II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DECISION

of 28 September 1987

concerning the framework programme for Community activities in the field of research and technological development (1987 to 1991)

(87/516/Euratom, EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 130Q (1) thereof,

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

Having regard to the proposal from the Commission [1],

Having regard to the opinion of the European Parliament [2],

Having regard to the opinion of the Economic and Social Comittee [3],

Having regard to the opinion of the Scientific and Technical Committee,

Whereas Article 2 of the Treaty establishing the European Economic Community assigns to the Community, *inter alia*, the task of promoting throughout the Community a harmonious development of economic activities, a continuous and balanced expansion and an accelerated raising of the standard of living;

Whereas, in order to encourage the development of the international competitiveness of European industry, it is necessary to promote scientific research and technological development at Community level in order to strengthen the scientific and technological basis of its industry, thereby complementing the activities carried out in the Member States;

Whereas it is necessary to encourage undertakings, including small and medium-sized undertakings, research centres and universities in their research and technological development activities as well as to support their efforts to cooperate with one another;

Whereas it is recognized that small and medium-sized enterprises are able to make a significant contribution to the innovative process and should play a substantial role in the implementation of Community R & TD, thereby contributing to the improvement of industrial competitiveness; whereas, therefore, particular attention should be paid to the specific needs of such enterprises in order to encourage their access to information, their effective participation in Community programmes and their ability to exploit the results of Community research;

Whereas it is necessary to promote the overall harmonious development of the Community with a view to strengthening its economic and social cohesion; whereas it is intended that the implementation of common policies of the Community, and its strategy for research and technological development, shall contribute to this objective; whereas a Community framework programme should play its part, along with other Community instruments, in contributing to strengthening scientific and technological infrastructure and potential throughout all parts of the Community;

Whereas it is necessary to associate the implementation of the Community strategy for science and technology with the

(1) OJ No C 275, 31. 10. 1986, p. 4.
(2) OJ No C 7, 12. 1. 1987, p. 19.
(3) OJ No C 333, 29. 12. 1986, p. 45.

completion of the internal market, particularly through increased research and development efforts enabling the definition of common standards to be applied throughout Europe; whereas this process will enable undertakings to take full advantage of the potential of the internal market; whereas this strategy should take into account, in particular, the implementation of common policies on competition and trade;

Whereas, in order to present as comprehensive an overall view as possible of its science and technology strategy undertaken under the Treaties of Rome, the Community intends to adopt a multiannual framework programme laying down the scientific and technical objectives of its activities, defining their respective priorities, setting out the main lines of the activities envisaged, estimating the necessary amount and drawing up detailed rules for financial participation by the Community in the programme as a whole and the breakdown of this amount between the various activities envisaged; whereas, nevertheless, the Commission is undertaking autonomous activities under the Treaty of Paris in the coal and steel sectors which are not financed by the general budget of the European Communities and cannot therefore be included in the framework programme;

Whereas on 25 July 1983 the Council adopted a first four-year framework programme 1984 to 1987 to be reviewed during the course of its execution; whereas a five-year period running from 1987 to 1991 appears, in the light of experience, more appropriate for the second framework programme;

Whereas the amount deemed necessary for a multiannual framework programme is the sum of the amounts deemed necessary for the specific programmes to be decided on during the reference period;

Whereas the relationship between the framework programme and the specific programme leads, in practice, to a time-lag between the reference period of the framework programme and the period during which the amount deemed necessary will be committed in the budget;

Whereas, owing to this time-lag, there is an amount of 1 084 million ECU to be committed in respect of research programmes already decided on or under way and which cannot be included in the amount deemed necessary for the framework programme 1987 to 1991;

Whereas, for the same reason, it may be expected that part of the amount deemed necessary for the framework programme 1987 to 1991, 863 million ECU, will have to be committed in the budget after the reference period of the framework programme:

Whereas it proved necessary, in the light of the evolution of scientific and technical objectives and of the accession of two new Member States on 1 January 1987, to revise the criteria governing the selection of Community R & D activities as set out in the Council resolution of 25 July 1983;

Whereas the framework programme must be implemented through specific programmes developed within each line of activity, the methods, duration and finance deemed necessary being open to a decision at the time of adoption of those programmes;

Whereas it may be appropriate to allow for some of these programmes to take the form of supplementary programmes;

Whereas, in the same spirit, provision should be made to allow the specific and supplementary programmes to include a Community contribution to research and development programmes undertaken by several Member States;

Whereas the detailed rules for implementing the framework programme provided for above should not rule out the possibility of Community cooperation with third countries or international organizations with a view to pursuing the scientific and technical objectives established by the framework programme;

Whereas COST activities and those of the Community should operate in a mutually beneficial way; whereas COST activities could contribute to the implementation of the framework programme and pursue a specific and complementary role by encouraging scientific and technical cooperation between the Community and the members of COST by means of research projects of a multilateral character;

Whereas it is appropriate for projects carried out in the context of Eureka and specific activities undertaken within the framework programme to operate in a complementary manner and to their mutual advantage; whereas it may be necessary in the implementation of the framework programme to provide for an appropriate Community participation in certain Eureka projects;

Whereas it may be appropriate to review customary arrangements for levels of Community contributions to projects and to consider the use of varying levels of such contributions, depending *inter alia* on the nature of the participants, the degree of precompetitiveness of the project and the progress of the research on the one hand, and the available resources on the other; whereas, if flexibility of this type were to prove necessary, the specific programme decisions would set out the provisions governing the level of Community contribution in a manner consistent with the optimal achievement of scientific and technical objectives;

Whereas the adoption of a five-year framework programme does not in any way preclude amendments or additions to the

programme on the basis of the continually changing scientific and technological context; whereas it is appropriate and desirable that the Commission should carry out an evaluation of the execution of the programme and a general review from the third year of execution;

Whereas the Scientific and Technical Research Committee (CREST) has been consulted,

HAS DECIDED AS FOLLOWS:

Article 1

1. The framework programme for Community activities in the field of research and technological development (hereinafter referred to as the 'framework programme') shall cover the period 1987 to 1991.

2. The framework programme shall provide for the following activities:

(1) Quality of life

(2) Towards a large market and an information and communications society

(3) Modernization of industrial sectors

(4) Exploitation and optimum use of biological resources

(5) Energy

(6) Science and technology for development

(7) Exploitation of the seabed and use of marine resources

(8) Improvement of European S/T cooperation.

3. Without prejudice to the amount of 1 084 million ECU deemed necessary in respect of research programmes already decided on or under way, the total amount deemed necessary for Community participation in the achievement of the scientific and technical objectives set out in Annex II, and therefore the sum to be allocated to specific programmes to be decided on during that period, shall be 5 396 million ECU, of which no more than 4 533 million ECU are deemed necessary to be committed for the execution of specific programmes before the end of 1991.

Of the abovementioned amount of 5 396 million ECU, the amount deemed necessary for specific programmes to be decided on during 1987 to 1991 shall provisionally, and pending the Council Decision referred to in the third subparagraph, be fixed at 4 979 million ECU.

The Council, acting unanimously, will subsequently decide on the addition of the remaining amount of 417 million ECU to the amount of 4 979 million ECU.

4. The breakdown of the amount deemed necessary between the activities listed in paragraph 2 is set out in Annex I.

5. The main lines of the activities envisaged and their scientific and technical objectives are set out in Annex II.

6. The selection criteria to be applied in the implementation of the programme are set out in Annex III.

Article 2

1. The framework programme shall be implemented through specific programmes developed within each of the activities set out in Article 1 (2). It may also be implemented, where appropriate, by supplementary programmes.

In implementing the framework programme, provision may be made for Community participation in activities undertaken by several Member States and for Community cooperation with third countries or international organizations.

2. Each specific programme shall:

— define the detailed rules for implementing it, fix its duration and provide for the means deemed necessary,

— state its precise objectives and provide for an evaluation of results achieved in relation to these objectives,

— be evaluated in the light of all the selection criteria set out in Annex III, which include that of contributing to the strengthening of the economic and social cohesion of the Community,

— define the rate or rates of the Community's financial participation.

3. The Council shall define the detailed arrangements for the dissemination of knowledge resulting from the programme, in particular in the context of the adoption of specific programmes.

Article 3

The detailed rules for financial participation by the Communities in the framework programme as a whole shall be those provided for in Article 87 of the Financial Regulation applicable to the general budget of the European Communities, without prejudice to the charging to the

budget of any contributions from the Communities to national or multinational activities or projects.

