JPRS-EST-90-011
21 MAY 1990

FOREIGN BROADCAST INFORMATION SERVICE

JPRS Report

Science & Technology

Europe

Science & Technology
Europe

JPRS-EST-90-011 21 May 1990

CONTENTS

WEST EUROPE

ADVANCED MATERIALS

European Materials Research Consortium Formed *[Brussels EUROPE, 3 Mar 90]* 1

AEROSPACE, CIVIL AVIATION

Metals, Other Materials in EEC Aeronautics Program
[London METALS FIGHT BACK CONFERENCE, 17 Oct 89] 1
Processing Aluminum Lithium for Aerospace Industry
[London METALS FIGHT BACK CONFERENCE, 17 Oct 89] 7
Belgium To Design Spectrometer for Mir-2 *[Zellik TECHNIVISIE, 7 Feb 90]* 11
ELITE Launcher Technology Program Begins
[J.F. Lieberherr; Noordwijk REACHING FOR THE SKIES, Jan 90] 12
FRG Aerospace Research Institute Expands Focus
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 13
FRG: Interim Report on Hypersonic Technology Published
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 28 Feb 90] 13
FRG: Dornier Develops Tank Bulkhead for Ariane-5
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 16 Mar 90] 14
FRG: University Develops Experimental Microgravity Satellite
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 14
Fokker To Open Composites Plant *[Ohain AVIANEWS INTERNATIONAL, Mar 90]* 15
Production of Ariane-5 Booster Cases Begins
[M. Koeppel; Noordwijk REACHING FOR THE SKIES, Jan 90] 15
Dassault Opens Space Center *[Toulouse LA LETTRE DU CNES, 18 Dec 89]* 15
French Assessment of SPOT 1 Performance
[Paris LE MARCHE DE L'INNOVATION, 12 Jan 90] 16
Plans for SPOT 4, 5 Satellites Outlined *[Albert Ducrocq; Paris SCIENCES & AVENIR, Dec 89]* .. 16
Italy To Enter Commercial Space Launch Market *[Rome AIR PRESS, 15 Dec 89]* 17
Italian GaAs Solar Cells Panel Developed *[Rome SPAZIO INFORMAZIONI, 29 Jan 90]* 17
Italy's Role in European Space Suit Program Discussed *[Rome AIR PRESS, 7 Mar 90]* 18

AUTOMOTIVE INDUSTRY

Audi To Unveil Mixed Diesel, Electric Engine Prototype
[Paris L'USINE NOUVELLE, 25 Jan 90] 19

BIOTECHNOLOGY

Dutch Biotechnology Stimulation Program
[P.H. van Lelyveld, M. Samson, et al.; Rijswijk BIOTECHNOLOGIE IN NEDERLAND, Jan-Feb 90] 19
EC FLAIR Program Selects 35 New Projects *[Brussels EUROPE, 4 Apr 90]* 22

COMPUTERS

EC Commission, Firms Debate Software Rights *[Brussels EUROPE, 12 Apr 90]* 22
ESPRIT Parallel Processing Projects Described
[Edam SUPERCOMPUTER EUROPEAN WATCH, Jan 90] 23
FRG: BMFT Subsidizes Parallel Computer Projects
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 22 Dec 89] 24

FRG: BABYLON Expert System Developed
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 25
Italy: Data Transmission Project for Research Centers
[Francesca Cusumano; Milan ITALIA OGGI, 13 Mar 90] 25

DEFENSE INDUSTRIES

Military Spin-Offs of JESSI Considered *[Olivier Gras; Paris L'ARMEMENT, Dec 89]* 26
Westland Role Seen in Tigre Helicopter
[Paris LA LETTRE HEBDOMADAIRE DU GIFAS, 15 Mar 90] 26

FACTORY AUTOMATION, ROBOTICS

EC Approves Italian Role in EUREKA Project *[Brussels EUROPE, 16 Feb 90]* 26
EC: Joint Research Project With Japan, U.S. Considered *[Brussels EUROPE, 3 Mar 90]* 27
French Industry Investment in Information Technology
[Paris LE MARCHE DE L'INNOVATION, 5 Jan 90] 27
FRG: BMFT Subsidizes Factory Automation Projects
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 28
French Industrial Use of Robots Increasing
[Paris LE MARCHE DE L'INNOVATION, 12 Jan 90] 29
Italy: Robotics Consortium Planned *[Daniele Bo; Milan ITALIA OGGI, 13 Mar 90]* 30
Italy: Selenia Participating in EUREKA Robotics Project *[Rome INCONTRI RSE, Sep-Dec 89]* .. 30

LASERS, SENSORS, OPTICS

FRG: Erlangen Laser Research Association's R&D Reported
[Coburg OPTO ELEKTRONIK MAGAZIN, No 5 1989] 31
FRG: BMFT Promotes Laser Technology Standardization
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 33
UK: Laser Research Achievements Reported
[C. Hopper; Stuttgart LASER & OPTOELEKTRONIK, Apr 90] 34

MICROELECTRONICS

France: CNET Develops Optical Emitter
[Levallois-Perret LA LETTRE DE LA FIBRE OPTIQUE, 29 Jan 90] 34
France: CNET, SGS-Thomson Open Submicron R&D Center
[Paris ELECTRONIQUE HEBDO, 11 Jan 90] 34
SGS-Thomson Opposes Japanese Semiconductors
[Francoise Grosvalet; Paris ELECTRONIQUE HEBDO, 15 Feb 90] 35
Italy: SGS-Thomson Digital Signal Processors *[Rome FINMECCANICA NOTIZIE, 30 Nov 89]* ... 36
Italian, French Microelectronics R&D Facility Planned
[Rome FINMECCANICA NOTIZIE, 31 Dec 89] 36
Italy: Microelectronics Research Consortium Established
[Daniele Bo; Milan ITALIA OGGI, 28 Feb 90] 37
French Semiconductor Suppliers Form Interest Group
[Frederic Fassot; Paris ELECTRONIQUE HEBDO, 22 Feb 90] 37
FRG: JESSI Board Approves 20 New Projects
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 31 Jan 90] 40
Belgian-Japanese Microlithography Joint Venture *[Brussels EUROPE, 23 Feb 90]* 40

NUCLEAR ENGINEERING

Italy: Superconducting Cyclotron To Be Installed
[Rosanna Mameli; Milan ITALIA OGGI, 20 Feb 90] 41

SCIENCE & TECHNOLOGY POLICY

Philips Participation in ESPRIT, BRITE/EURAM Outlined
[Amsterdam COMPUTABLE, 16 Feb 90] 41
EC Council Approves EFTA R&D Cooperation *[Brussels EUROPE, 14 Feb 90]* 42
EC Vice President Assesses U.S. Visit *[Brussels EUROPE, 9 Mar 90]* 42
EC Document Assesses Framework Program
[Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES, 7 Mar 90] 42
EC Commission Approves FRG Research Aid *[Brussels EUROPE, 15 Mar 90]* 53
France: Results of EUREKA Program *[Paris LE MARCHE DE L'INNOVATION, 19 Jan 90]* 54
FRG's R&D Policy, Future Strategy Reviewed
[Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN, 22 Dec 89] 54
France: Increased Aid to Electronics Industry
[Michel Heurteaux; Paris ELECTRONIQUE HEBDO, 11 Jan 90] 55

SUPERCONDUCTIVITY

UK Firms Awarded Superconductor Materials Contract
[Toddington NEW MATERIALS INTERNATIONAL, Feb 90] 56
France: CNET Develops High-Temperature Superconducting Thin Films
[Levallois-Perret LA LETTRE DE LA FIBRE OPTIQUE, 15 Jan 90] 57

TECHNOLOGY TRANSFER

Vienna Council Proposal on Technology Transfer *[Brussels EUROPE, 18 Apr 90]* 57

EAST EUROPE

FACTORY AUTOMATION, ROBOTICS

Hungarian CAD Simulation Software Developed
[Budapest COMPUTERWORLD/SZAMITASTECHNIKA, 15 Mar 90] 59
Hungarian Software Developed for Machine Industry
[Budapest COMPUTERWORLD/SZAMITASTECHNIKA, 15 Mar 90] 59

TECHNOLOGY TRANSFER

Hungarian Firm Accused of Passing Western Technology to USSR
[Tamas Rac interview; Budapest HETI VILAGGAZDASAG, 10 Mar 90] 59

ADVANCED MATERIALS

European Materials Research Consortium Formed

90AN0217 Brussels EUROPE in English
3 Mar 90 pp 7-8

[Report: "Research: EC Joint Research Centre and Three National Centres Form Consortium for Materials Research"]

[Text] The Community's Joint Research Centre (JRC) has joined forces with three other research institutes to pool their expertise in the development and testing of advanced materials. The JRC's Institute for Advanced Materials at Petten in the Netherlands will team up with TNO [Organization for Applied Scientific Research], The Hague, Netherlands), NEL (National Engineering Laboratory, East Kilbride, Scotland), and CISE [Center for Information, Studies, and Experiments], Milan, Italy) for the European Materials Research Consortium (E-MARC) in order to meet a growing range of needs on the European market.

In many areas of modern technology, progress is dependent on the availability of new and improved materials, including new ceramics, polymers, superalloys, intermetallics, and composite materials. The application of these materials requires highly specialised experts and extensive equipment for the manufacture or testing of the materials and components.

The joint availability of combined expertise and facilities will make this type of commissioned research more attractive to European industries. E-MARC will have about 1,000 researchers and technicians at its disposal in the materials field.

By its nature, E-MARC will bring to bear a complete range of competence from materials innovation to the engineered prototype, and has already begun with joint initiatives to secure contracts in industrial sectors such as the automotive industry, aerospace, off-shore engineering, and energy generation.

AEROSPACE, CIVIL AVIATION

Metals, Other Materials in EEC Aeronautics Program

36980022A London METALS FIGHT BACK CONFERENCE in English 17 Oct 89 pp 1-9

[Text] **Abstract**

The purpose of this paper is to identify the origins, objectives and current activities of the Commission of the European Communities in the pursuit of technological excellence and competitiveness in materials. Whilst the prime focus is on the Aeronautical Programme, materials and materials technology are dealt with in a number of Commission initiatives.

1. Introduction

For some years the Commission of the European Communities has been concerned that the industries of the Member States should be world competitive. The main policy instrument for this has been, and continues to be, support for research and development. Four clear thrusts are evident. The Commission catalyses the involvement of European industry and academia; it provides a forum for the interested parties to meet on a pan-European basis; it provides 50 percent (at least) of the funds for a research project; it provides mechanisms for the dissemination and deployment of the research project outputs. (Figure 1).

Figure 1.

The Research Needs of Europe Reflect the Challenges

- To improve international competitiveness;
- To respond to the needs of society by improving the quality of life;
- To increase the Community's capacity to develop and pursue its own technological options.

5 Key Areas

- Information Technology & Telecommunications;
- Industrial materials & Technologies;
- Aerospace;
- Biological Sciences;
- Energy.

General Technology Systems Limited has, for many years, assisted the Commission in the design, management, evaluation and auditing of these applied research and development programmes. It has been closely involved with the design of the current Aeronautical Programme and is now active in the management of its initial project implementation.

Whilst the Aeronautical Programme stands alone, it is part of a much larger programme, BRITE-EURAM. It is necessary to consider this larger programme in order to get the European Community position into proper focus. (Figure 2).

Figure 2. 1987-1991 EEC Programme for R&D in Millions of ECUs

1. Quality of Life		375
1.1 Health	80	
1.2 Radioprotection	34	
1.3 Environment	261	
2. Information and Communication Society		2275
2.1 Information Technology (ESPRIT)	1600	
2.2 Telecommunications (RACE)	550	
2.3 New Services (DRIVE-DELTA-AIM)	125	

Figure 2. 1987-1991 EEC Programme for R&D in Millions of ECUs (Continued)

3. Modernization of Industrial Sectors		845
3.1 Manufacturing Industries (BRITE)	400	
3.2 Advanced Materials (EURAM)	220	
3.3 Basic Materials	45	
3.4 Standards and Measurements (BCR)	180	
4. Enhancement of Biological Resources		280
4.1 Biotechnology (BAP-BRIDGE)	120	
4.2 Food Technology (ECLAIR)	105	
4.3 Agriculture	55	
5. Energy		1173
5.1 Fission	440	
5.2 Thermo-nuclear Fusion (JET)	611	
5.3 Non-nuclear Energy	122	
6. Science and Technology for Development		80
7. Enhancement of Ocean Resources		80
7.1 Ocean Sciences and Technology	50	
7.2 Fishing	30	
8. European Cooperation		288
8.1 Stimulation of Human Resources (Science)	180	
8.2 Use of Major Facilities	30	
8.3 Forecasting & Assessment (FAST-SPEAR)	23	
8.4 Exploitation of Research Results	55	
Total		5396

2. Europe and the Aeronautical Industry

Each of my colleague presenters is dealing with an important area of special materials interest. From a European point of view it is also useful, briefly, to demonstrate the overall position of the aerospace industry in the total economy. The key features are shown in Figures 3 to 7.

Figure 3. Economic Changes in the Community

The industry sector	1980	1987
Employment in the main economic activities	36.9%	32.1%
Share of main economic activity in value added added at market prices	27.6	26.3
All sectors production index	100	107.4
Metal articles	100	119
Aerospace	100	205
Metal sector investment	3937 MECU	6038 MECU

Figure 4. Community Production MECU

Sector	1980	1983	1986
Mechanical eng'g	119521	133305	164295
Metal articles	98754	109152	127137
Vehicle parts & acces.	14978	18715	22702
Shipbuilding	1172	1900	1582
Rolling stock	1681	2975	2460
Aerospace	17252	25572	33485
Ceramics (Less BRICKS)	9525	10278	11390

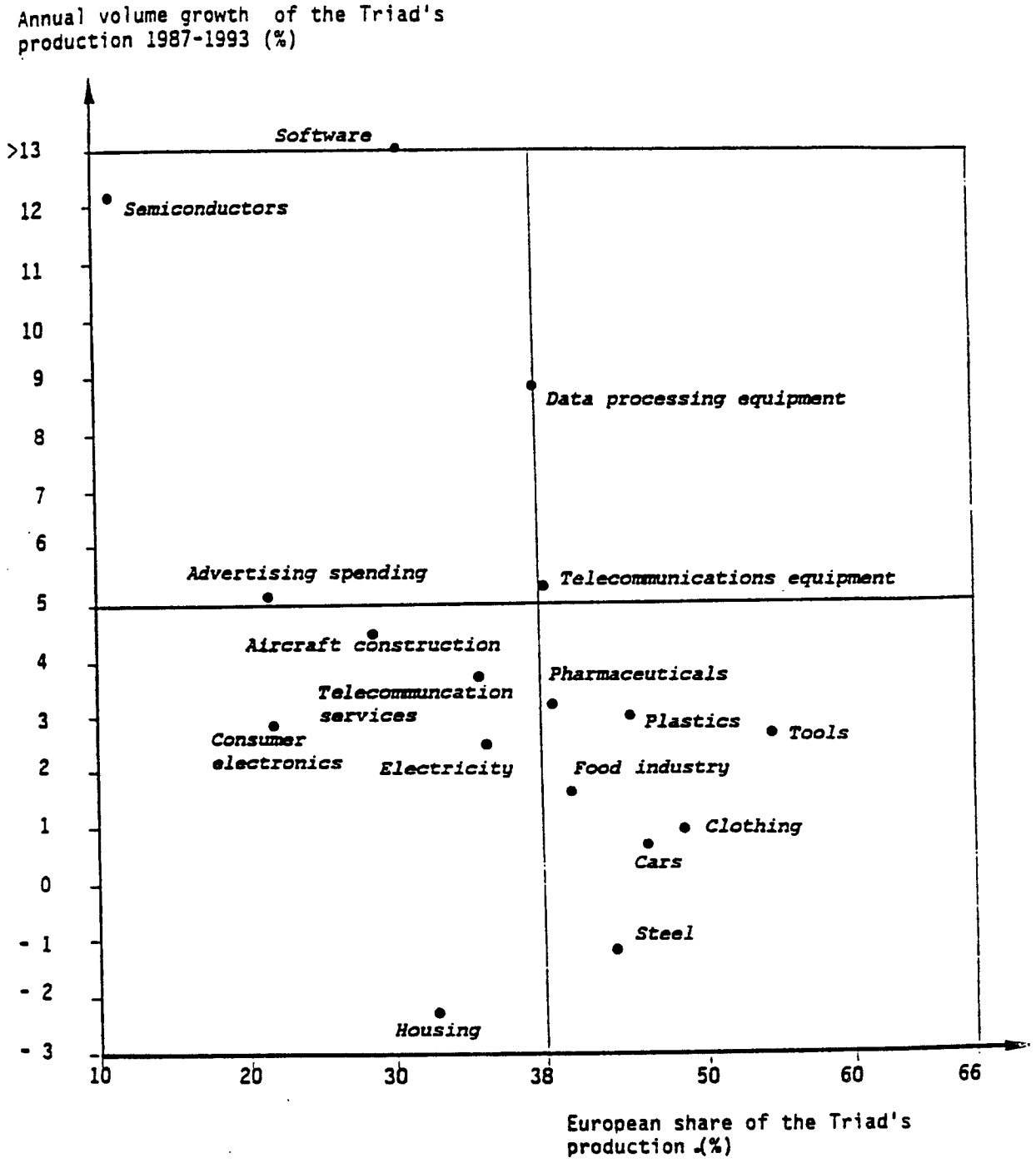
Figure 5. Relative Profitability, % on Turnover

	1980	1983	1986	1987
Major European aerospace companies	1.5%	-0.6%	2.0%	0.1%
American aerospace industry	4.3%	3.5%	2.8%	2.8%

The data presented derive mainly from published and available work done under the sponsorship of the Commission of the European Communities.

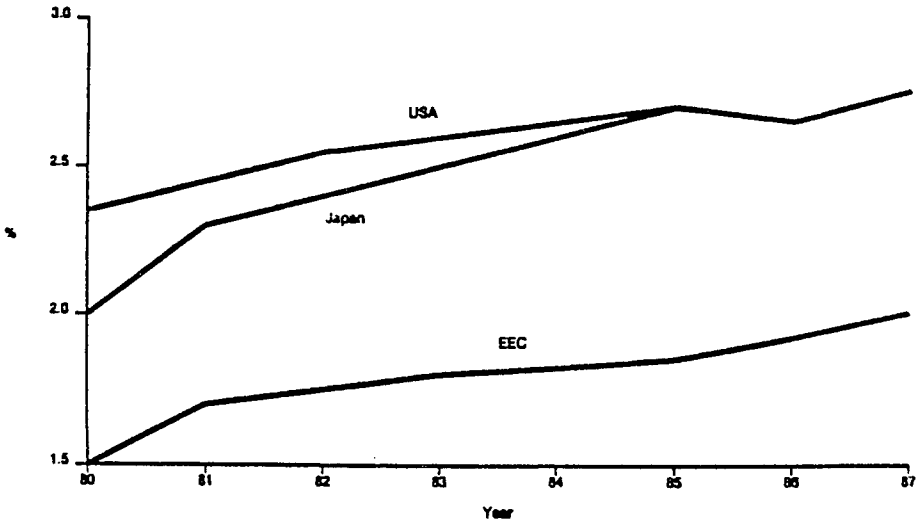
As Figure 3 shows, Europe's industry has shed much of its labour and maintained its trading position reasonably well. Both the metal articles and aerospace sectors have better than average productivity improvements. The investment position, too, is not unfavourable. Figure 4shows that the aerospace sector is not one of the major manufacturing sectors, but is significantly larger than other transport equipment sectors. More importantly its rate of growth is much greater than the others with which it is compared. Underneath this success, however, is a background of much lower profitability than the principle competitors in the United States as Figure 5 shows.

The Triad of major economic powers, the USA, Japan and Europe, dominate world industry. Figure 6 shows that the aeronautical industry in Europe represents about one third of the Triad, and is one of the moderately expanding sectors at this time. To sustain that



The term "Triad" refers to total activity in Japan, the United States of America and the European Community.

Figure 6. The European Portfolio



Source: OECD

Figure 7. R&D Spending in the Triad R&D/GDP (%)

position it must have competitive new products. This requires research and development, but Europe is not very well placed as Figure 7 shows. The Commission has for some years past given strong support to the information technology based industries which feature as strong Triad domains. It has now identified the need to support a more closely defined industry sector. It is worth noting that the aeronautical sector is the first specialised industrial sector to have such a specifically targetted support programme, notwithstanding a history of sectoral cooperation (Figure 8) and R&D expenditure which compares well with the competition (Figure 9).

Figure 8. Some European Aerospace Programmes

Space	Ariane I, II, III, IV (1988)
	Ariane V (1984 with VULCAIN engine)
	Hermes (1996)
	Columbus (1998)
Civil aviation	Fokker F27, F28, FO50, FO100
	Concorde
	Airbus A300, A310, A320, A330, A440
	ATR 42/72
Military aviation	Jaguar
	Tornado
	Alpha-Jet
	Transall
	Atlantic 1-2
	EFA
Helicopters	Puma
	Gazelle
	Lynx
	EH 101
	HAP-HAC/PAM2
	NH 90
	A 129 LAH

Source: BIPE

Figure 9. Privately Funded R&D Expenses of the European, American and Japanese Aerospace Companies

First 10 European companies	1986 R&D expense in percent of sales	First 10 American companies	1986 R&D expense in percent of sales	First 4 Japanese companies	1986 R&D expense in percent of sales
SNECMA	13.50	Northrop	6.75	Mitsubishi	4.85
Aerospatiale	10.50	Allied Signal	6.20	Fuhi Hi	3.37
Rolls Royce	7.33	UTC	5.44	Kawasaki Hi	3.06
Matra	7.27	Lockheed	4.80	I Hi	2.78
Fokker	6.91	Sundstrand	4.63		
MBB	5.77	Boeing	4.63		

Figure 9. Privately Funded R&D Expenses of the European, American and Japanese Aerospace Companies (Continued)

First 10 European companies	1986 R&D expense in percent of sales	First 10 American companies	1986 R&D expense in percent of sales	First 4 Japanese companies	1986 R&D expense in percent of sales
MTU	5.52	Martin Marietta	4.61		
CASA	4.71	McDonnel Douglas	3.99		
B Aerospace	3.52	General Electric	3.64		
Westland	1.66	Raytheon	3.48		

Source: Annual Reports of Companies, Synthesis Eurostat

3. The Origins of the Support

The Framework Programmes of the Community have been supporting a number of broad areas for some years. The BRITE programme has been concerned with manufacturing technology and EURAM with materials science. They have had a broad overlap in the area of materials technology. It may be useful to review briefly where metals and non-metals stood in these two programmes. Since a separate entity, the Coal and Steel Community, has addressed steel issues, steels are barely in evidence in these two programmes. The two earlier programmes received around 230 MECU of Commission funding.

An example of overlap was the acceptance of powder based projects in EURAM I Area 1 Metals. A closer examination of the projects funded in EURAM I shows that 11 projects out of 13 related to Al, Mg or Ti base alloys had aerospace applications potential. Aerospace was certainly one application field for projects in a number of ceramics based projects in Area 2. In Area 3, as would be expected, a high proportion of the 12 organic matrix composite projects could have aerospace applications, but not all. The 6 metal matrix composite projects were all, effectively, aerospace oriented. Nearly 30 aerospace companies and institutions worked on EURAM I projects.

The aerospace connection is less well established in BRITE I, only some 12 aerospace organisations and companies being involved. Indirectly however, suppliers of manufacturing equipment, components, and other input materials were well represented. In a diverse range of topics, metals were well represented as Figure 10 shows.

Figure 10. BRITE I

	Percent projects metals related
Area 1: Reliability, wear & deterioration	47
Area 2: Laser technology	54
Area 3: Joining techniques	73
Area 4: New testing methods	28
Area 5: CAD/CAM & mathematical modelling	32
Area 6: Polymers, composites, other new materials & powder technology	22
Area 7: Membrane science & technology	0

Figure 10. BRITE I (Continued)

	Percent projects metals related
Area 8: Catalysis & particle technology	20
Area 9: New production technologies suitable for products made from flexible materials	0

In considering the topics what would have been for BRITE II and EURAM II, the character of the support for various topics areas in their predecessors was taken account of. Such considerations were also important during the design and development of the current Commission Aeronautics Programme. As many of you will know, the aircraft builders in particular made major contributions to EUROMART, the programme design study. To a degree this reflected business patterns in the sector (Figure 11). Some twelve working parties developed pilot and main programmes for well identified research and development areas in the aeronautical field. Recognising that a number of funding and participation problems could not be overcome easily, and recognising the already strong presence of the aerospace industry in other programmes, the outcome of the EUROMART study was to create an aeronautics research and development programme comprising 5 areas. One overall programme emerged—BRITE/EURAM.

4. The Current Programme

4.1 Directorate General XII for Science, Research and Development manages the Research and Technological Development Programme BRITE/EURAM 1989/1992. The full catalogue of priority themes may be seen in Community publications. The major technical areas are shown in Figures 12 and 13. The continuing emphasis on light alloys in area 1.1 illustrates both Commission's concern for the longer term and the maintenance of aerospace oriented metal based projects. An examination of the details of the other areas shows that metals and other materials in aerospace applications can be catered for in respect of airframes, engines and equipment. Because of these opportunities in the main part of BRITE/EURAM, it has been possible to focus the relatively limited funds available onto a two year pilot programme. Some 35 MECU are available for BRITE/EURAM Area 5—Aeronautics.

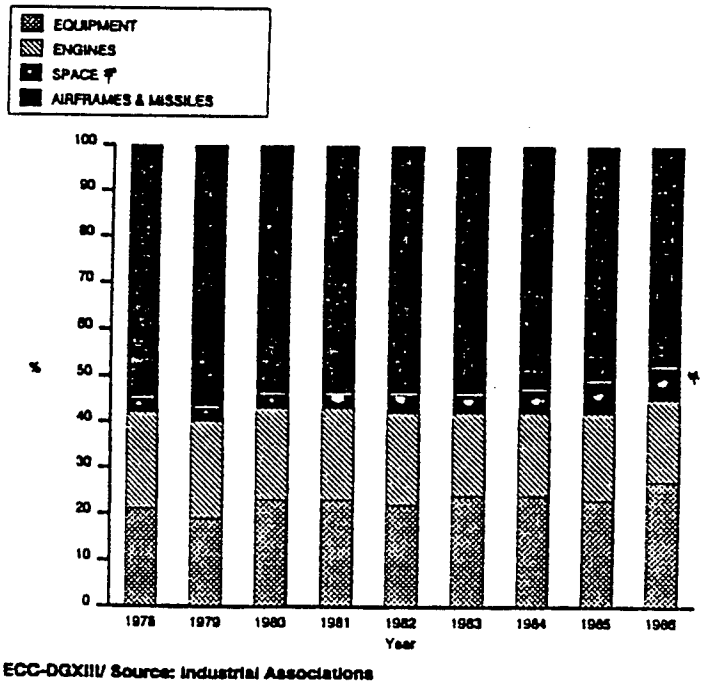


Figure 11. EC-12 Turnover

Figure 12. BRITE/EURAM

1. ADVANCED MATERIALS TECHNOLOGIES

1.1 Metallic materials & metal matrix composites

1.2 Materials for magnetic, optical, electrical & superconducting applications

1.3 High temperature non-metallic materials

1.4 Polymers & organic matrix composites

1.5 Specialized applications (biomaterials; packaging, civil engineering) 2 DESIGN METHODOLOGY & PRODUCT/PROCESS ASSURANCE

2.1 Quality, reliability & maintainability in industry

2.2 Product & process assurance

3. APPLICATIONS OF MANUFACTURING TECHNOLOGIES

3.1 Advanced manufacturing practices with emphasis on SMEs

3.2 Manufacturing processes for flexible materials

4. TECHNOLOGIES FOR MANUFACTURING PROCESSES

4.1 Surface techniques

4.2 Shaping, assembly & joining

4.3 Chemical processes

4.4 Particle & powder processes

Figure 13. BRITE/EURAM

5. SPECIFIC ACTIVITIES RELATING TO AERONAUTICS

5.1 Aerodynamics

5.2 Acoustics

5.3 Borne systems & equipment

5.4 Propulsion systems (not new engines)

4.2 Not only in an aeronautical context, but more widely, metals are more than holding their own. Europe is supporting both science and technology. It needs to. Whilst the competitor materials are predicted to have strong applications growth in all sectors (Figure 14), metals and metal-rich materials remain well placed and important. Europe is seen as being somewhat less dynamic than both the USA and Japan in materials (Figure 15). Perhaps this is where the challenge lies and the Commission recognises it. Remember that the Commission takes active and continuing advice from industry. To a significant degree this means that programmes do reflect the views and needs of industry.

Figure 14. World Market for New Materials

	1986 MECU	Percent average annual volume growth 1986-1995
New steel products	50,000	2.3
Technical thermoplastics	10,000	8.3
Technical thermosets	15,000	5.5
New non-ferrous metals	13,000	3.8
Composites	12,000	8.8
Technical ceramics	7,000	13.9
New Glass Products	4,000	9.3
Functional materials for electronics	14,000	12.0
Total	125,000	6.4

Figure 15. US, W. Europe, Japan & USSR in Four Key High Technology Sectors

	USA	Japan	W. Europe	USSR
Computers	9.9	7.3	4.4	1.5
Life sciences	8.9	5.7	4.9	1.3
New materials	7.7	6.3	6.0	3.8
Optoelectronics (1)	7.8	9.5	5.7	3.6

(1) Exluding big lasers

Source: Fortune, October 1986

4.3 Is it then worthwhile seeking to be part of collaborative ventures? On balance, the answer has to be—YES.

- Some R&D expense is funded;
- If you are an SME, 75 percent is funded;
- You gain access to the results of work done;
- You become part of a European network of expertise;
- You contribute to remedying competitive deficiencies for Europe;
- Although the programmes are pre-competitive, involvement helps to identify commercial opportunities.

