



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 22.03.1996
SEC(96) 568

COMMISSION STAFF WORKING PAPER

Financial Supplement for the Fourth EC Framework Programme

Research-Industry Task Forces
An Overview

This paper provides a consolidated overview of the Task Force reports and puts them in the context of the Commission's proposal for a financial Supplement to the fourth framework programmes (COM(96)12).

- The first Part of the paper sets out how the Task Forces form the basis of an innovative approach designed to consolidate Europe's research efforts around key themes of European interest. It clarifies what is meant by a "key theme" in this context and identifies a number of considerations which have been significant in arriving at the choice of themes proposed by the Commission.
- The second Part contains summaries of the state of progress of each of the Task Forces.

**PART I: FOCUSING AND COORDINATING EUROPE'S RESEARCH:
THE APPROACH**

- LINKING RESEARCH, INDUSTRY AND SOCIETY: THE NEED TO CONCENTRATE EFFORT
- THE WAY FORWARD - PILOT ACTIONS ON KEY THEMES OF EUROPEAN INTEREST
- THE CHOICE OF THEMES

Linking research, industry and society: the need to concentrate effort

Research makes a crucial contribution to industrial competitiveness and to economic and social progress. Europe's level of investment in research and its capacity to turn research into successful innovation lag behind its competitors. In its proposals for a Financial Supplement to the framework programme - COM(96)12 - the Commission has emphasised the need to create and sustain mutually reinforcing links between research and industry that will work to the benefit of society as a whole.

The increasing cost and complexity of research means that it is impossible for countries and even regions the size of Europe to maintain a world-class research base in every discipline of relevance to industry and society. In an open trading system, S/T has little economic or social value if it is not of the highest quality, and it must be remembered that two-thirds of the world's supply of S/T is created outside Europe. Success also depends on developing capabilities in science and technology and in industry which are mutually supportive and which are closely aligned to the opportunities arising in high growth markets.

If the European Union is to improve its industrial and technological performance and to make these function in the interests of European economy and society as a whole, it needs to consolidate its research base in areas of key importance and develop stronger links between research and industry. The evidence suggests that the most competitive countries or groups of countries tend to be relatively highly specialised in their S/T capabilities. These countries devote a considerable proportion of national funding to areas which contribute to industries in which they have a particular comparative advantage.

The Union is relatively badly placed in this context. In the EU there are differences in national S/T capabilities and in the extent to which they are specialised in areas where there are high technological and market opportunities. There are also variations in industrial capabilities across Europe. But in very few disciplines or industries does Europe devote more concentrated resources to S/T than Japan or the US. And those areas in which the EU is specialised tend to be medium and low-growth sectors, typically mature industries. This is in marked contrast to the position of Japan especially, which is relatively highly specialised on the highest growth markets and corresponding technologies. For reasons of both competitive advantage and social progress there is clearly a need for Europe to do more to develop concentrated research and industrial capabilities in areas which will be of key importance in the future.

The way forward - pilot actions on key themes of European interest

However, "objective" analysis, on the basis of today's data alone, is not enough to determine what are the key areas of S/T for industry and for Europe in the future. This depends on judgements of the convergence of interests, expertise, industrial capability, social and market need, and on Europe's ability to bring these interests together so as to create virtuous circles of opportunity, increased understanding and growth. This is one of the main lessons of "foresight" exercises, where the process of bringing research and industrial interests together to develop networks and to identify and follow up new opportunities is one of the most important benefits.

The choice of key areas of research to be addressed by the Union is therefore not simply a technical problem. It requires choices and commitment, based on an examination of society's needs, industrial realities and future prospects. Technologies at the heart of the growth markets of the future are crucial for social as well as economic development. Getting an early start up the learning curve in both the industrial and S/T aspects of these new markets can keep the Union ahead of its competitors. At the same time, technology can also contribute to maintaining or improving competitiveness in those mature industries on which Europe depends most strongly today.

Identifying key areas of research for Europe does not therefore mean finding an exhaustive list of topics through a top down process. Nor can this be done by considering research interests in isolation. The opportunities arising from research must be linked organically to those arising from markets, through industrial enterprises and entrepreneurs, taking account of investment needs and the availability of finance for all subsequent stages in the process of innovation, commercialisation, production and marketing.

This is the logic of the Task Force approach. The Task Forces provide a nucleus around which the various parties concerned with science, technology and industry in a particular area can come together, identify research needs and coordinate research actions in the context of their vision of future demands. They provide an opportunity for improving the effectiveness of research at Community level, and open the possibility for coordination with other research actions, including those of the member states, as well as the engagement of the financial community for example through the use of venture capital funds.

The choice of themes

The choice of themes in which the Commission's Task Forces are active and of the priority areas proposed by the Commission for supplementary funding has taken into account a large number of factors.

The areas of truly European interest cannot be homogeneous - no two disciplines or sectors could be - and different considerations come into play in different cases. Overall the themes proposed by the Commission form a balanced package which has a general relevance.

The idea of European interest in key areas of research does not mean that national competitive advantages in these areas will be eroded by action at European level. The intention is not to harmonise but to ensure that national strengths both contribute to and are reinforced by an improved European position in science and technology and an improved competitive position for Europe as a whole.

(a) The main considerations applying to the European Interest include:

Employment

- High levels of employment in the industries which are likely to benefit from priority areas of research. For example, more than 4 million jobs depend on the automotive

industry, about 1.8 million of them in vehicle production. A decrease of 1% in the market share of European manufacturers induces a loss of 18,000 jobs in the vehicle manufacturers alone.

- High growth expectations due to new or emerging markets which can be accessed through technological advance. For example, the world market for water technologies is growing fast - three times faster in South East Asia and South America than in Western Europe - and will be accessible if sufficient RTD effort is put into extending the well-established competences of European companies to meet these countries' specific innovation needs.
- High growth expectations in new industries which will emerge from the S/T being developed. On-line services, for example, provide vast potential for developing new markets for education and training which will serve employment growth in a range of provider industries whilst improving the qualifications and employability of people using these services across the Union.

Industrial base

- Industrial capability, including SMEs, associated with the priority areas, which exists across several member states. This is the case for example for the industries associated with the New-Generation Aircraft, the Car of Tomorrow, Water, Maritime Systems and Trains and Railway Systems of the Future.
- The potential for emergence of industrial capability including technology-based SMEs in new industries or new areas of industry. The new markets associated with the Task Forces on Educational Software and Multimedia, and Vaccines and Viral Diseases, for example offer such prospects.
- Industries which are important users of S/T and related industrial products. For example, all industries are dependent on water and will benefit from more rational usage of water but overall the level of recycling in European industry is between 2 and 4 times lower than that of the US and Japan.

Environment/sustainability

- Capacity of research to reduce environmental and social externalities associated with specific application areas of technology. For example, the research identified by the Task Forces on New-Generation Aircraft, Car of Tomorrow, Maritime Systems and Trains and Railway Systems of the Future aims to reduce environmental pollution and congestion and to limit the depletion of fossil fuels.
- Capacity of research to reduce environmental impact by creating new technological opportunities to substitute for environmentally-damaging economic activities. Transport Intermodality, for example, could offer a real alternative to the increasing use of roads for both passenger and freight transport. Educational Software and

Multimedia will provide the basis for distance learning services which reduce the need for travel and improve the education and training prospects of learners. In both cases, these developments would serve to benefit those in remote and peripheral areas.

- Capacity of research to provide opportunities for preserving and improving environmental quality. This is case for example for research areas identified by the Task Forces on Water and Maritime Systems of the Future.

Economic and Social Cohesion

- Broad spread of *producer interests* across the EU. The emerging industries associated with Educational Software and Multimedia, for example, are constituted by a large and growing number of SMEs, which are spread over all the EU member states. The majority of Task Forces are addressing applications involving diverse technological inputs whose suppliers are located in a wide range of member states.
- Broad spread of *consumer interests* across the EU. All of the Task Forces address topics which are of benefit to consumers across the Union as a whole.
- High scope for diffusion of S/T capability and training through value chains. This is particularly relevant in industries which are highly concentrated but involve significant supply chains including SMEs. This applies for example to the automotive, aeronautics and railway industries.
- Impact on remote and peripheral regions. Transportation and distance learning, for example, are developments which serve to alleviate the social and economic disadvantages of remote and peripheral regions.

(b) The main considerations applying to the need for funding include:

Added value of additional funds, - the multiplier effect vis à vis existing research

- Qualitative differences in the type of research conducted. For example, the priority areas identified by Task Forces are in many cases concerned with research to improve the manner in which technologies arising from many disciplines are integrated in complex application domains. It is accepted that 80% of the cost of producing a new aircraft is associated with this integration process. Increasing the concentration of research in this area provides a major opportunity for cost savings and thus improving competitiveness across such industries.
- Filling gaps in existing research activities, thus to provide a more coherent S/T base for the development of new products. For example, in the case of the Car of Tomorrow it is important to ensure that different S/T options which might be relevant to improving propulsion system efficiency and reducing environmental impacts are developed to an equivalent degree of maturity so that they can compete on equal footing.

- Generating user-producer interactions through the use of additional funds whose application would be highly coordinated, also between different sources of support for research, for example by linking EU with member states' RTD activities. This is of general relevance to the Task Forces themes and is illustrated for example in the case of Educational Software and Multimedia by the inclusion of a broad range of educational and training users in research consortia and by the coordination of research, training and other Community actions in this domain.

Urgency, - the importance of allocating additional funds without delay.