Article 4

During the third year of execution of the framework programme the Commission shall assess its progress. It shall examine, in particular, whether the objectives, priorities, activities envisaged and financial resources are still appropriate to the changing situation. In the light of this review, it shall make proposals for the revision of the framework programme.

Done at Brussels, 28 September 1987.

For the Council

The President

B. HAARDER

ANNEX I

FRAMEWORK PROGRAMME OF COMMUNITY ACTIVITIES IN THE FIELD OF RESEARCH AND TECHNOLOGICAL DEVELOPMENT (1987 to 1991)

Breakdown of the amount deemed necessary between the various activities envisaged

			(million ECU)
1.	**Quality of life**		375
1.1.	Health	80	
1.2.	Radiation protection	34	
1.3.	Environment	261	
2.	**Towards a large market and an information and communications society**		2 275
2.1.	Information technologies	1 600	
2.2.	Telecommunications	550	
2.3.	New services of common interest (including transport)	125	
3.	**Modernization of industrial sectors**		845
3.1.	Science and technology for manufacturing industry	400	
3.2.	Science and technology of advanced materials	220	
3.3.	Raw materials and recycling	45	
3.4.	Technical standards, measurement methods and reference materials	180	
4.	**Exploitation and optimum use of biological resources**		280
4.1.	Biotechnology	120	
4.2.	Agro-industrial technologies	105	
4.3.	Competitiveness of agriculture and management of agricultural resources	55	
5.	**Energy**		1 173
5.1.	Fission: nuclear safety	440	
5.2.	Controlled thermonuclear fusion	611	
5.3.	Non-nuclear energies and rational use of energy	122	
6.	**Science and technology for development**	80	80
7.	**Exploitation of the sea bed and use of marine resources**		80
7.1.	Marine science and technology	50	
7.2.	Fisheries	30	
8.	**Improvement of European S/T cooperation**		288
8.1.	Stimulation, enhancement and use of human resources	180	
8.2.	Use of major installations	30	
8.3.	Forecasting and assessment and other back-up measures (including statistics)	23	
8.4.	Dissemination and utilization of S/T research results	55	
	Total		5 396

ANNEX II

FRAMEWORK PROGRAMME 1987 to 1991

MAIN LINES OF THE ACTIVITIES ENVISAGED

and

SCIENTIFIC AND TECHNICAL OBJECTIVES

1.1. HEALTH

A. PURPOSE

To contribute to a European concept of the quality of life in those aspects which are most clearly perceptible to each individual: his health and all the resources available to maintain it at an optimal level in all Member States.

B. OBJECTIVES FOR 1987 to 1991

To improve the efficacity of efforts made by the Member States in overcoming certain categories of important diseases. To improve the use of technological tools and operational resources; to achieve the knowledge needed to detect a tendency to certain diseases as early as possible in order to prevent their incidence.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

Health research is in itself of a very diverse nature. Implementation methods to coordinate existing activities will by way of concerted action with some reinforcements of the so-called centralized facilities where a selected institution is providing a unique service to all other institutions participating in a defined project. Initiation of new activities relating to the development of predictive medicine and novel therapy will essentially be by way of shared-cost actions. Specific training actions in the field of cancer research will also be required.

D. TECHNICAL CONTENT

The coordination of *medical and public health research* will be oriented on a priority basis towards the most important health problems common to all Member States. It will include the new targets 'Cancer' and 'AIDS' and will provide for the continuation of actions referring to both age-related health problems (incuding disabilities) and to environment- and life-style-related health problems. Moreover, it will continue the actions on improvement and efficient use of health resources, encompassing medical technology R & D and health services research (research on health care organization and delivery).

The development of *predictive medicine and novel therapy* will mainly be oriented towards better knowledge of the human genoma, immunity techniques (applicable to cancer, auto-immune diseases, infections), genetic engineering processes aiming at repairing DNA defects (e.g. in congenital diseases of genetic origin), and development of diagnostic test kits (e.g. for AIDS).

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

The relationship to other actions (Eureka) and with international organizations (Council of Europe, European Office of WHO, ESF) will be maintained and strengthened in all cases where mutual benefit can be expected.

Ongoing collaboration with European non-member States as well as with the USA and Canada will be maintained.

F. EVOLUTION OF THE ACTIVITY

It is intended that the coordination of medical and public health research should attain the culmination of its gradually progressive expansion in 1989, and it might also reach the limits of its managerial capacity, whereas predictive medicine has still to undergo a preparatory and evolution phase.

(ECSC actions in *occupational medicine* are oriented towards health problems and occupational diseases associated with the specific environments of steelworks, coking plants, and coal and iron mines.)

1.2. RADIATION PROTECTION

A. PURPOSE

To gain adequate scientific and technical understanding and control of radiation risks.

B. OBJECTIVES FOR 1987 to 1991

To provide data and methods needed for the prevention and counteraction of harmful effects of ionizing radiation and radioactivity, and to assess the consequences of radiation accidents. Particular attention will be paid to the evaluation of recent accidents and incidents, and to the lessons which can be learned from them.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

As a logical continuation of programmes executed since 1959, the activities will be implemented essentially by shared-cost actions, with a certain contribution in the form of direct action.

D. TECHNICAL CONTENT

R & TD will concentrate on efficient and cost-effective measures to control radiation risks (of natural, medical or industrial origin), on research in support of the 'basic safety standards' and their implementation and on the radiological consequences and preparedness for possible accidents. Inter-comparisons of measurement methods will be performed within the Community.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Contact will be maintained with international bodies such as the IAEA (International Atomic Energy Agency), ICRP (International Commission on Radiological Protection), ICRU (International Commission on Radiation Units and Measurement) UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation).

F. EVOLUTION OF THE ACTIVITY

A temporary increased effort is envisaged to evaluate the consequences of recent events and to increase preparedness for future possible accidents.

1.3. ENVIRONMENT

A. PURPOSE

To generate such scientific knowledge in the fields of environmental protection, climatology and safety, as is necessary for the implementation of the Community environment policy and of the Community consumer protection policy, and for their further development; to contribute also to other relevant Community policies (energy, agriculture, industry, aid to developing countries).

B. OBJECTIVES FOR 1987 to 1991

To meet the immediate research requirements, in particular those of the proposal Fourth Environment Action Programme and of the current actions in the consumer protection policy, each of which will have also a significant impact an other policies; and to increase understanding of long-term problems such as possible climate variations.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

As a logical continuation of a sequence of programmes executed since 1972, the activities will be implemented by means of in-house research (JRC), shared-cost actions and concerted actions. It is envisaged that the JRC will contribute in particular to the elaboration and standardization of measurement and analysis techniques. Shared-cost actions will ensure a coordinated approach to the solution of common problems and various well defined concerted actions will exploit national research programmes on a European level.

D. TECHNICAL CONTENT

Research in the area of *environmental protection* will deal with detection, measurement, analysis and monitoring techniques (including remote sensing), effects of pollution on health and ecosystems, assessment of chemicals, effects of human activities on environmental quality, study of basic principles of environmental processes and the functioning of ecosystems, waste management, development of technologies for the reduction and prevention of pollution and restoration of damaged environments. Remote sensing from space is under rapid development and applications for environmental protection will receive increased attention.

Research on *the cultural heritage* will focus on the investigation of the mechanisms of deterioration, on establishing methods for damage assessment and prevention, reduction or elimination of the man-made contributions to decay and an investigation of methods for the restoration of irreplaceable cultural objects.

Research on *climatology* and *natural hazards* will focus on efforts to understand the mechanisms which govern the phenomena concerned, e.g. by developing powerful models capable of forecasting such phenomena in temporal and spatial scales useful for planning and prevention, by refining our ability to assess impacts upon specified segments of European Community geography, society and economy, and by establishing a sound scientific basis for any preventive or corrective measure.

Research on *major technological hazards* will be oriented towards understanding, preventing and mitigating the consequences of large chemical/petrochemical accidents.

Work on *fire safety* in buildings of all types will be directed towards risk analysis, fire development and growth, and damage mitigation measures.

Research on *remote-handling technology* will be applied to environments incompatible with or dangerous to man, such as places contaminated by radioactive or biologically active material or subject to extremes of pressure and/or temperature.