4.4 Metals are fighting back. In one sense they have never been at risk—under threat perhaps—but not yesterday's materials by any means. Europe recognises this, and at the more innovative boundaries of some topics, materials are being investigated where no clear distinction can be made among metals, polymers, ceramics and other materials. This is the essence of advancement, and the aerospace sector is a major contributor.

Dr. F. A. Green, C.Eng.

Frank Green is a materials and manufacturing technologist currently a Senior Consultant with General Technology Systems Ltd., and a Director of General Technology Systems (Scandinavia) A/S.

From an early career in R&D he moved into operations management in the United Kingdom and Latin America with companies such as the AE Group, Calor Group, Stewart-Warner Corporation. His last industrial appointment being as Managing Director—Europe for Twin Disc Inc. He has been a technical advisor to the Mexican Government and latterly an Industrial Advisor to the British DTI.

With GTS his responsibilities cover industrial development, technology transfer, and materials and manufacturing R&D and deployment strategies. The working of the European Community as a single economic entity has been a particular interest for a number of years.

Processing Aluminum Lithium for Aerospace Industry

36980022B London METALS FIGHT BACK CONFERENCE in English 17 Oct 89 pp 1-9

[Article by D. Constant, M. Doudeau, and J. M. Sabathier; first paragraph is METALS FIGHT BACK CONFERENCE introduction]

[Text] After a survey of Pechiney's Aluminum-Lithium alloys and their means of production, we present hereafter the engineering properties, together with an indication of recent work carried out by our customers during the manufacturing of this new family of alloys.

Introduction

Over the last ten years, considerable financial means have been devoted to the definition of composition and tempers of those Aluminum-Lithium alloys liable to compete with existing conventional alloys.[1]

It is now generally acknowledged that new alloys have reached a compromise where properties are concerned. These are now very similar to those of classical alloys with an increase in stiffness and reduction in density of up to 10 percent.

On the basis of the first very promising results, Aluminum producers and aircraft makers expected a rapid introduction of hundred percent Aluminum-Lithium air frame structures. However, it was hardly realistic to think that Aluminum-Lithium could take a significant share in the market much more rapidly than other materials used in aeronautics.

Whether for the Aluminum 7000 series, or for composites, roughly 10 years' work is considered necessary for the new material to go from the laboratory stage to the factory stage, and again 10 years from the factory to the airplane manufacturer.

After intensive research, the principal Aluminum producers are facing the problem of the industrialisation of the Al-Li alloy. Today's problem is no longer the delivery of samples or to prove the feasibility of the product, but to produce "just on time" the products for the most extensive industrial use possible.

This presentation therefore summarizes our current developments, and explains how Pechiney has progressed with Al-Li from the "tailor-made" to the "ready-to-wear" stage.[2]

Production of Al-Li

Casting

With an experience of several hundred castings in both slab and billet forms, and on a variety of alloys and ingot cross-sections, the casting technology of Al-Li is well mastered.

Regardless of the Aluminum-Lithium alloy used, current 3-ton ingots present a good surface condition, leading to the same amount of scalping as on conventional alloys. Their processing is performed solely in plant, under fully industrial conditions. We are now able to guarantee properties, including the short-transverse direction on thick products. This confirms the good quality control of the cast ingot, in terms of:

—homogeneity of composition,
—inclusion and impurity level,
—gas content, porosity,
—grain size.

Very thick ingots with a cross section of up to 1300 x 450 mm have been successfully cast in 2091, and we are very confident for the future regarding the casting ability of our foundry for delivery of the large ingots needed for the very wide, thick pannels of airplanes.

On the other hand, billets with a diameter of up to 450 mm have frequently been cast in the 8090 high-strength version that we have developed for extruded semi-products.

Since the properties obtained on extrusion parts with this latter alloy are very attractive,[3] aircraft manufacturers such as MBB and Aerospatiale chose it for their qualification programs.

This casting unit is flexible enough, should the customers' requirements increase, to meet the demand for the next 2 to 3 years, with capacity left for early introduction of Al-Li semis on aircrafts. It enables the manufacture of the same semi-products (dimension-wise) as on conventional alloys with representative properties, which is the key point when supplying for qualification programs.

Transformation

Sheets and plates are rolled from 3-ton ingots on the existing hot and cold rolling lines at Issoire. Sheets are produced by continuous rolling. Pechiney's experience is now based on the rolling of sheets from 1 mm to 88 mm thick, in widths from 1000 mm to 2000 mm. Cladding of sheets is possible, regardless of the cladding material (7072 or 1xxx).

The evolution of the size capacity in Issoire is shown in Figure 1, and we are now able to produce in Al-Li all the sheets currently used in aircraft manufacturing.

Extrusions are produced in the Montreuil-Juigne plant. Profiles are directly extruded from machined or pre-extruded billets. Research on thermal treatments has been carried out in order to obtain a good surface aspect on extruded parts.

With the properties of the Pechiney 8090 version, we are expecting a quick development of this product. Most of the extrusions in conventional alloys could be replaced very shortly.

Forgings have been carried out at Airforge, a former Pechiney subsidiary in Issoire. Large hand forgings have been processed in order to evaluate the potential use of 2091 for thicker gauges, without any difficulty. Numerous shapes in precision and thin-walled forgings have been successfully produced from 8090 and 2091 alloys. Other producers such as Otto Fuchs or V.A.W. in Germany have realized forgings and extrusions with Pechiney billets.

Metallurgical Goals and Alloys Review

Pechiney has developed three main Al-Li alloys, covering the whole strength range of conventional alloys, with a density reduction of 8 to 10 percent and a Young modulus of about 11 percent.

They belong to the Al-Li-Cu-Mg-Zr family, which turned out to be the most promising. The replacement of 2024 and 7075 guides the work on Al-Li alloy design.

Main properties and alloys to be replaced by Pechiney's Aluminum-Lithium are summarized in Table 1.

Table 1. Description of Pechiney's Aluminum-Lithium

Main properties	Alloy to replace	Al-Li alloy	Potential density reduction	Potential Young modulus increase	Product forms
Damage tolerance	2024-T3	2091	-8%	+ 7%	Fuselage skins bare of clad; Stringers
Medium strength	2214-T6, 7075-T73	2091(*)	-8%	+7%	Intermediate sheets; Plates
		8090		+11%	Extrusions; Forgings
High strength	7075-T6, 7010 or 7050-T76	CP276	-8%	+11%	Plates; Thin extrusions

(*)strength-wise = excluding ST stress-corrosion resistance

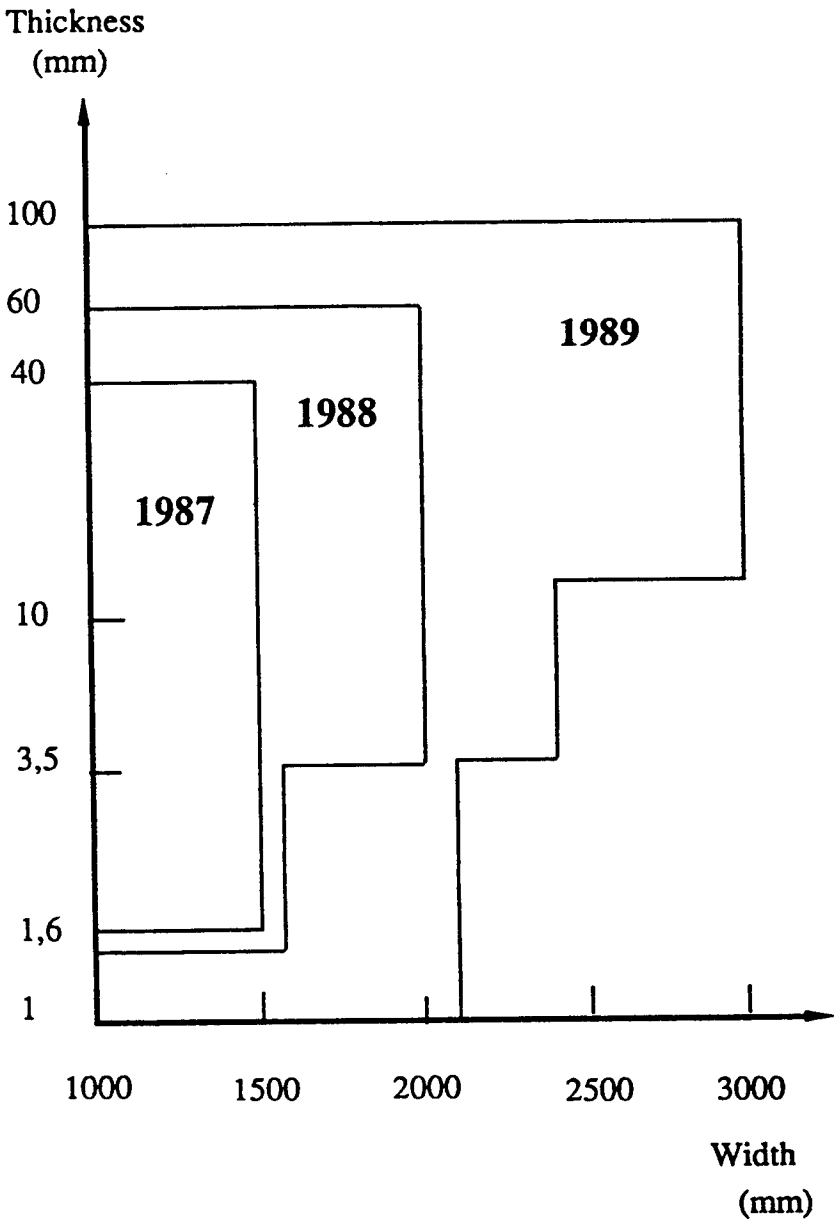


Figure 1. Evolution of the Size Capability at Issoire Plant

Development is conducted on every possible product form. The overall status is as follows:[1]

2091 is a good candidate for 2024-T3 replacement:

—rolled products are processed according to fixed procedures, under fully industrial conditions (quality assurance system) hence the existence of minimum guaranteed properties. Short-transverse properties of plates are also guaranteed.

—CPH version, developed to reach high stress corrosion cracking resistance, has been improved to match the aircraft manufacturers' specifications.

—the same status has been reached on thin extrusions and thick forgings, although 8090 is also a good candidate for thin extrusion replacement.

It's for this replacement of damage tolerant alloys that Aerospatiale and MBB have carried out large evaluation programs[4,5] in order to introduce Al-Li alloys on the Airbus 330/340.

For medium strength replacement, both 2091 and 8090 give promising results: extrusions, thicker sheets, thin-walled forgings. Guaranteed properties have been established only in the case of thin extrusions, due to a more limited experience.

2091 is recommended for applications where strength-toughness combination is of prime interest, especially for structural parts usually made out of 2214-T6 type of alloys: plates and thick forgings. 8090 is favoured for some 7075-T7351 replacements, where very high short-transverse stress corrosion resistance is not important: thinner plates and extrusions.[6]

CP 276 is Pechiney's candidate for high strength replacement, with confirmed achievements in two cases: medium-thickness plates and thin extrusions. The extent to which CP 276 can replace 7075-T6 or -T76 in the other product forms is still being evaluated.

Engineering Properties

This chapter concerns the ease of manufacturing for the aircraft maker, as well as the performance in service for the end-user. The results given here are based on the experimental programs conducted by customers, and on the results of in-house programs. The engineering properties of Al-Li alloys are similar to those of conventional alloys, with improvements in certain cases. The manufacturing techniques therefrom remain unchanged for the aircraft maker.

Thus two years ago AMD/BA realized structural assemblies such as air intakes on the Mirage 2000.

Recently Fokker[7] has successfully produced access doors using 2091. Almost every manufacturing technique has been tested: machining and blanking, bending, chemilling, surface treatment, drop-hammer forming, stretch forming, painting and riveting.

Forming

As a general rule, the as-quenched condition provides the best forming ability for Aluminum-Lithium alloys. In this temper, the forming ability of 2091 recrystallised sheets exceeds that of 2024.

This outstanding behaviour facilitates forming operations: it authorizes a decrease in the number of forming stages as compared to 2024. This benefit has been checked in bending, drawing and stretch-forming tests by Dassault, Fokker and Aerospatiale.

Moreover, the forming ability of 2091 sheets in T3 or T8X is also high enough for some forming operations: Fokker has successfully manufactured stringers out of 2091 sheets in the final (T8X) condition.

Thermal Treatment

The solution treatment holding time and quenching techniques applied to 2024 can be used for aluminum-lithium alloys on the whole, and in particular for 2091 and 8090.

One of the biggest advantages of 2091 is that this alloy can be used with every type of furnace (air or saltbath). Conditions of thermal treatment have also been established for typical forming procedures used by customers.

The natural ageing of aluminum-lithium alloys is significantly lower than that of 2024. This gives rise to an increased comfort in the workshops.

The influence of cold-working between quenching and ageing has been measured on 2091. This alloy is less sensitive to cold working than 2024. This leads to an improved homogeneity of properties within the formed piece, as observed by Aerospatiale and by Dassault on 2091 (T8-T6)X sheets.

Because of grain coarsening, the critical lower work hardening limits the maximum intermediate strain in the forming sequence before the last solution heat treatment. The same limitation exists on conventional alloys. To be precise, the actual values of [blank space in text] are: 5 to 13 percent for 2091, 6 percent to 10 percent for 2091-CPHK and 6 percent for 2024 sheets.

Chemical Milling—Machining

Chemical milling can be successfully applied to aluminum-lithium alloys and in particular to 2091 and 8090. The surface quality naturally depends on the baths used by customers (additives, etc.). The chemical milling speed of 2091 is equivalent to that of 2024 when measured in a pure soda aqueous solution. The influence of the ageing temper is negligible. The presence of Lithium does not alter the stability of the baths, although more mud is generated during the chemical milling of Al-Li alloys. Machining can be performed on existing tools; it is safe providing that a vacuum system is placed at the base of the tool, or a proper lubrication used to avoid dust formation.

Surface Treatments

Acid etching is recommended to eliminate the Li2C03 carbonate layer resulting from the solution heat treatment. Before anodizing, acid (e.g. sulphochromic) etching is preferable to caustic etching. As observed on 8090, the attack due to the sulfochromic [as published] etching is regular and slightly slower than on 2024.

Chromic anodizing creates an efficient barrier against corrosion in Al-Li alloys. The thickness of the oxyde layer is equivalent for 2024 and 8090. Hard anodizing has been proved feasible on CP 276. Sulfuric anodizing has been tested on 8090. The thickness of the oxyde increases continuously with time, resulting in a thicker layer than on 2024.

Joining

Riveting performs well on Al-Li alloys,[7] with a fatigue behavior usually similar to that of 2024, or even better, as measured by Aerospatiale and Dassault. Spot welding is used by Dassault.[8] It is easier than with conventional alloys due to the increased resistivity of Al-Li alloys. The resulting weld is also stronger. TIG welding has been tested, especially on 2091 and CP 276.[9] A complete heat treatment is still needed (including the solution heat treatment) in order to reach an acceptable elongation of the weld.

Conclusion

The most recent progress made in processing:

—casting of large size ingots and billets,
—improvement of damage tolerant alloy properties,
—increase of the capacity in size for sheets and plates,
—production under quality assurance systems,

has left us confident in the future of Aluminum-Lithium alloy production on an industrial scale by Pechiney.

We have reached the point where the introduction of Al-Li in airplane construction seems to be feasible.

Due to the fact that Aerospatiale and MBB have decided to build the fatigue cells of the A330/A340 with parts in Al-Li, we believe that we are now at a turning point in the history of this material.

Major aluminum producers are looking forward to meeting the needs in Aluminum-Lithium that aircraft manufacturers may express and Pechiney is ready to produce these alloys of the year 2000.

Didier Constant

D. Constant is a graduate of the Ecole Centrale de Paris with a certificate of metallurgy.

In 1987 he joined Pechiney's Voreppe Research Center and was in charge of projects on high strength aluminium alloys.

From 1986 to 1987 he was assigned to the Center of Development of Metal Matrix Composites.

Since 1987, he has been in charge of the development of Aluminium Lithium alloys at the Issoire plant as project manager.

References

1. Le Roy, G. and Meyer, P., Aluminium Lithium Symposium, Westec, Los Angeles, U.S.A., March 1986, 1987, 1988.

2. Derian, J. C., "La Grande Panne de la Technologie Americaine", Albin Michel, France, 1988.

3. Smith, A. F., "Uses and Properties of Al-Li on the New EH101 Helicopter", Westland Helicopter, U.S.A.

4. Barbaux, Y., "Properties of Aluminum-Lithium Alloys", Aerospatiale, Laboratoire Central, Suresnes, France, Agard Meeting, Mierlo 1988.

5. Zink, W., Weilke, J. and Rendigs, K. H., MBB, Bremen, W. Germany, "Investigations on Sheet Material of 8090 and 2091 Aluminum-Lithium Alloy", Agard Meeting, Mierlo 1988.

6. Constant, D., Meyer, P. and Doudeau, M., "Al-Li Alloys Developed by Pechiney", Agard Meeting, Mierlo 1988.

7. Vaessen, G. J. H., Dr., Van Tilborgh, C. and Van Rovijen, H. W., Dr., Vokker, Schiphol, "Fabrication of Test Articles from Al-Li 2091 for Fokker 100", Agard Meeting, Mierlo 1988.

8. Bevalot, J., AMD/BA, Saint Cloud, France, "Application of Alloy 2091", Agard Meeting, Mierlo 1988.

9. Canaby, J. L., Blazy, F., Fries, J. F. and Traverse, J. P., Arsenal de Tarbes, "Porosite dans les Cordons de Soudure d'Alliages Aluminum Lithium", Journees d'Automne de la Societe Francaise de Metallurgie, 18 Oct. 1988.

Belgium To Design Spectrometer for Mir-2

90AN0235 Zellik TECHNIVISIE in Dutch 7 Feb 90 p 3

[Text] The Belgian Institute for Space Aeronomics (BIRA) and the USSR Institute for Space Research of the Moscow-based Academy of Sciences (IKI) are to cooperate within the framework of the MIRAS project.

The aim of this project is to install an infrared spectrometer on board Soviet space station Mir-2, due to be launched in 1994. The space station will be recording observations as part of the "Global Change" study. It will study the composition of the atmosphere at a height of between 15 and 140 km and between 78 degrees North and South latitude. These observations are relevant for future industrial projects, such as supersonic civilian aircraft, and for the environment (the problem of the ozone layer).

This project fits into the agreement on economic, scientific, and technical cooperation between the USSR and Belgium.

The USSR will be responsible for control and integration tests on the ground, training of cosmonauts, launching of the Mir-2 space station, attaching the device to the outside of the station, data reception, and command transmission. The Belgian contribution will consist in updating the electronics and adjusting the spectrometer.

Infrared Spectrometer

For more than 25 years, BIRA has been working on the development of an infrared spectrometer, the latest version of which will be mounted on the Mir-2. The equipment was originally designed for short-term missions under the Spacelab program and was first tried out by NASA during test flights.

The newest version has been modified for a long-term mission (of at least one year, so that seasonal effects can be measured).

The instrumentation that is still to be produced consists of three parts. First, there is an optomechanical unit which directs the instrument's sighting device through the Earth's atmosphere to the Sun, close to the horizon, and which uses a telescope to provide an image of the Sun at the opening to the actual spectrometer. Second, there is the electronics equipment which will control the instrument, receive scientific signals, and monitor operations. Finally, a module will have to be placed in the pressurized cabin to ensure communications with the ground, which can also be accessed by cosmonauts for periodic checks.

Orbiting at 250 to 400 km altitude, the spectrometer will be able to measure concentrations of H2O, CO, NO, NO2, N2O, CH4, HCl, HF, and O3 in the stratosphere, the mesosphere, and low thermosphere by making observations near the horizon in either absorption or emission mode. It will also be able to record other trace gases.

Actual manufacturing is expected to take 72 months. The total cost of the spectrometer is estimated at 600 million Belgian francs, of which 50 million will be contributed by France.

The firm Space Technology and Construction Studies (ETCA) will make a preliminary feasibility study, which will take six months.

ELITE Launcher Technology Program Begins

90AN0215 Noordwijk REACHING FOR THE SKIES in English Jan 90 p 8

[Report by J.F. Lieberherr: "ELITE Technology Effort Launched"]

[Text] Efforts to improve on launcher technology are presently taking place in the various European countries according to the way the needs are perceived. There is an increasing urgency to improve the effectiveness of these efforts by creating a consensus on the areas that should be developed (i.e. where real needs exist), by identifying priorities, by improving the cost effectiveness of the amounts allocated to technology, by promoting cooperation within Europe and creating a synergy between the national activities, and in general by preparing the basis for future European cooperative launcher activities.

The launcher field has traditionally been a field where large amounts of technological work are necessary because technological uncertainties translate into design margins, then into mass. The major nations spend 5 to 7 percent of their launcher expenditures on fundamental launcher technology but this is done largely independently. Since it is a part of the European Space Agency (ESA) mandate to promote coordination within Europe, it has been felt necessary for ESA to try to federate the activities on launcher technology and to provide guidance for future activities.

This is why the ELITE approach was proposed to the ESA Ariane Programme Board on 31 May 1989. ELITE stands for "European Launcher Investigation and Technology Effort." Its purpose is to identify the needs for technological advances in critical areas, to orient the activities of the ESTEC [European Space Research and Technology Program] Technology Research Programme (TRP—Theme 8: Launchers and Reentry) according to the identified needs, to prepare activities to be jointly funded by ESA and national authorities and/or industry. Further developments of ELITE can be envisaged but they will not be considered for the moment.

In view of the favourable response of the Programme Board, the director of Space Transportation Systems and the technical director of ESA have decided to implement the proposed plan. In areas where coordination activities have already been started nationally, direct contacts with the national coordinating authorities are being established to examine the work plan and to open these activities to international cooperation. In other areas of interest it is planned to invite European experts to "workshops" aimed at identifying the needs and shortcomings of the present situation in terms of fundamental technological activities. These experts will be requested to assess the present situation and needs, to estimate the future trends, and to formulate recommendations for future actions. The accepted recommendations will be used as a basis for setting up the TRP activities with ESA funding and also to prepare proposals for National Authorities where mixed funding is considered. This approach should favour a dialogue between ESA and industry and improve the quality of the response of the Agency to the needs of industry.

The first activity that has been planned deals with flow inside rocket nozzles; and a workshop, bringing together European experts in the field, will convene in late February 1990. In the area of tribology and hydrogen combustion, where work was already started in France under CNES leadership, consultation meetings are being started. Whether consultation meeting or workshop, each activity will be followed by the establishment of a work plan and of a funding plan that will receive official ESA approval. ESA will then propose directly to national authorities or industries cooperation on the selected subjects. Additional workshops are being considered, but this will also depend on the expression of interest and needs by industry. The frequency of the workshops in each area will depend on the relevant rate of progress; they could take place each year or every second year. An important facet of ELITE is the promotion of exchange

of technical information while protecting legitimate ownership of data and proprietary rights. This will be achieved by leaving it to industry to decide what information should be exchanged, but it is expected that the simple fact of bringing industry and research organisations together to speak about their problems will increase their will to cooperate for their mutual benefit.

FRG Aerospace Research Institute Expands Focus

90MI00134 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 31 Jan 90 p 8

[Text] The FRG Aerospace Research Institute (DLR) has also linked up to the growing international research network. The DLR thus has a major share in the preparations for an aviation program initiated by the EC in consultation with nine European aircraft manufacturers from six countries. When presenting the 1989 annual report, board chairman Professor Walter Kroell said that—with a view to the single common market in 1992—the program would improve the European aviation industry's competitiveness in the face of international competition.

In addition to its responsibilities in these "traditional" areas, this major national aerospace research institute is also involved in research on power engineering and environmental surveying. Prof. Kroell stated: "The newly adopted environmental surveying program is in line with current space exploitation requirements." The DLR scientists will be deploying the skills and experience acquired in remote sensing from air- and spacecraft that, for example, they used to investigate the massive spread of algae blooms in the North Sea in 1988.

"Mission to Planet Earth" is the title of a major international project designed to achieve a better understanding of the earth as an overall system. Its goal is to record all the parameters relevant to the atmosphere and the earth's surface required to model the overall earth system. As a preparatory scientific program, a German-Italian Cx-band synthetic aperture radar (X-SAR) and American L-band and C-band synthetic aperture radar systems will be used between 1991 and 1994 in three shuttle missions, the "Radar-Lab" missions, at altitudes between 200 and 250 km. Various frequencies, polarizations, and angles of incidence in image-forming radar systems will be tested with a view to applications in geology, hydrology, vegetation mapping, or oceanography.

In its power engineering program, the DLR is increasing its research on the effects of the CO_2 problem. It proposes to study the contribution that solar energy may be able to make to power supplies on a long-term basis. Hydrogen, which scientists believe may contribute toward the large-scale exploitation of solar energy owing to its storage and transport capacity, is a potential future secondary energy source. To this end, the DLR is carrying out two programs, one on combustion technology and the other on solar and hydrogen power engineering, designed to reduce the build-up of pollutants and to exploit the potential of solar energy, respectively.

FRG: Interim Report on Hypersonic Technology Published

90MI0170 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 Feb 90 pp 8-9

[Text] The BMFT (FRG Ministry of Research and Technology) first presented its hypersonic technology subsidy program in February 1989, stating that with its two-stage "Saenger" reference concept, the FRG had set itself a particularly challenging task aimed at gaining a leading European position in hypersonic technology. The scientists and engineers involved, from industry, the DLR (FRG Aerospace Research Facility), and colleges and universities, have now presented their results in a detailed interim review.

In the first part of phase I of the subsidy program, scheduled to last from 1985 to 1992, the BMFT allocated 83 million Deutsche marks [DM], 35 percent for preliminary studies, 43 percent for technology development projects, and 22 percent for the extension of existing test facilities and the building of new ones. The completely novel combined turbo-ramjet engine, designed to run on a blend of ambient air and hydrogen, and its integration into the spacecraft were identified as the central technical challenges. However, the computerized aerodynamics calculations, the high thermal stresses—up to 2,000° C—on materials and structures, and the safe separation of the rocket-driven upper stage from the primary stage at seven times the speed of sound also require further, extremely detailed, preparation, development, and testing.

Fifteen main contracts have been awarded for the work carried out to date, and these have resulted in a further 50 subcontracts. In addition to firms in the aerospace industry, the DLR's major research establishment, and a wide spectrum of colleges and universities, small and medium-sized companies have also taken part in subprojects.

The involvement of the German Research Association (DFG) is regarded as particularly important and welcome. It established two new special research projects at the Rheinland Westphalia Technical University in Aachen and Munich Technical University in 1989, and another at Braunschweig Technical University in January 1990 to work on hypersonic technology. Consideration is currently being given to the establishment of a fourth special research project at Stuttgart University.

As completely new areas of research and technology are being explored under the hypersonic technology subsidy program, early training for young scientists and engineers is of special importance.

Questions regarding the environmental impact of space transport systems such as Saenger are being examined within the special research project at Braunschweig

Technical University; a study has also been commissioned from the Max Planck Institute of Meteorology in Hamburg. The Association of FRG Engineers (VDI) has also been asked to assess the impact made by this technology.

This BMFT funding program has attracted considerable attention outside the FRG, and a number of western European countries have expressed an interest in becoming involved. However, in addition to all its bilateral contacts and joint programs, the FRG intends to incorporate the hypersonic program with its Saenger reference concept into a joint European program under the auspices of the European Space Agency, ESA, from 1993 onwards, i.e., after technology phase I has been completed.

FRG: Dornier Develops Tank Bulkhead for Ariane-5

90MI0187 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 16 Mar 90 pp 14-15

[Text] On 8 March 1990, Dornier GmbH, a Deutschen Aerospace AG company based in Oberpfaffenhofen near Munich, presented the first tank bulkhead for the European launch rocket, Ariane-5. Dornier is carrying out this work under subcontract to Cryospace, a subsidiary of the French aerospace concern, Aerospatiale.

Ariane-5 differs from its predecessor, Ariane-4, in several decisive aspects that take account of developments achieved in rocket technology in recent years.

The hydrogen/oxygen tank in the central stage of the Ariane-5 consists of a cylindrical part and three tank bulkheads. The central tank bulkhead is also the only partition wall between the liquid hydrogen and the liquid oxygen. Since sheet metal is not commercially available as a raw material in the requisite size, the "dome," i.e., the convex tank bulkhead, can only be built out of individual segments welded together.

This project is opening up new structural potential as it uses the aluminum alloy 2219, which has been relatively unknown to date in launch rockets in Europe. Because it is highly ductile and its strength increases as the temperature decreases, this alloy may be regarded as "the" future material for space tanks.

A process that is unique for components of this size is used to shape the domed segments: Shaping by shot peening. In this process the sheet metal is bombarded with steel balls, which shape it mechanically. Working closely with the Rhineland-Westphalia Technical University in Aachen, Dornier has succeeded in determining the parameters required for ball diameter, impact speed, and process. The shot peening machine with automatic process control required specially for this development program is the largest of its kind in Europe.

The machine that Dornier developed, using particularly sophisticated technology, to weld the individual segments of the tank bulkhead is the only one of its kind in the world. The mechanical preparation of the weld seam and all the welds required can be carried out automatically.

Because of the accident with the American space shuttle Challenger in 1986, the conventional, nonrecoverable launch rocket has received a new lease on life. For this reason, alongside series production of the Ariane-4, of which Arianespace has just ordered 50, Ariane-5 will also go into series production in mid-1990.

About eight will be needed every year to satisfy the demand for satellite launches, in which market research forecasts a marked increase over the next few years. Satellites weighing between two and 2.8 tonnes each will account for 50 percent of the forecast market by the turn of the century.

By the mid-nineties, Ariane-5 will be used both to launch satellites and to transport the Hermes space shuttle.

