JPRS-EST-86-033

6 NOVEMBER 1986

Europe Report

SCIENCE AND TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-EST-86-033

6 NOVEMBER 1986

EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

WEST EUROPE

ADVANCED MATERIALS

Results of FRG's D1 Microgravity Experiments
(CHEMISCHE RUNDSCHAU, 5 Sep 86)..... 1

AEROSPACE

Impact of Challenger Disaster on Italian Space Effort
(AVIAZIONE, May 86)..... 3

STET Researchers Develop New Space Antenna
(TECNOLOGIE ELETTRICHE, Jun 86)..... 8

French CNES Marketing Satellite Product
(Marina Angel; L'USINE NOUVELLE, various dates)..... 12

MBB Financial, Production Figures, Projections
(HANDELSBLATT, 23 Jul 86)..... 14

BIOTECHNOLOGY

Overview of Austrian Activities in Biotechnology
(Herta Scharsach; DIE PRESSE, 11 Sep 86)..... 18

CIVIL AVIATION

FRG: Wing Research Under Way at MBB
(FRANKFURTER ZEITUNG/BLICK DURCH DIR WIRTSCHAFT,
1 Sep 86)..... 20

LASERS, SENSORS, AND OPTICS

Siemens-Corning Build FRG's First Glass Fiber Plant
(HANDELSBLATT, 25, 26 Jul 86)..... 22

SCIENTIFIC AND INDUSTRIAL POLICY

FRG Institute Compares German, U.S., Japan Research Expenditures
(TECHNOLOGIE NACHRICHTEN, No 431, 15 May 86)..... 24

1986 Factual Report Supplements 1984 FRG Research Report
(TECHNOLOGIE NACHRICHTEN, No 431, 15 May 86)..... 34

FRG Science Association Reports Research Subsidies for 1985
(TECHNOLOGIE NACHRICHTEN, No 431, 15 May 86)..... 36

Swedish Technical Development Board Asks for 1.2 Billion
(Sverker Nyman; NY TEKNIK, 4 Sep 86)..... 37

Finland in ESA, Eureka: EFTA, EEC Talks Recalled
(HELSINGIN SANOMAT, 19, 20 Sep 86)..... 39

ESA: 10 Million in 1987 39
Eureka: Europe, Finland, USSR 40

Briefs
FRG-GDR Discussions on S&T Continue 43

EAST EUROPE

COMPUTERS

Microcomputer Control System for Bulgarian Railroads
(Nedelcho Nedelchev; TRANSPORTEN GLAS, 27 Aug 86)..... 44

Hungarian Computers Collect Data at Paks Nuclear Power Plant
(Lajos Ivanyos; ENERGIA ES ATOMTECHNIKA, No 7,
Jul 86)..... 49

Computers for High Pressure Gas Networks
(Erno Stukovszki; ENERGIA ES ATOMTECHNIKA, No 7,
Jul 86)..... 64

FACTORY AUTOMATION

'Mechatronika' Technical Development Cooperative Established in Hungary
(FIGYELO, No 27, 3 Jul 86)..... 71

LASERS, SENSORS AND OPTICS

Use of Lasers in CSSR Agriculture
(Jan Hruby; TECHNICKY TYDENIK, No 27, 1 Jul 86)..... 75

MICROELECTRONICS

Vapor Phase Epitaxial Growth of GaAs Layers
(Imre Gyuro, et al.; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 78

Development, Test Production of GaAs Parts
(Imre Mojzes; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 79

Qualification of n-GaAs Epitaxial Structures
(Karoly Somogyi; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 85

Application Testing of Gunn Diodes Over 10 GHz
(Tibor Berceli, et al.; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 86

Development, Small Series Production of GaAs Based Schottky Diodes
(Bela Szentpali, et al.; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 87

Development of GaAs Based Microwave Schottky Tuning Varactors
(Zsolt Horvath, et al.; FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 88

Accomplishments of Technical Physics Research Institute
(FINOMMECHANIKA-MIKROTECHNIKA, No 2-3, 1986)..... 89

SCIENTIFIC AND INDUSTRIAL POLICY

President of Academy of Sciences Ivan T. Berend Interviewed
(Denes Kovacs; NEPSZABADSAG, 7 Jun 86)..... 90

Role of Hungarian Academy of Sciences Redefined
(AKADEMIAI KOZLONY, No 5, 13 Jun 86)..... 98

Role, Members of Science Policy Committee
(AKADEMIAI KOZLONY, No 5, 13 Jun 86)..... 100

Organization of National Technical Development Committee
(AKADEMIAI KOZLONY, No 5, 13 Jun 86)..... 102

Cyclotron Made Entirely From Polish Designs, Materials
(Henryk Jezierski; ZYCIE WARSZAWY, 19 Aug 86)..... 108

Polish Commentary on Leipsiz Fair
(Jerzy Jacek Tomczak; PRZEGLAD TECHNICZNY, No 18,
4 May 86)..... 112

/12223

WEST EUROPE/ADVANCED MATERIALS

RESULTS OF FRG'S D1 MICROGRAVITY EXPERIMENTS

Solothurn CHEMISCHE RUNDSCHAU in German 5 Sep 86

[DPA Report: "D1 Mission--Crystallization at Zero Gravity"]

[Text] Research results of the space lab mission D1 were the focus of attention during a conference on the North Sea island of Norderney. Their objective was to find out to what extent weightlessness and gravity affect various processes on earth. The fields from which the 75 experiments came--two could not be performed due to technical difficulties--were fluid physics, material science, biology, medicine, communication, and navigation.

The scientists of the D-1 mission used the seven days which they had in space under conditions of weightlessness almost exclusively to find out what effect the gravity parameter has on various growth and production processes. Due to the scientific complexity and the overwhelming variety of results only a few research results can be described here.

The experiments onboard the space lab confirmed, for instance, a theory which cannot be proven by experiments on earth. This theory describes under which marginal conditions tiny particles in solidifying molten metal are pushed ahead of the solidifying front or are incorporated in it. This is significant for the production of dispersion hardened materials from the molten stage or for purification processes of molten masses.

In addition, questions of melting with form stability as well as the solidification of molten metals under conditions of weightlessness were examined. This support film technology is considered a prerequisite for the processing of high-quality structural components, for instance in turbine blades.

Improved conductivity of semiconductor materials is of special interest for the computer industry in particular. For this purpose, experiments were conducted with silicon, gallium-antimonite, and indium-phosphite. In the space experiment it was possible to achieve a more balanced distribution of the doting material which ensures conductivity.

The astronauts investigated similar problems in the field of glass production. The production of more homogenous, better glass materials depends to a large

extent on reducing foreign particle contamination in the molten glass. The absence of convection (lighter-weight liquids do not rise, heavier ones do not fall) and the melting and solidifying of the molten glass outside a container--which is also possible only in zero gravity--notably reduced the degree of glass contamination in space. According to these results it would be possible to produce substantially better glasses in space.

Furthermore, as a result of several complementary biological experiments the scientists found out that weightlessness clearly affects biological cells. This finding has far-reaching consequences for all life under zero-gravity conditions and can also become important for applications on earth.

12831
CSO: 3698/5

WEST EUROPE/AEROSPACE

IMPACT OF CHALLENGER DISASTER ON ITALIAN SPACE EFFORT

Rome AVIAZIONE in Italian May 86 pp 262-264

[Text] Until now Italy has participated in ESA's (European Space Agency) space projects with rather high financial investments (from 10 to 18 percent) when compared to scientific and industrial returns. Regarding this, it is worthy to note the share contributed to the realization of the "Spacelab" (first flight: November 1983) and to the "Giotto" mission (March 1986). In recent years the national space program of CNR [National Research Council] gave the go-ahead to five joint projects with the United States that were closely connected to the use of the Space Shuttle and were initially planned for the period 1987-1990. Of these projects, three involve scientific and technological research (TSS, SAX, Lageos 2), one involves telecommunications (Italsat) and one, space transport (IRIS).

The TSS (Tethered Satellite System), the satellite on a leash as conceived by Dr. Giuseppe Colombo, is certainly the most ingenious and the one with the most scientific-technological uses in the future. It is composed of a spherical satellite 160 cms. in diameter connected to the Shuttle by a cable 2 mm. in diameter with a variable length, up to a maximum of 120 kms. The satellite can face up or down in relation to the Earth. Initially, three missions are planned; the first and the third, in which the satellite will face upwards in order to perform measurements of ionospheric plasma using a 20 km.-long guiding cable. The second mission will see the satellite "immersed" in the high atmosphere (or rather, the lower ionosphere) suspended from a non-guiding cable 100 kms. long.

The Shuttle will fly at approximately 250 kms. from the Earth's surface and, therefore, during the second mission, the satellite could be pulled into an area of the high atmosphere that is not normally accessible to regular satellites, which would have a very short lifespan because of friction. It will then be possible to carry out physical measurements in the atmosphere in an area that is practically unexplored and extremely important because of the chemical reactions that take place there and which have a strong impact on the Earth's ecology.

The missions devoted to the study of ionospheric plasma will enjoy the advantage of instruments to effect measurements in areas free of the disturbances caused by the contaminating presence of the Shuttle and it will be possible to study the interaction of a high-power (approximately 5 kV) metal body with the surrounding plasma.

One of the most interesting aspects of its application will be that of energy as the satellite, moving at a speed of 8 kms. per second in the surrounding plasma, acts more or less like a generator. For instance, it will be possible, through the guiding cable, to obtain electric energy for use in future space stations.

Actually, the fields of application are multi-fold: gravity, geodynamics, telesurvey, interplanetary transportation, ULF/ELF communication antennas, artificial gravity, etc. Surely, this Italian idea will become a milestone in the space technology of the future; however, the project is extremely complex and, during the next few years, the Shuttle missions with TSS will be among the most difficult undertaken for scientific purposes. On the Italian side, "Aeritalia" is responsible for the construction of the satellite and the design of on-board experiments, while "Martin Marietta," its American counterpart, must build the very complex launch and recovery apparatus of the satellite through the single cable.

There are three experiments aboard the satellite that fall under Italian jurisdiction during the first mission: RETE, the experiment of ionospheric plasma under the auspices of the Physics Institute of CNR's interplanetary space (principal researcher and project scientist of the TSS, M. Dobrowlny); the Magnetometer (principal researcher and project scientist of the TSS, F. Mariani, University of Rome II) and the CORE Instrumentation, that is, the instrumentation that will be used to carry out the electrodynamics experiments (principal researcher, C. Bonifazi, IFSI-CNR). The first flight, which was to have been the first space flight by the first Italian astronaut, had been scheduled for 16 December 1987, it was postponed then until September 1988 and, as a result of the Challenger disaster, we can rejoice if it takes place by the end of 1989.

However, there is the great risk that, in order to speed up the flight of the TSS, there may be an attempt to eliminate the scientific instrumentation in favor of American use for military purposes.

As a matter of fact, the TSS cable acts as an antenna for very low frequency waves suitable for communicating with deeply submerged nuclear submarines. In view of the fact that this project will cost Italy approximately 100 billion lire, it is to be hoped that the Italian scientific community will be able to express its opposition to such an alternative and succeed in obtaining compliance with the contents of the "memorandum" signed with the United States in March 1984.

On the other hand, SAX (X-ray Astronomy Satellite) will be the first Italian astronomic satellite.

In the X-ray astronomy field, the ESA has already successfully launched the "Exosat" and Germany is about to launch the "Rosat." The SAX will investigate the energy field between 2 and 200 keV and will be utilized to study the violent evolution of stellar systems and galaxies and to enhance information obtained by the other two European satellites.

This Italian project, under the guidance of the University of Bologna's Dr. Spada, will be carried out with the scientific and industrial participation of the Netherlands. The "Lageos 2" is a geodetic satellite whose purpose is to measure the movements and deformations of the Earth's crust in order to forecast seismic activities.

To that effect, there will be used laser technology and satellites equipped with reflecting mirrors, in a mosaic-like pattern, on their surfaces.

Approximately 20 stations located in various spots on the globe will participate in taking these measurements.

In 1983 the station at Matera, Italy was inaugurated. The building of the mobile systems for laser-aiming has been entrusted to CISE, supported by other Italian industries.

The "Lageos 2" will be made in Italy under "Aeritalia's" industrial leadership and will be launched by means of the IRIS system.

The IRIS (Italian Research Interim State) is a space transport system capable of placing satellites in orbits that are not reachable from the Shuttle (for an altitude of more than 500 kms.).

This will be launched from the Shuttle and can carry satellites weighing between 600 and 900 kgs.

"Aeritalia" and SNIA-BPD are the Italian industries most involved in the project. The first flight had been scheduled for 1988 in order to place the "Lageos 2" in a 6,000-km. orbit. The SAX as well would have been carried by the IRIS in the early '90s.

The "Italsat" is a telecommunications satellite conceived in accordance with the most modern criteria by using frequency bands in still free areas of the eleetro-magnetic spectrum (from 20 to 30 GHz).

One of the systems aboard the "Italsat" will implement the Italian telephone network with 11,000 new telephone channels and the second system will provide total coverage of the entire Italian territory with ultramodern data-transmitting systems.

The satellite will be built by "Selenia Spazio" in cooperation with "Aeritalia," SNIA-BPD, LABEN, etc. The "Italsat" as well was to have been placed in orbit by the Shuttle in 1988.

The project with the greatest commitment, from the financial and industrial points of view, is the "Columbus" space station, originally begun on a bilateral basis between Italy ("Aeritalia") and Germany (MBB/ERNO) and later incorporated into the ESA programs.

The "Columbus" European space station, which, according to the initial plans, could have begun operating in 1992 to coincide with the 500th anniversary of the discovery of America, is based on the modular concept.

Cylindrical elements called modules, resulting from the joining of several sections derived from those of Spacelab, are coupled to form an independent space station or one that is coupled to the American one.

After considerable controversy between ESA and NASA regarding the coupling of

"Columbus" to the American space station (the Americans would accept only a permanent coupling, while ESA wanted a "Columbus" that was independent from the American station), it appears that a compromise solution has now been reached with the proposal of the Space Bureau of our Scientific and Technological Research Ministry.

Such a solution provides for a manned module built by ESA permanently coupled to the American station and for a smaller module, to serve as a European vehicle, operating as a "free-flyer," that is independent from the central station and used for microgravity experiments.

Such a solution, more than anything else, is less expensive because the basic study remains the same and the construction takes place almost simultaneously, and was approved on 17 April of this year by the "Columbus Programme Board" of ESA.

However, the independent lab, supplied by a resources module (energy and propulsion), would have to be launched by the ARIANE-5 European launch vehicle, while the central lab would be assembled by the Space Shuttle after 1994. The Shuttle disaster of 28 January, followed within a few months by the explosions of a Titan with a military satellite and of a Delta rocket with a scientific satellite, have dramatically influenced all Shuttle-connected projects. As far as Italy is concerned, none of the above-listed projects, already financed and in progress, has been cancelled or slowed down here at home.

The great unknown remains the scheduling factor. The Rogers Commission, created by President Reagan to investigate the causes of the Challenger disaster, should issue its report in May and this will spell out the future for the Shuttle. It is to be hoped that the fundamental components of the system will not need to be redesigned with the ensuing postponement of the entire program for many years, but that it will instead be sufficient to review NASA's organization, which is no longer excellent, and to correct the technical errors that led to the disaster. In this case, one must allow at least 1 year's delay for all commercial and civilian projects.

Of the above-mentioned Italian projects, only the "Italsat" could be launched by the ARIANE European rocket, while the others will have to wait for the not-yet-foreseeable schedule of the Shuttle.

Particularly affected by this postponement is also the team of Italian astronauts who have been waiting since 1978 to be launched and have seen themselves passed over in the past 3 years by the French, the Germans, the Dutch, the Canadians, the Arabs and the Mexicans. Of the five national scientist-astronaut competition winners for the Spacelab, three have remained active and are, therefore, candidates for the first three Italian flights on the Shuttle: the author of this article, as an astrophysicist and space physicist; Professor Franco Rossitto, as a materiel physicist, and Lt. Col. Andrea Lorenzoni, as a telecommunications engineer (see AVIAZIONE issue 200, p. 707).

In December of 1st year the minister for Scientific Research, Luigi Granelli, announced the use of Italian astronauts in flights for astronomy, space biomedicine and for the TSS, and the beginning of an Italian school of astronautics.

The latter's purpose will be to create a new generation of astronauts for the space stations. Let us hope that the Shuttle's delay can be held to a maximum limit of 18 months in order to allow Italy to acquire the necessary experience in manned flight that will allow it to compete effectively in the future for the unstoppable human conquest of extraterrestrial space.

9731
CSO: 3698/660

WEST EUROPE/AEROSPACE

STET RESEARCHERS DEVELOP NEW SPACE ANTENNA

Milan TECNOLOGIE ELETTRICHE in Italian Jun 86 pp 86-89

[Text] The Atlantic Ocean has always been regarded by telecommunications technicians as a far too long distance that needed to be shortened and with channels that were too narrow and in need of being widened.

At present there are two systems that compete on an equal level for North Atlantic communications: the underwater cable, whose telegraphic prototype was laid in 1858, and the telecommunications satellite, born in 1960, more than 100 years later.

The survival properties of the two systems in various kinds of disasters caused by war or nature make them quite complementary; therefore, it is reasonable to expect a balanced development of both systems in the future, even because the cost differences are not that dramatic after all.

The telecommunications satellite, born after the cable, was considered as not being much different from a cable in space, a passive transit junction, with amplification its only function. The Intelstat series satellites, for instance, were always designed in accordance with this principle and the only aspect of their evolution has been the increase, substantial though it may be, of the capacity of the antennas for every new generation. The most important parts of the entire telecommunications system by satellite are precisely the antennas, both those orbiting with the satellite and those on the ground. Those on the satellite must comply with very strict limitations with regard to size for reasons having to do with the characteristics of the launching rocket's nose. The maximum diameter obtained to date is 3.20 m., while there is under study at Selenia Spazio, a 4-meter antenna with two small grooves at the edge.

In order to overcome these limitations, some devices such as the folding of the antenna when inserted into the nose and its unfolding at the moment it is placed in orbit were used. The unfolding is a very delicate process because it guarantees the rigidity and precision of the final result and it is effected by complicated mechanical devices controlled by a computer. This kind of solution was adopted for the ATS-6 satellite and in the Space Shuttle.

The antennas on the ground do not have these limitations and can reach up to 30 meters in diameter and weigh 150 tons [metric], but, as a result, they are

extremely expensive. Small antennas in space and large (and costly) antennas on the ground characterize the classical use of the satellite, that is, long-distance broadcasting of the intercontinental kind.

This situation is now subject to great changes in view of the fact that the perception of satellites has changed from a cable in space to an intelligent communications junction in space.

Since 1976, CSELT, STET's research center, has been thoroughly researching the field of antennas and one of the results was precisely the change in perception of the satellite and making it an essential element, at reasonable cost, even of that part of telecommunications that has a much shorter range than the intercontinental one, as, for instance, the European regional network. The role of satellites in long-distance communications is in no way reduced because there is no substitute for it; as a matter of fact, the future plans for inter-Atlantic communications provide for an equal share between the use of satellites and the new underwater cables. The balance between satellites and cables is going to remain unchanged because of their necessary interrelationship and the redundancy they guarantee, precisely because both are revolutionizing their technologies: the evolution in the field of satellites we are witnessing corresponds to the new technology of fiber optics transmission that led to the TAT 8 transatlantic cable.

The domestic satellite, this is the name given to the new concept of space communications, broadcasts towards several areas, known as spots, each corresponding to a station on Earth. The latter can be very numerous, to the point of having one per user; therefore, it is necessary to reduce their cost and size.

Moreover, such a change in function will, as a result, reduce the size of the antennas on the ground and conversely, increase the need for change in the size and capacity of the antennas aboard the satellite.

Therefore, ESA has entrusted a few European firms with the development of antennas along this new concept, characterized by their large size and light weight, but with minimal encumbrance prior to extension in orbit in order not to necessitate a change in the space vehicle.

The new antenna, in addition to being larger, must have multiple arrays and the focusing system must be guided by a special program in order to allow each array to travel rapidly from one ground antenna to another, depending on demands and traffic needs. A solution of this kind has its advantages for intercontinental satellites as well because it enables them to provide service to small stations with limited traffic, including mobile ones such as those aboard ships.

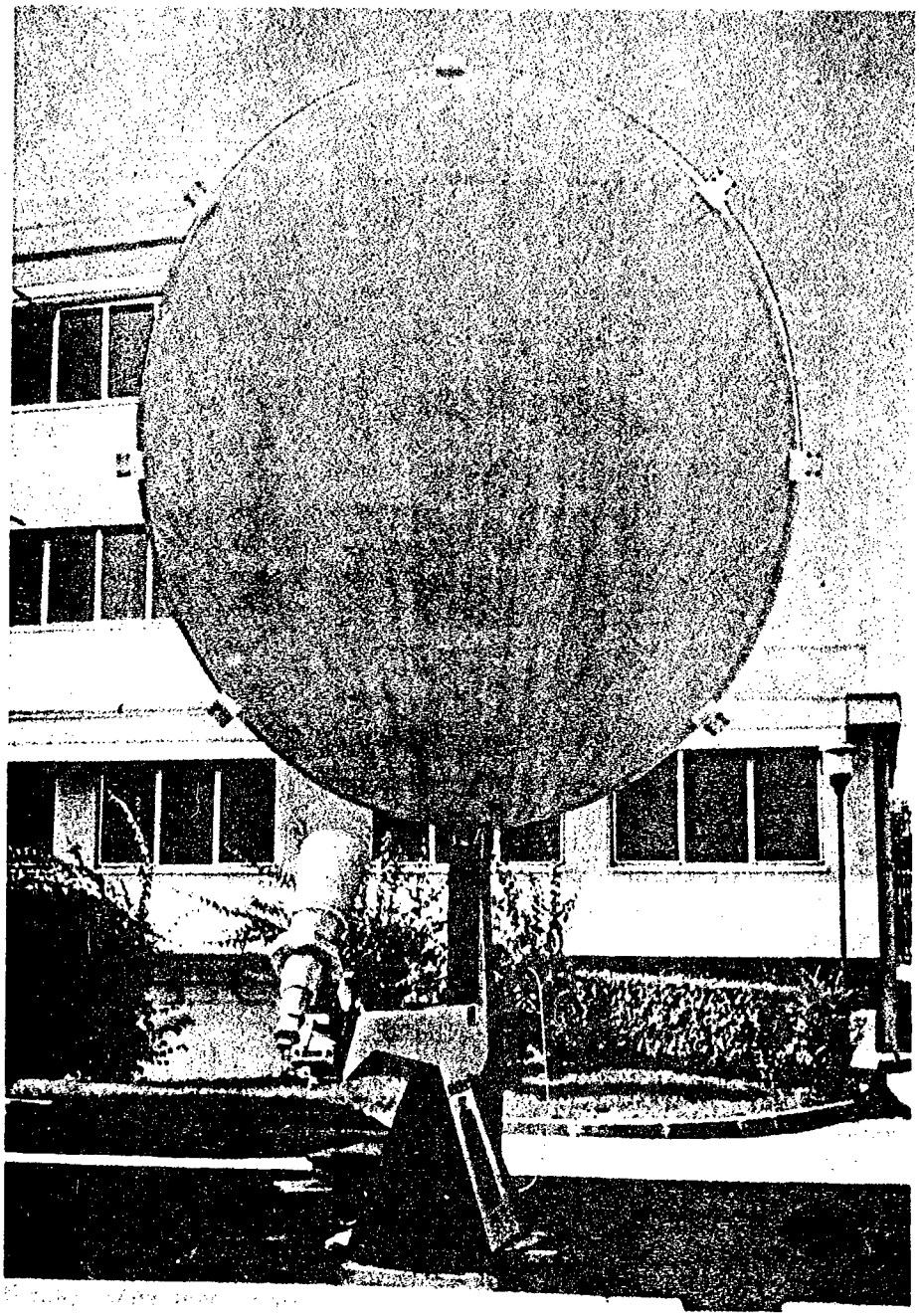
The firms most involved in the development of the new antenna were: "Contraves" of Zurich, for mechanical technology development, and CSELT of Turin, for the electromagnetic project and related measurements. The solution that was adopted was that of a self-inflating structure, of the same type as that of self-inflating rubber boats, capable of guaranteeing a maximum flexibility during the phase when it achieves the desired shape and its maximum rigidity and strength, when operationally deployed. For that matter, it must ensure the

accuracy and uniformity of the radiation diagram by maintaining its direction focus, the shape and opening of the main array and must attempt to reduce secondary lobes. Another critical aspect is the resistance to mechanical stimulation resulting from collision with micrometeorites and to thermal stimulation caused by extreme variations in temperature. Eventual punctures pose no problem because the similarity to a self-inflating rubber boat is limited to the extension phase and the gas is gradually expelled because the antenna, once it has achieved its rigid position, no longer needs it.

The flexible extended antenna, ADE, can be built in various diameters of up to 40 meters for frequencies of up to 30 GHz.

The first construction being mentioned is a 12-meter reflector equipped with five illuminators. The weight, which is a critical factor, will be limited to 15 kgs., five times less than that of the reflectors presently used, which are made of carbon fibers. The ratio between the initial volume and the extended volume is that of 1 to 20. The fact that this performance is achieved at lower costs than those for traditional antennas is, therefore, most interesting.

The first satellite to be equipped with this type of antenna will, most probably, be the "Quasat" satellite, to be used for astronomical observations for which CSELT is researching a multi-frequence illuminator consistent with the new technology made possible by ADE.



The first prototype of the ADE antenna mounted at the CSELT measurements field.

9731
CSO: 3698/660

FRENCH CNES MARKETING SATELLITE PRODUCT

Paris L'USINE NOUVELLE in French 24, 31 Jul, and 7 Aug 86 p 26

[Article by Marina Angel: "CNES Creates Subsidiary for ARGOS"; first paragraph is L'USINE NOUVELLE introduction]

[Text] In charge of marketing and promoting the ARGOS system from Toulouse, CLS will not be satisfied with disseminating raw data, but is offering to adjust its service to each customer's needs.

Crowning several years of R&D work on a French space program, CNES [National Center for Space Studies] has just made the creation of CLS [Satellite Localisation Collection] official. CLS is a CNES subsidiary in Toulouse that sprang from its ARGOS service. The ARGOS project is conducted in cooperation with NASA within the Meteorological Data Collection Program. The idea is to receive and preprocess messages from ground stations aboard American NOAA satellites. The system includes both equipment on board the satellites and beacons installed in the various stations.