Research on reduction of *risks in private life* will emphasize protection of consumers against dangerous products, accidents due to introduction of new technologies and new types of domestic equipment, special products for the elderly, the disabled, children, etc.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

As in the past, suitable parts of the activity will be integrated in the COST framework. Where appropriate, coordination with Eureka

projects will be established. Where feasible, Community activity will be carried out as in the past in close collaboration with other international activities, such as UNEP programmes on the Mediterranean Sea, the IPCS (International Programme on Chemical Safety), the World Climate Programme or the WMO Global Ozone Project.

F. EVOLUTION OF THE ACTIVITY

Most areas are covered by on-going activities which are continuously adapted to new needs and developments.

Fire safety, remote-handling technology and risks in private life are new activities to be explored with a view to defining the needs for Community R & TD. A phased build-up in the level of activities will be considered in the light of the identified needs.

(ECSC work on *occupational safety* is oriented towards problems of ergonomics, safety and hygiene in the specific environment of steelworks, coking plants and coal and iron mines.)

2.1. INFORMATION TECHNOLOGIES

A. PURPOSE

The purpose of this action is to create and develop the necessary synergies in the IT sector through cooperative precompetitive research and development projects and related actions.

B. OBJECTIVES FOR 1987 to 1991

The objectives of the activity are:

— to contribute to providing the European IT industry with the basic technologies to meet the competitive requirements of the 1990s,

— to promote European industrial cooperation in precompetitive R & D in IT,

— to contribute to the development of international standards.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The activity consists of precompetitive R & D projects, carried out by the collaborative effort of Community undertakings, on a shared cost basis, and actions in basic research including concerted actions and accompanying measures.

D. TECHNICAL CONTENT

(a) **Research and development projects**

Research and development projects will be carried out in the following three sectors:

1. *Microelectronics and peripheral technologies*

Work in this sector will have to be addressed primarily to improving the competitiveness of the Community microelectronics industrial sector so as to enable it to provide the IT industry with full system capability through access to up to date functional components and subsystems based in particular on state of the art semiconductor technology. To this end and in support of the development of application systems, it will encompass the provision of the technological capability to design, manufacture and test application specific integrated circuits (ASIC) in a 'system on a chip' concept. Such circuits will range from high-complexity random logic, including several million elementary devices, to very high-speed lower-complexity circuits capable of operating at up to 5 GHz.

The R & D activities to be pursued include:

— high-density integrated circuits,

— high-speed integrated circuits,

— multifunction integrated circuits,

— peripheral technologies, including magneto-optic and optical mass storage and retrieval systems, non-impact printers, displays, devices incorporating logic elements in conjunction with sensors, transducers and actuators.

2. *Information processing systems*

The main objective of this area is to bring together tools and technologies from the hardware and software domains, in order to enable the design and development of the information processing systems of the 1990s. Particular attention will be paid to new approaches to systems design which will enable high quality complex systems to be developed efficiently. To develop the methods and tools needed, it is imperative that all aspects of the system (e.g. architecture, interfaces) are considered while at the same time new technologies like knowledge engineering are integrated.

As a consequence, work in this sector will provide the capability of producing systems (of similar complexity to those produced now) with a significant increase in designer productivity. For example, the methods and tools developed will provide the mechanism by which the development costs of selected system components (e.g. microprocessors, real-time software modules) will be reduced to 10 % of the current development costs.

The main R & D activities to be pursued fall into four complementary sub-areas:

— systems design,

— knowledge engineering,

— advanced systems architectures,

— signal processing.

3. *IT application technologies*

The main objective of this sector is to enhance European capabilities in the integration of IT into systems able to be

used in a broad range of applications and to validate the results in selected, realistic environments.

The R & D activities to be pursued in IT application technologies fall into three complementary sub-areas:

— computer integrated manufacturing, including design and analysis systems for flexible product development, logistical and physical control of factory management, robotics systems, integration of material handling systems, computer integrated control in process industries and architecture and methods for integration,

— integrated information systems, including user-environment analysis and support, system engineering, generic communication technologies, integrated office systems, distributed systems and data collection and monitoring systems in non-factory environments (e.g. home, laboratory),

— IT application support systems, addressing the integration of basic IT components into subsystems, including work-stations, storage and processing subsystems, local network systems and user-interfacing subsystems.

Throughout the three abovementioned sectors, a limited number of technology integration projects of strategic importance to European industry will be undertaken.

(b) **Actions in basic research**

The envisaged actions in basic research aim at providing a Community dimension to research work in selected areas of long lead-time. The actions shall, in particular, encourage highly qualified research institutes in IT to become international in their orientation.

The work areas include:

— molecular electronics,

— artificial intelligence and cognitive science,

— applications of solid state physics to IT,

— system design.

(c) **Accompanying measures**

The main objective of the accompanying measures is to provide the framework necessary to make optimum use of the R & D activities undertaken in the ESPRIT programme and related activities.

E. RELATIONSHIP TO OTHER COLLABORATIVE ACTIONS

Accompanying measures include the coordination between Community, Member States and international actions in or relevant to information technology.

F. EVOLUTION OF THE ACTIVITY

The projects arising from the R & D topics will be starting progressively over the period of the activity, based on an annually updated work programme leading to public calls for proposals, and building on projects currently being undertaken in these areas.

Assessment of concrete technology results and an attempt to measure the impact and industrial application of individual projects will be conducted by means of reports from independent technical evaluators, who will assist in monitoring the progress on a regular basis.

2.2. TELECOMMUNICATIONS

A. PURPOSE

Cooperation of network operators and industry in advanced telecommunications technologies at the precompetitive and prenormative level.

B. OBJECTIVES FOR 1987 to 1991

The main action in this field is to make a major contribution to the objective of the 'Introduction of integrated broadband communication (IBC) taking into account the evolving ISDN and national introduction strategies, progressing to Community-wide services by 1995'.

The thrust of this action is towards establishing on the world market a strong, or even leading, position of the Community telecommunication manufacturing, operating and service industries in integrated and broadband communications (IBC) (1) on the basis of the accelerated development of a *strong and competitive Community market for telecommunications equipment and services.*

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

This activity consists of precompetitive and prenormative R & D carried out on a shared-cost basis.

D. TECHNICAL CONTENT

Summary of areas

— *Part I: IBC development and implementation strategies*
  1. IBC reference model (continuation of RDP work)
  2. System analyses and functional specification
  3. Implementation and planning support

— *Part II: IBC technologies*
  1. Enabling and supporting IBC technologies
  2. Communication software technologies
  3. Basic technologies for IBC Users
  4. Subsystems and techniques

(1) Integrated broadband communication refers to the use of advanced technology to transmit voice, data and images at high speed and at low cost.

— *Part III: prenormative functional integration*

1. Customer facilities
2. User access
3. Network functions

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

In drawing up the proposal for this action, special attention has been paid to the relationship with Community actions in the field of information technologies, so as to make best possible use of the generic work done there for IBC. Though not directly related to the commercially oriented work in the framework of Eureka, close links to the telecommunication related projects will be established.

F. EVOLUTION OF THE ACTIVITY

The action is conceived as an evolutionary strategy distinguishing:

— Definition phase (1985 to 1986) to execute initial work as required to focus the R & D work of the main programme accurately towards future functional requirements of the network, terminal area and future applications. It also includes the assessment of the technology options of key items;

— Main action (1987 to 1992) having the objectives:
  - of developing the technology base for IBC,
  - of carrying out the precompetitive development necessary for the provision of trial equipment and services for IBC demonstration,
  - of supporting the work of CEPT and CCITT in the formulation of common proposals for specifications and standards.

1. better equipment and systems for *open and distance learning* so that Europe's labour force at the various levels can keep abreast of rapidly changing knowledge in all fields of economic activity. The aim of this action in concertation with other measures is to increase the possibilities of *access to further education and training;*

2. enhanced *road security and management,* with a reduction of accidents, including deaths on the road, and of the resources wasted thereby, including resources wasted through inadequate route and traffic information. A particular aim of the action in this field is to achieve a substantial reduction of road deaths and an increase in road transport efficiency;

3. more competitive deployment by Europe in the medical and biotechnological fields of the many new techniques available to support medical diagnosis, health care, treatment, medical records and their analysis, and the investigation of biological structures at molecular level. The aim of this action, together with other measures, is to *increase the productive part of medical care* (that part of the expenditure benefiting the patient as opposed to administrative overheads).

