the design of highly intricate patterns linking the numerous components on a chip. In IC technology, attention is shifting from the actual silicon toward the layers of circuitry deposited on the silicon wafer.

UK Calls for GaAs-Based Networks

AN890257 Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 7 Jul 89 pp 1-2

[Article: "UK PCNs To Operate With GaAs Semiconductors—Do Potential Operators Have the Technology?"]

[Text] Micro-cellular personal communications networks (PCN) are "yet another demonstration of the British Government's enthusiasm for gallium arsenide integrated circuits," according to some industry watchers. They have noted that the key element in the new networks, scheduled to become operational around 1992, is the relaxation of current regulations on the use of point-to-point radio links to allow their use by PCN operators to effect cordless "local loop" connections between micro-cell base stations and the switched infrastructure. The Department of Trade and Industry (DTI) specified that these links must be in the "millimeter range of the radio frequency spectrum." That means they must operate at frequencies higher than 30 GHz, in turn implying the use of gallium arsenide-based semiconductors.

No details were given of the precise frequencies the DTI has in mind. However, in September 1988, the department issued a consultative "Green Paper" asking users and manufacturers to "contribute to the DTI's thinking"

on the use of the spectrum above 30 GHz. This revealed that the DTI's Radio Regulatory Department "had identified two bands for early release to users." These bands were from 37 to 39.5 GHz and around 60 GHz.

The DTI stated earlier this year that it is considering the higher frequency for use in microwave television distribution systems. The September 1988 document revealed that the lower band had already been earmarked "for shared use by private users and public telecommunications operators on the basis of a low-cost relaxed specification currently being drafted."

Now after their first rash of enthusiasm, potential PCN operators are left wondering just where they will obtain this type of equipment before 1992 and how much they will have to pay for it.

The only equipment in regular use in British telecommunications networks is that used by the police and by Mercury to bring services quickly to heavy business users in the City of London. It works at frequencies between 49.2 GHz and 50.2 GHz and is sourced from Japan.

But Len Lake, telecommunications engineer for Ewbank Preece Consulting Limited, says the NEC Pasolink equipment they use is designed to provide 2 Mbit/s data links and would need considerable modification to make it efficient for the transport of closely spaced, narrowband voice channels. "And it is very expensive," he says.

According to the "Green Paper," there are "only two link equipments available in the UK which operate above 30 GHz." One is a portable electronic news gathering (ENG) system working at 40 GHz—but that provides only a one-way video link—and a point-to-point system operating at around 50 GHz. Both are believed to be relatively expensive.

British Telecom has shown prototypes of a potentially low-cost system for use at 29 GHz, but, intended for TV distribution, it is configured as a receive-only terminal at present. Nevertheless, BT is confident that using low-cost manufacturing techniques it has devised, the unit could be built in commercial volumes for a target price of less than 100 pounds. Ironically, British Telecom is barred from seeking a PCN operator's licence.

"Some British companies are also engaged in research and development work on military units," the Green Paper notes. But "this research may offer lower-cost spin-off parts for civil applications," it adds.

Heavy exploitation of the millimeter bands "must await the development of low-cost, solid-state microcircuits," the document states. However, it concludes that semiconductor device makers need the spur of large orders to stimulate investment in the development of suitable low-cost devices, and, in their turn, equipment builders will not develop low-cost systems until circuit prices drop. "It might take 10 years to break that cycle," the DTI believes.

Significantly, the DTI's announcement of the PCN licensing race stated that "PCNs provide a significant market opportunity for developing millimeter wavelength radio link technology for civilian applications."

Len Lake estimates that a PCN covering a 10-km radius would probably require some 20 pairs of link equipment to link its micro-cells with their switch. He says that at millimeter wavelengths, absorption by rain severely limits range, and allowing for worst case rainfall of two inches an hour, range would be restricted to little more than 1-2 km. He estimates a cost of 2,000 pounds per unit at present prices.

In addition to PCNs, link equipment of this type is also likely to find application in other areas. The DTI Green Paper suggested that 50,000 to 60,000 millimeter transceivers would be required to link EFTPOS terminals to banks by the early 1990s, and that "there might be a market for 1.2 million units in cordless PABX systems."

The DTI said "the long-term future of these millimeter-wave radio systems is critically dependent on the development of Gallium Arsenide microcircuits." Now it remains to be seen whether this market potential is enough to stimulate UK companies to invest in the enabling technologies.

Unfortunately, Britain's last remaining GaAs integrated circuit foundry at Towcester, Northants, was closed by Plessey just a month ago because the company could see no prospects of significant volume markets for its products.

UK's Plessey Ends Commercial GaAs IC Production

AN890194 Paris ELECTRONIQUE HEBDO in French 1 Jun 89 pp 1, 14

[Article signed F.G.: "GaAs ICs: Plessey Throws in the Towel"]

[Text] Plessey, the only European manufacturer really involved in the commercial market for gallium arsenide integrated circuits (GaAs ICs), is giving up.

Tired of waiting for a market that still has not materialized, the UK group, like others before it, has just decided to close its Plessey III-V subsidiary, created in 1983 to manufacture and market GaAs ICs.

At that time, hopes were high, but sales failed to follow. The $66 million in sales expected by 1990 will never be reached.

