European Commission

Work programme for RTD actions in support of "Competitive and sustainable growth" 1998-2002

Details of objectives and RTD priorities

GROWTH WORK PROGRAMME 2000

This version of the Growth work programme replaces and supersedes the March 1999 edition

Edition December 1999

COMPETITIVE AND SUSTAINABLE GROWTH

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SUMMARY OF MAIN CHANGES TO THE CURRENT EDITION OF THE GROWTH WORK PROGRAMME

This version of the GROWTH work programme replaces and supersedes the March 1999 edition[1].

The contents of the document cover the next two **periodic calls** (planned for December 15, 1999 and June 2, 2000), the on-going **open calls,** and the **dedicated calls** which will open during the year 2000.

A further revision of the work-programme is planned following the June 2000 call, and will be valid until the end of the Programme.

The **main** changes in the work programme are highlighted below. Users should consult in detail the text of the document to ensure that they take into account **all** changes which may affect them.

- **Section B: Key Actions**

  Key Action 1: Redefined and re-focused *Targeted Research Actions.*

  Key Action 2: No significant changes (note that complementary information will be available for KA2 upon publication of the calls, obtainable from the GROWTH home page http://www.cordis.lu/growth/home.html).

  Key Action 3: No significant changes.

  Key Action 4: Technology Platforms on TP1, TP2 and TP4 closed (for activities other than co-ordination). Technical description of remaining Technology Platforms has been further detailed.

- **Section C: Generic Activities**

  Materials and their technologies: No significant changes.

  Steel: No significant changes.

  Measurements and Testing: No significant changes.

- **Section D: Support for Research Infrastructure:** New modality for production of CRMs.

- **Section E: Programme Implementation**

  1) Periodic calls are open to Thematic Networks and Concerted Actions for all objectives of the work programme (except *Support for Research Infrastructure,* and in the case of KA 1 they may only address the TRAs).

  2) Important clarification regarding the priorities on the basis of which Exploratory Awards will be evaluated for non-CRAFT projects.

- **Section F: Road map:** Road map tables have been simplified for the interest of clarity.

Note that the specific sub-sections defining the *strategy and priorities* for the December 1999, June 2000 and subsequent periodic calls have been included for each Key / Generic action.

Please note that a further revision of the work programme is planned following the June 2000 call, to cover the remaining period of the Programme.

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[1] An electronic version of this work programme, together with all other information necessary for the submission of proposals, is available at the CORDIS web site http://www.cordis.lu, and at the GROWTH home page http://www.cordis.lu/growth/home.html.

A. INTRODUCTION

RTD&D activities should help to prepare the policy making, industrial and related service sectors for the challenges of the new millennium and to generate a strategic vision of research in all sectors throughout Europe. They will focus on clearly identified needs and on improving the information available to policy makers about the implications of technological and organisational change and opportunities for, and the effectiveness of, policy measures.

The structure of the programme “competitive and sustainable growth” giving support to the systems approach comprises three elements:

(i) A set of four key actions oriented to solve clearly identified socio-economic problems by developing critical technologies or methodologies and clustering, when appropriate, small and large, research and demonstration projects of industrial, basic, policy-driven or applied nature around specific and strategic common challenges:

- innovative products, processes and organisation

- sustainable mobility and intermodality

- land transport and marine technologies

- new perspectives in aeronautics

These actions will combine efforts in various research areas (e.g. materials, chemistry, physics, application of information technologies, clean technologies, human factors, socio-economic research, as well as training or accompanying measures) in order to achieve their objectives. The achievement of a critical mass will be essential to attain concrete and visible RTD results. This would necessitate, as appropriate, mobilising national and Community resources, in particular through calls for proposals targeted on RTD priorities and launched in these key actions to concentrate and better co-ordinate RTD efforts towards strategic European objectives, including pre-normative research in support of standardisation.

(ii) RTD on generic technologies helping to develop the scientific and technological base as well as qualified human capital in critical areas, and giving support to innovation across a range of applications:

- materials and their production and transformation

- new materials and production technologies in the steel field

- measurements and testing

(iii) Support for the more efficient utilisation of existing research infrastructures to provide an attractive networked environment in the fields covered by this programme.

Activities will be integrated and co-ordinated as necessary, within and between the different key and generic actions as well as with other programmes of FP5, with the JRC and with national programmes. This should provide mechanisms by which stakeholders including industry, public authorities and the research community can work jointly in response to common strategic problems.

B. KEY ACTIONS

KEY ACTION 1 INNOVATIVE PRODUCTS, PROCESSES AND ORGANISATION

SOCIO-ECONOMIC OBJECTIVES AND EXPECTED OUTPUTS

A competitive industry of the future should play a key role in contributing to sustainable development through reduction of material content of products whilst increasing their service value, and through innovative, safer, cleaner and low natural resource intensity processes and products-services. Also new methods of organising production, service and logistics should be sought that reduce costs, time-to-market, lead time, and make improved use of human resources. Since industrial economic strength has increasingly been found in closely webbed interdependencies between firms, organisations and institutions, research objectives have to be considered not just within individual plants, construction sites or industries but throughout the extended value chains from raw materials to end-use products and services. Indicative medium term goals to which this Key Action should significantly contribute include:

a) *Contributing to modernisation of industry and adaptation to change*, through the combined effects of improved industrial capability and innovation capacity, while introducing more flexibility and capability to respond in real time to customer needs. Research should stimulate cross-sectoral exchanges and participation of SMEs, taking into account their specific needs and roles in the supply chain as well as approaches able to create and hold in Europe sufficient jobs to arrest the decline of industrial employment while improving the overall quality of work;

b) *Substantially [2] improving overall quality* within the value chain (quality is intimately linked to value for and timely satisfaction of customer needs at the lowest costs) and consequently *reducing "inefficiencies" and* overall *life-cycle product costs* by the same order of magnitude;

c) *Minimising resource consumption* (e.g. materials, energy, water) to *reduce substantially the overall "life cycle" impact of "product-service" provision and use.*

These goals should be dealt with in a synergetic way. They should not be regarded as absolute targets for individual projects but rather as broad indications of the direction towards which the European industrial system, supported by improved regulations, should evolve.