Further information is available from Wolfgang Buehler and/or Dr. Laszlo Menzel of Dornier's Press and Information Office, tel. 07545- 83893, fax 07545-84411.

FRG: University Develops Experimental Microgravity Satellite

90MI0136 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 520, 31 Jan 90 pp 9-10

[Text] "We do not spend much time in discussion; we get down to work," says Professor Hans Josef Rath, head of ZARM (Center for Applied Space Technology and Microgravity) at Bremen University. At a press conference this week, he and his assistants presented a result of this credo: The BremSat. One of the special features of this new ZARM development is that at a total cost of DM4.2 million, the satellite is relatively cheap and will in future offer universities and research institutes the opportunity to conduct experiments in space at reasonable expense. As with the Bremen gravity tower for experiments in microgravity conditions, the BremSat also bridges a gap in space research services. The maiden flight of this innovative satellite is scheduled for February 1992 and will form part of the planned D2 mission. Reasonably-priced experiments in space will also be achieved with BremSat because its capacity will be fully exploited for various types of experiments in each phase of the flight, from launch to reentry into the earth's atmosphere. According to Prof. Rath, the BremSat will set off on its first mission early in 1992 "packed solid," with five different payloads on board, and the work schedule is just as full for each separate flight phase up to the time when the satellite burns out after completing its tasks. There would be absolutely no room for backing or retrieval systems in this first version of the new type of satellite. However, Rath considers it possible that these, too, could be designed into a new "layout." "We shall certainly be building more of them, as they are relatively cheap."

There is clearly great interest in this type of satellite. The project is funded by the Federal Research Ministry, and

well-known aerospace companies and research institutes are involved in developing the BremSat.

Fokker To Open Composites Plant

90AN0265 Ohain AVIANEWS INTERNATIONAL in English Mar 90 p 35

[Article: "Fokker: Production for the Future"]

[Text] As composite materials progressively invade all areas in the aerospace industry, Fokker opened the first phase of a new composites factory at its site in Ypenburg in November last year. This factory specialises in the production of advanced composites and metal bonding. It will be fully operational in May 1990 and will allow the Dutch manufacturer to meet the increased demand for the Fokker 50 and 100. A $150 million programme was launched to increase the rates of production: 60 aircraft were produced in 1989 and more than 100 will be produced in 1993. The plant at Ypenburg accounts for $60 million of the total investment.

When construction is finished in 1992, this composites plant will, according to the president of Fokker Aircraft, Menno van der Veen, be one of the largest and most modern in Europe. The total production area will be 30,000 square metres and between 950 and 1,100 people will be employed. A new control system, unique in Europe, will institute a new production philosophy. All steps in the production flow will be logically sequenced, resulting in minimum cycle time. In addition, a "just in time" concept will be applied in order to reduce stocks, shorten production delays and ensure that delivery schedules are met.

After this restructuration at Fokker, the Ypenburg site will be the only one to produce composites, which means that the carbon fibre production currently undertaken at Hoogeveen will be transferred there, as well as the metal bonding unit which is sited at Schipol at present.

The Ypenburg plant produces various elements for Fokker aircraft: rudders and ailerons for the Fokker 100, Fokker 50 cowling doors, as well as wall panels, luggage bins, cockpit panels, radomes, air ducts and fairings for both types of aircraft. The new plant also supplies composite products for the Airbus 300/A310 and the Shorts 330/360 airliners, the Westland Lynx helicopter and the General Dynamics F-16 fighter. Composites are extensively used because of their durability, combined light weight and resistance as well as the fact that they are easy to repair.

Production of Ariane-5 Booster Cases Begins

90AN0214 Noordwijk REACHING FOR THE SKIES in English Jan 90 pp 1, 3

[Report by M. Koeppel, affiliated with MAN Technologie AG, Augsburg, West Germany]

[Text] The first booster cases for the development of the P 230 boosters are under fabrication at MAN Technologie in Augsburg.

The construction of the workshop for the production and development of Ariane-5 booster cases was begun in June 1987. The total area of 5,400 square meters is divided into two main parts, a non-air-conditioned production area comprising turning lathes, flow-forming machines, heat treatment facilities, ultrasonic-eddy current inspection machines and sand-blasting, cleaning and coating facilities and an air-conditioned area of 1,800 square meters for final machining of the clevis/tang connection between the booster segments.

Since the inauguration of the workshop in September, when the flow-forming of the first cylindrical segments was started, more than 80 percent of the planned machines and equipment have been put into operation.

The foremost production facility, the 500 ton flow-forming machine, with its foundations extending 7.5 meters into the ground, has proven its technical capability. Four pairs of rollers press from inside and outside with a force of 40 tons against the 40-mm-thick and 1,000-mm-high cylinder walls measuring 3,000 mm in diameter. Under this pressure the high-strength steel of the rotating cylinder preforms begins to flow, and while the flow-forming rollers move slowly from top to bottom, the cylinder grows up to its final length of 3,500 mm while the wall thickness is reduced down to 8 mm.

More than 10 cylinders have already been produced by this flow-forming technology and some of them have already been heat-treated in an elaborate heat-treatment process where the steel reaches its final material properties with an ultimate strength of 1,500 N/mm^2 in combination with a high fracture toughness. The high-precision turning lathes and drilling devices in the air-conditioned area have also met the stringent tolerance requirements at the intersegment connection of feasibility demonstration parts. A first hydraulic pressure test on a short-length prototype is planned in the first half of 1990 to check the dimensioning of the clevis/tang intersegment connection. A hydraulic burst test of a development case comprising 4 segments and 2 closures with an overall length of approximately 15 m is planned for early 1991.

Dassault Opens Space Center

90AN0182 Toulouse LA LETTRE DU CNES in French 18 Dec 89 pp 5-6

[Article: "Dassault Space Center in Toulouse"]

[Text] On 18 October 1989 Dassault announced the creation of a space center in Toulouse designed to expand the company's space activities.

The Dassault Space Center will participate in the definition, manufacture, and initial flight of the Hermes space plane in 1997-99. Within this European project for the development of the Ariane-5 launcher, Hermes, and

the Columbus space module (1996), Dassault will be responsible for solving problems linked to the space plane's reentry into the atmosphere.

The setting up of the "Ariane-5/Hermes/Columbus" trio is the responsibility of the European Space Agency (ESA), which, in turn, has assigned the manufacture of the space plane to the National Center for Space Studies (CNES). The CNES has delegated the industrial development of this project to Aerospatiale and its aeronautical development to Dassault. Engineers from both companies as well as engineers from "Deutsche Hermes" (FRG) are working on the Hermes project in Blagnac. The Dassault space center will participate in other space activities in the future, such as the development of reusable space transport vehicles currently under study and known as Star-H.

French Assessment of SPOT 1 Performance

90AN0172 Paris LE MARCHE DE L'INNOVATION in French 12 Jan 90 p 6

[Text] The SPOT 1 earth-observation satellite, now celebrating its fourth year of service and awaiting its successor, has earned a favorable technological assessment. Two major components have failed: one of the two on-board magnetic recorders manufactured by the U.S. firm Odetics, which lasted only 6 months (transmission belt failure), and one of Thomson's two traveling-wave tubes (after three and a half years of operation). A few minor anomalies have also troubled the satellite's operation: an occasionally imperfect mirror positioning (five unexplained cases) and heavy ions that "bombarded the wrong place" on 19 occasions. These microprojectiles, connected to solar activity, have emptied some of the system's data processing memories and have sent the satellite into a state of alert; ground-control stations initiated a restart. The solar generator (13,356 cells taped onto a Kapton skin) performed better than expected (60 W lost out of 1,380 W), and so did batteries submitted to a very fast charging/discharging cycle (14 times in one 24-hour cycle). The images are accurate, in spite of a degradation of quality, a drift of the photodetectors, and a borderline signal/noise ratio. This inevitable aging of components makes the satellite "a well-performing but very vulnerable system," according to National Center for Space Studies (CNES) deputy CEO's Jean-Jacques Sussel. SPOT 2, the launching of which has been delayed, will not differ greatly from SPOT 1.

A supplementary payload (Doris) will allow localization of the satellite in orbit within 10 cm and the geodesic control of natural phenomena with the same precision. The connector bar of 6,000 CCD detectors is now supplied by Thomson (Fairchild on Spot 1), but not until SPOT 4 will the recorders be "made in France" (by Enertec). In addition, electronic components have been hardened in order to resist solar radiation. Thus, SPOT's service life is an undeniable technical success and even almost surpasses expectations. The commercial assessment, however, is less certain. While the total turnover of the company that markets the images (Spotimage) is about Fr 300 million, so far the program has cost over Fr 3 billion.

Plans for SPOT 4, 5 Satellites Outlined

90AN0144 Paris SCIENCES & AVENIR in French Dec 89 pp 58-61

[Article by Albert Ducrocq: "SPOT: Four Aces"]

[Excerpts] The first French earth observation satellite is a triumphant success. While SPOT 2 is about to succeed SPOT 1 in space, construction of SPOT 3 has just begun. The launch of SPOT 4, which will have a completely new design and deliver pictures of unequaled quality, has been scheduled for 1995. [passage omitted]

Since SPOT 1 was a success, it made sense to retain its characteristics for SPOT 2 and SPOT 3, whose launch is scheduled for 1992. However, SPOT 4, whose construction was approved on 21 July, will use a new platform, the same as that used in the Helios French military observation satellite.

The picture quality of SPOT 4 will be greatly improved thanks to new sensors, which, with the aid of new color-picture-processing software, will provide 5-meter resolution. When tested on pictures from SPOT 1, this software made it possible to discern city blocks.

Another improvement planned for SPOT 4 will be the incorporation of a "vegetation channel" for detailed vegetation studies in the infrared, where plant species and health signatures are usually very difficult to distinguish. However, for improved picture quality, more data has to be transmitted; this requires either an increase in transmission time or a different transmission medium. SPOT 4 will provide the opportunity to test a device that uses a laser beam as a direct transmitter, regardless of the resolution level. SPOT 4 will be more accurate and efficient and should also have a longer service life because it will carry more fuel. It is expected to operate from 1995 to 2000, or even 2002, before being replaced by SPOT 5, which currently exists in an initial-draft phase only.

At the International Space Federation congress held in Malaga in October, Jean-Paul Aguttes revealed the essential features of this initial SPOT 5 draft. If SPOT 5 uses the same platform as its predecessor, it could be equipped with a zoom lens that would permit variation of the image width from 200 to 20 km with a resolution of two meters for the smallest angle. Furthermore, combined use could be made of optical devices and radar photography, since SPOT 5 will have an active synthetic aperture radar (SAR) antenna for round-the-clock sensing of areas by radio beams operating in the X band. This active antenna comprises 6,600 microwave monolithic integrated circuits (MMIC's), the radar equivalent of charge-coupled device (CCD) cells in optics. Operational tests are scheduled for 1992. If results are favorable, they should lead to a decision to build the SPOT 5

radar photography satellite, scheduled to enter into service in 2001, so as not to lose the lead over the United States in earth remote-sensing satellites, in spite of the launch of Landsat 6 in 1995. [passage omitted]

Italy To Enter Commercial Space Launch Market

90MI0111 Rome AIR PRESS in Italian 15 Dec 89 pp 2380-2381

[Text] Italy will update the San Marco launch platform and will develop a more powerful version of the Scout carrier under a joint program with SNIA-BPD and the U.S. company LTV. To date, the Scout carrier has been used for the 10 launches under the San Marco program. This important news, though anticipated for some time, was officially announced at the press conference organized by La Sapienza University in Rome, represented by the rector, Giorgio Tecce and Professor Luigi Broglio, by the Ministry for Universities and Research, represented by Undersecretary Learco Saporito, and by the ASI (Italian Space Agency).

The press conference was held to celebrate the 25th anniversary of the first San Marco launch, the first Italian and European carrier rocket to be launched into space. Italy is one of the few countries to have a satellite launch site, despite its considerably limited launch capacity (low orbit and reduced payload), due to the limitations of the LTV Scout carrier. San Marco, which uses a launch site located off Kenya's coast at Malindi, is at a considerable advantage because its location coincides almost perfectly with the equator, and is therefore capable of putting its payloads in an equatorial orbit. This is considered a point of major interest by the entire international scientific community. As Tecce stated at the press conference: "Italy's geographical position and launch equipment place it at an obvious advantage in a sector of space activities which has become of vital importance for the survival of the human race."

By exploiting a feature that is a drawback, this carrier can launch satellites into a low equatorial orbit, and is currently particularly important as an ideal launcher for three lines of programmed development—scientific: Research on the atmosphere, geomagnetic phenomena, and astronomy; environmental: Research on the thickness of the ozone layer, etc.; humanitarian: Remote sensing and searching for natural resources on behalf of developing countries. These operations, the development of which calls for large government funding, could create attractive business prospects for a whole range of small payloads—a market which is expected to boom over the next two years.

The program is being finalized by a team led by Professor Broglio, who originally devised San Marco, and calls for a much more accurate and three to four times more powerful carrier. The San Marco Scout can be completed with three different configurations: A four-stage, which is particularly suitable for low orbits (515 km in circumference, with a 600-kg payload in an equatorial orbit and a 410-kg payload in a polar orbit); a five- stage, which is best suited for multistationary orbits, with payload capability being roughly 3.6 times the Scout; and finally, a six-stage configuration—for the time being merely a hypothesis—to carry 130-170 kg payloads into geostationary orbit.

By the end of this year the launch site development plan will be submitted to CIPE [Interministerial Committee for Economic Planning] for review only, as the funding is part of the ASI [Italian Space Agency] program. A three-year plan for a total of 90 billion lire has been drawn up by the Space Agency, and will be carried out in cooperation with the Air Force. As for the improvement of the carrier, Undersecretary Saporito spoke of another 90-100 billion lire, which must also be submitted to CIPE for approval. It is still too soon to say whether Italy will enter the commercial space market as one of the launching countries. However, a preliminary contract to launch two NASA scientific satellites in 1992 will be signed within the next two years. While this program will be carried out with the San Marco, the San Marco Scout has in the meantime already been presented to the American space agency, under an agreement between SNIA-BPD (FIAT Group) and the U.S. LTV, as a bid for a space launch contract for satellites weighing up to 700 kg, which NASA will announce by the end of February. The program was announced in Rome by the director of SNIA-BPD's space division, Giuseppe Grande, at the meeting on Italian-U.S. space cooperation, organized during the international electronics and space exposition held on 8 and 9 December. NASA's requirement is for 10 launches with an updated Scout carrier, involving an Italian participation of approximately 50 percent.

The Italian development of the Scout 2, which is capable of carrying satellites weighing up to 700 kg into low orbit, will have to coincide with the agency's plans. Under the agreement between SNIA-BPD and LTV, the Italian company will develop the additional boosters and the carrier's additional fourth stage.

Italian GaAs Solar Cells Panel Developed

90MI0146 Rome SPAZIO INFORMAZIONI in Italian 29 Jan 90 p 5

[Text] CISE (ENEL's [National Electric Power Company] Center for Data, Studies, and Experimentation based in Segrate-Milan) has developed a GaAs solar cell panel in collaboration with Fiar. The panel was installed on the UoSAT-E microsatellite launched into orbit recently together with the French SPOT-2 remote-sensing satellite by the Ariane V35 carrier. The UoSAT-E satellite (60x35x35 cm in size, 47.5 kg launch weight, five-year operating life) is an experimental microsatellite developed by the University of Surrey in Guildford, UK. The following missions will be carried out: 1) solar cell technology; 2) total radiation dose; 3) transputer data processing; 4) CCD [charged-couple device] earth imaging camera. The panel developed by CISE and Fiar (respectively responsible for the development of the solar cells and their assembly into the panel itself) will

produce approximately 25 percent of the satellite's total electric energy requirement, which, by the end of its operating life, is estimated at approximately 30 W.

CISE is currently involved in other space programs. It has presented a project for the development of a lidar source (laser or solid state) to the European Space Agency (ESA). The device will be placed aboard a satellite in polar orbit to monitor cloud conditions and to study the distribution of aerosol in the atmosphere. Another project presented to the ESA involves a CO_2 laser source for remote-sensing. The Italian Space Agency (ASI), instead, has received CISE's proposals involving the use of GaAs cells and the development of instruments for microgravity experiments.

Italy's Role in European Space Suit Program Discussed

90MI0159 Rome AIR PRESS in Italian
7 Mar 90 pp 554-556

[Excerpt] The program for the development of the European space suit, which has been approved by the European Space Agency (ESA), was presented to the press at Laben's headquarters. Only two space suits have been used to date, the U.S. and the Soviet versions, each in its own field. The American suit consists of two parts joined at the waistline and is well known because detailed descriptions have been provided by NASA. No description of the Soviet space suit is available. The French cosmonauts who used it mentioned the virtual lack of built-in electronic equipment and computers capable of managing the whole system. Adjustments and controls are manual and rely on human intervention.

There are two reasons why ESA decided to develop a new space suit and to seek a new solution to the problem of man's survival in space, including space outside shuttles or orbiting laboratories: First, space technologies currently represent the most innovative aspect of applied science. Any failure to compete effectively in this area would prove to be disadvantageous with serious consequences for research and industry. Second, the European space program has specific features of its own which involve every aspect of its activities—ranging from the Ariane-5 carrier rocket to the Columbus orbiting laboratory to the Hermes shuttle which, unlike the American space shuttle, will have three instead of five crew members. These different features are in response to different requirements which, in turn, call for different solutions.

The EVA [Extra Vehicular Activity] (this is the name of the new European space suit) program has been awarded to a consortium of European companies, represented on a coordinating board by four primary contractors: the FRG's Dornier, France's Marcel Dassault-Breguet Aviation, Spain's CASA [Construcciones Aeronauticas S.A.], and Italy's Laben. Italy's share in the program, which involves Aeritalia and Microtecnica as well as Laben, is estimated at approximately 10 percent. The particular features of this new space suit, which is a robotized piece of equipment rather than a simple suit, were described by Laben's managing director, Marco Gerevini, director Marco Pascucci, and by Engineers Maurizio Forcesi, Giovanni Cordoni, and Giorgio Adami. The essential feature of the European space suit (unisex, capable of covering a wide range of sizes by means of a clever folding system which alters its dimension, designed to withstand temperatures ranging from minus 160° C to plus 130° C) is its high capacity to process mission data and to present this data on an easy-to-read display located in a small front knapsack on the chest.

The suit consists of three modules. The first, known as ESEM (Eva Suit Enclosure Module), is the real suit, including the helmet and gloves. Its structure (to be developed by Aeritalia) consists of 16 layers of different materials because the astronaut must be protected from ultraviolet and ionized radiation as well as from the impact of micrometeorites. The space suit contains pure oxygen at a pressure of 0.5 atmospheres pressure. The second, known as ELSM (Eva Life Support Module), is the large knapsack placed on the back of the suit, which contains all the astronaut needs for his survival. It includes a six-hour oxygen supply (plus a 30 minute emergency reserve); temperature control, air purifying and electric power supply devices (lithium and descutum [descuto]-zinc batteries with a seven-hour limit of endurance). All the equipment is controlled by a computer which uses the information gathered by the sensors to verify the normality of the parameters and to report any anomalies. The survival kit includes food in little blocks and water. They reach the astronaut's mouth from within the helmet built into the suit. The excreta are collected and stored within the suit.

The third module, known as ELCM (Eva Information and Communication Module), is the computerized system which monitors and manages the information on the functionality of the suit. This information is shown on the display installed on the astronaut's chest and simultaneously transmitted to the orbiting space shuttle. The system is referred to as the "heart of the suit" by Laben's engineers who are in charge of its development. The ELCM consists of a computer capable of recognizing the astronaut's voice and carrying out his orders. It also contains a communications system designed to transmit the data collected (including information on the physiology of the astronaut, such as a continuous electrocardiogram) to the Hermes space shuttle and to the ground station. Other functions performed by the computerized system include a self-diagnosis of any operating failures, isolation of the faulty section, and circuit regeneration; the ability to suggest discontinuing the mission; and checking on the overall performance before leaving the vehicle to enter space. A preliminary model of the suit has already been developed (the first stage of the study began in 1986 and ended in 1988) and weighs 130 kgs. "We are now into the second stage," Dr. Cordoni stated. "This is expected to cover the 1989-90 period and centers on defining the details of the project." This stage

will be followed by the development of a prototype (1991-92), and, finally, by the manufacture and final adjustments (1993-98). The first flight is scheduled to take place at the end of 1999 with the Hermes space shuttle launch. Basically, the various stages of the entire ESA space program are proceeding simultaneously.

The final cost, calculated on the basis of current prices, is estimated at 130 billion lire, or 1 billion per kg. This figure, however, is only true if all the research, testing, and production costs result in the production of a single suit. If the robotized suit be produced in larger numbers (for example 20), it is obvious that the unit cost would decline dramatically. The voice recognition control is an original characteristic and can be considered a worldwide innovation. It is capable of identifying 80 words and understanding verbal messages lasting up to 100 seconds.

The space suit program automatically draws one's attention to those who are expected to wear it. Franco Rossitto reported on the ESA's activities and, in particular, on the procedures for the recruitment, selection, and training of European astronauts.

Rossitto, presently in charge of the Astronaut Division at ESA's European Astronauts Centre (EAC) in Cologne, is professor of Nuclear Physics in the Faculty of Nuclear Engineering of the Milan Polytechnic. He recalled that so far three Germans, two Frenchmen, and one Dutchman have represented Europe in space missions carried out by the U.S. Space Shuttle and by the Soviet Salut and MIR space vehicles. In the near future, an Englishman and an Austrian will fly with the Soviets, while an Italian and a Swiss are scheduled for a flight with the Americans. European space activities however, will begin with the continental program and the relevant vehicles: Ariane-5, Columbus, Hermes. Hermes will be used for a number of subsonic flights between 1994 and 1997, while its first orbital, automatic flight is scheduled for 1998. This will be followed in 1999 by the very first orbital flight with no more than two crew members and by the first operational mission with only two crew members. In the case of Hermes, there will be three crew members: the commander, the pilot, and a laboratory expert or a specialist in charge of the scientific payload.

AUTOMOTIVE INDUSTRY

Audi To Unveil Mixed Diesel, Electric Engine Prototype

90CW0138A Paris L'Usine Nouvelle in French 25 Jan 90 p 69

[Article: "Hybrid Drive Prototype Car"]

[Text] Diesel on the Open Road, Electric in Town

In order to minimize urban pollution, Audi has developed a vehicle that can be driven either by an electric motor or by a combustion engine.

Volkswagen is anticipating possible restrictions on the use of pollution-producing vehicles for in-town driving. At the Geneva Salon in March, the German manufacturer will unveil a prototype Audi 100 Quattro equipped with two engines, one diesel and the other electric.

The diesel engine, located under the hood, drives the front wheels. It is used when the vehicle is on the open road. In town, at low speeds, the driver need only push a button to switch to the electric engine which is coupled directly to the rear axle differential and drives the rear wheels. The small electric engine, developed by Pohlman, weighs only 60 kg. The top speed becomes 50 km/hr, but the car runs quietly and no longer produces pollution.

This solution has two advantages. It combines the speed, acceleration, and operating range of the combustion engine on long trips with the cleanliness of electric drive in town. It also increases the operating range of the electric engine and minimizes battery size. In fact, while the diesel engine is running it recharges the nickel-cadmium batteries that supply the electrical power. The batteries weigh only 180 kg for a total vehicle weight of 1740 kg and are small enough to fit into the spare wheel compartment under the luggage deck in the trunk. In addition, the Audi Quattro's batteries can accommodate high-voltage currents, so their recharge time is only 45 minutes.

The major disadvantage is the high cost differential (85,000 francs) of the mixed drive feature, which makes the marketing of such a vehicle a problem. VAG will not start production unless it first has a sufficient volume of orders for the target markets: administrations, municipalities, and businesses. In Germany, tax incentives could help reduce the additional cost involved. Volkswagen seems to believe this will happen, as it is developing a prototype Golf that is also equipped with mixed drive.

BIOTECHNOLOGY

Dutch Biotechnology Stimulation Program

90AN0209 Rijswijk BIOTECHNOLOGIE IN NEDERLAND in Dutch Jan-Feb 90 pp 9-10

[Article by P.H. van Lelyveld, M. Samson, and H. Meewisse, staff members of the Netherlands Technology Stimulation Program: "Government Stimulates Biotechnological Research, Especially in Smaller Companies"]

[Excerpts] In 1987, the minister for economic affairs first created a research support opportunity through the Program for Company-Oriented Technology Stimulation (PBTS). In 1989, 27.5 million guilders was allocated to Dutch industry for biotechnological research. More than 70 percent of these subsidies were granted to companies with fewer than 200 employees. [passage omitted]

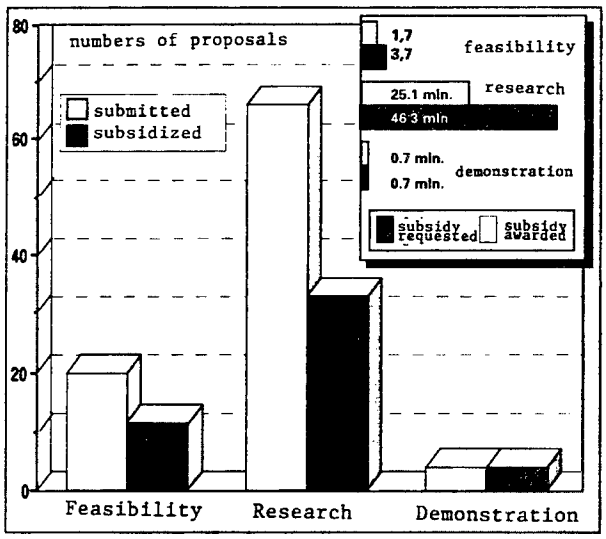


Figure 1. 1989 PBTS Projects Submitted and Subsidized (Copyright: 1990 BIN/Arie Onnink)

Reactions From Business Community

Of the 27.5 million guilders allocated to the PBTS Biotechnology program last year, 23.5 million was for research projects and 2 million guilders each was for feasibility studies and demonstration projects. By late June 1989, 90 project proposals had been submitted: 66 related to research projects, 20 to feasibility projects, and 4 to demonstration projects (Figure 1).

In 1989, the demonstration project category was more accurately defined, because in the previous years there had been some uncertainty about the purpose of these projects. The small number of proposals for biotechnology demonstration projects reflects the sector's unfamiliarity with this category.

For the 90 projects, a total of 50.7 million guilders in subsidies was requested. In all, 108 companies were involved; for 56 of these, it marked the first time they had submitted a request within the framework of the PBTS program.

Subsidies Granted

Of the 90 requests, 4 were withdrawn and 20 had to be rejected because they did not comply with PBTS procedures. Most rejections were done on the grounds that the proposal was not in agreement with the definition of biotechnology, or that it dealt with development instead of research. The remaining proposals were evaluated according to the above-mentioned criteria. In all, 48 projects were eligible for subsidies, including 4 demonstration projects and 11 feasibility projects, which were granted 0.7 million and 1.7 million guilders, respectively. The lion's share went to 33 research projects, which received 25.1 million guilders in subsidies. The projects subsidized in 1989 involve 25 companies which had never participated in the PBTS program.

Involvement of Small and Starting Companies

To a larger extent than in 1989 [year as published], subsidies were granted to small companies with fewer than 200 employees (Table 1). Of the 27.5-million-guilder budget, 71 percent went to small or medium-sized companies, whereas in 1988 this was only a little over 60 percent, and in 1987 approximately 50 percent. So it is obvious that aid to innovative biotechnology research by small companies is still increasing. The small companies are particularly well represented in the sections "plant and animal breeding," "human and animal health care," and "instruments and equipment." In the "industrial chemicals" section, only two projects from large companies were subsidized.

Sixteen "starting" companies, founded in 1986 or later, are participating in 19 projects, representing 10 million guilders in subsidies (36 percent of the total amount).

Table 1. Distribution of Subsidized Projects by Section

			Requesting Companies with:			
			Fewer than 200 Employees		More than 200 Employees	
	Number of Projects Subsidized	Total Budget (Million Guilders)				
	Projects	Subsidy	Projects	Subsidy		
Plant and Animal Breeding	18	12.7	15	10.2	3	2.5
Food and Stimulants	11	3.1	6	1.2	5	1.9
Human and Animal Health	8	3.8	7	3.3	1	0.5
Industrial Chemicals	2	2.4	0	0	2	2.4
Instruments and Equipment	8	5.3	7	5.0	1	0.3
Environmental Biotechnology	1	0.2	0	0	1	0.2
Total	48	27.5	35	19.7	13	7.8

Thus, it is obvious that the 1989 PBTS Biotechnology Program has stimulated the biotechnological activities of new companies. In 1989, the larger companies with a well-established biotechnology reputation received subsidies for 14 projects (totaling 7.9 million guilders). This was less than in 1988, when 18 proposals were accepted (representing 11.1 million guilders).

Cooperation With Scientific Institutes

Seventy percent of the 48 subsidized proposals involve the cooperation of a university or a scientific institute (Table 2); several projects involve the participation of more than one institute. The involvement of the various universities, institutes, and R&D companies seems to be characterized by several trends. Just as in previous years, universities are represented in almost 50 percent of the projects. The State University of Groningen is further extending its involvement, whereas the State University of Utrecht took a slightly less prominent position than in 1987 and 1988. Involvement of the Netherlands Organization for Applied Scientific Research (TNO) is comparable to last year. Approximately 5 percent of the projects attracted a foreign institute. The share of commercial R&D companies remained at the 1988 level. In 1989, the PBTS projects mobilized 13 million guilders for research contracts involving universities and institutes.

Table 2. Participants From the Research Community

Research Projects Contracted Out to:	Number	Percentage
Universities	30	50
- Agricultural University of Wageningen—7		
- Association for Organic/Dynamic Agricultural Methods—8		
- State University of Utrecht—3		
- State University of Groningen—6		
- University of Amsterdam/Free University of Amsterdam—2		
- Others—4		
Institutes	20	35
- TNO—9		
- Agricultural Institute—8		
- Health Institute—3		
R&D companies	6	10
Outside the Netherlands	3	5
Total	59	100

In many projects, the research partner is a company. Among the project proposals, 19 applicants (21 percent) have a business partner. Among the subsidized proposals, this is true for 10 projects (also 21 percent).