However, Plessey will continue its research activities in this field and is not planning for the moment to give up its discrete GaAs components activities. This withdrawal from the commercial sector, which means closing the Plessey III-V subsidiary and its production facility at Towcester, UK, does not imply that research in the GaAs field will end completely. The British company has decided to continue working in this field, mainly in the

area of discrete and microwave components. Research has therefore been transferred to the Caswell research laboratory. Production of the various products in this area have been integrated into the divisions that use them. GaAs devices are definitely in great demand internally, mainly in the radar field. However, the future of activity in GaAs discrete circuit components is highly uncertain, even though it is profitable. Many observers in Britain point out that this activity requires large production facilities that are not available at the Caswell research center. Plessey III-V was created in 1983, at a time when growth forecasts for the GaAs IC market were most optimistic. These forecasts, which estimated the market at $5.5 billion by 1992, unfortunately failed to come true. According to Dataquest, the annual market for GaAs components is currently estimated at $2.8 billion, the bulk being due to optoelectronic devices. For 1991, the market research company is predicting a total consumption of $4.5 billion for all types of circuits. When Plessey III-V was created, the British group expected this subsidiary, which is independent of Plessey Semiconductors, to reach sales of approximately $66 million in 1990. This figure has not been reached either; this explains the decision just made by the British company, which is the target of a joint GEC-Siemens takeover bid. Most of the integrated circuits produced by Plessey III-V were used by direct satellite reception and U.S. defense industries, two as yet uncertain markets. There are many reasons why digital GaAs IC's have not penetrated the market: price, low density of integration, etc. In addition, for Plessey III-V, there was internal competition within Plessey Semiconductors' bipolar division, which markets emittee-coupled logic (ECL) circuits—comparable in performance to their GaAs competitors.

NUCLEAR ENGINEERING

EC Council Decision on TELEMAN Program

AN890276 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English No L226, 3 Aug 89 pp 16-20

[EC document: "Council Decision of 18 July 1989 Adopting a Research and Training Programme for the European Atomic Energy Community in the Field of Remote Handling in Hazardous or Disordered Nuclear Environments (1989 to 1993)—TELEMAN"]

[Text] The Council of the European Communities,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,

Having regard to the proposal from the Commission, submitted after consulting the Scientific and Technical Committee,

Having regard to the opinion of the European Parliament,

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

Whereas, by its Decision 87/516/Euratom, EEC as amended by Decision 88/193/EEC, Euratom, the Council adopted a framework programme for Community activities in the field of research and technological development (1987 to 1991), which acknowledges the importance of contributing to improving the level of scientific and technical knowledge relevant to nuclear safety;

Whereas the inherent radioactivity of nuclear plants makes remote handling essential for the conduct of nuclear operations on an industrial scale;

Whereas the safety of nuclear installations and protection of their environment depends on operators being able to inspect, maintain and repair plants when necessary;

Whereas exposure of man to radiation should be kept as low as reasonably practicable;

Whereas an action in research on remote handling in hazardous and disordered nuclear environments offers an opportunity to realize these goals more efficiently;

Has adopted this directive:

Article 1

A specific research and training programme (TELEMAN) for the European Atomic Energy Community in the field of remote handling in hazardous or disordered nuclear environments, as defined in the Annex, is hereby adopted for a period from 18 July 1989 to 31 December 1993.

Article 2

The funds estimated as necessary for the execution of the programme amount to ECU 19 million, including expenditure on a staff of four.

An indicative allocation of these funds is set out in the Annex.

Article 3

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

Article 4

The Commission shall be assisted in the implementation of the programme by the Management and Coordination Advisory Committee CGC-5 for Nuclear Fission Reactors and Safety, Safeguards and Fissile Materials Management, set up by Council Decision 84/338/Euratom, ECSC, EEC of 29 June 1984 dealing with structures and procedures for the management and coordination of Community research, development and demonstration activities.

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 5

In the third year of implementation, the Commission shall undertake a review of the programme and send a report on the results of its review to the European Parliament, the Council, and the Economic and Social Committee. 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 European Parliament and the Council.

The abovementioned reports shall be established having regard to the objectives set out in the Annex to this Decision and in accordance with Article 2 (2) of Decision 87/516/Euratom, EEC.

Article 6

This Directive is addressed to the Member States.

Done at Brussels, 18 July 1989.

For the Council The President R. Dumas

Annex

Programme Objectives, Contents, Implementation, Indicative Allocation of Funds, and Evaluation Criteria

1. Objectives

TELEMAN's objective is to realize advanced tele-operators that respond to the ultimate needs of the nuclear industry in order to reinforce the scientific and technological base used for the design of nuclear remote handling equipment. Tele-operators contribute to the safety and profitability of man and plant employed in all parts of the nuclear industry, from mining through reactor operation to reprocessing and decommissioning. This programme concerns the contribution that tele-operators can make to nuclear safety in the areas of accident management where the environment may have changed unpredictably and decommissioning, including prevention, inspection, and maintenance.

The tele-operators of interest are mechanical arms to which a variety of tools and sensors can be attached, manipulators attached to movable gantrys, and partially auntonomous vehicles equipped for specialized jobs.

In particular, TELEMAN will help the nuclear industry to comply with the requirements that workers be exposed to the minimum practicable amount of radiation, always remaining within relevant limits, without compromising inspection, maintenance, and repair operations.