The first American satellite carrying the French equipment was launched in October 1978. Since then, the system has not ceased to develop and to attract more users. "A little over 800 beacons are currently operational worldwide. Their market is growing by roughly 20 to 25 percent annually."

Michel Cazenave has been in charge of the ARGOS file for 1 year. "Applications, too, are diversifying. Although ARGOS is mainly used by oceanographers (atmospheric measurements, force of currents, wave height, chemical analyses, etc.), it also permits seismic or volcanic surveillance or any geographic location work." Experiments have been performed to track migratory animals. Recently, for instance, an expedition left for Spitsbergen and will "plant" 12 beacons permitting the study of ice field movements.

ARGOS offers 0.5 to 1 km precision in location finding. If necessary, this precision can be improved to approximately 100 meters. Delivery time for the results has constantly been improved, from 6 hours in 1978 to approximately 3 and 1/2 hours today.

"Creating a subsidiary to market and promote the system will enable this space program to reach financial equilibrium." CLS employs a novel formula that has already been tested with Spot Image, the CNES subsidiary marketing images from the French earth observation satellite SPOT.

"This new subsidiary will not be satisfied with marketing raw data. The idea is to offer customers turn-key service by providing an engineering service for the design of a sensor and a collecting station suited to their requirements, and by providing them with adjusted data."

Standard products will be developed: a routing service for transatlantic liners and other routes for sailing vessels, a serice for fishers, etc.

For the company's financial setup CNES (55 percent of the capital) has called on a significant partner, IFREMER [French Research Institute for the Exploitation of the Sea] (15 percent), whose director general, Jean-Claude Husson, was general manager of the Toulouse space center for 10 years. BNP [National Bank of Paris], Credit Lyonnais, Societe Generale, Indosuez, and Paribas hold 21 percent of the shares. The remainder belongs to participating institutes, incldiug IRDI [Institute for Industrial Research and Development] Midi-Pyrenees. The Toulouse center should employ approximately 20 people. By the end of this year, a subsidiary is to open in Washington, D.C. to cover the American market, with a business office in Seattle, on the West Coast. An investment of Fr 22 million is to equip the American station (20 people) and to complete the ground equipment at Toulouse, near CNES. Turnover for the first business year is expected to reach Fr 40 million.

25046/13104
CSO: 3698/A207

WEST EUROPE/AEROSPACE

MBB FINANCIAL, PRODUCTION FIGURES, PROJECTIONS

Duesseldorf HANDELSBLATT in German 23 Jul 86 p 11

[Article by gw: "Messerschmitt-Boelkow-Blohm GmbH/Airbus Losses Are Weak Point Again--Siemens Will Increase MBB Participation from 5.85 to 10 Percent--Expansion of the Airbus Family Should Prevent Future Gaps Between Orders"]

[Text] Munich, 22 July--Overall, 1985 was a satisfactory year for Messerschmitt-Boelkow-Blohm GmbH (MBB), Munich-Ottobrunn; however, this does not obscure the fact that there is still undeniably a weak point. This was how Dr Ing Hanns Arnt Vogels, president of MBB, characterized the past business year, during which the largest German aerospace concern suffered a substantial loss in earning capacity.

Financial Manager Dr Johannes Broschwitz also argued for a cautious approach in interpreting the results of fiscal 1985, for which management obviously had higher hopes than were borne out by the closing balance sheet. It was expected that the Airbus losses would be cut in half, to DM60 million, but instead they went up again, to DM130 million (110 in 1984, after 200 in 1983). To date, MBB has had to pay a grand total of DM1.6 billion in Airbus losses out of its own pocket. These losses ate up all of the company's domestic profits over the past year, said Broschwitz.

In addition, MBB has had to absorb DM90 million in losses from dollar transactions, which it covered by liquidating "freed-up reserves." Yield from the liquidation of reserves jumped to DM 100 million, to DM 151.5 million (from the previous year's DM51 million). Since rate-of-exchange losses must also be expected in 1986, the same type of liquidation will probably be done again in order to offset them. The drop in earnings is reflected most clearly by the heavily reduced cash flow, which has sunk from DM515.9 million to DM395.5 million, but also by the marked decrease in income-related taxes, which have gone from DM179 million to DM134 million. Nevertheless, stockholders will again receive a 6-percent dividend totalling DM36 million.

Actually, the company just broke even, after showing DM90 million in operating profits the year before, said Broschwitz. He is treating the DM150 million in earnings from military technology offered by the German-French partnership Euromissile, taxed at the lower French rate of 50 percent, as extraordinary income, and placing the remaining DM73 million in reserve funds. This will be

done just once more, in 1986, with DM120 million in Euromissile profits (before taxes). This income will be used to cover the Airbus losses for 1986, estimated at about DM60 million. There is not likely to be any increase in operating profits this year, either.

While 1981 to 1985 was a period of peak activity for MBB in terms of industrial production, 1985 to 1987 is a time of flagging demand in the civilian sector, which had risen to 46 (40) percent of the annual sales in 1985, and by the termination of old military programs and the initiation of new ones. Provisions against this difficult phase were made in previous years, Broschwitz explained.

Although a slight drop in sales, to DM5.9 billion, must be expected in 1986, MBB is increasing its number of personnel by about 1,000 workers, to over 38,000 (36,915 in 1985). On the one hand, this must be seen as a move to prepare for 1987, which is expected to show a hefty increase in sales to DM7.4 billion. On the other, however, the number of production personnel is being cut back, while the number of development and service personnel is being increased.

The fact that sales increased 5.1 percent in 1985, to DM6.011 billion, is due to the anticipatory allowance for the DM350 million Spacelab contract. This contract provides a windfall of over DM40 million in earnings which can go into the stockholders' dividends.

As a result of this contract, the percentage of the company's business accounted for by space technology has jumped to 13 percent (from 7 percent), or DM757 million (from DM376 million). During the current year, only DM400 million in sales are expected in this area. Military and civil aircraft construction constituted 26 percent of sales, military technology another 26 percent, and helicopters 5 percent, while areas of diversification, including traffic engineering, made up only 4 percent.

Due to the large percentage of the sales figure accounted for by space technology, the share attributable to development also increased, to 29 percent. DM331 (233) million of this went into self-financed research and development. MBB President Vogels considers 30 percent of annual sales to be the upper limit for development. In 1986 this share will be cut back to 25 percent, and then increased to 30 percent again until 1990, with the increasing activity in space technology and the development of the 90-series fighter.

In the area of military aircraft, the seventh batch of Tornados, which will be in production until 1991, the 80 aircraft for the Near East, the nine replacements for Great Britain, and the 35 Tornado ECRs for the German Federal Armed Forces, comprising a total of about DM6 billion in orders, are having a positive effect on getting maximum activity going in this field, although the pace is gradual. This will shorten the gap in production that looms between 1991 and 1995, when series production on the new EFA [European Fighter Aircraft] combat airplane will be getting under way. The EFA aircraft is scheduled to make its initial flight as early as 1990. The development budget for this aircraft for 1986/87 will be DM360 million.

Messerschmitt-Boelkow-Blohm

Item	Millions of DM	
	1984	1985
Sales	5719	6011
Change, percent	-2.6	+5.1
Exports, percent	62	58
New orders	4620	6519
Existing orders	8400	9000
Number of personnel at year-end	35,485	36,915
Total production	5833	5870
Of this, as a percentage:		
Personnel costs	38.9	41
Material costs	37	34.8
Gross cash flow (1)	515.9	395.5
as percent of total sales	9	6.6
Retained earnings	98	108.9
Total investments	389	339
Investments in material assets	273	320
as percent of total sales	4.8	5.3
Percentage self-financed (2)	80.7	66.4
Net worth	798	871
Of this, capital stock	600	600
Balance-sheet total	6620	6438
Net worth as percent	12.8	13.5
Long-term investments as percentage of fixed assets + inventory	59.2	58.8

Explanations: (1) Retained earnings + EEV [authorized collection] taxes + write-offs + contributions to pension fund ± extraordinary items. (2) Gross cash flow ÷ EEV taxes and dividends as percentage of total investments.

With regard to the controversial German-French PAH 2 antitank helicopter, opinions differ as to whether an American night vision system or European avionics will be built in, so this project is not coming along as well as it might be. The civilian helicopter market is also in a slump.

While three Airbuses per month were still being built last year, the decreased demand for wide-body aircraft in 1986 has caused a slowdown: the rate of production was cut back to 2.7 aircraft per month and only 27 Airbuses were built all year. Plans are to increase production to 30 aircraft again in 1987, however.

Only when the Airbus A 320 goes into series production in 1989/90 will the production rate increase to six aircraft per month or 66 per year, a rate which can be stepped up to eight Airbuses a month starting in 1991 if required. The A 320 is due to fly as early as the beginning of 1987; 134 firm sales and 133 options have already been concluded. The Airbus family is being expanded by the A 330 (two power plants, large passenger capacity, medium range) and the A 340 (four power plants, range [as published]. There are plans to have the Airbus series include aircraft for regional traffic, possibly to be built in cooperation with China (up to 80 seats) and with Indonesia (100 seats).

The $4 million SDI contract is only the first phase of a three-phase contract amounting to $38.8 million, said Vogels. The aim for the current year is to increase investment by DM50-60 million, to DM370-380 million. Vogels confirmed that Siemens AG is making efforts to increase its direct participation in MBB from the present 5.85 percent to about 10 percent.

13114/13045
CSO: 3698/693

OVERVIEW OF AUSTRIAN ACTIVITIES IN BIOTECHNOLOGY

Vienna DIE PRESSE in German 11 Sep 86 p 7

[Article by Herta Scharsach: "New Projects in Biotechnology--Rechannelling of Agricultural Surplusses"]

[Text] Vienna--Since the drop in crude oil prices ruined the market opportunities for biofuel, Raiffeisen (an agricultural cooperative) is now banking on the biotechnological production of protein products. Biochemie Kundl, Tirol, is also developing additional activities: it entered into a joint venture agreement with the U.S. chemical giant Monsanto. A number of larger companies in Austria are already working in biotechnology and genetic engineering and the industrial production of natural products. Due to the great demand, subsidies in these fields are already getting scarce. In the future, two associations will act as information exchanges. However, a biotechnological overall concept urged by the scienctific community has not yet been developed.

"We want to channel the agricultural surplus production into new products," Leopold Wiklicky, member of the board of directors of the Zuckerfabrik AG, Tulln, explains in connection with the planned activities of the Raiffeisen-Bioforschung Ges. m.b.H. which received a capital stock of eight million Austrian schillings from the Raiffeisen sector including its group of banks. At present, a research center is being built in Tulln for approximately 20 million schillings. Starting in 1987, 25 and later 50 employees will work in a laboratory area of 800 square meters. Here, Raiffeisen cooperates with the chairman of the Institute for Microbiology of the University for Agriculture, Hermann Katinger.

Protein Concentrate To Replace Soya Meal

In the first the production of a protein concentrate from peas as a substitute for the feed component soya meal is planned which could save annual imports of up to 500,000 tons or 2 to 2.5 billion schillings. The production of enzymes and organic acids for industry is also under consideration. The Raiffeisen sector hopes to mass produce the first biotechnology products as early as 1988. For its efforts it is willing to spend 20 million schillings to begin with, and later at least twice as much.

The pharmaceutical producer Biochemie Kundle is also counting on a protein hormone in the future which is supposed to induce cows to increase their milk

output by one fifth. At present, a processing installation is being built. Production which is intended exclusively for export will start in 1987. U.S. partner Monsanto puts the total cost of such a project at more than one hundred million dollar. For protein production Biochemie will increase its current personnel level of 1,550 people by 100 additional employees.

Jungbunzlauer, a producer of citric acid, also counts among the "biggies" in the domestic biotechnology scene. Starting this October the Institute for Oncogene Research (IOF), a joint-venture of the German company Boehringer-Ingelheim and the U.S. research firm Genentech will conduct cancer research in Vienna.

The Boehringer subsidiary Bender is investing 200 million schilling in a research laboratory called "Biotechnikum" where the cancer fighting drug interferon and other pharmaceuticals will be tested. Immunoa AG, a producer of pharmaceuticals, will work on the production of pharmaceutical preparations from cell cultures within the framework of the Common Market research program. The project is intended to reduce the research lead of the Americans and Japanese.

However, in the nationalized industry there is biotechnological silence in most places. Basic research plans by OIAG fell by the wayside during the most recent reform of the OIAG law. Chemie Linz is the only one to operate a small biotechnological laboratory.

The Voest subsidiary Vogelbusch which concentrates on the marketing of biotechnological installations is currently suffering from the breakdown in crude oil prices. It reduces the demand for biofuel installations and--because of the Arab sheiks' shrinking revenues--also those for desalization of sea water. Activities by smaller companies are frequently hindered by a lack of technical personnel, long development periods, and high investment costs.

Two Associations as Providers of Information

As part of the biotechnology focus program the Ministry of Science has been supporting basic research projects with subsidies totalling 60 million schillings. At present, the subsidies pot is empty. The two research support funds are also largely overextended. Approximately 46 million schillings have been awarded by the Ministry of Transport for technology transfer to production; additional may applications still have a chance.

In the coming weeks two constituting sessions of two Austrian associations for genetic engineering and for biotechnology will take place with the objective of clarifying the program and providing information. Industry, science, and government will be represented in the associations. This year, they will be funded with 250,000 schillings each, and with twice as much in 1987. Next February, a large information meeting will take place to elevate the biotechnology status quo in Austria, so to speak.

12831
CSO: 3698/4

WEST EUROPE/CIVIL AVIATION

FRG: WING RESEARCH UNDER WAY AT MBB

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIR WIRTSCHAFT in German
1 Sep 86 p 7

[Article by re.: "Air Flow Control Can Reduce Consumption--MBB: Cavities in the Barrier Layer Reduce Shock Wave Resistance"]

[Text] Frankfurt--Messerschmitt-Boelkow-Blohm [MBB] believes that a system with a controlled air flow at the wings can reduce the fuel consumption of the Airbus airplane by approximately three percent. This would reduce air resistance by keeping the shock waves small which are characteristic of transsonic currents. Such transsonic wings have a profile which accelerates the air flow at its surface beyond the sound barrier. However, this causes the so-called "compression shock" on the wing surface which generally constitutes the end of the supersonic zone and thus generates a wave resistance. This shock greatly interferes with the laminary air flow next to the surface which should adhere to the wing as smoothly and with as little friction as possible.

MBB builds several cavities, only a few centimeters deep, into the wing surface at the point where the shock hits the wing. To the outside, the cavities are covered with perforated sheet metal which forms a surface with the wing coating. In a model test the holes in the cavity cover had a diameter of .3 millimeters. With the help of these cavities a circulating air flow can form at the foot of the shock. Since the pressure behind it is always much greater than the pressure in front of it, part of the air flow close to the wing flows behind the shock through the perforated metal sheet into the cavity and exits the cavity again in front of the shock. Due to this exiting air flow a type of ramp is formed there for the external air flow which causes a double shock system with favorable resistance properties. According to observations by MBB this can reduce the effect of the compression shock and lower the shock resistance. At the same time, it has a positive effect on the barrier layer, since most of it flows into the cavity behind the shock and thus becomes thin and very stable for the rear part of the wing. Guidance of the barrier layer through the cavities is passive. The air flow is not suctioned off by additional means such as an auxiliary turbine, and blown into the barrier layer flow again.

In model tests the company used wings with a half-wing span of 1.20 meters and for the barrier layer cavities it used titanium sheet covers with 60,000 to 80,000 electron beam holes. Based on projections MBB expects that this will result in fuel savings of three percent assuming that the pressure across the wing span is distributed as evenly as possible and that the shock position of an Airbus wing is basically stable. It was also mentioned that the concept of a controlled air flow can be implemented with the variable wing curvature which was also developed by MBB.

12831
CSO: 3698/5

SIEMENS-CORNING BUILD FRG'S FIRST GLASS FIBER PLANT

Duesseldorf HANDELSBLATT in German 25/26 Jul 86 p 20

[Article by gw: "SIECOR / At a Cost of DM100 Million, Siemens and Corning Glass Have Built the First Glass Fiber Plant in the FRG--Aim To Capture at Least 30 Percent Market Share in Lightguides"]

[Text] Munich, 24 July--Siemens AG, Munich, and Corning Glass Works, Corning, NY, are the first companies in the FRG to begin the industrial manufacture of glass fibers, at a new production center in Neustadt/Coburg.

The German Federal Postal Service's expected need for 800,000 fiber kilometers of lightguides for the period from 1986 to 1990, as well as increasing demand throughout the world, have made it practical to build the first glass fiber plant in the FRG, noted Dr Hans Baur, a member of the board of directors of Siemens AG,

Siemens had already laid the groundwork to assume a leading role in the glass fiber cable market back in the early 1970's, through its joint venture with Corning Glass and the establishment of the joint subsidiary Siecor Corporation. Siecor is ranked first in the U.S. market, with a 40 percent share, ahead of AT&T (35 percent). Since the United States alone represents 70 percent of the current world market of 2 million cabled fiber kilometers (the FRG accounts for 5 percent), this makes Siecor the world leader as well. A joint sales subsidiary for glass fibers, Siecor GmbH, Munich (DM20 million in capital stock), was founded in 1973. Its total sales for 1986 are projected at DM 50 to 60 million, and a 10- to 15-percent increase is expected for next year.

After the Federal Cartel Authority prohibited five German manufacturers from building a joint glass fiber plant in Berlin, in 1984 Siemens and Corning Glass established the production company Siecor GmbH & Co. KG, also provided with DM20 million in capital stock, in Neustadt/Coburg. Siecor built a glass fiber manufacturing plant in the same city for about DM100 million, located right next to Siemens' largest telecommunications cable plant. Only 20 percent of the investment is to go into environmental protection.

Neustadt is starting out with 80 employees (to be increased to 120 as early as 1987) and an annual capacity of almost 100,000 fiber kilometers, which can

gradually be expanded to a capacity of over 1 million fiber kilometers, explained Wolfgang Buchholz, manager of Siemens AG's Telecommunications Cable Division. With the optical components that will be manufactured at the Berlin plant which is currently under construction (an investment of DM200 million), Siemens will be able to offer complete telecommunications systems. The world market for the components alone is expected to have an annual growth rate of 30 percent, with a market volume of about DM3.5 billion in the 1990's.

For the present, Siemens is aiming for at least a 30-percent share of the lightguide market. Of the European competitors, Philips supplies the German market from Eindhoven. AEG [Allgemeine Elektrizitaets-Gesellschaft; General Electricity Company] is also producing glass fiber cable in small quantities. According to experts in the field, the world market for lightguides should increase 25 percent per year, and it should double, from the current DM3 billion to about DM6 billion, by 1990.

In 1986, the German Federal Postal Service will lay about 70,000 km of glass fiber cable in its telecommunications network and 15,000 km in its local network. By 1990 it expects to have 275,000 km in the local network and 60,000 km in the telecommunications network. Siemens reports that the Postal Service will be using glass fibers to replace the conventional copper cable, but also to construct overlay networks for the introduction of new wideband telecommunications services (wideband ISDN [Integrated Services Digital Network]). The Postal Service will be investing DM2.5 billion to lay more than 800,000 km of glass fiber cable. DM1.5 billion of this amount will be used for underground structures; 60 percent of the remaining DM1 billion will go into installation. Baur calculates that only DM400 million are left for the glass fiber cable.

The wiretap-proof glass fiber cable technology is, overall, 30 percent cheaper than the copper coaxial cable technology used until now, and it also guarantees a much higher transmission capacity. However, Baur stated, used as distribution cable to connect subscriber's stations, it is four times as expensive as copper cable because of the additional electronics necessary for this application. Next year the Federal Postal Service will be ordering DM600 million worth of copper coaxial cable and DM220 to 250 million of glass fiber cable. The cost of the orders for both types of cable will have evened out by the end of this decade.

13114/13046
CSO: 3698/692

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG INSTITUTE COMPARES GERMAN, U.S., JAPAN RESEARCH EXPENDITURES

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 pp 2-5

[Excerpt] The Batelle Institute of Frankfurt has presented the results of its "Research Budget 1986" study which states that, with a total of DM54 billion, there is over DM3 billion more available for research in the FRG than last year. The real growth will be near 3.6 percent, considering an expected 2.5-percent price increase in the research field. However, dynamism will not quite reach the level of the United States and Japan. For the U.S., Batelle is expecting a 4.4-percent real growth in 1986; therefore, the U.S. research budget will grow to $116.8 billion (1985: $106.6 billion). For Japan, a 4.5-percent real growth is expected. The Japanese research budget will amount to DM108 billion in 1986 (1985: DM100.8 billion). The higher economic dynamism in the U.S. and Japan is primarily caused by the enormous efforts of the private sector. According to the Batelle Institute, the FRG economy, which has clearly already accomplished considerable achievements in the R&D area, must continue to observe carefully competitors' activities in the U.S. and Japan to avoid a financial growth gap in the future which could easily develop into a technological gap.

(A) R&D Operations in the Federal Republic of Germany

Area of operation	Million DM	Percent	Million DM					Million DM	Percent	Growth Percent 1985/86	
	1980		1981	1982	1983	1984	1985	1986		Nom	Real
Trade & Industry	25,400	65.6	26,850	29,600	31,330	33,300	36,540	39,210	70.9	7.3	4.7
Government	1,820	4.7	2,000	2,030	1,630	1,665	1,675	1,725	3.1	3.0	0.5
Institutions	4,150	10.7	4,315	4,460	4,650	4,805	5,135	5,335	9.6	3.9	1.4
Universities	6,360	16.4	6,750	6,810	7,140	7,200	7,365	7,600	13.7	3.2	0.7
Domestic Total	37,770	97.4	39,915	42,900	44,750	47,000	50,715	53,870	97.4	6.2	3.6
Foreign	1,000	2.6	1,085	1,100	1,150	1,250	1,335	1,430	2.6	7.1	4.5
Total	38,770	100.0	41,000	44,000	45,900	48,250	52,050	55,300	100.0	6.2	3.7

(B) Financing of the Research Budget -- FRG

Area of financing	Million DM	Percent	Million DM					Million DM	Percent	Growth Percent 1985/86	
	1980		1981	1982	1983	1984	1985	1986		Nom	Real
Federal	10,400	26.8	10,700	11,910	11,310	11,620	13,090	13,500	24.4	3.1	0.6
State	6,430	16.6	6,900	6,900	7,690	7,780	8,010	8,300	15.0	3.6	1.1
Local	170	0.4	150	150	150	150	150	150	0.3	---	---
Government	17,000	43.8	17,750	18,960	19,150	19,550	21,250	21,950	39.7	3.3	0.8
Trade & Industry	20,850	53.8	22,500	24,290	26,000	27,900	30,000	32,500	58.8	8.3	5.7
Private Domestic Organizations	320	0.8	300	300	300	300	300	300	0.5	---	---
Domestic Total	38,170	98.5	40,550	43,550	45,450	47,750	51,550	54,750	99.0	6.2	3.6
Foreign	600	1.5	450	450	450	500	500	550	1.0	10.0	7.3
All areas	38,770	100.0	41,000	44,000	45,900	48,250	52,050	55,300	100.0	6.2	3.7

(C) R&D Operations in Trade and Industry

Structure of Trade & Industry	R&D Expenditure						Growth Rate (yearly average) Percent	
	Million DM			Percent				
	1979	1981	1983	1979	1981	1983	79/81	81/83
Energy and mining	1,150	1,070	2,104	4.9	4.0	6.7	-3.5	40.2
including:								
Energy & water supply	261	268		1.1	1.0		1.3	
Mining	889	803		3.8	3.0		-5.0	
Manufacturing	22,301	25,197	28,428	93.2	93.8	90.7	6.9	6.2
including:								
Chemical Industry	5,307	6,192	6,845	22.4	23.1	21.8	8.0	5.1
including:								
Chemical Industry	5,017	5,790	6,393	21.2	21.6	20.4	7.4	5.1
Nuclear Fuel & Fertile Materials	164	191		0.7	0.7		7.9	
Mineral Oil Processing	126	210		0.5	0.8		29.1	
Plastics & Rubber	319	411	446	1.3	1.5	1.4	13.5	4.2
Minerals	242	277	346	1.0	1.0	1.1	7.0	11.8
Metal Production & Metal Processing	599	755	889	2.5	2.8	2.8	12.3	8.5
Steel, Automotive, & Mechanical Engineering	8,265	9,498	10,881	35.0	35.4	34.7	7.2	7.0
including:								
Mechanical Engineering	3,035	3,191	3,463	12.8	11.9	11.1	2.5	4.2
Automotive Engineering	3,074	3,784		13.0	14.1		10.9	
Aeronautics & Space Engineering	1,460	1,701		6.2	6.3		7.9	
Electrical Engineering, Precision Mechanics/Optics	6,776	7,453	8,349	28.7	27.8	26.6	4.9	5.8
including:								
Electrical Engineering	5,974	6,545	7,456	25.3	24.4	23.8	4.7	6.7
Precision Mechanics/Optics	425	487		1.8	1.8		7.0	
Iron, Steel,& Metal Products	309	354		1.3	1.3		7.0	
Wood/Paper/Printing	184	191	203	0.8	0.7	0.6	1.9	3.1
Leather/Textile/Clothing	135	124		0.6	0.5		-4.2	
Food	203	306	336	0.9	1.1	1.1	22.8	4.8
Remaining Sectors	464	583	799	2.0	2.2	2.5	12.1	17.1
including:								
Civil Engineering	68	105		0.3	0.4		24.3	
Traffic/Telecommunications	135	182		0.6	0.7		16.1	
Total	23,645	26,850	31,330	100.0	100.0	100.0	6.6	8.0