Distribution by Section

Just like in 1987 and 1988, most subsidized projects relate to the plant/animal breeding section (PAB); 17 out of the 18 projects within this section come under plant breeding. Almost 75 percent of the projects are conducted by small companies (which also receive 75 percent of the subsidies). Within the food and stimulants section (FS), the distinction between large and small companies is less marked: The proportion here is about 50:50. The agricultural section (PAB and FS combined) represents 42 percent of all projects, which is a slight decline compared to previous years. The most striking fact is the total absence of small companies in the industrial chemicals section, while the instruments and equipment section seems to be catching up after a downturn in 1988. That year, during the information phase prior to the PBTS program, special attention was paid to environmental biotechnology. This resulted in the subsidizing of five (ten percent) projects in this field. In 1989, however, only one project was subsidized which explicitly related to this section.

PBTS Program for 1990

In 1990, companies will also be invited to submit proposals for feasibility, demonstration, or research projects in the field of biotechnology. By mid-February, the "kickoff" will be given with the publication of the 1990 regulations in the STAATSCOURANT [Official Gazette]. Project proposals can then be submitted until 29 June 1990. In addition, a PBTS program on environmental technology will be launched in 1990, for which project proposals can also be submitted as of mid-February.

EC FLAIR Program Selects 35 New Projects

90AN0267 Brussels EUROPE in English 4 Apr 90 p 11

[Report: "Research: 35 Projects Selected Within the Framework of the Community 'FLAIR' Programme (Food-Linked Agro-Industrial Research)"]

[Text] Thirty-five new research projects in food science and technology have been chosen for support under the Community's FLAIR programme. The projects will involve partners from eleven EC member-states, five EFTA countries, and Yugoslavia, and will be carried out through precompetitive collaborative R&D which promotes cooperation between industry, universities, and research institutions (both public and private).

FLAIR aims to develop technologies which will promote the efficiency and competitiveness of Europe's food industries; to improve food safety and quality for the consumer; and to strengthen the scientific and technical infrastructure which supports the food industry. It was adopted by the Council in June 1989 and will run until 1993 with a budget of ECU 25 million.

Twenty-two of the projects will operate at an industrial level, and will include some of Europe's major food producers. For these projects, the Community shares the costs with the industrial partners. These 22 "shared-cost actions" will involve 13 large companies and 31 SME's [small and medium-sized enterprises] together with 55 research institutes and 39 universities. They cover the three main aspects of FLAIR (food, quality, safety and nutrition) and all links of the food chain from food processors, the producers of flavours and other ingredients, through to the distributors and the final consumers.

Here are a few examples:

a) Elaboration of methods to maximise the flavour quality and improve the texture of processed vegetables;

b) Identification of a human probiotic bacteria thought to have anticarcinogenic effects;

c) Investigation of the antimicrobial properties of certain naturally occurring agents in plants and animals which could replace chemical preservatives in foods.

Thirteen "concerted actions" will bring together many of the best food research laboratories in Europe in new collaborative networks involving 43 companies, 157 research institutes, 79 universities and 3 consumer groups. In these cases, only the costs of coordination (workshops, conferences, travel, publications, etc.) are paid for by the Commission.

For example, one of these networks will bring together more than 30 laboratories on projects aimed at the development of technological food production processes which will improve the quality and the safety of foods. Another network will work on methodology in sensory analysis aimed at better understanding consumer choice and behaviour in matters relating to food.

COMPUTERS

EC Commission, Firms Debate Software Rights

90AN0268 Brussels EUROPE in English 12 Apr 90 p 12

[Report: "Computing Programmes: European Commission Services Investigate in Industrial Milieux on Possible Revision of EEC Directive Project on Legal Protection"]

[Text] At the recent meeting between UNICE [Union of Industrial and Employers' Confederations of Europe] and the European Commission, the discussions which centred on the Uraguay Round negotiations also covered the draft directive of the EEC concerning legal protection of computer programmes. This proposal is at present not only held up at the Council Working Party but also in the qualified committee of the EP [European Parliament]. No common orientation has yet been found either in Community authorities or in business milieux on two fundamental elements of the directive:

1) *Decompilation of computer programmes* (reverse engineering), that is, analysis of a programme in order to know the underlying codes and connections. In its proposal, the Commission has not included specific provisions to settle the question that is to what extent a user can carry out analysis of a computer programme without the copyright holders. Some delegations consider that this question should come under European regulation as it covers a very important aspect of protection. Decompilation enables a company to analyse the programme created by another company, either to modify it or to make, in some way, a new programme, or to make its own programmes interfunctional with the analysed programme. The stakes amount to billions of ECUs. Other delegations consider, on the other hand, that the EEC directive should remain neutral on this point and that the question will be resolved progressively due to traditional jurisprudence. Neutrality on this point should, according to the delegations, be found in all the clauses of the directive especially with regard to regulations concerning access to interface specifications.

2) *Interface specifications*: These are the principles and rules governing interfaces, the means by which programmes communicate with "the outside" (computer, user, other programmes, etc.). More or less protective regulations on this would give, to a greater or lesser extent, greater facility of access to programme analysis. The current proposal states that "protection provided for in the present directive is to be applied to every form of expression of a computer programme, without, however, encompassing ideas, principles, the logic or algorithms or the programme language which underlie the programme. When the interface specifications are drawn up with the ideas and principles which are at the base of a computer programme, these ideas and principles cannot be protected by copyright." According to certain information, it would appear that we are heading towards a formula of compromise which ensures the

protection of computer programme producers against over-easy access by competitors to programme analysis and at the same time encourages interconnection of programmes at public disposal (thence a certain freedom in the access to interface specifications).

As far as decompilation is concerned, Commission authorities, while maintaining for the time being the original programme, have elaborated and presented to industry, last week, provisions according to which: "When a modification of the type of code (mechanism by which the programme functions, NDR) in which the programme has been supplied is indispensable to ensure that interfunctioning programmes can be created or can function," then this must be made possible in 5 conditions:

1) The "modifier" legitimately holds a copy of the programme;

2) Modification is strictly limited to the parts of the programme necessary to attain interfunctionability;

3) Information necessary to ensure interfunctionability cannot be found in the documentation given by the copyright holder or standardisation bodies; and

4) Information obtained must not be used to commercialise a substantially similar programme. The copyright holder must bring proof of a modification (respecting the above provisions) causing unjustified prejudice to his legitimate interests in order to establish whether violation of copyright has been committed.

EUROPE recalls that two associations of interests defend, on this theme, two quite different theses. SAGE maintains that prohibition of decompilation is justifiable as it ensures adequate protection of software copyright holders. On the other hand, ECIS defends the idea that interfaces must be excluded from this protection by copyright and that decompilation should be allowed with complete legal freedom, for, in its opinion, this is the only means by which companies (especially SME's) can create new programmes compatible with products of major companies on the market such as IBM and Digital.

ESPRIT Parallel Processing Projects Described

90AN0205 Edam SUPERCOMPUTER EUROPEAN WATCH in English Jan 90 p 13

[Article: "ESPRIT Projects on Parallel Processing"]

[Text] Several projects on parallel processing have been started in 1989 within the EEC-sponsored ESPRIT program (for research and development in information technology).

The transputer T800 and the Supernode are presently the most successful spin-offs of the ESPRIT project. This year a number of parallel processing projects have been initiated. Two are described here.

NANA

NANA (Novel Parallel Algorithms for New Real-Time VLSI Architectures) concentrates mainly on the development of new algorithms/architectures for multi-dimensional signal processing.

The project is oriented towards the development of efficient multi-dimensional subsystems needed in such application domains as image processing, robotics, seismic processing, biomedical technology. etc.

The most important class of required techniques are mathematical: linear system solving, least squares solution of overdetermined systems resulting from measurement data, singular value decomposition. Strategies for allowing the future design of high-complexity applications in mega-chip technologies will also be an important research topic.

The institutions involved are IMEC [Interuniversity Microelectronics Center] and the Catholic University (both of Leuven, Belgium), Delft University (The Netherlands), IMAG/TIM3 (Grenoble, France), and IRISA-INRIA [Institute for Research in Information Science and Random Systems - National Institute for Research in Information Science and Automation] (Rennes, France).

REX

REX (Reconfigurable and Extensible Parallel and Distributed Systems) started in May. Ten research organizations and industrial enterprises from France, the FRG, Greece and the UK will cooperate. The main contractor is Stollmann GmbH from Hamburg, FRG.

The REX project will develop a methodology and support tools for the development and management of parallel and distributed systems. The emphasis is on the support of reconfiguration and extension in order to exploit the parallelism available.

Some research objectives are:

- System specification and modelling: Express structure and behavior of parallel systems and to guide activities to construct and (re)configure them.
- System programming: Adequate support for the design of software components.
- Dynamic (re)configuration: Support for the construction of systems based on the (re)configuration of software components and allocation to the hardware.
- Runtime support: Enabling software components to (re)configure, including monitoring tools.
- Demonstrator applications: Realistic examples are integrated, thus showing feasibility and a base for the interchange of technology.

The GMD group in Karlsruhe will be involved in the research for specification and language concepts.

FRG: BMFT Subsidizes Parallel Computer Projects

90MI0121 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 22 Dec 89 p 7

[FRG Ministry of Research and Technology announcement regarding the funding of information processing research and development projects, dated 13 November 1989]

[Excerpt

I . The Federal Ministry of Research and Technology [BMFT] intends to fund information processing research and development projects pertaining to software for high performance parallel computers.

Work will be based on the parallel computers, with their widely varying computer architectures, developed over recent years and the knowledge of handling parallel processing acquired to date, and will seek to convert fresh findings in computer science, mathematics, and/or applied natural sciences into efficient procedures for exploiting the parallelism inherent in hardware and software.

The BMFT intends to subsidize research and development projects on the topics relating to software for (highly) parallel computers with distributed memories listed below.

The projects will place particular emphasis on fundamental principles. Application software devised for specific consumers will not be eligible for funding.

1. Dynamic Algorithms and Data Structures

Self-adapting procedures, which adapt their algorithms and data structures to the computation, promise substantially greater efficiency than the approach adopted to date, which was to parallelize static procedures. Important criteria for balanced strategies for mapping dynamic procedures on parallel computers with distributed memories are flexibility, a steady demand on resources, and minimization of interprocessor communication. Concepts for procedures that optimize these aspects must be developed and converted into examples.

2. Opening New Fields of Application by Developing Innovative Parallel Algorithms

Transit times in parallel computers are significantly more dependent than in sequential machines on the data structure on which the computing process is based, and on the localization inherent in the problem. New fields of application will be assessed for their suitability for parallel processing. Priority areas are:

- Sturctural analysis (finite element methods);
- Physics (Monte Carlo methods);
- Chemistry (particle models);
- Hypersonic fluid mechanics;
- Simulation of complex technical systems.

3. Transfer [Portierung] and Conversion of Existing (Sequential or Vectorial) Application Software

In the future, program transformers (parallelizers, partitioners) will replace code conversion to parallel computers, which is now largely performed manually. Suitable concepts for automatic parallelizers must be developed and their efficacy demonstrated by prototype implementations.

4. Distributed Operation and Dynamic Resource Allocation

As high performance computers installed in computer centers will have to deal with several tasks at a time, computer resource allocation must adapt flexibly and automatically to different requirements. The static allocation concept (each job is assigned to a rigid sequence of processors and resources from the outset) will be expanded into a dynamic allocation facility. Suitable operating system functions must be developed.

5. Numerical Standard Libraries and Test Software for Assessing Performance

The main numerical standard libraries (existing in sequential or vectorial form) will be studied with a view to parallelization, and those found suitable will be converted as satisfactorily as possible. The communications routines required in computers with distributed memories must also be standardized and pooled in special libraries.

In addition, methods for assessing parallel computer performance must be developed. The test packages currently used for sequential computers do not provide reliable information on parallel computer performance. Innovative standard tests for parallel computers must be designed, and the tools currently used for the computational simulation of several parallel architectures must be further developed.

6. Error Detection and Correction

Error tolerance mechanisms for raising the reliability of the overall system must be developed. The concepts must include reconfiguration and restart strategies as well as error diagnosis.

Priority will be given to fundamental principles with potential for incorporation in future computer developments.

II.

Only joint projects planned and implemented on a work-sharing basis by several project partners will be eligible for grants. Preference will be given to projects involving partners from industry. [passage omitted]

FRG: BABYLON Expert System Developed

90MI0135 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 31 Jan 90 pp 8-9

[Text] VW-GEDAS, the Volkswagen group's computer science concern, performs engineering and software work and supplies its range of services mainly to manufacturing industries. Its principal areas include technical and scientific applications and administrative information processing. Expert systems represent a high proportion of VW-GEDAS's work.

The BABYLON expert system tool will be further developed into an industrial software product and professionally marketed. A cooperation contract on this subject was concluded between the Society for Computer Science and Data Processing (GMD) and the Volkswagen Technical Data Processing Company (VW-GEDAS) in Wolfsburg on 4 December 1989. BABYLON was developed by the GMD's expert systems research team and this marriage of research and application will now develop it for a wide market.

As the major state research facility responsible for computer science and applied computer science, the GMD will share the BABYLON research costs with VW-GEDAS. VW-GEDAS will be responsible for marketing and sales.

Complex projects in industry are increasingly requiring access to know-how and knowledge that conventional computer aids cannot display. This is where expert systems, which are designed to display the experts' knowledge structures as a basis for decision-making, come into their own. Expert systems contribute to the safeguarding and wide application of know-how and knowledge in a company. The most efficient way of creating expert systems is to use expert system tools, which are also simply known as tools.

The GMD BABYLON research project developed the bases for an advanced expert system tool and a software prototype. The joint project aims to develop BABYLON into an open, portable user-oriented expert system tool that can be used with a wide range of hardware, from the personal computer to the mainframe. The development will consist of a complete, newly designed reimplementation featuring improved user interface, knowledge representation formalisms, and integration concept, as well as greater transferability. Standards such as UNIX, CommonLISP, OSF/Motif, and X-Windows will be used. BABYLON's capacity for integration with existing data processing environments, particularly in major corporate structures, will be enhanced by access to available data stores and data bases. The project is divided into three development phases, and the results of each one will be presented at a major computer fair. VW-GEDAS will launch BABYLON on the market in the spring of 1991.

Italy: Data Transmission Project for Research Centers

90MI0162 Milan ITALIA OGGI in Italian 13 Mar 90 p 41

[Article by Francesca Cusumano: "A Single Computer 'Language' for Research Centers Worldwide"]

[Text] One language for computerized research systems all over the world that will be able to transmit data at high speeds in real time. This is the ultimate goal, and the GARR network project (Network Harmonizing Group for Research), presented yesterday in a press conference at the Ministry of Scientific Research, is the first step.

"It is an effort to overcome an 'autarchic' attitude," explained Minister Antonio Ruberti, "under which each research center has its own computing center, library, and separate structures, despite their cost."

In addition to integrating the networks of the research institutes and making the various computer languages compatible, the project is the first in Europe to provide for high-speed data transmission. The infrastructure, monitored by SIP [Italian State-Owned Telephone Company], which furnished the transmission services, is already operational and links the primary network centers of the six institutes that constitute the GARR in Milan, Bologna, Pisa, Rome, Frascati, and Bari at two Mbit/sec. It also ensures access to some international research networks via the Pisa-Montpellier, Bologna-Geneva, and Pisa- United States links. Secondary poles in Italy will be linked to the principle ridge by means of medium- to high-speed connections (64 Kbit to two Mbit/sec) and will allow for access to the national network by other Italian scientific institutes. The computers of research centers and public and private institutes in 43 Italian cities, 25 percent of which are located in the South, are also connected to the network.

Eight Billion—The Cost of the Project

The Ministry provided five billion lire in initial funding for the project directed by Professor Orio Carlini. An additional three billion lire was made available by means of a an agreement among the CNR [National Research Council], INFN [National Institute for Nuclear Physics], ENEA [Italian Committee for R&D of Nuclear and Alternative Energies], CILEA [Lombardy Interuniversity Consortium for Electronic Data Processing], CINECA [Interuniversity Consortium for Data Processing and Electronic Computation], Tecnopolis, and CSATA [Center for Study and Advanced Technologies Application], following the directives of the GARR ministerial commission and under the responsibility of a management committee presided over by Professor Antonio Cantore. The annual cost predicted for the management and development of the project is five and a half billion lire and the minister has already assured his support. "It is the public system that must provide the infrastructures," says Ruberti, "instead of a shower of

financing. I am convinced of the utility of providing the researchers with the fundamental operating instruments, and we will therefore guarantee financial support for this program."

According to technicians, the ultimate objective is to "migrate" toward international standards such as ISO/OSI (open system interconnection). This will enable heterogeneous systems like IBM, Digital, and Olivetti to reciprocally exchange the data necessary for research by means of a single code or, using the more technical term, protocol. The most optimistic predictions for knocking down the computer science frontiers, however, talk in terms of several years:— When the computer manufacturers are convinced about using the same language codes.

DEFENSE INDUSTRIES

Military Spin-Offs of JESSI Considered

90AN0177 Paris L'ARMEMENT in French Dec 89 pp 101-105

[Article by Olivier Gras, senior armaments engineer at the Electronics and Computer Science Directorate of the French Ministry of Defense: "The JESSI Program"]

[Excerpt] [passage omitted]

Potential Spin-Offs of JESSI Program in Field of Military Applications

The technological projects of the French Ministry of Defense are based on existing professional or lay general-use technology and components. The technological projects of the Ministry of Defense are confined to the development of military applications for general-purpose technology and products and to the support of specifically military technology and products with no equivalent in the civil sector.

The potential military spin-offs of the Joint European Submicron Silicon Initiative (JESSI) are primarily in the areas of technology and applications.

As work within JESSI progresses, the Ministry of Defense will endeavor to make JESSI's 0.5- and 0.3-micron CMOS [complementary metal oxide semiconductor] technologies (slated to be ready by 1993 and 1996, respectively) available for military applications; and to gain access to cell libraries, software design tools for application-specific integrated circuits (ASICs), and components that will have been developed under the program.

Thus, the Defense Ministry is interested in the results of JESSI insofar as electronic components for military equipment can be derived from the technologies developed for civil applications.

France is a major participant in the JESSI program. It is our country's only chance to play a primary role in the European microelectronics industry. In conjunction with its European partners, the General Armaments Directorate (DGA) is endeavoring to optimize the military spin-offs of the JESSI program under the European Collaboration for the Long Term in Defense (EUCLID) program.

Westland Role Seen in Tigre Helicopter

90AN0250 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1506-2, 15 Mar 90 p 1

[Article: "International Cooperation for the Tigre"]

[Text] Aerospatiale, Westland Helicopters and Messerschmitt-Boelkow-Blohm have signed an industrial memorandum of understanding concerning a British derivative of the Franco-German Tigre helicopter.

The British defense minister expressed a need for 125 light attack helicopters and is weighing solutions. Aerospatiale and MBB via Eurocopter have submitted an offer to the British Defense Ministry. The proposal, drawn up with the aid of Westland Helicopters, would make the latter a full partner in the Tigre program.

British industry already participates in various aspects of the weapon system. Rolls Royce participates in development of the MTR 390 jet in cooperation with Turbomeca (France) and MTU (FRG). Through British Aerospace, the British Government participates with France and West Germany in development of the third-generation anti-tank missile (AC3G-Trigat), the basic weapon of this helicopter's weapon system. Approval of the British Government would complete an already existing cooperation arrangement in this program while including Westland Helicopters, a partner that has already proved excellent in the past with programs such as the Gazelle, Lynx and Puma helicopters. Under the agreement, activities would be shared by the three firms, whose shares would be tailored to the participation of their governments. The specific development work connected with the British version would be done by Westland. This agreement would be the fulfilment of a desire often expressed by Aerospatiale and MBB to expand the helicopter cooperation framework to include other European manufacturers.

FACTORY AUTOMATION, ROBOTICS

EC Approves Italian Role in EUREKA Project

90AN0194 Brussels EUROPE in English 16 Feb 90 p 13

[Report: "State Aid: European Commission Approves Aid for Italian Participation in EUREKA Project"]

[Text] The European Commission has decided to approve the aid granted by Italy to three Italian companies—Irtma, Prima Industrie and Ansaldo Componenti—which are to participate in a EUREKA project concerning the definition of technical specification, the design, and the building of a cell for heat treatment by

laser to be integrated in a flexible manufacturing system. The share of the three firms in this project amounts to ECU 13,613 million, for which they will receive a maximum aid of ECU 2,905 million for Irtma, of ECU 1,980 million for Prima Industrie and of ECU 0.510 million for Ansaldo Componenti. Acting jointly and severally for the purpose of the present research, the companies wil be awarded a grant aid with an overall aid intensity of 39.6 percent (gross). The project covers both basic and applied research with respective shares of 85 percent and 15 percent.

In reaching its decision, the Commission considered that this research will allow important reductions in time and costs and will help achieve the spreading of flexible manufacturing systems, both of which are instrumental in improving the competitiveness of European industry.

EC: Joint Research Project With Japan, U.S. Considered

90AN0216 Brussels EUROPE in English 3 Mar 90 p 7

[Report: "EEC-Japan: European Commission Gives Careful Consideration to Participation in the Japanese IMS Programme—Modifications and Clarification Are Needed"]

[Text] The European Commission has taken a "wait-and-see" attitude towards EEC participation in the Japanese IMS (Intelligent Management Systems) initiative for the realisation of a joint project by Japan, the EEC, the United States, and perhaps some other partners in the area of precompetitive research for Advanced Manufacturing Systems (which are likely to be the production methods of the future). The Commission does not deny the interest of the initiative nor the principle of international cooperation in this area, but it feels it is absolutely necessary to ascertain what benefits there would be for European industry from Community participation in the expenses and to obtain clarification of the objectives and certain terms.

The objective that the Japanese authorities cited for this joint action was threefold: avoiding duplication of effort in research; improving production technology through joint effort; and developing a "common international culture" in the area of production technology. On the Japanese side, participants will be the Ministry of International Trade and Industry (MITI), public research laboratories, the University of Tokyo, and 70 or 80 private enterprises and their research centres (as well as enterprises that manufacture machine-tools and robots and those that use them). The Japanese authorities have made contact with the authorities in the EEC, the United States, and with bodies and enterprises that might be interested in taking part in the project. In principle, the reactions have been positive.

The budget planned by the promoters of the project is $1 billion over 10 years, and the Japanese have offered to take on 60 percent of this cost. The ten years would be preceded by a "feasibility study" lasting one year, for which MITI has already set aside the equivalent of ECU 600,000 in its budget for fiscal year 1990 (which will begin in April).

Following an analysis and consultation of the European sectors concerned, the Commission services came to the preliminary conclusion that the project is of interest to the extent that it would make it possible to pool the knowledge of the Americans in software, the knowledge and experience of the Europeans in production machinery, and Japanese organisation of production. In any case:

- There is a danger that the industry that has been preparing itself for this initiative for some time now would be the first to benefit from the results of the research. And in this case, it would be Japanese industry.

The proposal for setting up the administrative centre in Japan (while a research centre would be set up in Europe) could lead to a flow of knowledge and results out of Europe.

- The terms proposed regarding intellectual property for the results seem unacceptable.

Under these conditions, the Commission feels that before giving a definitive response, the EEC should:

- do an in-depth analysis of the content of the research planned and the terms of cooperation, in order to ensure a balance and reciprocity of advantages;
- obtain guarantees regarding protection of intellectual property rights;
- coordinate the European position with that of the United States.

A preliminary study is in progress; the Commission services are bringing in high-level experts and representatives from the member states to advise them. This preliminary study could be completed soon; if the conclusions are positive, the EEC could open formal negotiations with the Japanese and American authorities, not on participation in the project as a whole, but on participation in the preliminary one-year phase. The EEC's financial contribution to this phase (ECU 200,000) would come from the ESPRIT [European Strategic Program for Research in Information Technologies] budget and could be decided in the context of the management of this programme.

French Industry Investment in Information Technology

90AN0170 Paris LE MARCHE DE L'INNOVATION in French 5 Jan 90 p 1

[Text] This year, French companies invested over Fr 7 billion in industrial information technology. This survey conducted by Travail et Main d'Oeuvre on behalf of INDUSTRIES ET TECHNIQUES confirms the findings of previous studies. It examined 3,000 companies, representing 14 industrial branches, and their projected

investment in computer equipment and software packages. Two sectors are definitely in the lead: the metals-processing industry (Fr 1.315 billion) and mechanical engineering (Fr 1.235 billion).

The modernized paper and graphics industries come in third, followed by the electrical/electronics industries and the food and agricultural industries (see table). A breakdown by company size reveals a few surprises. Small businesses (fewer than 49 employees) can now be proud of their classification and have clearly integrated industrial information technology into their development strategy. This trend is particularly noticeable in the metals-processing sector, where small and medium-sized businesses with fewer than 50 employees, admittedly numerous, will invest Fr 784 million in information technology this year.

On the other hand, there were few surprises in the regional breakdown. Almost 50 percent of investment estimates are concentrated in four regions. In the lead are the two usual heavyweights: Ile-de-France (Fr 1.630 billion) and Rhone-Alpes (Fr 986 million). There are two real surprises in third and fourth places: Nord-Pas-de-Calais (Fr 514 million) and the Loire region (Fr 382 million). There are no surprises in the technologies involved in these investments. Computer-aided production control easily remains in first place, followed by computer-aided design and manufacture (CAD/CAM) and programming/control.

Another interesting breakdown highlights the strong points of each region. In Rhone-Alpes, the major investors in industrial information technology are naturally concentrated in the metal-processing sectors, mechanical engineering, and textile industries. In Ile-de-France the leaders are found in the paper and graphics industries, mechanical engineering, and metals processing. Some of the sectors remain the poor cousins of industrial information technology: foundry (Fr 45 million), the leather industry (Fr 82 million), and construction materials (Fr 129 million).

	(in Fr million)
Foundry	45
Leather	82
Construction	129
Clothing	194
Wood	230
Plastic/Rubber	389
Textile	454
Transportation	474
Chemistry	543
Food and agriculture industries	615
Electrical engineering	680
Paper	754
Mechanical engineering	1,235
Metallurgy	1,315

FRG: BMFT Subsidizes Factory Automation Projects

90MI0133 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 31 Jan 90 pp 6-8

[Text] Assembly costs accounting for 20 to 50 percent of production costs are the current norm in broad areas of industrial manufacturing, and the trend is still upward. This is attributable to the low degree of automation in comparison with other production areas. The principal cause is the lack of systematic, broadly applicable knowledge about product design for assembly, efficient computer-aided planning systems for assembly preparation and control, and economical, versatile machines or equipment and robots to mechanize complex assembly processes.

Assembly automation requires the complementary use of advanced technologies such as robot technology, computer-aided engineering (CAE), industrial networks, image processing, and artificial intelligence. Flexible assembly automation is thus a decisive technological challenge for European production engineering in the nineties. The effective modernization of assembly will substantially improve the competitiveness of European industry while at the same time relieving factory workers of strenuous routine jobs.

The FRG Ministry of Research and Technology has therefore included assembly in both its old and new production engineering programs. There are several national and international (EUREKA [European Research Coordinating Agency] initiative) joint projects on assembly. Several industrial companies and research institutes (for example, the Fraunhofer Society) are cooperating on each of these projects on a work-sharing basis, using the latest research findings to solve problems facing a large number of companies.

PRIMOS, a joint project on assembly planning, has meanwhile been successfully concluded. Its objective was to develop a "program for integrated, computer-aided assembly system planning" and to test it in prototype. The project team consisted of assembly system producers, research institutes, and software suppliers. This composition provided a good base for practice-oriented developments on a high methodic and scientific level, and guaranteed that the results were tested in industrial practice.

The outcome was a modularly structured assembly planning system. Its main application systems such as assembly task analysis, product analysis [Produktwerbung], plant structure planning, information system planning, subsystem layout (e.g., material-flow system, automated and manual work stations) can be used both individually and collectively as an integrated overall system with a common data base. Two research institutes and five companies, including four small and medium-sized companies, worked on the project. The

Ministry of Research and Technology subsidized the work with about 7.8 million Deutsche marks [DM] from 1986 to 1989.

Two more international joint projects have now been started as part of the EUREKA initiative, FAMOS (Flexibly Automated Assembly Systems). Under EUREKA-FAMOS, work on fundamental assembly research and development problems is being carried out jointly with companies and institutes from other EUREKA member states on a transnational, work-sharing basis.

The IMOLOS (Integrated Assembly and Logistics System for Small and Medium-Sized Assembly Units) project is the prelude to FAMOS. Its goal is to develop solutions for assembly-intensive products such as electrical do-it-yourself equipment, water fittings, door locks, or mobile telephones in order to adapt the supply and feeding system to the requirements of a flexible assembly line with regard to planning, functions, information, and plant technology. In the definition phase the features required of a flexible pilot assembly system are being defined. Using standard organization and technology components, it must adapt rapidly to different assembly tasks with minimum resetting. Three companies (including two small and medium-sized companies) and a research institute from the FRG are working on this project together with Finnish companies and research institutes. The FRG Ministry of Research and Technology has allocated about DM440,000 to the German partners for the definition phase, which is scheduled for completion in the first half of 1990.