- The need to reverse a declining trend of European competitiveness and the stimulus to growth, competitiveness and employment which will arise from research investment. In each of the priority areas there is evidence of a high level of unsatisfied capacity to absorb profitably additional research funds, and to benefit from the high benefit/cost ratio which has been demonstrated to apply to Community funded industrial research. Moreover, over-constrained budgets imply a need to "pick winners" amongst the technological options on offer.
- Similar benefits accruing to the consumer and/or the public good (eg environmental improvement) arising from the early availability of new products derived from the industries associated with the new research. It is of the utmost urgency, for example, to address the widespread pollution problems, in urban areas especially, arising from transport. Each of the research Task Forces which deal with transport is addressing this issue.
- The need to respond to competitors' behaviour which - if left unchallenged - could quickly result in a potentially irretrievable situation of declining EU competitiveness. This is the case for example for the industries associated with the Task Forces on New-Generation Aircraft and Car of Tomorrow, where the EU's competitors are putting large sums of money into new developments.
- The need to catch a "window of opportunity" in industries faced with a need for rapid restructuring as a function of technological change. This is the case for example in multimedia, where the very competitive European publishing industry risks a radical decline if it cannot accommodate the new demands of electronic publishing and if it cannot take the opportunities inherent in this emerging industry as a result of inadequate standards and poor market development (eg in schools technology).

PART II: SUMMARY REPORTS OF THE TASK FORCES

- NEW-GENERATION AIRCRAFT
- EDUCATIONAL SOFTWARE AND MULTIMEDIA
- THE CAR OF TOMORROW
- INTERMODAL TRANSPORT
- ENVIRONMENT - WATER
- VACCINES AND VIRAL DISEASES
- TRAINS AND RAILWAY SYSTEMS OF THE FUTURE
- MARITIME SYSTEMS OF THE FUTURE

NEW-GENERATION AIRCRAFT

Background

World-wide industry forecasts agree that air traffic is likely to double by 2010 and that over 17 000 new commercial aircraft, worth nearly ECU 1 trillion, will be needed over the next 20 years to meet this demand. Demand for helicopters and associated engines and equipment is expected to double the projected value of the market over this period. The EU aeronautics industry and its air transport infrastructure must prepare themselves for this situation. With the largest home market in the world at present, the US remains by far the dominant supplier of aeronautical products, although in the last 25 years the EU aeronautics industry has worked hard to build up a share of the civil market of about 30%, thanks to European cooperation, innovation and very substantial investment. The EU industry will, however, face enormous competition even to retain its present market share, both from the very well supported US rivals and other producers emerging from the world's rapid growth regions.

The consultation process

Extensive consultations have taken place with all branches of the aeronautics industry (airframers, engine producers, and mechanical and electrical equipment suppliers). A workshop involving users, suppliers, sub-contractors and other interested parties has been held. Contacts have been made with several national aeronautical research establishments as well as with the association of aeronautical research establishments in Europe (AEREA) and the work of the Aeronautics Task Force has been presented to the 4th Framework specific programme committees.

In addition to these meetings with industry and the research community, the Task Force has also held discussions with representatives of the Member States, and the Commissioners responsible have reported to the European Parliament on the progress of the Task Force initiative.

As a result of the Task Force's consultations to date, it has become clear that there is widespread industrial and political support for the view that when looking at the vehicle component of the air transport system, the priority measures identified by the Task Force would, if implemented at European level, most effectively and rapidly enable improvements to be deployed to competitive benefit. However, this extensive consultation exercise will continue, thereby giving industry at large the opportunity to make proposals for the content and procedures to be included in any future Framework Programme.

Employment and Industrial Base

In the EU the total aerospace market is estimated at some ECU 34bn annually, whereas in the US it is ECU 83bn and in Japan ECU 7bn. Although the major EU aeronautics industries

are mainly located in seven member states, their industrial network, involving materials, components, equipment, machine suppliers, maintenance and repair, covers the whole Union and accounts for about 350 000 employees directly, and around four times that number indirectly. The competitiveness of those European industries faced with the thorough restructuring of their competitors will therefore depend on the whole supply chain being more competitive, with the objective of delivering to the market, on time, the new generation of aircraft which users and society need.

There are other important security and industrial considerations in the maintenance of a healthy and competitive aeronautical industry. Aeronautics technology produces spillover benefits in many areas including materials, structures, electronics, telematics, communications, power generation, design methodologies, systems integration, manufacturing technology, etc. It is also an important contributor to Europe's trade balance since without a European presence, the US would enjoy a monopoly in the large civil aircraft market. Moreover, at over 20%, the industry spends one of the highest proportions of turnover on R&D.

Environment/Sustainability

Increasing public concerns for the environmental effects of transport together with the expected growth of air traffic in the coming years are putting additional pressure on the demand for more stringent regulations concerning aircraft noise and emissions. However it is clear that technological developments can lead to significant improvements. (The US government has committed \$239m over a period of 8 years on aeronautical noise R&D.)

A number of actions are already underway in various Member States, but a European approach is essential to generate additional synergy if industry is to acquire a position through research, to lead the field in cleaner air transport. Such a focused research activity would also complement other actions (such as the ECARDA initiative on air traffic management) and, by attacking the problem at source, could be considerably cheaper than alternative measures.

Thus the Task Force has developed the environmentally friendly aircraft action, an action which by its very nature encourages cross-border cooperation since it responds to global concerns regarding the environmental hazards of aircraft noise and emissions by attacking the problem at source.

Cohesion

The supply chain of the 3 main sectors (airframe, engine and equipment) involves more than 7 000 companies throughout Europe, of which only about 40 are large-size firms. This demonstrates that SMEs have an important role in the competitiveness of the system. For all of them, survival depends strongly on the health of their customers and user companies.

Accordingly, the Task Force has developed the distributed concurrent engineering action, a concrete example of an application of the information society through the use of modern technologies to link enterprises together thereby creating an integrated aeronautics structure throughout the entire supply chain across Europe.

Its purpose is to break the barriers between companies and improve supply chain efficiency, because design and engineering could be done simultaneously rather than sequentially, giving immediate feedback and eliminating costly errors and delays at source. This implies new working practices and consequently new organisational structures supported by the application of advanced information and communication technologies. This process should therefore be accompanied by relevant dissemination/exploitation or training activities at all levels of the design and production chain throughout the EU. Such actions should be extended as much as possible, both to the network of all the supply companies and to users, thereby facilitating the integration of SMEs in the market.

The application of advanced technologies in this field presents a great potential for delivering substantial reductions in the production cycle and thus in the cost of introducing and supporting new and derivative products, and hence on competitiveness.

Added Value of Additional Funds

Several civil aeronautics research programmes exist in Europe, either at industrial or national level. Overall public support for these activities is estimated to be around ECU 400m. per year, or around one quarter of the level provided in the US. However, no real coordination exists between these European programmes, which very often overlap. In addition not all national research programmes permit cross-border collaboration, a pre-requisite for technology integration for the aeronautics industry. Additionally, the common European emphasis on basic research militates against the short or medium-term application of technology, which is encouraged in the US and Japan.

The EU aeronautics industry and research establishments have started a process of restructuring. Increased cooperation among them is ever more necessary, and the EU has a role to play in supporting these efforts and in encouraging greater coordination at government level. Such cooperation stimulates synergy between applied and fundamental research and increases the impact for all industry, large and small, and at all levels of the supply chain. Therefore collaborative R&D activities have been growing at EU level.

Since any new major aircraft programme in Europe will only be undertaken on a European basis using joint technology, the Task Force considers that an integrated action at European level is essential to demonstrate and validate those technologies which improve the overall efficiency of future aircraft, and thus improve the competitiveness of all economic actors in the aeronautical field. Only by bringing collaborative R&D activities closer to the market will the entire spectrum of technologies needed for preparing new and competitive designs be secured comprehensively as is done in the US. As a result of its high cost a large scale technology demonstrator is currently out of reach of single companies or Member States.

The specific technologies to be covered relate to systems, airframe and operational efficiency. The basic and applied research actions must be taken forward into usable technologies, materials or processes by means of a European risk-reducing demonstration programme involving the use of flying and static testbeds so that they are thoroughly validated before introduction on new aircraft. This is necessary for safety, and to secure the confidence of buyers and users, as well as reducing certification and lead times.

Urgency

Access to state of the art technology is the prime ingredient for preserving or increasing the competitiveness of the aeronautics industry and for being able to provide the high-technology sophisticated products at low cost that the market demands. The incorporation of new technology has indeed underpinned the re-emergence of European products in the world aeronautics market.

However, at the same time as the US has initiated a number of well-funded, and highly-coordinated technology acquisition programmes (e.g. HSCT, IHPTET, CTR¹), for the express purpose of strengthening its leadership in the aeronautics industry well into the next century, the 1992 EU/US bilateral agreement has imposed strict limits on the level of direct support which may be provided (the traditional European method of funding aircraft development). But the agreement allows greater possibilities for indirect support which the EU should use to move the emphasis from direct to indirect (i.e. R&D) support.

In line with the policies adopted by the Council of Ministers on research and industrial policy, the Task Force has therefore identified priority industrial and technological objectives (the environmentally friendly aircraft, the more efficient aircraft, and the aeronautics network for concurrent engineering) which will create more synergy between EU and national programmes by making the best use of the facilities offered by these programmes.

¹ HSCT, High Speed Civil Transport; IHPTET, Integrated High Performance Turbine Engine Technology Initiative; CTR, Civil Tilt Rotor.

**Multimedia for Education and Training:
Executive Summary of the Intermediate report of the Task Force
"Educational Software and Multimedia"**

The Task Force "Educational Software and Multimedia" has addressed educational multimedia as a whole, from research and development work up to the deployment of advanced educational and training services using multimedia technologies.

Indeed, deployment policies and programmes, both at national and at European Union level (Socrates, Leonardo da Vinci, Media II or Info 2000), play a key role in promoting the dissemination of existing and past research results on multimedia applications for education and training. Furthermore, these deployment activities should also help to prepare the ground for an easier introduction of the next generation of multimedia applications which should result from existing and forthcoming research programmes, both at national and EU levels (notably Telematics Applications and Esprit).

The consultations carried out by the Task Force with providers and users, together with the results of the call for expressions of interest (5056 ideas coming from 2216 actors - publishers, industries, educational institutions, etc - who responded to this call) led to the conclusion that multimedia for education and training is a burgeoning market. Off-line products predominate today, though frequently they are not considered very suitable for education and training purposes by the users. A growing number of on-line services are available on networks, though still with limited multimedia content.