(b) To initiate Community research activities addressing problems of economic efficiency, safety and environmental acceptability of transport, particularly in the fields of track-guided transport, road traffic, maritime transport and air transport.

To establish the extent of need for European cooperative research in the field of aeronautical technology, leading to a common European aeronautical technology requirements plan for precompetitive research. Subsequently research would be initiated on key elements of the plan.

2.3. NEW SERVICES OF COMMON INTEREST (INCLUDING TRANSPORT)

A. PURPOSE

(a) Integration of telecommunications with information technology and broadcasting for new applications meeting common needs (in particular open learning, road transport and management of health care). In addition, the creation of an inventory of other possible areas of application.

(b) To enhance the effectiveness, economy and safety of the transport systems.

B. OBJECTIVES FOR 1987 to 1991

(a) To promote the utilization of prospective advances in information technology and telecommunications, in order to secure:

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

(a) The activities related to the integration of IT and broadcasting would, essentially, involve industry, academia, publishers, audio-visual industries, network and broadcasting operators and the national authorities concerned with each field. All activity would be at the precompetitive and prenormative stage. *The participation in the financing of these efforts would concentrate on aspects where public interests or responsibility prevail.* The cost would be shared between the Community, industry, and national budgets where appropriate. Preliminary stages would include studies of feasibility, evaluation of technical options and the development of functional specifications, with possible implications for existing or prospective standards.

(b) The new activity in the field of transport will be implemented by means of concerted action to foster synergies between national efforts. Cost-shared actions will also be necessary to initiale

common research in areas where Member States' efforts are insufficient or must be complemented. Some of the COST actions in the field of transport will be included in the Community programme.

D. TECHNICAL CONTENT

(a) **of the activities related to the integration of IT and broadcasting for new applications meeting common needs**

1. The work will concentrate on prenormative efforts. A learning system reference model would be the basis for the work on learning technology and for the concertation of requirements. Research and development would concentrate on: the learner environment; the authoring/tutoring environment, including specialized authoring languages; learning programme production; communications; testing and validation.

   The action would traverse three time horizons: the first deploying the technology available now or immediately in prospect, including the use of the compact disc for local storage and the interactivity of video discs; the second taking in the integrated services digital network leading on to video transmission via wide band, more powerful personal computers with enhanced image processing and memory addressing capability, programme diffusion via direct broadcasting by satellite, and increasingly incorporating artificial intelligence, both for learning programmes and for the construction and accessing of learner knowledge bases.

2. The key prenormative technological requirements so far identified for development or for integration into traffic safety and management systems include: human factor engineering, dashboard display, standard digital maps and network representation, vehicle location, RDS (road data service) broadcasting, cellular radio, infra-red transmission, standards for traffic message content.

3. In the field of medical- and bio-informatics, the main areas of prenormative work on: biomedical instrumentation, image processing, signal processing, laboratory equipment and patient monitoring, biomedical communications systems, fast local area networks for data handling, 'bus' standards for connection of instrumentation, standards for access to large data banks, advanced information processing, including parallel processing, and the use of artificial intelligence.

(b) **of the activities related to transport**

A general research action will be concerned essentially with the following topics:

— track-guided transport: automation of traffic monitoring and advanced signalling equipment,

— road traffic: safety and ergonomy of heavy goods vehicles, management and control of urban traffic,

— maritime transport and shipbuilding: reduction of operating costs by research on automation and rationalization of on-board functions and on preventive maintenance, traffic management,

— air transport: improvement of advanced techniques for traffic management and control with a view to promoting European harmonization.

In the field of aeronautical technology, the activity will concentrate on specific projects – still to be selected. Emphasis would be on prenormative research relevant to aeronautical equipment and operations.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

(a) **For the activities related to the integration of IT and broadcasting:**

The learning system related work is complementary to COMETT, which seeks to help the design and application of schemes of further training and education in technology, as well as to promote exchanges of academic and industrial personnel, and to create a network of associations between academia and industry. This action would build on some of the basic and enabling technologies arising from Community actions in information technology and telecommunications. One of the Eureka proposals concerns learning work stations; the companies concerned are taking part in the initial work for this action.

The road safety and management initiative has established a close relationship and worksharing agreement with the Eureka project Prometheus, which seeks to bring the car manufacturers together to devise improvements to road safety.

(b) ***For the activities related to transport:***

The work will be closely coordinated with national and company programmes and complementary activities, such as Eureka and GARTEUR.

Where appropriate, collaboration with ESA will be developed.

F. EVOLUTION OF THE ACTIVITY

The actions are phased as follows:

(a) **For the activities related to the integration of IT and broadcasting**

The exploratory phase for these actions will be concluded before the end of 1986. During this phase, main actors throughout Europe have identified the scope and scale of precompetitive and prenormative work best undertaken on a European level and primarily in the public interest or falling within public responsibility.

A pilot phase could be launched in 1987 with the objective of engaging in the conceptual and preparatory work required for optimal collaboration in the implementation of the action.

The main action, including those activities of all three parts which are retained and to be implemented, could be launched in 1988 after the completion of the pilot phase.

In-depth reviews will occur after the exploratory phase and before the pilot phase is proposed, during the pilot phase in the preparation of the main action and in yearly intervals in the definition and approval of the work plan.

During the implementation of the main action, the work plain will be reviewed each year.

(b) **For the activities related to transport:**

Work on this activity will be built up by a carefully managed sequence of requirement analysis and planning, followed by a phased build-up in the level of activity. Substantial work is likely to extend over a 10-year period.

3.1. SCIENCE AND TECHNOLOGY FOR MANUFACTURING INDUSTRY

A. PURPOSE

Research in advanced technologies is an essential element for the competitiveness of manufacturing industry. The Community can assist in accelerating this process by stimulating cooperation in research at the precompetitive stage across the frontiers, between different industry sectors and between industry research institutes and academic institutions.

B. OBJECTIVES FOR 1987 to 1991

On the basis of experience obtained and in continuing close consultation with industry, the programmes will be further focused on the strategic needs of industry.

The content of the programmes will in particular reflect the technological needs of SMEs. Other methods of including SMEs more in the process of technological renewal will be developed, such as demonstration projects and the possibility of giving a European dimension to cooperative and collective industrial research schemes.

The industrial relevance of the projects will be ensured by requiring industrial partners in all projects and a substantial commitment of industry's own resources to the projects.

Projects of a multisectoral nature will be encouraged involving a combination of 'users' and 'suppliers'.

Particular emphasis will be laid on the full involvement of industry in the formulation of detailed programme requirements and priorities and on the guarantee of an independent and objective evaluation of all proposals. These elements are particularly important if the participation of SMEs is to be maximized.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

This activity will be implemented primarily by means of shared-cost actions; where appropriate, concerted actions will be used.

D. TECHNICAL CONTENT

Within the global context of new production technologies and the application of new materials, a variety of multisectoral fields will be considered, including:

— the reliability of engineering materials, components and systems,

— advanced design and manufacturing techniques, laser technology, joining techniques, application of new technologies in manufacturing processes with special problems (e.g. production processes involving the use of flexible materials), non-destructive testing, online testing and computer-aided testing,

— membrane science and technology, catalysis and particle technology.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Appropriate collaboration will be developed with Eureka and COST projects.

F. EVOLUTION OF THE ACTIVITY

This activity will be amplified in the 1987 to 1991 period to strengthen the developing trend towards transfrontier industrial cooperation in a wide range of multisectorial technologies of strategic importance.

(ECSC actions in steel research are oriented towards the improvement of production processes, steel properties, fabrication procedures and product quality.)

3.2. SCIENCE AND TECHNOLOGY OF ADVANCED MATERIALS

A. PURPOSE

To contribute to the competitiveness of traditional and new industrial sectors in developing high-quality advanced materials, as well as to contribute to improved processing techniques for manufacturing them.

Another purpose is to increase the level of cooperation beween national laboratories of different Member States and, in particular, to offer the opportunity to laboratories from the smaller Member States to participate actively in a broader material science and technology programme. Furthermore, this programme will be widely open to SME participation.

B. OBJECTIVES FOR 1987 to 1991

The prime objective is to ensure that the manufacturing industries of the Community have a better access to a wide range of advanced

materials and that these materials are produced by cost-effective means and incorporated in high-performance components. The initial thrust is on engineering ceramics, advanced composites, light alloys and magnetic materials. Research on other advanced materials will be considered in a second phase.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The programme will be carried out in three different ways:

— the largest part of activities will be devoted to shared-cost action,

— a small part of the funding will be spent for coordinated activities (COST actions, materials networks),

— a part of this action will be carried out by direct action.