The definition phase of the second EUREKA-FAMOS project, RAPP (Relay Assembly Pilot Project), has been successfully concluded and the research and development work proper has now begun. The goal of the project is to solve assembly problems that are particularly prevalent in the manufacture of electro-mechanics components. The fact that the individual parts are manufactured at different times and in different places means that these miniature parts, which are often sensitive, require interim storage, transport, individual pickup, and separate feeding. In addition to costs, this entails a high risk of damage, contamination, and malfunctions in the manufacturing process. Taking miniature relays as an example, this project will integrate production machinery such as stamping presses, injection molders, handling units, assembly devices, and monitoring systems as modules to form a fully automatic production line, which will then be tested in pilot production. The research and development work will focus on the versatility of the individual system components and their integration at the control and information technology levels. Three small and medium-sized FRG companies are working with companies and institutes in Austria on this project. The FRG partners carried out the definition phase without any subsidies. The Federal Ministry of Research and Technology has provided approximately DM2.7 million for the development phase to cover the period from 1989 to 1991.

In all three projects, the industrial partners are bearing at least 50 percent of their own costs, and they are also covering at least 25 percent of the expenses incurred by the research institutes involved.

Additional information is obtainable from the Karlsruhe Nuclear Research Center GmbH, Production Engineering Project Manager, Box 36 40, 7500 Karlsruhe 1, Tel. 07247/82-5296 (Mr. Wolter).

French Industrial Use of Robots Increasing

90AN0171 Paris LE MARCHE DE L'INNOVATION in French 12 Jan 90 p 1

[Article: "Robotics Fever"]

[Text] By the end of 1989, just over 7,000 industrial robots were in service in France. The latest survey by the French Industrial Robotics Association and the journal AXES ROBOTIQUE confirms a rapid growth in the robot base of almost 20 percent per year. Last year, 1,489 new robots were installed, versus 1,282 in 1988.

A breakdown by user sector confirms the predominance of the automotive industry, which accounts for almost 40 percent of the total surveyed (2,750 robots in service, including 485 installed last year), although all sectors have been affected by robotics fever. The number of robots used in the plastics industry almost doubled between 1987 and 1989 (see table). In terms of applications, spot and arc welding takes the lead (35 percent), followed by parts handling (14 percent), assembly (14 percent), machine loading and unloading (10 percent), and plastics-injection machine servicing.

A breakdown by robot type indicates that manufacturers largely prefer robots with five or more axes (70 percent of the total in service by the end of 1989) and robots with spherical coordinates (60 percent of the total).

In any case, the robot remains a significant investment. In 46 percent of the cases it exceeds Fr 500,000 and in 40 percent it costs between Fr 350,000 and 500,000. It is therefore not surprising that these machines are installed mostly in companies with more than 1,000 employees (64 percent). This survey also shows that French manufacturers have certainly profited from this increase, at least in France. Almost one out of two robots in service in this country appears to be of French origin, although it might be worth taking a closer look at some of the robots labeled "made in France." Exports of French-made machines are also increasing, but at a slower rate than that of the market.

The last section of the survey provides international comparisons, which, as usual, are imprecise due to terminology problems. Excluding Japan, for which the official (JIRA) data are very uncertain (160,000 robots), the United States currently has a robot base of about 50,000 robots; the FRG has around 20,000; Italy, 10,000; and Sweden, almost 3,500.

French Robot Base 1987-1989			
	End 89	End 88	End 87
Total	7,063	5,658	4,376
Vehicles	2,750	2,265	1,782
Mechanical Engineering/ Manufacturing	1,191	967	710
Plastics	741	554	373
Equipment Industry/Automotive	654	472	340
Electricity/ Electronics	563	485	418
Chemistry	191	150	97
Food and Agricultural Industries	182	114	90
Metallurgy	84	75	71

Italy: Robotics Consortium Planned

90MI0161 Milan ITALIA OGGI in Italian 13 Mar 90 p 46

[Article by Daniele Bo: "Elsag and Ansaldo Together in the Robotics Industry"]

[Text] Elsag and Ansaldo will join forces. According to ITALIA OGGI, the two companies have launched a joint work program that will lead to the establishment of a robotics consortium. For a number of reasons, this group will enter the robotics market by using its resources and international know-how.

Until now Elsag and Ansaldo—both part of the IRI [Institute for the Reconstruction of Industry]-Finmeccanica group—had worked separately in their respective fields. Elsag, primarily through its associated company DEA [Digital Electronic Automation], gained a foothold in the field of factory automation through robotics applied to 'structured,' namely repetitive and predictable, environments, such as a large number of production processes. Ansaldo, on the other hand, was actively involved for many years in research and applications in the field of 'unstructured' robotics, which are used in highly unpredictable situations. Having worked on the development of nuclear power plants for many years, Ansaldo has "had" to develop a robotics line capable of intervening in critical and difficult situations with a high degree of potential danger.

Ansaldo and Elsag will pool their experience by relying on their industrial and manufacturing expertise. What are the potential market sectors in which the new consortium will operate, with a range of products, i.e., robots, ranging in price from 50 million lire (the minimum, for the simplest system) to two billion lire maximum)?

There are already a number of draft projects that could be developed. Among them is a robotized nightwatch system for production plants, offices, and companies. The expertise acquired by Elsag in the design and development of "artificial vision" systems, combined with Ansaldo's expertise in the field of telemanipulation (remote handling) have been put into practice and demonstrated with this project.

A second area for cooperation is a rather large sector, which involves dangerous and toxic industrial processes such as handling toxic substances or cleaning oil tankers. In addition, the Elsag- Ansaldo consortium is working on a program to automate practically all mining operations. On paper, the market prospects therefore appear more than interesting.

Another concrete example of possible intervention in places where humans experience difficulties, involves a case that has recently been in the press—namely, the buildup of salt deposits on thousands of ENEL [National Electric Power Company] pylons in certain areas of Italy. In theory, the work could be carried out by teams of human "cleaners," but remote-handling robotized systems could carry out the work just as well. Not to mention the 2,000 offshore rigs installed throughout the world, the maintenance of which will increasingly be entrusted to automated, remote-controlled systems. A project is being developed in this area with Ansaldo's participation.

The problem, according to the experts in the sector, is social rather than technological in nature. In this case, it is the social attitude—that is, the degree to which society is prepared to replace human beings with robots—that makes the market. Any change in this attitude could either boost or limit robotization.

Italy: Selenia Participating in EUREKA Robotics Project

90MI0156 Rome INCONTRI RSE in Italian Sep-Dec 89 p 13

[Text] They will be ready to intervene in any emergency: fires in high-risk areas, rescuing people that cannot be reached with ordinary means, and defusing explosive devices. They are AMR [automatic message registering] 1 and 2 robots, the prototypes of a series being developed by Italy, France, and Spain as part of a EUREKA [European Research Coordination Agency] project. The AMR system provides for two types of robots with different dimensions and tasks.

The first is the size of a Land Rover and is designed for long- distance, outdoor missions (30 kilometers, maximum speed 50 km/hour). It can be used in case of earthquakes, chemical and nuclear disasters, large-scale fires, and so on.

The second is smaller, but can enter buildings, climb over different levels, and go up and down stairs.

Both models will have numerous "intelligent" capabilities: The ability to recognize the area in which they are working as well as people and objects, move according to

an electronic map, and adapt to different commands from the operator. The operator will guide the vehicles from a distance inside a control booth (Surveillance Mobile Station), located at a safe distance from the area of intervention.

The Italian participants in the program include ENEA [Italian Committee for R&D of Nuclear and Alternative Energies] and the Italrobot Consortium, composed of Ansaldo, Elsag, Fiar, Officine Galileo, OTO Melara, Selenia, RTM [expansion unknown], and Vitroselenia.

This project is of particular interest to the companies in the Finmeccanica Group. Ansaldo, in strict collaboration with ENEA, is responsible for all aspects of the system as well as specialized activities such as locomotion. The Selenia-Elsag group is also making important technological contributions. Selenia has been assigned the development of the infrared sensors, Elsag has been assigned important activities in the field of artificial vision, and Vitroselenia is responsible for the important radio communications subsystem.

EUREKA has launched approximately 300 projects to date, for a total of almost 10 trillion lire, involving more than 1,600 European companies. Italian companies are participating in 66 of these projects, with public funding amounting to approximately 900 billion lire. Italy is heavily involved in the robotics sector with a total of 15 projects.

LASERS, SENSORS, OPTICS

FRG: Erlangen Laser Research Association's R&D Reported

90MI0118 Coburg OPTO ELEKTRONIK MAGAZIN in German No 5, 1989 pp 507-510

[Text]

Professor Hans W. Bergmann's Team at the Department of Materials Sciences II

Prof. H.W. Bergmann's team at the Department of Materials Science (Metals) is working on the following laser processing topics: Laser cutting, laser welding, surface refinement, and on-line process control. **Key Research Projects: Laser material development, laser processing of nonferrous metals, laser surface treatment, laser refining, laser hardening, material process simulation.**

Work on laser cutting and welding focuses primarily on Al and Ti alloy processing. Because of their high degree of reactivity with atmospheric gases, these materials set scientific and technological requirements that only a careful choice of parameters and process control can adequately satisfy. It is particularly important to ascertain the mechanical and technological properties of cut and/or welded aluminum and titanium alloys in view of their potential use in the aerospace sector.

Surface refining, which comprises modifying the surface in both the liquid and solid states, is the key process in laser material processing. In the solid state, martensitic surface conditions are produced in steels through transformation hardening. The combination of the component's hard surface and tough core makes it possible to achieve good abrasion properties, adequate toughness, and high strength. Uniform hardness results can be attained with on-line process control that continuously measures the processing temperature and keeps it constant by adjusting the laser output accordingly. Hardening edges poses a problem in this respect, since an overheated edge may result in irregular hardening or even melting. The change in speed required to avoid this can be calculated by mathematical simulation.

Liquid state processing differs according to whether it is performed without additives under inert gas (refining), with an additive (alloying), or with a coating (cladding). Cast materials such as cast iron and Al-Si alloys are the primary areas of interest for surface melting. The abrasion resistance of cast iron can be improved by producing a ledeburitic skin. Enhanced abrasion resistance may also be expected in Al-Si alloys after refining, although this requires the addition of suitable alloying constituents as well as refining. Hard metal (TiN, TiC) surfaces can be obtained with Ti materials by refining in a reactive gas (N_2CH_4) environment. Components from industry have already been successfully processed according to this method, which raised their abrasion resistance during use. Layers containing hard materials can be created not only by triggering a chemical reaction in the melting bath, but also by melting powders containing hard materials directly into the surface. Diamond, WC [tungsten carbide], and other hard materials have already been successfully incorporated into surfaces in this way.

The studies listed above are currently carried out with CO_2 lasers, but they will be complemented in the future with experiments using solid-state lasers.

In addition to these two types of laser, the excimer laser, too, is currently playing an important role; it features very short pulse durations at high peak output rates. These properties are used to evaporate layers immediately below the surface, which produces a cleaning and polishing effect. Highly promising experiments have been carried out in this connection on contact materials, cast iron, and other materials. An on-line quality control system, which assesses processing quality on the basis of variations in the optical properties of an illuminated surface, has been developed to monitor the surface processing of metals with excimer lasers.

Professor Jens Christiansen's Team at the Department of Experimental Physics

Department I of the Physics Institute under Prof. J. Christiansen has been studying plasma and gas discharge physics for 15 years. These studies originally grew out of nuclear physics research. Twelve years ago this work

produced a concept for studying rapidly changing plasma systems in the low pressure range. The resultant pseudospark switch and the principle, based on gas discharge, generating intensive electron beams have led over recent years to applications in laser technology. It was for this reason that the department joined the FLE [Laser Technology Research Association] in 1987.

Key Research Projects: applied laser physics

1. Development of power switches for switching high performance excimer lasers

The development of high-power switches for use in excimer lasers is based on the discovery of the pseudospark as a discharge system and, administratively, on the funding received since 1984 from the BMFT [FRG Ministry of Research and Technology] for the development of a technically viable high-power switch. The development work is so far advanced that a prototype suitable for mass production and with data comparable to the high-power thyratrons currently on the market will be presented late in 1989. This switch will be used as the basis for the development of a generation of switches for use in excimer lasers, and which experts expect to influence the further development of high performance laser technology. From the physics point of view, an optimistic assessment of this concept is justified in that the pseudospark principle makes it possible to combine high repetition rates in the gigawatt switching range with a controllable level of switching system erosion. Experiments have established that several pseudospark switches can be paralleled. It can be used on a long-term basis for further developing high performance lasers with light pulses in the 10^{-8} to 10^{-7} second range.

2. Development of heavy current switches for controlling light emission in flashlamp systems for use in high performance solid-state lasers

The power rating of Nd:YAG lasers is currently characterized by the warming of the solid-state laser configuration as a consequence of optical pumping involving flashlamp light sources. The economics of this pumping process can be improved if flashlamp systems are wired to extinguishing switching units. This reduces thermal radiation, thus enhancing the pumping capacity of the light source. Preparations are underway for a pilot project that will measure pumping capacity ratings.

3. Development of high-power electron beams for research into the plasma-wall interaction of plasmas produced by electron beams on solid-state surfaces

The plasma-wall interaction of a pulsed electron beam with a megawatt range energy transfer onto a target leads to shock waves in the rear area of the target. Optical schlieren photography has been used to examine these shock waves. This process is suitable for use in similar experiments in the impact zone of a high performance excimer laser, for which preparations are currently being made.

4. Development of diagnostic methods for determining electron density and plasma temperatures using optical spectroscopy in rapidly varying plasmas

Work based on studies of the Stark and Doppler effects on spectral lines of atomic hydrogen have made particular headway. When the tests are performed correctly, the methods devised can be used to develop procedures for determining plasma electron density and plasma electron temperature in the impact zone of high performance laser pulses. The team will pursue application-oriented projects up to the process control and process regulation levels.

Professor Manfred Geiger's Team at the Department of Production Engineering (FLE spokesman)

The Department of Production Engineering (under Prof. M. Geiger) is part of the Institute of Production Engineering in the Engineering Faculty of Erlangen-Nuernberg University, and its work focuses on the following main areas: Shaping and materials technology, and laser technology.

The department regards these two broad topics as complementary fields comprising both basic and applications-oriented research work.

Key Research Projects: Shaping technology, materials technology

As part of the joint project on "Process Simulation in Shaping Technology" various computer program systems are being developed for uses such as bending process simulation or tool failure analysis.

Work on materials technology centers on fracture mechanics and wear in machine parts. In powder metallurgy, work is being done on the development of sinter techniques for wear-resistant material alloys.

One example of further process development is "rubber bending." This research project is studying working precision in the production of sheet metal parts with a U-shaped cross section by bending with an elastic matrix.

Key Research Projects: Laser process research, diagnostics, laser production engineering, laser cutting, laser welding

The Department of Production Engineering's major research projects on materials processing by laser concern production processes involving cutting, such as laser cutting and drilling. In addition to metals, these projects are also studying nonmetallic materials (plastics, fiber composites, and composite materials).

Other research areas involve 3-D material processing by laser of three-dimensionally shaped workpieces with a commercial five-axis laser cutting and welding center. Interesting innovations are emerging here in combined laser cutting and welding. For example, welding can be carried out on the visible areas of automobile bodywork.

The laser beam sources used at the Department of Production Engineering range from CO_2 lasers (up to 2.2 kW) via Nd:YAG (up to 300 watts) to excimer lasers.

The department has combined shaping and laser technology within a flexible sheet metal processing unit consisting of a commercial laser cutting system and a 10-axis bending machine. This could not have been done without fundamental work on automation technology. A few examples of the problems encountered are: The handling of bent parts, the design of CIM modules, and the introduction of special quality assurance processes such as image processing or on-line process control.

Other major research areas in the department are sensory analysis, diagnostics, and process control, all of which will contribute both to enhancing processing quality in all laser materials processing techniques and to improving understanding of the physical processes involved. The department also has several semiconductor lasers and He-Ne lasers for optical metrology (interferometry, schlieren photography) and CO_2 lasers with 20- and 50-watt output capacities for this work. As part of the "Automated Production Systems Project," the laser technology section of the Department of Production Engineering is working on the development of a technology processor for laser cutting. As a knowledge-based software module, the processor will supply the flexible sheet metal processing unit built by the department with the process parameters (for achieving uniform processing quality) established in technological laser cutting studies. The department's most important research work on laser technology currently covers the following topics:

- Study of processing quality in laser cutting of steel materials;
- Study of processing precision and process control in laser cutting of composite materials;
- Study of processing quality and process control in the processing of three-dimensionally shaped sheet metal parts by a combination of laser cutting and welding;
- Diagnosis and process data acquisition in laser cutting;
- Laser beam diagnostics system for plant monitoring during cutting with high performance CO_2 lasers;
- Precision drilling with Nd:YAG lasers;
- Fine cutting with Nd:YAG lasers;
- Fine machining of ceramic and composite material surfaces with excimer lasers.

FRG: BMFT Promotes Laser Technology Standardization

90MI0131 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 520, 31 Jan 90 pp 4-5

[Text] The conventional standardization procedure involving drafting periods of several years is no longer economically viable in laser technology with its rapid changes and annual growth rates of more than 10 percent. The new technical rules required must be drafted and converted into international standards in a short space of time. Regulations governing health and safety and other areas that relate to the well-being of society at large must be harmonized not later than 1992, the deadline for the establishment of the single European market.

To satisfy the great need for new technical rules and standards, the new concept of "development-paced standardization" has thus been drawn up for specialized, highly innovative fields. It follows a simplified procedure and makes for greater flexibility and swifter introduction of what are termed European preliminary standards right from the research and development project phase.

The Federal Minister of Research and Technology had already advocated more intensive use of development-paced standardization to promote technological developments in Europe when Germany had the chair of the EC Council of Ministers (Memorandum No. 4939/88 dated 14 March 1988). With the support of the BMFT [FRG Ministry of Research and Technology], development-paced standardization was first introduced in the FRG in CIM (computer-integrated manufacturing). With laser technology, a second high technology area is being prepared for the requirements of the single European market through development-paced standardization.

For this purpose the BMFT has allocated to the German Standards Institute (DIN) in Berlin funds totaling 1.3 million Deutsche marks [DM] for a three-year project. A primary goal of this project is to bring together the institutes and companies subsidized by the BMFT under its "Laser Research and Technology" funding program in a network of preliminary standardization activities. The EUROLASER projects, which have from the outset been planned for international cooperation under the EUREKA [European Research Coordination Agency] program, play an important part in this respect.

The DIN has appointed a laser technology committee to provide the project with expert guidance. The committee, which held its constituent meeting in Berlin in early December 1989, is responsible for steering working methods and measures toward the goal of development-paced standardization in laser technology. Its members are drawn from science, industry, and scientific and technical associations and authorities. The DIN will publish the results of a preliminary study early in 1990.

By funding the DIN project, the BMFT is intensifying its commitment to the funding of Berlin-based laser technology institutes. In the Solid-State Laser Institute and the Laser Medicine Center, the BMFT is funding two major research institutes in Berlin that were set up only three years ago but have already gained international recognition. The Solid-State Laser Institute is a leading partner in the EUROLASER "High-Performance Solid-State Laser" project.

UK: Laser Research Achievements Reported

90MI0188 Stuttgart LASER & OPTOELEKTRONIK in English Apr 90 p 14

[Article by C. Hopper: "New British Nd:YAG Laser Research Achievements"]

[Text]

Q-switched Nd:YAG Operates at 946 nm

Workers at the University of St. Andrews, St. Andrews, Fife, Scotland, have operated a Q-switched Nd:YAG laser at a wavelength of 946 nm for the first time. A specially designed Brewster-angled acousto-optical Q-switch with a low insertion loss was employed, as the laser gain was quite low. This Q-switch provided a 14 nm path length in a lead molybdate crystal.

The pump power of 280 mW of 809 nm radiation from a laser diode array was focused into a 80 x 25 μm spot on the Nd:YAG crystal surface. In continuous operation, the output power was 22 mW without the Q-switch, falling to 18 mW with the Q-switch in its low-loss state. In Q-switched operation, the peak pulse power was 81 W with a pulse duration of some 40 nsec.

Average power was 4.9 mW at a 1.5 kHz pulse repetition rate in the TEM_{oo} [transverse electromagnetic mode] elliptical mode.

The output could be frequency doubled to pulses of blue light of 473 nm wavelength. Pulses of an energy of 8.2 μJ were obtained by using a crystal of potassium niobate of length 4.8 mm for frequency doubling; it provided a conversion efficiency of 8 percent.

Sub-Threshold Pumping Improves Flexibility of 'Tuned' Resonators

During the past decade designers of Nd:YAG lasers have adopted 'tuned' resonators instead of the inherently inefficient long apertured resonators, as tuned resonators can yield both good beam quality and high efficiency. Tuned resonators rely on a constant mean lamp power being generated in the laser rod. In many applications this does not cause any significant operational difficulties. However, for applications where it is desirable to fire the laser in response to external signals (such as drilling-on-the-fly), the laser will be detuned when the heat input to the laser rod is not at the design value.

Lumonics, Rugby, Warwickshire, UK, has shown that an active pulse forming, chopper-mode power supply can be employed to overcome this operational disadvantage. In order to restore the heat input to the design value, the flash lamps are operated during the inter-pulse period at a power level which is too low to produce laser output, but which continues to provide heat to the laser rod. This power level is regulated by a feedback system implemented within the microprocessor control system of the laser so as to maintain the tuning of the resonator.

The repetition rate is typically in the 30-1000 Hz range, so the inter-pulse period is much shorter than the time constant of the laser rod, and the necessary servo response is quite modest. The chopper mode power supply for the generation of the required laser pulses has a rise time of the order of 100 μsec, so its response is fast enough to allow it to cope easily with the demands made by the servo system.

This correction scheme requires no additional hardware, as the measurement of the instantaneous lamp power is available within the computer as a fundamental control variable. It allows the optical efficiency of lasers used for drilling and cutting to be optimised and can minimise the main operating cost of replacement flashlamps, which is very sensitive to the power loading.

MICROELECTRONICS

France: CNET Develops Optical Emitter

90AN0227 Levallois-Perret LA LETTRE DE LA FIBRE OPTIQUE in French 29 Jan 90 p 1

[Text] The Bagneux laboratory of the National Center for Telecommunications Studies (CNET) has recently developed, for the first time in Europe, an operational 1.3-micron optical emitter that monolithically integrates a BRS-type double-heterostructure InGaAsP-InP laser (CNET patent) and an insulated-grid InP field-effect transistor (MISFET type).

The integrated emitter has a "quasi-planar" structure which is mounted on a semi-isolating InP substrate. Epitaxy and implantion technologies have been used for the laser and the transistor, respectively. The laser has a threshold current of 10 mA and a maximum optical power above 30 mW. The transistor is a conventional closed-type one (implanted active Si layer) with a transconductance of 16 mS/mm.

The technological compatibility of the BRS laser and the implanted FET opens the way to more complex monolithic integrated-transmitter-type developments, which should lead to significant reductions in production costs while providing performances compatible with fiber-optic communications (transmission-distribution).

France: CNET, SGS-Thomson Open Submicron R&D Center

90AN0181 Paris ELECTRONIQUE HEBDO in French 11 Jan 90 p 18

[Article by F.G.: "Joint CNET/SGS-Thomson Laboratory Launched"]

[Text] On 20 December 1989, the National Center for Telecommunications Studies (CNET) and SGS-Thomson signed an agreement confirming the official launch of a joint research and development center for submicron silicon technologies. This project, also known as Grenoble-92, is one of the French projects within the Joint European

Submicron Silicon Initiative (JESSI), the European microelectronics research program. For the center's operation, CNET and SGS-Thomson executives have formed an economic interest group on a 50/50 basis. The center, which will initially employ 150 to 200 people, will be located in Crolles, on the outskirts of Grenoble, on land donated by the local and departmental (Isre) authorities. A total investment of about Fr 750 million contributed equally by both partners is planned for the installation of the laboratory, which will be responsible for the integration of 0.3- and 0.5-µm linewidths, research on production techniques for 200-mm-diameter wafers (in particular, on the transition from 150-mm wafers to those of the next size), and the rapid manufacture of prototypes for the above-mentioned technologies. Moreover, the government has pledged additional funding for the installation of a prototype production unit on the same site with a monthly production rate of 5,000 wafers 150 mm in diameter. The total investment will thus reach Fr 1 billion, as scheduled and announced last April. In a subsequent phase, SGS-Thomson plans to set up, as called for in the initial plans, a production unit for 150- to 200-mm wafers, with a monthly production capacity of about 20,000 wafers. The unit would be destined to replace the present facility in the Polygone (formerly the Company for the Study and Manufacture of Special Integrated Circuits or EFCIS) site in about 1994. These investments would be funded by the Franco-Italian company itself, outside the JESSI framework.

First "Silicon" by Late 1991

The new center's mission will be, on the one hand, to give the CNET and, more broadly, France Telecom, the technological expertise and the prototype circuits in 0.8- and 0.5-µm technologies that are necessary to the definition and study of future telecommunications systems; and, on the other hand, to contribute submicron technologies and the capacity to develop prototypes to SGS-Thomson. With the technological experience of both partners, originating in the case of SGS-Thomson from previous research in collaboration with the Laboratory for Electronics and Information Technologies (LETI), the center will initially concentrate on complementary metal-oxide semiconductor (CMOS) logical, analogical, and mixed bipolar complementary metal-oxide semiconductor (BiCMOS) linewidths of the crucial 0.8- and 0.5-µm sizes.

Construction work is due to start imminently so that the center might be operational by late 1991.

The first silicon is scheduled for late 1991, a few months later than first scheduled.

SGS-Thomson Opposes Japanese Semiconductors

90AN0221 Paris ELECTRONIQUE HEBDO in French 15 Feb 90 p 14

[Article by Francoise Grosvalet: "SGS-Thomson Calls On Europe To Shut Out Japanese Semiconductors"]

[Text] "We must stop listening to the declarations of intent by the Japanese, however good they may be. The time has come to strike back." This is the view of Philippe Geyres, vice president for corporate planning of SGS-Thomson Microelectronics. Geyres believes the future of the entire European electronics industry is at stake.

"European semiconductor producers could, given their size and their financial clout, aspire to 10 percent of the Japanese market, if that market were as open as that of the Old Continent, for example. That is far from the case. The top 20 European semiconductor manufacturers today manage to do only two percent of their sales with Japan," Geyres notes. SGS-Thomson Microelectronics has called on the European Community to take the following four emergency measures:

- A halt to European subsidies for the installation of Japanese factories, and not just in the semiconductor sector (the European consumer industry, which is still holding out, would also benefit);
- The preservation of national quotas;
- The establishment of truly effective antidumping measures that, according to Mr Geyres, bear no relationship to the ones just adopted in Brussels following a complaint filed back in 1986;
- The cessation of negotiations aimed at reducing customs duties on products imported into Europe.

Job Creation—In Reverse

According to Geyres, the time has also come to increase customs duties on imports to Europe. During the last GATT negotiations, the European semiconductor manufacturers succeeded in beating back a 30-percent reduction in customs duties on imported semiconductors, but the game is not over.

These four measures boil down to a closure of European borders to Japanese products as long as Japanese borders remain impenetrable to Western products. Some of these measures seem only fair. The subsidies to Japanese semiconductor manufacturers actually finance the Japanese equipment industry. And if these subsidies are expected to create jobs, it must not be forgotten that each job thus created entails the elimination of two jobs among European competitors and ten jobs in the entire electronics industry.

But is it not already too late? Do not some of the measures urged by SGS-Thomson, a semiconductor manufacturer, go against the immediate interests of European computer hardware firms?

"Too late? Not yet," says Geyres, "but it is time to take measures and to no longer heed verbal promises by Japanese manufacturers. Europe has already undertaken a certain number of programs (including the Joint European Submicron Silicon Initiative, JESSI) which go in the right direction, but that is not enough. The Japanese do not play by the rules; we have to fight with the same weapons they do."

"It is true that in the short term the measures proposed may seem to be against the interests of the European computer hardware companies, but is it not in their interests, in the long term, to stop depending for the supply of memories, for example, on Japanese companies which are also their competitors in the systems market? What's more," Geyres observes, "computers are not the major market for semiconductors in Europe. And it is not only the semiconductor industry that is at stake, it is a matter of survival for the entire European electronics industry."

Consumer Electronics, Semiconductors: Same Struggle

The European consumer electronics industry is a major semiconductor user whose needs are still increasing: According to figures provided by SGS-Thomson, the share of global consumer electronics industry is expected to increase from 20 to 23 percent by the year 2000, whereas that of the computer sector is to decline from 41 to 40 percent. "The two have common interests and thus have everything to gain from an agreement on the measures to be implemented. Unlike its U.S. counterpart, the European consumer electronics industry has not thrown in the towel—two European manufacturers (Philips and Thomson) are among the top four—and needs a strong European semiconductor industry in order not to be dependent, as are computer manufacturers, on its competitors for the procurement of components. Consumer electronics represents a substantial market for the semiconductor industry. By 1995, a high-definition color television set will have $150 worth of semiconductors—five times more than today—including 70 percent in memory chips, 15 percent in logical circuits, and the rest in analog components. At the same time, personal computers, nowadays the major users of memories, will see their semiconductor share increase only by four percent to reach $410."

Geyres believes that semiconductors and consumer electronics will be the last two bastions to fall in a total and final invasion of Europe by Japanese products and manufacturers. "It is therefore time to react and take steps," he asserts. In this regard, the United States would appear to be a logical ally, especially for the development of a European semiconductor equipment industry, even if it is recognized that a lot remains to be done to reach full reciprocity: European manufacturers have approximately 20 percent of their sales in the United States, whereas U.S. manufacturers hold almost 50 percent of the European market. However, the IBM-Siemens agreement for the development of the 64-Mbit DRAM does not seem to be clarifying matters.