Sectors and research addressed by the Key Action

This key action is addressed to all productive sectors, including related services. The term production covers all activities in the product cycle including extraction of raw materials, product design, manufacturing, processing, construction, distribution, servicing and recovery of end-products. The term "product" ranges from pre-processed raw materials, through intermediate materials, components and systems to mass produced or one-of-a-kind end-products or structures and associated services. The term « product-service » should be understood as physical products, which offer combined or integrated associated services. The term « Innovative products, … » in this context does not mean that any development of innovative product or process can be proposed for funding. Only proposed research activities which meet the criteria described in this work programme can be accepted.

[2] The term « substantially » means over 20-30% in the shorter term or over 10% per year in the longer term.

RESEARCH OBJECTIVES

In order to foster project proposals consistent with the problem solving approach of the Fifth Framework Programme, and contribute effectively to the socio-economic objectives defined in the previous section a distinction is made between:

a) the research areas: which identify the key RTD areas where significant new RTD progress is required; and

b) the targeted research actions (TRA) which define RTD priorities on which RTD within the research areas should be focused and for which an integrated problem-solving approach is required.

Therefore, project proposals should be designed to address objectives of the Targeted Research Actions. The research work would comprise and integrate as many aspects as possible of the research areas.

PROPOSALS SUBMITTED IN RESPONSE TO A CALL FOR PROPOSALS, WHICH DO NOT ADDRESS THE TARGETED RESEARCH ACTIONS (TRAs) SPECIFIED IN THE CALL, WILL BE CONSIDERED OUT OF SCOPE

I. RESEARCH AREAS

The Key Action RTD areas address critical problems linked with the research of efficiency, intelligence, environmental friendliness and organisation, around the three major phases of the industrial production lifecycle. The main challenge is to integrate the complete aspects of design, production, operation/use and re-use until the end of the operative life, at both technical and organisational levels. The RTD activities should combine, as appropriate, social science and organisational aspects with the classical priority technological developments, leaving to the participants their identification, choice and application.

1.1 Efficient production, including design, manufacturing & control

The aim is to develop European approaches, innovative technologies and methodologies for improved competitiveness, leading to enhanced industrial output in product/service combinations, to development of increased added value, quality and responsiveness-to-market and to reduced time-to-market and material content. Micro- and nano-scale technologies and engineering as well as innovative industrial products and systems with improved lifecycle performances are typical examples to be considered within this area.

1.1.1: Integrated “product-service” design

The aim is to increase the added value due to high functionality and service value, to reduce material intensity in the whole life of products, including manufacturing and construction processes, and to reduce time to market of new high quality goods. RTD should support development and application of modelling, simulation, design technologies, fast prototyping technologies. Attention should be given to lower barriers between designers, users and consumers and to achieve full integration in developing “product-service” combinations.

1.1.2: Advanced production and construction technologies

The aim is to develop systemic approaches for advanced manufacturing and construction, production equipment and facilities which will provide improved processing efficiency, accuracy and reliability while fully exploiting the properties of advanced materials and technologies. RTD should target in particular high precision technologies and methodologies, manufacture of complex products, modularisation and product miniaturisation, including manufacture and assembly of micro-systems.

1.1.3: Safe and reliable extended life of products and industrial systems

The target is to extend the life and optimal operation and use of products, production facilities, industrial systems and structures through development and integration of technologies and methodologies such as new maintenance and repair schemes, control, monitoring and test systems. RTD activities should concentrate on new technologies and methodologies for enhanced process, product and production system safety conformance and for improving life cycle costs, reliability, serviceability and quality.

1.2 Intelligent production

The aim is to improve the level of performance (improved quality, minimisation of use of resources) of all elements of the European industrial environment through the deployment, integration and application of innovative technologies, including information society technologies (IST), in production and related logistics systems. RTD should take into account operators' requirements and improved use of human resources. The activities should be concentrated on three domains for the deployment, application and integration of such technologies:

1.2.1: Design of products and production-service systems

The aim is to focus on the provision of flexible and interoperable supply-production-distribution systems for quality and customer-driven product design and manufacturing. Such RTD activities should support the digital product-service lifecycle design as well as the development of competitive production systems.

1.2.2: Intelligent manufacturing and processing

The aim is to support European approaches for development of a new generation of facilities, machinery, tools and equipment. RTD should address reconfigurable and flexible production means, autonomous cells, on-line control and knowledge-based management systems, to enhance performance (improved quality, minimisation of resources) of the overall production system.

1.2.3: Monitoring and optimal use of industrial systems

The aim is to support the extended life and optimal use of structures and industrial systems through efficient monitoring, maintenance and repair technologies. Research should in addition focus on on-going measurement and analysis of impacts of the related processes and production systems on health, safety and environment, making use of life-cycle approaches.

1.3 Eco-efficient processes and design

The aim is to develop and validate global approaches to minimise "full life-cycle" impact of processes and products-services, taking into account all essential elements of the industrial system ranging from extraction through production to waste management, with emphasis on resource intensive processes and reduction and valorisation of waste. The activities should be concentrated on:

1.3.1: Eco-efficient design of products and processes

The aim is to support the development of methodologies, tools and technologies compatible with the challenges of sustainable growth through improved design, use of renewable resources, and the development of advanced process-engineering solutions. RTD should focus on modelling, control engineering and on mastering basic phenomena such as synthesis, catalysis, separation and reaction mechanisms. Research activities would be geared by life cycle and whole industrial system concepts as well as by reduction of the use of resources.