In the near future the contribution of on-line services available through the emerging broadband telematics networks (the so-called "information superhighways") will certainly increase and research work should allow them to have improved multimedia and interactivity capabilities. Most providers in Europe clearly feel that they have to strengthen and enlarge their existing cooperative research as a key means to prepare the next generation of applications and maintain competitiveness.

Rationale

A major contribution to increasing European employment

The pace of growth in the multimedia industries will not only continue but even accelerate. In particular, education and training services are likely to become, together with culture and leisure, one of the main sectors, with a huge capacity to create employment. These high growth expectations of the emerging multimedia and education and training markets stem from the development of the Information Society. Indeed, the demand for education and training is rapidly growing and evolving towards lifelong learning. This will lead to high growth of employment in the coming years in new industries, which will provide education and training services both "off line" and "on line". These services will also allow the increasing demand for new skills in the labour force to be met and will thus make it possible to reduce the mismatch between supply and demand for skills, and therefore contribute to reduced structural unemployment.

Key opportunities for European Industry, notably SMEs

Large companies in the relevant sectors - the information technologies industries, telecommunications operators, publishing, among others - are fully aware of the above challenges brought about by the Information Society and are conscious of the necessity to invest in research and development on multimedia products and services, and particularly in the education and training field. They all know that applications will be the driving force for the deployment of the Information Society, and that future markets will be based on services rather than on basic infrastructures and technologies. A large number of highly innovative and creative SMEs, which are burgeoning all over Europe, are equally demonstrating a great capacity for innovation and creativity in addressing niche markets.

Furthermore, one can also expect that the proposed research will in the long term have an overall benefit for the whole European economy, through improved competitiveness of European firms, by means of a better trained workforce in accordance with needs stemming from the Information Society (fast changing work profiles due to the introduction in the production process at all levels of the new technologies, and quality management of the entire value chain).

Bringing services to the citizens and increasing sustainability

The provision of high quality education and training services to the entire population regardless of time and location will help to prevent the movement away from rural areas, and the need to concentrate trainees in training centres, and therefore to reduce transportation needs. Large companies have already managed to reduce sharply the travel budget of their trainees by these means. In the near future these developments will be generalised and made accessible to SMEs and home users in rural areas.

Increasing economic and social cohesion and respecting cultural diversity

The Task Force, through hearings and the call for expressions of interest has demonstrated the huge interest of producers and users in this field. It is worth highlighting that this interest is broadly spread in all countries and regions of the EU. This is due to the fact that local education and training markets can also be addressed by local producers (because of local cultures and languages) and by meeting this demand some of them also succeed in finding market niches in other EU countries and abroad.

Peripheral regions and rural areas are prime users of these technologies as they allow access to the same education and training opportunities as those available in more central regions. In this and many other respects, the capacity to adapt and to provide equality of access, even to disadvantaged groups and special needs' learners, makes the use of multimedia technologies for education and training undoubtedly a prime public interest service. User-friendly and cost-effective solutions should be developed to facilitate the work of the companies involved in multimedia content production.

Finally, there is considerable scope for the diffusion of multimedia applications because there is no need for large investments to be part of the production chain delivering multimedia based learning material or services. Indeed, through the networking of small

production and research centres in the multimedia field, there is a great potential for "virtual" distributed production centres.

The need for increased research effort

As described in the intermediate report of the Task Force, there is a clear need to pave the way for the new education and training products and services of a high quality which will be widespread by the year 2000. Clear signals have been given by the key actors and the market players that they are ready to invest in R&D in this field.

- The call for proposals of the Education and Training sector of the Telematics Applications Programme that closed on March 15 1995 resulted in a request for funding 17 times larger than the available budget. Proposers were ready to invest in projects worth nearly 1000 MECU, requesting 600 MECU of EU contribution, although only 34 MECUs were available for that call.
- The recent Call for Expressions of Interest launched by the Task Force reinforced this conclusion: more than 50% of the total 5,000 contributions received expressed interest in undertaking R&D in this sector.

The cooperation, through public-private partnerships, that the intended research will mobilise, will help to structure the sector in the medium term, through the joint definition of quality standards for new education and training delivery systems. It will be possible to coordinate through these actions research and experimentation carried out by the various Member States, to foster trans-border cooperation and diffusion of the results and to make possible sharing of the risks involved in the creation of such future systems.

The early availability of high quality experimental learning services using advanced multimedia and telecommunication technologies will bring about an increase in quality, with sound pedagogic approaches, improved interactivity for learners and rich multimedia content. This research will increase accessibility to citizens of what is a prime public interest service. Our competitors, and notably USA, are devoting ever increasing efforts, as they have understood the wide ranging implications for the future of a well educated population in general and a more skilled labour force in particular, capable of mastering the new technologies and with a high innovation capacity.

The stakes are high and if we want Europe to meet this challenge, stronger research efforts are urgently needed. Equally, from an industrial viewpoint, electronic publishers and broadcasters are risking a radical decline in the medium term if they are not capable of mastering the use of these new technologies to provide new learning applications capable of competing with products and services coming from our competitors. This is particularly risky in a sector with such a structuring capacity as education and training, as the European cultural identity is at stake. Publishers, information and telecommunication technologies industries, and telecommunications operators need to coordinate their research efforts in cooperation with teachers and education and training institutions in general so as to take up the opportunities inherent in this emerging market sector.

Objectives and scope of the R&D proposed

The Research and Technology Development and Demonstration (RTD&D) work will focus, on the one hand, on new applications of multimedia in education and training which will be available by the end of the century and, on the other hand, on prototyping and experimenting with systems and services integrating the more advanced features enabled by the emerging multimedia and communication technologies. It will be user-led and will investigate all the learning issues and socio-economic implications of those new services and will address the specific needs of learners, teachers and trainers for user-friendly and cost-effective multimedia systems and services for education and training.

Further RTD&D work will be undertaken so as to reinforce the innovative experimental services that have already started in the Telematics Applications programme. These new services will be based on high quality content and on a mix of interactive cable TV and other broadband communication means.

- New ways to address educational and training needs of young people and adults, including special categories of people such as disabled or learners in remote rural areas, teleworkers, migrants, etc. This will include validation with real users in primary and secondary schools, universities, vocational and dual-mode educational and training institutions and on-the-job training.
- Experimental services for individual learners, accessible from the home, public libraries or other resource centres.
- Experimental services for teacher and trainer training, both for initial and in-service training, and training of designers and producers of multimedia learning materials.

The research currently under way in the Telematics Applications and IT Programmes will be extended to address specific facilities required for the development of advanced multimedia education and training contents and services:

- Design and production methodologies for teachers and trainers developing educational multimedia, (including co-operative production and pooling of multimedia resources over the World Wide Web).
- Development of advanced multimedia courseware based on user-friendly and intuitive interfaces such as virtual reality, which are easily adaptable to specialised training as well as to the diversity of learners such as disabled people.
- Advanced systems for professional design and production of multimedia courseware, based on functionalities including quality control and copyright enforcement tools and billing provisions.
- Advanced learning delivery mechanisms based on broadband communication, such as, Asynchronous Transmission Mode (ATM), interactive cable television and research networks, and focusing on the interoperability of the various application and on on-line learning delivery services.

This research will be coordinated with that carried out at member state level through the concerted actions mechanism.

Finally in the field of international co-operation considerable economies of scale could be obtained through the development of experimental education and training services easily adaptable to the needs of developing countries.

THE CAR OF TOMORROW

Objective

The *Car of Tomorrow* aims to contribute to the research and demonstration effort necessary to develop a new generation of competitive vehicles (cars, trucks, buses, motorised two-wheelers) that are clean (with ultra low or zero emissions), efficient, safe and intelligent. This objective brings together the industrial, environmental and social concerns faced by road transport. This action responds to the strategy developed in the Green Paper on "Innovation", the White Paper on "Growth, competitiveness and employment", the White Paper on "An energy policy for the EU", the White Paper on "The future development of a common transport policy" and the Green Paper on "The impact of transport on the environment".

The initiative includes a process of comparative assessment of the technologies developed reflecting the diverse European social, environmental, climatic and geographic conditions, both urban and regional. This will enable more technically informed policy decisions to be made concerning future provision of mobility, having regard to industrial competitiveness, employment, energy supply and security, and environmental matters such as greenhouse gas emissions, ozone formation, and health and safety.

The consultation process

The Action Plan of the Task Force *Car of Tomorrow* has been prepared in close consultation with all the actors concerned including those from automobile, electronics, materials, and energy related industries and public authorities. Starting from an assessment of the current situation, the essential technological targets needed to achieve the objective have been identified. By mapping these onto current activities, the additional RTD priorities for European action have been established. It recognised that a flexible approach is essential to leave room for rapidly emerging and promising technologies identified by industry. Accordingly the basis for future action is defined in terms of the deliverables. For the short to medium term these are energy efficient, competitive ultra low and near zero emission vehicles (ULEV) for both urban and regional use, and radically new, zero-emission vehicles (ZEV) concepts. For the long term they are radical, fully sustainable, negligible or zero emission propulsion systems, for example fuel cells, which have the prospect of exploiting renewable primary energy sources.

The Action Plan proposes to establish an advisory group, comprising representatives of industry, utilities, research centres, local public authorities, users and the public. This will enable the Commission to receive the views of all the stakeholders concerned in a way which can be taken into account in the realisation of the Action Plan as well as in the definition of transport, energy, environment and industrial policies. It will be possible to create a number of working groups, dealing respectively with comparative assessment of technologies,

proposing vehicle efficiency and emissions targets, and investment and technical risk assessment. The Advisory Group will advise on future technical priorities and strategy for RTD&D, maintaining a balance between the more commercially driven "bottom up" approach to technology acquisition and "top down" measures to implement policy.