Italy: SGS-Thomson Digital Signal Processors

90MI0152 Rome FINMECCANICA NOTIZIE in Italian 30 Nov 89 pp 17-18

[Text] SGS-Thomson Microelectronics has added two new devices to its line of ST18900 digital signal processors. These have been given the codes ST18940 and ST18941, and were developed with high- performance CMOS [complementary metal-oxide semiconductor] technology. They are 32-bit components with upward compatibility (in response to the source code) with the current 16-bit devices of the same line. The 32-bit word length and additional resources integrated in the chip make these two new devices particularly appropriate for DSP [digital signal processor] application in advanced fields such as telecommunications, word and image processing, spectral analysis, the control of high-speed systems and digital filtering. Thanks to a 100 ns machine cycle, the two new devices can achieve an effective processing speed of 10 MIPS. Their innovative parallel architecture enables the devices to read two independent operators, multiply on ALU [arithmetic and logical unit], write the results into a memory, modify the three address pointers, and carry out an I/O operation, all during a single machine cycle. This is obtained by using four independent units for processing of addresses, three internal busses for 16-bit data, three internal data memories, and a separate, 32-bit program bus. These two devices also include two external busses (the system bus and local bus), which facilitates their use in a wide range of applied configurations, from single chip systems to multiprocessor systems.

Compared to the previous devices in this line, additional elements include a serial gate for direct interfacing with codec and ISDN [integrated services digital network] devices, a parallel gate for input/output, and an integrated controller for DMA [direct memory access]. The ROM [read-only memory] version can be programmed with the ST18940 mask, and the ST18941 version without ROM is supported by a series of software and hardware instruments to design systems, such as: A stand-alone emulator, a module for EPROM [erasable programmable read-only memory] emulation, a powerful multiprocessor development station, a module to evaluate PC compatibility, an assembler/linker, and a C compiler.

Italian, French Microelectronics R&D Facility Planned

90MI0149 Rome FINMECCANICA NOTIZIE in Italian 31 Dec 89 p 12

[Text] The SGS-Thomson group and CNET (National Center for Telecommunications Studies) have signed an important cooperation agreement in the field of microelectronics. The agreement covers the joint development and use of a research center for submicron silicon technology to be carried out through a jointly controlled consortium.

The new center will be located in Crolles, Isere, in the "Grenoble 92" industrial area. Its design will probably make it the most modern research laboratory for dedicated integrated circuits in the world. The laboratory will have two goals. First, to provide CNET with technological know-how and with prototypes of advanced circuits that are essential for the study and definition of the

telecommunication systems of the future. Second, to provide SGS-Thomson with submicron technology and the potential to develop prototypes, particularly for the dedicated integrated circuits used by the electronics industry in the telecommunications and audiovisual systems sector, as well as in the data processing, automotive, and professional electronics sectors.

The SGS-Thomson group already has a highly advanced laboratory for research on submicron integrated circuits at its headquarters in Agrate Brianza. Nonvolatile memories ranging from four to 64 Megabits are also developed at the laboratory within the framework of European microelectronics programs. The group also plans to set up a third laboratory in Catania through the consortium, which also involves the University of Catania as one of its members. This laboratory will have the same highly advanced characteristics and will develop high power electronic components for the 1990's.

Italy: Microelectronics Research Consortium Established

90MI0160 Milan ITALIA OGGI in Italian 28 Feb 90 p 43

[Article by Daniele Bo: " 'Genova Ricerche': The Spearhead of Microelectronics"]

[Text] The Genoa Research Consortium will be a reference point for all Italian universities carrying out research in the field of microelectronics. This is the essence of an agreement made public yesterday at a meeting held in Genoa between the directors of Genova Research Consortium and IMEC (Interuniversity Microelectronics Center of Lovanio). According to this agreement, IMEC will be a reference point for Italian researchers at the European level. Leading academic experts in the sector from the Universities of Bologna, Pisa, Padua, Rome, Palermo, Turin, Genoa, and Parma were also present at the meeting.

This agreement will offer Italy the opportunity to reestablish a link with the principal institutes working in the microelectronics sector and which are also members of the Eurochip consortium. Some countries such as Italy, Spain, and Greece have been excluded from this consortium, which includes five institutes: GMD [Society for Mathematics and Data Processing] (FRG), CMP (France), RAL (UK), DHT (Denmark), in addition to the above mentioned IMEC. As the speakers at the meeting explained, these centers operate as "silicon brokers." They design integrated circuits, then seek the silicon foundry that quotes the best price for the most suitable and technically compatible product.

Yesterday's meeting, the first of its kind in Italy, was organized as part of the EEC's two-year program, entitled "Esprit Promotion of VLSI (very large-scale integration) Design Skills." The goal of the program is to increase all the training activities connected with the design and development of VLSI integrated circuits by research centers and universities. More specifically, the program aims at providing researchers with access to the industrial manufacture of integrated circuits and the training of a significant number of engineers and designers (roughly an additional 3,000 people per year). The EEC project is supported by 118 universities, divided into five groups, each of which depends on the founding members of the Eurochip consortium.

The EEC has already signed a number of agreements with CAD [computer-aided design] system suppliers and "silicon foundries." As a result, over the next three years 50 "Run Multi project chip," will be implemented, that is, several projects on the same silicon wafer.

French Semiconductor Suppliers Form Interest Group

90AN0224 Paris ELECTRONIQUE HEBDO in French (English-language supplement) 22 Feb 90 pp 29-30, 34

[Article by Frederic Fassot: "Founding of JEMI: Association of French Suppliers for the Semiconductor Industry"]

[Text] French suppliers for the semiconductor industry have formed a group to favor their growth. First victory: A seat in JESSI [Joint European Submicron Silicon Initiative] an initiative which may encourage the creation of the same kind of association on a European scale.

Last June, around thirty French suppliers for the semiconductor industry, including equipment manufacturers, material suppliers and service providers got together to form JEMI France (Joint Equipment Manufacturers' Initiative), an association whose goal is to promote and organize the actions of French industrialists in the field of microelectronics within the framework of European research and development programs (ESPRIT [European Strategic Program for Research in Information Technologies] and JESSI. To fulfil this role, JEMI France represents its members at the decision-making level of the EEC and JESSI by supporting and defending the projects in which they participate. JEMI France has received the backing of the Ministry of Industry, the CNET[1] [National Center for Telecommunications Studies] and LETI[2] [Laboratory for Electronics and Information Technologies], as well as industrial partners such as SGS-Thomson, Matra MHS, etc. Since government subsidies will be going more and more through European channels, it has become vital for French companies to be represented at the European level and thereby become familiar with the rules of the game. Presence in the field has become a major necessity. Increasing the market share of French products is JEMI's ultimate goal.

According to Claude Doche from LETI, chairman of JEMI France, "a major weakness is becoming more and more apparent in the Old World: the lack of a competitive equipment industry." Can this situation still be

reversed by breaking European semiconductor manufacturers' dependence on American and Japanese equipment manufacturers? First of all, the European industry of equipment and materials for microelectronics is far from non-existent or insignificant. IBM Europe, for example, is reported to use more than 40 percent of European equipment in its integrated circuit production lines. European suppliers of materials (gas, chemicals, silicon) operate on an international scale. Moreover, by participating in the JESSI program where some one hundred proposals for action have been made, industrialists prove the vitality of their profession.

Reaching a Critical Size

But let's not be lured. We cannot count on any favors from European semiconductor manufacturers to make European equipment progress at an international level of competitiveness, as was the case in Japan. Too busy with increasing their own competitiveness, they cannot take risks with equipment that is insufficiently tried or lose time in machine development. On the other side, the European industrial organization of semiconductor industry suppliers seems poorly structured and often lacking in efficiency. In this context, we can see how essential it is to form a French association. "Grouping together companies in an association to coordinate means and harmonize partnerships, sharing the development expenses for equipment by relying on competent structures, joining together to develop a powerful representation and sales force on the international scale": this is what is really at stake for JEMI France. Obviously, such an ambitious project cannot take shape over night. To gain international credibility, a critical size must be reached. An association is the first stage but should not hide the fact that certain mergers are required. This is a sensitive area. For some (the largest suppliers for the SC industry and many semiconductor manufacturers) we are inevitably heading towards a decrease in the number of suppliers as well as an increase in their size. For others (especially suppliers of moderate size), there are still areas, where you don't have to be as big as the biggest. This issue is still up for debate. The multi-chamber and multi-processing concept which all semiconductor manufacturers are praying for illustrates this cleavage. The trend is towards facilities which are capable of carrying out various processes such as plasma etching, CVD [chemical vapor deposition], sputtering, rapid thermal processing (RTP) and cleaning in different reaction chambers. Because of its complexity and level of integration, this type of machine can only be developed by a small number of well-to-do equipment manufacturers. However, the diversity of the modules required makes it necessary to be able to master as many special skills, leading the way to associations and collaborations.

The first success won by JEMI France: The association was granted a seat in the Management Board of JESSI in the commission in charge of studying projects and allocating subsidies for equipment and materials used in semiconductor manufacturing. This commission has thirteen members: four German, four Dutch, three French, and two English. Air Liquide (a JEMI member) and Alcatel each have one seat. By capturing the third seat, JEMI enables all French suppliers for the semiconductor industry, regardless of their size, to participate in the decisions concerning subsidy grants for research and development programs (a Fr 440 million envelope [as published] will be distributed to French projects). In addition, since the commission is in charge of studying all European project applications, JEMI will be able to provide its members with all the information obtained on projects by the European competition. An invaluable source of information which places France in a privileged position compared to other European countries, because the ten other seats in the commission are held by individual companies.

Open to All IC Manufacturers

The association's role, however, is not limited to participation in JESSI; it is the promotion in the broad meaning of the term of the French offer of supplies for the SC industry which is the real reason for the foundation of JEMI. The assocation intends to favor industrial cooperation agreements between its members. In addition, JEMI is determined to integrate European partners (semiconductor manufacturers) in French projects and to favor reciprocity. It is true that only French suppliers for the semiconductor industry are admitted as members to the association, but JEMI is open to all semiconductor manufacturers without discrimination of nationality. JEMI-France is determined to improve the image of French companies in the sector, to concentrate their efforts and make them competitive, to promote their products on the international level and to set up an appropriate marketing structure.

A Technical and Commercial Database for Members

The gradual setting up of an international representation common to all JEMI France members is also under study. Moreover, JEMI-France is participating in the group SEMI Europe in charge of standardization work based on the work by the MESA group (Modular Equipment Standards Architecture), part of the SEMI [Semiconductor Equipment and Materials Institute] international trade union since October 1989. One of the other goals of the association is to set up a database for its members (with technical and commercial information; portfolio of adresses and skills; inventory of requirements; state of the markets). Plans are also underway to organize seminars. JEMI France has an annual operating budget of FR 2 million from its members' dues, a percentage of the aid received concerning projects accepted by JESSI as well as government funds. To date, JEMI has registered 29 members out of a potential membership of around 40 interested likely parties. An organization with goals that can only be praised and which, faced with the internationalization of this sector, beckons a similar structure on a European scale. When will there be a JEMI Europe?

[Box, p 29]

Who's In?

Apart from certain members like Air Liquide, the majority of the members of JEMI-France are small companies of less than 50 employees with a sales figure

of several million French francs. This fragmented offer is accompanied by an orientation of proposed products towards research and development rather than mass production. Formed of small and medium-size companies operating in very specific fields, the association cannot claim to be on an equal footing with large equipment manufacturers for the semiconductor industry. But by creating JEMI, French industrialists should now feel more aggressive and confident in certain profit-generating markets. And another sign of distinction is that most of the members of JEMI-France belong to companies in activities other than microelectronics. Some ten companies, however, operate in this field alone. Except for Air Liquide, the French industrial fabric of suppliers for the semiconductor industry represents some Fr 800 million.

Joint Equipment Manufacturers Initiative

Company Name	Skill	Products
Aluminium Pechiney	Ultra pure metals	Metal targets
ASTI	Teflon PTFE and PFA engineering	PTFE and PFA pumps, fittings; valves and miscellaneous parts
Bertin	Private R&D center; laser CVD and etch techniques (VHF ultrasonic inspection, optical inspection)	Repair machines, prototypes
Blomme Automation	Stainless steel technology; automated wet process	Wet benches, wet closed chamber
CENG/LETI	R&D center of the CEA Group; microelectronics technologies; 16- and 64-MB advanced processes; manufacturing science	New IC technologies
CETIA	Computer aided design; networks	CAD stations, networks; custom IC design
CNET	R&D center of the French telecom group; telecommunication IC design and technology; advanced IC and equipment research	Telecommunication IC devices; new IC and equipment technologies
Cybernetics	Robots, flexible manufacturing cell	Robots, TAB handler; electrical test automation
Eferel	Gas distribution and safety systems	Ultrapure gas supply systems; safety cabinets
Epitech	Epitaxy, LPCVD, polishing	Thin film and polishing service
Institut Technique NEU	Clean room technology	studies, training
ISA Riber	Vacuum technology	Reactors and scientific instruments
Jipelec	Thin film deposition; thermal processing	Diffusion and RTP furnaces
L'Air Liquide	Ultra pure gases; purification and supply techniques	Ultra pure gases and supply
Labeille	Ultra pure materials; distribution technique	Plastic and stainless steel tubing
Microcontrole	Accurate micromechanics, optics	Handlers, metered stages; optical inspection and metrology; pattern generator
Micropolish	Wafer polishing technique	Wafer repolishing
Plassys	Vacuum and plasma techniques	Downstream stripper
Plastacid	Wet process automation	Automated wet benches
Plastic Omnium	Plastic components technology; ultra pure products handling	Plastic containers; tubing and accessories
RECIF	Clean surfaces	Tweezers, carriers; wafer cassette transfer system
SAPI	Wet processing chemical dispense	Automated wet benches, cleaning stations; dryers, laminar air flows
Schlumberger	IC electrical testing	Electrical testers, E-beam testers
SEIV	Mechanics, stainless steel and copper welding; high vacuum devices; high energy physics, robotics; wet process	Special prehensile flanges handlers; custom high vacuum vessels; wet benches, alignment system
SET	Wafer marking, photolithography; probing, microconnection	Wafer marker, contact and proximity aligners; flip-chip aligner, bonder; latchup tester, spinners
Sitesa	Single wafer thermal and CVD process	RTP and CVD equipment
SNE La Calhene	Absolute barrier and laminar air flow technology	Laminated flow isolators, remote handling; operation and transfer systems
Sogelerg	Classical and advance clean room engineering	Clean room engineering
Somos	High technology surfacing	Polishing machines, high tech surfaces

Non JEMI Members

Company Name	Skill and Products
Alcatel CIT	Etching, stripping and sputtering systems, vacuum pumps; helium leak detectors, vacuum components, etching systems for III-V compounds
Fluidsysteme	Gas pressure regulators, valves and manifolds, pressure gauges, gas and liquid filters, particules in-line analyzer; electropolished tube single/dual, moisture analyzer, toxic gas monitors, toxic gas standard generator
Ion Beam Services	Ion implanting service
Le Carbone-Lorraine	SiC-coated graphite susceptors for epitaxy growth; pyro-coated PECVD carriers, LPE boats, jigs
Microsolve	Thermal processing equipment: furnaces, controllers, boat pullers, cantilevers; characterization equipment, graphite tooling, burn in board
Picogiga	GaAs & Heterostructure MBE Epiwafers
Sairem	Microwave power supplies at 2,450 MHz; radio frequency power supplies at 27.12 MHz, waveguide accessories
Servin Quartz	Quartz materials for semiconductor industry: diffusion tubes, white elephants, soft landing system, cantilever system, slotted boats
Smart Technologies	Loading station, LPCVD furnace

Footnotes

1. CNET: R&D center of the French telecom group specialised in telecommunication IC design and technology, advanced IC and equipment research.

2. LETI: R&D center of the CEA group sepcialised in microelectronics technologies, 16 and 64 MB advanced processes, manufacturing science.

FRG: JESSI Board Approves 20 New Projects

90MI0132 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 31 Jan 90 pp 5-6

[Excerpt] The JESSI [Joint European Submicron Silicon Initiative] board approved more than 20 new projects under the various subprograms at a meeting held on 23 January 1990. CMOS [complementary metal-oxide semiconductor] technology projects on application-specific processes and production engineering were accepted.

Nine new projects were launched immediately under the "Devices and Materials" subprogram, which is considered the key to an independent, effective European chip industry. The JESSI board is aware of the fact that despite the great number of projects in this field, no substantial improvement in the European companies' share of IC [integrated circuit] producers' production facilities may be expected in the short term. Several CAD [computer-aided design] projects were also adopted. They involve logical and electrical simulation, layout, and testing of circuits. Chip users in Europe thus have access to the best possible procedures for designing highly complex circuits.

The first Europrojects were confirmed; they focus on circuits of special strategic significance, including those for ISDN [integrated services digital network] and automobile electronics. With an eye to small and medium-sized companies, another project designed to assist these branches of industry in using chips by providing training and design support was launched.

A number of ambitious projects falling under the "Long-Term and Basic Research" subprogram received the JESSI stamp of approval. Foremost among these is a project that has a future 0.25 micrometer CMOS technology as its goal. Scientific institutes and industrial laboratories will cooperate closely on this project.

The JESSI board regards cooperation with SEMATECH (U.S. Semiconductor Manufacturing Technology) as playing an important role in guaranteeing top-level Western suppliers to the semiconductor industry on both sides of the Atlantic. The individuals and groups responsible for this reciprocal cooperation were expressly encouraged to accelerate the preliminary work on this project. In this connection, the board paid tribute to the role played by IBM, a leading member of SEMATECH, as the bridge between JESSI and SEMATECH. The JESSI board thus invites IBM Europe to contribute its experience and knowledge to selected JESSI projects.

At this point it should again be mentioned that the JESSI organization invites companies and institutes to submit project proposals for the "Applications" subprogram, which aims for a close strategic partnership between users and producers of semiconductors. Projects proposed should fall within one of the following fields:

- CAD projects (e.g., CAD tools and CAD libraries);
- Europrojects (e.g., system concepts and/or proposals concerning system integration). [passage omitted]

Belgian-Japanese Microlithography Joint Venture

90AN0196 Brussels EUROPE in English 23 Feb 90 p 17

[Text] The Belgian group UCB (Union Chimique Belge) and the Japanese firm JSR (Japan Synthetic Rubber Co Ltd, Tokyo) have concluded an agreement for the joint development of technology and know-how in the area of special chemical products for use in electronics. Under the terms of this agreement, JSR has acquired 50 percent

of the stock of UCB Electronics (of the UCB group), a supplier for European industry and the inventor of Plasmak, a product used in a new microlithography process currently being tested by manufacturers of integrated circuits. UCB Electronics' production units and applications labs in Belgium (Haasrode and Drogenbos) will be expanded, and collaboration with IMEC (Interuniversity Microelectronics Center, Leuven) will be pursued. The joint venture will also create subsidiaries during the first half of 1990. All of these developments represent an investment of 350 million Belgian francs for UCB in 1990 and 1991.

NUCLEAR ENGINEERING

Italy: Superconducting Cyclotron To Be Installed

90MI0148 Milan ITALIA OGGI in Italian
20 Feb 90 p 50

[Text] The National Institute for Nuclear Physics' (INFN) superconductive cyclotron will soon be installed in Catania. Funding, which dates back to the early 1980's, involved setting up the machine at one of the institute's laboratories (Frascati, Lenaro near Padua, Catania, or Gran Sasso). Catania was chosen in view of the need to develop southern Italy. The project was promoted by the prematurely deceased Professor Francesco Resmini, launched by Antonino Zichichi, and supported by Nicola Cabibbo. The total costs are estimated at between 15 and 20 billion lire. The INFN began funding the project in 1981, to encourage the development of advanced technology in Italy, a political decision made at a time when Italian industry was experiencing a downturn.

For example, Ansaldo had to change its activity following a decision to stop the construction of nuclear power plants in Italy. Consequently, together with Zanon, the company began manufacturing superconductor coils and cryostats, which laid the foundations for its participation in the development of superconductor magnets for the HERA [electron-proton collider ring] accelerator in Hamburg. When the cyclotron project was approved in 1981, the accelerator was scheduled to begin operating in 1987. Due to a mistake in estimates this will now occur in 1991. A comparison with similar cases in the United States shows that Italian schedules fall within the norm, and the fact that in 1984 there was no building in which to assemble the machine should also be taken into consideration. There are few similar accelerators in the world. This will be the first in Europe and the third or fourth in the world. It is called superconductive because it uses coils made of a superconductor niobium-titanium alloy in a copper matrix. These are then immersed in liquid helium at minus 269 degrees centigrade (superconductor alloys have no electrical resistance at low temperatures). The use of superconductor coils results in high magnetic fields (on the order of 5 telsa), and consequently produces a compact and less expensive accelerator (the external diameter of the magnet is 3.8 meters).

Heavy particles will be accelerated for research purposes. Completely new operations are involved: The acceleration of all the particles, from the lighter ions to uranium, meets a need that arose after research possibilities with machines from the previous generation began to diminish. If complex projectiles such as heavy ions are used, a new behavior of matter is observed when the nuclei of hundreds of nucleons are formed. Certain patterns of behavior cannot be studied when using light particles. According to Emilio Acerbi of the INFN, by the end of 1991 this machine will place Italy in line with nations such as France and the FRG, which have a longstanding nuclear tradition. Another very interesting prospect is experimentally proving the theory that calls for an area of stability for particles with an atomic number greater than 120. The stable elements go from hydrogen to uranium; beyond this, the average life of the elements becomes shorter and shorter—infinitesimal fractions of a second, that is, microseconds or nanoseconds. According to the theory, there should be an area of more stable elements corresponding to atomic number 120/125. The Soviets are working on this and have reached atomic number 109. They are still far from the critical number, but prospects for Italy still exist.

SCIENCE & TECHNOLOGY POLICY

Philips Participation in ESPRIT, BRITE/EURAM Outlined

90AN0232 Amsterdam COMPUTABLE in Dutch
16 Feb 90 p 11

[Text] Philips will take part in the fifth round of the European Strategic Program for Research and Development in Information Technologies (ESPRIT) with nine new microelectronic projects. These Philips projects will cost approximately 45 million guilders, half of which will come from EC subsidies.

The areas of research are complementary metal-oxide semiconductor (CMOS) technology and III-V integrated circuits (three projects), instrumentation and automation (five projects), and computer peripherals (one project). Philips is leading three of these: A technology program involving metal tracks deposition on semiconductor surfaces using specialized metal organic vapor phase epitaxy (MOVPE) equipment; a project for the development of precision instruments to measure critical dimensions on a chip; and a project in the field of integrated circuit wafer exposure equipment in the far ultraviolet range. The number of current ESPRIT projects in which Philips is participating is now 58.

In the Basic Research in Industrial Technologies for Europe/European Advanced Materials (BRITE/EURAM) program, which focuses on the introduction of advanced techniques and materials in existing industries, Philips is investing 57 man-years in seven new projects, six of which as the project leader. With an average duration of three years, the budget for the new Philips projects will amount to approximately 15 million

guilders, about half of which to be provided by the EC. The projects concern the deposition of surface layers using advanced technologies and research in the area of advanced industrial measurement methods in the nanometer range. The number of current BRITE/EURAM projects in which Philips is taking part has now reached 17.

EC Council Approves EFTA R&D Cooperation

90AN0192 Brussels EUROPE in English 14 Feb 90 p 10

[Article: "EEC-EFTA: Council Approves the Conclusion of Agreements on the Participation of EFTA Countries in the 'Science' Programme"]

[Text] The Community Council has adopted decisions on the conclusion of five cooperation agreements between the EEC and Austria, Finland, Norway, Sweden and Switzerland on a planned programme to stimulate international cooperation and exchanges necessary for European researchers (SCIENCE).

These agreements join the five countries mentioned above in the development of a stimulation plan, stipulating that for researchers and research and development organisations, the terms and conditions for the presentation and evaluation of research proposals, as well as the terms and the conditions for forwarding and signing contracts, are the same as those applicable to researchers and research and development organisations of the Community.

The financial contributions of the contractual partners are determined by a proportionate coefficient based on GNP. Thus, the contributions of the five countries involved to the total amount believed to be necessary for the realisation of the SCIENCE programme (ECU 167 million) is respectively: Austria: ECU 3,271,000; Finland: ECU 2,460,000; Norway: ECU 2,394,810; Sweden: ECU 4,514,100; Switzerland: ECU 4,600,200.

EC Vice President Assesses U.S. Visit

90AN0236 Brussels EUROPE in English 9 Mar 90 p 6

[Report: "EEC-United States: A Joint Task Force in the Area of Research and Development Will Become Operational Next Month"]

[Text] The proposal by Vice President Pandolfi to develop five priority areas for cooperation between the Community and the United States regarding R&D was warmly welcomed by the United States, in particular by Mr. Allan Bromley, President Bush's assistant for science and technology. A task force covering these areas is due to be set up before the EEC-United States ministerial meeting planned for 23 and 24 April. This task force will be at a high political level and will not be permanent. It will have the aim of encouraging work undertaken jointly (each side making precise elements of the whole, cross-financing not having given the expected results).

On his return from the United States, Vice President Pandolfi said that he found a far more cooperative attitude than he had expected (the letter received before his departure from Mrs. Carla Hills "set the tone"). Mr. Pandolfi had the feeling that the U.S. Administration wanted to reaffirm the ties between his country and the EEC. [as published] In particular, it appeared to him that the U.S. Administration had the desire to integrate research of both sides regarding semiconductors. Concerning HDTV (High-Definition Television), Mr. Pandolfi was satisfied to note that the United States was moving towards an intermediary technology (i.e. compatible with existing material) and thus towards the same line followed by the EC. Cooperation is thus possible, without questioning the existing competition between both sides.

In conclusion, the vice president felt that his visit was very positive and that it could be considered that it represented the end of hostilities between the EC and the United States in areas such as HDTV and telecommunications. Mr. Pandolfi felt that in Congress there were fewer simplistic ideas regarding a so-called "Fortress Europe."

EC Document Assesses Framework Program

90AN0238 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English No C56, 7 Mar 90 pp 34-47

[EC Document: "Opinion of the Economic and Social Committee on the Proposal for a Council Decision Concerning the Framework Programme of Community Activities in the Field of Research and Technological Development (1990 to 1994)"]

[Text] On 16 August 1989 the EC Council decided, in accordance with Article 130q (2) of the Treaty establishing the European Economic Community to ask the Economic and Social Committee for an Opinion on the above-mentioned proposal.

The Section for Energy, Nuclear Questions and Research, which was responsible for the preparatory work on the matter, adopted its opinion on 3 November 1989. (Rapporteur: Mr de Normann)

At its 271st plenary session (meeting of 15 November 1989), the Economic and Social Committee adopted unanimously the following opinion.

1. Summary and General Considerations

1.1. The Committee recommends that the Council adopt the Commission proposal for a Framework Programme of Community activities in the field of research and technological development (1990 to 1994) (COM(89) 397 final) for a sum of ECU 7,700 million deemed necessary over the five-year period, subject to a further interinstitutional agreement covering the years 1993 to 1994.

1.2. The Committee has taken into account the supporting papers tabled by the Commission both in advance of and subsequent to the issue of the third Framework Programme proposal.

1.3. The Committee supports the concept of a rolling programme of R&TD which will enable work to be concentrated in essential and effective areas, will enable the reduction or removal of nonessential or ineffective work and the introduction of new work as it becomes necessary.

1.4. It urges that the rolling programme approach should be adopted also for future framework programmes in order to provide essential continuity of work, and to reduce the time required to agree and implement the individual programmes.

1.5. The Committee considers that the existing system of finite framework programmes results in artificial breaks for financial reasons and in uncertainty about the funds available for the continuation of worthwhile projects.

1.6. It believes that there will be an opportunity to introduce certain strategic adjustments and new concepts into the rolling framework programme at an earlier stage and appreciates that the introduction of an overlap in the year 1990 to 1992 enables the funding to be increased from the beginning of that period.

1.7. It emphasizes that the successful implementation of a rolling programme must involve a strong managerial discipline which will necessitate stopping programmes as well as starting them.

1.8. The Committee regards the global sum of ECU 7,700 million proposed for 1900 to 1994 as a ceiling figure. It notes Article 1 (3) of the proposal which states that the budgetary authority shall determine the availabe funds for each year. It notes that the amounts deemed necessary for the implementation of each specific programme shall be the subject of two Council decisions covering the periods 1990 to 1992 and 1993 to 1994 respectively.

1.9. The Committee feels nevertheless that the proposal to commit a Community budget of ECU 10,825 million in total, together with further funds supplied by contractors for shared cost and concerted action programmes, is submitted in an atmosphere of technological isolation from the overall policies for the Community.

1.9.1. The Committee would like to see the R&TD policy and the strategy to achieve it made an integral part of Community policies including the improvement of the quality of life, the achievement of cohesion and the principle of subsidiarity.

1.9.2. The Committee believes that the Council should ask the Commission to set up a small strategic body to be appointed by the Council to overlook the R&TD policy and strategy in the light of overall Community policies and strategy over a 10 to 15 year horizon. This strategic body should be chaired by an eminent figure independent of the Commission.

1.10. The Committee emphasizes the need for full and effective mid-term reviews called for by the second and the proposed third Framework Programmes. It believes these must form a basis for the activities described in Annex II of the proposal.

1.11. The Committee also draws the attention of the Council to a number of requirements for which it will be looking when individual programme proposals are referred to it under Article 130q (2) of the Single European Act.

1.11.1. Some of these requirements will need action by the Commission in advance, notably a policy for third countries, an assessment of the optimum relationship with EUREKA, a reconsideration of the treatment of intellectual property, a formal mechanism for utilization of results and a new approach to technical communication at a general level.

2. Mid-Term Reviews

2.1. Article 4 of the Council Decision of 28 September 1981 calls for a mid-term review of the second Framework Programme on the basis of which the Commission shall make proposals for revision.

This review gave rise to three main documents:

- The first report on the State of Science and Technology in Europe (COM(88) 647 final of 29 November 1988),
- The report of the Framework Programme Review Board (forwarded to the Commission in June 1989),
- A Communication from the Commission entitled *A Framework for Community R&TD Actions in the 90s* (SEC(89) 675 final of 13 June 1989), in the light of which the Commission felt that strategic adjustments were necessary, which would require more than a simple revision of the current Framework Programme which would be limited to the two years 1990 and 1991.