(D) 1985 Federal R&D Budget

Subsidized Areas	Million DM	Share Percent	Growth 84/85 Percent
1 Holding organizations, construction of universities	1,441.0	11.0	1.6
2 Selected areas of basic research in natural sciences	857.2	6.6	12.7
3 Ocean research & technology, polar research	236.2	1.8	5.4
4 Space research & technology	829.1	6.3	7.0
5 Energy research & technology	2,325.4	17.8	0.0
6 Environmental, climatic & safety research	593.8	4.5	13.3
7 R&D for health services	363.5	2.8	4.6
8 R&D in ergonomics	126.0	1.0	24.9
9 Information technology, manufacturing technology	658.1	5.0	12.1
10 Biotechnology	149.5	1.1	14.3
11 Materials research, chemical processing technology, physics technologies	335.5	2.6	4.4
12 Aeronautics R&D	734.5	5.6	71.3
13 R&D for ground transportation	201.9	1.5	-11.8
14 Geo-sciences, availability of raw materials	108.3	0.8	-25.7
15 Environmental planning, urban development, architecture	157.8	1.2	- 3.8
16 R&D in the food sector	74.7	0.6	- 1.2
17 R&D in agriculture, forestry, fishery	213.3	1.6	3.0
18 Research both for school and professional education	122.2	0.9	9.1
19 Innovation and improvement of infrastructures	666.4	5.1	42.3
20 Professional information	70.1	0.5	37.2
21 Arts and humanities, commercial, social sciences	229.3	1.8	14.4
22 Other areas	83.4	0.6	24.9
23 Military research & technology	2,508.9	19.2	28.0
All areas of subsidy	13,086.1	100.0	12.6

Source: BMFT [Federal Ministry for Research and Technology]

(E) Financing of the Research Budget--Japan

Area of financing	1979	1980	1981	1982	1983	1984	1985	1986
Trade & Industry:								
Billion Yen	3,226.6	3,776.3	4,363.8	4,855.5	5,451.2	5,941.0	6,500.0	7,000.0
Percent Share	70.4	72.0	72.9	74.4	75.9	76.7	77.4	77.8
Percent Growth								
Nominal	16.3	17.0	15.6	11.3	12.3	9.0	9.4	7.7
Real	8.1	8.8	11.7	8.0	10.6	6.3	6.2	5.1
Government:								
Billion Yen	1,353.4	1,465.0	1,612.2	1,666.2	1,721.4	1,800.0	1,890.0	1,990.0
Percent Share	29.5	27.9	27.0	25.5	24.0	23.2	22.5	22.1
Percent Growth								
Nominal	6.7	8.2	10.1	3.3	3.3	4.6	5.0	5.3
Real	-0.8	0.7	6.4	0.2	1.8	2.0	1.9	2.7
Foreign:								
Billion Yen	3.6	4.9	6.2	7.0	8.2	9.0	10.0	10.0
Percent Share	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
All areas:								
Billion Yen	4,583.6	5,246.2	5,982.4	6,528.7	7,180.8	7,750.0	8,400.0	9,000.0
Percent Share	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Growth								
Nominal	13.3	14.5	14.0	9.1	10.0	7.9	8.4	7.1
Real	5.3	6.4	10.1	5.9	8.4	5.3	5.2	4.6

(F) Research Operations--Japan

Operational Sector	1979	1980	1981	1982	1983	1984	1985	1986
Trade & Industry:								
Billion Yen	2,664.9	3,142.3	3,629.8	4,039.0	4,560.1	4,960.0	5,420.0	5,850.0
Percent Share	58.1	59.9	60.7	61.9	63.5	64.0	64.5	65.0
Percent Growth								
Nominal	16.3	17.9	15.5	11.3	12.9	8.8	9.3	7.9
Real	8.7	9.7	11.6	8.0	11.2	6.1	6.1	5.3
Universities:								
Billion Yen	1,258.3	1,340.1	1,445.6	1,540.4	1,649.6	1,750.0	1,880.0	1,980.0
Percent Share	27.5	25.5	24.2	23.6	23.0	22.6	22.4	22.0
Percent Growth								
Nominal	9.3	6.5	7.9	6.6	7.1	6.1	7.4	5.3
Real	2.2	-0.9	4.3	3.4	5.5	3.5	4.3	2.7
Institutes								
Billion Yen	660.4	763.9	906.9	949.3	971.0	1,040.0	1,100.0	1,170.0
Percent Share	14.4	14.6	15.2	14.5	13.5	13.4	13.1	13.0
Percent Growth								
Nominal	9.4	15.7	18.7	4.7	2.3	7.1	5.8	6.4
Real	2.2	7.6	14.7	1.6	0.8	4.5	2.7	3.8
All Areas:								
Billion Yen	4,583.6	5,246.2	5,982.4	6,528.7	7,180.8	7,750.0	8,400.0	9,000.0
Percent Share	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent Growth								
Nominal	13.3	14.5	14.0	9.1	10.0	7.9	8.4	7.1
Real	5.3	6.4	10.1	5.9	8.4	5.3	5.2	4.6

(G) Research Operations of Trade and Industry--Japan

Sector	Billion Yen		Percent Share		Percent Share of Turnover		Percent Growth	
	1982	1983	1982	1983	1982	1983	81/82	82/83
Agriculture, Forestry, Fishery	4.7	5.7	0.0	0.1	0.3	0.3	-3.0	20.7
Mining	15.6	15.6	0.4	0.3	0.7	0.7	20.9	0.2
Construction	80.6	101.3	2.0	2.2	0.4	0.5	10.6	25.7
Manufacturing	3,755.5	4,257.2	93.0	93.4	2.2	2.3	11.3	13.4
Electrical Machinery	1,176.4	1,416.2	29.1	31.1	4.5	4.7	16.9	20.4
Electrical Machinery	385.8	457.6	9.6	10.0	4.2	4.4	12.8	18.6
Communication, Electronics	790.6	958.6	19.6	21.0	4.7	4.9	19.0	21.3
Chemicals	687.5	774.5	17.0	17.0	3.1	3.3	11.4	12.7
Ind. Chemicals, Fibers	273.4	297.7	6.8	6.5	2.2	2.3	8.0	8.9
Drugs & Medicines	239.8	289.9	5.9	6.4	5.6	6.6	9.8	20.9
Oils & Paints	67.3	75.0	1.7	1.6	2.7	2.8	6.1	11.8
Other Chemicals	107.2	112.0	2.7	2.5	3.4	3.4	29.8	4.5
Transport Equipment	671.9	714.5	16.6	15.7	2.7	2.7	7.1	6.3
Motor Vehicles	569.5	605.8	14.1	13.3	3.0	2.9	8.8	6.4
Other Transportation	102.4	108.7	2.5	2.4	1.7	1.9	-1.5	6.1
General Machinery	281.0	311.7	7.0	6.8	2.3	2.6	16.1	10.9
Iron & Steel	182.8	186.1	4.5	4.1	1.5	1.6	7.7	1.8
Precision Instruments	134.2	158.8	3.3	3.5	4.0	4.0	5.9	18.3
Ceramics	93.6	113.3	2.3	2.5	1.6	1.8	11.3	21.0
Food	104.9	111.2	2.6	2.4	0.6	0.7	13.8	5.9
Fabricated Metal Products	64.8	82.8	1.6	1.8	1.4	1.3	0.3	27.7
Non-Ferrous Metals & Products	72.1	74.0	1.8	1.6	1.6	1.5	6.5	2.6
Rubber Products	55.8	57.8	1.4	1.3	2.5	2.4	6.4	3.5
All Other Sectors	413.1	436.6	10.2	9.6	1.0	1.0	6.0	5.7
All Sectors	4,039.0	4,560.1	100.0	100.0	1.8	2.0	11.3	12.9

(H) Financing of the Research Budget--USA

Area of financing	Million $	Percent	Million $					Million $	Percent	Growth Percent 1985/86	
	1980		1981	1982	1983	1984	1985	1986		Nom	Real
Federal Gov't	29,451	47.1	33,402	36,502	40,344	44,675	49,775	54,540	46.7	9.6	4.4
Industry & Trade	30,911	49.4	35,941	40,088	43,245	47,975	53,210	58,180	49.8	9.3	4.2
Universities	1,323	2.1	1,523	1,683	1,830	2,080	2,300	2,570	2.2	11.7	6.5
Non-profit Organization	908	1.5	973	1,028	1,135	1,195	1,315	1,470	1.3	11.8	6.6
All Areas	62,593	100.0	71,839	79,301	86,554	95,925	106,600	116,760	100.0	9.5	4.4

(I) Research Operations--USA

Area of financing	Million $	Percent	Million $					Million $	Percent	Growth Percent 1985/86	
	1980		1981	1982	1983	1984	1985	1986		Nom	Real
Federal Gov't	7,632	12.2	8,425	9,141	10,582	12,300	13,300	14,020	12.0	5.4	0.5
Industry & Trade	44,505	71.1	51,810	57,995	62,815	69,250	77,500	85,265	73.0	10.0	4.9
Universities	8,306	13.3	9,304	9,740	10,482	11,400	12,600	14,015	12.0	11.2	6.0
Non-profit Organization	2,150	3.4	2,300	2,425	2,675	2,975	3,200	3,460	3.0	8.1	3.1
All Areas	62,593	100.0	71,839	79,301	86,554	95,925	106,600	116,760	100.0	9.5	4.4

(J) Matrix of 1986 Research Budget--USA (Million $)

Operation / Financing	Federal Gov't	Trade & Industry	Universities	Non-profit Institutions	All areas	Percent Growth
Federal Gov't	14,020	27,975	10,110	2,435	54,540	46.7
Trade & Industry		57,290	550	340	58,180	49.8
Universities			2,570		2,570	2.2
Non-profit Institutions			785	685	1,470	1.3
All areas	14,020	85,265	14,015	3,460	116,760	
Percent Share	12.0	73.0	12.0	3.0		100.0

(K) 1986 Research Operations of Trade and Industry--USA

Sector	Billion $	Share Percent	Government Share of financing Percent
Aerospace	20.9	24.5	75.9
Electrical Machinery, Communications	16.8	19.7	36.7
Machinery	11.0	12.9	13.4
Chemicals	9.0	10.5	6.3
Autos, Trucks, other Transportation	8.2	9.6	11.6
Professional & Scientific Instruments	7.5	8.8	15.0
Petroleum Products	2.4	2.8	6.3
Rubber Products	1.2	1.4	20.5
Food & Beverage	1.1	1.3	0.0
Pulp & Paper	0.8	1.0	0.0
Fabricated Metals & Ordnance	0.8	0.9	11.0
Stone, Clay & Glass	0.7	0.9	3.7
Iron & Steel	0.7	0.8	18.9
Other Sectors	4.2	4.9	28.9
Total	85.3	100.0	32.8

(L) GDP and Research Budget

Year	Federal Republic of Germany					USA					Japan				
	GDP	R&D	R&D Share	R&D Growth Nom	Real	GDP	R&D	R&D Share	R&D Growth Nom	Real	GDP	R&D	R&D Share	R&D Growth Nom	Real
	Billion DM	Million DM	Percent	Percent		Billion $	Million $	Percent	Percent		Billion Yen	Million Yen	Percent	Percent	
1962	360.9	5,300	1.5			569.1	15,394	2.7							
1964	422.1	6,170	1.5			642.8	18,854	2.9							
1966	492.1	8,370	1.7			762.7	21,846	2.9							
1968	540.5	10,000	1.9			863.0	24,605	2.9							
1970	678.8	14,090	2.1			981.2	26,134	2.7			73,290	1,355.5	1.8		
1971	754.9	17,210	2.3	22.1	11.7	1,061.1	26,676	2.5	2.1	-2.6	80,630	1,532.4	1.9	13.1	7.0
1972	826.0	18,570	2.2	7.9	0.4	1,168.3	28,477	2.4	6.8	-3.3	92,310	1,791.9	1.9	16.9	7.8
1973	918.6	19,810	2.2	6.7	-2.9	1,302.1	30,718	2.4	7.9	-1.1	112,420	2,215.8	2.0	23.7	2.9
1974	987.1	21,560	2.2	8.8	-0.9	1,406.8	32,864	2.3	7.0	0.5	134,170	2,716.0	2.0	22.6	-1.3
1975	1,034.0	23,710	2.3	10.1	3.2	1,538.6	35,213	2.3	7.1	2.9	148,030	2,974.6	2.0	9.5	2.0
1976	1,122.8	24,820	2.2	4.7	-1.4	1,705.7	39,018	2.3	10.8	3.0	165,850	3,320.3	2.0	11.6	3.0
1977	1,200.5	26,840	2.2	8.1	2.6	1,902.4	42,782	2.2	9.6	3.9	184,460	3,651.3	2.0	10.0	4.8
1978	1,286.4	30,740	2.4	14.5	9.4	2,131.8	48,129	2.3	12.5	4.3	202,640	4,045.9	2.0	10.8	7.9
1979	1,392.5	34,995	2.5	13.8	7.9	2,388.4	54,933	2.3	14.1	4.5	218,620	4,583.6	2.1	13.3	5.3
1980	1,481.4	37,770	2.5	7.9	1.2	2,606.6	62,593	2.4	13.9	5.6	235,910	5,246.2	2.2	14.5	6.4
1981	1,540.9	39,915	2.6	5.7	0.3	2,934.9	71,839	2.4	14.8	5.1	252,550	5,982.4	2.4	14.0	10.1
1982	1,597.9	42,900	2.7	7.5	2.7	3,045.3	79,301	2.6	10.4	3.4	264,710	6,528.7	2.5	9.1	5.9
1983	1,670.9	44,750	2.7	4.3	0.4	3,275.7	86,554	2.6	9.1	3.7	274,570	7,180.8	2.6	10.0	8.4
1984	1,745.6	47,000	2.7	5.0	2.0	3,620.0	95,925	2.6	10.8	4.1	292,500	7,750.0	2.6	7.9	5.3
1985	1,827.0	50,715	2.8	7.9	4.9	3,830.0	106,600	2.8	11.1	4.4	311,200	8,400.0	2.7	8.4	5.2
1986	1,925.0	53,870	2.8	6.2	3.6	4,100.0	116,760	2.8	9.5	4.4	327,400	9,000.0	2.7	7.1	4.6

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

1986 FACTUAL REPORT SUPPLEMENTS 1984 FRG RESEARCH REPORT

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 pp 2-5

[Text] The 1986 factual report supplements the 1984 federal research report with up-to-date statistical data. As Federal Research Minister Riesenhuber emphasized during the presentation of the factual report, the data show that the reorientation of research policy toward more self-initiative is enjoying some success. The report also confirms that the FRG is assuming a leading position in research expenditures among the major industrialized nations of the world. The 1985 budget for domestically financed R&D corresponds to 2.8 percent of GNP (1979: 2.5 percent; 1981: 2.6 percent). The R&D expenditures of trade and industry have risen by 33.5 percent, that is, by one-third, since 1981, while those of the federal government have increased by 27 percent. The share of the R&D budget financed by trade and industry in the same period rose from 56.7 to almost 59 percent, that of the federal government remained the same with roughly 25 percent, and that of the federal states dropped by 2 percent to 14.5 percent.

Federal expenditures for basic research have reached 26.9 percent overall expenditures compared to 24.2 percent in 1980. Because of the special importance of basic research, this share of the BMFT Federal Ministry for Research and Technology budget will be 35 percent in 1986 as opposed to 26.5 percent in 1982.

Indirect subsidies nearly doubled from roughly DM780 million in 1982 to DM1.489 billion in 1985. Subsidies of individual projects focused on areas with long term importance for the national economy which represent typical government responsibilities, that is, particularly on the fields of environment, new key technologies (information technology, materials research, biology), as well as on aviation and space research. Already 1982, DM3.1 billion was granted by the BMFT for concrete, individually proposed and controlled research projects. In 1984, this has dropped to DM2.4 billion.

The reorientation of research subsidies during recent years was documented by Federal Minister Riesenhuber with examples of increasing expenditures for research subsidies in the following priority areas :

Research Field	1983 (millions of DM)	1986 (millions of DM)
Space research	710	967 (+36 percent)
Environment, climate, safety	476	646 (+36 percent)
Information technology	542	790 (+46 percent)
Biology	128	181 (+41 percent)
Aviation research	365	589 (+61 percent)
Defense research and technology	1,838	2,658 (+45percent)

8617/12951
CSO: 3698/M261

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG SCIENCE ASSOCIATION REPORTS RESEARCH SUBSIDIES FOR 1985

Bonn TECHNOLOGIE NACHRICHTEN in German No 431, 15 May 86 p 7

[Text] The Association of Foundations of German Science and the 108 foundations it manages made DM65.5 million avaible in 1985 for scientific subsidies in research and teaching, as well as for qualified junior scientific staff. This means a growth of almost 10 percent compared to the total expenditure of DM59.6 million in 1984. These results were reported in the recently published activity report for 1985 released in Stuttgart by Dr Klaus Liesen, chairman of the board, and Dr Horst Niemeyer, secretary general of the association.

Among the new association initiatives for this year on which Liesen reported, the "subsidy program for sponsored professorships" is the most comprehensive. The objective of this program is to reinforce under existing conditions the efficiency of university research and to enhance professional opportunities for qualified junior staff scientists. The program, publicly announced in the fall of 1985, is mutidisciplinary, will run up to 1992, and is endowed with DM10 million. Liesen reported that the association received 106 requests from 42 scientific universities in the FRG. Following the recommendations of a scientific commission, the association panel granted 20 sponsored professorships which are distributed over a variety of disciplines, from archeology to biochemistry. Included in this number is a sponsored guest professorships for Operations Research at the University of Bonn, which had already been subsidized since it was financed from special funds given to the association for this purpose.

With an additional new subsidy program, the association intends to contribute --through the financing of guest lectures, postgraduate stipends, and interdisciplinary work groups--to the establishment of a separate field of "Ethics in Medicine" in the FRG like those already established in other, predominantly Anglo-Saxon countries.

8617/12951
CSO: 3698/M262

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

SWEDISH TECHNICAL DEVELOPMENT BOARD ASKS FOR 1.2 BILLION

Stockholm NY TEKNIK in Swedish 4 Sep 86 3

[Article by Sverker Nyman]

[Text] The Board for Technical Development (STU) wants sharply increased allocations from the government next year. An additional 400 million kronor will be needed if STU is to meet its goals.

STU normally has a budget of 800 million kronor. Thus, the organization is demanding a 50-percent increase in allocations at a time when the government is calling for a zero budget growth.

STU director general Sigvard Tomner does not believe that all the millions will come from the government, but he believes that he must point out both the possibilities for rapid technical development and the possible consequences if Sweden does not keep up with international developments.

The 400 million kronor is included in a special program on technical policy that STU has added as an appendix to its proposal. STU wants to spend the most money on information technology: more than 175 million. It wants to give materials technology 35 million, biotechnology 25 million, micronics 30 million, biomedicine 20 million, environmental protection technology 50 million, energy technology 30 million, and regional innovation policy 40 million.

In addition, STU wants to give another 20 million to its own technical research council.

This would require an additional 400 million kronor. The rest could be taken from other sources.

Micronics

A new element of the program is the investment in micronics. This can be defined as "technology for the production of components whose functions are based on a combination of extremely small geometrically determined structures with varying chemical and physical properties," as it is stated in the program.

In plain language, this refers to a technology that is located on the boundary line between electronics and mechanics, with some biology and chemistry thrown in.

Some people believe that the potential for the future of micronics rivals that of microelectronics.

One example of a conceivable micronic product is a chip that could be swallowed and, as it passes through the intestinal tract, it could measure pH, temperature, and other quantities and transmit the information by radio. Other possible applications include new types of catalysts and sensors.

In the field of biotechnology, the newly created National Committee on Biotechnology has proposed a national biotechnology program. The recent proposals by STU are part of this program, but if it is to be effective it must be given funding over and above the usual STU budget.

9336
CSO: 3698/701

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FINLAND IN ESA, EUREKA: EFTA, EEC TALKS RECALLED

ESA: 10 Million in 1987

Helsinki HELSINGIN SANOMAT in Finnish 20 Sep 86 p 37

[Article: "Finland Became Associate Member of ESA, Price Under 10 Million Next Year"]

[Text] Finland officially became an associate member of the European Space Agency, ESA, when an agreement concerning this was signed in Helsinki on Friday. The signers for the Finnish side were Trade and Industry Minister Seppo Lindblom and Juhani Kuusi, director of the Technological Development Center, and Director Reimar Lust signed for ESA.

Participation will cost Finland 8.3 million markkaa next year. The amount of the associate membership fee is 3.4 million, the scientific program participation fee is 3.9 million, and participation in the tele-surveying program will cost 1 million.

The agreement will remain in effect for 5 years. Toward the end of the term of the agreement the cost of participation will increase to approximately 20 million markkaa according to Minister Lindblom, and if Finland later becomes a full member, the price will increase to approximately 40 million markkaa.

In the first phase Finland will participate in only a small part of the organization's work. The ESA's annual budget is approximately 5 billion markkaa and its programs include the Arianne booster rockets and the Spacelab-, Eureca- and Columbus space laboratories.

Beginning next year Finland will be ESA's only associate member since Austria and Norway will become full members. Canada has an agreement of cooperation with ESA as the only country outside of Europe.

ESA's scientific program, in which Finland will now be participating, is comprised of large general projects. The Cluster research project dealing with phenomena of the earth's magnetic field and the Soho solar research project are interesting from Finland's point of view.

The system being developed in the tele-surveying project will be applied in Finland to the compilation of weather forecasts, the clarification of ice conditions as well as to forestry and water management, among other things.

The assessment is that 40-70 percent of the cost of participation in the programs will be returned to Finland as contracts with industry and research institutes. The amount of money returned will depend on the activism and abilities of businesses and institutes. Participants in the projects will be selected by means of a competitive bid.

Data Transfer of Interest

Minister Lindblom stated at the signing ceremonies that Finland's status as an associate member will not prevent it from participating in all ESA's projects that are of interest.

At the present time the ministry is studying the option of participating in a data transfer program, which would play an important role in industrial policy according to the minister.

Lindblom considered the conclusion of the agreement as a commercially important matter also since the magnitude of the markets connected with space technology will amount to approximately 40 billion markkaa annually in the next decade.

Director Reimar Lust considered Finland's research relations with Sweden and the Soviet Union to be important from ESA's point of view. Besides the USA, ESA will strive to cooperate in future research with Japan and the USSR also according to Lust.

Eureka: Europe, Finland, USSR

Helsinki HELSINGIN SANOMAT in Finnish 19 Sep 86 pp 1, 8

[Article: "Foreign Ministry's Valtasaari on Finland's Participation: 'Eureka Just as Important as EEC Decision'"]

[Text] The high-tech project Eureka is now just as important for Finland as our country's decisions regarding the EEC and EFTA were at the time.

So says Jukka Valtasaari, assistant section chief of the Political Section of the Foreign Ministry. The finding of a satisfactory solution is now just as important as the solution with the EEC and EFTA once was.

"As far as Eureka is concerned, we will be ensuring that we will not fall behind in technical and scientific development. At the same time, however, we will have to make certain that we do not irritate the Soviet Union. We had the same problems regarding the EFTA and EEC agreements also," says Valtasaari.

Valtasaari spoke in Espoo on Thursday at a seminar arranged by the Education Ministry for a discussion of high-level international educational and scientific cooperation. Doubts regarding the civilian nature of the project were expressed in Soviet articles concerning Eureka.

Previously, the Soviet Union adopted an understanding attitude toward Finland's participation in Eureka. The issue has not come up recently.

Jukka Valtasaari, assistant section chief of the Foreign Ministry, considers Finland's Eureka decision comparable in importance and structure to the EFTA and EEC decisions.

"Finland's inclusion in the Eureka-project is a question of the same problems which were encountered at the time of the conclusion of the EFTA and EEC agreements. Also a decision regarding Eureka is of the same class as relations with EFTA and EEC with respect to its consequences," said Valtasaari in Espoo at a seminar arranged by the Education Ministry for a discussion of Finland's international scientific cooperation.

"The basic question in our participation in the Eureka-project or in our attitude toward Star Wars is how we can keep up with technical and scientific development. On the other hand, how we can avoid aggravating the Soviet Union," deliberated Valtasaari.

Finland's solution with respect to Eureka has been an independent definition of the whole project's limits and nature.

"We will participate in only those aspects of Eureka which deal with peaceful projects. However, the difficulty lies in the fact that some of the technology is applicable to civilian as well as military use. Participation in Eureka has not, however, produced any negotiations similar to the ones between Finland and the USSR at the time of the EFTA and EEC solutions," said Valtasaari.

Finland Did Better in Middle Ages

Culture and Science Minister Gustav Bjorkstrand (Swedish People's Party member) considered the international level of Finland's science and scientific contacts to be modest.

"In the middle ages Johannes Pietarinpoika and Olavi Maunonpoika were rectors of Sorbonne University in Paris even though contacts with the outside world were weak in comparison with today's contacts. Today the situation is not at the same level as in the 12th and 13th centuries," said Bjorkstrand.

The minister saw an increase in resources as a solution for improving the international "competitiveness" of Finnish science.

"Our scientific budget should be relatively greater than in the leading developed countries since diversification is a condition of our independence. The Snellman-like concept of science playing a central role in the cultural and political existence of a small nation continues to be timely," believes Bjorkstrand.

In the distribution of financial resources we must not in the opinion of Bjorkstrand forget research areas remaining in the shadow of scientific publicity under any circumstances. Several areas in the humanities, for example, fall into this category.

Bjorkstrand sees the brain drain as a definite indication of a shortage of resources and a narrow attitude. This phenomenon is becoming a problem in certain areas of science. The Education Ministry is even considering a work group to deal with the question.

Eureka Is A Countermove to Star Wars

The Eureka-plan is Western Europe's countermove to Star Wars or the strategic defense initiative being promoted by the United States. By means of Eureka the countries of Western Europe will try to create sufficient material conditions for new extensive scientific research.

Several dozen different research projects are being sponsored by Eureka primarily in France, West Germany, and England. The majority of the research is aimed at peaceful use and some for military use also. In some projects the boundary is difficult to distinguish.

Funds for the projects come from various quarters in Eureka. Work is funded by various governments, universities, and businesses. Eureka is primarily a coordinator of research and funds.

Certain business firms from Finland have already participated in Eureka. The Soviet Union has not, for the time being, opposed Finland's participation in this work.