The European interest

Sustainable Mobility

Road transport is a victim of its own success. The personal mobility afforded by private cars is increasingly limited by traffic growth and eventual grid-lock (the total number of cars is forecast to increase by more than 25% between 1992 and 2005). Poor air quality is forcing some of European major cities to limit access to certain categories of polluting vehicles. Road transport emissions affect not only the citizens' health (the total external costs of health problems attributed to transport emissions are estimated at 0.3%-0.4% of GDP) but also the global environment owing to the generation of greenhouse gases. Road transport amounts to nearly 80% of transport generated CO₂. Transport consumes 30% of final energy demand and is responsible for the release of 25% of all CO₂ emissions. The rise of these environmental and social externalities, coupled with underlying concerns for long term energy security and supply, provides immediate motivation to develop a technological development plan, providing short, medium and longer term vehicle and infrastructure technologies, compatible with emerging telematics and intermodal transport systems for reducing congestion. It is consequently imperative that European road transport takes up the challenge of sustainable mobility and integrates the vehicle of tomorrow within the transport system of tomorrow and its intermodality requirements.

Industrial Base

Mobility is essential to economic activity and the European automotive industry is itself a major wealth creator. Vehicle production contributes 2% to the total European GDP. The annual turnover of the European car industry is more than 300 billion ECU. Industrial competitiveness is heavily dependent on production scale economies, and product standardisation. The *Car of Tomorrow* aims to provide a framework of European dimensions within which to develop and evaluate advanced, cleaner vehicle propulsion technologies, their integration into future vehicle concepts as well as the associated infrastructure, including telematics systems, enabling their eventual market potential to be assessed and maximized. Immediate benefit will result from establishing this new focus, concentrating on both techno-economic and political issues, enabling better coordination of RTD at Union, national and industrial level, thereby sharing costs, avoiding wasteful duplication, and maximizing opportunities for standardization. Through a deepening of the consultation processes between the vehicle industry and the other stakeholders, a more consistent and coherent approach to future RTD strategy can be established. Strengthening the bridge between technological progress and the regulatory processes will help create the much needed stable environment from which the vehicle industry can profitably develop new products.

Employment

More than 4 million jobs depend on the automotive industry. About 1.8 million are employed in vehicle production representing 8.3 % of all manufacturing jobs. The recent restructuring to achieve "lean production" has had a consequential loss of more than 100,000 jobs in the last 2 years. It is estimated that a decrease of each 1% of market share by the European manufacturers induces a loss of 18,000 jobs among the vehicle manufacturers alone. As suppliers of equipment and materials, SMEs play an important role in vehicle production.

In the future, it is likely that niche markets will develop worldwide for more efficient ultra-low and zero emission vehicles, based on propulsion technologies matched to the vehicle mission, eg private ownership or hire, bus, distribution. The range of opportunities will vary in line with the characteristics of the local transport systems. With further development, the most successful technologies may achieve self sustaining market penetration, with the possibility of significant structural changes in the vehicle industry, creating new employment and training opportunities, especially for dynamic and flexible SMEs, as suppliers of new components. Whilst the need for new infrastructure may stimulate significant employment demand transiently, the longer term outlook for jobs is probably substitution rather than creation.

International Competitiveness

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 industry is extremely dependent on its ability to produce world class products at fiercely competitive prices. US Government support includes shared cost funding of the United States Advanced Battery Consortium, a battery development project and the US Partnership for a New Generation Vehicle (PNGV). The Japanese are also very active with NEDO launching a 10-year programme LIBES for developing high performance lithium batteries. They are also working on fuel cell technologies which have stationary and transport application potential.

The recently announced postponement of the 1998 Californian zero-emission vehicle mandate (note : the stringent 2003 targets are maintained) underlines the need for a constructive partnership between the vehicle industry and regulatory bodies. This change in policy is reported as having a particularly adverse effect on the already vulnerable US component supply industry, which was gearing up for 1998. Regulation should be linked to the pace of technological development. The *Car of Tomorrow* can provide a European framework for giving a technical view of the costs of realizing such technological developments, balancing industry's economic viability with societal interests, as well as stimulating the appropriate technical developments.

Cohesion

The objectives of the *Car of Tomorrow* reflect concerns shared by all Members States. An increased effort and coordination of vehicle-related research could have significant consequences in terms of employment and training across the Community. European SMEs

supplying materials, equipment and services to the vehicle constructors are to be found in almost all regions. Planning for new European networks and intermodal systems will need to anticipate trends in vehicle and infrastructure development. Accordingly there is a need for the comparative assessment phase of the initiative to reflect and involve the different needs of transport users across the Union.

The need for funding

Inadequacy of existing instruments

The existing Framework Programme instruments are addressing some of the major economic considerations, notably through RTD measures to enhance industrial competitiveness: eg. improving products, processes (Brite-Euram) or traffic management systems (Telematics). They concentrate on the short to medium term functional aspects of conventional vehicle and transport system technologies but tend to address the social and environmental considerations only in so far as they directly impact competitiveness. For example, lightweight, aerodynamic vehicles are primarily of interest to the market because they consume less fuel and cost less to operate. Fortunately they also generate less CO₂, although that can be offset by ever faster driving habits and increased equipment levels.

The unsustainability in the medium to longer term of the current situation and growing trends in road transport are now universally recognised. Yet the research policy has still to reflect this to any significant extent. Relatively small-scale, but growing efforts to develop and promote more efficient, cleaner, propulsion technologies are being funded in FP4 in the Joule, Thermie and Brite-Euram programmes.

Making better use of resources

The *Car of Tomorrow* initially proposes an RTD strategy which includes propulsion technologies (electric vehicle, hybrid vehicle and fuel cell vehicle, and radical changes in internal combustion engines) and design (development of a new concept of vehicles able to make use of a range of propulsion systems). The ambitious objectives reflect broad consensus arising from extensive consultation with all the stakeholders concerned. By definition this could not be achieved by a single company or a single Member State and itself represent a small, first step towards developing a common European vehicle RTD strategy. The action proposed by the Commission aims to ensure a better coordination between all relevant actions at European level, which today are too fragmented and dispersed. The better use of European human and financial resources should allow the realization of radical innovations as well as a broad application of newly developed clean technologies.

Urgent need for action

Responding to the social, environmental, energy efficiency, mobility and economic concerns identified above requires that consideration is given to aspects not adequately covered by existing measures. This includes identification of areas where additional funds should be

allocated urgently in order to provide the prospect in a realistic timescale of having the technological base of very low and zero emission vehicles. The activities identified include:

- extending the scope of RTD on energy storage/converters to include new energy storage/converter technologies, eg new battery systems, fuel-cell/reformer systems, materials and processes where existing budget levels are too constraining, resulting in a strategy of picking winners with attendant risk of failure;
- development of advanced combustion engine technologies and intelligent fuel charging, including cleaner fuels, capable of achieving a substantial reduction in harmful emissions, balanced with fuel efficiency and vehicle performance; these may be based on 2- or 4- stroke Otto and Diesel, gas turbine, or Stirling cycle, including their application to hybrid vehicles;
- establishing a new European framework for broad-based technical and socio-economic comparative assessment of clean propulsion technologies, as a basis for RTD strategy development and input to the regulatory process.
- developing new electronic control system technologies based on hybrid propulsion systems and telematics systems for active vehicle safety and active environmental control of urban areas;
- extending the current very limited emphasis on studying infrastructure issues, such as compressed/liquid gas refuelling, eg, for natural gas, hydrogen, battery recharging, and attendant safety.

INTERMODAL TRANSPORT

Introduction

In 1994 the total volume of world-wide trade in goods amounted to more than 3,000 BECU². The EU was accountable for almost 25% of this amount. If the Union wants to continue being a major trading partner, efficient transport services are obviously required.

Moreover, an enormous increase in the demand for transport services has resulted from the implementation of new logistics concepts (just-in-time, inventory postponement, etc.) and the change to more and more specialised industrial processes. During the period 1975-1995 the demand for inland freight transport services almost doubled in the Community, and will probably have doubled again by 2025.

The growth in transport services demand is not distributed evenly between the modes. In 1975 road transport accounted for 50% of total inland freight carriage in tons-kilometres in the Community. In 1993 this had already increased to 71%. Rail and inland waterways lost market share. The most significant example is rail transport which saw its share in freight transport decrease from 32% in 1970 to 15% in 1990.

But what is valid for freight is equally valid for passenger transport. In 1970 the modal share in passenger-kilometres of private cars was almost 75%. In 1993 their share had increased to almost 80%. During the same period the market share of railways dropped from more than 10% to 6%; the share of buses and coaches from 13% to 9%. No discontinuation of this imbalanced growth is expected soon.

Not surprisingly, road transport accounts for a total estimated congestion cost of 120 BECU per annum. But congestion costs are not the only negative external effect of the current imbalance of the Union's transport system. The estimated total rises to 250 BECU with the inclusion of other external costs (environmental impact, safety etc).

These few figures clearly demonstrate the need for new and innovative solutions to improve the performance and limit the harmful economic, social and environmental impact of the Union's present transport system. It is no longer possible nor acceptable that the problems of tomorrow are tackled today by solutions we used yesterday.

Note: This section is substantially the same as, but not identical to, the Progress Report of the Task Force on Transport Intermodality, published separately as SEC(96)503.

² 1 BECU = one billion ECU

Intermodal transport

The EU's Common Transport Policy promotes the concept of "sustainable mobility" to solve the different bottlenecks. It aims at the development of transport services which are efficient, cost effective, safe, clean and socially acceptable and which give scope for the consolidation and the enhancement of the competitiveness of European industries.

The development of a sustainable transport system has to address as a priority issue the current modal imbalance. Fragmented, unimodal solutions no longer offer scope to solve existing bottlenecks. A holistic and system approach is needed.

To meet customers' requirements, transport services should be at least reliable, cost-efficient, and fast. Services of this nature can best be achieved through modal integration and through the interconnectivity and interoperability of networks. In short, a shift from unimodal transport to intermodal transport is required. However, this shift will only be achieved if intermodal transport services offer added value to all parties involved, i.e. industry, operators and users. This added value will be more easily created by modal co-operation and by combining the strengths of each of the modes into customized high quality door-to-door services, rather than by modal competition.

