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**Proposal for a European Parliament and Council Decision  
adapting for the second time Decision No 1110/94/EC concerning  
the fourth framework programme of activities in the field of  
research, technological development and demonstration (1994-98),  
as adapted by Decision .../..EC**

**Proposal for a Council Decision  
adapting for the second time Decision 94/268/Euratom concerning the  
framework programme of activities in the field of research and  
training for the European Atomic Energy Community (1994-98),  
as adapted by Decision .../..Euratom**

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(presented by the Commission)



## **CONTENTS**

### **1. The framework programmes: adaptation and supplementary financing**

### **2. The criteria for deciding on the supplementary financing**

**assessment of the state of implementation of the framework programmes**  
**contribution to the competitiveness of Community industry at international level**  
**value for money**  
**development of the financial perspective of the European Union**

### **3. General context and implementation of the guidelines**

**inter-programme coordination**  
**selective supplementary financial support**

### **4. Guidelines and priorities**

#### **4.1 Themes to be reinforced through inter-programme coordination and selective financial support**

**aeronautics**  
**educational multimedia**  
**automobile RTD activities**  
**transport intermodality and interoperability**  
**environmental RTD**

#### **4.2 Themes to be reinforced through inter-programme coordination**

**life sciences: vaccines and viral diseases**  
**trains and railway systems of the future**  
**maritime systems**

### **5. Conclusions**

## Explanatory Memorandum

### 1. The framework programmes: adaptation and supplementary financing

Article 1(3) of the Decisions of 26 April 1994 adopting the fourth European Community research, technological development and demonstration (RTD) framework programme and the Euratom framework programme for the period 1994-98 provides for a review not later than 30 June 1996. In the light of the criteria set out in the Decisions, the maximum overall amount for the fourth EC framework programme could be increased by ECU 595 million to ECU 11 641 million and the amount deemed necessary for the Euratom framework programme could be increased by ECU 105 million to ECU 1 359 million.

After consulting the Economic and Social Committee, the European Parliament and the Council are expected to approve a proportional readjustment following the accession to the European Union of Austria, Finland and Sweden, bringing the maximum overall amount for the fourth EC framework programme to ECU 11 764 million. The Council also decided to raise the amount deemed necessary for the Euratom framework programme to ECU 1 336 million.

Applying the same multiplier (6.5%) to the total amount of supplementary financing for the framework programmes, which was originally set at ECU 700 million, would raise it to a maximum of ECU 745 million (ECU 634 million for the fourth framework programme and ECU 111 million for the Euratom framework programme). As stated in the respective programme decisions the actual amounts must be compatible with the financial perspective.

In preparing for this review of the Framework Programmes the Commission has explored the case for supplementary funding by means of a detailed analysis of European research needs in key areas of interest to industry and society, which also takes into account the situation of our competitors. It has come to the conclusion that significant and urgent increases in research funding are needed.

However, the Commission must also respect the pressing demands of many other policies on a constrained Community budget and the principles of sound financial management. For this reason, even though this would be more than justified on the basis of research needs, its proposal does not fully exploit the provisions for supplementary expenditure indicated above (ie. ECU 745 million), and is limited to ECU 700 million.

In view of the budgetary constraints and to exploit the research capacity of the EU to the maximum in pursuit of industrial competitiveness and social benefit, the Commission's proposal also includes provision for better focusing and coordinating existing research activities under the framework programmes, which will cover research areas where additional funding is not at present, bearing in mind all the relevant circumstances, being proposed.

Even limiting its proposal to ECU 700 million, the Commission stresses that the present ceilings of category 3 of the financial perspective should be substantially raised to allow for the satisfactory financing of RTD framework programmes and transeuropean networks. Consequently, the Commission reserves the right to modify the present proposal when it presents its proposals for the revision of 1997 and 1998 financial perspective and to modify the proposal according to the decisions of the budgetary authority on this subject.

In this regard, it is pointed out that the present proposal concerns only the increase of the Maximum Overall Amount of the 4th EC framework programme and the Estimated Amount Necessary for the EAEC. As the financing of these programmes through the Community budget has to be carried out in conformity with point 18 of the Inter-institutional Agreement of 29 October 1993, with respect to the financial perspective in effect in 1997 and 1998, the granting of supplementary financing is dependent on the prior authorisation, by the Budgetary authority, of an increase to the ceiling of the category concerned for reasons relating to the funding of the research programmes.

## **2. The criteria for deciding on the supplementary financing**

The Decisions adopted on 26 April 1994 gave four main criteria for assessing the need for an increase in the amounts assigned to the framework programmes for the period 1997-98:

### **Assessment of the state of implementation of the framework programmes**

The Commission has done its utmost to speed up the implementation of the framework programme despite the constraints imposed by the co-decision procedure and the time needed for the adoption of the specific programmes and their work programmes. The first calls for proposals, which were launched between December 1994 and March 1995, enabled the appropriations foreseen for 1995 to be committed to a level exceeding 99%.

The first indications from the evaluations of the activities under the fourth framework programme are encouraging: a massive response to the calls for proposals; much greater involvement of industry than in the past; a significant improvement in quality, a general increase in the scale of the proposals; mobilization of economic operators around projects on certain promising topics which have hitherto been tackled simply by means of concertation and which needed to be made more effective.

Some problems still exist, however. The funding currently available does not in all cases enable the proposals, the quality of which is nevertheless increasing all the time, to be dealt with satisfactorily. For example, it has been possible to finance only 20% of the proposals submitted under the Information Technologies and Telematics Applications programmes (despite an increase of ECU 53 million in the budget initially earmarked for 1995 the total requested budget was ten times larger than the available budget), 18% of the proposals submitted under the Industrial and Material Technologies programme (despite an increase of ECU 70 million in the budget available for this call) and 9% of the proposals submitted under the biomedicine programme.

Even if the proposals are for projects on a larger scale than in the past, particularly in the most industrial sectors, there is a tendency for resources to be spread too thinly, resulting all too often in projects of subcritical size. This is one of the shortcomings of the framework programme adopted in April 1994 which covers too many topics.

In view of the keen interest shown by all of the economic operators concerned, the aim now must be to provide substantial funding in order to achieve more concrete results which are better targeted on realistic objectives.

Consequently, special attention is being paid to the links between research and technological development, on the one hand, and growth and employment on the other. The fourth framework programme makes specific reference to this in the definition of the scientific and technological objectives, proposing that an effective interface should be established between the programmes and the needs of industry and society.

It is precisely in order to meet these challenges and the requirements indicated in the Decisions adopting the framework programmes, that research-industry *Task Forces* have been set up within the Commission departments.

They are based on what has been achieved under the framework programmes in progress and have the following objectives:

- to define research priorities better in closer consultation with industry, including SMEs and the users of the results, taking greater account of the needs of society. Following the philosophy of the White Paper on Competitiveness, Growth and Employment<sup>1</sup> this will help to ensure that competitiveness and social goals are pursued together, thus helping to generate a virtuous circle of higher employment and sustainable growth;
- to ensure that the means available under the fourth framework programme are more efficiently coordinated and targeted towards the identified priorities, and thereby to coordinate national activities in these fields more effectively;
- to ensure a better match between supply and demand where research and technological development are concerned and to promote an environment favourable to innovation by providing additional funding and facilitating inter-firm cooperation, especially where the legal aspects are concerned. These issues have been addressed by the recent Innovation Green Paper.<sup>2</sup>

The subject matter of Task Force themes has been the subject of careful consideration and appraisal by the Commission. This new initiative needs to be launched quickly in a few representative areas so that experience can be gathered before the fifth framework programme. In making its selection the Commission has taken into account the wide Community interest, economic factors such as the scale and the spread of industry and market prospects, as well as the interest to the population at large in terms, for example, of employment, mobility, and the protection of health and of the environment.

Certain major themes have been identified<sup>3</sup> in areas connected with the information society, aircraft, motor vehicles, transport, life sciences, maritime systems and the environment.

So far, the Commission has set up the following Task Forces: *new-generation aircraft, multimedia educational software, car of tomorrow, transport intermodality and interoperability, vaccines and viral diseases, trains and railway systems of the future, and maritime systems of the future*. In addition, the Commission is in the process of formalising the setting-up of a Task Force focusing on water, based on considerable prior work by the services. Further Task Forces may be established in the future; possible candidates might be, for example, in the areas of eco-building, renewable natural resources, and technologies for the protection of goods against counterfeiting.

Industry, users and the research community have been widely consulted by the Task Forces and have given strong support to the initiative, as indicated for example by opinion of the European Science and Technology Assembly (ESTA) published in November 1995. The quality of discussions which have taken place between these parties and the Task Forces already confirm the relevance of this formula.

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<sup>1</sup> COM(93)700

<sup>2</sup> COM(95)688 final

<sup>3</sup> SEC(95) 1824.

The reports of the Task Forces, which the Commission intends to publish in the near future<sup>4</sup>, will provide detailed and well-supported analysis of the challenges and of the EU's pressing research needs in these areas, taking account of existing national and European activities, and of the necessary contributions of the private sector, and setting out plans for cost-effective action at the Union level.

### **Contribution to the competitiveness of Community industry at international level**

In view of the specific structure of research in Europe, the public authorities, in particular at Community level, play a crucial part in financing research which, as the Green Paper on innovation stresses, plays an important role in supporting innovation. The 1993 White Paper on Growth, Competitiveness and Employment strongly recommends that research efforts should be increased.

The situation is urgent, as the following observations show:

- Between 1987 and 1993 public spending on research carried out by enterprises amounted to some ECU 168 billion in the United States compared with only ECU 66 billion in the Union. Public support represented around 27% of companies' research investments in the United States compared with an average of 14% in the Union. During the same period US support for civilian R&D increased by 30% in real terms. Although these figures and their trends may be disrupted by the outcome of the current US budget debate, this is unlikely to erode entirely the large discrepancy between the levels of EU and US public support.
- In 1987 the balance of trade in advanced technologies between the Union and the United States was more or less in equilibrium. In 1993, however, while the United States and Japan had a surplus of ECU 75 billion, the Union had a deficit of around ECU 14 billion, and the gap is widening.

The Union cannot afford simply to follow its competitors' lead. It has to be prepared to set its own priorities with a forward looking RTD policy. Moreover, research and technological development can play an important role in the revival of growth and employment in Europe. Generating new knowledge and knowhow opens up opportunities for product, process and service innovations (as well as new ways of consuming or of organizing work and inter-firm relations, including relations between SMEs) and ultimately provides opportunities for transforming and enlarging existing markets or creating new ones. In doing so it also contributes to and reinforces the initiatives taken with regard to competitiveness, growth, employment and social cohesion in the context of other Community policies (structural funds, social fund, environmental policy etc.).

The employment effects of RTD also depend critically on other structural factors such as the demand trend, industrial structures and specializations and the organization of work and society. Early recognition of users' needs and of the socio-economic context in the direction and priorities of research is an essential factor in the effective utilization of research results by economic and social actors.

The technology/growth/employment dynamic depends increasingly on an ability to invest in intangible assets: knowledge, technical skills, creativity and innovation; Europe, and even more so its main trading partners, the United States and Japan, for example, are aware of this and of the corresponding need to focus their resources on the key areas which generate wealth and at the same time create a

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<sup>4</sup> In the case of the Task Forces on New-Generation Aircraft, Car of Tomorrow and Multimedia Educational Software, these will be available in Spring 1996.

closer relationship between industry and the research community. This was, indeed, one of the conclusions of the first Ciampi report on Enhancing European Competitiveness.<sup>5</sup> Because such key technologies are of generic importance across a wide range of industrial sectors, the benefits of such a focus will be felt across the whole of the EU. The framework programmes have proved themselves to be a sound basis for developing such a focused orientation for research in Europe which reflects the EU's strategic needs.

### **Value for money**

Two points need to be mentioned, one concerning the coordination of the resources allocated to research and the other concerning the evaluation of the economic effects of Community research activities.