2. Programme Technical Content

Program Areas and Indicative Allocation of Funds (in millions of ECUs)

Area 1: Tele-operator component and sub-system development	8.8
In the framework of the abovementioned nuclear safety objectives, research and development will be carried out on the utilization, modification and, where necessary, the development of sensors, perception and decision-making systems, information transmission, and engineering for tele-operator mobility and dexterity in nuclear environments.	
Area 2: Environmental tolerance	2.5
Research will be carried out throughout the life of the programme on the adaptation of sensors and electronic hardware to nuclear environments, the development of machine monitoring systems and design strategies that permit easy repair or recovery of stranded machines.	
Area 3: Research machine projects	6.4
Development will be focussed on tele-operators that respond to the demands of the nuclear industry for enhanced safety. These will be defined in consultation with end-users who in turn will be expected to test new tele-operators in their installations (cf. Area 4). Definition of industry's needs will precede the launching of research in Areas 1 and 2.	
Products of research on components and sub-systems wil be demonstrated by incorporating them into research machines that already exist or into new machines that typify nuclear industry requirements, such as intelligent manipulators and cranes equipped with control systems suitable for use in high-radiation fields, and a mobile platform for information gathering under normal and abnormal conditions.	
Area 4: Product Evaluation and Studies	1.3
End-users of TELEMAN technology will be encouraged to test and evaluate the practicality and reliability of the products of the programme in realistic environments to guide the subsequent commercialization of successful ones by industry. Studies will be made of topics relating to the application of new technologies, new uses for computer-assisted tele-operators, the evolution of guidelines and standards and programme development.	
TOTAL	19.0

3. Implementation

The programme consists of activities carried out by means of shared-cost research contracts with competent public organizations or private firms established in the Member States. The participation of small and medium-sized enterprises in the programme will be encouraged.

The Commission shall distribute, in all Community languages, information packs to accompany the invitation to

participate in order to guarantee equal opportunities for the undertakings, universities, and research centers in the Member States.

In addition to shared-cost research contracts, the programme may also be carried out by means of study contracts, coordination projects, and awards of training and mobility grants. Such contracts and grants shall, where appropriate, be awarded following a selection procedure based on calls for proposals published in the OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES.

Participants in shared-cost contracts may be industrial organizations, research institutes, and universities established in the Community. Each contracting party will be expected to make a significant contribution to projects. The contracting party shall be expected to bear a substantial proportion of the costs, 50 percent of which shall normally be borne by the Community. Alternatively, in respect of universities and similar organizations carrying out projects, the Community may bear up to 100 percent of the additional expenditure involved.

Shared-cost research projects should, where appropriate, be carried out by participants from more than one Member State.

The information resulting from the implementation of the shared-cost activities shall be made accessible on an equal basis to all Member States. Licences and/or other rights developed in the framework of the programme will be subject to the normal contractual conditions of the Community.

4. Evaluation Criteria

The Commission requires that, where possible, the objectives and milestones of each research programme be set out in a quantitative form to facilitate evaluation.

The long-term objectives (2000) are that operators of nuclear installations should be able to buy world-class computer-assisted tele-operators from Community-based manufacturers and that the radiation exposure of workers should be appreciably reduced.

TELEMAN's principal technical objectives relate to reinforcing the scientific and engineering base upon which the design of nuclear remote handling is based, to solving problems of manipulation, material transport, and mobile surveillance within the nuclear environment, and to demonstrating the feasibility of the solutions offered.

The technical criteria in terms of which the different aspects of the programme are to be evaluated, initially in 1992 to 1993 and more thoroughly in about 1996, are:

- The extent to which projects were selected against credible technical criteria;
- The development achieved within TELEMAN projects, e.g., whether TELEMAN projects achieved a significant (100-percent) improvement in performance/price ratios. Typical performance parameters might be sensor resolution, power/weight ratio, system response time, etc.;
- The extent to which different technologies have been integrated;
- The performance and acceptance of research machines in tests conducted with the participation of potential end-users;
- Whether the projects were of high scientific value as judged by the number and impact of patents, publications in referred journals, and invited contributions to conferences. Output should be compared with that from other similar programmes being executed elsewhere.

TELEMAN's industrial objectives relate to more effective application of investment in research, generation of awareness of the potential of computer-assisted tele-operators, and creation of a pool of experienced firms and engineers able to exploit research machines and manage the application of new technology.

The industrial criteria in terms of which the different aspects of the programme are to be evaluated are:

- Whether the calls for proposals attracted sufficient industrial interest to permit formulation of a coherent programme. The criterion of sufficiency would be that the ratio of resources proferred by industrial contractors to Community funding is to be greater than 1.5;
- The extent to which projects were selected against credible industrial criteria;
- That at least half the proposals received envisage a major role for a university or research laboratory in a Member State other than that of an industrial partner;
- The extent to which links formed to execute TELEMAN projects have continued and led to joint development of industrial products, new multinational firms or new research projects;
- Application of technology and patents arising from TELEMAN are applied by other firms and in other industries.

SCIENCE & TECHNOLOGY POLICY

European Technology Institute Finances Nine Research Projects

MI890357 Milan ITALIA OGGI in Italian 5 Jul 89 p 41

[Article by Gianni Manzo: "Nine Research Projects"]

[Text] The EIT (European Institute of Technology) will provide ECU 4 million (6 billion lire) in funding for nine research projects in the fields of biotechnology, pharmacology and material and computer technologies. These

projects were selected from 1,000 research programs presented by various European universities. In this way, the EIT intends to carry out its goals during the first year of activity. This will result in a new and more efficient collaboration between industry and university research through the use of a single data base that brings together the best European researchers. The institute was founded in Paris by a group of leading international companies in the field of technology, including Montedison, Philips, IBM France, AT&T, and Enichem. Its goal is to promote the university's validity in the technical and scientific fields by encouraging the elimination of barriers and resistance to economic growth and technological innovation.

The president of the institute, John Markum, announced the projects that had been selected at the annual meeting in Verona, the institute's center in southern Europe. These projects mainly concern the production of new antibiotics, the application of biosensors in clinical medicine and biotechnology, the creation of a microprocessor to process large amounts of data, three-dimensional visual recognition for industrial robots, ultrasonic methods of analysis, the production of special plastic materials, the practical application of high temperature superconductors, and the use of lasers for thermal treatment of metal surfaces. Each project will receive a total of ECU 750,000 over a 3-year period, at the end of which research should be completed.