1.3.2: Cleaner processes, products and eco-efficient technologies

The aim is to look for new technologies and/or methodologies to save resources and reduce emissions, effluent and waste. RTD should aim at eco-efficient chemical process

engineering, at development of new processes, at the utilisation of renewable raw materials, at the application of best and clean techniques to raw material processing, manufacturing, construction, operation and maintenance processes and at clean alternative solutions for effluent and emission suppression.

1.3.3: Product recovery and waste recycling

The aim is develop technologies and methodologies to improve disassembly, in-situ and on-line recovery of waste as well as development of novel processes for treatment, re-utilisation and safe disposal of waste. RTD will not only address products but also production plants, structures, facilities and equipment as well as impact monitoring, assessment of risks and support to enforcement of regulations.

1.4 Organisation of production and work

The goal is to move towards innovative high performance industrial systems, agile customer-driven networked industrial and related service enterprises, including SMEs, with multi-skilled highly motivated labour force, working in efficient, safe and pleasant workplaces and taking into consideration the diversity and specificity of European society and manufacturing tradition. RTD should if appropriate enable policy makers to draw conclusions about issues such as future industrial structures or skill needs.

1.4.1: New methods of organisation, work and human capital improvement

The aim is to develop new organisational structures and work practices together with developments in industrial products, processes and services, and the appropriate human capital, competence and skills. RTD should address methodologies and tools for efficient organisation, knowledge and technology management, and support the close integration and networking of people, organisations and technologies, recognising the importance of improved procurement methods and new decision making tools as a crucial input to innovation and competitive production.

1.4.2: Adaptation of enterprises and human oriented production

The aim is to facilitate the integration of new forms of work organisation techniques into the productive process and to improve performance of production systems. RTD should concentrate on new methodologies and tools, reinforcing innovation capabilities of industry and improving socio-economic aspects i.e. creation of high quality jobs, health and safety, workers' protection and job satisfaction. The impact of new business ideas (industrial products-services) and incorporation of a multiskilled workforce in work and organisations should be considered.

1.4.3: Knowledge, learning and management of change

The aim is to develop methodologies and techniques, supporting where appropriate regulatory determinants, to enhance individuals and organisations' capacity to learn, be retrained, adapt and change by addressing jointly production, innovation, quality of life and preservation of environment goals. RTD should also support transition of society towards efficient and sustainable production and consumption.

II. TARGETED RESEARCH ACTIONS (TRAs)

The problem solving approach characterising this Framework Programme needs to maintain concentration on a few relevant priorities. Concentration of resources and efforts are achieved through calls for proposals targeted on clearly identified Targeted Research Actions (TRAs), integrating research activities within research areas 1.1 to 1.4.

KA1 objectives: modernisation of industry, improvement of quality, minimisation of use of new resources

Five TRAs: Five paths towards more competitive & sustainable industries

"***Products***" Evolutionary value-added and resource saving product services, including miniaturised systems	"***Machines***" New generation of machinery, production equipment and systems manufacturing	"***Extended enterprise***" The knowledge based extended manufacturing enterprise	"***Modern factory***" Customer-oriented, high-tech, agile and towards zero waste production	"***Infrastructure***" Safe industrial facilities, construction and civil infrastructures

Research area 1.1 Efficient production
Research area 1.2 Intelligent production
Research area 1.3 Eco-efficient processes and design
Research area 1.4 Organisation of production and work

1.5 TRA "*products*": evolutionary value-added and resource-saving products-services, including miniaturised systems

Competitive and sustainable growth is directly linked to increased value added in products. This can only be achieved, through the simultaneous consideration of the "hard" and "soft" components of a "product-service", and therefore by optimising tangible aspects as well as improving the intangible ones such as information, intelligence, functionality, and service (e.g. maintainability). The global trend towards increased functionality and environmental friendliness is creating fast growing and dynamic markets for novel resource-saving and miniaturised products, as well as related production techniques. The market for such products and processes has the potential to create many new jobs in industry and to provide solutions for social and environmental problems.

Activities should primarily contribute to solving clear user problems through technological research aiming at

(a) improved processes for the development of innovative concepts for added-value products-services;

(b) solution to problems related to development of new miniaturised systems and to integration in products of advanced micro-components.

Long term RTD activities should focus on multi-disciplinary and strategic research approaches for design and manufacturing technologies as well as for enhancing embedded

intelligence (see areas 1.1 to 1.4). Particular attention should be paid to “de-materialisation” and life-cycle technologies for product-services and micro-systems.

Complementary materials research activities (see objectives 5.1 to 5.7) may also be necessary, in particular on cross-cutting technologies, on new functional materials, or on more added value and “intelligent” structural materials.

Expected RTD results should contribute in the medium-long term to stimulate effective development of new products and processes and therefore to create new markets for manufacturing industries. Potential exists in virtually all sectors ranging from consumer products, medical instruments, IST related products, safety monitoring, etc, to numerous other applications within more traditional sectors.

This TRA will be co-ordinated with action line “Microsystems” of key action 4 of the IST programme and developed together with the generic activity “materials and their technologies for production and transformation”, with possible joint evaluation of proposals.

1.6 TRA “*machines*”: new generation of machinery, production equipment and systems for manufacturing

Within the context of smaller production batches and more stringent users’ requirements, the factories of the future will need new and more efficient machines and production equipment. Particular attention should therefore be given to the development of new concepts and of user friendly and highly reliable and integrated machinery and production equipment, leading to quick set-up time, modularity, multiprocessing and reconfigurability. The lower capital investment, easy maintenance, upgradability and recovery of such equipment will be in addition fundamental to the target of sustainable production. The shop floor operator’s role will also be changing, necessitating innovation in the overall workplace design as well as in the Man-Machine-Interface (MMI) level. The improvement of the working conditions may allow a better image of the industry, retention of skills, as well as productivity increase.