10576
CSO: 3698/13

WEST EUROPE/ SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

FRG-GDR DISCUSSIONS ON S&T CONTINUE--An agreement on environmental protection is considered ready to be signed and, as we hear from East Berlin, could be signed as early as October. The preparations for the signing of a scientific agreement might take somewhat longer. From what we hear, at present the GDR could not be interested in a lasting deterioration of relations with the FRG. Evidently, it finally got Moscow's approval in this respect as well. It remains to be seen whether this conciliatory turn by the GDR can be considered proof of a "new approach to problems"; still, this phrase was used a few days ago in the discussion between physicist and peace researcher Carl-Friedrich von Weizsaecker and the two politbureau members Hager and Axen in the house of the permament representation. In any case, in the solution which was found diplomates note the obvious attempt by the GDR leadership to develop "normal, good-neighborly relations" as it is phrased in Article 1 of the Basic Treaty. [Excerpt] [Frankfurt/Main FRANKFURTER ALLGEMEINE in German 20 Sep 86 p2] 12831

CSO: 3698/5

EAST EUROPE/COMPUTERS

MICROCOMPUTER CONTROL SYSTEM FOR BULGARIAN RAILROADS

Sofia TRANSPORTEN GLAS in Bulgarian 27 Aug 86 pp 6, 7

[Article by Docent, Candidate of Technical Sciences Nedelcho Nedelchev: "Algorithms of Reliability"]

[Text] Today microprocessor equipment is developing very intensely. Production methods are being continuously improved, the integration density of the chips, the speed and functional capability are rising and at the same time prices are becoming evermore accessible. In our daily life we are coming to encounter microcomputers more and more frequently. Microcomputers are being employed to control spacecraft, chemical enterprises, to optimize the energy consumption of motor vehicles and locomotives and to control traffic lights. Microcomputers at enterprises carry out accounting and data planning activities, they sell gasoline, they teach geography, they are being built into stoves, watches, telephone sets and wherever. They are also moving into railroad safety equipment.

However, it must be immediately pointed out that their invasion into controlling traffic in transport, and particularly rail traffic, has not been so dazzling. The high demands of reliability and primarily safety require the designers to be more restrained, to wait for the assembling of statistical material and to carefully analyze the systems both according to the operating principle as well as the hardware and software implementation. Quantitative criteria for reliability and safety are required as well as the methods of achieving these. While the slowness with which the microcomputer equipment is entering the safety installations is an objective pattern, the factors for computerization do exist and it is gradually beginning to assume its proper place in the facilities and equipment for controlling and supporting train traffic.

Here is the point to emphasize that our country is among the first which are going into the mass introduction of microprocessor equipment in this area. In the first stage, this is being done using imported equipment from the most advanced firms and subsequently using our own system facilities.

Background Facts

There are grounds for computerization in the control of station interlocking.

-- The crucial thing in this process is that modern scientific thought in the area of safety equipment has available the methods and means for achieving reliability and safety the quantitative measures of which are equal to those provided by relay equipment.

-- In a computer system by using the software it is much easier to make changes due to the expansion of the stations, sections and so forth as well as changes in the aim of widening functional capabilities.

-- Computer equipment, due to its built-in intellect, permits easier localization and detection of damage in comparison with relay equipment and discrete electronics.

-- Computer equipment provides greater opportunities for automating designing.

-- At the present moment of development, the prices for electronic equipment and primarily microcomputer equipment are constantly dropping and this is not a trend in the labor- and metal-intensive relay groups and relay bays.

-- The equipment of one microcomputer station interlocking system is many times smaller and consequently allows installation at stations with insufficient interior space.

-- The operator (the traffic controller on duty) receives a larger amount of more precise information. This is due to the possibility of utilizing colored video displays. This information is more easily perceived and as a result there is a faster and more efficient response.

-- The presence of a memory makes it possible to recall the established routes, to make up the commands ahead of time which are then activated at a certain hour and in fulfilling a certain condition, with the establishing of the desired priorities. The storage of the introduced commands can be called up on the screen at any moment.

-- In relay systems with an emergency nothing is recorded. It is hard to figure out in what position of the relays the emergency occurred and, respectively, to discover the causes. With computer equipment, it is possible to provide for the automatic recording of events. This includes all commands, changes in the states of the equipment and generally the state of the system. When necessary it is possible to recover the states a certain period back. The latter is extremely important for maintaining the system's authority.

-- An essential advantage of computer interlocking is that it permits operation in an advisor mode. The latter facilitates the work of the leader on duty.

-- Computer equipment is coming from the producer plant in a more compact form. This means that under factory conditions it is almost completely tested out and on the spot it is merely a question of testing out and adjusting the internal devices (the relay circuits, the switches, the light signals and so forth) and their connections with the computer.

Problems

A study of the few developments of microcomputer station interlocking (MKTs) which exist throughout the world at present, and primarily the problems arising in line with their adaptation to Bulgarian conditions, indicates that there is an objective need for developing and introducing our own MKTs.

The main problem in this regard is that in the established systems there still is a great deal of relay equipment (predominantly of less than excellent quality). Virtually entire systems for direct control and monitoring of the switches, signals and so forth are relay. In addition, adapters have been added and these employ new relays. At the same time, the signal systems (including speed) and the external equipment installed in our country differ substantially from that of the supplier country. This means that if we maintain the relay nature of the circuits for direct control and monitoring, these will be very close to our presently existing systems of switches, light signals and so forth. In addition, Bulgaria has established traditions of employing relays of the NMSh type and these, like all first-class relays, have large overall dimensions. With the above situation, the future adaptive nature of such an imported system will entail large size and high prices.

Another problem arises out of the particular features of our technical operations in comparison with certain other countries. These particular features require a good amount of redundancy in the system as a whole, making it possible to automatically switch to the resources in reserve without disrupting the production process at the station.

In analyzing all these facts and in bearing in mind the system which has already been established in Bulgaria, the possibilities of producing and supplying spare parts and, not lastly, the purchase prices, it can be concluded that we must rely on imports only in the initial stage of computerizing the station interlocking. The BDZh [Bulgarian State Railroads] is already decisively entering this stage and hence the task of creating an employing a Bulgarian MKTs is becoming imperative.

Solution

The development of a Bulgarian MKTs was assigned to the special-program collective headed by Docent, Candidate of Technical Sciences, Khristo A. Khristov. The leading group is the Sectorial Scientific Research Laboratory for the Electronization and Automation of Railroad Transport (ONILEAZhPT) under the Lenin VMEI [Higher Electrical Equipment Institute] with the co-executors of the BRV po AT [Bureau for Research and Introduction of Automated Equipment] under the Sofia Division of the BDZh and the TsTKA [? Center for Technical Control and Automation]. In solving certain problems, the collective is drawing on results achieved in other socialist countries and primarily the USSR and GDR as well as the achievements of leading Western firms.

Development commenced in mid-1982 and the first results came at the end of 1984. At that time there was a laboratory model with minimum capacity with which thorough testing was carried out.

The work has been continued with the expanding of functional capability and corrections.

The MKTs has a decentralized structure with an allocated intellect. The basic data processing and the generating of control commands for the facilities are carried out from a central control panel.

Here the interdependencies are realized, functional tests are run and the logical level of orders for the facilities are formulated. The central control post runs a colored video display and printer and receives orders from the duty leader given over a standard alphanumerical keyboard.

The screen of the video display constantly shows the system of track development at the centralized station with all the controlled and monitored facilities (light signals, switches, car humps, barriers, fish connections, track lines and so forth), in providing information on the state of these facilities, the state of the ordered routes and a select amount of information bearing directly on the work of the duty operator. The screen visualizes the entire dialogue of the MKTs with the human operator.

All crucial operations of the duty operator are put out on the printer. (Analogous operations in the presently existing relay interlocking are fed in with sealed buttons.) In addition, all recorded damage is printed out.

All operator interventions as well as changes in the state of the station are stored for several hours in a semiconductor storage which has been specially built into the central panel. There is the possibility of reading the information from storage, its visualizing as well as printing out as a hard document.

The central control post is connected by series channels with a certain number of concentrators.

The concentrator computers receive the controlling telegrams from the central control post and organize the appropriate control signals for operating the direct control and monitoring circuits of the station facilities. The monitoring information concerning the state of the latter, after processing, is transmitted by the series channels to the central control panel.

The employment of concentrators (from one to eight) makes it possible to break down the tasks and freeze the time of the central control panel for its main tasks of solving the interdependencies in handling the movements in the area of the station.

The use of the series communications channels between the central control post and the concentrators has made it possible to spread out the latter in the station area and this creates prerequisites for a significant savings of cable lines.

Cooperation

The thus described interlocking is a complex system with modular organization. For example, in the interlocking of a comparatively small station there will be around 20 microcomputers in operation while the number of input-outputs is on the order of thousands. The introduction of such a large system creates a multiplicity of problems the main ones being dependable operation, safe conduct with an emergency and a correct functional algorithm. Effective measures have been taken to solve these problems with complete equipment redundancy and built-in devices for self-diagnosis.

For proving the safety and functional readiness of the MKTs, together with specialists from the Budapest Technical University, a simulation system has been developed by which the interlocking will be tested before put into service.

At present with the participation of the ZAT [? plant for automated equipment], equipment is being produced for the experimental Brigadir Station which will go into operation in mid-1987. Brigadir Station will be the first station within the CEMA member nations which will be completely controlled by microcomputers.

10272
CSO: 2202/1

EAST EUROPE/COMPUTERS

HUNGARIAN COMPUTERS COLLECT DATA AT PAKS NUCLEAR POWER PLANT

Budapest ENERGIA ES ATOMTECHNIKA in Hungarian No 7, Jul 86 pp 317-323

[Article by Lajos Ivanyos, graduate mathematician and graduate electrical engineer, Mechanical Measuring Instruments Factory (MMG) Automatic Works: "Microcomputer Data Collection Systems for the Paks Nuclear Power Plant"]

[Text] A Soviet designed and made information computer system was put into operation for blocks 1 and 2 of the Paks Nuclear Power Plant. In the course of putting the first block into operation the question arose whether it might not be possible to create an information computer system providing more services using domestic suppliers and largely information equipment manufactured in Hungary. Preparatory work and harmonization with the Soviet side began in 1981, in regard to blocks 3 and 4. As a result of this, on a commission from the Hungarian Electric Works Trust, the ERBE [Power Plant Investment Enterprise] signed a contract with the MMG Automatic Works (MMG-AM) and the MTA KFKI [Central Physics Research Institute of the Hungarian Academy of Sciences] in 1984 to create the information computer systems.

According to the contracts the delivery program of the MMG Automatic Works includes the intelligent data receiving real-time terminals (AFRT) connected to the process instrumentation, the event handling concentrator or subsystem (EKK), the so-called reserve path processor (TUR), the color quasigraphic display stations (MA) connected to the latter and to the block computers to be delivered by the KFKI and the devices needed for installation and maintenance.

In this report I will deal with the devices delivered by the MMG-AM, including those developed and manufactured by the MMG-AM, and with their tasks.

1. Tasks and Construction of the Data Collecting Systems
   The data collection system for blocks 3 and 4 collects, by block,
   --the analog measurements of the technological control system of the given block,
   --the two-state indicators of the technological control system of the given block,
   --the position signals of the intervention and execution organs,
   --the initiating, checking and executing signals of the protection systems,
   --and the operating mode and check signals of the more important control cycles and controls.

It constantly checks them and does pre-processing of them, making possible their ordered display on technological schema and the time sequence recording and archiving of changes in the indication status.

a. Process Peripherals
The signals of the technological instrumentation are connected to the so-called process peripherals; it is the task of these to perform continual checking and preprocessing. The process peripherals are actually industrial microcomputers which are supplemented by units serving to connect the technological instrumentation; they perform their tasks autonomously with a program system burned into EPROM cartridges and they can forward current, preprocessed information to the computers carrying out further tasks on two independent serial asynchronous channels simultaneously.

Among the process peripherals are the "data receiving real-time terminals" (AFRT, there are 21 of these for each block) and the "event handling concentrator subsystems" (EKK, there is one of these subsystems for each block, each subsystem consists of five microcomputers).

b. Reserve Path Processor System (TUR)
One of the serial asynchronous lines of the process peripherals is connected to the "reserve path processor system." The tasks of the multiple processor microcomputer are:

--arranging the preprocessed information,
--supplying the three display stations with information, and
--printing out the information designated for archiving and/or handing it on to the computer carrying out "disk management" functions.

The role of the reserve path processor system is significant primarily when one of the so-called block computers is not functioning; at such times the reserve path processor system must provide current information via the display stations connected to it to the operating personnel working in the block control room. With an operating block computer the task of the reserve path processor system is to record technological disturbances and archive the information of the period of a few minutes preceding the disturbance for purposes of later analysis and the cyclic recording for longer time intervals of information designated by the operators for the purpose of process identification.

c. Block Computers
The other serial asynchronous line of the process peripherals is connected to the so-called block computers. The block computers, with an online/stand-by organization, are TPA 11/440 configurations provided by the KFKI. These perform more complex processing tasks and supply information to several (a maximum of eight) display stations. (Since the block computers are not built into the data collection system within the framework of this undertaking we will not deal with them in any more detail.)

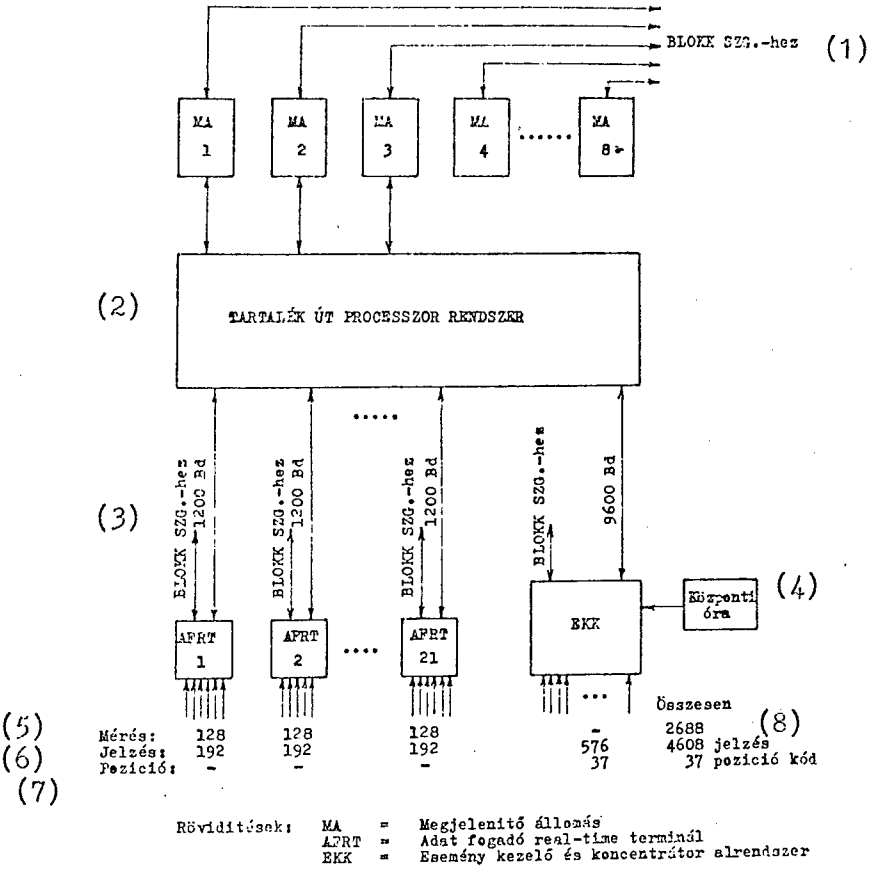


Figure 1. Theoretical Structure of the Block Level Data Collection System

Key:

1. To block computer
2. Reserve path processor system
3. To block computer, 1,200 baud
4. Central clock
5. Measurement
6. Indicator
7. Position
8. Total:
   2,688 measurements
   4,608 indicators
   37 position codes

MA=Display station
AFRT=Data receiving real-time terminal
EKK=Event handling and concentrator subsystem

d. Display Stations (MA)

The electronics of the color, quasigraphic display stations consist of a multiprocessor microcomputer; its auxiliary units are an alphanumeric and functional (image calling) keyboard and a color television monitor. A burned in program system ensures that an efficient man-machine link is created, with the aid of the keyboard, with the reserve path processor system or with the block computers and that the changing data on the color screen are very quickly refreshed. Each of the display stations has two, physically independent serial asynchronous channels. Three display stations are connected

simultaneously to the block computer and to the reserve path processor system; the others are connected only to the block computer.

Figure 1 illustrates the theoretical structure of the data collection system and the connections of the devices.

2. The Device Base for the Data Collection Systems
We can divide the device based used into two groups:
--process pre-connectors and
--modular industrial microcomputers.

A. Process Pre-Connectors
Their task is to transform the signals coming from the technology into a form which can be handled by the microcomputers.

Under normal conditions the two-state signals (indicators) arrive from voltage free contacts on long cables. For various reasons the cables can pass on noise voltages to the microcomputers working in the 0-5 V voltage range, so the galvanic isolation of such signals is necessary.

Interventions done along the cables or at their connection points can cause cable breaks or connection faults and the sensing of these must be taken care of.

The GLVS and GLVD units provide galvanic isolation of the two-state signals and check for signal cable interruptions.

The GLVS units are suitable for receiving 48 so-called static indicator inputs, for galvanic isolation of them and for interruption tests. They produce 96 TTL level signalling bits in the direction of the microcomputer; 48 of these correspond to indicator states and 48 correspond to the continual or interrupted state of the cabling. (The signal sources are make-contacts bridged with 10 k ohm resistance.)

The GLVD units are suitable for receiving 48 so-called dynamic indicator inputs, for galvanic isolation of them and for interruption tests. They produce 96 TTL level signalling bits in the direction of the microcomputer, concerning the state of the change contact signal sources or of their cables.

Analog signals are connected to the A/D converter modules of the industrial microcomputers via modular electronic multiplexer signal transforming units (model name, MULTITRAN). In the MULTITRAN units each module has eight inputs. In this case these are:
--0-5 mA current inputs (Soviet supplied remote transmitters),
--4-20 mA current inputs (Hungarian supplied remote transmitters),
--resistance temperature sensors, and
--thermistor pair temperature sensors.

Each MULTITRAN unit contains eight input modules (receiving a total of 64 analog inputs); its output signal falls uniformly in the 0-20 mA range.

The MULTITRAN units can be located at the technological site (next to the sensors or remote transmitters) and thus in theory a significant amount of cable can be saved. In actuality out of the total of 84 MULTITRAN units for blocks 3 and 4 only 24 (12 per block) were so located, the rest are located in the computer room.

B. Modular Industrial Microcomputers
The equipment is built up out of modules of two MMG-AM developed microcomputer families.

The chief characteristics of the SAM-E industrial microcomputer module family are:

- --"Simpla Europa" size modules (100 x 160 mm),
- --on the bus side, 64 pin, 0.1 inch division direct connectors,
- --I/O connection on the front of the modules with a 50 pin, 0.1 inch division direct connector,
- --bus structure: an STD bus expanded to 64 points,
- --Intel 8085 or Z80 compatible processor,
- --rack, maximum of 20 modules per drawer.

The modules used out of the SAM-E assortment are:

- --ECPR (a processor module containing an 8085 processor, a real-time clock and a switchable 2 x 2 K byte memory),
- --VMEM (a 16 K byte memory module containing eight 2 K byte RAM or EPROM memory cartridges),
- --SRAM (an 8 K byte static RAM memory module),
- --VSIO (a module suitable for servicing two independent serial asynchronous data transmission channels at a maximum data transmission speed of 9,600 baud per channel),
- --ADOP (a 12 bit plus mark bit double integration A/D converter module for 0-20 mA current signal input),
- --MTCM (a control module, which sends channel selection signals to the MULTITRAN unit),
- --CDC1 (a module to receive 48 static indicator inputs),
- --CDC2 (a module to receive 24 dynamic indicator inputs),
- --KDCM (a module to connect call switches and displays on the local operator's console).

The chief characteristics of the MP 8501 multiprocessor industrial microcomputer module family are:

- --augmented "Dupla Europa" size modules (233 x 220 mm),
- --on the bus side, two 64 pin, 0.1 inch division indirect connectors; the first connector connects to the "system" bus and the second connects to the "local" bus,
- --I/O connection with "CANON" type connectors on the front of the modules,
- --system bus: to connect a maximum of 8 microcomputers working with 8085 processors, a common memory (128 K bytes) and the module controlling the signal traffic of the system bus (the organization of the system bus is hierarchic, one of the microcomputers plays the favored role),
- --local buses: providing signal traffic among modules making up a part of each microcomputer,
- --48 K bytes of local memory per microcomputer,

--pre-established task distribution among microcomputers,
--an INTEL 8085 or INTEL 8088 processor, and
--a maximum of 27 modules per rack drawer.

The modules used out of the MP 8501 assortment are:

--CMCU: (Common Memory Control Unit) the module controlling access to the common memory and service of program interrupts among microcomputers,

--P85P: a "processor" module working with an INTEL 8085 processor which also contains a test program in a 2 K byte EPROM cartridge. The additional 8 K bytes of EPROM/RAM memory in the module are part of the 48 K bytes of local memory of the microcomputer; this also contains the task independent part of the multi-real-time monitor. There is also one serial, asynchronous I/O circuit or coupler in the module,

--UM 8/32: (Universal Memory) provides 8 K bytes RAM and 32 K bytes EPROM/RAM (variable) memory area on the local bus,

--RM 64: (RAM memory) provides 64 K bytes RAM memory area on the system bus (two such modules provide the 128 K bytes of common memory),

--SIO4: (Serial Input-Output) connects four independent serial asynchronous data transmission circuits to the local bus, the maximum data transmission speed is 9,600 baud per channel,

--PIO2: (Parallel Input-Output) connects two each independent, parallel, 8 bit hand-shake data transmission channels to the local bus,

--TVM: (Television Monitor) a module to display a quasigraphic image on an RGB color TV monitor in accordance with the OIRT standard. It is served from the local bus with "memory mapped" addressing.

Configurations put together from the modules described can be found in mechanics developed from the MMG-AM 19 inch rack and frame system, together with the power unit supplying the power.

Concerning the power supply we will mention here only that two independent 24 V storage battery systems guarantee uninterrupted power to the equipment provided by the MMG-AM. The power unit of the equipment is connected through a so-called "Dual Feed-In Adapter" to two 24 V power supplying networks. Under normal conditions the load is divided equally between the two power supplying networks. If, however, the voltage drops in one of them due to a short or other cause the Dual Feed-In Adapter automatically disconnects the equipment from it and simultaneously produces a failure signal to be passed on by the data collection system.

3. Equipment of the Data Collection System

In this section we provide a review of the equipment used in the system. (Here we understand by equipment the parts logically related to one another independent of whether they are in common or separate cabinets in regard to physical arrangement.)

3.1 The Data Receiving Real-Time Terminals (AFRT)

The "soul" of each AFRT is a microcomputer put together from the SAM-E module assortment. To this we connect, out of the process pre-connectors, two MULTITRAN units (a total of 128 analog inputs) and four GLVS units (a total of 192 static indicator inputs).

An optional operator's panel makes possible local data querying.

One of the serial, asynchronous data transmission channels provides a two-way data transmission link with the reserve path processor system (TUR) and the other provides this with the block computer. The transmission speed on both channels is 1,200 baud. Figure 2 illustrates the connections.

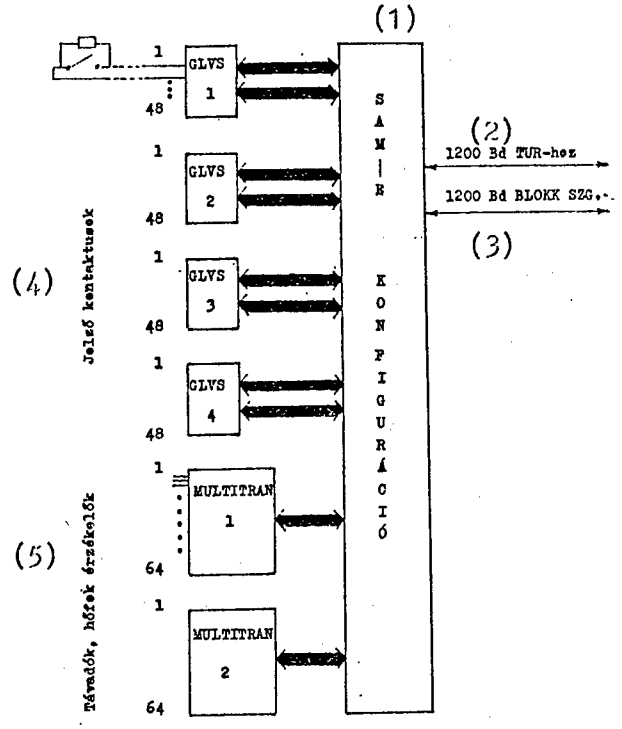


Figure 2. Block Diagram of the Data Receiving Real-Time Terminals

Key:

1. SAM-E configuration
2. 1,200 baud to the TUR
3. 1,200 baud to the block computer
4. Indication contacts
5. Remote transmitters, temperature sensors

There are 21 AFRT's in the data collection system for each nuclear power plant block, thus the volume of signals which can be handled per block is:

--analog signal input: 2,688,
--static indication input: 4,032.

The distribution of the analog signal inputs according to polling cycle time is:

Cycle Time (seconds)			Number
	1		35
	3		209
	6		1,101
	12		910
	60		433
Average:	7.25	Total:	2,688

The tasks of the data receiving real-time terminals are:
- --cyclic sampling of the inputs,
- --watching for changes in the inputs,
- --correction of errors deriving from the non-linearity of sensors with the polynomial method,
- --producing parameters appropriate for the analog inputs in the engineering units,
- --trend calculation on the measured parameters,
- --passing the current content of changed information to the reserve path system and to the block computer,
- --cyclic refresshing of the queried information on the control panel.

3.2 The Event Handling Subsystem

The event handling subsystem contains a microcomputer put togther from one MP 8501 module and four SAM-E modules. To this subsystem we connect those state indications any change in which must be reported immediately to the personnel managing the block (operating mode and check indications from protection equipment, more important control cycles and controls).

3.2.1 The Position Indication Receiving Real-Time Terminal (PFRT)

Four GLVS units are connected to a microcomputer put together out of the SAM-E module assortment. These receive those contact signals which show the position or change of position of the control rods in the reactor container. There are four contact signals for each rod, each combination of the four signals indicates a position of the rod, a change in the combination indicates movement of the rod. There are 37 control rods in the reactor container, so the number of inputs actually used is 148. Figure 3 illustrates the structure of the PFRT.