A substantial share of the programme will be directed towards oriented basic research. Cooperation between universities and industries will be the general way of implementation.

D. TECHNICAL CONTENT

Issues of highest relevance are: the creation, development and use of new materials and the upgrading for more conventional materials to a higher level of sophistication. Furthermore, optimization of processes in order to produce these new materials in a more competitive way. Fields of interest are as follows: engineering ceramics; polymers and composite materials; advanced metal alloys; magnetic materials; coating materials and surface processing; electronic materials; amorphous and disordered materials; building materials; bioengineering materials; microgravity engineering materials.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Appropriate coordination is or will be established with international initiatives in materials research, such as the relevant COST actions, the VAMAS (Versailles project on advanced materials and standards) activities and specific Eureka projects.

F. EVOLUTION OF THE ACTIVITY

Due to its nature (oriented basic research in a vital sector for a modern economy), this activity should increase substantially during the period of the framework programme.

3.3. RAW MATERIALS AND RECYCLING

A. PURPOSE

To contribute to the competitiveness of traditional and new industrial sectors of the Community, by satisfying their requirements in raw materials, both renewable (wood) and non-renewable.

B. OBJECTIVES FOR 1987 to 1991

To ensure that the sectors of industry involved in the exploitation of raw materials (mining, metallurgy, wood-using industries) have access to cost-effective means of production. To improve the self-supply potential in raw materials, such as wood, and to increase the rate of recyling.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The largest part of activities will be carried out by means of shared-cost contracts. Part of the funding will be devoted, however, to coordination activities.

D. TECHNICAL CONTENT

Primary raw materials: research to focus on problems of common interest in exploration (preparing concepts and methods in view of a future revival of exploration activities), mining technology (improving the economic viability of existing mines and developing advanced technologies for future mines) and ore processing (treating complex, lean and refractory ores and ores which contain metals for advanced materials technology).

Recycling: urban, industrial and agricultural waste are included. Emphasis is on cost-effective recycling techniques. A point of specific interest will be the recovery of special alloys and composites which will find increasing uses in advanced technologies.

Forestry and wood products: covering the whole 'wood chain' (including cork) from seed production to final uses of wood and other forestry products, including aspects such as genetic improvement, tree physiology, protection against pests and pollution (in line with the proposed forestry action programme), improvement of processing and utilization of wood products.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Several EFTA countries are associated to the relevant programmes or subprogrammes. Furthermore, a coordination with relevant Eureka projects will be undertaken.

F. EVOLUTION OF THE ACTIVITY

The overall level of activities will remain steady.

3.4. TECHNICAL STANDARDS, MEASUREMENT METHODS AND REFERENCE MATERIALS

A. PURPOSE

Uniform standards applicable throughout the Community are a key factor for industrial competitiveness. However, the necessary scientific and technological basis for the preparation and application

of such standards is often missing. There is, therefore, a strong need for generating the data wherever necessary, a task which is typically of Community responsibility (1).

B. OBJECTIVES FOR 1987 to 1991

The satisfaction of the need for further harmonization and standardization is one of the major objectives of a number of Community policies: the completion of the internal market, energy, consumer protection, agriculture, environment and health.

In addition to this need for harmonization, there will be an increasing need to demonstrate the quality of products and to prove the conformity with either written standards or regulations. This requires testing, measurements and analyses and it is essential to avoid disagreements between testing laboratories. Further, there will be an increasing need for research in particular prenormative and data bases to promote and facilitate the establishment of future written standards.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

This activity will be implemented primarily by means of direct action. Shared-cost action will also be used to a considerable extent, and concerted action will be used to a limited extent where appropriate. The choice of a particular means will depend on the nature of the project (e.g. prestandardization research, round robins, etc.) and the scientific and technical capabilities available in various laboratories.

D. TECHNICAL CONTENT

There are three main lines:

— promotion of cooperation between national laboratories to improve measurement methods (applied metrology and chemical analyses) and establishment of suitable means of verification (reference materials), recognized at Community level, in a variety of fields, including environment, health, foodstuff and industrial products,

— improvement of nuclear measurement (neutron-induced reactions, radionuclear decay, neutron flux and doses, etc.) and provision of nuclear reference materials for fission and fusion,

— prestandardization research in structural reliability and materials. The emphasis will be on reliability methodologies and models of behaviour of advanced materials and industrial structures with the view to improving codes of practice.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Depending on the nature of the projects, cooperation is sought with programmes like COST, VAMAS, international organizations in the nuclear field and with national organizations, such as the NBS in the USA.

(1) It is also to be noted that specific prestandardization work in certain areas is carried out, where appropriate, within the corresponding sectoral actions.

F. EVOLUTION OF THE ACTIVITY

The growing demand for standardization in the Community will demand increasingly scientific and technological assistance at Community level. This Community activity will, therefore, be moderately strengthened in the 1987 to 1991 period.

4.1. BIOTECHNOLOGY

A. PURPOSE

To master the properties of living cells and to secure their exploitation, in the interests of consumers, by both industry and agriculture.

B. OBJECTIVES FOR 1987 to 1991

It is necessary to reinforce the competitiveness of industry and agriculture in many areas of activity relating to the improvement, diversification or transformation of biological substances and products. To this effect there is a need to continue current efforts towards the understanding and exploitation of molecular and cellular structures and mechanisms in organisms which are important for man and for his environment. The main objective, in this area of basic biotechnology, is to promote the production of substances with high added value and the creation of microbial, plant or animal strains which express characters desired by European industry and by European agriculture.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

Community activities will be implemented by means of shared-cost research contracts and training contracts with research institutions, universities and industries.

D. TECHNICAL CONTENT

— Establishment of Community R & D networks specifically designed for contributing a transnational dimension to national efforts and for facilitating technology transfer towards industry and agriculture in each of the following areas:

  — improvement of R & D infrastructures (bio-informatics and collections),

  — basic biotechnology for the removal of scientific and technical bottlenecks to the exploitation in agriculture, industry and medicine of methods and materials originating from fundamental research,

  — analysis of risks which may be associated to the development of modern biotechnology.

— Continuous evaluation of the strategic significance of new developments in biotechnology and promotion of the essential coherence between the different areas of Community policy concerned with, or impinged on by, biotechnology.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

This action will be implemented in close relationship with the different COST activities associated with agricultural research and biotechnology.

F. EVOLUTION OF THE ACTIVITY

The general tendency in all fields of biotechnology and its applications is towards expansion, in volume as well as in diversity.

4.2. AGRO-INDUSTRIAL TECHNOLOGIES

A. PURPOSE

To benefit simultaneously agriculture, industry and the consumer, in particular through the implementation of technologies based on modern concepts in the life sciences.

B. OBJECTIVES FOR 1987 to 1991

The aim is to make best possible use of the rapid developments which are resulting from, on the one hand, basic work in the life sciences and, on the other, from the continuing progress achieved in the industrial technologies relating to agriculture, including the transformation and utilization of its outputs. The action will therefore develop between agriculture and industry a technological interface fully open to innovation. Pilot actions will also be undertaken to verify, at appropriate scale, the validity of the methods and products resulting from research in basic biotechnology and in agricultural science.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The activities will be carried out through shared-cost actions and pilot actions involving research institutes and industries, in particular those upstream and downstream of agriculture itself.

D. TECHNICAL CONTENT

— Research on the quality and competitiveness of foodstuffs,

— Research on the nutritional and toxicological properties of foodstuffs,

— Development to demonstrate innovative possibilities resulting from research undertaken in biotechnology and agriculture (industrial inputs to agriculture and new production or processing possibilities offered by agro-industrial technologies).

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

The action will be carried out in close relation with the various COST actions relating to agricultural research, food technology and biotechnology. Where mutually beneficial, appropriate cooperation will be established with Eureka projects concerning the industrial applications of the life sciences.

F. EVOLUTION OF THE ACTIVITY

The specific development of the interface between agriculture and industry constitutes a new element in the Community's activities in research, development and technology. It is essential that a resolute start should be made on this action, while accepting the obligation to evaluate correctly the potential side-effects, from the dual perspective of the Community's policies both for agriculture and for industry.