Specific RTD goals should therefore focus on acquisition of knowledge and technologies for new generation multi-functional, more efficient and safe machinery and production equipment, fulfilling increasingly stringent industrial requirements. This should include the processing, forming and assembly domain as well as the related control and maintenance technologies for an improved working environment (see areas 1.1 to 1.4). RTD activities should aim at developing and, if appropriate, demonstrating:

(a) new concepts and critical technologies for eco-efficient manufacturing and production processes, including multiprocessing and fail-safe manufacturing systems;

(b) procedures, methodologies and technologies for efficient production equipment design and manufacturing;

(c) scientific and technical knowledge facilitating the operational aspects and the management of change within the context of the new generation of machines.

Medium-long term RTD projects should normally address three principal steps, all covered in one single project or within co-ordinated projects: development of technologies, validation phase, and integration of technologies through prototyping and demonstration.

RTD activities within this TRA should demonstrate that they ensure an effective involvement of the many end-user sectors and should normally lead, after further industrial development, to substantial reduction of the time for design and pre-production of equipment, increase on quality and reliability and substantial gain in set-up time and operational efficiency, giving also importance to social acceptance (human impact of new methods of working).

1.7 TRA “*extended enterprise*”: the knowledge based extended manufacturing enterprise

Most European industrial enterprises are confronted with new challenges and opportunities, derived from globalisation, new business dynamics and manufacturing concepts. The overall

challenge of the "extended enterprise" is to ensure effectiveness of supply chains and production networks, at European and global level, whilst reinforcing European industrial base, including the SMEs. Multiskilled and knowledge intensive enterprises are at the very heart of "tomorrow's production systems".

To this end, the present TRA addresses the integration and application of information society technologies and management tools for organisational change (see areas 1.1 to 1.4). Research proposals have to address the whole extended value chain enterprise system as well as the multi-cultural and/or multi-sites production infrastructures. The RTD activities using a "problem solving approach" should aim at the development of:

(a) new and improved methodologies to facilitate integration of design and production activities and to improve logistics across the extended enterprise, taking into account product life cycle requirements,

(b) organisation and simulation tools, forecasting methodologies for structural rearrangement of industrial sectors, and understanding of factors that determine the impact, success or failure of industrial change;

(c) tools and methods for enhanced management of human resources and knowledge in the extended manufacturing enterprise.

The development of new manufacturing related organisational structures (such as virtual manufacturing companies), new patterns of work organisation and practices (such as parallel manufacturing), knowledge management (e.g. codification of tacit knowledge) are some of the research priorities of the present TRA. It is important to point out that production knowledge issues should also be assessed from a socio-economic perspective, with benchmarking exercises based on historical or geo-political studies and assessing the adoption of change of industrial organisations. RTD should be carried out in close interaction between technology lead organisations and large user groups.

The long-term issues of this TRA should be to help the European industry to adapt to change, reduce the overall production costs and time-to-market, increase the overall quality and efficiency, while making improved use of resources.

The call for this TRA is closely co-ordinated with KA2 of the IST programme concerning knowledge management and "smart " organisations.

1.8 TRA "*modern factory*": customer-oriented, high tech, agile and towards zero-waste production

Competitive and sustainable growth can only be achieved through substantial modifications in the production and consumption patterns. Mass production industry is asked to recognise and understand consumers' needs and to effectively produce the required goods in the demanded quantities with the appropriate quality at reduced costs. The competitive success of European enterprises depends on their ability to anticipate and better respond to changing consumer needs (better quality) and fast changing environment (agile enterprise) as well as to implement innovation and reduce costs. Also, in the search of zero-waste industrial production, intense symbiotic interactions should to be developed in such a way that they improve the use of resources in all phases of their life cycle.

RTD activities under this TRA (see areas 1.1 to 1.4) should therefore address the strengthening of the scientific and technological base to help industrial competitiveness and environmental friendliness. Considering these challenges at EU level, activities under this TRA should attempt to integrate research approaches in support of new and high-tech design and production schemes. In particular, problems of traditional sectors (upgrading production of final products as well as intermediate parts, components and related services) should be addressed. The reduction of the time-to-market and the lead-time within the manufacturing cycle is aimed at. Of course, while individual proposals should look for improved agility and efficiency, they should also clearly consider environmental friendliness. In particular industrial ecology concepts should be investigated further.

Medium term RTD activities should aim at developing and, if appropriate, demonstrating

(a) procedures, methodologies and technologies for efficient and intelligent design, including life-cycle aspects;

(b) procedures, methodologies and technologies for clean, efficient and intelligent manufacturing and production;

(c) scientific and technical knowledge facilitating eco-efficient production and organisation as well as process integration and intensification[3].

Activities should also be complemented by research on operational and managerial issues related to production, aiming at removing barriers to modernisation, such as at fostering improved organisation of production and work, as well as the development of new skills. Cross-sectoral research with multi-sectoral applications is encouraged. Activities may include as appropriate pre-normative and / or benchmarking work.

Expected RTD results should demonstrate that they substantially contribute, after further industrial development, to improving overall mass production quality and reduction of design and production costs. RTD should also contribute to the development of resource efficient production processes with a substantial waste and pollution reduction over the next 20 years whilst observing an overall positive ecological balance. In other words, this implies that RTD under this TRA should support the reinforcement of sustainable workplaces and help to respond to new production patterns at European level.

1.9 TRA "*infrastructure*": safe and cost effective industrial facilities, construction and civil infrastructures

Industrial facilities, construction and civil infrastructure are essential for sustainable economic growth and are source for wealth and safety in the EU. However, their impact on Europe's environment and citizens' quality of life may be considered potentially harmful and unsustainable.