The tasks of the PFRT are:
- --determining the insertion length, in meters, corresponding to the position combinations,
- --watching for changes in the inputs, and
- --forwarding the current insertion length data and information pertaining to changes to the event handling concentrator (EKK).

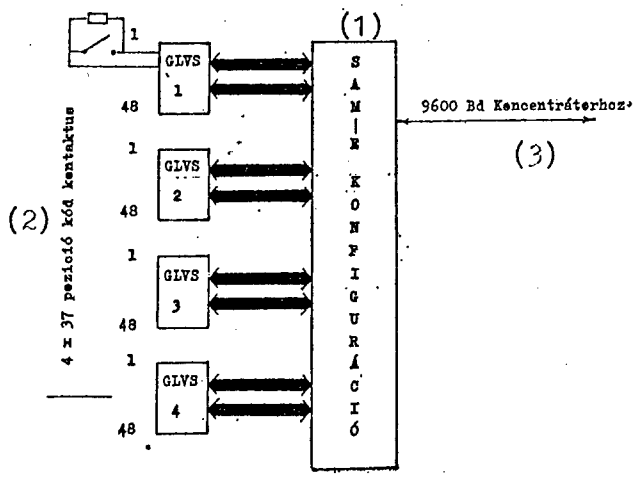


Figure 3. Block Diagram of the Position Indicator Receiving Real-Time Terminal

Key:

1. SAM-E configuration
2. 4 x 37 position code contacts
3. 9,600 baud to the concentrator

3.2.2. Event Indicator Receiving Real-Time Terminals (EFRT)
Four GLVD units are connected to a microcomputer put together from the SAM-E module assortment. These receive the so-called initiative signals, the sequential sensing or recording of which is indispensible for safe operation and for discovering the causes of possible failures. Figure 4 illustrates the connections of the EFRT.

There are three EFRT's in the event handling subsystem, so the number of initiative signals which can be received is 3 x 4 x 48=576.

The tasks of the EFRT's are:
- --cyclic polling of the interrupt checking inputs,
- --swift sensing of state changes in the indication inputs,
- --temporary storage, ordered in time sequence, of the state changes, and
- --forwarding the information pertaining to changes to the event handling concentrator (EKK).

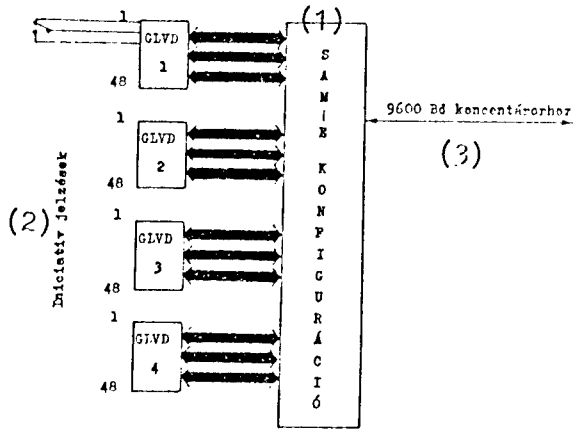


Figure 4. Block Diagram of the Event Indicator Receiving Real-Time Terminals

Key:

1. SAM-E configuration
2. Initiative indicators
3. 9,600 baud to the concentrator

3.2.3. The Event Handling Concentrator (EKK)
The five-processor microcomputer put together from the MP 8501 module assortment synchronizes the operation of the subordinate PFRT and three EFRT's and receives from them information pertaining to changes and the relative time data. The central clock of the nuclear power plant is connected to the EKK; it provides the system with precise time data at one minute intervals. Figure 5 illustrates the structure of the event handling subsystem.

The tasks of the EKK are:
- --to receive the change information coming from the subordinate terminals, and arrange it by giving it precise time data,
- --to forward the change lists, ordered by time, to the reserve path system and to the block computer, and
- --in periods free of events to give the current states and time data according to the central clock on the polling commands of the reserve path system and the block computer.

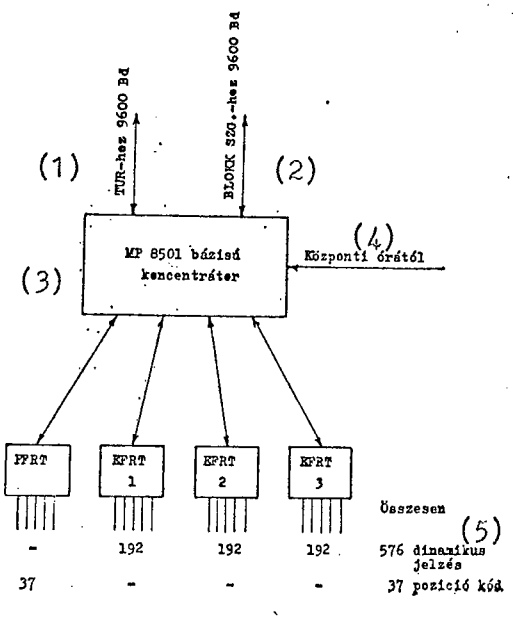


Figure 5. Block Diagram of the Event Handling Subsystem

Key:

1. 9,600 baud to the TUR
2. 9,600 baud to the block computer
3. MP 8501 based concentrator
4. from the central clock
5. Total:
   576 dynamic indicators
   37 position codes

3.3 The Reserve Path Processor System (TUR)

The role of the reserve path processor system has been discussed already in the first section. Here we will deal primarily with its structure and concrete functions. In regard to its structure the TUR consists of three parts:

--The part designated TURA is an eight processor microcomputer put together from the MP 8501 module assortment; with cyclic polling of the AFRT's it updates the recorded information;

--The part designated TURF is a seven processor microcomputer put together from the MP 8501 module assortment; on the basis of information transmitted by the TURA and the EKK it:

- --refreshes the information of the technological database stored in RAM,
- --forwards to the three display stations the information needed to refresh the images selected on them,
- --logs events on the printer,
- --prints out journal compilations on events selected by the operator, and
- --sends information designated for archiving or selected by the operator to the computer designated TURD, which plays the role of operator terminal.

--The part designated TURD is an intelligent terminal supplied with reliable disk units suitable for archiving tasks which is in information contact with the part designated TURF in the form of ASCII character sequences. At the request of the operators a TPA 11/440 configuration is used as the TURD

despite the fact that a terminal with smaller memory capacity and smaller disk handling capacity (e.g., a JANUS) would be suitable for this purpose.

Figure 6 illustrates the parts and connections of the TUR.

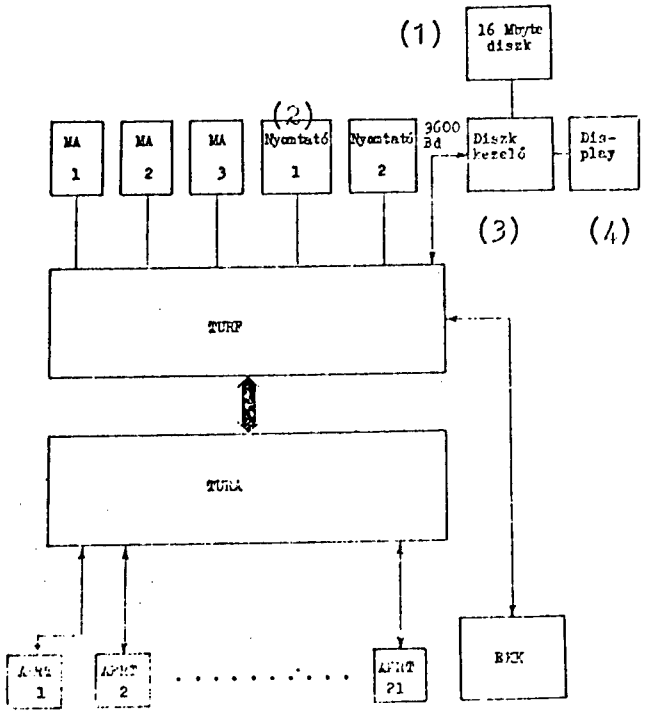


Figure 6. Parts and Connections of the Reserve Path Processor System

Key:

1. 16 M byte disk
2. Printer
3. Disk manager
4. Display

The processing tasks of the TUR are:
--producing data originating (calculated) from measurement data,
--comparing data on measurements duplicated for safety reasons,
--compiling journals,
--compiling data sequences to be archived, and
--evaluating state and change indicators.

3.4 Display Stations

The operating personnel maintain information contact with the reserve path system and the block computer with the aid of display stations.

For each block there are five display stations in the block control room and one each in the chief engineer's quarters and the auxiliary shop control room.

A display station consists of three main parts:
- --a four processor microcomputer put together from the MP 8501 module assortment (the electronics),
- --an alphanumeric-functional keyboard, and
- --an RGB color TV monitor meeting the OIRT standards.

The electronics of a display station can be connected simultaneously to the reserve path processor system and to the block computer. With the aid of the keyboard the operator selects from which he expects refreshing of the information of the selected image or which image he requests the display of. The reserve path processor system can serve a maximum of three display stations; of these two can be in the block control room and one can be in the chief engineer's quarters.

The TV monitor, with red-yellow-blue basic colors, displays 32 lines with 64 characters per line. The character size is 8 x 8 pixels. The character set contains, in addition to the alphanumeric symbols, a number of graphic character elements including characters which imitate movement (to illustrate flow or other changes).

The first and last lines on the screen are reserved for determined functions (precise time, event indication, event message, operator communication, etc.). The requested image appears in the field in between (the images can be tabular or graphic).

The image can always be broken down into two main parts:
- --an unchanging part appearing in fixed positions in the image, and
- --a changing part, also appearing in fixed positions.

Images called for with the aid of the functional keyboard go to the screen from the TUR within one second, the changing part is refreshed every few seconds, so the personnel working in the block control room get the desired fresh information quickly.

One can display or refresh in the images not only information stored in the technological database but also information derived from it by calculations or by logical operations.

4. Data Transmission Links

There is a serial, asynchronous data transmission link in the systems described and between the several items of equipment--with the exception of the link between TURA and TURF and with the printers. Data transmission is by character, generating a check sum by character group (by block).

The maximum 9,600 baud data transmission--with program interrupt per character--is a great burden on the microcomputers. The use of DMA data transmission units doing block transmission might have been more advantageous. But the devices for this--with the exception of the link between the display stations and the reserve path processor system--were not available; in contrast to this the experience with a number of our own reference systems guaranteed the reliability of the procedure used and of the hardware elements needed for it.

5. Further Development Possibilities

If the MMG-AM were to deliver a system of similar size for nuclear power plant tasks in the years ahead it would offer a system which was further developed in several respects. Thus:

--the data transmission links would be realized by high speed local networks at the higher levels (block computer-reserve path system, display stations, event handling and other concentrators),

--there would be concentrator microcomputers and real-time terminals in the system not according to the type of signals but rather according to the area and technological divisions,

--the real-time terminals would be installed near the technology and not in the central machine room (naturally in environment tolerant versions using circuit elements suitable for this), and

--the microcomputer system would do not only the data collection and processing tasks but also the regulatory and control tasks.

The device assortment proposed by the MMG-AM, developmental work on it began in 1986 in the Computer Technology Chief Engineer's Office of the enterprise, includes:

a. for the upper levels of the systems: VME bus, mono and multiprocessor configurations,

b. for the near technology level, using a CMOS element base:
   --a remote transmitter, encapsulated process link terminal,
   --an analog data collection terminal,
   --a PLC function control microcomputer,
   --a microcomputer subsystem to carry out regulatory tasks, and
   --a general purpose process control microcomputer which can be connected into a local network.

6. Summary

The article discusses the microcomputer data collection systems delivered by the MMG-AM and installed at the third block of the Paks Nuclear Power Plant or to be installed in the near future for the fourth block.

It describes the device base for the data collection systems, the process pre-connectors, the single processor SAM-E module assortment, and the MP 8501 multiprocessor module assortment which can be built up to eight processors.

It outlines the tasks of the equipment of the data collection systems. It deals with the data transmission links and with the possibilities for further development and finally outlines those devices which the MMG-AM intends to use in similar systems by the end of the decade.

8984
CSO: 2502/84

EAST EUROPE/COMPUTERS

COMPUTERS FOR HIGH PRESSURE GAS NETWORKS

Budapest ENERGIA ES ATOMTECHNIKA in Hungarian No 7, Jul 86 pp 297-299, 304

[Article by Erno Stukovszki, computer engineer, Gas and Oil Delivery Enterprise: "A Telemechanical System for High Pressure Gas Lines in Hungary," based on a talk given in a series titled "New Technology Days" organized by the National Petroleum and Gas Industry Trust with the cooperation of the Construction Industry Scientific Association 14-15 May 1985]

[Text] Control Technology Systems
It is a common property of the natural gas, petroleum and product systems operating under the guidance of the National Petroleum and Gas Industry Trust that one can find a delivery pipe network in each of the technical systems to fulfil its functions. The role of the network is to create a link between the sources (domestic, import and transit) and the consumers (domestic, export and transit) or processing centers. The networks serving the several systems are the same in many of their technical properties but they operate in different ways and so meeting different requirements is necessary to control them. The point to point transport of products--sometimes of different quality--is characteristic of petroleum and product delivery; this is closely coordinated with processing and distribution plans and with the available storage capacity.

The chief operational characteristics of the natural gas system are meeting the requirement of continual availability, spatial extension and dispersion, coordination in time and coordinating the differences in source output and consumption load, taking into consideration the meeting of import, export and transit obligations.

The telemechanization of the delivery lines is only part of the comprehensive automatic control and information system of the Petroleum and Gas Industry Trust. Within this the telemechanics of the petroleum, product and natural gas delivery lines are relatively autonomous systems--because of the differing operational circumstances. It is a known fact that the complexity of the pipeline system is increasing. The differing outputs of the sources, changes in load, breaking down import and transit deliveries according to a program and coordinating these in time and space and ensuring the pressure and output values prescribed in the contracts represent a task the solution of which is no longer possible with intuitive control. The system not only plays the role

of a delivery tool but also--because of the reserves in the pipes which can be temporarily mobilized--is a tool suitable for management, if the necessary information is available to the guiding organization. But an adequately precise determination of the status of the technical system requires the collection and evaluation--for a period of 24 hours--of about 10,000 data in such a way that sufficient time should be available for intervention ensuring the attainment of the desired status.

Figure 1 depicts the structure of the control technology system.

Technological Instrumentation

Parallel with the development of instrumentation there developed an "instrumentation conception" giving far-reaching consideration to the technological needs, a conception given its final form in the second half of the 1970's. The chief criteria of this are:

--The solution should ensure secure operation of the technological system.--Operation should take place with electric auxiliary power.--In general the control technology equipment located in areas where there is a danger of an explosion should operate with ignition spark free circuits, and should be in pressure resistant containers.--The automatic instrument system should fit in with telemechanics.The Telemechanical (TM) SystemsOn the basis of what has been described above the quantitative and structural development of the pipelines made necessary the control or automation of the lines. By the second half of the 1960's two stressed areas in regard to gas lines or two line systems had developed:--the ring lines supplying gas to Budapest, and--the central Hungary (Vecses-Hajduszoboszlo) system and its extension, Hauduszoboszlo-Miskolc-Ozd. A TM system for these two systems was developed in 1967 under the name of the Northern Telemechanical System (ETR). The Italian enterprise Pignone Sud (PS) delivered the system.Both the TM stations and the two centers (Master) located in Vecses and Hajduszoboszlo have discrete semiconductor, wired program module construction. Their teletype speed is 50 baud. By means of cyclic polling the centers provided the necessary information for the regional dispatchers in the form of schematic table display or postings. This information was:

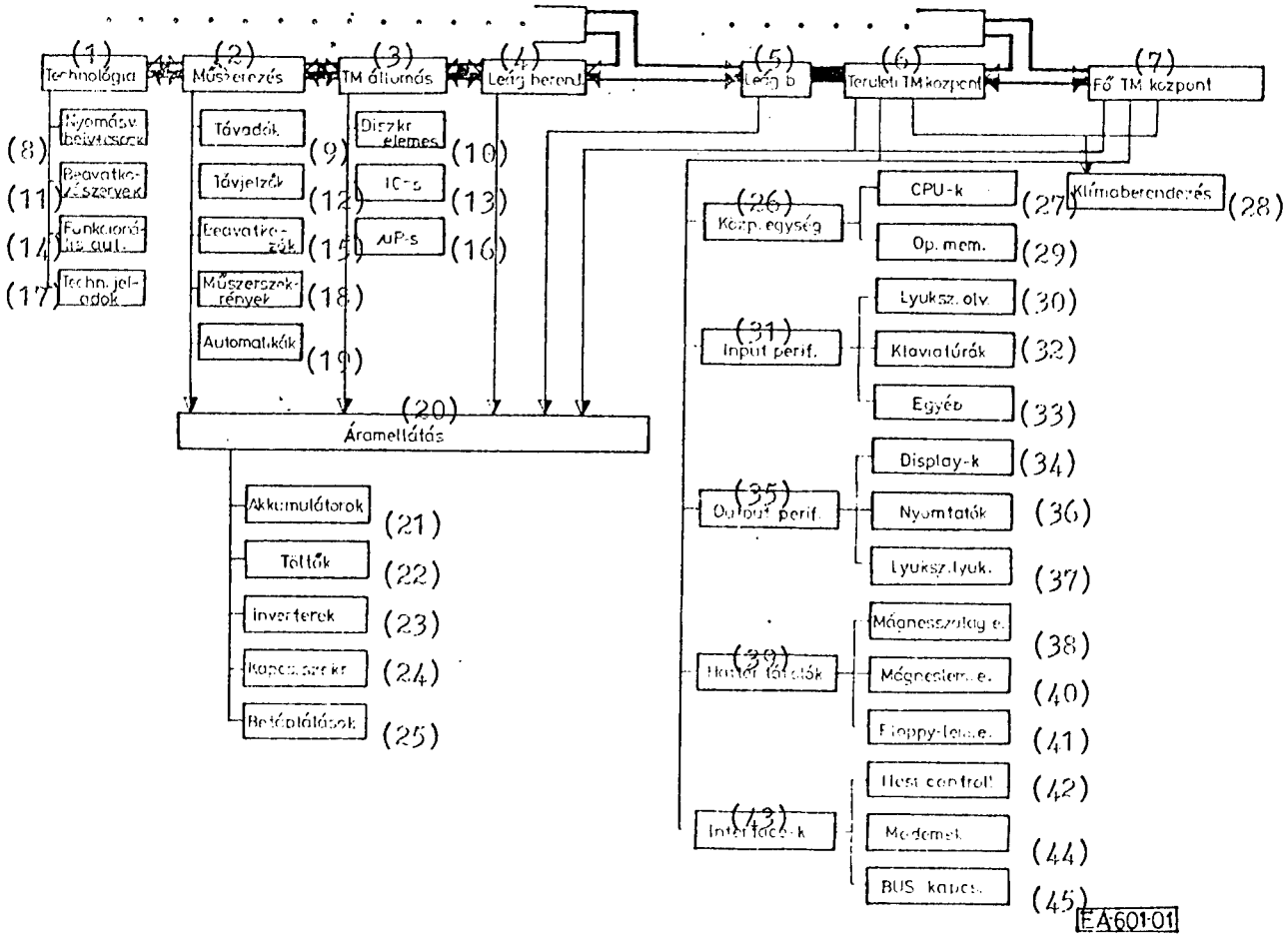


Figure 1.

Key:

1. Technology
2. Instrumentation
3. TM station
4. Branching equipment
5. Branching equipment
6. Regional TM center
7. Main TM center
8. Pressure setting
9. Remote transmitter
10. Discrete elements
11. Intervention organs
12. Remote indicators
13. IC's
14. Functional automatics
15. Interventions
16. Microprocessors
17. Technology signalling
18. Instrument cabinets
19. Automatics
20. Power supply
21. Storage batteries
22. Chargers
23. Inverters
24. Switch cabinet
25. Feed-ins
26. Central unit
27. CPU's
28. Air conditioning
29. Operational memory
30. Punch tape reader
31. Input peripherals
32. Keyboards
33. Other
34. Displays
35. Output peripherals
36. Printers

37. Tape punch
38. Magnetic tape unit
39. Background stores
40. Magnetic disk unit
41. Floppy disk unit
42. Host control
43. Interfaces
44. Modems
45. Bus coupling

--status and control of stop fittings,
--pressure relationships in the lines and the limit values assigned to them,
--pipe break indications,
--the volumes taken in and passed on,
--other technological problems and indications (odors, gas warming, power supply, etc.).

Looked at with today's eyes the Pignone Sud system is technically obsolete, but it is very reliable. So it is not by chance that these stations are still in operation after more than 17 years and have become parts of the new systems (the Fraternity and National Telemechanical System).

By the middle of the 1970's a large capacity gas line was completed which is outstanding from the viewpoint of supplying the country with gas.
--Fraternity I and II (national border-Leninvaros-Zsambok). This system was expanded at the beginning of the 1980's.
--Fraternity III/1 (Hajduszoboszlo is the "zero" point, Leninvaros-Hajduszoboszlo and Kistokaj-LKM [Lenin Metallurgical Works]-Kilian).

At the time of the Fraternity I and II investment it was decided to build the pipelines together with the TM system. The TM system was completed only at the end of 1980. Here for the first time there were branching amplifiers, originally developed for the dispatcher network, in the TM communications system.

Using these meant a number of advantages. For example:
--providing detours in the event of line failures,
--"insensitivity" in regard to line breaks and short circuits,
--providing standard transmission and reception levels.

The TM stations are integrated circuit devices made by MMG-AM [Mechanical Measuring Instruments Factory Automatic Works]. The data transmission speed is 200 baud. Stressed failure indications can be sent on to the center by a normal cycle interruption.

The intensive quantitative and "qualitative" growth of hydrocarbon transporting pipelines raised the problem that a suitable harmony must be produced between operations and guidance. The person who operates (maintains, repairs, develops) the pipeline system and its accessories must be located as close as possible to the system if he is to perform his task effectively.

Control from the TM center is not so bound to a place for this is rather a function of "terminating" at telephone lines, of the computer technology center or of the comprehensiveness of the individual.

Practice shows that the the optimum is integration of the TM centers at a higher level than that of the operating centers. This led to the present situation where four plus one regional centers operate with one main center, while the number of operating units is now fourteen.

A need arose for the affected operating centers to be provided with the necessary information from the data accumulated by the TM centers. On the basis of this ideology more operating centers got terminals (display and printer).

Immediately after the 1967 realization of the Pignone Sud TM system work started on the further development of the Northern Telemechanical System (ETR), to give it national scale. After a large number of preliminary studies and several investment programs, an investment program titled National Telemechanical System Phase I (OTR I) was prepared in 1980 under the auspices of the Gas and Oil Delivery Enterprise. This investment, about 300 million forints, was completed by the middle of 1984. The Regional Dispatcher Center (TD 1) was completed by June 1983 in a different investment but constituting an organic part of the OTR from the systems viewpoint.

The two chief factors for the OTR system were (figures 2 and 3):
--Bringing an ever greater portion of the volume delivered into the control system, and
--Creating regional centers and a main center which would provide a receiving area for more existing and to be created TM stations.

Taking the above factors into consideration and optimizing the possibilities the following solution was realized:
--The units (instrumentation, TM stations) of the previously described ETR system which could be used properly became parts of the new system. It was not possible to integrate the MASTER centers because of their excessive rigidity and limitations.
--Modular TM stations (32) made of microprocessor CMOS elements manufactured by the Nuovo Pignone firm were installed. Simultaneous with signing a delivery contract with the NP firm a license contract was signed between NP and MMG-AM. The future plan is that the telemechanization of the stations will be completed with NP 6008 data collectors manufactured by MMG-AM.
--Completing the instrumentation of the designated installations was handled by MMG-AM, doing the manufacturing and installation.
--Four Regional Dispatcher Centers (TD) were built:

TD-1, Leninvaros,
TD-2, Vecses,
TD-3, Kecskemet, and
TD-4, Siofok,

and a Gas Main Dispatcher Center (GFD) was built in Siofok.