New EC Science and Technology Research Program Described

MI890346 Milan ITALIA OGGI in Italian 21 Jun 89 p 32

[Article by Elysa Fazzino: "The Twelve Agree: More EC Research"]

[Text] The EC has laid the foundations for relaunching European research in the 1990's. At the meeting of research ministers of the twelve member states held yesterday in Luxembourg, general approval was given to proposals made by the technology commissioner, Filippo Maria Pandolfi, to begin the study of a new framework program. This new program will be related to the program currently in progress which will terminate in 1991.

The new outline program will be administered by France, which is due to take over the EC presidency from Spain on 1 July. In July the European Commission will submit a final proposal to the Council of Ministers. The French government intends to obtain the approval of the twelve members for the program by the end of the year. Yesterday, in fact, French minister Herbert Curien was one of the keenest supporters of the strategy presented by Pandolfi. This contained initial thoughts on the R&D initiatives for the 1990's that are necessary at the Community level, and a report on the current framework program drawn up by five "experts."

The subject of financing was also cautiously raised yesterday. The initiatives planned for the 1991-92 period will require a total expenditure of ECU 2.5 billion, approximately 3.8 trillion lire. The rest remains to be seen. Negotiations will begin in the fall, and this will be the most difficult aspect of the whole process.

There is overall agreement among the ministers on the strategic importance of European competitiveness in the fields of information and communications technologies, modernization of the manufacturing sector, and of progress in the fields of biotechnology and new materials. The ministers plan to place greater emphasis on initiatives for the training and mobility of researchers and engineers, particularly female scientific personnel. Greater attention will also be paid to environmental and energy research.

To ward off any resistance to increased research spending (Britain fought over every cent in the negotiations for the 1987-91 framework program), Pandolfi emphasized that the European Commission will not become "a pump sucking up money and generating waste." While there will be links between the EC and EUREKA, "management of the EC programs will be reserved for the European Commission."

The intervention methods will be diversified under the new program, with support being provided both for programs implemented exclusively at the national level and for programs carried out by a small number of countries.

Italian Research Minister Antonio Ruberti fully agrees with this strategy. "The Ispra Joint Research Center," says Ruberti, "will play an important role in the EC framework program, particularly in the environmental and industrial risk sectors."

At the same meeting the twelve members gave the final go-ahead to seven specific research programs, for a total expenditure of ECU 160 million, approximately 240 billion lire. The MAST [Marine Science and Technology] program will receive ECU 50 million (75 billion lire), while the FLAIR [Food-Linked Agro-Industrial Research] program will receive ECU 25 million (37.5 billion lire). The objective of the VALUE (dissemination and utilization of results from research in science and technology) and MONITOR (stragetic analysis, forecasting, and evaluation in research and technology) programs is to improve the use of research. The other projects are DOSES (Development of Statistical Expert Systems), Radioprotection (the study of exposure to radiation), and EUROTRA (machine translation system). This last program received additional funding.

EC Council Resolution on S&T Cooperation

AN890235 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English No C171, 6 Jul 89 pp 1-2

[EC document: "EC Council Resolution of 20 June 1989 Concerning Cooperation in the Field of Scientific and Technical Research (COST) and the European Communities"]

[Text] THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Commission's communication entitled "COST and the European Technology Community" submitted to the Council on 18 April 1988,

Having regard to the general resolution on scientific and technical research and development projects adopted by the Conference of European Research Ministers on 22-23 November 1971 [date as published],

Having regard to the approval by the Council of the four categories of cooperation within the COST framework,

Having regard to the conclusions of the Committee of Senior Officials on the future role of COST adopted on 23 and 24 June 1986,

Whereas the response by the president of the Council in his letter of 19 November 1986 relating to the conclusions of the COST Senior Officials Committee on the future role of COST stressed its important complementary role in relation to other forms of Community scientific and technical (S&T) activity and its valuable role in the promotion of cooperation in research and development (R&D) projects both between Member States and with other non-Community countries;

Whereas a report reviewing COST cooperation since its beginnings has pointed to the increasing numbers of projects carried out within the COST framework and has, in addition, underlined the strategic and organizational challenge facing COST;

Whereas the COST Senior Officials Committee has examined the communication of the Commission on COST and has set out its views in its chairman's letter, dated 16 January 1989, addressed to the president of the Council;

Whereas practical initiatives have been taken within the COST framework in recent times in relation to new areas for research, increased publicity and the setting up of more efficient decision-making processes.

Reaffirms its view that COST is an important means for promoting European cooperation in the field of scientific and technical research and recognizes the specific advantages of COST, in terms of its flexibility and informality, the possibilities it affords for optional participation in its activities, its responsiveness to scientists' needs, and its economic efficiency;

Urges the Commission to take into account the complementary role that COST can play in respect of Community R&D policy, in particular when considering any future proposals for the revision of the framework programme;

Welcomes both the positive attitude towards COST in the Commission's communication and the Commission's intention to continue and to strengthen its support for the technical and administrative secretariats of COST projects, which is an essential component to the future success of COST;

Recognizes that certain practical measures may be necessary to improve the functioning of COST and to meet the challenge of the changing context of international R&D cooperation;

Endorses and approves, therefore, the views expressed by the COST senior officials in relation to the simplification and redefinition of the categories of COST actions. These comprise two categories—A and B—as follows:

- Concerted action projects forming an integral part of a Community R&D programme, which are open on a multilateral basis to COST third state participation (Category A),
- Concerted action projects, not forming part of a Community programme, proposed either by COST states or by the Commission. Individual COST states and the Commission may participate in these projects (Category B);

Invites the COST Senior Officials Committee and the Commission to pursue its examination of:

- New areas for scientific and technical research appropriate for the COST framework,
- Specific improvements to the functioning of COST, in particular the administration and management of projects;

Recognizes the need for increased efforts to be made at the national level to publicize COST, thus ensuring that the scientific community and national policy makers are better informed of COST activities;

Recognizes the advantages of opening COST Category B projects to participation from non-COST states, in particular from other European states on a case-by-case basis where there is a clear scientific justification and where the benefits are mutual;

Invites all COST states and the Commission to give full support to the future development of the COST framework of S&T cooperation.