The aim of the TRA is to encourage the design, construction and operation of safe and sustainable industrial facilities, industrial and civil buildings and infrastructure, as well as the rehabilitation, upgrading and decommissioning of existing installations. The target is to address quality, efficiency, safety and reliability aspects through innovative and integrated design and modelling, construction and decommissioning, and operation and maintenance (see areas 1.1 to 1.4).

Medium term research activities proposed under this TRA should comprise the development and/or demonstration of technologies addressing:

(a) design, modelling and simulation tools for operational efficiency and reliability, considering hazard and risk assessment and incorporating life cycle analysis for facilities and structures as well as quantified socio-economic impact assessment.

(b) construction and decommissioning processes, for improved quality of construction in terms of cost efficiency and reduction in delivery time, maintenance costs, energy consumption, waste, pollution and accidents. Rehabilitation, upgrading and remediation of civil and industrial structures and facilities should be addressed as well as structural integrity assessment and construction health and safety.

(c) operation and maintenance, ensuring efficiency as well as occupational health and safety, including human aspects and facilities management systems, through for example automated systems, safety and facility integrity inspections, performance or quality measurement.

[3] *Priority is given to recycling or recovery within the production cycle. Please note that the area of off-line process technologies, i.e. end-of-life product recycling is not a priority.*

This TRA covers all the phases in the life of the industrial facilities and of buildings and civil infrastructures. It should address the impact on resources, environment and society in general. Special attention must be paid to the broad involvement of end-users in the research activities. Industrial facilities include chemical and other process industries, mines and quarries. Civil infrastructures include buildings, roads, bridges, tunnels and underground facilities, dams, waste treatment systems and waste disposal sites, etc

The call for this TRA is closely co-ordinated with generic technologies "materials and their technologies for production and transformation" as well as with KA2 "sustainable mobility" and KA1 of the IST programme concerning the security of transport, in particular for roads and tunnels.

NB: The TRAs call for proposals with as wide a multisectoral approach as possible and will not support proposals only addressing one sector, where provisions are made for support through other programmes. For example, proposals addressing the energy and power generation sector should be directed towards Thematic Programme 4 "Energy, environment and sustainable development", and proposals dealing with specific urban aspects of group of buildings should be directed towards the key action "City of tomorrow and cultural heritage".

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL

For RTD, demo and combined projects, and for Thematic Networks and Concerted Actions, the call will be open to TRA "*machines*", "*extended enterprise*", "*modern factory*" and "*infrastructure*".

A large SME participation is encouraged, e.g. through participation in user groups.

It is reminded that the call on IMS "Intelligent Manufacturing Systems" is permanently open. Proposals for IMS should have an "interregional" dimension (see specific information on IMS).

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

For RTD, demonstration and combined projects, the call will be open to TRA "*products"*.

All TRAs will be open for Thematic Network and Concerted Action proposals.

A large SME participation is encouraged, e.g. through participation in user groups.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

The calls planned for December 2000 and June 2001 are expected to address all the objectives of the Targeted Research Actions, however with a possible revision of their content.

KEY ACTION 2: SUSTAINABLE MOBILITY AND INTERMODALITY

SOCIO-ECONOMIC OBJECTIVES AND EXPECTED OUTPUTS

Compared to the other key actions of this programme, this key action is largely policy-driven and therefore justifies a more detailed definition of the objectives and a more direct involvement of policy-makers from Member States[4]. The key challenge is how to reconcile the increased demand for transport on the one hand and the need to reduce its impact on the physical, social and human environment on the other hand, and how to reduce the transport intensity of economic growth. This key action offers the opportunity to involve all stakeholders in facing this challenge and in enhancing innovation in the transport sector by fostering the use of new technologies, developing new services and providing new concepts and policies. The key action bases itself on an integrated systems approach to transport. As the road, rail, waterborne and air transport modes are at different stages of their development, their optimisation from a modal perspective will continue to be necessary. However, a major focus will be to enhance the integration between the different modes of transport in respect to infrastructure, operations, services, procedures and regulations. In other words, to enhance intermodality in order to enable a better use of existing capacities.

This key action will help the Union to further develop and implement the objectives of the Common Transport Policy [5] and those of national transport policies:

promoting transport **sustainability** from an economic, social and environmental point of view;

enhancing the **efficiency and quality** of transport systems and services;

improving **safety and security** and optimising the **human role and performance.**

It will also support other Community policies in such fields as energy, industry, environment, employment, cohesion and the fight against fraud, in co-ordination with other key actions as outlined under section E of this work programme.

For ***sustainability***, the aim is to promote a long-term balance between the growing demand for mobility on the one hand and the necessity to respect environmental, safety social and economic constraints on the other. Some parameters to guide the key action's activities should be to enable the transport sector to contribute to the realisation of ambitious standards for air quality and noise in a cost-effective way, and to reduce the growth of transport CO_2 emissions as well as to enhance the attractiveness and accessibility of more sustainable transport modes such as rail, inland waterways and short sea shipping and to increase the use of public transport.

For ***enhanced efficiency and quality*** the aim is to improve the overall cost-effectiveness and functioning of transport operations and infrastructure. Particular attention will be paid to how best integrate the respective strengths of all modes of transport in order to provide door-to-door services for both passengers and freight. Some parameters should be focused for example to significantly reduce congestion in the networks by the year 2010; to reduce the average viability threshold for intermodal freight journeys in the European Union from ca 500 km to 200 km by the year 2010; to support Community policy in the field of transport charging

[4] In accordance with the rules for participation and dissemination and the European Commission regulation for implementing them, Member States and Associated States may have access, on presentation of reasoned request, to useful knowledge which is generated by RTD activities under this Key Action and is relevant to policy making.