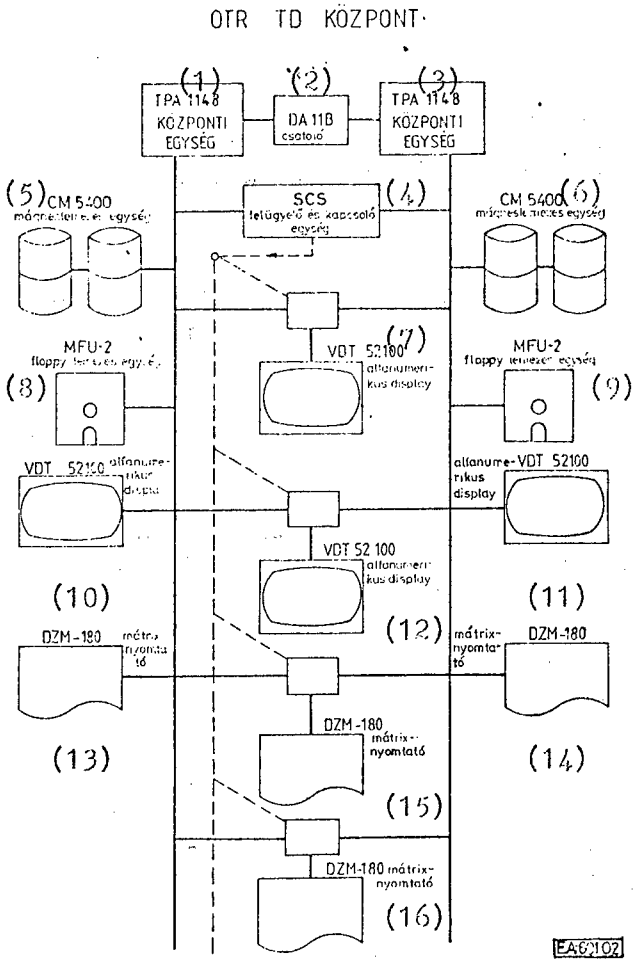


Figure 2. The OTR TD Center

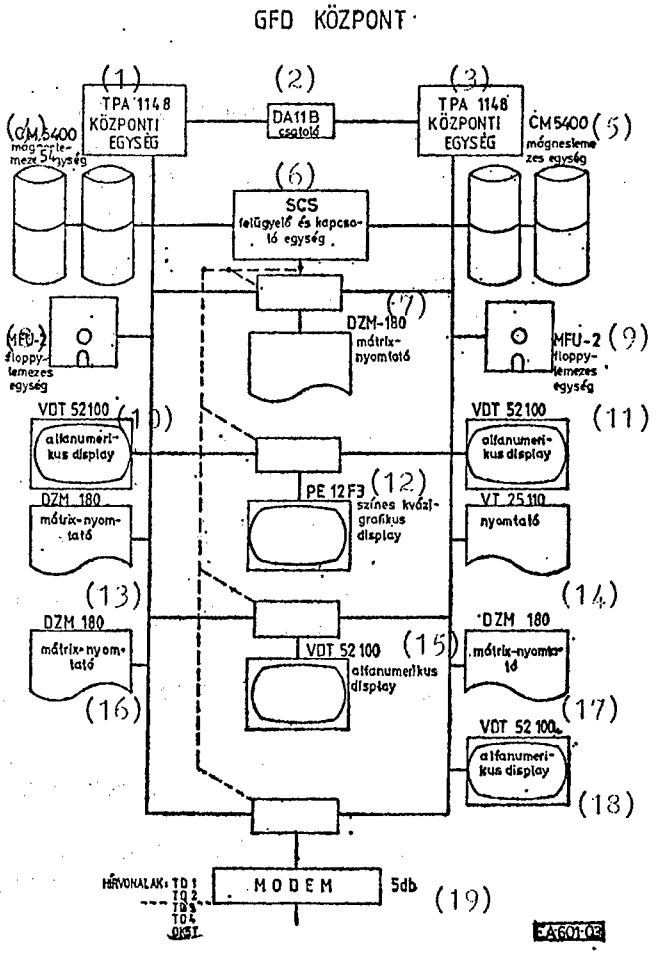


Figure 3. The GFD Center

Key:

1. TPA 1148 central unit
2. DA 11B coupler
3. TPA 1148 central unit
4. SCS monitoring and coupling unit
5. CM 5400 magnetic disk unit
6. CM 5400 magnetic disk unit
7. VDT 52100 alphanumeric display
8. MFU 2 floppy disk unit
9. MFU 2 floppy disk unit
10. VDT 52100 alphanumeric display
11. VDT 52100 alphanumeric display
12. VDT 52100 alphanumeric display
13. DZM 180 matrix printer
14. DZM 180 matrix printer
15. DZM 180 matrix printer
16. DZM 180 matrix printer

1. TPA 1148 central unit
2. DA 11B coupler
3. TPA 1148 central unit
4. CM 5400 magnetic disk unit
5. CM 5400 magnetic disk unit
6. SCS monit. and coupling u.
7. DZM 180 matrix printer
8. MFU 2 floppy disk unit
9. MFU 2 floppy disk unit
10. VDT 52100 alphanum. display
11. VDT 52100 aplahnum. display
12. PE 12F3 color quasigraphic d.
13. DZM 180 matrix printer
14. VT 25110 printer
15. VDT 52100 alphanum. display
16. DZM 180 matrix printer
17. DZM 180 matrix printer
18. VDT 52100 alphanum. display
19. Modem (five, with lines to TD 1, 2, 3 and 4 and OKST)

--Striving for a high degree of security in the centers and in the interest of providing a high level of availability we doubled the exposed resources such as the Host Controller (MMG-AM) TPA 1148 computer configuration (KFKI [Central Physics Research Institute]) which plays the role of TM manager.

When creating the OTR I system we gave far-reaching consideration to experiences acquired in already existing systems (ETR and Fraternity). On the basis of this:

--it has great flexibility and expandability,
--there is great flexibility in its communication system,
--instead of schematic tables the mode of display is a graphic display,
--minor developments in the system are guaranteed from its own resources.

In the course of realizing the OTR I, local computer controlled highly complex compressor stations entered the gas pipeline system.

The TD's and the GFD are prepared to operate these installations with remote control as needed and possible.

The OTR I system is already operating as a computerized network. The several centers are in data contact with one another on the communications lines and together they create the necessary resource for telemechanical control of the national hydrocarbon transporting pipeline system (gas, oil, pb, condensate, etc.).

Several indexes pertaining to the telemechanization of the hydrocarbon transporting system of the Gas and Oil Delivery Enterprise in its present state are:

--12 computers with 5 M bytes operational memory and 40 M bytes background memory,
--more than 100 telemechanical stations,
--150 instrumented installations, and
--8 computer technology based controls.

The conception for further development is unambiguously to make use of the given central capacity and to instrument the stations not thus far managed by telemechanical means and to complete their telemechanics.

8984
CSO: 2502/84

EAST EUROPE/FACTORY AUTOMATION

'MECHATRONIKA' TECHNICAL DEVELOPMENT COOPERATIVE ESTABLISHED IN HUNGARY

Budapest FIGYELO in Hungarian No 27, 3 Jul 86 p 22

[Article: "Electronics + Mechanics = Mechatronics, Indispensable Component of the Machine Building of the Future"]

[Text] Before one can accept the truth implied in the title of this article, the concept of mechatronics must be clarified. Mechatronics is the newest, dynamically developing frontier science. Its goal is the creation of qualitatively new kinds of machinery and mechanical systems by a fusion of advances in electrinics, data processing, computerization, control technology and, last but not least, mechanics.

Design, construction, and propulsion of machines have undergone enormous development prior to reaching today's modern, multi-axis electric driving systems. In spite of tremendous development in this field, it is only in our day and age that revolutionary changes are beginning to unfold. The preconditions for this were given by electronics, and by research and development conducted by the use of data processing, computerization, measuring, and control techniques built on the achievements of electronic technology. In our times the next step is obvious: let us combine electric command systems with electronics already replete with the above mentioned advances. Thus electonics, capable of executing total operation, or of controlling moving parts up to the level of electric propulsion, in combination with mechanics capable of receiving such commands, make up MECHATRONICS. Applied mechantronics can already boast about representative creations in the form of robots, work centers, flexible assembly modules and production systems.

Last year the Mechatronika Technical Development Cooperative was established in Gyongyos. The aim of its members is to strengthen the program spelled out by the name of the cooperative. Upon establishment, TESZM placed the cooperative in the category of purveyor of general technical development services.

The activies of mechatronics may be arranged into three groups:

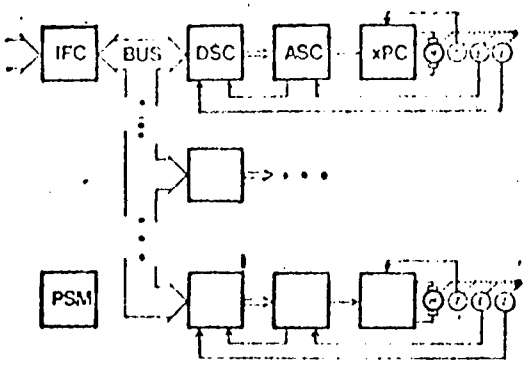
--hardware and software development for electronic systems and components,

--experimental pilot production and large-scale production, measuring, and quality control development services, and

--data processing services.

DC-IMS intelligent motor control system

IMS-IFC interface and BUS control module



Using an initial capital outlay of 1 million forints, the goal is to reach a sales volume of 500,000 forients per worker. As early as 1986 an internal development program with a volume greater than one half of total capacity is designed to assure dynamic development. The primary purpose is to develop marketable products, to create exportable, import-replacement electronic components which may be used as module elements, as well as the preparation for the assembly line production and manufacture of the latter.

The cooperative's products are good examples of this practice. As a result of concerted internal development efforts, they have completed the IMS--intelligent motor control system. The IMS is a module in installations and systems containing electric motors. The function of the complete IMS is the intelligent control of the command-interpretative, regulatory, power driving, and automatic data feedback tasks between the motors which perform functional control and movement execution. Individual IMS modules may be utilized as independent components in electronic devices driving, commanding, or regulating electric motors.

The IMS system developed for installations containing AC and DC motors is modular regarding both hardware and software. Its general configuration is, with in a wide range, independent of the quality and type of the installation's central control module, of the number of motors drive, of the paramenters of the individual motors, and of the quality and complication of the motion to be performed.

Designs of different variants, their adaptability, function, reliability, and documentation make it possible for the installation manufacturers to use them as components in a wide variety of applications (from a one-motor transfer mechanism to industrial robots with several degrees of freedom).

The IMS--intelligent motor command system, in its complete design, may be composed of the following functional elements:

IMS--IFC: interface BUS controller,

IMS--BUS: internal BUS system,

IMS--DSC: digital servo controller,

IMS--ASC: analog servo controller,

IMS--SPC: switching power supply controller,

IMS--APS: analog power supply controller,

IMS--PMS: power supply module.

The OP3--IMS, built using the IMS system, has been in operation for several months as a glass industry material handling device at the Oroshaz Glass Factory. Another IMS system is one of the main components in a research and development project for the development of a command system for an industrial robot with 6 degrees of freedom being conducted at the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences. Both machines put in a successful appearance at this year's Budapest International Fair.

The command system for a hollow-ware production line is a most interesting device, in whose technical development we participated. This production line was developed and delivered to socialist countries by the Gyongyos factory of Tungsram. The factory completed a more modern, large capacity version of this machine. At the same time, the glass industry commissioned the cooperative to develop the electronic command system domestically (IS--command). The pilot program of this electronic command device is already in operation, which means that this is also an accomplished task. We took on the small-scale production of electronic command systems.

A job of a smaller caliber was the development and manufacture of the electronic command module ordered by Plant IV of the Spare Parts Manufacturing and Supply Enterprise of the Light Industry for stamping machines (light industry presses for the stamping of leather soles and uppers). Mechatronika assumed the design and development of the device, including a quality guarantee. According to word from the principals, electronic malfunctions stopped upon installation of the device. Our international partners, too, had nothing but praise for the device, 500 pieces of which are on order for serial production in 1986.

Another item of note is the reliable electronic command system made for the Kombi gas furnace burner of Firearm and Gas Equipment Factory. We completed

development and received an order for delivery of 1,000 pieces. The same factory further commissioned the cooperative to design and develop the technology needed for large-scale, serial production.

By enumerating the above products we did not mean to set limits to, but rather to characterize this electronic and mechatronic development/production activity. A common denominator of all products is that they are concrete realizations of the results of mechatronics. In this spirit, the well prepared staff of experts at Mechantronika Technical Development Cooperative is at your entire disposal in solving any development or re-design problems of your products or tools of your trade.

12759/6662
CSO: 2502/76

EAST EUROPE/LASERS, SENSORS AND OPTICS

USE OF LASERS IN CSSR AGRICULTURE

Prague TECHNICKY TYDENIK in Czech No 27, 1 Jul 86 p 3

[Article by Jan Hruby: The Laser's Red Light Awakens Life]

[Text] A truly revolutionary way of effectively increasing yield--usually by several dozen percentage points--was successfully developed by researchers at the Agricultural College in Brno. At a minimal cost they increased, for example, the yield of seed grain by 8-12 percent and increased the yield of alfalfa and particularly red clover by as much as 30 percent and, most importantly, increased the amount of sugars and albumen in the feed matter, producing a so-called balanced feed which cattle tolerate better. Moreover, the richer clover can be processed into dried feed more easily without the use of additives. One can continue to list remarkable results. For example, the yield of both flax fiber and seed has been increased. Substantially better yields have also been reported for fruit-bearing vegetables such as peppers, tomatoes and cucumbers, and almost unbelievable things are being dong with legumes, particularly peas; the amount of sugar in sugar beets was increased.

During the Seventh 5-Year Plan 10 agricultural enterprises in southern Bohemia conducted laboratory experiments, and their economic results demonstrate their effectiveness.

All this began in the Laboratory of Electronic Microscope and Laser Technology at the Agricultural College in Brno. It was initiated by a 5-member collective which had written improvement proposal No 11/81, including Eng Jiri Vancura, laboratory chief, Eng Josef Musil, chairman of the unified agricultural cooperative of Czech-Bulgarian friendship in Lipovice in Blanensko, Eng Rudolf Stepanek, director of laser technology development in Metro Blansko, Eng Vojtech Reznicek from the Agricultural College and Dr Barbara Doubkova, a medical doctor from Brno.

After many repeated experiments they discovered that seeds treated with laser beams have a faster germination rate. Later in experimental plots they also found that young seedlings form a good root system and strong stalks much faster. At a later stage it is obvious even without taking measurements that plants develop better because they are able to absorb more nutrients and that stronger plants are more resistant to disease and pests. Very good results, as was later confirmed at areas under

cultivation of the agricultural enterprises, have been achieved in winter crops which are not affected by frost and get off to a quicker start in spring. That sequence leads to higher yields and better quality of crops of all cultivated plants. However, results vary with different types of plants and varieties; location, and the amount of moisture in the soil, etc., also affect results in different ways. We cannot therefore generalize on the basis of results obtained in specific cases.

The new method of preparing seed grain for sowing in grain and fodder culture is of greatest importance. Remarkable results have been achieved at the State Farm Znojmo in growing fruit-bearing vegetagles at the Enterprise Osevy in Jaromerice and Rokytnov.

Recently, research on the greater vitality of seed treated with lasers has been made part of the state task of technological development called Regulations of the Integrity (wholeness) of Cultivated Plants in Relation to Their Productivity. Research is being conducted to find out where and according to what laws the energy of photosynthesis is deposited in the plants and to find a method of channeling it so that it is absorbed into the most beneficial part of the plant. The experiments with lasers revived scientists' interest in phytochromes, which are present in leafy vegetation. It is known that they influence seen germination plant growth and that they are extraordinarily sensitive to red light with wavelengths of 660 to 730 nm. They encode the plants' response to light which determines their response to long and short days.

Work on the project is directed by Prof Dr Eng Jiri Sebanek, doctor of science, chairman of the department of botany and plant improvement. He says:

"It is not the first time in the history of science that practice has overtaken theory. The effort to stimulate plants and their genetic material to greater efficiency by means other than breeding is not new. For example, stimulation of plant hormones is well known. The laser beam is another, very effective means. Laser technology opens up new possibilities because it has become affordable and because it is productive. Science will have to determine why genetic plant material also reacts strongly to light of atypical wavelength. It could be simply because it is not very much shorter than 660 nm. However, one could also hypothesize that it is due to the quality of the laser beam, and on that basis formulate a number of variants for further increasing its effect. The aim of scientific research will be to explain these relationships so that they can be put to effective use."

Let us also hear from a specialist in practical application, Eng Josef Musil. During our visit to Jedovnice we inspected the laser device installed in 1982. This is the first production line in CSSR with an output of 400 to 600 kg/h. It cost approximately 250,000 Kcs, but it paid for itself in less than a year. The chairman of the cooperative assured us that the most pressing need at this time is to double the output of the device, so that it could process all the seeds needed for

both spring and fall sowing. He shares the opinion, Antonin Zouhar, that, apart from increased output, they will be able to economize on chemical sprays because laser-treated plants obviously do better and are more resistant.

The laser device that was installed in Jedovnice basically does not differ from the experimental one in the laboratory of the Agricultural College in Brno. The difference lies in the output and in certain details, for example the arrangement of the optical system, as well as in being equipped with 2 lasers.

However, we are not a specialized agricultural magazine and, moreover, it is not possible to give detailed instructions in this article on building a laser device for preparing seed grain for sowing. Therefore, in brief: the operation of laser equipment is controlled by appropriate regulations, which primarily concern the protection of eyesight because reflected light can damage the retina! No less important is the admonition that it is essential in processing seed to adhere to a definite schedule, particularly for the duration of irradiation (seconds). A method appropriate for different plants and varieties has already been devised by laboratory workers. Of course, it is the authors of improvement proposal No 11/31 who have the most knowledge and experience.

12605/12828
CSO: 2402/32

EAST EUROPE/MICROELECTRONICS

VAPOR PHASE EPITAXIAL GROWTH OF GaAs LAYERS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 36-39

[Article by Imre Gyuro, Karoly Somogyi and Akos Nemcsics, scientific workers at the Technical Physics Research Institute of the Hungarian Academy of Sciences: "Vapor Phase Epitaxial Growth of GaAs Layers and Factors Influencing Homogeneity"]

[Excerpt] GaAs vapor phase epitaxial growth is a widely used procedure to produce layer structures for use in microwave devices. We describe the theoretical basis for the procedure used by us, based on the chloride method, and describe the devices produced. We describe the effect on the homogeneity of layer thickness produced by the several growth parameters (temperature gradient, flow speed in the H_2 branch, $AsCl_3$-I) and give an interpretation of these effects.

In our institute we use a procedure based on the chloride method with the aid of which we prepare layer structures of Gunn, Schottky and varactor diodes and MESFET transistors.

8984
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

DEVELOPMENT, TEST PRODUCTION OF GaAs PARTS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 33-35

[Article by Dr Imre Mojzes, leader of main department, Technical Physics Research Institute of the Hungarian Academy of Sciences: "Development and Experimental Manufacture of GaAs Based Parts Between 1980 and 1984"]

[Text] Foreword
The editors of FINOMMECHANIKA-MIKROTECHNIKA have made it possible for us to put together a special issue on the results of the research and development activity taking place in the microwave devices main department of the Technical Physics Research Institute of the Hungarian Academy of Sciences (MTA MFKI). In essence the activity embraces an entire innovation chain ranging from the epitaxial growth of gallium arsenide layers through the production of microwave active semiconductor devices to the development of simpler assemblies not primarily used for communications engineering purposes. Naturally this presumes the conduct of targeted basic research, research to lay the foundations, which relies on living traditions deriving from the character of the institute. We have concentrated the work of the main department on the following three areas:

1. A study of the metal-semiconductor mutual effects,
2. Development of GaAs based microwave active elements, and
3. Development and testing of assemblies and automation applications questions.

In what follows we want to describe a few new achievements in these three areas. Naturally the results discussed are the achievements of a research collective, of the researchers and assistant personnel alike. In the name of the authors I would like to thank them for their contribution here.

Summary
We summarize below the chief results of the work done between 1980 and 1984 at the Technical Physics Research Institute in the area of research and development on GaAs based parts in the area of developing microwave active devices. The results illustrate the use made of results achieved or information acquired in the course of considerable earlier basic research. We also turn to the experiences provided by an experimental manufacturing base created in the course of making use of the results.

1. Antecedents

Research on compound semiconductors (GaAs, InSb, GaP, InP) has been done at the MTA MFKI since its founding. Initially this meant primarily luminescence research; later there were achievements noted even internationally in research on and production of heterojunctions. In the initial phase of research there was a study of different types of compound semiconductors; the chief emphasis of the research was limited primarily to research on the physical phenomena which could be observed in these systems. The institute had laboratory level technologies suitable for the production of some of these compound semiconductors (e.g., GaAs) and it had the basic instrument inventory needed to study the physical phenomena.

The so-called Gunn phenomenon, the great discovery of the mid-1960's, gave the first impetus for our development of modern solid body microwave generators. The device structure required solution of a series of special physical, measurement technology and technological tasks. The initial goal of the development was creation of prototypes of a pulse operating Gunn diode. Even while developing the first device we consistently stuck to the idea that the parameters of the devices we were developing should correspond to the needs of industrial users who might make use of the parts. The institute received a commission from the TKI [Telecommunications Research Institute] to develop the first device, and it enjoyed the moral and material support of the KGM [Ministry of Metallurgy and the Machine Industry]. After the successful conclusion of the development, the first continuously operating, 7 GHz frequency Gunn diodes were made in the first quarter of 1975.

In the following 5-year plan--again on the basis of user needs--the development of three devices began: a Gunn diode, a Schottky diode and an IMPATT diode. Prototypes of pulse operating and continously operating Gunn diodes and then of a Schottky diode were prepared; because of changes in user needs there was no need to develop the IMPATT diode.

Even at the beginning of the developmental work a need arose for device oriented research as a continuation of research on physical phenomena; this included the solution of tasks requiring the development of special measurement methods with which the institute had not dealt earlier (e.g., microwave measurement techniques). The results of this activity are embodied in the development of finished, industrially tested devices making it possible for us to develop well utilizable solutions for a large part of the physical, technological problems which arose in the course of research.

2. Basic Research Achievements

Although the article lists the results in the area of the development of GaAs based devices at the institute it is especially important to mention the professional contacts in the area of basic research achievements and the institutional background in general which contributed to achieving the results listed below--not dealt with in detail because of the limitations of space. Thus we must mention the work done in the area of structure research and material studies.

As we noted earlier the institute had traditions primarily in the area of so-called phenomenon research. In the study of phenomena significant research activity developed primarily in the area of a study of galvanomagnetic phenomena. The results achieved in the area of a study of galvanomagnetic phenomena meant a secure foundation in classifying epitaxial layers and in measuring the device physical parameters. In the former area we should mention primarily our achievements in the area of magnetic resistance changes and in the latter area we whould mention primarily our achievements in the area of specific contact resistance and thermal resistance measurement--frequently cited even internationally.

Among the research achievements pertaining to materials science we should mention the knowledge we obtained in the area of epitaxial growth of GaAs and studying the effect of the circumstances of growth.

The study of metal-semiconductor mutual effects constituted that basic research area which meant a very substantial contribution to device research. We should mention our studies in the area of vaporization of volatile components, thin phase epitaxia and formation of ohmic contacts. We should also mention the results achieved in the area of large scale transport phenomena and the study of deep layers.

3. Device Development

3.1 Development of Gunn Diodes

Table 1 shows the chief data for the Gunn diodes developed at the institute.

Table 1. Gunn Diodes, Typical Characteristics (at 25 degrees Celsius)

Continuous operation output power	P_{CW}	(5--200) mW
Pulse operation output power	P_1	(5--300) mW
Frequency	f	above 7 GHz
Efficiency (minimum)		1 percent
Power voltage (continuous)	U_{BC}	(5--15) V
Power voltage (pulse)	U_{BI}	(8--25) V
Power consumption	I_B	(0.1--1.1) A (depending on output)
Operating temperature	T	(-55--+50) degrees Celsius

In the course of device studies we got very important data pertaining to metal-semiconductor mutual effects from the materials science and reliability studies. We should note that essential steps in device technology took place on the basis of an institute service patent, providing the very good parameters of the finished devices, even by international standards.

In the course of the development many-sided cooperation developed with the institutions and enterprises using the device (TKI, BME [Budapest Technical University], FMV [Precision Engineering Enterprise], MOM [Hungarian Optical Works] and Orion).

The development of this device resulted in the accumulation of much information which could be well used in later device development also (ohmic contacts, crystal growth, measurement techniques).

3.2 Development of Schottky Diodes

The development of Schottky diodes suitable for microwave mixing and detector purposes ended with success. Tables 2, 3 and 4 show the parameters of the diodes developed.

Table 2. Schottky Diodes; Typical Characteristics (at 25 degrees Celsius)

Breakdown voltage	min. 3 V typical 20 V with a blocking current of 100 micro A
Series resistance	max. 10 typical 5 Ohm
Capacity of diode junction	typical 0.08 pF 1 MHz, 0 V bias voltage
Full capacity	typical 0.25 pF 1 MHz, 0 V bias voltage
Encapsulation, S4	series coaxial S4
L1	series coaxial LID

Table 3. Mixer Diode Types

Type	Noise Factor*
S 401	max. 5 dB**
S 411	max. 5.5 dB
S 421	max. 6.5 dB
L 101	max. 5 dB***
L 111	max. 5.5 dB
L 121	max. 6.5 dB

* Measured at a frequency of 7500 MHz in a GIT 70 type mixer.
IF: 70 MHz; noise factor of IF pre-amplifier 1.5 dB.
** Equivalent type MEDL (AEI) DC 1304 C
*** Equivalent type MEDL (AEI) DC 1301 C

Table 4. Detector Diode Types

Type	Voltage Sensitivity*	Minimal Tangential Sensitivity**	Video R Type
S 4 D01	min. 5 mV/micro W	-60 dBm	
S 4 D11	typ. 8--10 mV/micro W	-55 dBm	1.6 k Ohm
S 4 D21	typ. 8--10 mV/micro W	-50 dBm	

* Measured in tuned assembly.
** Band width of pre-amplifier measured at 3 dB points 20 Hz--20 kHz.

By the end of the 1970's we had developed structures which, on the basis of the type tests done, resulted in semiconductor devices of suitable quality. It should be mentioned that in the course of realizing the Schottky technology we had to solve oxide precipitation on the surface of the GaAs and the photolithographic processing of the very small structures determined by the device.

3.3 Varactor Development

The need for assemblies which is detailed below created a need for us to produce a modern GaAs varactor. Making use of the earlier device development experiences, we succeeded in making and testing, within one year from specification of the target type, a GaAs tuning varactor with very good electric parameters. In the course of the developmental work it was our experience in GaAs epitaxial growth technology and device technology which made this brief development time possible. Table 5 shows the parameters of the tuning varactor.

Table 5. GaAs Tuning Varactors; Typical Characteristics (at 25 degrees Celsius)

Minimal breakdown voltage (V_B)	(-10--30)V
Minimal capacitance coverage on the chip ($C_{JO}/_{JVB}$)	3--12
Capacitance for zero bias voltage (C_{TO})	(0.6--8)pF
Minimal quality factor at -4 V bias voltage at 50 MHz (Q)	500--12,000
Operating temperature	(-55--+70) degrees Celsius

Encapsulation: The tuning varactors are mounted in coaxial metal-ceramic or LID capsules.

3.4 Development of a Microwave Transistor (MESFET Type)

The development of microwave signal generating, detecting and tuning diodes made necessary an expansion of the GaAs device family thus being created with a microwave transistor which is required by modern circuit design. Development of a microwave transistor poses very extreme crystal growth and device technology requirements. The developmental work is now in progress and the first model transistors of GaAs have been made already.

3.5 Development of Assemblies

Even during the development of the first devices we recognized that for a number of users the devices we developed would represent well utilizable parts if they could get them mounted in smaller subassemblies, already tested, and thus avoid having to use a special inventory of microwave measuring instruments. This requirement started the development at the institute of simpler microwave assemblies not serving communications engineering goals. As our first achievements we produced a microwave transceiver and a Doppler assembly. Following this we developed a special microwave assembly requiring a very great intellectual expenditure. We have sold commercially the assemblies produced in our institute; because of the great demand we are now handing over their manufacture to an industrial enterprise.

Summing up, it can be said about the development of microwave devices that this proved to be a good goal economically and professionally and in the course of the activity we made good use of our basic research achievements.