European Contract Research Group Established

Overall Aims Outlined

AN890174 The Hague TECHNIEUW'S EUROPA in Dutch May 89 pp 40-41

[Text] At the end of last year five European research organizations decided to set up the European Association of Contract Research Organizations (EACRO). The association includes AIRTO of the United Kingdom, ASIROI of France, CISE-CESI-ISMES of Italy, the Fraunhofer Institute of West Germany, and TNO of the Netherlands.

EACRO's major goals are the following:

1. To be recognized as a contract research organization by the European Commission, governments, customers, and other research organizations;

2. To establish close cooperation with the European Commission to develop generic technologies benefiting various industrial sectors and to disseminate research results.

3. To create a European "technological excellence" network among members.

4. Association members must:

- be commercially independent
- be established in an EC member state
- be active mainly in R&D and innovation on behalf of customers
- have a reputation for professional competence
- have been operational for at least 5 years
- employ at least 20 persons

EACRO is partly funded by membership fees, which range from ECU 500 to ECU 20,000 per year. The annual budget is estimated at ECU 100,000. The European Commission has been asked to contribute ECU 100,000.

April Progress Report

AN890174 Luxembourg INNOVATION AND TECHNOLOGY TRANSFER in English No 3/89, Jul 89 p 29

[Report: "New SPRINT Initiative Successfully Started: European Association of Contract Research Associations (EACRO)"]

[Text] At the meeting of the SPRINT Working Party on Contract Research Associations (CROs) on 19 April 1989, Mr Mordchelles-Regnier, chairman of EACRO, presented a progress report on the first months of work of his new European association. He pointed out that EACRO emanated from the first CRO meeting convened by the Commission last October. It was formed by the Association of Independent Research and Technology Organisations (AIRTO), UK, representing 45 CROs; the Association des Societes Independantes de Recherche et Developpement Industriels (ASIRDI), France, representing 10 CROs; the Italian Contract Research Organisations CISE, CESI, and ISMES; the Fraunhofer Gesellschaft, West Germany, with its 20 individual centers; and TNO from the Netherlands. The meeting also discussed the proposal for a Symposium on Contract Research in Europe.

EACRO has as general aims:

- The promotion of Contract Research Organisations in Europe and the defence of their interests;
- The transplantation and dissemination of results of precompetitive research for the benefit of small and medium-sized enterprises (SMEs);
- The identification of common needs for new generic technologies in European industries;
- The establishment of a European network to disseminate methodologies and know-how between the members of EACRO;
- The provision of help and services to build up a CRO base in countries where no national CRO infrastructure exists;
- The establishment of links with other research-oriented professional associations (e.g., FEICRO).

Italy: Research Ministry Finances Biotechnology Programs

MI890297 Brescia BIOTECH in Italian Mar-Apr 89 p 62

[Text] The list of companies awarded research contracts under the National Advanced Biotechnologies Program conducted by the Ministry for the Coordination of Scientific and Technological Research was published in the Official Gazette of 30 December 1988. The Scientific Research Ministry has allocated 209 billion lire for the program's first year of activity under Law No 46 for technological innovation (a move by the government to provide incentives for and to promote "high risk" research in the private sector). These financial resources have been allocated to the following sectors: medicine and veterinary science (99 billion lire), chemistry, energy, and the environment (58 billion lire), and food and agriculture (52 billion lire). The implementation of almost all the projects for research programs published under ministerial decree of 10 July 1987 in these three sectors was awarded to the following companies by ministerial decree of 23 December 1988.

Medicine and Veterinary Science

Consorzio per le Biotecnologie (Brescia) Nucleic acid probes. Maximum duration of research project: 5 years. Maximum value of contract: 7.155 billion lire. **Consorzio Siena Ricerche** (Siena) Plasmatic protein characterization and separation technologies. Maximum duration of research project: 5 years. Maximum value of contract: 16 billion lire.

Farmitalia Carlo Erba S.p.A. (Milan) Fibrinolytic enzymes modified through DNA technologies. Maximum duration: more than 5 years. Maximum value of contract: 10.44 billion lire. **Sudbiotec S.R.L.** (Pomezia-Rome) Immunotoxins and other conjugates for use in therapy. Maximum duration of research project: 5 years. Maximum value of contract: 9.51 billion lire. **Farmitalia Carlo Erba S.p.A.** (Milan) Biologically active microbial metabolites. Maximum duration of research project: 5 years. Maximum value of contract: 11 billion lire.

Chemistry, Energy, the Environment

Tecnofarmaci S.p.A. (Pomezia-Rome) Enzymes with new properties. Maximum duration of research project: 5 years. Maximum value of contract: 13 billion lire. **Instituto Guido Donegani S.p.A.** (Novara) Bioconversion and enzymatic catalysis processes for the development of intermediate and/or fine chemical products. Maximum duration of research project: 5 years. Maximum value of contract: 15.61 billion lire. **Fidia S.p.A.** (Abano Terme,

Padova) Polysaccharides from natural sources. Maximum duration of research project: 5 years. Maximum value of contract: 14.49 billion lire. **Eniricerche S.p.A.** (Milan) Biological degradation of sludge and oily waste generated by the oil and petrochemical industry. Maximum duration of research project: 5 years. Maximum value of contract: 5.79 billion lire. **Consorzio Bioprogram** (Ravenna) Biological treatment of dairy industry affluents. Maximum duration of research project: 4 years. Maximum value of contract: 5 billion lire.