2.2. The Committee agrees with the Review Board that the Commission has achieved real progress in the attainment of the 1987 to 1991 Framework Programme declared objectives and that management and administration have responded well.

2.3. The Commission has replied to the report of the Review Board and has incorporated a proportion of its recommendations into its current proposal.

2.4. Nevertheless the Committee considers that the Council should ask the Commission to provide a full and in-depth mid-term evaluation to include an analysis of value for money spent, programme by programme, an

estimate of likely achievements from promising programmes and a post-mortem on programmes stopped for lack of promise.

2.5. The Committee would like to see the resulting information used by the Commission to produce a simple account of the R&TD activities which would be comprehensible to citizens of the Community (see section 19).

2.6. The Committee emphasizes the value of the mid-term evaluation and the discipline demanded to prepare for it and emphasizes the value of Article 5 of the current proposal which calls for review in 1992.

3. The Relevance of the Commission R&TD Framework Programme to the Community Policies Strategy and Objectives

3.1. The Committee considers the third Framework Programme proposal is technologically isolated. For instance, it fails to set the R&TD proposals in the context of the various needs for the improvement of the quality of life and to propose global projects aimed at effective solutions which will require political will of the Community to implement them.

3.2. The Committee believes that the Community should now begin to plan to move towards the creation of a single science and technology space. The present mosaic of Member States acts against achieving an optimum output from R&TD expenditure in comparison with USA and Japan. The lack of a single agreed plan made in the full knowledge of national and regional policies acts against the Community interest to a greater extent than discrepancies in funding.

3.3. The Committee considers that the current and proposed Framework Programme rely to a large extent on "bottom-up" proposals. It would like to see in addition a complementary "top-down" approach which begins with the definition of a Community R&TD policy and strategy based on agreed criteria, identifying the work that should be done at Community level in the light of Member State existing and projected programmes, fixing urgencies and priorities and finally estimating the funding necessary.

3.4. Certain areas of R&TD which affect the quality of life such as environmental problems in meteorology, climatology and oceanic science are best tackled on a global scale.

3.5. The proposal appears to lack a global project for an effective mechanism for diffusion of the technology which is already available as well as that which will be generated by the current and proposed programmes.

3.6. In the Treaty establishing the European Economic Community, Article 2 states:

"The Community shall have as its task, by establishing a common market and progressively approximating the economic policies of Member States, to promote throughout the Community a harmonious development of economic activities, a continuous and balanced expansion, an increase in stability, an accelerated raising of the standard of living and closer relations between the States belonging to it."

3.7. The Committee considers that these five objectives all form part of a single overall objective, to improve the quality of life of all citizens in the Community. Within this single overall objective, the Section defines a whole series of secondary objectives, some of which will be conflicting and which will need to be balanced to meet the overall objective.

3.8. In its communication entitled *A Framework for Community R&TD Actions in the 90s* the Commission identifies two objectives designated as the "challenges of 1992."

3.9. The first objective is defined by Article 130f as the Community aims to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at international level.

3.10. In so far as the achievement of this objective will secure employment, raise the standard of living and strengthen the economic base of the Community, it contributes actively to the material well-being and hence quality of life of all citizens. The Committee considers this to be an objective to achieve and active improvement resulting from the creation of wealth.

3.11. The second objective is to improve the quality of life by means of the achievement of a cleaner and safer environment, better health-care education and training, more efficient and safer production and transport systems, more wholesome food products.

3.12. These two objectives will conflict at certain times in certain areas. The first objective will be carried out in the private sector to a considerable extent. The second objective in that it is an overall wealth consumer will be largely carried out either in the public sector or by the private sector within a national or regional regulatory mechanism. Improvements in the quality of life will inevitably involve the achievement of a balance of objectives which will not always be compatible.

3.13. The Committee considers that the Commission has not given an explicit commitment to the quality of life as an overall objective permeating the third framework programme proposal despite the emphasis given to it in its communication entitled *A Framework for Community R&TD in the 90s* and the frequent opinions of the Economic and Social Committee.

3.14. It urges the Commission to propose a direct active orientation of R&TD towards the enhancement of the quality of life with the complementary objective of creating new market products.

3.15. The Committee supports the views expressed by the Framework Programme Review Board, whose report states that "the Framework Programme should ideally

be based on a series of well-defined long-term strategic objectives that European research ought to pursue. This in turn implies an agreed overall European strategy, with a set of socioeconomic, political, scientific and broader cultural objectives."

3.16. The Committee suggests that each and every proposal for expenditure on research and technological development covered by the Framework Programme should include a quality of life impact assessment. The Commission would be required to use proper consultative procedures to complete the questions posed.

4. The Need for Social Research

4.1. The Committee emphasizes that it is already accepted that human social factors are critical in research, innovation and coping with competitive challenges. It believes that it is clear too that policy decisions at a variety of stages determine whether the state of technology in use has a malign or benign impact on the quality of life. Similarly human interaction and policy decisions to an extent derive from social and cultural factors which are insufficiently understood and inadequately researched.

4.2. Economic well-being involves a high level of competitiveness for Community industry, the satisfaction of new needs with new products and a minimum social consequence in terms of unemployment, destruction of the environment and upset of the cohesion between Member States.

4.3. The Committee believes that a revised Framework Programme should reflect a balanced view of all these factors, notably technical feasibility, economic desirability and social acceptability. The balance will not be the same in each Member State. A Framework Programme should take this into account and must include social cohesion within the Community as an important objective.

4.4. These requirements emphasize that the social research aspects of the programme will need to be strengthened.

4.5. The Committee considers that social research will need to take its place alongside the areas of:

- Science and engineering,
- medical and health research,
- agricultural research,
- environmental research,
- research on the working environment and the health of workers,

as a research field and as a major factor in promoting the effectiveness of all research.

4.6. Social research is not a last stage examination of scientific advance. It must be involved at an early stage when priorities for programmes are being evolved.

5. The Key Principles of Subsidiarity and Cohesion

5.1. The Committee believes that a Community policy and the strategy to achieve it rest upon certain key principles which include subsidiarity and cohesion.

5.2. The Committee supports the principle of cohesion to Community policy and strategy.

5.3. Member States have differing technological requirements, differing technological resources available to meet them and differing levels of science and technology. The technological imbalance between one Member State and another is growing.

5.4. R&TD can contribute significantly to the correction of this imbalance:

- By encouraging access in all Member States to a first class level .MDFL/.MDNM/of R&TD. There must be no second class research. There must be quality criteria for R&TD;
- By deliberate efforts to achieve a Researchers' Europe in which there is an optimal climate for human and scientific potential development based on mobility, laboratory linkage interchange and on training;
- By encouraging technological transfer of results;
- By programmes designed to tackle the problems of less favoured regions and areas of industrial decline.

5.5. The Committee also emphasizes the direct and effective contribution made to economic and social cohesion by the training activities provided for in some specific research programmes. These activities play a key role in enabling Member States less well-equipped in terms of research infrastructures and scientific personnel to participate more fully in the research programmes and therefore make a significant contribution to narrowing development gaps between Member States.

5.6. The Committee realizes that a number of centres of excellence exist in Member States and there could be a tendency to encourage them to take a major share of work on an ever increasing basis. This would result in the most competent researchers being increasingly drawn to them and their facilities growing in proportion.

5.7. The Committee would encourage the Commission to try to redress the balance by the deliberate creation of new centres of excellence spread throughout all the Member States. This could involve a specific programme to identify embryonic centres which would be encouraged to grow.

5.8. The Committee suggests that the Council ask the Commission to propose a programme with this objective.

5.9. The principle of subsidiarity demands that the Community Institutions should not arrogate to themselves functions which can be performed efficiently at national, regional or local level.

5.10. The Committee regards this as a fundamental principle which should apply throughout the Community and not least to R&TD activities. The Community therefore should leave to lower levels the operations which these can effectively perform, and which otherwise would greatly distract it. The Community will thus be able to carry out with greater freedom, power and success the tasks appropriate to it alone because it can effectively accomplish these, according to its needs and those of the Member States.

5.11. The Committee believes it is necessary for the Commission to define clearly what it means by the principle of subsidiarity and to formulate a set of criteria against which programme proposals will be assessed.

6. Financial Considerations

6.1. The second Framework Programme for R&TD has two years (1990 and 1991) to run. It commits ECU 3,125 million for the period 1990 to 1992.

6.2. The Committee supports the Commission proposals that this programme should be completed in accord with its commitments, subject to the usual programme assessment and evaluation.

6.3. The third Framework Programme for R&TD proposes a further commitment of a ceiling of ECU 2,700 million for the same period subject to approval of the programmes submitted.

6.4. The two Framework Programmes will commit funds concurrently for the three years 1990 to 1992.

6.5. The Committee supports this increase from ECU 3,125 million to a ceiling of ECU 5,825 million on the basis that the actual increases approved will be based on sound programme proposals backed by effective assessment and evaluations.

6.6. The Committee urges the Commission to fix criteria for value for effort in terms of manpower and finance and only to spend on programmes which satisfy these criteria.

6.7. It believes that funds should be requested to satisfy sound and necessary R&TD proposals rather than that proposals should be formulated to meet the funding available.

6.8. The Committee endorses the principle that actual expenditure should be related to the importance and quality of the detailed proposals for activities which will be submitted to Council for final decision at the level of specific programmes covering the periods 1990 to 1992 and 1993 to 1994 (Article 2.3 of the Commission proposal).

6.9. The Committee notes that this ceiling of ECU 5,825 million commitment for 1990 to 1992 is in accord with the interinstitutional agreement for that period [1].

6.10. The third Framework Programme proposes a commitment of ECU 2,400 million for 1993 and ECU 2,600 million for 1994 subject to Council decisions for each specific programme.

6.11. The Committee notes these figures which show an increase over the preceeding years and regards them as indicative and subject to a further interinstitutional agreement.

6.12. The proposed ECU 7,700 million refers to Community financial means. However a considerable proportion of the programmes will be shared cost with a Commission commitment of less than 100 percent or concerted action in which the Commission commitment is marginal.

6.13. The Committee suggests that the Commission estimates the total amount which will be committed under the Framework Programme proposal, year by year from 1990 to 1994 and expresses it as:

- A percentage of total Community budget;
- A percentage estimated of the total R&TD funding of the Member States.

6.14. The Committee believes that it would be beneficial to secure an indicative R&TD ceiling expenditure by the Commission for the years ahead to 2000 and hopes that the next interinstitutional agreement will provide it.

7. The Proposed Activities

7.1. The second Framework Programme is implemented through 37 specific programmes with their corresponding budget allocations. These constitute a financial straight jacket on flexibility and the ability of the Commission to repond to the results of programme assessment by increasing or reducing resources or even stopping unpromising programmes.

7.2. The third programme reduces the number of specific programmes to six very wide areas of activi.MDFL/ .MDNM/ties subdivided into 29 subgroups.

7.3. The Committee assumes that each of the six activities will form the basis of an individual proposal to Council for the years 1990 to 1992 and again for 1993 to 1994.

7.4. The Committee foresees difficulties in the overlap years of 1990 to 1992 between the rigid second Framework Programme and the more widely defined third programme.

7.5. The Committee recommends that the Council ask the Commission to seek a compromise based not so much on modifying the extent of each area of activity but more on a more flexible funding approach. The Committee has drawn attention to this need in past opinions.

7.6. The Committee draws the attention of the Council to the considerable problems of management and of the organization of the advisory committees which the Commission will experience in effecting a smooth transition

from the second to the third Framework Programme. It welcomes the suggestion that the Commission will consider the use of outside management consultants.

7.7 It urges that the Commission use this opportunity to forge closer links with the Member States with the objective of moving closer to a single science and technology space.

7.8. The Committee also welcomes the opportunity to introduce certain strategic adjustments and new concepts into the rolling Framework Programme at an earlier stage and appreciates that the introduction of an overlap in the year 1990 to 1991 enables the funding to be increased from the beginning of that period.

7.9. The Framework Programme proposes six areas of activity:

	Million ECU	Percentage
Information and communication technologies	3,000	39
Industrial and materials technologies	1,200	15.6
Environment	700	9
Life science and technologies	1,000	13
Energy	1,000	14.4
Human capital and mobility	700	9
Total	7,700	100

7.10. The Committee does not consider that sufficient data has been provided in the Commission proposal and its supplementary working paper to enable it to comment in detail on the work proposed under each activity, the funding deemed necessary for that work or the balance of funding proposed for the six activities. It reserves its opinion on the work content of each activity until the Commission makes proposals made under Article 2 (3) of the new framework programme proposal.

7.11. The Committee considers however that the Commission could offer some degree of clarification by showing for each area of activity, subgroup by subgroup, and year by year; the sums committed under the second Framework Programme together with the sums deemed necessary under the third Framework Programme. It considers furthermore that it would be helpful to add the further funds committed or expected to be committed by shared-cost contractors.

7.12. The Committee believes that an evaluation of funds expended to date in each activity group and subgroup together with a forecast of the likely utilization of the results expected and their cost-benefit would assist in an objective assessment of the proposal.

7.13. Information and Communication Technologies

7.13.1. The Committee feels that the area to be covered is all-embracing and it does not have sufficient information to judge whether the Commission is proposing to cover ground that has already been covered elsewhere (USA, Japan), the so-called "catch-up" R&TD or whether the successful outcome of the proposals would result in European leadership.

7.13.2. However it is concerned that the other areas of work under the third Framework Programme appear almost to be the structuring of a whole new generation of the industry. The Committee therefore would like to see the utilization plan for this work together with associated programmes outside the third Framework Programme and making greater use of EUREKA programmes such as JESSI (Joint Submicron Silicon Initiative).

7.13.3. The Committee emphasizes the need for the organization of an effective and rapid standardization procedure in this field and it urges that full use be made of JRC (Joint Research Center) resources and of the European standards organizations.

7.14. Industrial and Material Technologies

7.14.1. The Committee supports the objectives of the proposed activity in industrial and material technologies to rejuvenate European manufacturing industry and to increase its competitiveness. It queries nevertheless the balance between the activity on information technologies and the other advanced technologies which form now or will form in the future the basis of many traditional manufacturing industries and of agriculture. The Committee looks to a reevaluation of the BRITE/EURAM (Basic Research in Industrial Technologies for Europe/European Research on Advanced Materials), FLAIR (Food-Linked Agro-Industrial Research), and BRIDGE (Biotechnology Research for Innovation, Development, and Growth in Europe) programmes.

7.14.2. The Committee points out the importance of new areas of material technology such as superconductivity and advanced materials which can arise rapidly and especially at technology interfaces. It expects the Commission to build a degree of flexibility into the programmes in order to be in a position to respond rapidly to indications thrown up by basic research.

7.14.3. The Committee cites the examples of the "clean car" in the Commission proposal by which it assumes that the Commission is referring to the numerous technologies which need to be developed and integrated in order that the automobile industry of the Community should remain in a competitive position.

7.14.4. The Committee notes that approach to industrial competitiveness now undertaken in Japan whereby a continuing series of microincremental advances lead to a steady development of better quality products at lower prices. The strategies of this nature should be analysed and where promising utilized.

7.15. Environment

7.15.1. The Commission proposes the expenditure of 9 percent of resource on environmental work. At face, this might appear to be less than adequate but the Section notes that a proportion of the research work under the

"Energy" heading will be concerned with "clean" technologies as will some of the industrial and material technologies.

7.15.2. The Committee exphasizes the need for the Commission to attempt an overall strategy for the Community to take account of all the existing work in the Member States. This will only come about by cooperation and coordination and will involve a reappraisal of the existing structure of advisory committees.

7.16. Life Sciences and Technologies

7.16.1. In this activity the Committee draws attention to its comments on quality of life as an overall objective. It urges the Commission to take specific note of the needs of the handicapped, the sick and the elderly as well as the requirements for basic biotechnology, agricultural and agro-industrial research, biomedical and health research in both the industrial and public domains.

7.16.2. The Committee also draws the attention of the Commission to the need for a clear policy to balance research into the pathogenesis of disease with health research to improve the standards of health in the Community and the economic consequences of actions taken.

7.16.3. The Committee supports the inclusion in the proposal of work on the life sciences and technologies for developing countries.

7.16.4. The Committee emphasizes the extreme importance of information and communication in this activity and urges that the units of the Commission such as CUBE (Concertation Unit for Biotechnology in Europe) are adequately funded to achieve their objectives.

7.16.5. The Committee draws attention to the ethical nature of some programme decisions in this activity and refers to the opinion which it expressed on this subject.

7.17. Energy

7.17.1. The Committee notes the amplification of the proposal for the activity on energy provided in the working paper but it feels that a breakdown of work into the categories of energy generation (subdivided into fossil fuels, renewable sources of energy and nuclear energy), novel processes (hydrogen and other liquid fuels, fuel cells, photovoltaics) is necessary.

7.17.2. The breakdown should also identify the work committed and proposed on the various aspects of safety and the work which is environment related (zero emission power).

7.17.3. The Committee urges the Council to ensure that the Commission work on safety is extended to all types of nuclear power plants. It believes that the Commission has a special duty to ensure international awareness and understanding of methods used to assure and verify the safety of numerous plants, and has a special task to focus all aspects of technological advance to bear on nuclear safety. To do this the Commission must take a prominent position in all discussions at European and international level.

7.17.4. The Committee does not question the organizational relationship between the DGs concerned with research, development, demonstration and policy in the energy field but it would like to see proposals laid out in their entirety rather than put forward separately by Directorates-General. In particular this would ensure continuity between R&TD and the demonstration phase.

7.17.5 The Committee believes that the Framework Programme does not give sufficient emphasis to the work directed towards energy problems of the less developed nations.

7.17.6. The Committee would also like to be assured of a close link to the Thermie programme (ECU 700 million) for 1990 to 1994 which the Committee supports. To this extent a more detailed breakdown of Thermie into hydrocarbons, coal, renewable energy and energy efficiency would help an overall review of Commission proposals.

7.18. Human Capital and Mobility

7.18.1. The Commission states there is a major increase in both absolute and relative terms in the funds allocated to the management of intellectual resources (compared to the second Framework Programme), to include a major programme of mobility and research training of young researchers at post-doctoral level.

7.18.2. The Committee has emphasized the importance of the criterion of a single S&T space in the Community on a number of occasions and in particular in two information reports on *The importance of R&TD to SME's* (small and medium-sized enterprises) and *Training and employment of research workers in the European Community.*

7.18.3. The Committee feels that there is no cause for complacency. The factors which give rise to movement include the state of science in the Community and elsewhere and their relative qualities of life for researchers. The Commission forecasts a shortage of young researchers due to appear in the 1990s.

7.18.4. The Committee will consider the individual proposals when they are made but it recognizes some problems which will need to be addressed when the specific programme is submitted to Council for approval.

- Centres of excellence are currently concentrated among the northern Member States and are at an earlier stage of growth among many of the Mediterranean States. An immediate exercise would therefore concentrate researchers at these northern institutions to the detriment of some Member States;
- Certain Member States and notably the UK may fare badly from a potential drain of researchers to the USA if researchers move in from Community Member States,
- There appears to be an element of over emphasis of direct Community involvement and funding. If the principle of subsidiarity is followed, the Community needs to seek to influence and catalyse the scientific community in the Member States, but to restrict itself to the minimum central action.

7.18.5. The Committee believes that the action the Commission does decide to carry out should be considered for organization on a concerted action basis or at the most on a shared-cost basis.

8. Scientific Services and the Management of Commission Resources

8.1. The Committee considers that a seventh activity should be included in the new framework programme under the heading "Scientific services and the management of Commission resources".

8.2. This would encompass the following essential tasks:

- The formulation of a Community R&TD policy strategy and plan in cooperation with the 12 Member States, maintaining and amending it continually in the light of available information;
- The coordination of objectives in strategic areas throughout the Community;
- The operation of forecasting and monitoring activity at present carried out under Monitor on a programme basis;
- The operation of a social unit and to coordinate the preparation of social impact analysis and to be responsible for promoting necessary work in the social sciences (see paragraph above),
- An evaluation unit to operate on a continuous basis the evaluation activities,
- The assessment and evaluation of the R&TD strategies of other trading blocs and nations.

8.3. This overall activity should be created to stand separately from the other six activities and its costs should not be allocated to those activities although they would fall within the global proposal. This seventh activity would be horizontal and this would be the only location in which the overall R&TD activity of the Community and the 12 Member States would be considered as a single entity.

9. The Principles Which Should Underlie Commission R&TD Proposals

9.1. The Committee feels that the Commission should identify and clearly state the principles which are to be applied in selecting proposals for R&TD work.

9.2. In the course of a number of its opinions on R&TD proposals the Committee has identified the following 15 principles:

9.3. Subsidiarity with regard not only to the distinction between Community and Member State working level but also to the location of work between Member States according to their particular strengths.

9.4. The Commission should perform the functions of information, analysis, forecasting, catalysis and stimulation and only as a last resort, expenditure on programmes to achieve the objectives which are agreed with Member States.

9.5. The Commission must promote to off-set the effect of political division into Member States with differing economic levels and hence with different R&TD structures. To this effect the Commission should encourage new centres of skill in Member States which will assist in training and regional collaboration.

9.6. The Commission should find a way to integrate a "top-down" approach arising from the results of a concerted Member State/Commission analysis and strategy with a "bottom-up" approach arising from the work of the advisory committees. Proposals should be formulated in full knowledge of the extent of Member State activity.

9.7. The Commission must organize and implement a consultation process with industry for workers and consumers in addition to the scientific community.

9.8. The Commission must encourage the formation of a three-dimensional S&T space in the Community in which links are created between Member States (and their regional activities) between R&TD levels (industry, higher educational establishments, research institutes) and between scientists.

9.9. The Commission must find a way to maintain the flexibility of funding in response to programme assessment while assuring reasonable security of their contractors in shared-cost and concerted-action programmes. It is essential that successful programmes can be reinforced and less-promising ones reduced or terminated.

9.10. There must be selectivity and concentration in order to arrive at a limited number of programmes which are of adequate size, allocated to the most effective centres of skill in the Member States, have clearly stated objectives which can be subsequently evaluated for their achievement and which are cost-effective. Selectivity must be based on priority and importance in consultation with and after consideration of Member States' R&TD programmes.

9.11. The Commission should use its funds as leverage to enhance the effects of Member States' expenditure.

9.12. Work should be returned by the Commission to national, regional or interregional ownerships as soon as practicable and cost-effective.

9.13. All programmes should be subject to evaluation. This evaluation should be tailored to individual programmes. Too much scientific resource should not be tied up in peer group evaluation and that a simple and effective set of evaluation principles needs to be produced by the Commission.

9.14. No programme should be approved without a utilization plan for successful results.

9.15. When appropriate, programmes proposed should be accompanied by a quality-of-life impact assessment.

9.16. Programmes should be based on a new approach to precompetitiveness and the further development of successful results considered in the light of EUREKA projects and other options.

9.17. A satisfactory solution to problems raised by intellectual property in the specific proposals should be offered.

9.18. The Committee stresses the importance of consultation with the social partners, industry and workers at every stage of the R&TD programmes.

10. The Definition of Precompetitive Work

10.1. The Committee notes an apparent variation in the interpretation of the "precompetitive requirement" between the activities decribed. It assumes that this arises from a change in the application of the 50/50 principle on which shared-cost contracts are based; as a result of this change, Commission funding is reduced as the project approaches the competitive market place (regressive funding). This "regressive funding" principle would apply only if the results of a project were used commercially for profit.

10.1.1. The Committee urges the Council to demand from the Commission a clear statement of this modified approach to precompetitive conditions which takes into account the need for the Community to remain competitive with other blocs such as the USA and the Pacific rim nations.

10.2. The Committee emphasizes the important role which the EUREKA approach could provide and urges the Commission to consider its potential of closer cooperation.

10.3. The Committee urges the Council to consider in advance the areas to which R&TD is directed in terms of financial support, taxation, external duties, standards and regulations by the Community and its Member States. Preparatory work will be needed to ease the path to the market of innovative products and technologies. If this work is not done at the right time much of the benefit of successful R&TD may be wasted or overtaken by competitors.

11. Utilization of R&TD Results

11.1. The Committee considers that the Commission has always given insufficient attention to the diffusion of technology and that it is necessary to review and strengthen its efforts.

11.2. The Committee endorses the preamble to the proposal which states that dissemination and enhancement of the results of R&TD activities are essential elements in the process of innovation, in particular for SMEs and hence a global initiative should be undertaken which will apply to all activities in the field of R&TD.

11.3. The Committee notes Article 4 of the proposal which states that the financing of activities related to the utilization of the results of specific programmes shall be brought about by bringing together sums allocated to these activities according to a percentage to be determined for each specific programme.

11.4. The Committee does not consider that Article 4 provides for an adequate utilization mechanism. It believes that the Commission should be asked to review the requirements and to come forward with the "global initiative".

11.5. No R&TD programme should be put into effect without a coherent and credible utilization programme to take effect in the event of results which meet the programme objectives.

11.6. Such a utilization programme should estimate time and cost of each of the clearly defined steps which would take the results into the market place or into public use.

11.7. An estimate of the optimum approach to the protection of the intellectual property including cost and time scale should be provided.

11.8. Each R&TD programme should be accompanied by a quality-of-life impact assessment. In particular any ethical considerations should be clearly delineated.

11.9. The programme should be accompanied by an analysis of the importance of successful results to SMEs and how the optimum benefit to SMEs would be secured.

11.10. The Committee does not wish to comment on the organization within the Commission best suited to achieve these objectives. It wishes however to suggest that utilization usually succeeds best when there is a continuous line from research to practical use. Wherever possible a handover from one DG to another or from one programme to another or indeed from one funding provision to another should be avoided.

12. EUREKA

12.1. The Committee endorses the support for and involvement in the activities of EUREKA by the Commission. These activities form part of the downstream element of the Community's R&TD strategy. The Commission proposes to reinforce its relationship with EUREKA as an instrument of minimum limitations for downstream development in areas which are close to the competitive border.

12.2. The Committee notes that Article 130m of the Single European Act permits the Commission to participate in the R&TD activities undertaken by several Member States, including participation in the structures created for the execution of these programmes. It encourages the Commission to participate accordingly in relevant EUREKA projects such as the JESSI programme on microelectronics and the high-definition television programme.

12.3. The Committee suggests that the Commission should issue a review of its relationship with EUREKA and the opportunities which it provides in utilization proposals. It envisages a more frequent consideration of EUREKA in the utilization plan which should accompany programme proposals.

13. International Policy

13.1. The Committee identifies the need for a clear statement on R&TD international policy and the future role of third countries by the Commission. The existence of a policy is of importance to industry and affects not only its competitiveness but its overseas investment activity and the siting and strategy of its R&TD.

13.2. The Committee supports a policy in which Community programmes are opened to EFTA States when clear mutual advantage can be established in anticipation of the European economic space of 18 nations arising from work on the harmonization of standards by the European standards organizations.

13.3. The Commission should consider bilateral cooperative agreements in R&TD with certain countries in the Eastern Bloc with a view to involving these countries when the time is ripe in COST (Cooperation in Scientific and Technical Research) projects.

13.4. The Committee supports the Commission in its approach to the problems of the lesser developed countries.

13.5. Consideration should be given to the position of the Community's major competitors, the USA and Japan, in the R&TD strategy especially with regard to the eligibility of their Community operations for funding and the utilization of intellectual property resulting from Community funding.

13.6. The Committee supports the Commission efforts to achieve transparency in its work but warns that, at the same time, some security of forward thinking and of evaluation of results needs to be considered.

14. The Role of the Joint Research Centre (JRC)

14.1. The Committee welcomes the Commission proposal to use the JRC to provide an impartial and independent expert opinion for the benefit of all Community policies and to act as a technical conscience for the Commission throughout its activities. It should provide technical data which will be required by all the relevant Directorates-General of the Commission as a basis for their regulatory activities and in the derivation of policy. This will assist the Commission and the governments of Member States to balance the requirements for the protection of the health and safety of citizens (and of animals) and the preservation of the environment with the demands for deregulation and minimum bureaucratic control.

14.2. The Committee notes that it is not the intention of the Commission to propose a major programme of exploratory (basic or fundamental) research for the JRC under the new Framework Programme. This decision accords with the principle of subsidiarity under which such work is preferably done by the higher educational centres of the Member States.

14.3. The Committee is aware of the proposal for work by the JRC for private or public external third parties put forward as an interim solution to current problems. However the Commission believes that as other responsibilities develop the proportion of work in this area should be progressively reduced. The Committee does not regard such activity as right and proper for a Commission laboratory once the necessary redistribution and reorganization of staffing has been achieved.

14.4. The Committee believes that instead the JRC should concentrate its work in a limited number of areas which are best covered at Community level.

14.5. It should work on nuclear safety on a continuous basis to provide a clearing house and forum wherein Member States which have retained their nuclear option can meet those which have abandoned it and provide information about nuclear protection, radioactive waste and other matters affecting the health and safety of all citizens.

14.6. It should provide a similar forum and clearing house for industrial safety covering major industrial incidents such as run-away reactions, explosions, leaks to atmosphere and so on. Such information will provide Member States with an independent and scientific basis for regulatory action based on scientific knowledge which will be welcomed by industry and workers and which will reassure citizens.

14.7. It should provide technical support in the form of common testing and measuring methods and their interpretation for the European Environmental Agency and

should be considered as the pivot of a Community regional contribution to a world-wide programme of global change.

14.8. It should act as a focal point in a series of laboratory networks covering a whole range of prenormative activity, environmental protection, health, nuclear and industrial safety, food purity, pharmaceutical testing and the testing background to the essential requirements of the new approach Directives. The Committee supports the JRC initiative in this respect in the area of structural mechanisms and believes this should be extended to other areas of building research, especially structural stability, fire testing, and thermal and acoustic insulation.

14.9. The Committee recommends that the JRC should be allowed to initiate and participate in shared-cost and concerted-action programmes appropriate to its experience and resources.