4.3. COMPETITIVENESS OF AGRICULTURE AND MANAGEMENT OF AGRICULTURAL RESOURCES

A. PURPOSE

To contribute, in particular through the application of advanced technologies, to a response to the numerous challenges (economic, social, environmental, regional) deriving from the evolution of agricultural activities in the socio-economic framework of rural areas.

B. OBJECTIVES FOR 1987 to 1991

The action will mainly be devoted to increasing the efficacy of human and financial resources devoted to agriculture. To this end, the development of a European scientific Community in the area of agriculture will be encouraged, and research efforts will be oriented according to current market realities and new requirements of the common agricultural policy.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The Community R & D actions in the agricultural field will mainly be implemented through shared-cost and coordination actions, as well as through pilot projects.

D. TECHNICAL CONTENT

Community R & TD activities will focus on the following themes:

— effectiveness of human and financial resources,

— diversification, higher quality and lower costs of production,

— development of new applications and markets,

— utilization of soil and water,

— promotion of forestry,

— effective protection of the rural environment,

— regional balance and integrated rural development.

The techniques used for this purpose include remote sensing.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

The action will be carried out in close relation with the various COST actions which are related to agricultural research.

F. EVOLUTION OF THE ACTIVITY

Agricultural competitiveness remains dependent upon steady progress in various technologies. The situation will be closely monitored with a view to identifying possible adaptation of the present equilibrium between the research themes.

5.1. FISSION: NUCLEAR SAFETY

A. PURPOSE

To contribute to improving the level of scientific and technical knowledge relevant to nuclear safety. Furthermore to contribute to the harmonization of approaches to safety within the Community.

B. OBJECTIVES FOR 1987 to 1991

To reinforce the scientific and technical basis necessary to strengthen the safety aspects of nuclear plants and operations and to provide objective information that transcends the national dimension.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The largest part of the activities will have recourse both to the Joint Research Centre and to shared-cost contracts. It is envisaged that research requiring large out-of-pile installation will be performed by the Joint Research Centre, whereas shared-cost contracts will be more adapted to cover large-scale demonstration of technologies and in-pile experiments. Other actions may be in the form of complementary programmes supporting participation, and/or joint undertakings.

D. TECHNICAL CONTENT

R & TD areas will be orientated towards issues of highest relevance:

— work on *reactor safety* will cover plants in operation and under development, including their fuel cycles, taking into account the observed behaviour of operating plants. Work will in particular address the prevention and mitigation of major accidents,

— *radioactive-waste management* will include waste treatment, conditioning and quality assurance and concentrate on demonstration of sale long-term waste disposal options in geological formation, such as salt, granite and clay. This will be accompanied by attempts to reach a European consensus on a common approach,

— work on *decommissioning operations* will involve demonstration of relevant technologies,

— *safeguarding* methodologies and techniques, and techniques for safeguards integration, will be further developed,

— work on *actinides* will provide the necessary scientific base for the areas described above.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Collaboration and information exchanges between the Community and extra-Community RTD activities have long been established and should continue (e.g. with IAEA and with OECD NEA). In particular the collaboration with the IAEA should be strengthened in view of the key role now assumed by this agency in matters of safety following the Chernobyl accident. Furthermore, the network of collaboration established within the RTD programme of waste management should continue to be exploited.

F. EVOLUTION OF THE ACTIVITY

The proposed activities take into account the need to preserve the underlying continuity of action towards longer-term objectives of nuclear safety.

Deeper evaluation of the Chernobyl accident will influence the reactor safety activity for the coming years; radioactive-waste management and decommissioning activities will evolve towards larger-scale technological demonstrations.

5.2. CONTROLLED THERMONUCLEAR FUSION

A. PURPOSE

To open a new way of power generation having a moderate impact on the environment and using a practically inexhaustible fuel. This long term cooperative project embraces all the work carried out in the Member States in the field of controlled thermonuclear fusion.

B. OBJECTIVES FOR 1987 to 1991

The following objectives are established for the period 1987 to 1991:

— JET (Joint European Torus): this installation should be fully exploited,

— Other tokamaks: the medium-size specialized tokamaks in existence or in construction should also contribute to the success of fusion,

— fusion technology: the current activities should be strengthened,

— alternative lines: the reactor potential of magnetic confinement systems other than the tokamak will be explored,

— other activities: outside magnetic fusion, the objective is to carry out a minimum programme on inertial confinement and review periodically muon-catalysed fusion.

The aim of the above activities is to establish the physics and technology basis necessary for the detailed design of NET (Next European Torus).

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The implementation of the JET project has been entrusted to the Joint European Torus (JET) Joint Undertaking, which is financed at 80 % by the Commission budget. The remaining part of the fusion activities will be executed principally by shared-cost actions (associations contracts) and for some parts by direct actions (fusion technology at the JRC).

D. TECHNICAL CONTENT

The main activities for the period 1987 to 1991 will be:

— NET is in the pre-design phase. The main performance specifications have been tentatively selected, resulting in a coherent set of parameters which is presently being used for further optimization and for guidance of the technology programme,

— JET: this is the leading fusion experiment in the world and, in order to fully exploit the potential of this device, the best use of its capabilities should be made, which implies adding some supplementary equipment (pellet injection, plasma exhaust, sawteeth and disruption control, current profile control). This requires more time and funds than hitherto envisaged. To this end, a proposal to extend the lifetime of the project up to the end of 1992 is also presently being submitted,

— the European medium-size tokamaks will contribute to the progress of fusion and to the future success of JET by experimenting with different configurations, by exploring new heating methods and by developing new diagnostics,

— the technology activity is mainly oriented towards NET, but there are also longer term activities. Efforts will concentrate on superconducting magnets, tritium, blanket, remote handling, materials, safety and environment,

— alternative lines: the construction of an advanced stellarator and of a large reversed-field pinch will be completed and results will be obtained. A flexible heliac, presently under planning, will possibly de built,

— a 'keep in touch' activity is maintained in the field of laser fusion and muon-catalysed fusion is kept under review.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

In the field of fusion, there has always been very active international collaboration:

— Sweden and Switzerland are fully associated with the Community fusion programme,

— bilateral framework agreement exists with Canada, will be signed in November 1986 with the USA and is in preparation with Japan,

— several implementing agreements in the framework of the International Energy Agency in Paris (OECD) are either in execution or in preparation,

— cooperation in the framework of IAEA with the three other large fusion programmes (Japan, USA, USSR) in the INTOR workshops,

— Discussions of technical levels are being carried out to explore the possibility of constructing the next step after JET (experimental test reactor: ETR), in the frame of a worldwide international cooperation.

F. EVOLUTION OF THE ACTIVITY

The Community fusion programme is a long term cooperative project embracing all the work carried out in the Member States in the field of controlled thermonuclear fusion. It started with the foundation of Euratom in the late 1950s and is designed to lead in due course to the joint construction of prototype reactors with a view to their industrial production and marketing.

The path to be followed can be schematically divided into three stages: demonstrations of scientific feasibility, technological feasibility and eventually economic feasibility. At present all fusion programmes in the world are still essentially in the scientific stage.

5.3. NON-NUCLEAR ENERGIES AND RATIONAL USE OF ENERGY

A. PURPOSE

The purpose of developing energy technology derives directly from the Community energy strategy, the overall goal of which is to increase, in the long term, security of supply and to decrease energy imports both at reasonable cost and in consideration of environmental conditions. With regard to the technologies covered under this activity, this objective calls for an increased contribution — in the medium and the long term — of fossil fuels and new and renewable sources and for a considerable reduction in energy demand intensity.

B. OBJECTIVES FOR 1987 to 1991

During the period 1987 to 1991, the activities will be structured progressively so as to lead to a limited number of target-oriented high-technology actions with well-defined goals. The aims will be:

— to increase the range of energy sources and reduce dependence on petroleum based products,

— to develop further the technological capabilities and competitiveness of the Community's industries in the field of energy technology,

— to reduce the economic burden of inefficient energy use,

— to reduce the adverse environmental effects of energy production and utilization.

These aims will be achieved by making progress in the development and availability of advanced technologies for the rational use of energy and the use of fossil, hydrocarbon and renewable sources. This will be ensured by stimulating and coordinating research along common lines where appropriate, and encouraging transfrontier collaboration where country-specific applications are involved.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The activity will be carried out primarily by cost-shared contractual research. It includes assessment and feasibility studies and collaborative projects. Industry will be involved for a large part in the implementation. The activity will be carried out to a certain extent by the JRC.