Intermodal transport services are already available on the transport market, but their market share is still very limited. To realize the full intermodal transport potential, significant efforts are required. One of these efforts is in the area of research and technological development and demonstration (RTD).

On the basis of existing or planned RTD activities some of the tools to meet the challenge are available. However, a major research effort is still needed to provide solutions to the technological, legal, logistical and institutional barriers which prevent the rapid customisation and integration of technologies which are capable of making a real contribution to the seamless transfer of goods and passengers from one mode of transport to another. Research of this nature will have major benefits for both the efficiency and the competitiveness of European industry (particularly for SMEs which are strongly represented in this sector).

The better provision of cheap, environmentally friendly transport will allow a significant part of the production costs linked to transport to be reduced and thus permit an overall increase in the efficiency of Europe's industries. The competitiveness of the European supply industries which provide tools capable of promoting intermodality such as telematics applications/systems or transshipment technologies will directly benefit from increased European research efforts. This is particularly important in the context of increasing competition from American and Japanese counterparts and a rapidly expanding market for such products.

The benefits will not only assist the competitiveness of industry. The enhanced provision of door to door transport for both goods and passengers will promote the creation of new transport service industries with subsequent benefits for employment.

Other key Community policies such as environment, energy, cohesion, regional and social policies will also be supported by this initiative which aims to improve the quality of life of

Europe's citizens by providing better, more accessible, cheaper, efficient and environmentally friendly transport services.

The Task Force Transport Intermodality

The Task Force Transport Intermodality has been created with a view to developing a consistent intermodal transport RTD-effort at a European level. An important objective of this Task Force is to look at synergies between the various RTD programmes of the Community related to intermodal transport, to cluster different actions and activities to avoid overlap and strengthen their impact, and to help identify the priorities for future research actions responding to the new identified needs. By doing this, new technologies, concepts and strategies will be generated contributing to the realization of the full potential of intermodal transport.

The work of the Task Force, in which the different Commission services dealing with intermodal transport participate, has been accompanied by extensive consultation involving approximately two hundred relevant actors in the field, including industry, operators, users, local authorities, international organisations and other interested parties. The two major fora in which the interests concerned have expressed themselves are a High Level Group and a Steering Committee. In the Steering Committee more than 30 international organizations interested in the development of intermodal transport are represented.

The High Level Group, chaired by Commissioner Kinnock, groups key representatives of the European transport sector (industry, operators, users and other interested parties). A first meeting was held on 29 September 1995. This meeting supported the Commission's initiative and endorsed the proposed terms of reference and the proposed action plan. A second meeting is scheduled for 20 May 1996.

The work of the Task Force Transport Intermodality

The Task Force has already produced three reports:

- A diagnosis report of intermodal freight and passengers transport;
- An inventory report of RTD-activities at Community and national level;
- A report on priority actions to be developed.

Diagnosis report

The diagnosis report highlights the modal imbalance and the resulting harmful externalities. To reap the full economic benefits of transport, operators and users will have to focus more on integrated transport services which are customer-oriented and offer high quality door-to-door services in the framework of logistics organization. The supply of efficient intermodal transport services requires synergies between the modes, and the strengths of each of the individual modes to be integrated into a high value transport product.

To make intermodal transport more efficient and to allow for the full benefits of the single internal market, there is a strong need to align intermodal transport policies at national and Community level and to develop a consistent and coherent intermodal transport strategy, including the development of a long-term European railway strategy and the adaptation and development of new supportive technologies.

Intermodal freight transport could become more appealing if, in addition to the existing functions of modal operators and forwarders, a new generation of intermodal transport operators could offer the most cost-efficient and user-friendly door-to-door transport services with an equidistant or neutral view on each mode.

Moreover, intermodal freight services are driven by logistics requirements of the industry. Such services are only able to function efficiently when supported by technology which enables co-operative freight and resource management, with a view to trading off transport costs against value added logistics services.

As was already indicated in the Commission's Green Paper "The Citizens' Network", intermodal passenger transport will have to offer smooth interchange facilities, good level of service quality, user-friendly travel information and attractive fare and ticketing systems. In responding to customer requirements, the sector needs to overcome obstacles caused by its structure whereby operators are mostly organized along modal lines. Special attention will have to be paid to the transport of disabled persons.

The diagnosis report confirmed the need to focus future RTD-activities on six priority themes which are of major interest for the improvement of intermodal transport in the Union. These are:

- Transfer point efficiency;
- Intermodal network efficiency;
- Information and communication technologies;
- Improvement of transport means and transport equipment;
- Market conditions;
- Training and market oriented strategies.

Inventory report

The inventory report provides an inventory of past and ongoing activities in the field of intermodal transport in Europe at both national and Community level. It also gives an overview of the allocated resources. The structure of the report follows the priority themes identified.

Information on more than 160 projects related to intermodal freight and passenger transport have been collected from Community programmes. Obviously, substantial financial contributions have already been made in studies and research. However, operational validation of the results is lagging behind. As a consequence, a gap exists between research and the implementation of its results. Innovations are only finding their way into the market at a slow pace.

The inventory report constitutes the starting point for a further co-ordination of the different intermodal transport related activities in order to increase the effect of the financial resources which have been employed and to establish a more consistent impact on the market of the results obtained. The Task Force has identified clustering as the appropriate way forward.

Furthermore, after an assessment of the funds available in the existing specific programmes it is clear that additional resources are urgently required to ensure the necessary critical mass and achieve tangible results that can have a significant impact on the transport system. The Task Force will have an important contribution to make in ensuring that the funds are channelled to the strategic priority issues.

Priority report

The priority report focuses on the required RTD-actions to achieve balanced solutions for the development and improvement of intermodal freight and passenger transport. The aim is to define a coherent intermodal RTD-strategy which will comprise the identification of new intermodal research projects and propose demonstration projects able to present the technical and commercial advantages of intermodal transport for operators and users.

In view of this the following RTD-actions are proposed:

Intermodal freight terminal 2000+ This action aims at developing cost-effective solutions for the transfer points. It envisages transfer technologies which are adapted to the size of the cargoes handled and a strategy to provide real-time information for operators and users.

Intermodal freight network 2000+ This action aims at developing an intermodal transport system in the framework of logistics chains. It will enhance the ability to handle and integrate consignments of different size. In addition, it will look at design and integration of networks.

Transport town 2000+ This action focuses on urban mobility. It aims at providing a seamless intermodal transport system. The use of private cars and freight haulage will be integrated with other forms of transport which are more environmentally friendly and energy efficient.

Intermodal traveller 2000+ This action aims at providing customers with reliable information and other value added services for the use of urban and inter-urban transport systems.

Passenger interchange 2000+ Appealing and passenger friendly interchange facilities are the targets of this action. They include information and other services designed to reduce existing bottlenecks.

Research studies and support activities

Research will be undertaken into the structure of the intermodal market, including inter alia access conditions to the market and the profession, and competition rules. Data on intermodal transport will be collected and analyzed.

Human resources development, as a support activity par excellence, will be addressed in each of these six actions. The development of specific training schemes will be promoted.

Future work

In order to verify and develop the specific RTD-activities within these actions, the Task Force has established work panels consisting of external experts for each of these actions. They are working under the responsibility of the Task Force and base their work on the issues and priorities identified by the three Task Force reports.

The Commission services responsible for the specific programmes will take into account the input received from the panels with a view to prioritising and/or updating the relevant work programmes after having submitted these proposals for approval to the relevant Programme Committees. The aim is to come to more consistent RTD actions for intermodal transport setting out common priorities and improving co-ordination.

ENVIRONMENT - WATER

Objectives

The objectives of the Task Force are to contribute towards the development of a European strategy for sustainable management and rational use of water, to make European water companies more competitive on the internal and world markets and to refocus scientific and technological cooperation on priority projects, inter alia in the EU's relations with the Central and Eastern European and Mediterranean countries.

Importance and European dimension

Water has become a coveted economic good, whose management will be one of the major problems of the 21st century. Increasingly, geographical and seasonal imbalances between availability of and demand for water are leading to overexploitation and degradation of reserves, and indeed provoking conflicts between competing users or even countries. Even when water is plentiful, pollution, wastage and other types of mismanagement are widespread, jeopardizing the long-term availability of supplies at acceptable cost, the environmental balance and the quality of life of most people.

Despite the action taken, water pollution remains a reality in the European Union: 20% of the surface water is at risk; a variety of ill-controlled sources pollute underground aquifers; coastal zones are becoming increasingly fragile, particularly due to the development of tourism and the lack of knowledge about discharges at sea; over 60% of farmland has fertilizer and pesticide contents considered alarming for water quality in the vicinity. Between 15 and 30% of the water collected is lost in distribution. And 85% of the civil protection measures taken by the Member States are concerned with flooding, etc.

The situation of some of our non-Union partners gives even greater cause for concern. North Africa and the Middle East are the regions with the lowest water supplies in the world: 53% of their population receive less than 1 000 m³ per inhabitant per year, the threshold below which the shortage endangers food production. The Central and Eastern European countries - another priority region for Europe's international cooperation - face serious pollution problems calling for solutions which are both effective and economically sustainable for the countries concerned.

To a large extent, water resources are shared (in several Member States over 50% of the supply depends on other countries). They are controlled by a host of management bodies whose decisions generally have a transregional and transnational impact and, therefore, must be coordinated. Flood-prevention measures have demonstrated, if there was any need, the complex multiple interdependence (between regions, players, etc.) to such an extent that the idea of transregional and transnational cooperation on flood prevention and management has given way to the far broader concept of integrated water flow management plans.

Along the same lines, last year the Commission embarked on a study on water management in the Iberian peninsula. The results are now being discussed.

In practice, the Community already has numerous ways of influencing water management, whether directly (Directives, infrastructure funding, etc.) or indirectly (agricultural, industrial, environment and regional policies). A recent communication from the Commission to the European Parliament and the Council outlined a new approach to environmental legislation on water going beyond the traditional instruments (standards and regulations) and taking due account of the leverage offered by technologies and financial and fiscal instruments.