First, experience has shown that Community research programmes encourage the formation of networks and enable a considerable amount of time to be saved by involving industrial and public-sector researchers at the stages of basic research and research and development. This makes it possible to avoid fragmentation of research activities and duplication of work and ensures a more even distribution of the risk inherent in any research. Business enterprises, including SMEs, are the main beneficiaries. SMEs in particular have also benefited from the simplification and harmonisation of administrative procedures, specific stimulation measures which have involved the wider availability of exploratory awards to assist firms in developing fully fledged proposals, and the extension of cooperative research (CRAFT) actions.

Second, with regard to the impact of Community research activities, the recent evaluations in 1994 of, for example, the Industrial and Materials Technologies programme (BRITE-EURAM), one of the most important in the field of industrial research, indicate that the measurable economic impact of industrial research activities jointly funded by the Union is on average seven times greater than the initial investment, that 48% of projects may result in at least five applications, and that 74% of results reach the market three years later. It has consistently been found that Community research provides a stimulus to long-term international collaborations extending beyond the life of the projects themselves.

The following can be counted amongst the many "success stories" from Framework Programme research:

- A project in the Information Technologies programme has facilitated the development of a particularly powerful supercomputer. At the time of its development (1994), it was the fastest computer in Europe. This success enabled the British company marketing it to enter a market which had until then been occupied exclusively by Japanese and American companies.
- By the end of March 1996, a network of European laboratories is set to complete the sequence of the yeast genome. This will be the first time that all genes of a complex living organism are unravelled. Started under the Community BAP programme, the project has involved more than 100 laboratories, backed by an association of interested industries, and demonstrates that ambitious objectives can be achieved very rapidly by bringing European laboratories together in networks.

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<sup>5</sup> *Enhancing European Competitiveness*, First report of the Competitiveness Advisory Group to the President of the Commission, the Prime Ministers and Heads of State, June, 1995



- An EC project under the JOULE programme has shown - a world first - that when the coal used in power stations is mixed with waste, emissions of pollutants (particularly CO<sub>2</sub>) are substantially reduced. Based on these findings, a new project has been proposed to construct a 5 megawatt pilot plant in Germany which would produce clean electricity for a town of 30,000 inhabitants and burn all the waste generated in the town.
- A project under the Industrial and Materials Technologies programme has resulted in a car engine incorporating components made of plastic (reinforced with glass fibre). The tests have been very encouraging: noise levels have been reduced by 30% and gas emissions by 20% compared with a conventional engine. A prototype has been successfully constructed.

Through reinforcing and improving the focusing and coordination of research activities in key domains for Europe, the actions undertaken under this proposal will help further to improve the cost-benefits of European research.

### **Development of the financial perspective of the European Union**

Reference has already been made to the development of the financial perspective under point 1 above. Given the time limit of 30 June 1996 for the Decision to be taken, as laid down in the April 1994 Decisions on the fourth EC framework programme and the Euratom framework programme, the urgent need to adapt the framework programmes, and the lead times involved in the co-decision procedure, the Commission must submit its proposal without delay.

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The criteria are therefore now met for the submission of this proposal as a result, first, of the urgent needs identified and, second, the need to meet the commitments entered into and the time limit for the co-decision procedure (30 June 1996).

### **3. General context**

The concept of the framework programmes in progress were basically framed in the early '90s. Since then there have been rapid fundamental changes, notably with respect to international competitiveness and the technological and societal issues to which Community research must adapt, possibly necessitating readjustments and the selective reinforcement of certain activities.

The Union's main competitors are endeavouring to strengthen their companies' competitive base, and the Union needs to do likewise, focusing its funding on a limited number of areas. Europe has genuine advantages. It also has to realize like its competitors that it needs to have a sufficiently solid science and technology base in certain critical areas. It can be noted that:

Public spending cuts in the Member States have resulted in a reduction in their research budgets, but average spending on research in relation to GDP remains higher in the US and Japan (2.7%) than in the Union (2%). In order to improve this state of affairs in the most cost-effective way, it is therefore necessary to reinforce the Union's joint research effort.

As the White Paper on competitiveness, growth and employment and several important studies (eg the British "Technology Foresight" and French "Technologies-Clés") show, a small number of key

technologies will determine the future competitiveness of countries and firms. Comparative appraisals, based on patent data, indicate that Europe's technological weaknesses compared with the United States and Japan are relatively greater in precisely these key technologies for the future<sup>6</sup>.

Although targeted on specific objectives, the research connected with the areas identified by the Task Forces is not sectoral in nature. It aims to promote the development, demonstration and the integrated utilization of various generic technologies in which companies would not invest or would invest too late without initial public support.

The response to the research needs identified will be reflected in adaptations to the specific programmes under way and can basically take two separate and complementary forms:

- **increased inter-programme coordination**, which will be used systematically and which could involve modifications to work programmes, publication of grouped or joint calls for proposals, clustering of projects arising under different programmes, integration of targeted technological projects, liaison with Eureka, consultation with national programmes, etc.;
- **selective supplementary financial support** which, following a similar approach will enable the reinforcement of certain activities by augmenting the current framework programmes.

In order to make use of the flexibility of the instruments available, there is a need for closer concertation between the various parties involved in order to facilitate contacts between different scientific areas and complementary technological systems. These modalities demonstrate a clear desire for coherence; so as to make the objectives and efforts as transparent as possible. To be totally effective, the research connected with the areas identified by the Commission with the help of the Task Forces need to be efficiently coordinated with activities in the Member States, within the limits of competition rules as set out in the Treaty and relevant secondary legislation.

Although this does not form part of the present proposal the establishment of supplementary programmes (Article 130k), Community participation in RTD programmes undertaken by several Member States (Article 130l), and/or the setting-up of joint undertakings or any other structure (Article 130n) could also be envisaged in the future.

#### 4. Guidelines and priorities

The conclusions of the Commission's analysis are unambiguous: there are many areas where increased EU research activity would bring major benefits. As limited funds are available, a choice has to be made in order to ensure that their impact is not diminished because they are spread too thinly. A *pro rata* allocation would be ineffective. In order to achieve the necessary critical mass the current proposal therefore focuses extra funding on research orientated towards the priority themes where, taking account of the situation in all member states, and of the activities of industry and the private sector, the evidence suggest there is the most urgent demand for additional European effort. Other areas, where for the moment the demands are marginally less pressing, should be addressed by greater focusing and coordination of activities within existing budgets.

In determining research needs the analysis carried out by the Commission, assisted by the Task

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<sup>6</sup> See, for example the very recent report "Des technologies-clés pour l'avenir" Lettre OST, Observatoire des Sciences et Techniques, N° 10, Jan, 1996.

Forces, has considered the following factors: existence of industrial bases (including SMEs and subcontractors); market opportunities; effects in terms of cohesion: knock-on effects of technologies promoted in the various regions of Europe; positive impact on employment; environmental soundness and sustainable development opportunities; existence of an industrial and political consensus; public interest; and globalisation of markets. In every case, the key has been to identify the need for action at Union level, as is well illustrated below.

Considerable risks are involved in research on high technologies. Community participation in research activities in these areas remains modest, given their very high costs, but such participation serves as a catalyst for enterprises, universities and research centres to work together. The Task Forces have analysed the actions undertaken at national level so as to establish what should be done by the Community. Moreover, better coordination of national and Community activities will itself help to avoid duplication.

#### **4.1 Themes to be reinforced through inter-programme cooperation and selective financial support**

The Commission's analysis, taking account of the need for a balanced proposal result in the following priorities for the allocation of selective supplementary financing. The purpose of additional research funding is not to expand further the areas of research within the framework programme, but to bring together and fill the gaps in existing research around integrating themes.

##### **Aeronautics**

In recent years, technological innovation and cooperation have enabled Europe to mount a challenge to the dominance of US firms in the world markets for civil aircraft, which is underpinned by a level of public support for civil aeronautics research four times higher than the ECU 400 million per year provided in the EU. These markets are set to expand considerably over the next two decades.

Air traffic is likely to double over the next fifteen years. The potential world market is estimated at 17 000 new aircraft, representing an investment of around ECU 1 000 billion over the next two decades. In this context, only companies capable of making aircraft which are efficient, safe and environmentally friendly will be able to compete. This trend is already apparent in the United States where a highly restructured industry receives in excess of \$8 billion annually in government support for civil and military aeronautics R&D.

The 7000 firms directly involved in this sector in the EU (of which the vast majority are SMEs) have a total of nearly 400 000 employees. Other industries are indirectly involved (e.g. those producing new materials). In all cases, they employ highly skilled workers.

In its Communication "The European Aircraft Industry: First Assessment and Possible Community Actions"<sup>7</sup>, the Commission not only recognised that "aeronautics exerts a knock-on effect on the acquiring and mastering of a very broad range of leading-edge technologies and of know-how, which are applicable to other sectors", but also identified the need to "maintain the technological level" of the European aeronautics industry as a key element of competitiveness, noting that Europe was "still penalised by the excessive fragmentation of public support for research and technology". The demonstration and application of key technologies through an integrated programme at EU level can

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<sup>7</sup> COM(92)164

therefore make a crucial difference to the aeronautical industry whose survival depends on co-operation on a European scale.

The discussion process initiated on new-generation aircraft should enable European industry to be fully involved in the development of a new generation of aircraft which are more competitive in terms of their production and more efficient and safe in terms of their use, and which can meet high environmental standards. Engineering techniques and computerized inter-firm communication techniques facilitating joint developments will also be explored.

There is broad consensus across all branches of this industry (airframe, engine and equipment manufacturers), which have been widely consulted, on the priority topics for research, technological development and demonstration where action at European level could have a major impact on industrial competitiveness. Moreover, aeronautics research gives rise to major technology transfer to many European industrial sectors throughout all Member States.

These recommendations are designed to ensure the selective reinforcement of and an improvement in synergy between certain activities under the first area of activity of the framework programme.

To this end, for the aeronautics sector an overall amount of ECU 165 million is foreseen.

### **Educational multimedia**

In the information society, education and training must, in addition to their traditional tasks, prepare citizens for using the new communication tools. The Bangemann report "Europe and the Global Information Society", to the European Council of June 1994, the first Campi report "Enhancing European Competitiveness" to the European Council of June 1995 and the White Paper on education and training<sup>8</sup> stressed the importance of this. At the same time, educational multimedia should allow the modernization of teaching methods if it allows a user-friendly access, off-line or on-line, to programmes offering high interactivity, rich contents - text, images, sounds - and good pedagogical value.

The main end-use sector for multimedia educational software in Europe is in schools, with nearly 67 million pupils, 4.5 million teachers and 350 000 educational establishments. At present, much of the demand in this sector remains latent as a result, among other things, of the fact that the computer:pupil ratio is too low - about 3 computers for every 100 pupils in France compared with 11 in the United States. Furthermore, the average rate of household computer ownership in Europe is 19% compared with 27% in the United States. Across the Union, large industrial groups, telecoms operators publishing and communication companies, and especially many specialist small businesses, are actively contributing towards the emergence of the multimedia educational software market. The knock-on effects, especially in terms of employment, are expected to benefit SMEs in particular, which are already very well represented in this area. All these actors are committing themselves to a swift research and development effort. Indeed, in 1995, the "Education and Training" sector of the Telematics Applications programme was heavily over subscribed. The total requested funding was 18 times larger than the available budget.

Expertise in the field of educational multimedia is widely distributed throughout the Union: software designers, editors, multimedia designers, and graphic designers represent a valuable potential resource.

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<sup>8</sup> COM(95)590

Vigorous efforts in terms of research, development and demonstration in the field of multimedia educational software will, however, be needed to translate this know-how and these technological breakthroughs into practical achievements. It is necessary to face up in particular to pressure from the big American companies which dominate the market to a large extent, to build on Europe's cultural and linguistic diversity, and to prepare for a new generation of multimedia educational products and services by the end of the century.

The objective of this research, development and demonstration effort is to mobilize a critical mass of operators and resources in order to design and try out innovative contents, software platforms, multimedia tools and services tailored to meet the needs of educational establishments and firms in Europe and also allowing them to answer the needs of other countries, in particular developing countries, in the global information society.