D. TECHNICAL CONTENT

Research and development will be focused on:

— technologies for exploiting renewable energy souces:
  — solar energy, in particular photovoltaics, passive solar technology and testing,
  — energy from biomass, mainly production and conversion,
  — wind energy, with a special accent on critical components and systems,
  — geothermal energy with, as a main objective, hot dry rocks and related technologies;

— technologies for a more rational and clean use of available energy resources:
  — energy conservation, including fuel cells and batteries,
  — solid fuels, in particular in view of their clean use,
  — new energy vectors,
  — hydrocarbons, in particular exploitation and use,
  — energy systems analysis and modelling;

— in addition to these sectoral activities, more horizontally oriented topics will be addressed, such as combustion science, sensors, deep geology, building technology, testing, norms and standards.

Within these areas, the actions will concentrate on the development of advanced (mostly long-term) technologies requiring transfrontier collaboration and on well-defined projects requiring a Community dimension for their execution.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

The longstanding collaboration with many actions carried out in the International Energy Agency (IEA) as well as bilateral actions with countries outside the European Community (USA, Japan, developing countries) will be pursued. The collaboration with ISO and other bodies for standards, etc., will be reinforced.

It is to be expected that the Community programmes will also lead to cooperation with certain Eureka projects (heat pumps, combustion, etc.) as they have already done in the past (amorphous silicon).

F. EVOLUTION OF THE ACTIVITY

The activities in this field will be continously adapted to new needs and developments. In this context, certain activities might be abandoned (as, for example, hydrogen was abandoned in the past) and related actions might be taken up, such as: deep geology for energy sources, magneto-hydrodynamic power generation (MHD).

6. SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

A. PURPOSE

To develop research capacity, both in Europe and the developing countries, in the vital areas of agriculture and tropical and subtropical medicine, and to increase scientific cooperation in these areas.

B. OBJECTIVES FOR 1987 to 1991

Scientific research to benefit the tropical world in this area remains at a limited level in Europe, while the developing countries' research needs have been increasing, and they have been unable to cope. This programme of scientific cooperation with the developing countries is intended to make it possible to:

— strengthen links between the various European tropical and subtropical research structures, to improve the coordination of their work and thus increase its efficiency,

— stimulate cooperation between laboratories in the North and South, in order to bring teams from the developing countries to a scientific level enabling them to become full partners of the teams from the North, and to develop improved South/South cooperation,

— implement measures to improve the developing countries' own research capacity, which will have the result, amongst other things, of ensuring greater long-term efficiency for development measures in these countries.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

Measures will be carried out by means of shared-cost research contracts in universities, institutes and public or private research centres. These contracts will comprise a training and an equipment section, both fundamental for the development of research in the developing countries and, when justified, the setting-up of research networks.

D. TECHNICAL CONTENT

Activity will be confined to two priority areas for the developing countries — agriculture and medicine, health and nutrition:

Agriculture

The research projects planned in this field will fall under the following four priority headings:

— improvement of agricultural production, whether of plant or animal origin, through its various constituents (improvement of species or breeds, their protection, improved yields, improvement in growing techniques, etc.),

— conservation and enhancement of the environment. This covers in particular the evaluation of natural resources, the management of water, and soil management and protection — all essential tools in the fight against desertification and the study of the exploitation of sensitive areas,

— agricultural engineering and post-harvest technologies. This heading covers research activities concerning rural engineering, mechanization, conservation and processing of products,

— growing and production systems. These involve multidisciplinary research to analyse the interaction between the factors which determine the development of plant and animal products in a particular environment.

Medicine, Health and Nutrition

Research in this field falls mainly under three headings:

— tropical diseases, whether transmissible or not, including the development or improvement of vaccines, diagnostic and treatment methods, and the control of vectors,

— operational research relating to health care systems appropriate to the rural or urban environments in developing countries,

— nutrition research which lies at the interface between a number of disciplines: medicine, agronomics, economics and the social sciences.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

As these activities are upstream of the development stage, they will be carried out in close cooperation with those of the Directorates-General involved in third world development. The subject matter of some contracts will require close collaboration with other activities planned in the framework programme.

Implementation procedures will also help to strengthen links with other bilateral and multilateral scientific cooperation bodies, for instance with UNDP, WHO, FAO, CGIAR and the UNIDO International Centre of Biotechnology.

F. EVOLUTION OF THE ACTIVITY

It is intended that research for development purposes will progress beyond the experimental stage it went through in its initial phase. It is essential to increase the volume of such research, taking into account the geographical extension of the Community and the increasing concern of countries in Latin America and Asia. Furthermore, this activity involves a strengthening of indigenous research capacities, along the lines of the Council's Decision dated 10 December 1985.

7.1. MARINE SCIENCE AND TECHNOLOGY

A. PURPOSE

To contribute to establishing a scientific and technological basis for the exploration, exploitation, management and protection of the European coastal and marginal seas.

B. OBJECTIVES FOR 1987 to 1991

To elaborate and to implement a first Community R & D programme in order to introduce the necessary Community dimension to various ongoing research activities.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The programme is to be implemented mainly by shared-cost contract research and coordination of national programmes.

D. TECHNICAL CONTENT

In the beginning the Community programme should concentrate on a small number of important topics. On the one hand, RTD areas could be: sea modelling, oceanographic research, coastal zone management, design and development of advanced instruments and technologies; use could be made of remote sensing techniques. On the other hand, supporting activities could aim at the networking of regional data centres and at ensuring a more economic use of existing major facilities, such as research vessels. Emphasis is to be given to the elaboration of common norms and standards, and to the establishment of mechanisms for data exchange.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Where appropriate, cooperation within COST and linking to pertinent Eureka projects will be ensured. In addition, collaboration will be established with relevant international programmes, such as the research activities coordinated by ICES (International Council for the Exploration of the Sea) and IOC (Intergovernmental Oceanographic Commission) of UNESCO.

F. EVOLUTION OF THE ACTIVITY

Work on this action line will be built up by a carefully managed sequence of requirements analysis and planning, followed by a phased build-up in the level of activity.

7.2. FISHERIES

A. PURPOSE

Fisheries research is an integral part of the Community fishery strategy and must contribute to meeting the needs of the market without disrupting fish resources and to a better utilization of the catches.

B. OBJECTIVES FOR 1987 to 1991

The action will focus on the development and application of new methods for resource conservation and management and waste reduction.

It will also endeavour to develop acquaculture techniques and products and will aim at a more efficient exploitation of certain zones which have not hitherto received sufficient attention.

Where appropriate, environmental factors will also be taken into account.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

The Community will lend financial support, through shared-cost actions, to research in which several Member States participate. It will promote and coordinate the exchange of researchers and the dissemination of scientific knowledge in fisheries matters.

D. TECHNICAL CONTENT

The action will focus on the management of fishing resources, catching techniques, aquaculture in sea and fresh water (including disease problems) and processing of products.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Cooperation with third countries is envisaged in the framework of COST, in particular in the area of aquaculture.

F. EVOLUTION OF THE ACTIVITY

No significant Community actions have been carried out so far. The activity will thus have to be launched, and it should reach a steady-state around the middle of the 1987 to 1991 period.

8.1. STIMULATION, ENHANCEMENT AND USE OF HUMAN RESOURCES

A. PURPOSE

Stimulation of cooperation and exchange between European research laboratories in universities and in public and industrial institutions, in order to contribute to the achievement of a *Europe for research workers,* and in particular to put existing scientific potential to good use at both the human level and that of institutions. Improvement of access to communication networks and scientific and technical information.

B. OBJECTIVES FOR 1987 to 1991

To increase the mobility of a significant fraction of the scientific community.

Establishing cooperation networks; increasing scientific exchanges; bringing together research teams which complement one another in joint research. Promoting the scientific and technical development of Europe, by giving all Community Member States genuine opportunities to take part in these exchanges.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

Contract research in the form of research grants, laboratory twinnings and operations (including equipment) as well as studies which help to define areas in which special support should be given. Putting human resources to good use through the distribution of scholarships for young researchers and through the setting-up of a 'career awards' system for senior scientists, provided they carry out their work in the Community. Eliminating obstacles and facilitating the free movement of scientific and technical facilities by regulatory measures.

Optimal use of high-level research teams in the Community, to be achieved in particular via improved means of access to communications and information networks, scientific data banks and laboratory equipment.