The measures taken under other Community policies have a considerable influence on market trends and the pattern of demand for technologies and services. For example, the Directive concerning urban wastewater treatment requires all towns with a population-equivalent of between 10 000 and 15 000 to be equipped with sewage collection and treatment systems by 2005.

The market is expanding vigorously. Within the EU (12) countries, spending on facilities and services (including operating and maintenance costs) rose from ECU 12 billion in 1990 to ECU 20 billion in 1995 and is expected to reach ECU 30 billion by 2000. The world market should more than double over the next 15 years. The growth will be three times stronger in South-East Asia and Latin America than in Western Europe.

Water rightly features prominently in the international cooperation programmes (Avicenne, Tacis and, more recently, Euro-Med, for example). However, it will not be possible to seize these opportunities fully without a special effort to adapt the technologies and to innovate, with regard to funding and how cooperation is organized. The need for closer coordination between the measures taken, particularly on technical cooperation with the developing countries, recently gave birth to a proposal to set up worldwide concertation structures, such as the Global Water Partnership, for which the Swedish International Development Agency (SIDA) provides secretarial services, or the World Water Council (discussions to link the two are now under way). Europe must be involved.

Water is one of the sectors in which Europe has companies of world-wide stature and leading methods for joint management of resources. Europe's leading private companies operate virtually all over the world and dominate a large number of markets, particularly for the construction and management of treatment plants for big cities. By contrast, there is tougher competition between the Americans, Japanese and Europeans for the development of more specialized facilities, for example to treat industrial effluent.

As regards the user sectors, Europe is lagging some way behind on rational use of water: recycling rates in the principal branches of industry, for example, are two to four times higher in the USA and Japan than in Europe.

But the distinctive feature of the water industry in Europe is, beyond doubt, the diversity of the situation. There are big gaps between operators and regions in terms of technological performance and management capabilities. Not all are equally well placed to meet the new requirements, particularly the legislative requirements, or to seize the opportunities opened

up by new technologies. Consequently, depending on the Member State concerned, the water industry accounts for between 50% and 90% of all the assistance granted from the Cohesion Fund.

Consolidation, coordination and concentration of research efforts

In the light of the foregoing, the Community's RTD efforts in this field appear extremely modest and low-profile: ECU 85 million over ten years (1984 to 1994), or just 1% of the total allocated to the first three framework programmes, shared between almost 400 projects (an average of ECU 210 000 per project), half of them under the international cooperation and environment programmes, the other half under more than four other programmes, with no particular coordination.

The same dispersal and lack of coordination marks the research undertaken at national or regional level. Nevertheless, ties between the (very large number of) laboratories have been strengthened by the establishment of various networks, some European (particularly TECHWARE - Technologies for Water Resources - and EURAQUA), others national such as UKWIR - UK Water Industry Research. But this trend is in its infancy and must be strengthened.

The objectives of economic and social cohesion, completion of the single market, safeguarding Europe's position on the international scene and promotion of industrial competitiveness are ample reasons to apply to this sector the full panoply of means available for pooling the efforts on research, development, demonstration, dissemination and take-up of knowledge. The diversity of the subjects to be dealt with (see below) calls for a particular effort to coordinate the relevant programmes: Environment, International Cooperation, Measurement and Testing, Industrial Technologies, Telematics Applications, Energy, Agriculture, Human Capital and Mobility, Leonardo etc.

Preparatory and future work

The Task Force is driven jointly by the Joint Research Centre and DGXII (Science, Research and Development) in close association with an interservice group bringing together DGIII (Industry), DGXI (Environment) and all the other services concerned (external relations, development, agriculture, regional policies, telematics applications energy). In addition to bilateral discussions, the first two meetings were held on 2 October and 11 December 1995. A third will be held in March 1996.

Various bodies have sent representatives to Brussels on their own initiative, in most cases followed by a written contribution to our deliberations. Others have asked to be informed as soon as the external consultation phase starts. This began on 6 March with a meeting with the leading European associations concerned: EUREAU (European Union of National Associations of Water Suppliers) and EWWG (European Waste Water Group) for the industry and EURAQUA and TECHWARE on the research side. These consultations are going to be stepped up and broadened in the months ahead. Everyone concerned in Europe will be approached: enterprises and other stakeholders in water supply and treatment, specialist research centres, users, regional and national authorities, regional planning authorities, etc. As regards the associations representing the main industrial users, both CEFIC (European

Chemical Industry Council) and UNICE (Union of Industrial and Employers' Confederations of Europe) have a working party on water.

A national task force has been set up in France, under the auspices of the Ministry of the Environment, to bring together the leading academics and industrialists involved in France. Another national task force is being set up in the United Kingdom, once again under the auspices of the Department of the Environment. Another is expected soon in Austria. The Commission will promote initiatives of this type, both at national level and by the trade associations, as they provide a means of involving the maximum number of participants (relay function).

The lines of action can be briefly summarised as follows:

- combatting pollution (development of the knowledge bases needed by all concerned, prevention of the diffusion of pollution through adaptation/decentralization of treatment operations, rehabilitation of contaminated sites and development of agricultural techniques for the prevention or limitation of pollution arising from pesticides and fertilisers; adaptation of treatment technologies to the needs of small communities, notably in peri-urban and rural situations; research on the elimination and reutilisation of water treatment residues; development of key technologies);
- rational use of water (re-use in short circuits, recycling and savings in agriculture, notably in irrigation, and in industry; minimisation of leakages in networks; development of economic, fiscal and institutional incentives);
- combatting chronic shortages in southern Europe (development of tools for land management, in particular through improvement of methods for analysis of environmental impact and for planning and management of water supply and demand; development and diversification of sources of supply through the extension of fields of application of techniques for artificial recharge of aquifers, improvement of desalination technologies, particularly in association with the use of renewable energy technologies, and examination of the possibilities for exploiting karstic aquifers);
- prevention and management of crises such as sudden and exceptional pollution, flooding and serious droughts (research to support the establishment of preventive practices; development of tools for prevention and management and in particular systems for monitoring, alert and communication; development of emergency systems for water supply to the populations affected).

The field covered encompasses targeted basic research, industrial and prenormative research, the development of measurement systems and decision-making aids (models, alert and communication systems), technological and management innovations, and the dissemination of knowledge and know-how.

Already, a general convergence between the priorities of industry and of universities and research centres can be observed. Moreover, everyone consulted so far has expressed strong interest in the establishment of links between the Community research programmes, the activities of the JRC, the national and regional programmes and private-sector research.

Despite the fact that water management is, in essence, a local activity, there are clearly several topics of common interest for which a European approach is amply justified.

The objective now will be to define the specific measures to be taken along the four lines proposed. These will be selected taking account of the existing activities, of the scale and urgency of the problems, of the prospects offered by science and technology, of the market opportunities, of Europe's competitive position and of the potential applications of the research results. Various methods of implementation will be considered, from coordination between research programmes or projects to the establishment of new industrial partnerships, through promotion of new research in key fields, and pilot and demonstration projects.

A reference framework will be established with a view to sharing tasks and establishing partnerships between all involved in research and innovation at local, regional, national, European and, where appropriate, international levels. Synergies will be sought between the action taken in the various Community, national or regional programmes and the research conducted under the Eureka programme or by industry.

The action to be taken on the dissemination and take-up of results will be examined right from the project design stage if possible. In this connection, account will be taken, in particular, of the regulatory, legal, financial and fiscal instruments which could facilitate implementation of the technological solutions envisaged and of any support measures needed on standardization, training, transfer of knowledge, etc.

The Task Force has already provided a forum for discussions to align the research priorities of water distributors (EUREAU) and waste water treatment operators (EWWG). The meeting held on 6 March also provided the first opportunity for these two associations to hold discussions around the same table with the EURAQUA and TECHWARE networks. It should be possible to establish a similar concertation process between the water industry and groups such as CEFIC or UNICE representing industrial users (chemical industry, metal-working, textiles, etc.).

VACCINES AND VIRAL DISEASES

Consultation Process

A consensus on the needs and priorities for R&D in the fields of vaccines and viral diseases has been reached by the Task Forces on Vaccines and Viral Diseases following a broad consultation covering a wide spectrum of potential partners from industry, SMEs, public institutions, international agencies, regulatory authorities, the scientific community and Member States. Several meetings with interested actors also helped to identify the most urgent actions in these fields.

CONSULTED	Industry (including SMEs)	Governments & Public Institutions	Academia	TOTAL
Institutions	31	47	54	142
Individuals	56	71	64	191

Reasons for and importance of reinforcement of RTD action in the area

Existence of industrial base. European private and public institutions led the world in introducing vaccines (e.g: smallpox, tuberculosis, tetanus and diphtheria, rubella, rabies, etc) and currently, provide over 65% of the vaccine volume supplied to developing countries. Seven private European companies, grouped under the European Vaccines Manufacturers (EVM) supply the majority of vaccines used in Europe and 33% of those used in the world.

Market opportunities. The world vaccine market (3,000 million ECU) will grow 9.7% per year in the next few years. For some diseases of major socio-economic impact the potential market is enormous. For AIDS, for example, the potential market, at least at the initial stages, would reach about 100 million people. Mature end-user markets not only demand disease prevention but also advanced technologies. The market for vaccines against cancer also shows increasing potential opportunities: the world market for cancer drugs could reach \$12 billion by the year 2000. In addition, new insights into the immunology of auto-immune diseases (multiple sclerosis, rheumatoid arthritis) have created the possibility to develop therapeutic vaccines against a wider range of diseases and thus to open new markets.

Public Interest: Prevention and treatment of diseases of major socio-economic impact. Infectious diseases account for 17 million of the 50 million deaths in the world each year. Despite the tremendous progress achieved in preventing infectious diseases through vaccination with an estimated three million childhood deaths prevented each year worldwide, improvement of existing vaccines or development of new ones is badly needed. Apart from

avoiding illnesses vaccination can also profoundly alleviate suffering, long-term after effects and premature death. In addition, vaccines could serve as therapeutic agents against numerous diseases like herpes or cancer.