Efforts will focus on the coordination of Community programmes and their complementarity with national initiatives. This coordination will concern research and development programmes such as the Telematics Applications, the Information Technologies and the International Cooperation programmes. It will also cover programmes that have a multimedia content (such as MEDIA II and INFO 2000), and those which have an educational and training content (such as SOCRATES and LEONARDO).

It is proposed that certain areas of the fourth framework programme should be reinforced.

To this end, for multimedia educational software an overall amount of ECU 125 million is foreseen.

#### **Automobile RTD activities**

Road transport is a major source of harmful externalities, both social and environmental, for which a pan-European solution must be found rapidly, and is a serious concern recognized in the Commission White Paper "The Future Development of a Common Transport Policy"<sup>9</sup>. An effort has to be made to accelerate the development of clean vehicles allowing the reduction of these harmful externalities, especially anticipating that the regulatory framework will become increasingly restrictive in environmental matters.

European citizens and public authorities are expecting cleaner and more economic vehicles, so as to reduce the rising levels of emissions from pollutants and greenhouse gases and other adverse effects of traffic which, as stressed in the Green Papers "Towards Fair and Efficient Pricing in Transport"<sup>10</sup> and "The Impact of Transport on the Environment"<sup>11</sup>, continue to increase. The Green Papers indicate that most ozone producing emissions are attributable to road transport, and that road transport is responsible for a considerable proportion of CO and particulate emissions. In addition the White Paper "An Energy Policy for the European Union"<sup>12</sup> identifies the need for strong policy intervention to achieve stabilization of CO<sub>2</sub> emissions at 1990 levels by 2000, reflecting international commitments. A global approach to transport problems will be necessary to fight against pollution and greenhouse

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<sup>9</sup> COM(92)494

<sup>10</sup> COM(95)691

<sup>11</sup> COM(92)46

<sup>12</sup> COM(95)682

gas emissions , which do not respect national boundaries.

The motor vehicle sector is a key sector of the European economy. The value added by the production of vehicles accounts for 2% of GNP and the annual turnover of the car industry exceeds 200 billion ECU. More than 4 million jobs depend on the automotive sector, of which about half are in production.

European industry will have to find rapidly the technological solutions, which will allow the mobility expectations of the citizens of the Union to be met in a sustainable way, whilst increasing the European motor industry's market share. The declining trend in export earnings since 1989 is a major concern. The United States and Japan have already committed considerable resources, far beyond those available in any single Member State. The US has launched a substantial programme "Partnership for a New Generation Vehicle (PNGV)" which involves the principal US car manufacturers. However the Member States cannot respond to such a challenge by themselves. A European focus on automotive RTD can have a strong multiplier effect, avoiding wasteful duplication by coordinating industrial, national, European and appropriate international efforts. It will also secure the widest application of newly developed clean technologies through a common basis for technology assessment, identification of opportunities for greater standardisation of components and fuels, and market exploitation.

A significant effort will be made at the level of the Union to improve the coordination of the resources and competences. This coordination will have to take into consideration the current actions within the FP4 in the programmes *Non-nuclear Energy*, *Industrial and materials Technologies*, *Telematic Applications*, *Transport* and *Information Technology*, which only focus on a limited part of the objectives for low emission vehicle-related RTD which have been identified through broad consultation with all the actors concerned. It is therefore necessary to reinforce the most relevant activities undertaken by each of these programmes to fill the existing technological gaps in the realisation of a new generation of clean, safe, efficient and intelligent vehicles.

In Europe, an increased effort and coordination of automotive research could have major consequences in terms of employment and training, with knock-on effects for equipment manufacturers and suppliers. European SMEs should also benefit from this action by working in partnership with large companies to develop new components for new vehicle concepts and corresponding infrastructures and services for the transport systems of tomorrow.

In the medium term, the objective is to realise economically viable and intelligent vehicles able to respect the ultra-low (ULEV) and zero emission (ZEV) objectives. No technology is encouraged *a priori* and a continuous process of comparative assessment will be set up with a view to defining the most cost-effective and socially acceptable future development strategy. European industry, which fully shares these global objectives, will itself choose the most suitable competitive technologies to achieve targets to be agreed, in respect of energy efficiency and reduction of polluting emissions.

To this end, for automobile RTD activities an overall amount of ECU 130 million is foreseen.

### **Transport intermodality and interoperability**

At present there is a significant lack of integration between the different modes of transport (road, rail, waterborne, air). As a result the market shares of road transport - the only transport mode that does not need to rely on other forms of transport - continually increases. The consequence of this situation is that pollution fails to come down sufficiently and road congestion is growing strongly.

The daily average of 4000 kilometres of traffic jams on European highways cost the businesses and citizens of the Union some 120 BECU per year in time delays and transport inefficiencies, which are gradually undermining the competitiveness of the European economy and affecting the quality of life of Europe's citizens. The Commission's Green Paper on the Citizens Network<sup>13</sup> shows the importance of intermodality for passengers to encourage more use of public transport.

Clearly, alongside cleaner car and truck technology, greater use of the environmentally friendly and less congested modes, notably rail, has to be made to correct this trend. This requires a better integration of the different modes of transport and the removal of obstacles to the interoperability of rail systems that have often been developed on different national bases in the Community. The economic, social, environmental and safety advantages that could ensue are very significant. For example, even if the resulting increase in combined transport would only reduce the external costs of road transport by 5%, it would still represent an annual benefit of at least 12 BECU to the European economy. Such action would also make an important contribution to Community integration. These issues are clearly set out in the Commission's Green Paper on Fair and Efficient Pricing in Transport.

The Community is already supporting this development through its work on the multimodal Trans-European Transport Network as well as in existing activities of the Fourth Framework Programme. However, to realise the significant market potential that exists more progress is also needed on the provision of information and technologies for integrated transport services. Vigorous RTD efforts are required. The RTD resources presently earmarked for transport intermodality and interoperability are far from adequate in the face of the size and complexity of the problems to be tackled, particularly when considering the need for demonstration projects to validate the solutions envisaged. Development of such actions at the European level is justified to avoid fragmentation of the European transport system, promote the full interoperability of transport networks and assure adequate links with neighbouring countries. Furthermore, a coherent European approach will have a multiplying effect on the efforts already underway or envisaged in the member states and contribute to making European industries more competitive in the world market. There is broad consensus on the increasing importance of intermodal transport solutions, the need to promote European supply industries and particularly SMEs and the necessary RTD priorities. Areas where urgent action has to be taken include: advanced technologies for passenger and freight transport, intelligent transport systems, traffic management and integrated passenger/freight information and logistics.

Efforts are needed to better coordinate ongoing research activities and expertise. A reinforcement of the activities under the Fourth Framework Programme is needed to arrive at the necessary critical mass and achieve tangible results that can have a significant impact on the Transport system in terms of reduced congestion and improved quality of transport service, and on the competitiveness of Europe in terms of performance and market share.

To this end, for transport intermodality and interoperability an overall amount of ECU 90 million is foreseen.

### **Environmental RTD**

Concerns over environmental effects of economic development have steadily increased during the 1970s and 80s. In the 90s pressures from the "green" lobby groups have been gradually accepted by the mainstream political bodies and incorporated into general economic and industrial development

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<sup>13</sup> COM(95)601

policies. It is now widely accepted that eco-industries represent a major, rapidly expanding market.

Industry and research should be brought together in order to develop management strategies and technologies which can ensure better control of environmental phenomena, rectification of (past) environmental damage, and reduction of environmental risks associated with any human activity. Although this is considered to be of relevance for all sectors of the economy and has been incorporated into general policy, there are two areas where specific actions on the part of the EU should be promoted : **water and nuclear safety** (the latter by means of reinforcement of Euratom activities).

Proper management of water resources represents a major challenge for society because of the geographical disparity between water reserves and population density, demographic pressures, deterioration of quality and over-exploitation of water resources, and global environmental pressures which have a detrimental impact on the water cycle.

Sustainable provision of water has become a matter of urgency throughout the world; the European Union and its immediate neighbours from Eastern and Central Europe and the Mediterranean basin are no exception. This has been highlighted by a series of high level international conferences (Rio, Dublin, Rome, Cairo), and in the Community context by the 5th Environmental Action Plan: Towards Sustainable Development.

Many efforts have already been made in RTD, infrastructure development and legislation to cope with the various issues. However, a reinforcement of the Community RTD effort is amply justified. As of now, Community water-related RTD activities are minimal (around 1% of the total RTD spending over the last 10 years); they lack credibility and visibility, and are not adequately related to relevant initiatives taken in other policy areas, such as environment, regional development, agriculture and international co-operation. It should be noted that the Council and European Parliament last year requested a comprehensive review of EU water policy, which is the subject of a forthcoming communication.

The initiatives taken in the context of other policies have considerable influence on the nature of demand for technologies and services and the development of the relevant market (eg. the Urban Wastewater Directive requires that communities with a population equivalent of 10-15 thousand must have an urban waste water collection and treatment facility by the year 2005). Community RTD must assist enterprises and other actors to respond to these developments. It must help to reduce regional disparities in technological and managerial performance relating to water systems, and to solve ongoing problems of water pollution and over-exploitation. It must also help devise adequate response to extreme events such as accidental pollution or flooding.

The global water industries market (equipment and services) is set to triple in the next fifteen years to reach some ECU 125 billion. However to participate fully in this market will require efforts both for the adapting technologies and innovation in financial engineering and the organisation of co-operation.

Analysis of research needs, taking account of existing community RTD actions, indicates that: additional effort and more strategic targeting in international research cooperation is required; research needs to be carried out into a range of advanced techniques; and information, planning and management systems need to be tested in order to ensure greater control over water resources in terms of availability, quality and efficient use. Many Union countries have an excellent technical and scientific base in this field, but action to improve coordination and



strategic targeting of the research effort will help strengthen Europe's position in its home market and worldwide. At the same time, the Union would be able better to concentrate its development co-operation actions towards the promotion of sustainable management of water resources, in regions where water is becoming an increasingly serious problem, to the extent of becoming in some cases a genuine political issue (resource-sharing problems).

As advocated by several national and European bodies concerned with water-RTD (EUREAU, EURAQUA, TECHWARE, UKWIR, etc.), operational links should be established between Community research programmes, JRC activities, national and regional programmes, and private sector research. Despite water management being essentially a local activity, there are several themes of common interest, where a European approach is amply justified, as a matter of efficiency. It is therefore also necessary to reinforce certain areas of both the first and second activities of the fourth framework programme.

To this end, for water-related RTD an overall amount of ECU 85 million is foreseen.

The topic of **nuclear safety**, especially in Central and Eastern Europe and the CIS States, which is another area with a significant technological and scientific content which is critical in terms of its potential environmental impact, is also a very urgent issue. The citizens of the entire continent of Europe are calling for greater protection. The public authorities' ability to harmonize these technologies, limit the risks and take preventive action will be a measure of their credibility.

It is an area of excellence as far as European know-how is concerned and one in which better coordinated research work is needed: exploration of innovatory approaches to achieve extremely high safety standards, safety of existing reactors, decommissioning techniques, waste processing, impact on man and the environment, control of pollution caused by past incidents in response to the demand of constructors and operators and public expectations. Coordination with the Union's assistance programmes will be assured.

The reinforcement of nuclear safety activities comes under the Euratom framework programme. Supplementary funding is essential to support cooperation with the East, to accelerate safely technology innovation and to strengthen European industry.

To this end, for nuclear safety an amount of ECU 105 million is proposed, corresponding to the total increase in the Euratom framework programme. To the Commission's way of thinking, much of this amount should be assigned to improving nuclear safety in Central and Eastern Europe and the CIS States.

#### **4.2 Themes to be reinforced through inter-programme coordination**

The Commission's analysis suggests that the following themes should also be given priority. They should in particular be the subject of improved inter-programme coordination. As this stage, bearing in mind the criteria adopted and the available resources, it is not envisaged that these themes will be accorded additional funding but, given their undoubted importance, a number of key considerations are set out here.