[5] Reference documents on the Common Transport Policy are "Future development of the Common Transport Policy towards a Community framework for sustainable mobility" of December 1992 (COM(92)494) and the Communication on "The Common Transport Policy; Sustainable Mobility: Perspectives for the Future" of December 1998 (COM(98)716).

across Europe and to integrate information technologies and second generation satellite navigation and positioning systems in the transport sector.

For ***safety, security and human factors*** the aim is to ensure a high level of safety and user-friendliness at an affordable cost for the individual user as well as for society. Parameters to be taken into account include the development and promotion of the use of new technological and behaviour-orientated tools to reduce the number, severity and impact of accidents, both in terms of safety and pollution prevention. The parameters should also significantly reduce the total number of fatal and other severe accidents, in particular in road transport and improve travellers' perception of security and to reduce loss or damage of goods.

RESEARCH OBJECTIVES

The key action's three RTD objectives, which contribute to achieving the policy goal of sustainable mobility, reflect the three main components of a modern integrated transport system:

(i) a regulatory and accountable framework reflecting socio-economic objectives;

(ii) an interoperable infrastructure which allows the operation of attractive, environmentally-friendly and efficient transport means;

(iii) modal and intermodal systems for managing operations and providing services.

Socio-economic scenarios	***Infrastructures and interfaces with transport means***	***Transport management***
2.1.1. Quantitative tools for decision-making	2.2.1. Infrastructure development & maintenance	2.3.1. Traffic management systems
2.1.2. Driving forces in transport	2.2.2. Environment	2.3.2. Transport and mobility services
2.1.3. Policies for sustainable mobility	2.2.3. Safety	2.3.3. Second generation GNSS
	2.2.4. Security	
	2.2.5. Human factors	

2.1 Socio-economic scenarios for mobility of people and goods

The aim is to develop strategies and tools for managing the impact of economic, social, political, demographic and technological developments on mobility demand and transport policies. Research will deliver the building blocks for a European strategic decision support and information system in the field of transport for policy-makers, authorities, industry and operators. The three major building blocks are quantitative tools, knowledge of today's and tomorrow's driving forces in transport and effective policies. These basic decision-support tools will provide the keys to further refine and operationalise the concept of sustainable mobility to further develop integrated transport systems in the specific European context.

2.1.1: Quantitative tools for decision-making

In order to anticipate, orient and respond to mobility needs, transport models have to be refined and developed to explain and predict the user's travel and transport decisions in a reliable way. They will also have to allow the evaluation of the impact of different transport policies and developments in terms of economic effects, employment, environment, safety and cohesion so that comprehensive assessments can be made. In particular, models and other evaluation tools will be designed that facilitate priority setting in the further development of the Trans-European Networks and the elaboration of other elements of the Common Transport Policy.

The **strategic information and evaluation systems** to be developed will support higher-level customised applications, guide decision-makers in planning the transport system and operations, and enable the assessment of projects and initiatives. The development of these systems requires new methodologies for data collection for specific transport domains where information is not available for use at European and global level such as mobility trends, origin-destination matrices, accidents, internal and external transport costs, emissions, both for passenger and for freight transport. It requires also setting up of coherent market observation tools and benchmarking methodologies, integration of assessment tools and models responding to policy-related queries, as well as improved models and evaluation methodologies.

2.1.2: Driving forces in transport

Present decisions and investments in transport determine the shape of Europe's future transport system. An early identification of future challenges and bottlenecks should enable decision-makers to better cater for current and future mobility needs. This requires the quantitative tools developed in sub-task 2.1.1. to be complemented with research into driving forces in transport that cannot be adequately addressed by quantitative forecasting tools.

Building integrated and sustainable transport systems in Europe to cater for current and future mobility needs will require research to produce structured and comprehensive frameworks which identify the political, social, economic, cultural, demographic and technological factors (including their impact assessment) which are likely to shape mobility and the transport business, including supply chain management, today and in the future. It will also require the preparation of long term reference scenarios, which portray sustainable mobility concepts for the future, defining their operational, technical and regulatory requirements and ways to get there. Prospects on how European integration, enlargement to the East, regional differences and subsidiarity are likely to determine transport in the Union need to be addressed as well as an identification of the most effective strategies to develop integrated and sustainable transport systems in this particular European context, responding at the same time to the challenges and opportunities raised by a continued globalisation of economic activities.

2.1.3: Policies for Sustainable Mobility

The third building block consists of efficient policies for sustainable mobility, taking into account the tools developed under the preceding objectives. Research on policy evaluation, implementation, acceptance and their further development will enhance the decision-making process and the execution of policies at pan-European, EU, national and regional levels.

An improved **development and implementation of policies** require research on strategies for dealing with possibly conflicting policy objectives and their implementation in terms of transport demand, environmental and safety impact, social, economic and regional cohesion, land-use planning; policy evaluation that combines economic analysis, environmental impact and safety assessment; regulatory enforcement techniques and methods as well as tools to measure the impact of non-enforcement of regulations; optimal legal, institutional and organisational structures for the transport sector as well as evaluation of needs and opportunities for public intervention and public-private partnerships. Finally research will also have to address optimal pricing policies, their relationship with infrastructure investment and operational strategies, their impact on society and ways to increase their public acceptability.

2.2 Infrastructures and their interfaces with transport means and systems

The goal is to enhance interconnectivity and interoperability in order to promote efficiency in the transport system through further strengthening the modes and enhancing their integration in terms of infrastructure, transfer points, transport means (vehicles, vessels,…), equipment, operations, services and the regulatory framework. Strengthening the modes also implies improving safety and security as well as their environmental-friendliness.