Employment. The Pharmaceutical Industry employs almost half a million people directly within the EC. The growth of biotechnologies industries, 20% of them implicated in therapeutics, will create 2 million jobs in the 15 Member States of the European Union by the year 2000. The overall growth in employment in this area will grow at 1 percent a year, considerably higher than the general European industry average. Most of this growth is expected to come from small companies, whose pay-rolls will grow by 6.5% a year. In addition, vaccination can also prevent the loss of working hours.

Effects in terms of cohesion. Joint ventures between large pharmaceutical industries, smaller biotechnology firms (rapidly growing all over Europe) and public institutions, will generate growth, employment and industrial capacity. Development of vaccines and surveillance systems to prevent potential outbreaks of infectious diseases will benefit the full community. Attention to vaccine development and quick diagnostic procedures is also considered as a high priority given the ever-increasing immigration from North Africa, CEEC and Latin America.

International dimension. The EU's capability to provide vaccines to its neighbours will make Europe a reference point for these countries. In addition, controlling disease outbreaks in other countries, mainly in developing countries, is important primarily for humanitarian reasons, but also prevents those diseases from spreading to Europe. In this spirit, the Task Force is collaborating with the relevant programmes of the WHO.

Environmental and ethical implications. The possible impact on the environment of the release of recombinant vaccines needs to be addressed. From an ethical perspective, refinement, reduction and where possible, replacement of animals in experimentation should be encouraged.

Scientific and Technological Priorities

Basic Science level

Basic research on the cellular and molecular mechanisms of immune responses and pathogenesis of microorganisms is essential for the development of recombinant and synthetic vaccines. The creation of a "European Mucosal Immunology Network" would be an important step in facilitating a concerted effort to increase the interactions and exchanges between industry and academia. Clear objectives must be defined for the use of animals, with appropriate considerations for animal welfare. Attention will be given to transgenic and transplantation models and novel *in vitro* alternatives. Research on veterinary vaccinology for the development of novel technologies should also be considered.

Technological level

Initiatives to promote technological innovations in the field of vaccinology will be focused on four main lines of action: (1) development of new delivery systems (DNA vaccines, genetically modified live vectors, adjuvants) that lead to safer and more powerful vaccines; (2) improvement of vaccine production systems through cutting-edge technologies such as molecular farming techniques in crop plants: industrial platforms establishing microbiological and cell factories should also be encouraged; (3) combination of vaccines aimed at the conversion of multidose vaccination to a single dose vaccination regime; and (4) biosafety of vaccines by developing techniques that can remove or inactivate extraneous agents without affecting the immunogenicity of the relevant antigens.

Clinical level

Development of new/improved vaccines against diseases of great socio-economic impact such as AIDS or tuberculosis, entails the coordinated efforts of both the EU and national programmes related to vaccine R&D. New insights into the pathogenesis and immunology of chronic (cancers), auto-immune (multiple sclerosis, rheumatoid arthritis) or allergic diseases have yielded the possibility to develop therapeutic vaccines against a wider range of diseases.

Structural level

A major problem underlying vaccine R&D is the serious deficiency that exists within Europe in the infrastructure for resources required to implement vaccine development, especially regarding phase I and II clinical trials. Furthermore, networks of academic and industrial laboratories (animal models, epidemiology, reagent standardization) should be stimulated.

Socio-political level

Attention should be given to the immunization policies and successful delivery of vaccines to the elderly and very young children. The Task Force should also help to coordinate efforts to establish a European Communicable Disease Surveillance System.

Added value and urgency of RTD action in these fields

Industrial competitiveness The strong European position in these fields can no longer be taken for granted, for several reasons: the 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. In the past, the industry has been dominated by a few competitors with international sales structures. But now the rapid growth of the market has changed dramatically this scenario. Emerging technologies allow biotechnology companies to enter the market. The European Biotechnology industry, including a large number of SMEs, still lags behind US biotechnology firms because these firms are financially more vulnerable and they lack complementary relationships to large multinational companies. Only one fifth of all European biotechnology firms are involved in therapeutics compared to 42 % in the US. Furthermore, the EU trails the US on biotech

patents: in the pharmaceutical sector, 65% of the biotech patents worldwide are US, against 15% European.

Public Health Over two million children lose their lives to illnesses such as measles which could have been prevented with adequate vaccination. AIDS could concern 30 to 40 million infected 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 and clearly demands transnational resources as well as the adoption of multi-disciplinary approaches within the Life Sciences.

Economic impact of immunization 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. As previous experiences with polio or smallpox vaccination programmes have shown, vaccination is less expensive than treatment.

Radical and Progressive innovation The rapid growth of the market is driven by new products for previously untreatable diseases. Dozens of biotechnology companies are researching and testing vaccines against cancer. A new approach to vaccination, DNA vaccines, will open additional possibilities for commercial expansion. Development of plant-based "edible vaccines" that could allow economic production and multidose products, combining a number of vaccines in the same dose, will define the next generation of products to drive the market. According to the Senior Advisory Group Biotechnology (SAGB), determinant factors in European Companies' decisions to move research activities to USA were the lack of high skilled staff and the existence of centres of excellence gathering University laboratories, research facilities and hospitals for basic science research. It is therefore important to support European-based centres and networks of facilities (for conducting phase I and II human trials, for animal experimentation, for in vitro alternative methods, etc) which represent valuable alternatives to US centres and therefore encourage companies to establish themselves in Europe. It is also crucial to invest in intangible assets such as knowledge, technical skills and innovation, essential in the technology/growth/employment dynamic.

TRAINS AND RAILWAY SYSTEMS OF THE FUTURE

A European Statement for Railways

Efficient, accessible and competitive transport systems are a lifeline for the economic and social development of the Union. They constitute an enabling infrastructure to foster the competitiveness of European businesses, to promote growth and employment, whilst ensuring the well-being and quality of life of individual citizens - as consumers, as transport users and indeed as people living and working in areas affected by transport activity.

In order to ensure a sustainable response to the ever growing demand for mobility, the Common Transport Policy (CTP) aims at the development of an integrated transport network that can fulfil the following important dividends: efficient transport services at competitive prices, reduced traffic congestion and a cleaner environment through a better balance between the different modes, wider choice for the traveller and enhanced travel safety. These strategic objectives are to be pursued against a backdrop characterised by the globalization of the economy, the increased deregulation of markets, competition based on customer service and the growth in preference for individual transport.

Evolving against this background railways are at present undergoing one of the most turbulent periods of their history. The abolition of monopolistic situations and long standing protected markets, which is one of the key features of the new European dimension, is calling for a transition from the rigid form of supply-oriented towards a demand-oriented positioning within the global transportation market. Managing the future has become an imperative and the pursuit of business strategies based on past traditions will imply living on borrowed time.

An urgent structural and cultural change is therefore required within the railway sector. It should aim at far-reaching restructuring measures to improving both the quality and diversity of customer service and the railways' financial and operational performance. Building upon the major advantages of railway transport (high density, environment-friendliness, land-use efficiency, safety and energy conservation) these conversion efforts should lead to a modern, interoperable, high performance railway system as a vital component of the EU-wide transport network.

The emergence of a borderless Europe, with the implementation of the Single Market and the gradual integration of Eastern and Central European countries, growing congestion affecting in particular the road traffic, and the development of new products and services (including the high speed train, together with innovative concepts for combined and urban transport systems, and technological innovation) present unprecedented opportunities for reinvigorating the railways in fulfilling this mission.

Note: This section is substantially the same as, but not identical to, the Progress Report of the Task Force on Trains and Railway Systems of the Future, published separately as SEC(96)502.

The achievement of such an objective will entail a multiplying effect across the whole value-chain of the railway industry - from system integrators through to component suppliers, and service providers, - by developing a dynamic European-wide home market, promoting product and service innovation, materialising the potential for direct/indirect job creation, and ultimately creating the window of opportunity to consolidate the European position in emerging world markets.

The Task Force Approach

The main objective of the Task Force is to bring together the previously separated strands of railway related transport, industrial and research policy, providing a focal point for all the major interests in Europe's railway systems in the 21st century (railway operators and infrastructure management, supplying industry, trade unions, and railway users at large), in harnessing technological development towards effectively contributing to the renaissance of the sector.

In close consultation with the main interested parties the Task Force has elaborated a diagnosis of the main strategic challenges facing the railway sector at large, and the contribution technology acquisition could provide in devising effective responses to the most pressing market needs. This market-led approach aimed at the identification of new systems or clusters of technology with the potential to lead to step-change improvements to the overall effectiveness of, and the service provided by, the railway transport system or to significantly enhance the competitive position of the European supplying industry in world markets. The underlying clustering criteria also aimed at:

- creating a coherent framework for the co-ordination of the hitherto disparate rail related research activities carried out in different national and Community RTD programmes, therefore optimizing the use of the restricted resources available, and
- congregating the critical mass for the development of high added-value demonstration projects of Community interest, with potential to bridge the gap between different EU funding instruments (viz. RTD, structural and transport infrastructure) and to reduce the lead time between research and Community-wide market applications.

The Priority Technological Clusters

The kernel of the proposed activities aims at supporting the railways in fulfilling new customer-oriented business objectives stemming from a quality of service and cost-effectiveness perspective, and meeting the challenges of mobility of the end of this century. To enable such a goal to be reached, ambitious reference targets have been identified and quantified. These include: a 50% decrease in transport costs; a 40-50% reduction in equipment life cycle costs; one order of magnitude increase in door-to-door freight speed. The rationale and the scope of the proposed themes is given in the following paragraphs.

The Modular High-Speed Train

The introduction of high-speed has to be seen as a major milestone in the evolution of rail transport. It has enabled a process of renewal of the railway industry at large towards providing future- and customer-oriented transport solutions.

The main objective of the work in this area will be to promote a collaborative effort within Community industry to jointly develop system approaches to product development, including cost-effective interoperable modular construction concepts and enabling technologies to improve structures, propulsion, control and cabin environment. These should lead to significant reductions in unit and direct operating costs, whilst enhancing overall quality and reliability of supplied products and services and compliance with emerging environmental requirements.