##### **Life sciences**

Infectious diseases are responsible for 17 million deaths in the world each year. HIV infection could reach 40 million people, including over five million children, by the end of the century. New diseases

such as Hepatitis C, with more than 5 million patients in Western Europe, are increasing societal concerns. The challenge ahead overwhelms the means available to any one country. Vaccine development clearly demands transnational leadership and resources as well as the adoption of multi-disciplinary approaches within the life sciences.

The reorganization of the vaccine market, strong competition of the US and Japan, and the emergence of new producers (ASEAN, Canada) represent a challenge to Europe only to be faced by substantial development of European R&D capacity and a better positioning in existing and emerging markets, which are rapidly evolving and growing.

The pharmaceutical industry has been and still largely is, a pivotal sector in European industry, employing over half a million people. The growth of biotechnologies industries, 20% of them implicated in therapeutics, will create 2 million jobs in the European Union by the year 2000. The overall growth in employment in this area is estimated at 1 percent a year, considerably higher than the general European industry average. Most of this growth is expected to come from small and medium sized companies distributed across Europe.

With western healthcare demands growing from about 632 billion ECU in 1990 to roughly 1340 billion in 2025, measures to decrease healthcare expenditures are urgently needed. Cost/benefit and cost/effective analysis for most vaccination programmes have shown strong reduction in public health costs. Furthermore, vaccines could go beyond prevention, serving as therapeutic agents against certain diseases (e.g. herpes). Vaccines against cancer, which in 1994 alone was the cause of an estimated 6 million deaths worldwide, and auto-immune diseases, are currently being developed, generating new market targets.

Actions on vaccines and viral diseases would be of benefit to the entire EU, both in terms of public health and economic development, through the promotion of close partnerships and networking structures between governments, industries, SMEs and academia. In addition, it would be of benefit to European external partners. Controlling disease outbreaks in other countries, mainly in developing countries, is important primarily for humanitarian reasons. But it also prevents those diseases from entering Europe, at great savings of lives and healthcare costs.

### **Trains and Railway systems of the Future**

The main parties involved in the development of rail transport are seeking to improve the quality of rail infrastructure, equipment and services and integrate the EU's fragmented rail systems into a multimodal European transport system. This type of approach, based on interoperability and interconnection, is needed in order to fully exploit the gradual opening-up of rail markets to competition and assure links to Central and Eastern Europe.

The activities in the area of trains and railway systems of the future are designed to ensure that rail systems take greater account of users' needs in terms of comfort, punctuality, reliability, safety, speed, profitability and information. The objective is to identify and overcome the shortcomings of the market and barriers to full exploitation of the potential of this mode of transport. Joint projects of industrial interest should help to make the European transport system more environmentally friendly, e.g. by reducing road congestion. Its activities will strive to make industry, including SMEs, more competitive by reducing transport costs and boosting the activities of the industries which supply capital goods for the rail sector.

The development of long-term European strategy for the railways and the coordination efforts will

concern the Telematics Applications, Information Technologies, Industrial and Materials Technologies, Energy and Transport activities of the fourth framework programme.

### **Maritime systems**

The maritime industries operate throughout the world and have to face strong international competition. In recent years, technological development and cooperation have enabled the European industries to increase their competitiveness and productivity. The maritime industries include shipping, shipbuilding, shiprepair, the service sector, marine equipment and the "marine resources" industries, including fishing, with a large number of SMEs which make a major contribution to local economies throughout the EU. Technological progress is crucial to the success of this industry which is of major importance in Europe. The three main sectors of the industry (shipbuilding, maritime transport and marine resources) provide more than 800 000 jobs in the Union.

On the basis of the work of the Maritime Industries Forum and hence on the basis of a consensus within the industry, the task mainly consists of assessing and pinpointing the industry's needs, coordinating the Community programmes with an impact on the maritime sector, analysing the priorities for industrial competitiveness, and coordinating the MARIS initiative (Maritime Information Society) at both European and G7 level. One of the 11 projects adopted by the G7 countries, the MARIS project is of general interest not only at European but also at world level. Special attention is being paid to strengthening and ensuring greater coordination between the various Community programmes (in particular Telematics Applications, Industrial and Materials Technologies, Energy, and Transport) and to the creation of complementarity between those programmes and the national programmes.

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Some of the work relating to the selected topics will be carried out in conjunction with non-Community partners and will help to reinforce international scientific and technical cooperation. This is in keeping with the recent communication entitled "Perspectives for international cooperation in research and technological development".<sup>14</sup> In particular it concerns cooperation:

- with the Central and Eastern European countries on the subject of nuclear safety; on water in order to devise adequate (and economically affordable) technological responses to the severe problems of water pollution encountered by these countries; and with regard to intermodality and interoperability of transport in order to promote the economic and geographical integration of these countries with the Europe of the Community;
- with the countries of the Mediterranean basin on the topics of water (North Africa and the Middle East being the regions of world experiencing the most severe unbalance between water availability and water needs, with 70% of the population supplied with less than 2000 m<sup>3</sup>/per inhabitant/per year already now, and current abstraction reaching already 75% of available resources) and vaccines, as well as on transport themes, particularly maritime ones;

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<sup>14</sup> COM(95)489.

- with the developing countries, in particular on topics related to environmental (water) technologies, multimedia and transport;
- with the most advanced third countries, in order to achieve more balanced cooperation.

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## **5. Conclusions**

The topics addressed, the range of means of action considered and the proposed reinforcements concern the entire EU and will make for greater economic and social cohesion. They will also help to make the overall effort envisaged more coherent, better coordinated and more effective.

On this basis, the Commission proposes the necessary redeployment and additional funding to adapt the framework programmes to the rapid development of the situation and the challenges with which the Union is faced, with a view to making its industry more competitive and improving the well-being of its citizens.

**Proposal for a European Parliament and Council Decision adapting for the second time Decision No 1110/94/EC concerning the fourth framework programme of activities in the field of research, technological development and demonstration (1994 to 1998), as adapted by Decision ..96/EC**

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i(1) and (2) thereof,

Having regard to the proposal from the Commission,<sup>1</sup>

Having regard to the opinion of the Economic and Social Committee,<sup>2</sup>

Having regard to the opinion of the Committee of the Regions,<sup>3</sup>

Acting in accordance with the procedure laid down in Article 189b of the Treaty,<sup>4</sup>

Whereas, by Decision No 1110/94/EC,<sup>5</sup> the European Parliament and the Council adopted the fourth framework programme for the period 1994 to 1998, which is being implemented; whereas, by Decision .../96/EC,<sup>6</sup> the European Parliament and the Council carried out a technical adaptation of that programme following the accession to the European Union of the Republic of Austria, the Republic of Finland and the Kingdom of Sweden; whereas Article 1(3) of Decision .../96/EC provides that the maximum overall amount for Community financial participation in the fourth framework programme shall be ECU 11 764 million; whereas the same Article stipulates that not later than 30 June 1996 the European Parliament and the Council shall review the maximum overall amount, with the possibility of increasing it to ECU 12 359 million;

Whereas the state of implementation of the fourth framework programme shows strong participation in the first calls for proposals; whereas this response, particularly by industry, has made it impossible to support some quality projects; whereas the appropriations provided for 1995 have been committed;

Whereas research efforts are a key component in industrial competitiveness and hence in the revival of the economy and employment; whereas the balance of trade in advanced technologies between the European Union and non-Union countries, calls for stepping up these efforts; whereas the scale of the requirements requires targeted intervention at Community level;

Whereas the 1995 annual report<sup>7</sup> submitted by the Commission in accordance with Article 130p of the Treaty shows that the Community research programmes stimulate the establishment of cooperation networks to counter fragmentation of effort and unnecessary duplication; whereas the recent evaluations have revealed significant economic spin-offs;

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4 Opinion of the European Parliament of ....

5 OJ No L 126, 18.5.1994.

6 OJ No ..., ... 1996.

7 COM (95) 443 final.

Whereas the increase in the fourth framework programme must respect the development of the financial perspective of the European Union;<sup>8</sup>

Whereas special priority should be assigned to activities liable to improve cooperation or coordination between the research activities of the Member States;<sup>9</sup>

Whereas the discussions by the research-industry task forces created by the Commission<sup>10</sup> help to define the research priorities more clearly, in consultation with industry, including SMEs, and users; whereas this leads to better coordination and targeting of the work carried out and the means available throughout the Union; whereas the objective is to create an environment favourable for innovation;

Whereas it is appropriate to implement research, technological development and demonstration projects (hereinafter referred to as RTD activities) on themes of importance to the Community which correspond to urgent needs, taking account of the rapid pace of technological progress, and which will contribute to improving the competitiveness of industry and increasing employment in the Community; whereas those themes cover aeronautics, automobile RTD, multimedia educational software, transport intermodality, environmental RTD, life sciences, trains and railway systems of the future and maritime systems;

Whereas, in order to attain the scientific and technical objectives of those projects, the implementation of the framework programme through the specific programmes concerned should lead to greater cooperation and coordination with regard to the activities in the first area of activity of the fourth framework programme (1994 to 1998) and a reinforcement of some of them; whereas, for this reinforcement to reach the critical mass which will permit a better integration of existing areas and to be effective, it is appropriate to focus efforts on the five priority themes covering aeronautics, automobile RTD, educational multimedia transport intermodality and interoperability, and environmental RTD, in particular water;

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

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<sup>8</sup>

<sup>9</sup> COM(94)438.

<sup>10</sup> SEC (95) 1824.

HAVE DECIDED AS FOLLOWS:

Sole Article

1. Decision No 1110/94/EC, as adapted by European Parliament and Council Decision ../96/EC of ... 1996 is hereby amended as follows:

- Article 1(3) shall be replaced by:

"The maximum overall amount for Community participation in the fourth framework programme shall be ECU 12 359 million.

2. Annex I shall be replaced by Annex I to this Decision.

3. Annex III entitled "Scientific and technological objectives" shall be supplemented by Annex II to this Decision.

Done at Brussels,

For the European Parliament  
The President

For the Council  
The President

ANNEX I  
 FOURTH FRAMEWORK PROGRAMME (1994 to 1998)  
 AMOUNTS AND INDICATIVE BREAKDOWN (Ecu million, current prices)

All Activities	Ecu million (current prices)
First activity (Research, technological development and demonstration programmes)	10 615 <sup>1, 2</sup>
Second activity (Cooperation with third countries and international organizations)	600
Third activity (Dissemination and optimization of results)	352 <sup>3, 4</sup>
Fourth activity (Stimulation of the training and mobility of researchers)	792
<b>MAXIMUM OVERALL AMOUNT</b>	<b>12 359<sup>5</sup></b>

Indicative breakdown of the themes and subjects in the first activity

Ecu million  
(current prices)

A. Information and communication technologies	3 826
1. Telematics Applications	1 048
2. Communications technologies	671
3. Information technologies	2 107
B. Industrial technologies	2 315
4. Industrial and material technologies	1 998
5. Measurements and testing	317
C. Environment <sup>6</sup>	1 190
6. Environment and climate	947
7. Marine sciences and technologies	243
D. Life sciences and technologies	1 679
8. Biotechnology	588
9. Biomedicine and health	358
10. Agriculture and fisheries (including agro-industries, food technologies, forestry, aquaculture and rural development)	733
E. 11. Non-nuclear energy	1 132
F. 12. Transport	326
G. 13. Targeted socio-economic research	147
	<b>10 615<sup>1, 2</sup></b>

1 Of which ECU 639 million for the operational budget of the JRC.

2 Of which ECU 96 million for programmed scientific and technical support activities suited to a competitive approach.

3 Apart from the funds allocated to the third activity, an average of 1% of the total budget of the fourth framework programme will be allocated to dissemination and optimization of results in the framework of the first activity. Close coordination of dissemination and optimization activities carried out under the specific programmes of the first activity with those carried out under the third activity will be ensured.

4 Of which ECU 40 million for *ad hoc* scientific and technical support to other Community policies which will be allocated on a competitive basis.

5 The amounts of the framework programme for research and training for the European Atomic Energy Community (1994 to 1998) are adjusted along with this programme and raised to a total of ECU 1 441 million, taking the total for Community RTD activity to ECU 13 800 million.

6 Environment-related research projects will also be conducted within several other lines of the first activity, in particular in the fields of industrial technologies, energy and transport.