2.2.1: Infrastructure development and maintenance

The operation of seamless intermodal door-to-door transport chains across Europe requires research to enable the cost-effective development and maintenance of infrastructures and nodal areas as well as to identify and realise promising alternative transport concepts.

The further **development, interconnection and interoperability of transport networks, in particular the Trans-European Transport Networks (TENs)** require research to address specifications for technical and administrative interoperability within and across modes; the identification of Trans-European and network effects of TENs and strategies to maximise their beneficial impacts; methodologies and best practices for improving the integration between local, regional and Trans-European and Pan-European networks, particularly in cross-border situations including new concepts to optimise the intermodal use of cargo units.

The optimisation of **nodal areas and terminals**, key elements of seamless intermodal networks, requires planning and design tools to better integrate ports, airports and inland terminals in the network as well as good practice guidance in planning, financing and operating accessible passenger interchanges.

For an improved and cost-efficient **infrastructure maintenance,** research will provide tools for infrastructure management and maintenance such as methodologies for life cycle cost assessment and business process re-engineering, infrastructure materials and tools to optimise the interaction between the infrastructure and the vehicle and strategies for cost-effective and reliable maintenance of transport means as well as condition-based and reliability-centred systems for infrastructure management for all types of infrastructure and all safety-critical components.

In order to develop innovative and cost-effective **alternative transport concepts** and to assess their potential impact, research is required on two areas. First, the needs and opportunities for new transport means and systems over the next 10 to 30 years, such as the innovative use of pipelines, floating tunnels, automated underground distribution systems, large capacity transport means, including investigations as to how current means could fulfil future requirements and how innovative technologies can be integrated. Second, the safe, efficient and environmentally-friendly integration of new means of transport, e.g. high-speed vessels, into existing transport operations.

*These activities are closely co-ordinated with the Generic Activity "Materials and their technologies for production and transformation" as well as with KA1 "Products, processes and organisation", in particular regarding **tunnels**.*

2.2.2: Environment

The aim is (1) to develop European harmonised methodologies to assess and monitor the effects of transport infrastructure and operations on the environment, and (2) to evaluate technologies, develop concepts and identify regulatory requirements to mitigate air pollution and noise from transport.

Decisions on environmental measures in transport require an adequate **assessment of the environmental impact of transport**. Therefore, research will have to address among other things measurement of noise and emissions, accidental and operational pollution, including regulated as well as non-regulated pollutants such as particulate matters and base metals as well as refinement of methodologies and procedures to evaluate the environmental impact of transport infrastructure master plans, international corridors and projects, as well as transport operations and alternative logistics chains and to integrate these into the broader socio-economic assessment (including Strategic and Environmental Assessments).

In order to **mitigate the environmental impact of transport**, research will have to address four areas. First, strategies for the abatement of noise and pollutant emissions in cities, at ports and airports and in the vicinity of large transport infrastructures. Second, new technical and regulatory requirements for enhancing the environmental compatibility of vehicle, train, aircraft and vessel operations. Third, specifications of environmentally compatible

infrastructures, including solutions to lower their visual intrusion in the environment and lastly organisational and policy frameworks for the introduction and use of environmentally friendly transport means and systems.

2.2.3: Safety

The aim is to develop and implement systematic approaches to safety in all modes of transport within a cost-effectiveness perspective. Research should provide the foundation for harmonised pan-European safety regulations.

The development of methodologies for a **systematic safety approach and risk analysis** in transport requires first of all common methodologies and tools for hazard and risk analysis, for the establishment of safety requirement targets and related safety control procedures and for the elaboration of safety assurance and management procedures as well as systematic approaches to emergency situations, including passenger survivability and evacuation from transport means and all kinds of infrastructure and for search and rescue. Furthermore, methodologies for cost-effectiveness assessment of transport safety measures and vehicle design improvements and methods and tools for implementation and enforcement of safety regulations and strategies will need to be developed, including also for the transport of dangerous goods. Finally, rules and procedures for the integration and use of safety enhancing navigational, management and information systems and automated solutions as well as assessment of the role of the human element and how to ensure a positive impact of telematics on safety and the increased use of communication devices needs to be addressed, and should also take into account the results of the “User-friendly information society“ (IST) programme.

Research will also address **specific safety issues,** such as the feasibility of transferring design methodologies and technologies to increase passenger survivability from the automobile area to aircraft, ships and railways, and vice-versa; safety risks of and solutions to the existence of different traffic signs and regulations across Europe; performance assessment of drivers’ and crew behaviour and physical state in relation to illness, fatigue and the use or abuse of alcohol, various types of drugs and medicines as well as confidential reporting schemes for hazardous incidents.

2.2.4: Security

Research should deliver strategies and tools to guarantee higher levels of security in transport. Improving **security** for passengers and cargo will require research, in co-operation with the IST programme, in three areas. First, reconciliation systems for luggage and goods in ships, aircraft and terminals. Second, security aspects of public transport, including automatic detection of security problems and incidents and security-enhancing conception and operation of facilities and transport means (including piracy prevention). Finally, harmonised security procedures for intermodal transport operations and organisation of measures on door-to-door transport chains as well as early warning and cargo security systems and measures.

2.2.5: Human factors

The aim is (1) to improve the human role and performance in transport operations, (2) to assess the future training needs and opportunities for jobs, while at the same time, (3) increasing the levels of comfort in and accessibility to transport means.

Improving the **human role and performance** in transport necessitates research to provide systematic approaches to the many factors which affect the interaction between human beings and automated systems in transport, such as the assessment of driver assistance systems and the development and acceptance of new procedures and technologies as well as the assessment of health effects of transport, including of transport at high speed and high altitude.

In the field of **training and education**, research will address the following issues : training tools and techniques for crisis management by staff in aircraft, vessels, vehicles and passenger interchanges; harmonised procedures to implement international regulations related to training and education; training and assistance systems for drivers and crew; new jobs, strategies for qualification and career development related to structural changes in rail, public transport and maritime transport, including ports as well as European educational and (re-) training needs for transport professionals, including the use of simulators.