The Urban Rail Citizen's Network of the Future

An efficient collective transport system has to be seen as one of the key contributors towards urban regeneration. This entails the need for devising global systems of urban mobility, allowing the right balance between public and private transport, and between the different transport modes, and responding to the major economic, environmental and social objectives underlying the sustainable development of major conurbations.

Light-rail systems may give a crucial contribution towards the set-up of intermodal urban mobility concepts fulfilling citizen's expectations in terms of quality of service, through-transportation and costs, and enabling the promotion of collective transport as a credible alternative to private transportation. The approach to be implemented aims at reconciling "top-down" strategic objectives of supporting urban transport policy and planning matters, with "bottom-up" technical measures aimed at solving specific operational problems. The latter includes new vehicle and infrastructure concepts conducive to major reductions in life-cycle-costs, and enabling multi-network operation, whilst ensuring proper interfacing with existing facilities.

A European System for Traffic Management, Passenger Services and Freight Logistics

The increasing integration of railway networks will entail the need to arrive at a harmonized train control and traffic management system that can fulfil both interoperability requirements and enable the efficiency of rail operations to be optimised on a Europewide scale. This should significantly improve cost-effectiveness and the quality of customer service, whilst contributing to overall environmental, safety and energy efficiency objectives. Further, it should provide the potential for creation of value-added services, in an environment characterised by an increase of multi-operator and multi-culture operations, and public-private partnerships.

The main objective within this theme will be to extend currently on-going work developed within the framework of the Transport Research and Telematics Applications programmes towards demonstration of full-scale systems. These systems should integrate into a coherent whole the relevant operational (viz. train command/control, traffic and safety management,

and infrastructure and fleet management) and customer driven services (viz. passenger information, reservation systems, freight logistics and schedule management).

The Virtual Factory

Customer-driven manufacturing systems capable of rapid product development and supply, and of meeting growing demands for more cost-effective (from a total life perspective), technologically complex and environmentally benign products, and fast delivery requirements, will be crucial in the re-engineering of suppliers to respond to the evolving railway market.

The main objective in this area will be to develop a pilot activity supporting the emergence and consolidation of new manufacturing paradigms (viz. cooperative/distributed manufacturing, virtual product concepts) conducive to significant improvements on critical business performance metrics, notably Time-to-Market, Customer Order Fulfilment Time, Production Costs, and Quality. Specific targets should be to respond to the increasing fragmentation of markets and to the drive towards more open and business-oriented procurement policies from customers.

The Train Cargo Liner

The globalisation of markets and the emergence of new industrial and product distribution paradigms have dramatically affected freight transport patterns in recent years. The trends towards increased frequency of transportation, the wider geographical spread and longer distance of destinations, and growing customer dependence on the reliability of the service, have resulted in ever more demanding requirements for integrated and cost-efficient door-to-door transport solutions, supported by effective order and consignment tracking facilities.

The work in this area will contribute to the design of optimised railway freight systems as an integral component of intermodal transport chains. It will combine a strategic stream aiming at decision support to the definition of optimal freight strategies with a technological stream supporting their implementation - notably through more efficient and cost-effective rolling stock designs, automated transshipment systems and order and consignment tracking information systems.

This thematic overview is to constitute the reference framework for the set-up of technical working groups whose mission will be to prepare a detailed workprogramme for each cluster.

Conclusion

The promotion of a new spirit of constructive dialogue and active collaboration, mobilising the railway community towards responding to the challenges of implementing the Railway System of the Future, is the key feature of the Task Force. Through contributing to the development of a forward looking and pro-active innovation strategy it is aiming at:

- Fostering the development of competitive and efficient railway services and their integration into intermodal transport networks within a perspective of sustainable mobility;

- Responding to new market opportunities arising from evolving social and economic needs regarding mobility; and
- Supporting the re-engineering of supply chains and fostering industrial collaboration, towards enhancing their competitive advantages in the world railway markets.

Nevertheless, the development of such objectives will call for the establishment of a long-term European railway strategy, bringing together the relevant political, financial, social and technological efforts, and creating the backcloth for the emergence of a competitive and business-driven railway sector capable of providing a decisive contribution to the solution of today's transportation problems and those of tomorrow.

MARITIME SYSTEMS OF THE FUTURE

Objectives

The Task Force on "Maritime Systems of the Future" aims to :

- identify priority industrial, research and technological objectives
- promote the coordinated exploitation of the 4th Framework Programme
- monitor the MARIS (Maritime Information Society) initiative at European and G7 level
- improve the exploitation of results, including possible demonstration activities
- explore the potential offered by supplementary programmes
- create more synergy between Union and national programmes, and
- make recommendations in view of the 5th Framework Programme.

Industrial basis

Maritime industries are of vital importance for the European Union, as the following statistics demonstrate:

- 2.5 million people are employed in these industries;
- 90 % of Europe's external trade is transported by sea;
- 30 % of Europe's internal trade is transported by sea with a major potential for growth (short sea shipping);
- Europe is the largest fish consumer in the world, and a major consumer of offshore energy (oil, gas and renewable).
- Europe has a 20 % share of the world market in shipbuilding and is specialised in the building of high value-added sophisticated ships.

Shipowners and shippers are important users of science/technology and industrial products in the shipbuilding and traffic management sector. The European maritime industries are in a process of restructuring. In order to ensure the success of this process a qualitative step to a high technology industry is needed.

In creating the Task Force "Maritime Systems of the Future" the Commission has demonstrated its conviction that the maritime industries are an industrial sector with a high potential for growth, development and technological improvement.

The recognition of maritime industries as a high-technology intensive sector has been confirmed by the G-7 which adopted MARIS as one of the 11 priority projects in the building of the global Information Society. High growth is expected in this new technology sector.

A large number of SMEs are part of the maritime industries, the shiprepair sector, the marine equipment, fishery industries and ports. The supply chain of this sector not only serves the commercial marine sector, but also the non-marine sector. These SMEs are spread all over Europe, making a major contribution to local economies.

Maritime industries are highly interdependent : for example, safe, efficient and environmentally friendly maritime transport can only be achieved if all sectors contribute equally to these goals. It is implicit that not only the construction and maintenance of a ship are to the highest standards but also the on-board equipment and operational systems and procedures contributing to intelligent safe and environmentally friendly operations. Furthermore high quality ships need high quality ports and inter-modal infrastructure to enhance and augment superior maritime transport.

For this reason the Task Force is defining R&D priorities relevant to the entire maritime system in order to exploit fully the potential of the sector.

Exploiting the potential of maritime industries will contribute to:

- job creation all over the Union;
- the protection of the marine environment;
- increased cohesion.

Employment

Maritime transport industries are the most important employers in the maritime sector (shipping, ports, etc.). These industries play a vital role in ensuring the necessary transport links between the Union and other parts of the world. There is concern about the continuing decline of EC shipping and enhanced R&D is needed to maintain an efficient and competitive industry in Europe.

Shipbuilding has been badly affected by unemployment particularly as a result of the necessary restructuring process. Only advanced technology products with high added value can guarantee the future of this industry.

In order to gain competitiveness maritime industries are moving from labour intensive to technology intensive industries, thus creating new job types in the sector. Shipbuilding is increasingly outsourcing and subcontracting substantial parts of its activities. Even if this

may lead to job losses in the shipyards, it creates new employment in SME's. Also in other maritime sectors like shiprepair, offshore equipment and fishery industries SME's play a major role.

Because of the generic nature of some of the technologies used in the sector, R&D may also have a "spill over" effect to other industries.

Protection of the marine environment

Shipping is among the most environmentally "friendly" transport systems. With its extensive coastline, Europe is ideally placed to develop fully the potential for short sea transport of passengers and freight through the introduction of purpose-designed vessels. This will reduce congestion generated by road based transport systems as well as environmental pollution .

Safer new vessels will be one of the tangible results of R&D. Other projects focus on environmental protection by the prevention of maritime accidents and by limiting their consequences.

The preservation and optimal exploitation of marine resources depend greatly on the results of R&D. Europe has to maintain its lead in this field, giving an example for the responsible use of marine resources.

Cohesion

Europe is genuinely maritime. Thirteen of its Member States have direct access to the sea. Austria and Luxembourg have shipping registers and all Member States have inland waterways. The unique port structure of the European coast-line directly links a considerable part of European territory namely northern and southern parts of the Union. Further prospects offered include the Euro-Mediterranean co-operation and the association and prospective accession of Poland and the Baltic States.

A considerable number of maritime regions are located in the less prosperous Member States. It is therefore essential to ensure that these regions fully benefit from the efforts which are undertaken to improve the competitiveness of maritime industries.

Consultation

- The "Maritime Systems of the Future" Task Force began work on 17 October 1995.
- Two meetings have been held since then with the participation of an industrial interface drawn from all sectors of the maritime industries (maritime transport, shipbuilding, marine resources).
- Bilateral talks between the Task Force President, Capitals, and the European Parliament have also taken place.

- Presentations on the Task Force initiative have been made by the responsible Commissioners to the Industry and Research Councils and to the European Parliament.
- Regular discussions have been held with industry to ensure the optimal preparation of future calls for proposals under the 4th Framework Programme.
- Since October 1995, Industry has been progressively refining and developing its priorities.
- Since 1995, workshops have been organised on MARIS and the Task Force initiatives with suppliers and user/customers.
- Further consultations between the Task Force actors are foreseen in 1996, in the form of workshops on specific themes.

This paper provides a consolidated overview of the Task Force reports and puts them in the context of the Commission's proposal for a financial Supplement to the fourth framework programmes (COM(96)12).

- The first Part of the paper sets out how the Task Forces form the basis of an innovative approach designed to consolidate Europe's research efforts around key themes of European interest. It clarifies what is meant by a "key theme" in this context and identifies a number of considerations which have been significant in arriving at the choice of themes proposed by the Commission.
- The second Part contains summaries of the state of progress of each of the Task Forces.