## Annex II

### SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES

Annex III of Decision N° 1110/94/EC is maintained and supplemented as follows :

i) add before the second last paragraph of the introductory section :

"In addition, a targeted approach to the solution of certain problems with which industry and society are faced will be implemented. This is not intended to be a sectoral approach, but a way of promoting the development, demonstration and utilisation, in an integrated fashion, of diverse generic technologies in which, in the absence of public incentives, enterprises are unlikely to invest or will invest too late.

This approach will be put into effect by means of two distinct and complementary modalities:

- **greater focusing and coordination of existing activities**, which could involve *inter alia* restructuring of work programmes, publication of joint or grouped calls for proposals, "clustering" of projects arising in different programmes, integration of targeted projects, liaison with EUREKA, and/or concertation with national programmes.
- **reinforcement of activities** in certain areas following a similar approach in order to respond to priority themes."

ii) add before the last paragraph of the introductory section :

#### "Priority Themes

European industry suffers several important disadvantages in comparison to its powerful competitors. Despite the promising development of the single market, European research and industry remain fragmented as a result of economic, cultural and institutional differences between Member States. There is a need to develop an integrated, operational approach so that research, development and demonstration activities - at EU and national level - effectively respond to market and policy requirements and thereby support industrial competitiveness and economic performance. Such cooperation should stimulate synergy at all levels of the supply chain, and promote research leading to the establishment of uniform standards.

The priority themes and the range of modalities adopted to respond to them are of direct concern to industry including SMEs, and to citizens throughout the European Union. These actions will bring together, focus and integrate research within the framework programme and thus contribute to protecting employment, to improving economic and social cohesion and to better coordinating research, technological development and demonstration (RTD) activities overall.

#### Aeronautics

Faced with ever stiffer competition in the global aircraft marketplace, both the aeronautics industry and research establishments are engaged in a process of restructuring, recognising that better cooperation at a European level is increasingly necessary to improve competitiveness. However, improving competitiveness will need multiple measures: enabling technology, new processes, better tools for design, new standards for the interchange of data, new skills in every area. No one programme can deliver all these benefits - they will only be achieved by an integrated set of measures which together help firms (including SMEs) individually and collectively to work together in the complex supply chain. The EU role is essential in encouraging greater coordination between the many existing civil aeronautics RTD programmes in Europe and as a response to the approximately four-times higher level of funding such programmes receive in the US.

The current challenge involves three central industrial and technological objectives: the application of advanced technologies to reduce design and production cycles and cost by 30% using modern distributed concurrent engineering techniques to break down barriers between companies and improve supply chain efficiency throughout the aeronautics network; the development, demonstration and validation of technologies which improve the overall efficiency of the aircraft of the future and thus substantially reduce its operating costs by 25% while improving safety; and the reduction of the environmental impact of aircraft, e.g. the reduction of gaseous emissions and the minimisation of noise from engines and airframes, and inside the cabin. Such aeronautics-related technology can produce spillover benefits in many areas including materials, structures, data processing, design, methodologies, electronics, telematics, power generation, systems integration, manufacturing technologies, and so forth. In addition, good practices will be transferred as widely as possible within the whole aeronautics supply chain in order to convert knowledge into industrial capacity, to improve efficiency and flexibility, and to reduce as much as possible the environmental impact of aircraft.

The EU can provide support for the efforts of this industry in the long term through its existing research programmes especially those on Information Technologies and Industrial and Materials Technologies. However, gaps exist, especially in the coordination of related activities and the rapid implementation of results of RTD actions. Selected large scale demonstration projects, which can only realistically be undertaken at European level, including the network of all supply companies and users, must be launched within the specific research programmes, accompanied by relevant dissemination/training activities at all levels of the design and production chain as well as service providers and infrastructure operators, throughout the EU. In addition, specific activities could be carried out in cooperation with third countries.

### **Educational Multimedia**

Education and training systems in Europe are facing a triple challenge: to prepare European citizens to take a full part in the Information Society; to meet the educational and training needs of a growing diversity of learners, ranging from school-leavers to specialised categories such as disabled people and learners in rural communities; and to improve cost and pedagogic effectiveness, because this increased and diversified demand cannot be matched with additional resources.

Educational multimedia - thanks notably to the inter-activity that it offers - presents a real opportunity to answer these challenges. This is already exemplified on a limited scale by pilot experiments in primary and secondary schools, new training approaches implemented in high-tech companies, and the emerging market for home-based educational multimedia services, both on-line and off-line.

The industries involved, including a large number of SMEs, have to position themselves on the world-wide market which will provide high quality low cost educational multimedia services by the end of the century, thanks to more user friendly multimedia systems and to the drop in hardware prices and telecommunications tariffs.

To cope with these industrial and societal challenges, educational multimedia Community research has an insufficient budget at its disposal. It must be reinforced to allow the European industry to develop and validate the multimedia systems, services and contents of the future. The latter will have to be competitive worldwide, take into account the cultural and linguistic diversity of Europe and answer the needs of teachers, trainers and learners. These activities should be integrated into the global information society context through the validation and demonstration of new multimedia applications in other geographical areas, in particular with a view to strengthening the cooperation with developing countries.

## **Automobile RTD Activities**

There is mounting concern over the growth in road transport and its harmful externalities. Urgent solutions are required to alleviate urban transport pollution and congestion where population densities are greatest, and to ensure long term sustainability. The major part of NO<sub>x</sub> emissions is from road transport and, by vehicle type, cars are responsible for the large majority of emissions of CO. A measured response is required, taking account of the global consequences and acceptability of alternative technologies.

The challenge is to have industry including SMEs and public authorities working together to advance new technological concepts for vehicles and their operating environment which reflect European Union policies for transport, energy and the environment, whilst respecting social needs and contributing to industrial competitiveness. Broad consensus already exists on the most promising technological options, performance and environmental targets. There is an urgent need to focus collaborative research on technological breakthroughs which will allow the development of ultra-low (ULEV) or zero emission (ZEV) vehicles as well as of the necessary infrastructure. The objective could be achieved through development of technologies such as: hybrid vehicles, electric vehicles, energy storage/converter devices (fuel cells, batteries), essential related technologies (electronics, lightweight materials, telematics, etc.), a new generation of internal combustion engines, and engines powered by new fuels (biodiesel, hydrogen, natural gas, etc.). The action aims to concentrate the efforts on the key technological barriers requiring additional RTD including demonstration actions to realise vehicles which are not only clean, safe, energy efficient and "intelligent" but which are also cost-effective to manufacture and use over their whole life cycle. Priority will be given to propulsion systems which are judged to have the highest potential impact in terms of overall environmental and industrial cost/benefit.

Within several Specific Programmes of the Fourth Framework Programme there is scope for meeting some important RTD needs. However significant additional RTD and demonstration is required to address strategically important priorities and to establish a coherent framework for comparative assessment of different technological and policy options.

## **Transport Intermodality and Interoperability**

To minimise the adverse effects of congestion, pollution and accidents, the Common Transport Policy aims at sustainable mobility by achieving the best balance between the different modes of transport and the most efficient and sustainable use of existing transport infrastructure capacity. Intermodal transport operations offer enormous potential to improve the performance of Europe's transport systems. An increase in such operations would stimulate the development and restructuring of the EU transport and transport supply industries, particularly SMEs and, for Member States, would also ease the financial burden of transport infrastructure provision.

The overall vision is of an integrated transport system which provides cost-effective and efficient door-to-door services, with seamless transfer of goods and passengers from one mode of transport to another. Its achievement requires a fine balance between a competitive, market-orientated environment on the one hand and coordination between transport operators, infrastructure providers, systems suppliers, public authorities and transport users on the other. Major questions concerning interoperability, the design of transfer points and transshipment technologies, traffic management, information systems, logistics and operational strategy need to be resolved through research and demonstration if the overall vision is to be realised. The needs of the rail sector will be given special attention.

At present multimodal transport research lacks resources and is fragmented between and within EU programmes. As a result, no demonstration of a significant size can be mounted. A "critical" mass of RTD activities is needed in both passenger and freight sectors, with greater reliance on demonstration projects in order to achieve tangible results that can have a significant impact on the transport system and the competitiveness of Europe's supply industries. Research will focus on transfer-point efficiency,

intermodal network efficiency, the use of information technology to improve service quality, improved transport means, overcoming traditional (modal) market perceptions, and training.

### **Environmental RTD (water)**

Sustainable provision of water has become a matter of urgency, for the European Union, its immediate neighbours in the Mediterranean and Middle East, and throughout the world. Rising populations and economic growth have led to disequilibria between supply and demand for resources, deterioration of water quality, over-exploitation of resources, and global environmental pressures which have a detrimental impact on the water cycle.

A reinforcement of the Community RTD effort is justified by the importance of the stakes; by the fact that the water cycle represents a tangible link between increasingly interdependent economic actors, and by the fact that policies affect the water cycle at an international level. Furthermore, the EU already influences water management both directly (through directives, infrastructure finance, etc) and indirectly (agricultural, regional and environmental policy) in ways which have had considerable influence on the nature of demand for technologies and services and the development of the water market. Community RTD must assist enterprises and other actors to respond to initiatives taken in the context of other policy areas. It must help to reduce regional disparities in technological and managerial performance relating to water systems and to solve ongoing problems of water pollution and over-exploitation. It must also help devise adequate response in the case of extreme events such as drought, accidental pollution or flooding.

The world water market is set to triple in the next fifteen years, to reach around 125 Bcu; however, to participate fully in this market will require efforts both in adapting technologies, and the organisation of cooperation. Europe is home to several global water companies and high quality water management systems as advocated by several national and European bodies with interest in water research. It is essential it reinforce and extend this European expertise, taking account of recent developments and needs at the international level, and to develop new European approaches to S&T cooperation in the area.

The research areas of greatest interest include ecotoxicology and the physics and chemistry of pollution; water resource monitoring and assessment; prevention of pollution diffusion through soil, sediments and aquifers; decontamination and decentralisation of some treatment operations; promotion of "rational use" of water in agriculture and industry through recycling and other means; adaptation of treatment operations to the needs of smaller communities; tools for supply and demand forecasting and management and hydrological hazards management; new sources of supply.

### **Life Sciences: Vaccines and Viral Diseases**

The benefits derived from vaccine research are unique because of their bidimensional nature: ***action and prevention*** - action by encouraging partnership, industrial progress, employment, and the development of new compounds that serve as therapeutic agents against numerous diseases (e.g. cancer or herpes) and promoting social welfare; prevention by avoiding illnesses (three million childhood deaths prevented each year worldwide), suffering, long-term after-effects, work loss, health-care expenditure and, ultimately, premature death.

Consensus has emerged between governments, industry and academia on the needs and priorities for R&D in the fields of vaccines and viral diseases. Several important priorities have been identified for their potential technological applications and their impact on global health. In the short-term these are: development of new/improved vaccines against diseases of major socio-economic impact, mucosal immunity, animal models for vaccine development, vaccines against cancer and other chronic diseases, delivery systems and production of vaccines in crop plants. Medium and long-term priorities are the establishment of a European-based centre for conducting phase I and II human trials, a European

surveillance system and support of joint projects and/or cooperative activities between the Community and the Member States.

These themes are foreseen in the specific programmes implicated in vaccine development, efforts will be made to improve coordination and clustering of specific areas of research thereby adjusting some activities of the specific programmes to comply with the common goals. The aim is to achieve a holistic approach to vaccine R&D, showing unity and coherence to the citizen in such a crucial field of industrial development and global health and welfare.

### **Trains and Railway Systems of the Future**

In recent years the railways' share of the overall transport market has declined. Costs have been too high and operational systems too inflexible and lacking in market orientation. But railways are now experiencing a revolution due to market liberalisation and the increasing need for harmonisation and interoperability required for a trans-European network, including better links between central and peripheral regions and to the networks of Central and Eastern Europe.

The long-term vision is for railway networks which form cost-effective components of the overall trans-European transport network and of integrated urban networks, providing services that both passenger and freight customers want. The railways' ability to move large numbers of passengers and large volumes of freight safely, and in an environmentally-friendly and energy-efficient manner, offers considerable advantages. The problems of congestion, safety and pollution in other modes can thereby be offset to a significant extent.