D. TECHNICAL CONTENT

Complementary stimulation projects covering the whole range of the sciences can be supported by financing the costs of these activities (typically, travel and subsistence expenses, staff costs, expenditure on equipment, computer costs, etc.).

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

There are close links with the complementary activities of the European Science Foundation and the Council of Europe. Furthermore, the action is to be opened to European third countries. Expressions of interest have been received from countries such as Norway, Sweden, Switzerland and Austria; negotiations with the latter two countries have already begun.

F. EVOLUTION OF THE ACTIVITY

Given the growth in demand for cooperation projects and the need for optimal use of all scientific resources in Europe, a substantial strengthening of the activities in these areas, aiming at scientific and technical development within the whole Community, becomes necessary. Contextual measures are provided for in the framework of a Europe for research workers in order to develop the transnational and interdisciplinary mobility of scientists and so as to keep highly qualified researchers in Europe.

8.2. USE OF MAJOR INSTALLATIONS

A. PURPOSE

To improve the Community's research competitiveness by rational (full) use of major European scientific and technical installations.

B. OBJECTIVES FOR 1987 to 1991

Gradually to improve and, as far as possible, optimize the development and utilization of major scientific and technical installations by exploiting the European dimension.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

Community support will be provided so as to enable researchers in the Community to make use of time and experimentation facilities at major European scientific and technical installations. In return, the installations could – thanks to the Community contribution – be adapted and given special features. The modality of the Community contribution will be decided on a case-by-case basis.

D. TECHNICAL CONTENT

Community support will include installations which have some measure of uniqueness in the European context. (An installation of this kind is complex and expensive and usually supported by a considerable scientific and technical infrastructure.) The Community effort could include areas of 'pure science' that involve large instruments and facilities, such as materials science, high-energy and nuclear physics, biology, etc., and 'big engineering science' facilities in the fields of oceanography, hydrodynamics, magneto-hydrodynamics, earthquake engineering, etc.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Close links will be maintained with international organizations with similar interest, the European Science Foundation, etc. Moreover, efforts will be made to encourage collaboration with European third countries (e.g. COST countries) in relation to the use of the major scientific and technical facilities in Europe.

F. EVOLUTION OF THE ACTIVITY

Particular emphasis should be placed on making full use of the Community's potential so far as major scientific and technical installations are concerned. Due to the Community's financial support, a significant improvement is envisaged during the reference period; the final aim is to optimize the rate of utilization of these installations in the future.

8.3. FORECASTING AND ASSESSMENT AND OTHER BACK-UP MEASURES (INCLUDING STATISTICS)

A. PURPOSE

To assess the long-term changes in science and technology and identify guidelines and priority fields for a common R & TD policy and long-term action in the Community. Also, to provide appropriate tools for the efficient and effective evaluation of Community R & TD activities and to disseminate the relevant information in the Member States.

B. OBJECTIVES FOR 1987 to 1991

To analyse the implications and consequences of long-term scientific and technological changes for R & TD policy and the socio-economic development of the Community.

To develop new techniques aimed, in particular, at analysing the impact of Community R & TD activities on industrial innovation and socio-economic development. In addition, to create a network of evaluation units between Member States and the Commission.

Finally, to develop knowledge-based expert systems in order to improve the usefulness of statistical information and the efficiency of its production.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

These activities will be implemented primarily by shared-cost actions with in-house studies, 100 % funded contracts, concerted actions and visiting fellows, as appropriate, as well as by promotion of European cooperation networks.

D. TECHNICAL CONTENT

The activities will be carried out with wider terms of reference than in the past so as to provide a better input to the Community science and technology strategy and its implementation.

Forecasting and assessment will include the analysis of the possible scientific and technological developments in the next 15 to 20 years, the assessment of the opportunities for new industrial and commercial developments associated with future scientific and technological advances and also the study of the integration of science and technology into society in the Member States and of the implications and consequences of new technology for society.

Evaluation research will cover the development and selection of new techniques, including the means of measurement of socioeconomic effects. A data base will be compiled and maintained on R & TD evaluation in the Community and in other countries.

The effort on *statistical tools* will include study of the problems underlying the construction of expert systems and systems designed to operate in selected areas, particular attention being paid to the need for the compatibility of future systems.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Contacts will be maintained with international bodies with similar interests, such as the Council of Europe, the European Science

Foundation, OECD (Organization for Economic Cooperation and Development), UNECE (United Nations Economic Commission for Europe), UNESCO (United Nations Educational, Scientific and Cultural Organization), ICSU (International Council for Scientific Unions), IIASA (International Institute for Applied System Analysis).

F. EVOLUTION OF THE ACTIVITY

A significant expansion is foreseen in the number and quality of the European networks between the Member States in forecasting and assessment of science and technology.

Similarly, a major expansion is needed in evaluation research to develop new methodologies, to promote cooperation with Member States and, above all, to ensure the systematic and effective evaluation of all Community R & TD work.

8.4. DISSEMINATION AND UTILIZATION OF S/T RESEARCH RESULTS

A. PURPOSE

To ease and accelerate the circulation of information related to RTD work and results in order to increase the efficiency of the RTD work itself, and to stimulate the process of innovation and industrial exploitation in Europe, by:

— removing the effect of linguistic barriers in the Community,

— improving the efficiency of distributed research and development activities throughout Europe,

— facilitating, through general measures, the utilization of the results of Community RDT activities by all potential users.

B. OBJECTIVES FOR 1987 to 1991

The objectives are the following:

— to develop rapid and efficient computerized systems for translation and interpretation,

— to contribute to the creation of a common integrated computer communication infrastructure and associated services, accessible to the various public and private research centres in Europe,

— for results of Community R & TD activities which must not be protected, to ensure complete dissemination by appropriate channels; for those which must be protected, to ensure a substantial improvement in the level of exploitation and the resulting creation of economic activities.

C. PREFERENTIAL MODALITIES OF IMPLEMENTATION

All modalities of Community action will be used for implementing this action. Recourse will be had to studies and creation of and support for European cooperation networks.

D. TECHNICAL CONTENT

The activity on *linguistic problems* will cover completion by 1990 of a first multilingual prototype machine translation system (for nine official Community languages), support to the industrial development of a machine translation system, development of methods and tools for the reusability of lexical resources in computerized applications, and creation of standards for lexical and terminological data.

Information and communication networks and scientific data bases will build on efforts already underway to develop and implement OSI (open systems interconnection) standards and provide the Community with high-speed and/or broadband communication services, as well as building on the potential of the RARE association (Réseaux Associés pour la Recherche Européenne).

The effort on utilization of R & TD results will include determined by the natur of the particular results: patent screening, market surveys, drawing-up of business plans and prototype or pilot installation development.

E. RELATIONSHIP TO OTHER COOPERATIVE ACTIONS

Contacts will be maintained with international bodies with similar interests, such as RARE. Where appropriate, coordination with Eureka projects will be established (e.g. Eureka Cosine project). Where feasible, results from COST projects will be used (e.g. COST 11).

F. EVOLUTION OF THE ACTIVITY

Increased attention will be paid to these horizontal actions which are an essential part of the establishment of the scientific and technological Community strategy.

A significant expansion is foreseen in the number and quality of the European networks, and renewed emphasis will be given to diffusion of R & TD results in order to promote innovation.

ANNEX III

SELECTION CRITERIA

In general, Community R & TD actions should be selected on the basis of scientific and technical objectives, their scientific and technical quality and their contribution to the definition or implementation of Community policies.

A particular aim of Community R & TD shall be to strengthen the scientific and technological basis of European industry – including that of SMEs – especially in strategic areas of high technology, and to encourage it to become more competitive at the international level.

Community action can be justified where it presents advantages (added value) in the short, medium or long term from the point of view of efficiency and financing or from the scientific and technical point of view as compared with national and other international activities (public or private).

The following criteria in particular justify Community action:

— research which contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality,

— research on a very large scale for which the individual Member States could not, or could only with difficulty, provide the necessary finance and personnel,

— research, the joint execution of which would offer obvious financial benefits, even after taking account of the extra costs inherent in all international cooperation,

— research which, because of the complementary nature of work being done nationally in part of a given field, enables significant results to be obtained in the Community as a whole for the case of problemes whose solution requires research on a large scale, particularly geographical,

— research which contributes to the achievement of the common market and to the unification of the European scientific and technical area, and research leading, where the need is felt, to the establishment of uniform norms and standards.