Food and Agriculture

Agrimont S.R.L. (Milan) In vitro regeneration of plants from protoplasts and cells. Maximum duration of research project: 5 years. Maximum value of contract: 8.17 billion lire. **Agrimont S.R.L.** (Milan) Introduction and expression of exogenous genes in plants. Maximum duration of research project: 5 years. Maximum value of contract: 7.62 billion lire. **Enichem Agricoltura S.p.A.** (Palermo) Nitrogenous metabolism of intensive culture plants. Maximum duration of research project: 5 years. Maximum value of contract: 13.06 billion lire. **Enichem Synthesis S.p.A.** (Palermo) Enzymes for the food industry. Maximum duration of research project: 5 years. Maximum value of contract: 9.70 billion lire. **Cremascoli S.p.A.** (Milan) Technologies for the assessment of safety in nutrition. Maximum duration of research projects: 5 years. Maximum value of contract: 5 billion lire. **Nuovo CRAI—Centro Ricerche Agro-Industriali** (Naples) Technologies for assessing the freshness of food. Maximum duration of project: 5 years. Maximum value of contract: 3 billion lire.

SUPERCONDUCTIVITY

FRG: Karlsruhe Research Center on Superconductor Applications

MI890315 Coburg OPTO ELEKTRONIK MAGAZIN in German Vol 5 No 2, Mar 89 p 112

[Text] Since the development of the new high temperature superconductors, the Institute of Technical Physics at the Karlsruhe Nuclear Research Center, one of the leading research centers in Europe developing technically viable superconductors, has been carrying out studies to assess the application potential of these materials. Work to date has concentrated on those fields which have already been recognized as potential areas of application for superconductors. Research has centered around whether the new materials could substantially improve the applications potential of superconductivity or help such applications make a breakthrough. The following picture is emerging: the decisive factor in superconductivity applications is the percentage of overall costs accounted for by cooling costs. If cooling costs play a minor roll, as is the case with future nuclear fusion plants or MHD [magnetohydrodynamic] generators, the new materials will only be able to compete with the present generation of technically advanced superconductors if they reach very high technical standards. If cooling costs are a substantial factor, as is the case with particle accelerators, widespread application of the new materials can be expected provided that they can be satisfactorily processed to make technically viable conductors. For all technical applications in which superconductor technology competes with other leading-edge technologies, the chances of the new materials must be assessed separately, case by case. Particularly promising areas include applications in electronic components and electrical energy transmission. These studies also indicate, however, that although simplified cooling methods are still the main criterion for the application of the new high temperature superconductors, the new materials have other properties which could open up applications which are still unthought of. One example of a well-established application of conventional superconductors is nuclear spin tomography, which only 15 years ago was not even included in similar studies.

In contrast to conventional conductors such as copper, superconductors conduct electric current without power dissipation. State-of-the-art conductors, such as the alloys niobium titanium or niobium(3)tin, must be cooled with liquid helium to around -269° C (4 Kelvin). The high temperature superconductors discovered last year, consisting of oxidic compounds of rare earths and metals, are superconductive at temperatures as "high" as -183° C (90 Kelvin) and can thus be cooled with liquid nitrogen at -196° C (77 Kelvin). Material combinations have been discovered recently in which superconductivity occurs even at -153° C (120 Kelvin). As well as considerably simplifying cooling techniques, this will also lead to the establishment of a supply infrastructure for liquid nitrogen as a coolant. A comparison of coolant costs in West Europe illustrates this point: liquid helium costs between DM15 and DM30 per liter, while liquid nitrogen costs only 20-40 pfenigs per liter. As well as marginal aspects such as cooling, superconductor technology itself also plays a decisive role in the assessment of applications potential. Although the new materials are still in a very early stage of development, researchers expect to be able to produce conductors that will compare favorably with the present generation of conductors in terms of current density and other electrical characteristics, mechanical properties, and production costs.

In view of these factors, the studies have come to the following conclusions. Energy technology will be an important application area for the new high temperature superconductors. For example, a 1000 MVA superconductive power generator, even using conventional superconductors, will pay for itself in power dissipation savings alone. The use of nitrogen cooling permits technical simplifications that will further increase market chances. The same applies to superconductive transformers, where it seems possible to cut costs by about one-third and reduce weight by one-fifth. Other attractive possibilities include switching elements such as current limiters, which exploit the transition phase between the superconductive and normal conductive states, and superconductive high power transmission cables, although it will be some time before the latter can

compete with conventional overhead cables. However, the various aspects of high temperature superconductors appear however to be less decisive in future energy technologies such as nuclear fusion with magnetic confinement and MHD generators. The advantages of nitrogen cooling do not represent a decisive factor in the viability of these power supply systems. The same applies to the use of the new materials in magnetically levitated trains (maglevs). The magnet system, and consequently the type of superconductor used, has hardly any bearing on whether, and in which areas, maglevs will replace the wheel and rail system.

Another important area is magnetic tomography, which uses nuclear spin resonance to provide 3-D information from the human body without the use of X-rays. This is currently one of the most important application areas for superconductivity. The market for tomography units is expected to increase as a result of conversion to high temperature superconductors. Prime cost reductions of between 5 and 10 percent seem possible.

Superconductors in thin layers are required for electronic components. This is already possible with the new materials. For this reason, electronic components will probably represent the first technical application achieved with the new high temperature superconductors.