At present EU railway research is both limited in volume and fragmented. More account must be taken of the requirements of rail users and of the supply industry. The latter needs to make very significant cost savings to remain competitive in world markets, and thereby to sustain employment in the Union. To overcome fragmentation, to improve synergy, to obtain a "critical mass" is needed in order to overcome the existing fragmentation, improve synergies and allow the rail industry including SMEs, to respond better to market needs. This requires a re-focusing of rail research onto areas such as the modular high-speed train, the urban rail network of the future, traffic management, multimedia information and integrated logistic systems, the train cargo-liner, and the "virtual factory" concept for the production of rail vehicles and assemblies.

### **Maritime Systems of the Future**

Maritime industries - shipbuilding, shipping and marine resources - are key global sectors in terms of the economy, trade and environment. The shipbuilding industry needs to produce increasingly efficient, environmentally friendly, energy-saving, safe ships in order to face international competition coming mainly from Korea, Japan and in the near future China as well as East European countries. The marine environment is a potential source of large amounts of energy and raw materials and is of significant interest with respect to environmental protection and energy supply.

The maritime industries are at the centre of one of the eleven Information Society projects adopted by the G7 countries in February 1995 (MARIS). They should become one of the pioneers of the social and industrial changes going along with the introduction of information technologies and new communication systems.

Technological and logistic research is a key to the future of these sectors. The development of new technologies will lead to the modernisation of shipbuilding and shipping as well as the optimal exploitation of marine resources and thus improve competitiveness, safety and environmental protection whilst protecting employment. The actions in this area will help to eliminate duplication, increase co-ordination

and create synergies between existing Community and Member States' programmes and ensure the optimal exploitation of research activities in cooperation with the maritime industries."

iii) Add after the existing text under the heading **FIRST ACTIVITY 1. INFORMATION AND COMMUNICATION TECHNOLOGIES: A. Telematics Applications of Common Interest:**

"To respond to priority themes **the following activities will be the subject of greater focusing and concentration:** telematics applications for road transport management and security; for the overall efficiency, safety and the operating cost of aircraft, for "door to door" intermodal transport, for maritime transport logistics, vessel traffic and cargo management systems, and MARIS research activities, for railway traffic management; development of high quality new multimedia, education and training tools and services with increased emphasis on involvement of education & training actors, libraries, museums and editors; development of telematic systems for water pollution and water resource management.

**The following specific activities will be reinforced:** development of active environment vehicle control, active safety and information systems for new automobile concepts, development and demonstration of telematics applications focused on improved aircraft efficiency and safety, tools for intermodal transport terminals, network operations, information and payment systems; large scale experimentation of innovative learning services, research and demonstration on telematics-based services for teacher training, development and validation of multimedia learning materials and services."

iv) Add after the existing text under the heading **1.C Information Technologies:**

"To respond to priority themes **the following activities will be the subject of greater focusing and concentration:** robust electronic sensors, processors and packaging for optimised vehicle and emissions management and integrated open system architectures; tools for information exchange and concurrent engineering within the aeronautics industry supply network; innovative generic tools and platforms for education and training; technologies to facilitate design, production and quality control of multimedia materials for professionals; MARIS research activities such as MARVEL; distributed industrial logistics for the railway supply industry.

**The following specific activities will be reinforced:** design and development of vehicle electronic control systems; software research on a system approach for functional or physical integration of components, networks and business processes to improve co-design activities with component suppliers. Demonstration of processes and IT tools to support distributed concurrent engineering and greater aircraft efficiency; enhancement of Multimedia Support Centres to address educational multimedia, interoperability of learning delivery systems and platforms."

v) Add after the existing text under the heading **2. INDUSTRIAL TECHNOLOGIES A. Design, engineering, production systems and human management:**

"To respond to priority themes **the following activities will be the subject of greater focusing and concentration:** improvements in industrial performance of water-related public utilities, conservation of water in industrial processes and adaptation of water technologies to the needs of small operators.

**The following specific activities will be reinforced:** research and demonstration in clean technologies for treatment, re-use and conservation of water and for preventing the diffusion of pollution; research for extending the application of desalination technologies."

vi) Add after the existing text under the heading **2.C Technologies for transport means:**

To respond to priority themes **the following activities will be the subject of greater focusing and concentration:** design methodologies and processes aimed at reducing aircraft development costs; materials contributing to greater aircraft efficiency or lower environmental impact; technology development and demonstration aimed at improving operating efficiency and reducing noise and emissions of aircraft; optimised internal combustion engine for hybrid vehicles integrated with advanced transmission systems; lightweight structures adapted to the requirements of alternative energy storage/converter devices; design, engineering, production technologies to improve shipbuilding competitiveness/productivity; ship safety (at the design stage as well as operational safety) and improved interface between ship and shore (eg cargo handling); demonstration of integration of advanced modular railway vehicle technologies, trackside and transshipment technologies.

**The following specific activities will be reinforced:** demonstration of materials and technology development for improved aircraft efficiency (in particular airframe, engine and systems) and reduced environmental impact; demonstration of distributed concurrent engineering and processes aimed at reducing aircraft development and fabrication costs; integrated design and manufacturing processes for energy storage/converter devices and clean internal combustion engines; materials and technology development for lightweight, low drag vehicle structures; technology development for specific intermodal transport equipment, intermodal freight transport units and intermodal integration."

vii) Add after the existing text under the heading **2.D Research linked with standards, measurement and testing:**

"To respond to priority themes **the following specific activities will be the subject of greater focusing and concentration:** the water theme will be a target for research in support of other Community policies.

**The following specific activities will be reinforced:** collaboration between industrial and other actors, in the areas of harmonisation of measurement and test methods and development of standards relating to quality requirements in the water area."

viii) Add after the existing text under the heading **3. ENVIRONMENT: A. Natural environment, environmental quality and global change:**

"To respond to priority themes **the following activities will be subject of greater focusing and concentration:** research relating to environmental impact of vehicle emissions; research relating to the environmental impact of aircraft emissions and emissions from shipping, SAFEMAR; evaluation of water resources and ecosystem disturbance associated with water pollution/management.

**The following specific activities will be reinforced:** demonstration of models to predict the impact of aircraft atmospheric emissions; strategic research on quantitative and qualitative evaluation of water resources, utilisation/pollution impact analysis methods, exploitation limits of existing and new water sources; models and tools for sustainable water management and water-related crisis management (floods, drought); development and application of space remote sensing techniques."

ix) Add after the existing text under the heading **3.B New technologies for environmental protection:**

"In response to priority themes **the following activities will be the subject of greater focusing and concentration:** water-related environmental technologies: pollution prevention and decontamination.

**The following specific activities will be reinforced:** research on pollution mechanisms and characterisation in soils, sediments and aquifers, and on related decontamination technologies."

x) Add after the existing text under the heading **3.C Marine science and technologies**:

"In response to priority themes **the following activities will be the subject of greater focusing and concentration**: sea bed utilisation and exploitation, coastal zone and shelf seas management including operational forecasting."

xi) Add after the existing text under the heading **3.D Human Dimension of Environmental Change**:

"In response to priority themes **the following activities will be reinforced**: research to develop an integrated analysis of the socio-economic interactions and trends affecting the water system."

xii) Add after the existing text under the heading **4. LIFE SCIENCES AND TECHNOLOGIES: A. Biotechnology**:

"In response to priority themes **the following activities will be the subject of greater focusing and concentration**: transdisease vaccinology: mucosal immunity and delivery systems."

xiii) Add after the existing text under the heading **4.B Biomedical and health research**:

"In response to priority themes **the following activities will be the subject of greater focusing and concentration**: research on vaccines against specific infectious diseases in Europe; vaccines against cancer; standardization, networking, safety and efficacy aspects of animal models used in vaccine development; novel *in vitro* alternatives."

xiv) Add after the existing text under the heading **4.C Agriculture and fisheries**:

"In response to priority themes **the following activities will be the subject of greater focusing and concentration**: production of vaccines in crop plants; water-conserving agricultural and agro-industrial production methods; optimisation and exploitation of fisheries and aquaculture, MARIS projects, including MARSOURCE.

**The following specific activities will be reinforced**: research and demonstration relating to rational use of water in agriculture and agro-industrial production, and to agricultural techniques which can help to prevent pollution of aquifers arising from agriculture.

xv) Add after the existing text under the heading **5. ENERGY**:

"In response to priority themes **the following activities will be the subject of greater focusing and concentration**: battery-vehicle RTD and demonstration: vehicle-mounted fuel cell/reformer systems; infrastructure for recharging/refuelling; vehicle emission simulation, comparative assessment and European 'best practice' database for alternatively propelled vehicles; demonstration of energy-saving research leading to greater aircraft efficiency or reduced emissions; demonstration of energy-saving solutions in the areas of rail and intermodal transport operations; renewable energy applications in the water sector; extension of the concepts and tools developed for energy conservation to the water sector; offshore hydrocarbons and renewable energy systems.

**The following specific activities will be reinforced**: energy-saving research leading to greater vehicle energy efficiency and reduced pollutant emissions; further development of batteries, supercapacitors, fuel cells and reformer systems; clean fuels and combustion simulation for internal combustion (IC) and hybrid vehicles; integration of energy storage/converter devices; framework for comparative assessment of propulsion technologies, including lifecycle, cost-benefit, and socio-economic analysis, safety assessment, and lifetime and performance testing of energy storage/converter devices; demonstration of new intermodal energy-saving solutions for existing transport sites; integration of renewable energy and desalination technologies."



xvi) Add after the existing text under the heading **6. TRANSPORT:**

In response to priority themes **the following activities will be the subject of greater focusing and concentration:** aircraft efficiency, safety and environmental impact within the air transport system; analysis of the potential for and policy implications of intermodal transport systems incorporating alternative propulsion vehicles; full scale demonstrations of technological and organisational solutions to improve efficiency, marketing and training in intermodal transport; maritime transport and port logistics, vessel efficiency, safety, traffic management and environmental sustainability; long-term railway strategy based on areas of high priority and decision-support tools for railway management and interoperability.

**The following specific activities will be reinforced:** integrating demonstration of concepts for aircraft efficiency, safety and environmental impact inside the air transport system; integrating demonstration of new vehicle concepts within intermodal transport systems; integration and demonstration of smart intermodal freight transfer technologies; modular and flexible technologies for integrating small loads; initial/final urban road haulage solutions; passenger and freight information systems; research and demonstration of optimal transport production systems applied to specific network conditions, strategies for market acceptance, integrated and transparent fares and tariffs; research on intermodal market conditions, including specific market needs, access conditions, competition, liability and transport quality."

xvii) Add after the existing text under the heading **7. TARGETED SOCIO-ECONOMIC RESEARCH: B. Research on education and training:**

"In response to the priority theme educational multimedia **the following activities will be the subject of greater focusing and concentration:** innovation and quality in formal and informal education and training; investigation of cognitive and pedagogic aspects of multimedia education and training; socio-economic implications of the introduction of multimedia based learning systems."

xviii) Add after the existing text under the heading **SECOND ACTIVITY A.2 Cooperation with central and eastern Europe and the new independent states of the former Soviet Union:**

"In response to priority themes **the following activities will be the subject of greater focusing and concentration:** cooperation projects in water resource conservation and management and water supply and use. Coordination of water related projects including the involvement of international organisations; research on vaccines and against infectious diseases of major socio-economic impact in the countries of Central Europe and the New Independent States; research on aeronautics in cooperation with the most advanced institutes and industries of the New Independent States.

**The following specific activities will be reinforced:** research related to the integration of the EU multimodal transport network with that of its European partners and neighbours."

xix) Add after the existing text under the heading **B Cooperation with industrialised non-European third countries:**

"Contacts and regular exchanges could be established, when appropriate, in areas covered by the priority themes listed above."

xx) Add after the third paragraph of the existing text under the heading **C Scientific and Technological cooperation with developing countries:**

"In response to priority themes **the following activities will be the subject of greater focusing and concentration:** cooperation projects in water resource conservation and management and water supply and use; coordination of water related projects including the involvement of international organisations; research on vaccines against infectious diseases of major socio-economic impact in developing countries.