4. Organization Of and Experiences With Experimental Manufacture

In a certain sense it is an irregular thing for the organization of small series experimental manufacture to come up in an Academy institute. In our case this is justified in part by the complex technological operations required by the specifics of the devices, the special instrument inventory and the small number of devices produced. The devices developed are of such a type that only several thousand of them are used within one country so it is unnecessary to create a special technological line with rather great expenditure to produce them. So it became possible to use the tool and instrument inventory used in the course of the research and development activity to organize experimental manufacture, within certain limits. In agreement with those commissioning us, or with the users, we set the manufacturing capacity of the institute at 3,000 good devices per year. Now, after the initial run-in period, we are exploiting the capacity well and have expanded it somewhat by improving or automating the technical level.

8984
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

QUALIFICATION OF n-GaAs EPITAXIAL STRUCTURES

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 41-43

[Article by Karoly Somogyi, scientific worker at the Technical Physics Research Institute of the Hungarian Academy of Sciences: "Concerning Qualification of n-GaAs Epitaxial Structures"]

[Excerpt] In the article we describe the most important qualifying characteristics of GaAs epitaxial structures containing only an n type layer and we describe those methods with which the qualification is done

We describe the basic methods for qualifying GaAs based layer structures intended for microwave purposes. In connection with this we intend to indicate by means of a unique example one of the special problems arising in the course of qualification. This clearly illustrates on the one hand that for the most part a knowledge of the physical content hiding behind the several parameters is possible only with a knowledge of the content of the measurement and on the other hand that it is absolutely necessary to have close cooperation among the experts producing the layer structure, those performing the qualification and those preparing the device, working out the definitions and interpretations among them.

8984
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

APPLICATION TESTING OF GUNN DIODES OVER 10 GHz

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 44-46

[Article by Dr Tibor Berceli, chief of scientific main department, and Kalman Juhasz, scientific worker, of the Telecommunications Research Institute, and Karoly Kazi, scientific worker, Dr Imre Mojzes, chief of scientific main department, and Bela Szendrenyi, scientific assistant, of the Technical Physics Research Institute of the Hungarian Academy of Sciences: "Application Testing of Gunn Diodes for the Frequency Band Above 10 GHz"]

[Excerpt] In the article we report on microwave tests of Gunn diodes developed for the frequency band above 10 GHz. We also measured the temperature effects--important from the viewpoint of use. The measurements were done in both coaxial and waveguide resonators.

8984
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

DEVELOPMENT, SMALL SERIES PRODUCTION OF GaAs BASED SCHOTTKY DIODES

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 47-51

[Article by Dr Bela Szentpali, chief scientific worker, and Mrs Tibor Nemeth and Dr Adam Tichy-Racs, scientific workers, of the Technical Physics Research Institute of the Hungarian Academy of Sciences (MTA MFKI): "Development and Small Series Production of GaAs Based Schottky Diodes"]

[Excerpt] In the article we report on the results of the development of a GaAs Schottky diode at the MTA MFKI. We briefly describe the design principles, the technology used for small series laboratory production and the testing methods.

8984
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

DEVELOPMENT OF GaAs BASED MICROWAVE SCHOTTKY TUNING VARACTORS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 52-55

[Article by Zsolt Horvath, Mrs Tibor Nemeth, Imre Gyuro and Karoly Kazi, scientific workers, Dr Bela Szentpali, chief scientific worker, and Dr Ivan Szep, scientific consultant, of the Technical Physics Research Institute: "Development of GaAs Based Microwave Schottky Tuning Varactors"]

[Excerpts] The development of GaAs based microwave Schottky tuning varactors is one of our device development activities. The article briefly describes the physical bases of the functioning of the device, the design considerations, the technological procedure and the more important results of the development and of the related studies--the breakdown properties of the GaAs-CrAu junctions and the barrier height values as a function of doping concentration, the character of the doping profiles and the tuning characteristics--and draws conclusions regarding further tasks.

Summary
The most important step in varactor design is optimizing the doping profile to the smallest series resistance value. The chief obstacle to reducing series resistance is the relatively small value of the breakdown field strength, which is a good bit greater and less concentration dependent in the case of mesa structures than in the case of planar structures.

In the event of using a mesa structure the series resistance of the active layer of varactors can be reduced to one third or one fourth. The barrier height values obtained for the GaAs-CrAu junctions still indicate current leakage in the case of mesa structures also. This makes necessary the solution of surface passivation after mesa etching.

The most delicate part of production is manual control of the doping gas during epitaxial growth, which makes it very difficult to produce devices with the planned parameters. Although broad band tuning and linear tuning characteristic varactors were produced, larger volume manufacture will require automatic doping gas control.

8983
CSO: 2502/83

EAST EUROPE/MICROELECTRONICS

ACCOMPLISHMENTS OF TECHNICAL PHYSICS RESEARCH INSTITUTE

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 2-3, 1986 pp 56-87

[The February-March 1986 special issue of FINOMMECHANIKA-MIKROTECHNIKA is devoted to articles on the accomplishments of the Technical Physics Research Institute of the Hungarian Academy of Sciences (MTA MFKI). The following is a list of those articles from this issue which are not translated or excerpted elsewhere. Except where noted otherwise all author affiliations are MTA MFKI.]

"Au-Ge-Ni Ohmic Contacts in $A^{III}B^{V}$ Compound Semiconductors," by Robert Veresegyhazy, Dr Balazs Kovacs and Dr Imre Mojzes.

"Testing of Microwave Metal-Ceramic Diode Capsules," by Akos Fogt, Karoly Kazi, Attila Toth, Dr Imre Mojzes and Dr Bela Szentpali.

"Technological Trends in the Photolithographic Production of GaAs Based Submicron Structures," by Dr Janos Szabo. [The article is essentially a review of the literature and all 30 citations are in the English language.]

"A Microwave Transceiver Unit for the 10 GHz Frequency Band," by Ferenc Csanyi, Laszlo Dobos, Istvan Jaszberenyi, Karoly Kazi, Dr Imre Mojzes, Antal Olah and Dr Adam Tichy-Racs.

"An Intelligent Measuring System for Qualifying a Varactor Tuned Microwave Oscillators," by Robert Veresegyhazi, Karoly Kazi, Dr Imre Mojzes, Sandor Biro, Peter Harmat and Gyorgy Fule.

"Development of Microwave Transmitter and Receiver Modules" by Dr Bela Szentpali, Dr Imre Mojzes, Gyorgy Reisinger, Karoly Kazi and Dr Adam Tichy-Racs of the MTA MFKI and Laszlo Ivanics, director general, Peter Bodolai, plant leader, and Bela Szucs, technologist, of the Industrial Instruments Factory, Iklad.

"Use of Microwave Technology in Solving Measurement and Control Technology Tasks" by Dr Imre Mojzes, Karoly Kazi, Dr Bela Szentpali, Dr Adam Tichy-Racs, Gyorgy Reisinger, Antal Olah and Istvan Jaszberenyi.

8984
CSO: 2502/83

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

PRESIDENT OF ACADEMY OF SCIENCES IVAN T. BEREND INTERVIEWED

Budapest NEPSZABADSAG in Hungarian 7 Jun 86 p 5

[Interview by Denes Kovacs: "About the Results, Problems of Research"]

[Text] This year's general assembly of the Hungarian Academy of Sciences, our country's preeminent scientific institution, completed its work only a few short weeks ago. We talked with Ivan T. Berend, who was elected president of the Academy last year, about the work of the assembly and about some lessons to be learned from the exchange of ideas there, lessons which will affect scientific activity and Hungarian public life in general.

[Question] General assemblies of the Hungarian Academy of Sciences usually give an accounting of the latest results achieved by science. How would you summarize this accounting?

[Answer] Drawing up a balance sheet was not a central task of the 1986 general assembly, since we are preparing for next year's evaluation of five years of scientific achievement. In any case, one year is an extremely short time in this field. The words spoken more than a hundred years ago by Janos Arany [19th-century classic poet], then general secretary of our Academy, in his report to the general assembly, are just as appropriate today: "They say that 'science advances taking giant steps' ... But the observer who ... watches only one year's activity of the academy would find it difficult to observe such giant steps ... instead of exceptional advances, he would see small-scale tinkering which ... adds no more than a speck of dust to the stocks of science."

Well, with our own "specks of dust" we were able, in spite of the conditions of the past few years, which have been difficult and are becoming more so, to increase "the stocks of science" last year as well. This is clearly proved by a few such facts as, for example, the participation of a 200-member team from the Physics Central Research Institute and the Technical University of Budapest in the Soviet Vega program organized to observe Halley's comet. This work has quickly brought our researchers world-wide fame. Hungarian science has had its share in this pioneering scientific achievement by creating the "eyes" and "brains" of the probe: the automatic on-board television system providing the pictures, the Hungarian electronic equipment recording the information, and the processing of the 2 million items of information obtained using these.

Another impressive example is the one involving researchers at the Plant Biology Institute of our Szeged Biology Center. Using the tools of modern cell genetics, they were the first to describe the phenomenon of gene exchange between the chloroplasts of two plant species, and have thereby attracted extensive international attention. This work opens up new paths for the improvement of plant species.

In difficult years, however, even an intellectual achievement such as keeping pace with the information revolution may be regarded as **of outstanding significance.** We were left far behind in the transformation of informaties. However, our researchers have been able to keep pace with the latest waves of this revolution, thus ensuring that we would not be left irremediably far behind.

Acceleration of the Reform Process

[Question] How have we advanced in the field of the social sciences?

[Answer] I don't think any epoch-making work in the social sciences was published last year. Nevertheless, our researchers produced worthwhile results in the critical processing of the life-work of one of the greatest figures in Hungarian social-science studies, Gyorgy Lukacs, who was born a hundred years ago. The recently published new volumes in the "History of Hungary" series produced mature synthesizing results with a universal outlook to advance this unusual undertaking to completion. A project aimed at unmasking falsifications of history, which is important from the standpoint of international disputes as well, came to maturity with the completion of the manuscript of the three-volume "History of Transylvania."

Besides all this, Hungarian research also endeavored last year to make a direct contribution to easing our country's economic problems. I am certain that the work of our economists will contribute to the necessary further development of our reform of the economic mechanism in the near future even more than at the present time. But we must by no means rest content with the present relationship between science and production, with the place science now occupies in technological development and modernization.

Let me also mention that in 1898 Lorand Eotvos found only two events of the Academy's life and work worthy of special mention, and one of these was the completion of the Great Pallas Encyclopedia! A weakness in our activities is demonstrated by the fact that work on the Academy's Great Encyclopedia was halted years ago and has not advanced since then. In the coming period, we must do everything we can to resume this work as soon as possible and to get it to the publisher.

[Question] Scientific research is characterized on the one hand by increasing specialization and on the other hand by interdisciplinary activity by an effort to maintain close collaboration between different branches of science. A sign of this that has been apparent for many years is that each year the general assembly has placed a comprehensive question, one which affects all of society, on the agenda of the plenary meeting as the subject of the main presentation. This year the connection between technological development and Hungarian intellectual life was discussed. What was the reason for regarding this particular subject as especially timely?

[Answer] We are living in an age of transformation of the world economy, of a crisis that is shaking its very structure. Old technologies and the production structures corresponding to them have become obsolete. Adjusting to the new ones is a historic task: can we continue to catch up, as we have during the past few decades, or will we again be doomed to relative backwardness? The key question for such adjustment is: what can we transplant from modern technology, the technology that can make us competitive, and what can we add to it from which fields using domestic intellectual capacities, or even more (and I want to emphasize this), what can the latter contribute to the renewal of traditional branches or products and what new opportunities can they open up, substantially expanding our markets?

A solution of our economic problems can come only if a leading role is played by industry. This year's general assembly of the Academy was expressing this view when it chose as the subject for the presentation at the plenary meeting the question of the marketability of Hungarian industry and Hungary's intellectual background, or when, at a scientific sectional meeting, it discussed the subject of a system of economic conditions for technological development. These subjects and presentations also made it unambiguously clear that a transformation of the regulating system which will take a more vigorous input from market interests, a monetarization of economic processes--that is to say, an acceleration of the reform process--is indispensable for the creation of a system of instruments appropriate to our economic goals.

[Question] The decision taken by last year's general assembly--also in the interdisciplinary spirit--made it an obligation of the Academy more often to place on the agenda of institutional forums questions of great importance to science, to society, to economics, and to public life. What have you done in this field so far and what do you plan to do in the future?

[Answer] The Academy must examine the most important socio-economic problems on a systematic basis. We are doing this partly on the basis of requests from the government, as part of the preparatory phase of governmental decisions. I would like to mention in particular two of the subjects on which we conducted studies last year.

At the request of the Chairman of the Council of Ministers, the Academy's presidium examined the draft of the seventh 5-year plan. While emphasizing its agreement with the plan's system of economic and social goals, the presidium considered it its duty to call attention to the weaknesses of the proposed strategy: the serious dangers arising from a maintenance of non-selective restrictive practices. These would result from a sort of "restriction spiral," that is, from the fact that retrenchments would create new imbalances, whose effects would tend to produce a downward movement. For this reason, the presidium proposed that the reform should be carried out much more vigorously than had been planned, since it considered this the only way to bridge the gap between the plan's goals and its system of regulators.

It further recommended that, even though the plan would start in 1986, the government should not regard the preparatory work on the plan as completed. Instead, we should do more work on economic policy and reform, develop the

plan further, and work out a possible variant for the second half of the plan period that would better serve to attain its goals. This central idea has since been adopted by the competent parliamentary committee and the governmental offices responsible for economic matters.

Position Paper on the Bos-Nagymaros Hydroelectric Power Station
Our Academy was also asked to preapre a position paper on the hydroelectric power station at Bos-Nagymaros. It is well known that the installation is already in the process of completion, on the basis of the 1977 intergovernmental agreement. This time we were asked to state our views concerning the environmental impact study ordered by the hydrological authorities, which may be expected in the wake of the construction of the hydroelectric power station. The Academy's debate, which has often been quoted in distorted form at Hungarian and foreign forums, had the purpose of making possible alternatives clear. The impact study yielded reassuring answers to a number of worries expressed during the past few years. In the end, our position paper outlined two alternative solutions. The first emphasized that if the construction was carried out in accordance with the original plans, it was indispensable that sewage purification be carried out in advance on an accelerated basis at Gyor and on the left and right banks. The government agreed to this. Giving due regard to environmental and social effects, we debated the planned quantity of water for the Old Danube and emphasized that it was essential to maintain the water level necessary for keeping it a living watercourse. We placed special stress on the importance of auxiliary installations. All of these views were taken into account in the government's work. Partly in order to avoid unpredictable harmful side effects, but (it must be admitted) primarily on the basis of economic considerations, we also outlined another alternative, which was based on the "temporary or final" elimination of this major dam project.

However, we do not want to express our views only on the basis of requests. Our presidium recently approved topics which we wish to examine on our own initiative. For the coming years, we have placed emphasis on subject groups of great importance, some of which are: health and environmental influences; the interdependence of community development and technological development; the role of the social sciences in promoting innovations; and the optimum social utilization of mathematics, natural-science, and technology. We will inform the government of the results of the studies, which will be summed up by the presidium or by special committees, and we will also strive to initiate appropriate action.

The Respectability of Basic Research
[Question] On the basis of the law-decree issued in March of this year by the Council of Ministers, the general assembly amended the Academy's charter and made the organization responsible for directing and coordinating the basic research going on in our country. What new tasks does this mean for the executive councils of the Academy? Are the subsidiary units of the Academy prepared to carry out this duty productively and effectively?

[Answer] Responsibility for our country's basic research has brought an extraordinary increase of the role of the Academy and of its sections.

Two-thirds of Hungary's basic research is carried on at the Academy's institutes. Now we have been assigned the added duty of participating in the specialized direction of the remaining third, and in the coordination of research, and in my opinion, this is a very significant change that helps us combine our forces and do our work more purposefully. A related fact is that the handling of the new national fund which plays an important role in financing basic research, the judging of the merits of the competition entries, and the highly precise measurement of performances in connection with this will also become the task of the Academy's sections. This is an important opportunity to arrange more favorable conditions for deserving researchers than had existed in the past.

The magnitude of the task may be seen from the fact that almost 2,000 entries must be evaluated on the basis of their scientific significance and timeliness. Every entry is examined by experts and then evaluated by the juries of our scientific committees and by our executive bodies. This must necessarily be based on the actual verification of performance that I mentioned earlier, which is the starting point for the judging of any further applications. Individuals, research teams, and institutions have an equal chance to win in this competition, and this opens an opportunity for quality selection, for supporting the most promising and most useful performance, and for successfully breaking through the barriers of the earlier egalitarian system of financing. Our experience with these tasks is still inadequate, but we are endeavoring with close attention and a high sense of responsibility to carry out our duties.

With this aim in mind, we have coordinated the work of the sections and specialized leadership of the Academy more closely, including on an institutional basis, and we expanded the scope of the scientific bodies' decision-making power. We have done all this without any organizational reform of the Academy, because I believe that the words spoken at the 1891 general assembly by Academy president Lorand Eotvos is still valid: "A good book that (the Academy) publishes or a scientific truth whose discovery it promotes is a more significant event in its history than any reshaping of its organization, no matter how ingeniously planned."

[Question] The quality, possibilities, and prospects of basic research have recently become the eyes of the storm of heated debates in professional and public life. Is there any chance in the attitude that holds basic research in low esteem? What do you think the possibilities are for financial assistance to research in the 5-year plan that is just starting now?

[Answer] Basic research has unquestionably become less respectable in recent years. This is due partially to the fact that the institutions responsible for it are supplying almost two-thirds of their budget from their own income, and they have therefore been forced to engage in more practical pursuits--which, of course, are often extremely useful to society. At the same time, on a national scale, we have by no means succeeded in overcoming the attitude that regards basic research as a liability item in the budget, a self-centered consumption of resources, because it does not provide returns in the short run. By contrast, in countries with a well-developed economic

and scientific structure, more and more ground is being gained by the view that basic research is part of the cost of production.

In recent years, the general assemblies of the Academy have emphatically called attention to the need for attaching more importance to basic research. The reason for this is not merely that most new results in technology and economics are rooted in some "self-centered" achievement of basic research. The significance of basic research is much greater than this, and it is indispensable even in a country whose economy is such that it does not itself produce most of the new achievements in technology but largely takes them from elsewhere, for it is around basic research that we can raise the army of specialists which is capable of creating the human and intellectual preconditions for the acceptance, mastery, and application of all such advances.

Recently there has been a definite change in the appraisal of basic research at the governmental level too; this is clearly illustrated by the fact that although in 1984 only 200 billion forints of "emergency assistance" was provided for expanding the resources available for basic research, which had been steadily decreasing preceding that year, the government in 1985 allocated almost 4 billion forints for this purpose over the coming 5-year period. This will not help us make up the deficiencies of the preceding five or six years; nevertheless, it not only halts the downward trend in the amounts allocated to basic research in the past but is the beginning of a modest improvement.

It is also essential today to build up a modern scientific infrastructure and a unified information system, including the technical facilities to enable authors at their desks to produce publication-ready manuscripts. In the coming years, we want to set out on the path of building up this system.

Harmonization of Teaching and Science

[Question] What changes can we expect from the fact that according to the charter as amended at the general assembly, the Academy's responsibility from now on will extend to the nation-wide direction and harmonization of the social-science research included in state plans? What do the Academy's executive councils intend to do in order to carry out this task?

[Answer] According to the decision taken by the Presidential Council in March of this year, the Academy's responsibility will extend to all of the social-science research conducted in our country and included in state plans. This means that the Academy will also partly take over the task (previously carried out by a governmental subcommittee) of coordinating social-science research. Special importance within this area will be given to the formulation of medium-term research programs and the arrangements for submitting reports. None of this detracts from the independence--partly associated with teaching--of university research. A system with unified identification of the most important research topics, unified determination of research priorities, and a unified appraisal process that goes beyond the unpredictability of particular institutions--such a system can make the work more concentrated and more effective in the social sciences as well. For this purpose the Academy is creating a coordinating body, with direct involvement of the institutions concerned. The Committee on Science Policy has entrusted me

with the duties of chairman. A significant portion of the work will be done by the Academy's sections in this case too.

[Question] A more vigorous social utilization of the Academy's intellectual capacity requires close coordination of research and teaching. What can and must be done to put an end to duplication of work in this field and to prevent the frequent dissipation of human and material resources?

[Answer] Some initiatives have already been taken to forge closer links between teaching and research, which had been separated under the system in use in Hungary for a third of a century. Duplication of work is harmful. Higher education that is deprived of a research background is bound to deteriorate in quality, while a researcher without teaching opportunities is deprived of important incentives. There is also greater dissipation in the utilization of our scanty resources. The efforts exerted to change this state of affairs have already brought some partial results: there has been an expansion in the research capacities of universities. The Academy has endeavored to contribute to this process: it gives support to fully 70 university departments or institutes, subsidizing research positions in a number of cases, and it has attached modest-scale research bases to a few university departments. However, we can do a great deal more than this, without impairing the independent legal status of research institutes and universities. At present only one-tenth of our researchers are teaching at universities.

In accordance with the position adopted last December by our presidium, we are striving to see to it that--where the prerequisites for this exist--our research institutes, adapting their work to the teaching plan of the university or faculty concerned, work out independent teaching programs under which the lectures and special symposia are conducted by institute researchers and these researchers also guide the work of students who are preparing theses. At the same time, we want to work more vigorously to open our research institutes to researchers who are teaching at universities. The detailed proposals relating to this will be brought before the Academy's presidium in September. In Debrecen, however, the first steps have already been taken, in the form of an agreement between the Academy's Atomic Research Institute and the physics departments of the university.

Popularization of Science

[Question] The debates and exchanges of ideas at the general assembly were characterized by an effort to bring about a substantial increase in the influence of the Academy's work not only on the research going on in Hungary but also on our country's intellectual life. I would like to ask you in your final comments to say something about how the diversified work of the Academy can be made more effective.

[Answer] The Academy is striving, through its multi-faceted activities, to see to it that the intellectual capital stockpiled in its institutes and sections bears interest. I have already spoken of several forms of this, for example, of the Academy's advance comments on governmental decisions relating to important economic and social problems. All of this is combined

with efforts--stressed with great emphasis by our general assembly--to make sure that the Academy, with its research base, its intellectual forces, and its prestige, participates, among other things, in the proposed campaign to reverse the unfavorable trend of Hungary's mortality rate, including a hygienic transformation of Hungarian life-style and the development of a more advanced system of preventive medicine than we have today.

At the same time, the April session of our presidium formulated an important position concerning the role of the Academy in popularizing science and disseminating its achievements, in dispelling the often widespread and growing plague of myths and superstitions, through the central lecture meetings which have been established on a regular basis at three-month intervals, through the regular publishing of information concerning research work, and through a much more intensive utilization of the forums of modern mass information media, not least among those of television.

Guided by the efforts of its founders, the Hungarian Academy of Sciences has, since its beginnings, not only fostered science but also carried out an important mission in public life. Although this mission differs from one age to another and imposes different tasks on this more than 160-year-old institution, the task remains as timely as ever.

13285/12947
CSO: 2502/60

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ROLE OF HUNGARIAN ACADEMY OF SCIENCES REDEFINED

Budapest AKADEMIAI KOZLONY in Hungarian No 5, 13 Jun 86 p 98

[Text] Law Decree No 5, 1986, of the Presidential Council of the Hungarian People's Republic Concerning Modification of Law Decree No 6, 1979, Concerning the Hungarian Academy of Sciences

1. The following provisions take the place of paragraph 2, Section 2, of Law Decree No 6, 1979, concerning the Hungarian Academy of Sciences (hereinafter, the law decree):

"(2) The Academy provides national guidance of basic research in all branches of science and of social sciences research figuring in state plans (hereinafter, social sciences research). It participates in the national guidance and coordination of research and development and in development and supervision of national research plans; it is responsible for the research taking place in institutions under its direct guidance; it aids the coordination of research, it follows and evaluates the development of the sciences with special regard to research laying the foundations for future development and it works out forecasts, ideas and guiding principles to encourage the domestic cultivation of science."

2. Section 4 of the law decree is supplemented by the following paragraph 4; at the same time the numbering of the present paragraphs 4 and 5 changes to paragraphs 5 and 6 respectively:

"(4) The Academy defines the directions and frameworks for the cultivation and development of basic research and of social sciences research."

3. (1) The following provisions take the place of paragraph 1, Section 8, of the law decree:

"(1) The Academy carries out the tasks falling on it in national guidance and coordination of research and it guides its institutions through the first secretary.

"In regard to basic research and social sciences research the positions taken by the general assembly and the presidium are the guide. In other questions of guidance the first secretary acts taking into consideration the opinion and

proposals of the corporate organs. The first secretary acts with the legal standing of the leader of an organ with national authority in the sphere defined in this law decree and on the basis of authorization by the Council of Ministers."

(2) The following provisions take the place of paragraph 3, Section 8, of the law decree:

"(3) The Council of Ministers appoints the first secretary of the Academy for a definite time from among the members of the Academy on the recommendation of the general assembly. He is responsible to the Council of Ministers for his activity. He reports to the general assembly and to the presidium about his work, he aids the implementation of the opinion and proposals of these bodies and asserts the positions taken by them in connection with the national guidance of basic research and social sciences research."

4. The following provisions take the place of paragraph 2, Section 11, of the law decree:

"(2) In matters affecting the Academy or the scientific life of the country and in matters significantly influencing research activity taking place in the country the ministers and the leaders of organs with national authority make their decisions taking into consideration the positions of or with the agreement of the bodies and first secretary of the Academy. A separate regulation will establish the cases for the exercise of the right of agreement."

5. This law decree goes into effect on the day of its promulgation.

signed, Pal Losonczi, president of the Presidential Council of the Hungarian People's Republic

signed, Imre Katona, secretary of the Presidential Council of the Hungarian People's Republic

8984
CSO: 2502/85

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ROLE, MEMBERS OF SCIENCE POLICY COMMITTEE

Budapest AKADEMIAI KOZLONY in Hungarian No 5, 13 Jun 86 pp 98-99

[Text] Resolution No 1070/1985 (XII, 28) of the Council of Ministers Concerning Modification of Resolution No 1016/1978 (VI, 10) of the Council of Ministers Concerning the Sphere of Tasks, Sphere of Authority and Operation of the Science Policy Committee

1. The following provisions take the place of point 2 of Section I of Resolution No 1016/1978 (VI, 10) of the Council of Ministers concerning the sphere of tasks, sphere of authority and operation of the Science Policy Committee (hereinafter, the Resolution):

"2. The Committee performs recommendation making and initiating tasks in the development of science policy in the interest of attaining goals set by the Council of Ministers. It has the role of guidance in principle in the realization of science policy, it aids the coordination of state guidance of scientific research and technical development, and it strengthens the link between research-and-development and practice. The Committee cooperates in the coordination of science and technical development policy and of social and economic policy."