Research is another important application area. Considerable reductions in operating costs are conceivable for accelerators, particle detectors, high definition nuclear spin spectrometers, and high power microwave generators working on the gyrotron principle.

As well as these "classical" domains for the application of superconductivity, the special properties of high temperature superconductors, for example different current intensities in different directions, may open up other areas of application which are still not technically conceivable.

TECHNOLOGY TRANSFER

Siemens, Soviet Firms Set Up Computer Venture

AN890275 Breda TELECOMBRIEF in Dutch 7 Jul 89 p 156

[Text] The West German company Siemens has set up a joint venture in the USSR with some companies that are controlled by the Soviet Ministries of Education and Communications Equipment Industry. The joint venture is to assemble computers and communications equipments in the USSR using Siemens or Siemens-specifications-based components.

The agreement involves a substantial transfer of production technology. Consequently, the number of locally produced components in the assembled products will gradually increase.

The funding procedure is quite unique. Part of the computer equipment is to be used in Soviet secondary schools and institutes for advanced vocational training. To obtain the necessary funding, the Soviets are going to produce high-grade chemical reagents for educational purposes, high-purity chemical materials, and mathematical computer programs. Since the Soviets themselves say they "are not very good businessmen," they have contracted the British company Afro Arab as a sales agent to introduce the Soviet products on the world market. Afro Arab is also funding the modernization of the Soviet plants that will produce the aforementioned high-quality products. The yields of this operation will then be invested in the Siemens production line.

Italian-USSR High Technology Joint Ventures Discussed

MI890326 Milan ITALIA OGGI in Italian 13 Jun 89 p 41 sb
[Article by Daniele Bo: "New High-Tech Alliances in Sight Between Italy and USSR"]

[Text] Concrete possibilities for new Italian-Soviet joint ventures exist, but things must speed up if advantage is to be taken of Italian industry's presence in the Soviet Union over the decades. If not, competition from other industrialized countries, with the United States at the forefront, will make its presence felt in the next 2 or 3 years. This is the main message given by Romano Prodi at the inauguration of the "Soviet Technology Exhibition" held at the Abbey of San Andrea in Genoa. The exhibition was promoted by IRI [Institute for the Reconstruction of Industry] in collaboration with the USSR's Science and Technology Committee. In a certain sense it was an historical event. The exhibition was the first of its kind to be organized by the Soviets in a capitalist country. It presented the best of their know-how in fields ranging from chemistry systems to software, from medicine to pharmacology, and to products for the electrical industry. According to experts, results obtained by Soviet laboratories in the field of biocompatible materials, surgical support automation, and artificial muscles are of great importance. The exhibition will continue in the FRG.

Therefore, the Soviet Union is also playing its advanced technology card. The prospects for collaboration with Italy continue to increase, whether in areas of established cooperation or in recently identified fields (iron metallurgy, engineering, energy, and infrastructures). This is a result of the Gorbachev approach. "There are several new sectors where concrete actions can already be taken," Prodi stated, such as in, "New materials, sensors, biomedical electronics, biocompatible tissues. The real point is that we are moving beyond bartering to a completely new 'counter-trade' by exchanging technology and technological products instead of steel, or even worse, steel scrap." Another opening in the high-technology field could be the Soviet reproduction of the Italian BIC (Business Innovation Centers) experience.

This would help the establishment of small high technology companies and assist Soviet researchers and scientists wishing to "industrialize" the results of their work.

While walking around the exhibition, Italian industry's number one leader commented on recent events in China and their possible repercussions in the Soviet Union. He stated: "Economists have always evaluated the development trend of the last few years by default, without taking into account the extraordinary growth in countries such as India and China. My concern is that these recent events may bring this development into discussion and that China, which opened its frontiers in the last few years creating a truly historic event, may now retract. As for the Soviet Union, there are currently no signs of internal repercussions from these events. The mere fact of looking at this problem, however, is already a worrisome sign."

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AEROSPACE, CIVIL AVIATION

Czechoslovakia Orders Two Airbuses

AN890254 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1491-3, 22 Jun 89 p 1

[Article: "Two 'Airbus A310-300s' for CSA"]

[Text] The Czechoslovakian national airline Czeskoslowenske Aerolinie (CSA) has ordered two Airbus A310-300s, thus becoming a new customer of the European consortium and the second airline in Eastern Europe to chose the Airbus. The first Airbus will be delivered at the end of 1990 and the second, early in 1991. Both will be powered by CF6-80C2 jets made by General Electric and SNECMA. They will accommodate more than 200 passengers in a two-class arrangement.

COMPUTERS

Development of CSSR's 32-Bit Microprocessor Described

24020026 Prague MECHANIZACE A AUTOMATIZACE ADMINISTRATIVY in Czech No 5, 1989 pp 186-187

[Article by Eng P. Golan, candidate of sciences, and Eng. J. Kelbler, candidate of sciences, Research Institute for Mathematical Machines, Prague: "Development of a Czechoslovak 32-Bit Microprocessor System"]

[Text] The advent of personal computers during the 1st half of the 1980's provided a new impetus for the further development of microprocessor equipment. In 1984 and 1985, the first high-capacity 32-bit microprocessors with CISC (Complex Instruction Set Computers) such as, for example, the MC-68020, the NS-32032, and the I-80386 computers, manufactured by the American firms of Motorola, National Semiconductor, and Intel, made their appearances. However, the utilization of a rich set of complicated instructions represented only one path of development to increase the output of 32-bit microprocessors. A second path involved the reducing and simplification of instructions based on the principle of the so-called computers having a reduced instruction set (RISC—Reduced Instruction Set Computers).