**The following specific activities will be reinforced:** research and demonstration in the areas of desalination, integrated water-management including water-saving technologies for irrigation and other uses, and appropriate wastewater treatment processes; research and demonstration on educational multimedia applications to meet specific needs of developing countries; dissemination of community research in this field; and transport."

xxi) Add after the third paragraph of the introduction to the **THIRD ACTIVITY:**

"In particular, coordination of dissemination and optimisation activities will be carried out in the areas of research and technology development associated with priority themes."

**Proposal for a Council Decision adapting for the second time Decision 94/268/Euratom concerning a framework programme of activities in the field of research and training for the European Atomic Energy Community (1994 to 1998), as adapted by Decision 96/.../Euratom**

THE COUNCIL OF THE EUROPEAN UNION,

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,<sup>1</sup>

Having regard to the opinion of the European Parliament,<sup>2</sup>

Having regard to the opinion of the Economic and Social Committee,<sup>3</sup>

Whereas, by Decision 94/268/Euratom,<sup>4</sup> the Council adopted a framework programme of activities in the field of research and training (1994 to 1998), which is being implemented; whereas, by Decision 96/.../Euratom,<sup>5</sup> the Council carried out a technical adaptation of that programme following the accession to the European Union of the Republic of Austria, the Republic of Finland and the Kingdom of Sweden; whereas Article 1(3) of Decision 96/.../Euratom provides that the amount deemed necessary for Community financial participation in the framework programme shall be ECU 1 336 million; whereas the same Article stipulates that not later than 30 June 1996 the Council shall review the above amount, with the possibility of increasing it to ECU 1 441 million;

Whereas the state of implementation of the framework programme shows strong participation by operators involved in European research into safety; whereas the appropriations provided for 1995 have been committed;

Whereas it is necessary that the Community continues to play an important international role in the field of nuclear safety; whereas it has special responsibility for enhancing the safety of nuclear plants throughout the continent of Europe; whereas constructors and operators in the Union must take safety requirements into account; whereas their competitiveness depends on the research and technological development work carried out in this field;

Whereas the 1995 annual report,<sup>6</sup> as provided for by the second subparagraph of Article 4(1) of Decision 94/268/Euratom shows that the Community research programmes stimulate scientific and technological cooperation to counter the dispersal of efforts and help to protect man and the environment;

Whereas the increase in the framework programme must respect the development of the financial perspective of the European Union;<sup>7</sup>

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4 OJ No L 115, 6.5.1994, p. 31.

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6 COM (95) 443 final.

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Whereas more research is needed concerning the protection of man and the environment, the exploration of innovatory approaches to achieve extremely high reactor safety standards, waste management, decommissioning, and the control of pollution caused by past incidents; whereas the scientific and technological objectives of this research entail a reinforcement of the nuclear fission safety activities under the framework programme; whereas greater technological cooperation is required, particularly with the countries of Central and Eastern Europe and the Commonwealth of Independent States (CIS);

Whereas the Scientific and Technical Committee has been consulted by the Commission and has delivered its opinion;

HAS DECIDED AS FOLLOWS:

#### Sole Article

1. Decision 94/268/Euratom, as adapted by Council Decision 96../Euratom of ... 1996 is hereby amended as follows:

- Article 1(3) shall be replaced by:

"Without prejudice to Article 7(3) of the Treaty, the amount deemed necessary for Community participation in this framework programme shall be ECU 1441 million."

2. Annex I shall be replaced by Annex I to this Decision.

3. Annex III entitled "Scientific and technological objectives" shall be supplemented by Annex II to this Decision.

Done at Brussels,

For the Council  
The President

ANNEX 1

**FOURTH FRAMEWORK PROGRAMME (1994 to 1998): AMOUNT AND INDICATIVE BREAKDOWN**  
(Ecu million, current prices)

	FP4
Nuclear fission safety	546
Controlled thermonuclear fusion	895
Amount deemed necessary	1 441 <sup>1</sup>

1 Of which ECU 319,5 million for the operational budget of the JRC allocated as follows: nuclear fission safety ECU 270,5 million and controlled thermonuclear fusion ECU 49 million.

## ANNEX II

### Scientific and technological objectives

Annex III, entitled "Scientific and technological objectives", to Council Decision 94/268/Euratom of 26 April 1994 shall be maintained and the following text shall be added at the end of the section entitled "Nuclear fission safety":

"Citizens all over the continent of Europe are highly concerned about nuclear fission safety and expect more stringent standards and safety practices to be established. European constructors and industrial operators must take account of these requirements at a time of mounting competition worldwide. Safety is also a crucial issue in the Union's relations with the Central and Eastern European countries and the Commonwealth of Independent States (CIS). In order to step up the pace of research, to ensure closer cooperation throughout Europe and to reduce the delays in take-up and dissemination of the results, the framework programme must be reinforced.

1. Reinforcement of the work on the following topics:

- Use of innovatory approaches taking account of the safety of the new generation of reactors, beyond the projects under development. This includes topics concerning both the reactor itself and the fuel (new absorbers, very advanced fuel, etc.);
- reactor safety will not be limited to indepth study of accidents. It also includes accident prevention (such as systems analysis and passive actuators);
- phenomena concerning the fuel cycle and management and storage of wastes, which remain a major issue, partly because of the non-proliferation imperatives (plutonium) and partly from the point of view of the energy efficiency of the fuel (burnup).

2. Closer cooperation with non-Union countries

The on-going activities on nuclear fission safety have taken account of the need for cooperation with the Central and Eastern European countries. However, they provide support only for participants from the Union, despite the definite mutual benefits to be gained from closer cooperation.

The emphasis on cooperation serves two objectives:

- to allow support for nuclear research teams, including young researchers, from Eastern European countries and the Commonwealth of Independent States (CIS) and, thus, to conduct joint research projects;
- to step up specific research particularly important for the safety of the nuclear cycle in these countries.

Cooperation with these countries covers control of past incidents and the radiological consequences of accidents. It will contribute to the establishment of a harmonized warning network and the development of technologies for restoring contaminated environments, and will seek to adapt the practices and know-how tested by the Union in emergencies.

On reactor safety, the current programme should be extended to include the development and validation of codes for analysis and prevention of accidents (design basis accidents and serious accidents). Another aspect covered is the behaviour, particularly ageing, of systems and components performing a safety function.

On radioactive waste, collaboration could be established to characterize potential storage sites for radioactive waste. The technology developed in the European Union for dismantling nuclear installations could be applied or, if necessary, adapted to the needs of Russian reactors. Reactors being dismantled could serve as a site for demonstration activities, training and transfers of technologies in this field. Coordination with the Union's assistance programmes will be ensured.

The research in the field of safety has always had quantifiable objectives (minimising the risk of a major accident, limiting exposure to specified dosage) allowing the progress achieved to be measured. The new activities proposed herein are set, among others, in the perspective of reducing the risks of a severe accident by a factor of 10 (new generation of power stations)."

## **FINANCIAL STATEMENT**

### **1. TITLE OF THE OPERATION**

Financial supplement for the Fourth framework programme of the European Community activities in the field of research, technological development and demonstration (RTD) and the framework programme of Community activities in the field of research and training for the European Atomic Energy Community (1994 to 1998):

### **2. BUDGET HEADING CONCERNED**

Sub-section B6.

### **3. LEGAL BASIS**

Article 130I (1) and (2) of the EC Treaty and Article 7 of the EAEC Treaty.

### **4. DESCRIPTION OF THE OPERATION**

#### **4.1 General objective**

Decisions No 1110/94/EC and No 94/268/Euratom, adopted on 26 April 1994, explicitly foresee - at Article 1(3) - the possibility of increasing the amounts allocated to the EC and Euratom framework programmes. This increase should take account of the state of implementation of the framework programmes, of their contribution to the competitiveness of Community industry at international level, of value for money and of the development of the financial perspective of the European Union.

The Commission commenced its reflections on the financial supplement at the beginning of 1995 and in particular has established a certain number of Task Forces, bringing together research and industry. They were created to identify problems in industrial areas which are of general interest, where not only industrial competitiveness is at stake but employment, the environment and public health are also concerned. The Task Forces have the responsibility of analysing the supplementary requirements as regards Community RTD, taking account of what is already being done at national and European levels. It is a new and thus experimental approach. Seven Task Forces have been established at the present time in order to carry out this process of analysis. A further Task Force should be formally established shortly.

On the basis of their recommendations and taking account of the opinions which have been expressed during a broad process of consultation with industry and academia (IRDAC - Industrial Research and Development Advisory Committee of the European Commission; ESTA - European Science and Technology Assembly), the Commission has assembled the information needed to make its proposals for the financial supplement for the EC and Euratom framework programmes. The supplement should reinforce Community RTD actions in five areas of public interest and industrial priority where the requirements are the most urgent. These areas are linked to aeronautics, the automobile, educational multimedia, intermodality and interoperability in transport and the environment (technologies focusing on water and on nuclear safety). Taking account of the financial envelope which was envisaged in the framework programme decisions and of the need to avoid spreading money thinly and less effectively, three further areas, though also priority ones, will be called upon to increase their efforts to coordinate



between programmes but without any financial reinforcement. In all cases, the activities will be implemented via those existing specific programmes which are directly concerned.

#### **4.2 Period covered**

1997-98.

### **5. CLASSIFICATION OF EXPENDITURE OR REVENUE**

#### **5.1 Non-compulsory expenditure**

#### **5.2 Differentiated appropriations**

#### **5.3 Types of revenue involved**

Certain associated countries will contribute to financing the operation.

### **6. TYPE OF EXPENDITURE OR REVENUE**

In the context of this supplementary action, research, technological development and demonstration projects carried out by external contractors may receive a Community contribution to the cost of research, with a ceiling of 50% of the costs or the equivalent (100% of the additional costs for universities and similar organizations).

Measures appropriate for certain specific programmes, such as feasibility awards, and preparatory, accompanying and support measures may receive a contribution of up to 100% of the costs of these activities.

### **7. FINANCIAL IMPACT**

#### **7.1 Method of calculating the total cost of the operation**

The amounts will cover scientific, technical, demonstration and related horizontal support measures as well as personnel costs and administrative, scientific and technical expenses directly linked to the implementation of these activities and measures. The Commission's proposals are based on their analysis of where financing needs to be allocated on research orientated towards priority themes where, taking account of the situation in all member states, and of the activities of industry and the private sector, the evidence suggests there is the most urgent demand for additional European effort.

#### **7.2 Itemised breakdown of cost**

Overall, the lines of activity of the EC and Euratom framework programmes will be affected by the financial supplement as follows (the lines which are reinforced appear in bold characters):

## AMOUNTS AND INDICATIVE BREAKDOWN ECU million (current prices)

Of which supplementary credits  
for 1997 and 1998

First activity (Research, technological development and demonstration programmes)	12 056 <sup>1 2</sup>	675
Second activity (Cooperation with third countries and international organizations)	600	25
Third activity (Dissemination and optimization of results)	352 <sup>3 4</sup>	
Fourth activity (Stimulation of the training and mobility of researchers)	792	
<b>OVERALL AMOUNT</b>	<b>13 800</b>	<b>700</b>

Indicative breakdown of themes  
in the first activity

ECU million  
(current prices)

<b>A. Information and communication technologies</b>		
1. Telematics Applications	1 048	150
2. Communication technologies	671	
3. Information technologies	2 107	50
<b>B. Industrial technologies</b>		
4. Industrial and material technologies	1 998	180
5. Measurements and testing	317	10
<b>C. Environment</b>		
6. Environment and climate	947	40
7. Marine sciences and technologies	243	
<b>D. Life sciences and technologies</b>		
8. Biotechnology	588	
9. Biomedicine and health	358	
10. Agriculture and fisheries	733	5
<b>E. Energy</b>		
11. Non-nuclear energy	1 137	65
12. Nuclear fission safety	546	105
13. Controlled thermonuclear fusion	895	
<b>F. 14. Transport</b>		
14. Transport	326	70
<b>G. 15. Targeted socio-economic research</b>		
15. Targeted socio-economic research	147	
<b>12 056 <sup>1 2</sup></b>		<b>675</b>

<sup>1</sup> Of which ECU 958.5 million for the operational budget of the JRC.