14.10. The Committee recommends that careful attention be given to the allocation of the costs of the JRC within the Framework Programme in recognition of the horizontal dimension of its work and in order to reduce any inhibitory effect on the allocation to it of tasks which it is best equipped to perform.

15. The Prenormative Dimension

15.1. The Committee endorses the incorporation of a prenormative dimension in the Community R&TD activities in order to guarantee the scientific and technical basis necessary to establish adequate norms and standards and hence to facilitate the completion of the single market and provide a response to the Community's responsibilities in the fields of environment, health and safety. In the Committee's view this will help to meet the overall objective of the improvement of the quality of life.

15.2. There is a need for a common set of regulations for the Community, based on scientific knowledge. This must be preferable to a series of individual Member State regulations not always based on the latest scientific knowledge.

15.3. For industry it makes sense to have a single Community set of requirements for the safety and testing of medical, health and food products, for the protection of consumers and the public. Industry will be able to bring new products to the market place more surely, more cheaply and more quickly. This becomes increasingly relevant as the cost of R&TD for new products rises and the time required for testing eats into the period of protection of the market provided by the patent legislation.

15.4. A single set of Community requirements established by the Commission would be regarded as independent and unbiased.

15.5 The Commission R&TD effort also has a role to play in the establishment of standards for the single market. It is clear that there is no possibility that the thousands of national standards will be harmonized into European standards by 1993. Reliance will have to continue for many years on the mutual recognition of certification and testing procedures and methods incorporating in sensitive areas the essential requirements for health and safety provided by the new approach Directives.

15.6. In the environmental field, the Commission can take a major step towards a world approach to environmental problems by coordination of the Community approach. To make effective regulations to protect the environment an advanced scientific base involving R&TD is essential. Greater understanding of natural phenomena of the land, the oceans and the biosphere is vital. Member States should pool their resources in a Community effort within the Framework Programme.

15.7. Nuclear safety is another area in which work should be done centrally within the Community.

15.8. In certain areas the coordination of work will need to be extended beyond the Community and will extend to cooperation with other blocs in Europe, America and the Pacific. This applies especially to nuclear safety and environmental knowledge.

15.9. Standards are ineffective unless there is a method of verification for their requirements. It is fundamental that whether there are harmonized European standards or not, there must be mutually accepted methods of testing resulting in certification.

15.10. The facilities of the Commission in collaboration with those of Member States can make a rapid and effective contribution to this by undertaking a review of Member State methods of test, establishing reference samples and correlating the Member States tests against the common reference.

16. Intellectual Property

16.1. The Committee asks that the Commission back the Framework Programme proposal with a fresh look at the effects of intellectual property provisions on the effectiveness of R&TD.

16.2. Two Areas Require Urgent Consideration:

16.2.1. In the utilization of the results of R&TD, the requirement to grant only non-exclusive licenses is unrealistic and inhibitory.

16.2.2. The need for the harmonization of test methods and acceptance criteria throughout the Community to reduce the time and cost required for the market development of new products.

17. European Cooperation Activities

17.1. The Committee believes that the European cooperation activities such as the European Space Agency and CERN (European Center for Nuclear Research) have an important role to play in the Community R&TD strategy.

17.2. The Commission should take an overall view of the requirements of the Community in specific areas covered by these organizations, and should plan an overall strategy for the Community, taking into account the activities of the individual Member States.

17.3. Article 130m of the Treaty provides for this and the Committee considers that the Commission should make full use of it.

18. Small and Medium-Sized Enterprises

18.1. The Committee notes that other than in the preamble to the proposal, the importance of the involvement in R&TD by SMEs and the dissemination of information to them is not emphasized.

18.2. The Committee draws the attention of the Commission to its information report on the importance of R&TD to SMEs and urges the Commission to prepare a communication covering this field of interest to inform those involved of the latest Commission thinking and to stimulate discussion.

18.3. In particular the Committee draws the attention of the Commission (as it has done in the past) to the small business innovation research programme (SBIR) of the USA as an approach to government-funded R&D in the belief that a close study of this US initiative by the Commission could lead to a proposal for a comparable network of such operations in the Community.

18.4. The Strategic Programme for Innovation and Technology Transfer (SPRINT) has been approved with an expenditure of ECU 90 million over the period 1989 to 1993 (in comparison with an expenditure of ECU 18.6 million for the previous four years). It lies outside the Framework Programme. The programme aims to help SMEs to gain faster access to new technologies from other Member States by means of grants for joint ventures to help with international consultancy costs.

18.5. The Committee believes that the Commission should consider to what extent the VALUE and SPRINT programmes overlap and whether they should have a common administration within the Framework Programme.

19. Generation of Awareness Through Communication

19.1. The Committee draws attention to the need for the Commission to improve its communication techniques in order to achieve a level of awareness at all levels which will be vital to the success of its R&TD activities.

19.2. At the technical level the Committee endorses the comments of the Framework Programme Review Board that an information exchange service is needed to speed development and lower costs within the R&TD Community.

19.3. At all levels a simple and more widespread review of R&TD activities is needed to show where funds have been expended and the results that have been achieved. This will help to generate a perceived view of Commission competence and urgency.

19.4. The Committee urges the Council to ask the Commission to come forward with an adequate and cost-effective proposal which could be brought into operation quickly.

Done at Brussels, 15 November 1989.

The Chairman of the Economic and Social Committee
Alberto Masprone

Footnotes

1.: Under the interinstitutional agreement of 29 June 1988 financial perspectives were set for the years 1990 to 1992 (OJ No L185, 15 July 1988). An increase of ECU 2,400 million for R&TD activities was agreed, to which the Commission has applied an inflation rate of 3.5 percent, making the total sum of ECU 2,700 million.

EC Commission Approves FRG Research Aid

90AN0239 Brussels EUROPE in English
15 Mar 90 p 11

[Report: "State Aid: European Commission Approves the German Scheme for Research Aimed at Promoting Information Technologies"]

[Text] The European Commission approved the West German aid scheme aimed at promoting modern information technologies. The West German Government wants to grant subsidies to research in this field from 1990 to 1993, worth a total of ECU 293 million. Research will focus on: parallel treatment, a technique which will make possible a very large number of simultaneous calculations by a single computer; artificial intelligence; developments in software technology; and the production of new semiconductors on the basis of chemical reactions of Groups Nos. 3 and 5. Research will also be financed in the area of photonics, an industrial optical technologies which could be used for the transmission of computer data through light impulses. This is mostly fundamental research, but it can also be qualified basic research in certain cases.

Aid to universities and research institutes will cover 100 percent of costs, and 50 percent in the case of private companies. This rate may be increased to 60 percent for companies located in West Berlin.

The scheme provides for the possibility of establishing links with research financed through the Community's Framework Programme.

France: Results of EUREKA Program

90AN0185 Paris LE MARCHE DE L'INNOVATION in French 19 Jan 90 p 6

[Text] The EUREKA research program has received the full attention of the French public authorities. Favorable results have led to official recognition, although industrial and commercial returns are still meager. To date, nine programs (out of 138 with French participation) have attained some measure of industrial maturity: the development of power electronic components (Gate Turn Off, GTO) for the railway industry (SGS-Thomson/Medl); the ADA work station project (Alsys/IST/Logica); the development of expert systems for industrial systems operations security (CEP/Atkins/Datamat/IGG); the development of an automated ready-to-wear workshop (Lectra Systemes/Effacec); electronic-card production machinery (Eurosoft/Sagem/CSEA/INISEL); the manufacture of rapid circuits (ES2 France/ES2 UK); organic filtering membranes (Lyonnaise des Eaux/DDS); the development of engineering methods (Serete/Sereland/EWI); and, finally, the automated service-booking system Amadeus (Air France/Iberia/Lufthansa/SAS).

Since the beginning, in 1985, 14 projects have been abandoned along the way (10 percent), which seems to be a reasonable number. The intellectual and emotional aspects, such as "creating links among European manufacturers that are not used to working together," still remain. Even there, the situation seems bright, at least according to a survey carried out by IDS to demonstrate the program's excellence. Entitled "Operational Audit," the document states with remarkable enthusiasm that EUREKA is an "undeniable success"; that the "program enjoys an excellent image"; and that "small and medium-sized businesses have had the opportunity to sign contracts with foreign partners." Thus, it is not surprising that the general level of satisfaction is nearly unanimous, extending to 89 percent of manufacturers. One final boast: "EUREKA is a real success; this is illustrated by the number of projects adopted since its inception." To sum up, "everything has worked out for the best in the best of all possible worlds," considering that all the budget allocations have been spent and that the question of profitability has not yet come up.

FRG's R&D Policy, Future Strategy Reviewed

90MI0120 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 22 Dec 89 pp 2-3

[Text] In response to an invitation from the W.E. Heraeus Foundation, experts from the FRG and other European countries met in Bad Honnef from 11 to 13 December 1989 to discuss future research and technology policy requirements. Professor Helmar Krupp, former director of the Fraunhofer Institute of Systems Engineering and Innovative Research (ISI) in Karlsruhe, was scientific chairman. The conference showed that research and technology policy must establish different priorities and ensure that promising scientific results are introduced in technical and commercial practice and, conversely, that the future of society rather than short-term interests will guide research. The conference's main conclusions may be summed up as follows: The primary duty of research and technology policy is to stimulate changes in social awareness and to bring about a majority consensus transcending party boundaries. In particular, industry must be persuaded to change course. Taking a longer-term view is in its own interest, since it helps reduce planning risks. In this process, considerable clashes of interests with the defenders of the status quo will have to be overcome. Examples where this is particularly true are the electricity generating, industrial chemistry, and transport sectors. In these fields, a considerable need for investment will emerge over the coming decades, particularly in view of the transition to intensive energy rationalization, the use of solar energy, low-emission production processes, new waste disposal methods, and more human traffic conditions.

The second political bottleneck is interdepartmental integration. Pollution, energy supplies, transport and so on affect all areas of the economy and politics. Research and technology policy must emerge from the corner that it currently occupies as procurer of subsidies for industry to develop application-oriented projects taking account of the benefits that the results will bring society.

The third problem is the need for transnational coordination in many cases. This would avoid problems such as lack of competitiveness at the national level due to the fulfillment of international joint commitments. The private sector must not be allowed to profit from lower environmental standards.

The three-day seminar had been assigned the task of drawing up concrete strategies for research and technology policy. Technically it may be assumed that between 10 and 20 percent of current primary energy consumption would be sufficient to cover our energy requirements at tolerable costs to the business and national economy. Likewise, technologies are already in sight that could enable us to reduce environmental pollution to about 10 percent of present levels. The politicians would like to know how this technical potential can be exploited by society. There is a wide variety of options, ranging from direct project funding by the state to state duties, regulations, levies, taxes, and other kinds of economic policy incentives that in turn affect technology policy.

Science is hardly equipped to help politics. Not enough research has been done on the effects of the various political instruments, and the available results are controversial. Prejudice also blurs vision, all the more since many effects are hard to quantify and generalize. Typical questions are: To what extent can market forces be

harnessed to the cart of environmental protection? How can expectations of profits in the private sector be balanced against the investment required for monitoring systems? How fast should we change course? How high are the social benefits and costs that the change in course will bring?

Technology policy must find answers to individual questions such as: When will nuclear energy run out? When will there be an international program to install the first large-scale solar power stations in the solar belt? What technical steps shall we take, and in what timescale, to establish a balanced relationship with the automobile? How can agriculture extricate itself from the dilemma in which it is caught, between environmental protection and adequate income? How shall we keep applications of genetic engineering in check so that it will benefit mankind without even further, and practically irreversibly, endangering the environment?

Professor Haber, chairman of the Environment Council, reported on ecological threats. In view of the close links between politics and industry, papers setting out basic issues by Professors Mayntz, Scharpf, Weingart, and other sociologists dealt with our society's apparently very limited capacity for self-control, which seems to learn best from catastrophes. Current technology policy was debated in the light of sample cases and found insufficiently geared to new needs and excessively weighted in favor of short-term issues.

On behalf of the Federal Confederation of German Industry, Dr. Kreklau demanded a longer-term view for technology policy and—having perhaps been favorably impressed by Japanese policies—better consensus forming among the major pressure groups. Professor Jaenicke drew attention to the growing influence of grass-roots democratic mechanisms, which should be utilized in the future. No new power plants can be built against the will of the population affected, but, for example, more energy can be saved and the traffic situation can be kept under better control with the help of the general public.

In conclusion, Professor Biedenkopf stressed the need for ecology- oriented research and technology policy reform that would establish new framework conditions for social and market policy.

The papers and the outcome of the discussions will be published by the Springer Publishing House in the form of conference proceedings in the summer of 1990.

France: Increased Aid to Electronics Industry

90AN0179 Paris ELECTRONIQUE HEBDO in French 11 Jan 90 p 4

[Article by Michel Heurteaux: "Electronics Sector: "Industrial Policy Makes Comeback"]

[Text] As a strategic activity sector, the electronics industry now depends on public support more than ever. The Ministry of Industry, not wishing to propose a sector-specific plan, is proposing a "program of voluntary action."

"Do we need an industrial policy in the electronics sector?" The Rocard government is beginning to formulate an answer to this question—which has been a continuous refrain since the liberal phase of 1986-1988—especially with the draft 1990 budget legislation, which is notable for government subsidies for technological development and major programs such as Airbus, high-definition TV, telecommunications satellites, semiconductors, new-generation high-speed trains, etc.

The effort taking shape is no doubt a response to the realization in high places of the strategic nature of the electronics industry. Admittedly, the industry has been able to build itself around the major firms—Thompson, Alcatel, Bull, and Matra—but it is also true that it has been losing a lot of ground all over the world for some years now. The industry is recording a growing trade deficit which, last year, reportedly reached nearly Fr 13 billion, or four times that of 1985. The time for action has come; the situation is so worrisome that last December Francois Mitterand personally asked the relevant ministries for a report on the future of the sector.

Thus, just before Christmas vacation, Minister for Industry Roger Fauroux gave a speech on the future of the electronics industry to the Council of Ministers. The text, in the form of a general declaration, has at least one merit: It clarifies the public authorities' position on an economic situation that is, to say the least, delicate. Having been trown out once already along with the previous inhabitant of Grenelle Street, [former Industry Minister] Alain Madelin, industrial policy is making a comeback.

Does this mean a return to the total, strict interventionism of 1981-83? While reiterating the fact that the electronics industry, as a strategic activity sector, is an absolute priority for France, the industry minister rejects talk of economic planning. On this point, he is on the same wavelength as his colleague at the Post, Telecommunications, and Space Ministry, Paul Quiles, who also recently rejected the idea of going back to past sector-specific policies based on a voluntary or solely technical approach. Rather, the government seems to want to keep to a middle road, somewhere between an outmoded interventionist approach and the laissez-faire attitude advocated by harebrained liberalists, but rejected by many French industrialists.

There is certainly room today for a voluntary policy, but it must "be supported by appropriate measures," says Roger Fauroux, whose speech enumerated the new constraints of industrial policy, namely: the internationalization of markets; the absence of important players in certain sectors where French businesses do not reach every market; and, finally and above all, the return to influence of foreign firms—American and Japanese—on the European scene in view of the 1993 single market.

One Imperative: Manufacturing in France

These factors call for a public initiative which has adapted to a context that has itself evolved. To existing programs—the EUREKA project for European cooperation, grants to the electronics sector, research tax credits for small and medium-sized businesses—the minister of industry would like to add some new ones, such as the decentralization of industrial activity in France. This point, considered crucial by Roger Fauroux, will be a priority of regional planning policy and will be taken into account in the allocation of public funds. In addition, the minister of industry has given an account of a collaboration with the larger French firms in the sector to examine "ways in which their research and manufacturing activities in France might be consolidated."

Moreover, grants will be emphasized and increased. The state would particularly like to strengthen the financial situation of the public representatives in the industry—Bull and Thomson—who are experiencing a capitalization slowdown and whose self-financing capabilities are still insufficient in the face of competition.

Other key points: a marked increase in subsidies for European standardization projects and for electronics research. Until now, public spending in this sector has hardly increased. The proposed plan will take the form of a significant increase in direct grants allocated by the different ministerial departments (industry, research, telecommunications and space, defense) in the 1990 budget. Taking civil electronics as an example, grants will rise from Fr 4.4 billion to Fr 4.7 billion—an increase of eight percent.

Any relaunching of industrial policy must—let us keep Grenelle Street in mind—do so as part of the European framework. The big technological programs like EUREKA and ESPRIT have become indispensable cooperation frameworks for a number of businesses in the industry. This is true both in the components field (the JESSI [Joint European Submicron Silicon Initiative] program) and even more so in the computer science and telecommunications field—two priority areas feeling the full force of American and Japanese assaults on the European market.

On this issue the government has stated its wish for a "more coherent trade policy" both with regard to the United States and Japan, and to Southeast Asian manufacturers. Some quick brain-storming with our European partners is needed before Asian industry "sweeps everything away." There are also new strategic questions regarding the major U.S. firms: For instance, should we deny them reciprocal participation in the major European technology programs?

Finally, the Ministry of Industry is recomending a community-wide shakeup of trade relations with Asian countries: badly utilized customs duties, antidumping taxes levied too late, quotas, and stricter regulations on the opening of public markets. On this issue, the minister believes that the "Buy American Act" regulations could inspire community policy on public markets. If implemented, this could be a significant measure that could give a concrete meaning to the somewhat fuzzy notion of industrial policy.

SUPERCONDUCTIVITY

UK Firms Awarded Superconductor Materials Contract

90AN0189 Toddington NEW MATERIALS INTERNATIONAL in English Feb 90 p 4

[Article: "Superconductors for Microwaves and Sensors"]

[Text] ICI Advanced Materials has been named the primary supplier of superconductive ceramic materials in a contract awarded to an international consortium by the Department of Trade and Industry (DTI). The contract, granted for the testing and evaluation of superconductors as well as microwave devices, sensors and actuators, is worth 1.65 million pounds in total and is 50 percent funded by the DTI over a three-year period.

Other organisations in the consortium include Plessey Research, Lucas Automotive Systems, and Birmingham University.

Under the contract, the consortium will develop microwave devices, sensors and actuators, and identify superconductor and microwave device applications. ICI will produce superconductive materials in complex shapes for test and evaluation by Plessey, an expert at microwave testing and measurement. Lucas Automotive Systems will carry out testing of sensors and actuators, and the University of Birmingham design and basic R&D. Work will focus on three broad areas: research into new compositions displaying higher transition temperatures; research into and fabrication of radio-frequency and microwave devices; and research into sensors and actuators.

The consortium brings together some of the world's most accomplished organisations in superconductor and microwave device development.

Birmingham University was the first to demonstrate flux quantisation in the new materials. Plessey has a strong background in RF and microwave systems and in ceramics for dielectric and piezoelectric applications. Lucas has considerable experience in the field of sensors and actuators. ICI is a manufacturer of high-quality high-temperature superconductors (HTSC) wire and has a proven capability in the processing of the materials into complex shapes.

In conjunction with Birmingham, ICI made and tested the world's first HTSC device, a dipole antenna. ICI also manufactured a 15-ft-long high-temperature coil which formed part of the world's first HTSC generator. Birmingham, Lucas, and ICI have collaborated in HTSC

research over the last two years and welcome Plessey's expertise as a valuable component of the consortium.

France: CNET Develops High-Temperature Superconducting Thin Films

90AN0226 Levallois-Perret LA LETTRE DE LA FIBRE OPTIQUE in French 15 Jan 90 p 1

[Text] The Bagneux laboratory of the National Center for Telecommunications Studies (CNET) has just developed superconducting thin films with zero resistance to 107 K, i.e., nearly 30 degrees above the boiling point of nitrogen. These thin films are one micron thick and consist of a superconducting substance that belongs to the class of bismuth-based "high-temperature" conductors discovered in Japan in early 1988. This class has two major superconducting phases, one that retains its superconductivity to approximately 80 K, the other to 107 K.

CNET is the first French laboratory to develop thin films with adequate proportions (greater than 85 percent) in the most interesting phase. These films were obtained by an assisted sputter deposition of a "target" of the superconducting substance using a high-power laser.

TECHNOLOGY TRANSFER

Vienna Council Proposal on Technology Transfer

90AN0276 Brussels EUROPE in English 18 Apr 90 p 15

[Report on technology transfer: "'Vienna Council' Proposal To Examine With Community Authorities the Coordination of Transfers Between East and West Europe and 'In-Situ' Controls on Observation of COCOM Restrictions"]

[Text] The representatives of the industrial and banking world of East and West Europe brought together at the "International Council for New Initiatives in East-West Cooperation", or the "Vienna Council", presided over by Umberto Agnelli, have worked out a series of recommendations on East-West cooperation concerning, especially, the role of international organisations, technology transfers, and training. With regard to technology transfers, this problem was mentioned on the fringes of the CSCE [Conference on Security and Cooperation in Europe] conference on economic cooperation which ended last week in Bonn by industrialists from East and West meeting within the framework of the "Vienna Council," chaired by Umberto Agnelli. As far as technology transfer is concerned, the "Vienna Council" is in particular proposing long-term initiatives jointly with the Community authorities and initiatives within the framework of COCOM to limit restrictions on technology exports which it imposes and at the same time to ensure greater respect for applied restrictions.

In general, the task force studying the problem of technology transfer, which is chaired by former Commission Vice President Narjes, warns against the "short-sighted strategy sometimes observed" in the West, consisting of limiting the transfer of technologies to the state of the art prevailing some years ago, "in the hope of benefitting with short time-horizon from the backwardness of recipients." Now, "to speculate on the perennial differential in productivity not only seems risky in view of possible competitors, it also leads in principle to suboptimal macroeconomic outcomes." The task force also says that technology transfer concentrates on a very small number of branches, with some of them not yet aware of the potential offered by technological development, and insists on the necessity of planning special measures for SMEs [small and medium-sized enterprises] to participate in international flows of knowledge.

Among the main recommendations made by the "task force" are:

1) *To organize, in preparation for the single internal market:*

a) Activities jointly with the European Community to investigate the possibility for coordinating the flow of technology transfer between East and West: this should, according to the task force, be a "long-term initiative";

b) A meeting of representatives of enterprises interested in West-East technology transfer, in cooperation with the International Chamber of Commerce;

2) *Within COCOM:*

a) On the governmental level, to launch "confidence-building" measures and safeguarding measures in technology transfer, including "in-situ" controls (the Soviet delegation to the CSCE conference in Bonn has made a similar proposal) and to conclude bilateral agreements guaranteeing the non-transference of technology to third countries;

b) On the international level, in light of the new rules COCOM will adopt, to set up: a sub-group charged with identifying the areas in which COCOM has caused both present and potential setbacks to technology transfer and also to evaluate and recommend methods of guaranteeing the availability of alternative technologies; another subgroup consisting of Western members is charged with examining remaining COCOM restrictions and discussing with COCOM the establishment of methods for improving the conditions for technology transfer;

3) To take initiatives to encourage governments to cooperate in the development of *common infrastructures*, as the problem of physical infrastructure in some COMECON countries is a real obstacle to cooperation. According to the "Vienna Council," the improvement of the physical infrastructure could be an important area for technology transfer;

4) To take initiatives on *property rights*, in view of:

a) Training specialists in the field of commercial and industrial property;

b) Adopting laws guaranteeing the protection of property rights;

c) The establishment in East European countries of branches of the Licensing Executive Societies;

d) Encouraging the elimination whenever possible of restrictions to licence practices to technology transferers;

5) *Liberalising capital movements* intended to finance technology transfer;

6) To open *national and international R&D programmes* to countries that do not already have access to them.

FACTORY AUTOMATION, ROBOTICS

Hungarian CAD Simulation Software Developed

25020010a Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 15 Mar 90 p 4

[Article: "Csepel Simulators"]

[Text] One of the prize winners at this year's MicroCAD exhibit was the System Csepel FMS [flexible manufacturing system] CAD [computer-aided design] Simulator prepared at the Csepel Machine Tool Manufacturing Company. With this software one can put flexible manufacturing system configurations together in theory, model their operation and present them on the screen with the aid of a graphics editor. One can study the load on a future manufacturing system and analyze optimal machine use. Its use is recommended for enterprises preparing to buy or build FMS for with it one can determine, before the investment is made, what combination of machines is most suitable for the given task and one can eliminate some of the bottlenecks. Machine tool manufacturers—including the Csepel Machine Tool Manufacturing Company—also use it to prepare proposals for potential purchasers of manufacturing systems. The hardware requirement is an AT with coprocessor and an EGA card. The proposed price is 300,000 forints.

Hungarian Software Developed for Machine Industry

25020010b Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 15 Mar 90 p 5

[Article: "Machining Programs Dister and Vulcanus"]

[Text] Software which aids the planning of machining and similar work processes is still embargoed and it is difficult to find ready-made programs on the market for special needs. For this reason the development of such software is being done in several places in Hungary with the support of the G/6 R&D Program.

Dister (Digep Interaktiv Sullyesztek TErvezo Rendszer [Digep—Diosgyor Machine Factory—Interactive Die Designing System]) was developed at the Heavy Industry Technical University in Miskolc on commission from Digep with the cooperation of MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Science]. With the 3-D software one can model classes (e.g. crankshafts and drive axles) of parts which can be made with die machining which satisfy certain geometric conditions, one can plan the manufacturing technology and prepare the technical drawings, tool drawings and documentation. The entire system can be run under UNIX and it is expected to be ready next year at Digep, with about 30 man-years of work. Market research will be completed by the end of March and on this basis the product may be for sale. The Koginform Small Cooperative will undertake to market a two-dimensional CAD/CAM system, simpler than Dister, called Vulcanus for the design of disk type parts and the CNC machining of die tools. The program package starts from the forged product, taking into consideration the peculiarities of machining technology, and aids designing, checks the filling of tool voids (so-called initial blanks and finished blanks), checks load, using the sliding line plastic method, so that one can make the tool blank placed in the die block on the basis of the CNC machining program prepared.

This product was developed by the Mechanical Technology and Material Structures Institute and Machine Manufacturing Technology Department of the Budapest Technical University together with experts from the Iron Works of the Csepel Works in the QuickBASIC language. At present the software is suitable only for the designing of disk type parts but a supplementary module to make possible the designing of oblong parts is being prepared. Vulcanus can be attached to AutoCAD, CADkey and PEPS2 systems. At the Iron Works of the Csepel Works it is linked with a Hunor PNC 7xx controlled SZIM [Machine Tool Industry Works] machine tool but it can be modified to suit the needs of future customers and their existing manufacturing tools. The basic system will probably cost less than 400,000 forints; costs of adaptation are extra.

TECHNOLOGY TRANSFER

Hungarian Firm Accused of Passing Western Technology to USSR

25020011 Budapest HETI VILAGGAZDASAG in Hungarian 10 Mar 90 pp 21-22

[Interview with Tamas Rac by Akos Tomory: "A 'Technology' Merchant Answers: "Whether or Not the Commission was Legal is an Internal Affair of the Soviet Union""]

[Excerpts] After the amusing conspiratorial efforts of so many years we are now learning more and more about the existence of a Hungarian munitions industry and Hungarian arms trade. But when we sought to interview someone knowledgeable about the matter it turned out that there were no Hungarian arms merchants. Even Tamas Rac (43 years old), of the Aircraft Development and Trade Corporation, roundly denies that he has anything to do with the sale or purchase of weapons or military technologies. At most he admits that in certain respects the aircraft industry falls under military supervision....

Tomory: The name, Repulogep-fejleszto es Kereskedelmi Kft [Aircraft Development and Trade Corporation], is not one of the better known undertakings in Hungary, and I think it does not want to become so. All the more so since the name, with a good Hungarian ring, actually "covers" a Soviet firm. Is this true?

Rac: The mixed enterprise came into existence in October of last year with 50 percent Soviet ownership and 50 percent Hungarian ownership. The founders are a subsidiary of one of the largest Soviet aircraft factories, the Soviet Aviation Ministry, the Komsomol and the MAI, the Moscow Aviation Technical University.

Tomory: Do not get angry, but what can we tell the Russians about aviation technology?

Rac: Our goal is that they should be able to develop in the Soviet Union aircraft for civilian purposes, such as light helicopters, which they have lacked thus far and to help organize the Soviet assembly, sale and modification of Western aircraft—to mention just the best known, the helicopters of Bell and Rogerson Aircraft. With the reduction in military production in the Soviet aircraft factory manufacturing capacity is being freed and we can offer help in using it thanks to our international aviation contacts and the geographic possibilities of Hungary.

Tomory: I would never have believed that geography could be a factor in this matter. In a word—disregarding the geographical point of view—I understand you to be saying that you are serving as a "conduit" for the transfer of peak technology to the Soviet Union and then the product prepared by using it will be resold elsewhere?

Rac: Not at all. The Soviet aircraft industry has no need for technology import. We would like to use the market information we have gathered to formulate new economical requirements and attitudes for the Soviets and to "translate into Russian" the Western planning system. But this is only one side of our activity. This undertaking will be profitable for the Hungarians if we can link, to at least a modest degree, into the manufacture of the most modern products, into the division of labor of the international aviation industry. [passage omitted]

Tomory: How are we to evaluate the correctness of the Hungarians in light of the fact that the name of Hungary—among other countries—came up as one of the intermediaries in the arms sale scandal recently disclosed in the Soviet Union?

Rac: I have no information about the concrete case so I can only speculate. In theory one could imagine that the Soviet firms—because of the greater commercial experience of their partners in Hungary—asked the Hungarian enterprises to take care of the deal. But I would find it difficult to believe that this request was the private action of one or two people. Whether or not the commission was legal is an internal affair of the Soviet Union. But this is a good example of the dilemma which the great powers—and not only the Soviet Union—must face. Namely, at what point does the sale of some product have greater political disadvantages than commercial advantages.

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, economic, military, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available source; it should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed, with personal and place names rendered in accordance with FBIS transliteration style.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Soviet Union, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.