The simplicity and regularity of the instructional set made it possible for these computers to shorten the instructional cycle, generally to a single unit of cycle time so that the instructions need no longer be interpreted with the aid of microinstructions, but can be "hard-wired" in. The length of programs translated from higher programming languages into simple instructions is, thanks to optimizing compilators, comparable to the length of appropriate programs for CISC microprocessors. This paradox is easily explained by using an example of microprogram "assists" which are utilized in central computers, for example, to speed up computations of frequently utilized mathematical functions, such as sin(x), log(x), etc. This involves the programming of the function directly into the microinstructions, which is far more economical than the sequence of microinstructions to interpret the instructions which realize the same function. From this standpoint, the optimizing compilators for RISC computers are de facto translators from higher programming languages directly into microinstructions.

The main advantages of the RISC architecture include simplicity and the ease of verifying the correctness of the logic design and the resulting shortening of the innovative cycle. It is, thus, possible to make more rapid use of advances in the technology of producing VLSI jacks.

In view of the technological possibilities at the disposal of Czechoslovak producers of integrated circuits, the RISC architecture is the only possible way of assuring a high-capacity 32-bit microprocessor of domestic production. Consequently, in cooperation with research workers at the Institute of Technical Cybernetics of the Slovak Academy of Sciences, the "A.S. Popov" Research Institute, the Research Institute for Mathematical Machines, and the Tesla Plant at Piestany, a design entitled 32-bit microcomputer system with SNK (Sokrashchennyy Nabor Komand) architecture was developed. Development is handled within the framework of the state task identified as AU7-561-830, New Generation of Computer Systems, which is the responsibility of the Institute of Technical Cybernetics of the Slovak Academy of Sciences which, together with the "A.S. Popov" Research Institute for Communications Technology, the Research Institute for Mathematical Machines, and the Tesla Plant at Piestany, concluded economic agreements calling for cooperation with respect to partial tasks.

The Institute for Technical Cybernetics of the Slovak Academy of Sciences is solving the proposal for a 32-bit microprocessor, the Research Institute for Mathematical Machines, and the "A.S. Popov" Research Institute for Communications Technology are working on the logic and technical proposal for a unit to control the MMU memory; the Tesla Plant at Piestany will handle series production.

The microprocessor is a functional equivalent of the ARM circuit of the British Acorn firm, or the Model VL86C010 of the American VLSI Technology, Inc. The MMU unit is a functional equivalent of the MEMC jack or the VL86C110 produced by the same firms. These jacks form the basis of the very high output Archimedes personal computer produced by Acorn which, according to tests published in the British journal PCW is approximately twice as fast as the 32-bit IBM PS2 Model 80 personal computer.

Both jacks will be produced by standard CMOS cell technology with a line width of 3 micrometers. Feed power is 5 volts. The microprocessor contains about 24,000 transistors and has 84 outlets; the memory control unit has approximately 30,000 transistors and 68 outlets. At a clock frequency of 8 MHz, the anticipated

average output of the microprocessor system is approximately 3-4 million instructions per second. The speed of transmitting data along the 32-bit data bus is up to 40 MB per second. The address bus is 26 bits wide.

The program model of the microprocessor is simple. Of 25 internal registers, the programmer has 16 universal 32-bit registers ranging from R0 to R15 at his disposal. The R15 register serves as a program counter. Data can have a width of 8 or 32 bits. All instructions are in the 32-bit format. The highest 4 bits contain a coded test in each instruction of the indications of the results of the preceding instruction. The execution of each instruction is conditional upon the results of this test. The set of instructions can be divided into four subsets.

Data processing instructions are executed by arithmetic-logic operations. The input operands are either both contained in the register or one of them is an 8-bit constant contained in the instruction. One of the input operands can be shifted by as much as 31 decimal places to the left or right. The result can be stored in any of the 16 available registers.

Two types of instructions serve the transmission of data between the operating memory and the microprocessor registers: one for a one-time transmission of a word or syllable and another for multiple transmissions. In multiple transmissions, it is possible to have a single instruction clear or renew the content of all registers from R0 through R15. For purposes of computing the address, use is made of basing techniques. It is also possible to carry out automatic indexing.

A program interrupt instruction is used to call up the services of the operating system. A transfer instruction and a transfer instruction with preservation of the return address is used to change the control of the program in register R14. The address of the transfer is obtained by adding the content of register R15 to the 24-bit offset vector, located directly in the instruction.

Contact between the microprocessor and the operating memory is handled by a unit for controlling the memory. The memory space has a capacity of 64 MB, of which 32 MB represent virtual memory, 4 MB are the maximum capacity of the attachable real memory, and the remainder of the address space includes the mapped-in input and output registers, the ROM memory, the programmable registers of the MMU unit, and the associative memory used to translate the virtual address. For purposes of virtualizing the address space, use is made of the paging technique. The number of frames of pages in the memory is 128. Depending on the magnitude of the attached operating memory (512 KB, 1 MB, 2 MB, 4 MB), the capacity of a page is 4, 8, 16, or 32 KB.

Part of the MMU unit is also made up of programmable DMA transmission counters, which are intended to service the displays and audio outputs. Other functions of the MMU include the periodic renewal of the contents of the dynamic random access memory (DRAM), protection of the memory against unpermitted entries, and the generation of systemwide clock pulses.

The logic and technical design of both jacks was concluded at the end of 1988 and the beginning of 1989. Laboratory samples are expected to be produced by June 1989. It is expected that the first application of the 32-bit microprocessor system will occur with respect to the accelerator disk of the IBM PC-type personal computer. Toward this end, the Institute of Technical Cybernetics at the Slovak Academy of Sciences is developing a module to handle the communication between the PC bus and the bus of the proposed 32-bit microprocessor system and the programming. Tests of the accelerator disk are planned for March 1990.