<sup>2</sup> Of which ECU 96 million for programmed scientific and technical support activities suited to a competitive approach.

<sup>3</sup> Apart from the funds allocated to the third activity, an average of 1% of the total budget of the fourth framework programme will be allocated to dissemination and optimization of results in the framework of the first activity. Close coordination of dissemination and optimization activities carried out under the specific programmes of the first activity with those carried out under the third activity will be ensured.

<sup>4</sup> Of which ECU 40 million for *ad hoc* scientific and technical support to other Community policies which will be allocated on a competitive basis.

### 7.3 Indicative schedule of appropriations

ECU million - current prices

YEARS	1997	1998	Total Supplement FP4
	200	500	700

The definitive annual amounts will be fixed by the budgetary authority.

### 7.4 Financial perspective

Even limiting its proposal to ECU 700 million, the Commission stresses that the present ceilings of category 3 of the financial perspective should be substantially raised to allow for the satisfactory financing of RTD framework programmes and transeuropean networks. Consequently, the Commission reserves the right to modify the present proposal when it presents its proposals for the revision of 1997 and 1998 financial perspective and to modify the proposal according to the decisions of the budgetary authority on this subject.

In this regard, it is pointed out that the present proposal concerns only the increase of the Maximum Overall Amount of the 4th EC framework programme and the Estimated Amount Necessary for the EAEC. As the financing of these programmes through the Community budget has to be carried out in conformity with point 18 of the Inter-institutional Agreement of 29 October 1993, with respect to the financial perspective in effect in 1997 and 1998, the granting of supplementary financing is dependant on the prior authorisation, by the Budgetary authority, of an increase to the ceiling of the category concerned for measures relating to the funding of the research programmes.

## 8. ANTI-FRAUD MEASURES

In the context of phase II of the action on "Sound and Efficient Management", Directorate-General XII and the other Directorates-General concerned have participated in the development of the audit functions of the Commission. Among the innovations introduced in this context, it is appropriate to draw attention to the use of binary audits covering the scientific and financial aspects of RTD projects.

Furthermore, there are many administrative and financial controls at each stage of the signature and implementation of research contracts. Among these controls are the following:

At the stage prior to the conclusion

- Initial selection of proposals based on the scientific merit of the project and on the realism of research costs relative to the content, duration of the project and his potential implications.
- Analysis of financial details submitted by the proposers in the contract negotiation form.

After signature of the contract

- Examination of expenditure statements before payments at a number of levels (financial officer, scientific officer).
- Internal audit performed by the Financial Controller.
- On site audit which should allow by examination of the supporting documents the detection of errors and other irregularities. In order to improve the efficiency of these controls Commission services established an audit unit, which co-ordinates all controls which are taking place. These controls are carried out either by members of this audit unit or by audit firms with which the Commission has concluded a contract, under the supervision of personnel from this audit unit.
- On the spot inspections made by the Financial Controller of the Commission and by the Court of Auditors of the European Union..

## **9. ELEMENTS OF COST/EFFECTIVENESS ANALYSIS**

### **9.1 Specific objectives and target population**

The five RTD areas have been identified as priorities for supplementary financial support with regard to objective criteria such as the existence of an industrial base, the effects in terms of cohesion, the positive impact on employment and on SMEs, respect for the environment and the public interest.

#### **Aeronautics**

The potential world market is estimated at more than 17 000 new aircraft over the next two decades, representing an investment of around ECU 1 000 billion. The 7 000 European firms (of which only 40 are large companies) directly involved in this sector have a total of nearly 400 000 employees. In order to remain competitive in the world market, all branches of European industry linked to aeronautics should now make a major research effort in order to draw the benefits within the next fifteen years or so. This theme addresses three industrial and technological objectives for Community RTD activities: research on the techniques of parallel engineering to improve supply chain efficiency throughout the aeronautics network; research to improve the overall performance of aircraft while improving safety; research on the environmental impact of emissions and to minimise engine and airframe noise.

#### **Educational multimedia**

Europe's 350 000 schools, with 67 million pupils and 4.5 million teachers, represent the main potential users of educational multimedia. Across the Union, large industrial groups, publishing and communications companies, and especially many specialist small businesses, are actively contributing to

the emergence of the educational multimedia market. The knock-on effects in terms of employment are expected to benefit SMEs in particular, which are already well represented in this area. It is necessary to face up in particular to pressure from the big American companies which dominate the market and to build on Europe's cultural and linguistic diversity. Expertise in the field of information and communications technologies is widely distributed throughout the Union. The research will be concentrated on new educational multimedia applications (including the development of prototypes). Also covered will be linguistic aspects and support for better access to networks of information and libraries.

### **Automobile RTD activities**

The motor vehicle sector is a key sector of the European economy. The value added by the production of vehicles accounts for 2% of GNP. Vehicle producers themselves employ 1.8 million people and generate 8.3% of manufacturing employment in Europe. Pressure is growing from citizens and public authorities for the development of "clean" vehicles so as to reduce the levels of pollution and other adverse effects of traffic which continue to rise. Increased research effort in this area will have major consequences in terms of employment, notably as a result of the diffusive effect it has for the tens of thousands of equipment suppliers and subcontractors throughout the Union, including very many SMEs. There is an urgent need to concentrate collaborative research on the technological breakthroughs which will allow the development of zero and ultralow emission vehicles. The objective is to treat the key technological barriers requiring additional RTD to improve the safety of vehicles, and to develop vehicles which are clean, energy-efficient and economic. Priority will be given to propulsion systems which are judged to have the highest potential impact in terms of overall environmental and industrial cost/benefit.

### **Transport intermodality and interoperability**

At present there is insufficient integration within transport networks (road, rail, ship, etc.). The market share of road transport, which does not need to rely on other forms of transport, continually increases with the result that pollution and congestion continue to rise. The daily average of 4000 kilometres of traffic jams on European highways cost the businesses and citizens of Europe some ECU 120 billion per year<sup>5</sup> in time delays and transport inefficiencies, which are gradually undermining the competitiveness of the European economy. Effort must be concentrated on improving the integration of different modes of transport and overcoming the barriers to interoperability of railway systems. Areas where urgent action has to be taken include: advanced technologies for passenger and freight transport, intelligent transport systems, traffic management and integrated passenger/freight information and logistics. These developments complement those already being undertaken and supported by the Community towards multimodal European transport networks.

### **Environmental RTD**

1. Water-related technologies: disturbances of the natural environment create serious problems at a planetary level (drought, flooding). Industrial and agricultural pollution also have an adverse effect on quality of life. Water has been identified as a topic which is an urgent social need and a political priority. Equally, it represents an economic opportunity as well as a targeted technological objective. The water industries market will reach some ECU 125 billion in the year 2010<sup>6</sup>. Community research will be focused on ecotoxicology and the physics and chemistry of pollution, water resource monitoring

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<sup>5</sup> According to a recent study of OECD (Guinet, 1994) quoted in the Green Paper on "Towards Fair and Efficient Pricing in Transport" COM(95) 691.

<sup>6</sup> Commission best estimate based on expert appraisal (ECOTEC Research and Consulting Ltd, specialists in environmental technology and policy).

and assessment, soil sediments and aquifer decontamination, promotion of recycling and decentralisation of some treatment operations, tools for supply and demand forecasting and management, hydrological hazards management and new sources of supply. Particular attention will be given to reinforcing cooperation with developing countries..

2. Nuclear safety: The citizens of the entire continent of Europe are calling for greater protection with respect to nuclear risks. Preventing accidents like Chernobyl is absolutely essential. This is an area of excellence as far as European know-how is concerned and once in which better focused research is needed. A financial complement is essential for supporting cooperation with Central and Eastern European countries and to accelerate technology innovation with respect to safety while reinforcing European competitiveness. Research will be devoted to exploring innovative approaches to achieve extremely high safety standards, safety of existing reactors, decommissioning techniques, waste processing, impact on man and the environment and management of pollution caused by past incidents.

The target population for the operation includes industrial enterprises - including especially SMEs - research centres and universities in their research, technological development and demonstration activities.

## **9.2. Grounds for the operation**

The operation is justified by the need for the Community to continue to strengthen the scientific and technological bases of Community industry and to encourage it to become more competitive at international level, while contributing to the definition and implementation of Community policies and to meeting the needs of society.

Furthermore, the operation is necessary in order to refocus the research activities of the Union on issues of public interest and in order to help European industry make greater efforts to respond to them, at the same time as improving its competitive position.

Considerable risks are involved in research on high technologies. Community participation in research activities in these areas remains modest, given their very high costs, but such participation serves as a catalyst for enterprises, universities and research centres to work together. The Task Forces have consulted industry, users and researchers and have analysed the actions undertaken at national level so as to establish what should be done by the Community. At the same time, better coordination of national and Community activities will itself help to avoid duplication. In determining research needs, the analysis carried out by the Commission, assisted by the Task Forces, has considered the following factors: existence of industrial bases (including SMEs and subcontractors); market opportunities; effects in terms of cohesion; knock-on effects of technologies promoted in the various regions of Europe; positive impact on employment; environmental soundness and sustainable development opportunities; existence of an industrial and political consensus; public interest; and globalisation of markets. In every case, the key has been to identify the need for action at Union level.

## **9.3. Monitoring and evaluation of the operation**

The form and frequency of the process of evaluation will be such as to enable the Commission to respond to the requirements under Article 4 of the framework programmes decisions and to evaluate Community RTD programmes and policies.

The Commission shall continually and systematically, monitor with appropriate assistance from external independent experts, the progress of the framework programmes as regards the criteria set out in Annex II to the framework programmes, which include that of contributing to the economic and social

cohesion of the Community, and the scientific and technological objectives set out in Annex III to the framework programmes. It shall examine in particular whether the objectives, priorities and financial resources are still appropriate to the changing situation. If necessary it shall make proposals to adapt or supplement the **framework programmes** according to the results of this assessment (Article 4(1) in the decisions on the framework programmes).

In addition, the Commission shall have an external assessment conducted by independent qualified experts into the management of and progress with Community activities carried out during the five years preceding this assessment. It shall communicate this assessment and conclusions, accompanied by its comments, to the European Parliament, the Council and the Economic and Social Committee prior to presenting its proposal for the fifth framework programmes (Article 4(2) of the decisions on the framework programmes).

Finally, in order to help ensure, *inter alia*, cost-effective implementation of the framework programmes, each specific programme shall provide for systematic monitoring and independent evaluation against the precise objectives referred to in Article 2; the modalities of such evaluation are laid down in each specific programme (Article 4(3) of the decisions on the framework programmes).

The evaluation of the research programmes, while not being intended in the first instance to consider financial management but rather implementation and scientific results, nonetheless has repercussions for research policy and thus on financial management.

The primary objectives of the Community research programmes are to promote the excellence of research and collaboration at the European level and in this way to reinforce the scientific base in Europe and its competitiveness at the world level. The results and direct and indirect effects of the research programmes are not always precisely quantifiable. Most frequently, questions linked to quantitative aspects (for example, the promotion of scientific excellence) are the most important objectives for enterprises and other participants. It is useful in this context to cite a recent report published by the OECD<sup>7</sup> which underlines the risk that overall evaluations of national technological effort may be biased against those programmes which, for technical reasons, are the most difficult to analyse in economic terms.

## **10. ADMINISTRATIVE EXPENDITURE**

The Commission ensures efficient management in the implementation of Community RTD activities. For this reason, it intends to apply to the staff and administrative costs a much lower rate of increase than that which would correspond to a pro rata increase. It will thereby ensure that the overall amount of the supplementary funding will be used as a matter of priority for research activities.

The implementation of this approach will be detailed in the proposals for the necessary revision of the specific programmes.

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<sup>7</sup> Impacts of National Technology Programmes, OECD, Paris 1995 ISBN 92-64-14423-4







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