2. The following provisions take the place of point 3 a of Section II of the Resolution ("The Committee discusses and expresses an opinion in advance regarding submissions to the Council of Ministers in regard to:"):

"a. proposals dealing with social and economic policy questions which are also significant from the viewpoint of science and technical development policy."

3. The following provisions take the place of point 4 i of Section II of the Resolution and point 4 of Section II is supplemented by a new point m ("The Committee, acting in its sphere of authority:"):

"i. assents in advance to the founding of research institutes."

"m. The Committee can establish permanent and temporary work organs for the purpose of making proposals and expressing opinions."

4. The following provisions take the place of point 5 of Section II of the Resolution:

"5. Within the framework of contact with other government committees the Committee:
--debates and from the science policy viewpoint evaluates those conceptions which are also important from the science policy viewpoint which conceptions lay the foundations for national economic plans of various time ranges dealing with comprehensive questions of social and economic development and it so debates and evaluates the research and development part of medium-range national economic plan conceptions or plan proposals;
--tracks the fulfillment of research and technical development tasks established within the framework of central development programs and gives an opinion from the science policy viewpoint concerning proposals pertaining to new central development programs;
--aids the harmonization of the medium-range national economic plan and the research and development plans;
--takes a position in determining the chief directions and tasks of international scientific-technical cooperation."

5. The following provisions take the place of point 6 of Section III of the Resolution:

6. The chairman of the Committee is a deputy chairman of the Council of Ministers entrusted with this task.

The members of the Committee are:
--the minister of health,
--the minister of industry,
--the minister of agriculture and food,
--the minister of culture,
--the minister of financial affairs,
--the president of the National Plan Office,
--the president of the Hungarian Academy of Sciences,
--the first secretary of the Hungarian Academy of Sciences, and
--the chairman of the National Technical Development Committee."

6. This resolution goes into effect on the day of its promulgation, at the same time points 4 j and 4 l of Section II of the Resolution and Resolution 1034/1984 (VII, 8) of the Council of Ministers lose their validity.

--signed, Gyorgy Lazar, chairman of the Council of Ministers

8984
CSO: 2502/85

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ORGANIZATION OF NATIONAL TECHNICAL DEVELOPMENT COMMITTEE

Budapest AKADEMIAI KOZLONY in Hungarian No 5, 13 Jun 86 pp 99-101

[Text] Resolution No 1071/1985 (XII, 28) of the Council of Ministers Concerning the Tasks, Sphere of Authority, Organization and Operation of the National Technical Development Committee

The Council of Ministers establishes in the following the tasks, sphere of authority, organization and operation of the National Technical Development Committee, which was established by Government Resolution No 1017/1961 (IX, 14).

The Tasks and Sphere of Authority of the National Technical Development Committee

1. The National Technical Development Committee (hereinafter, OMFB) is the central state organ for guidance of technical development of national economic significance embracing several branches and for guidance of the related research. Its basic tasks--in cooperation with the interested ministries and organs with national authority--are implementation of the government technical development policy, initiating and preparing government decisions connected with technical development, spreading developed technology, participation in the development of economic guidance, national economic planning and regulation and in guidance and coordination of scientific research and domestic coordination of international technical-scientific contacts.

2. In the area of developing and implementing technical development policy the OMFB

--initiates guidance, planning and regulatory measures encouraging technical development;
--works out the chief directions of technical development,
--tracks and aids the realization of the government technical development policy in the national economic branches;
--aids the recognition, domestic application and spread of the newest technical cultures;
--studies and discovers the mutual effects between technical development and economic and social processes; and
--offers financial support for the financing of technical research and development programs of national economic significance--primarily interbranch

programs or programs affecting several branches--and, in justified cases, for financing related basic research and for the creation, introduction and use of new production or technical procedures, systems and equipment appearing domestically for the first time.

3. Within the framework of preparing and realizing technical development decisions the OMFB
--works out proposals and submits them to the Council of Ministers and its committees, and expresses an opinion about submissions from other organs which affect its sphere of operations;
--participates in the preparation of decisions serving the realization of national economic plans and in the course of this implements the requirements of harmony with technical development policy;
--works out central economic development program conceptions, coordinates the execution of such programs, develops comprehensive technical development priorities affecting economic and social development as a whole and aids their realization; and
--selects, ranks and prepares by means of interbranch coordination research and development program proposals; coordinates--directs on the basis of government decisions--the organization of the execution of the programs and participates in the supervision of the execution of the programs.

4. In connection with technical development and national economic planning the OMFB
--works out forecasts and ideas regarding the expected and desired technical development of the national economy and participates in the formation of economic policy conceptions;
--works out and submits to the interested government organs the technical development policy conception connected with medium-range and long-range national economic plans and participates in the formation of the medium-range national economic plans; and
--participates in the analysis of the functioning of the national economic planning system and in its further development.

5. In the area of economic guidance the OMFB
--participates in the modernization of the economic guidance system;
--tracks the effect of the economic regulatory system on technical development; and initiates the further development of those elements of investment, price, wage, credit and trade policy and of the regulatory system which influence technical development;
--participates in the formation of the system for the generation and use of financial sources serving technical development activity; and
--takes a part in the further development of credit policy guiding principles and financing methods and in modernization of the credit requirements, adapting them to technical-economic conditions.

6. In the area of guiding and coordinating scientific research the OMFB
--works out the National Medium-Range Research and Development Plan (OKKFT) proposal and submits it for approval;
--aids the coordination of the long-range trends of scientific research and the National Medium-Range Research and Development Plans and of long-range and medium-range technical development policy;

--makes proposals for the financial sources for research and development and for the magnitude and chief directions of state support for it;
--tracks the activity of the research and development network; gives an opinion on proposals pertaining to the creation, reorganization or abolition of research institutions; and
--participates in the development of financial regulators and planning methods for research and development.

7. In the sphere of other activities connected with technical development the OMFB
--implements the positions of industrial law protection, metrology, standardization and quality protection activity in the formation of technical development policy and provides guides for the coordinated development of these activities;
--organizes and guides the central information system for scientific research and technical development, and takes care of the coordination of the activities of this system and of the several branch information systems connected with technical development;
--supports the modernization of the infrastructure for technical development and participates in developing requirements for technical training and further training;
--organizes activity aimed at better use of and development of the instruments inventory of the national economy;
--gives an opinion about the developmental goals of investments of national significance and about investment proposals, and tracks the technical development experiences of large investments realized; and
--takes care of the central coordination of technical developments in materials movement, packaging techniques, corrosion protection, industrial style design and ergonomics; and furthers the national spread of systems analysis methods.

8. In the sphere of its tasks connected with international cooperation the OMFB
--participates in the working out and fulfillment of international cooperation plans being conducted in the area of research and technical development;
--coordinates the carrying out of domestic tasks deriving from international research and development contacts;
--participates in the coordination of the technical-scientific and economic plans of the CEMA countries;
--performs the tasks falling on the Hungarian member of the CEMA Scientific and Technical Cooperation Committee and the Intergovernment Computer Technology Committee;
--participates in the work of the Hungarian member of bilateral and multilateral international cooperation committees;
--maintains contact with the central state organs of other countries guiding research and development;
--participates in the development of Hungarian positions connected with the activity of specialized (regional) organizations of the UN affecting technical-scientific questions and in the harmonization of domestic tasks, turning special attention to such contacts between our country and the World Bank;

--maintains contact with large foreign enterprises; and
--participates in the formation and further development of license policy, aids the purchase and sale of licenses and know-how and initiates the necessary government measures in this area.

Organization of the OMFB
9. The OMFB is an organ with national authority operating under the direct supervision of the Council of Ministers.

The OMFB carries out its tasks and sphere of authority with the aid of its body, its office and its committees organized to realize technical development goals.

The chairman of the OMFB organizes the functioning of the body and guides the functioning of the committees and the activity of the office.

The Council of Ministers appoints the chairman of the OMFB and, on the basis of his recommendation, the deputy chairmen. The chairman of the OMFB is responsible to the Council of Ministers--for the activity and decisions of the OMFB.

10. The corporate organ of the OMFB is the Plenum of the OMFB, which expresses an opinion in technical development questions of national economic significance and makes recommendations to government organs.

The members of the Plenum are appointed--on the basis of the recommendation of the chairman--by the deputy chairman of the Council of Ministers charged with supervision of the OMFB.

The Plenum determines the order of business and work program of the Plenum of the OMFB on the basis of the recommendation of the chairman.

The chairman creates case committees made up of experts to take care of the tasks of the OMFB connected with technical development.

The members of the Plenum and of the committees, in this quality, form their positions independently of their employers and supervisory organs in accordance with their own convictions.

The chairman of the OMFB can pay experts working in the Plenum and committees in proportion to the work actually done.

11. The official organ of the OMFB is the Office of the OMFB which--relying on the activity of the body of the OMFB and on the expert committees and in cooperation with the interested ministries and organs with national authority--prepares, organizes and executes the tasks falling on the OMFB.

The chairman of the OMFB determines the organizational structure and operational rules of the Office.

12. The financial assets needed for the functioning of the OMFB are provided from the budget and from the centralized sources for research and development.

13. The OMFB--in the course of carrying out its tasks--cooperates with the interested ministries, the Hungarian Academy of Sciences and organs with national authority. With its participation in the formation of technical development policy, in the preparation of government decisions, in the modernization of economic guidance, in national economic planning and in guidance of research and when fulfilling its international and other obligations the OMFB realizes primarily the interests of technical development and of the related research.

The OMFB relies on the advice and recommendations of the social organs--most especially of the technical and natural science associations and their federation--and regularly keeps them informed and encourages and supports their activity.

The OMFB follows the activity of the managing organs and of organs carrying out research and development and demands technical development initiatives from them. It keeps them informed about its developmental ideas and, on a contractual basis, it offers support for the realization of their research and development plans serving national economic interests and for the utilization of the results.

Supervisory and Authoritative Tasks and Spheres of Authority

14. On the basis of authorization by the Council of Ministers the chairman of the OMFB provides supervision of several organs with national authority.

The chairman of the OMFB can establish institutes, enterprises and offices to advance technical development undertakings, discover possibilities for the economical use of resources and carry out tasks connected with the activity of the OMFB.

The chairman of the OMFB
--exercises founder's rights in regard to the enterprises established by him;
--exercises supervisory guidance and control in regard to enterprises under his state administrative supervision;
--provides legality supervision over enterprises founded by him and operating under the leadership of an enterprise council or under the general leadership of the general assembly of the workers (delegate assembly);
--excercises legality supervision over economic associations of national significance established with his approval which function as legal entities (among these he also provides branch-professional supervision over those belonging to the branch designated "7417 general technical development service"); and
--excercises supervision over the budgetary organs established by him.

The chairman of the OMFB carries out the tasks referred to his sphere of authority in accordance with separate regulations (e.g., in connection with protection of social property, labor protection, fire protection, civil defense, protection of state and service secrets, personnel work and document management).

Concluding Provisions

15. This resolution goes into effect on 1 January 1986. At the same time Resolution No 1045/1978 (XII, 30) of the Council of Ministers concerning the organization and functioning of the National Technical Development Committee loses its validity.

--signed, Gyorgy Lazar, chairman of the Council of Ministers

8984
CSO: 2502/85

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

CYCLOTRON MADE ENTIRELY FROM POLISH DESIGNS, MATERIALS

Warsaw ZYCIE WARSZAWY in Polish 19 Aug 86 p 3

[Article by Henryk Jezierski: "Cyclotrons at Bronowicy"]

[Text] Because of its sophisticated research equipment nuclear physics is an expensive science. For this reason, in order to better grasp what has been accomplished by the Institute of Nuclear Physics at Bronowicy in Krakow, one should properly start with money. The cyclotron AIC 144 built at the institute is a modern piece of equipment which in the West costs from a few million to tens of millions of dollars--obviously, something you would not buy in a grocery store. For building such an installation one has to place orders with special firms and wait years for the completion of the project.

And yet the new second-generation cyclotron in Krakow has been developed by Polish designers and constructed fully from local materials. This has been accomplished without licenses, imported parts or spending of hard currency.

We enter the cyclotron room accompanied by the creator of AIC 144. The director of IFJ [Institute of Nuclear Physics] says briefly:

"Were it not for associate professor Dr Jerzy Schwabe there would be no cyclotron in Krakow!"

I met Jerzy Schwabe several years ago at Dubna at a party in someone's honor. A tall, thoughtful man stood in the corner, glass in hand.

"That's the one who wants to build his own cyclotron!" said someone with an ironic gesture.

It turns out that he would not let anybody dissuade him from his resolution, although it was no easy road.

"This is a typical human attitude all over the world," explains Dr Schwabe. "As soon as you come up with a new proposal you are confronted with a strong opposition. Certain groups pursue their interests. There are people who have been working for 20 years developing a certain piece of equipment and they want to finish their professional career in their present positions. They are afraid that their authority will be undermined, that it will turn out that they are not irreplaceable. We, however, need no positions. We

only wanted to build a cyclotron, not for ourselves but for the entire institute. Physicists will benefit greatly and will be able to invite colleagues from abroad to conduct joint research projects. In this case it would happen as an exchange between equivalent partners, with no hard currency expenditures."

One is struck by the miniaturization that has found its way into the Institute of Nuclear Physics. The control panel of AIC 144 fits easily on a desk, while the control room of the previous cyclotron was a large hall.

Actually, the new cyclotron comes as a fulfillment of the bequest of Professor Henryk Niewodniczanski, who "guided" Dr Schwabe in Dubna to prepare himself for reconstruction of the old cyclotron in Krakow. They have discussed this matter many times, but the death of the professor gave an additional stimulus to the future cyclotron builder.

When an occasion offered itself, Schwabe was the initiator of redesigning Dubna cyclotron U-120, similar to the old cyclotron at Krakow, into an isochonric cyclotron, and he developed the technical documentation. The idea was supported by a Soviet group, and a beautiful piece of equipment was created. However, it was eventually sent to Czechoslovakia. Realizing that he would have to return home empty-handed after he had planned to bring the cyclotron to Poland, Dr Schwabe began to think of building a second-generation cyclotron from domestic components and assemblies. While still abroad, he was able to order instruments and materials from Polish manufacturers, because his project was supported by the previous director of the institute, Professor Andrzej Hrynkiewicz, and the entire issue was sponsored by the president of the Government Atomic Agency, Dr Mieczyslaw Sowinski. Immediately after coming back to Poland, Dr Schwabe created at IFJ a group of specialists with the objective of building the cyclotron.

The industry fulfilled its obligations perfectly. Participants in the joint project were six major enterprises, including the Lenin Metal Works, Marcely Nowotka Metal Works at Ostrowiec Swietokrzyski, Mostostal, Zamech and Elblag. They succeeded in producing special materials difficult to obtain even in the West.

The new cyclotron has certain features which make it competitive with similar foreign installations. For one thing, its beam will have an exactly defined energy and good geometrical parameters. The beam particles will move along virtually parallel paths. Such beams can be used for exact experiments.

Secondly, the energy of accelerated particles can be varied in a broad range, making it possible to accelerate various charged particles from proton-rich oxygen nuclei. For example, the proton energy can be varied from 15 to 60 MeV.

There is also another advantage, probably the most important one. The installation is a link between science and industry. It can be used not only for physical research but also to produce isotopes. Its builders were aware of the fact that sooner or later Poland would be faced with the need of

industrial production of isotopes. Medicine (diagnostics, oncology, cardiology and pharmaceutics) and industry (mainly metallurgy) require a broad range of isotopes, particularly scarce neutron isotopes, so-called cyclotronic isotopes, that cannot be obtained in reactors. Until now Poland did not have an industrial cyclotron and all cyclotron isotopes had to be imported from Western nations. This made it impossible to use short-lived isotopes, which are especially valuable for medicine. The production capabilities of the new machine has been studied previously. The results indicated that the parameters of AIC 144 make it suitable as the principal manufacturing unit of cyclotron isotopes in Poland. Incidentally, there is a considerable demand for such isotopes also in the West. The institute has already received a tentative offer from the FRG.

In order to begin isotope production a small investment has to be made--building a so-called hot room. The investment will pay for itself in two years, even if isotopes are produced two days per week.

The staff of the institute consists of people who have worked in nuclear chemistry for many years and possess the necessary knowledge and experience. The method of cyclotron isotope production has been developed, specifically of iodine 123, thalium 199 and 201, gallium 67 and cobalt 57. Breakthrough results have been obtained from thermodiffusion, a method developed in Dubna by a group from IFJ led by the engineer Andrzej Kolaczkowski.

"Curiously enough, as soon as we try to do something that might have a practical value we find no understanding, and some people are obviously even resentful," says Professor Bochnacki.

"After all, we are not talking of using the beam as a cigarette lighter but for producing isotopes," adds Dr Schwabe.

One can only congratulate the Krakow scientists on their inventiveness and practical resourcefulness. When they began to order components for the AIC 144 they came up with the idea of duplicating everything, i.e., placing double orders for every part. As a result, it will be possible shortly to convert the old U-120 cyclotron into a second new AIC 144, which has been code-named Alfa to distinguish it from the first cyclotron. Two connected cyclotrons will create a tandem, accelerating the same beam of charged particles to double the present speed. This will open up major opportunities for the institute and in practical applications will make it possible to use a beam of heavy ions.

It is certain that both installations will operate precisely as a clock. The AIC 144 is the fourth cyclotron launched by Dr Schwabe. The associate professor is well known and valued also abroad. Soviet physicists have even symbolically given his name to an island on the Moscow Reservoir in recognition for his enthusiasm for sailboats; recently, physicists from the FRG asked for his help in the reconstruction of the old cyclotron at Karlsruhe.

[Box, p 3]

What is the AIC 144? It is an automatic isochronic cyclotron with a diameter of magnetic field equal to 141 cm. It is called automatic because it will be completely automated and controlled by computers. Isochronic means that it is capable of compensating (equalizing) the relativistic growth of the mass of accelerated particles. When a particle moves with a speed close to the speed of light, its mass increases, which makes it necessary to form the magnetic field in such a way as to maintain the particle on its own path; the field must compensate for the effects of increased particle mass. The cyclotron, or the circular accelerator which operates in cycles, repeats the process of particle acceleration on a spiral path. The major component of the cyclotron is electromagnetic currents; their diameter is 144 cm. This diameter determines the energy up to which it is possible to accelerate charged particles. An isochronic cyclotron with a diameter of 144 cm can generate a proton beam with an energy of 60 MeV or 600 million electron-volts. (An electronvolt is the energy developed by an electron accelerated by a potential difference of 1 volt.)

9922
CSO: 2602/2

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

POLISH COMMENTARY ON LEIPZIG FAIR

Warsaw PRZEGLAD TECHNICZNY in Polish No 18, 4 May 86 pp 32, 28

[Article by Jerzy Jacek Tomczak: "Letter From Leipzig"]

[Text] Two weeks before the opening of the spring Leipzig Trade Fair, a press conference was held at the embassy of the German Democratic Republic in Warsaw. The vice-director of the fair and the director of the Polish exhibit made a special trip to Warsaw to discuss the program for the upcoming event: "Time- and material-saving devices and technology to increase productivity in the machine-building industry". He also presented the most important information about the fair and therefore the number of participating countries (90), number of exhibits (9000) and the size of the hall and fairgrounds.

I suspect that similar such press conferences are being held in many of the German Democratic Republic's embassies in various countries around the world and this shows the significance our western neighbor attaches to this event as a very important meeting of CEMA nations and also an important one for East-West relations. The fair (which is chiefly a machine-building trade fair) was preceded by the 4th Metal-Working Congress with 50 specialist reports and numerous branch conferences.

Exhibit of Achievements

The economic planning and management system in the GDR is a highly centralized one which functions very efficiently. Following the spring Leipzig Fair, 90-95 percent of the planned trade with other countries is already covered in contracts and many contracts for longer-term trade in subsequent years are signed at that event.

Of course, no representative of a planned nor a free economy comes to the international fair to buy flexible manufacturing systems [FMS] or plasma-jet steel furnaces (such a furnace built using technology from the GDR has already been in operation for 2.5 years at the Austrian Voest-Alpine steel mill in Linz). But one can come to the fair to compare the offerings of various firms, their prices, delivery schedules and technology and to exchange information, initiate preliminary talks or conclude negotiations already long in progress. For that reason, fairs such as the one in Leipzig create a

unique opportunity and that is their role as an exhibition and great meeting of merchants and industrialists, producers and users.

For that reason, this fair has created a different emphasis than the preceding ones. There are fewer working machine tools piling up shavings while children cry "look its turning!". There are, however, more models, illuminated large-scale illustrations, video programs on playing over several monitors and secluded spots for talking.

Flexible Production Systems

As one might guess, the tone of this year's fair was set by firms from the GDR and not only because that they made up about half of the exhibitors present but because they best followed the fair's slogan of time- and materials-saving technologies.

What was most striking there was the WMW exhibit on flexible production systems for making body parts and symmetrical-rotary parts and for working sheet metal. Aside from entire systems, WMW is also offering flexible production centers and special turning, milling and cutting modules that can be incorporated into and FMS. The demonstration of an automated transport system for an FMS aroused much interest.

The exhibited FMS 250/1 flexible system for machining housings and spherical parts was composed of an FC 400 K/2.5 milling and drilling center and an FC DFS 2/2 center for turning chucks and shafts. The system was controlled by a Robotron K 1630 computer. The viewers could see that the WMW systems were also equipped with CAD/CAM systems, computer-aided design and computer-aided production. According the explanations provided by the producer's representatives at the exhibit and later at a separate meeting with the press, the automated production devices are manufactured according to a uniform plan which is simpler at first and later grows more complicated but all are interchangeable and can work in conjunction to create integrated systems which will most certainly soon become elements of an automated production hall. Such a production hall will almost certainly contain the GDR's series industrial ZIM 60-1 and ZIM 10-1 robots or their newer models.

All of this would be impossible without processors and computers and so we go to another hall in which Robotron computers are on display. Robotron offered equipment for automating office work, automatic production control and automated measurement and control equipment. They also offered software for data-transmission and processing and operating systems. The instrumentation on display included their professional computers (Robotron A 7100, A 5120.10), the Robotron 1715 personal computers and memory typewriters. Another known producer of data-processing systems was the RFT Radio and Audio Equipment Plant which offered items like the PCM 480 LLNS digital optical communications system and the BES 2000 image analysis system. Computer equipment was also being presented by other exhibitors such as China and Romania. More and more states are coming to recognize electronics as a prestigious industry and feel obliged to exhibit their own products.

The German Democratic Republic's achievements in this field are unquestioned and recognized throughout the world. In Leipzig I learned that these firms have even begun to compete on the very difficult and demanding Japanese microelectronics market by selling multi-chambered electronic ovens for producing microelectronic computer components. Soon, the Polish State Railways will buy an electronic system for reserving passenger seats from Robotron.

Knowledge and Information

According to a report issued by the Club of Rome, knowledge and information are becoming the most sought-after commodities in contemporary society. This point was most clearly demonstrated at the exhibit set up by the GDR's higher schools such as the Karl-Marx-Stadt Polytechnic which was offering programming, licenses, basic training, improvement of professional qualifications and know-how in many technological processes. They also displayed special documentation on the production of rubber, mixer designs, know-how technology on rubber mixing and principles on designing control operations, control devices along the production line and quality testing of the finished product. This is one of many examples of what a journalist found at the various exhibits and pavilions. Aside from know-how, professional training is also an important modern commodity and one cannot forget the offerings of firms such as Electro-Consult of Berlin or Interagrarkooperation of Markkleeberg.

The Beauty of the Equipment

This fair was also an exhibit. Nothing demonstrated this quite as well as the booth with the short title of DDR Metallurgie [GDR Metallurgy]. This was a black background with a shiny mirror. Coils of copper and steel wire turned on moving stands. Shadows arranged themselves in the narrow beam of a reflector. These were not the efforts of a product of a certain hardness or heat expansion characteristics but modern sculptures and mobiles. Nearby was an abstract picture made from microelectronic boards. Bright yellow, silver and vermillion pipes were arranged to look like an organ. Gears were set into the form of a clock mechanism. Laser beams were passed through a moving filter to produce a nebulous image on the wall. There was sheet metal from titanium alloy, cold-rolled galvanized steel and a tape made of zircon-niobium alloy.

The creators of the exposition decided against advertising or the traditional presentation of goods. They felt that technically-perfect products are beautiful and decided to show the beauty and the flexibility of technology. In my opinion, the achieved a great success.

From the fairgrounds in Leipzig, one could see from a distance of about a kilometer a dark and heavy (and in my opinion ugly) 100-meter high structure built on a height. This was the mausoleum built for those fallen in the 1813 battle of nations at Leipzig. I think that twice a year in autumn and spring, there is now a different kind of contest in which many nations try to show who is better at management, technology and innovation.

If the GDR's offerings at the Leipzig Fair reflects the state and growth of the economy on the other side of the Oder River, Leipzig is a good place to show that. What especially struck a Polish journalist's eye was the orderly and efficient organization of life and the careful effort to carry out everything planned. The city which twice a year sees an invasion of fair guests has been carefully prepared for this. I was genuinely jealous of their restaurants. There were clean, well-stocked shops with their courteous service. They have a punctual and efficient public transportation system that can take one to even the most remote neighborhoods where (and this is not surprising) the fair guests and myself were given private quarters. These new and modern neighborhoods and settlements give the impression of of being sensibly and solidly designed. The homes are quite functional and have many rooms with kitchens large enough to hold everything needed to cook as well as the family dinner table. My own lodgings were very pleasant.

Everything destroyed during the war was restored with great reverence: the great baroque town hall with its museum of paintings by Cranach and his students, the roccoco guild hall and the St. Thomas Church where Johann Sebastian Bach once worked and which is now a place of organ concerts. There was also the Auerbach viniary where Goethe first became acquainted with the Faust legend of eternal youth. And I was there and drank the wine...

12261
CSO: 2602/51

- END -