Increased levels of **comfort and accessibility** in transport will be achieved through research on strategies to improve access to transport and identification of the wider socio-economic cross-sector benefits of accessible transport and new designs for transport means and terminals to be accessible to all people.

2.3 Modal and intermodal transport management systems

The aim is to develop and facilitate the deployment of high-performance systems for managing traffic and transport services both on a modal basis for air, waterborne, rail, road and urban transport, and for intermodal transport. The development of second generation satellite navigation and positioning systems is thereby seen as an important contributing tool. These activities will be undertaken in liaison with the programme for a user-friendly information society and will include the use of related information systems, their integration into the transport system and the validation of the resulting integrated systems, including institutional solutions for their deployment.

2.3.1: Traffic management systems

A more efficient, safe and environmentally friendly use of available infrastructures requires an appropriate management of traffic flows. The three main aims in this respect are: (1) to contribute to the development, integration and validation of advanced traffic management systems, including the exchange between and the use of information systems; (2) to establish a coherent, integrated transport management systems architecture across the transport chain; and (3) to fine tune demand management tools and policies and facilitate their deployment.

In order to improve **traffic flow management**, developments will be centred on the following four issues, building on the results obtained within FP4. First, assessment of new European concepts and functions of vessel traffic management and information services (VTMIS) and river information services (RIS) for optimised waterborne transport management services including safe ship operations, contingency planning and increased traffic efficiency; improvement of navigational control and shore-based advice and pilotage; specific requirements for high speed craft. Second, extension of the European Rail Traffic Management System (ERTMS) towards the traffic management layers, including capacity analysis and allocation, building on the current signalling (ERTM/ETCS) and telecommunications (GSM-R) developments, including the use of an associated information infrastructure to support transport management activities and customer services. Third, validation in a structural way of the benefits and feasibility of the implementation of a European Air Traffic Management System (EATMS system), through integration and operational verification. Finally, transport policy assessment of automated guided vehicles and dynamic road traffic management systems, including incident management, covering operational procedures for data collection, processing, modelling and information provision to road users and road operators as well as the development of solutions to suit agreed levels of interoperability between road-based information and management systems across the EU.

Research also has to develop the basis for **integrated transport management architecture** across the transport chain, notably through the establishment of procedures for the exchange across modes and sectors of transport information and documents as well as of tools and methods to optimise the management of intermodal transport chains and the interconnection between nodal points, including their interfaces with incoming and outgoing traffic and integrating supporting information and communication systems. Finally, safe and efficient

management of nodal points such as airports, ports and freight terminals will have to be addressed.

Demand management tools such as pricing policies and their practical implementation both across modes as well as in modal situations require research and development on design of transport pricing schemes, including distance-based road pricing systems and mobility management schemes at site and area level and for tourism related mobility, including the development of policy scenarios promoting mobility management.

2.3.2: Transport and mobility services

Increasing the transport system's efficiency and sustainability, and promoting a modal shift require improved and innovative transport and mobility services and strategies. RTD should help to: (1) lower the break-even distance of intermodal freight transport and enhance the quality of intermodal freight services, (2) improve the quality and use of collective passenger transport, non-motorised modes and taxis in local and regional passenger transport; and (3) enable a better use of existing infrastructure and capacities through common freight and passenger services.

In order to enhance the quality of intermodal **door-to-door freight and logistics** services in all modes, both in urban and rural areas, research activities will cover four areas. First, new strategies for intermodal transport with particular emphasis on innovative concepts for short and medium distance services for non-standardised cargoes and small consignments. Second, new organisational solutions to improve the service quality of goods-distribution within urban and rural areas, and between these areas and freight centres. Third, the users requirements and the operational deployment of open and accessible information systems, building inter alia on electronic business, that will offer reliable real time information and other value added services to all actors in the transport chain with the aim of reducing their costs and to enable co-operative freight management. Finally, strategic tools to optimise the organisation of transport in the framework of logistic processes.

An improved **integration of individual modes** in the transport chain requires different organisational and technical solutions. Research will therefore address the following areas : the potential for rail/air freight services with innovative freight centres at airports; innovative concepts for door-to-door services integrating short sea shipping and inland navigation, in particular the role of waterborne transport management services in achieving efficient intermodal freight operations; emerging opportunities for new operational railway concepts and services, including the development of the European Rail Freight Freeways as part of door-to-door transport services and finally, intelligent intermodal transport equipment, including rail/road, to improve transport chain efficiency.

Improved **passenger transport systems and services** will be developed, validated and demonstrated in order to improve the quality and use of collective transport, non-motorised modes and taxis in local and regional transport. Research will address the following areas. First, intermediate mass transit systems to fill the gap between bus, tram and other public transport systems. Second, innovative customer-tailored services based upon specific traveller groups´ market needs such as mobility-impaired people, night-travellers, students and business-travellers. Third, use of non-motorised transport modes and taxis, especially in combination with public transport and finally, organisational and other requirements for door-to-door passenger services using inter alia integrated travel information, reservation, payment and ticketing.

In order to enhance the attractiveness of environmentally friendly transport modes at local, regional, national and international level and to promote behavioural change, through **common concepts for freight and passenger services**, research activities will cover good practice in planning and designing transport networks and services, particularly with regard to innovative financial and organisational partnerships for rural areas, city centres and low-density residential areas. It will also address strategies and tools for behavioural change in freight and passenger transport through awareness and marketing campaigns as well as

standard European markets segmentation and a set of indicators for local transport and strategies for the promotion of its use for benchmarking and decision making.

2.3.3: Second Generation Satellite Navigation and Positioning Systems

The aim is to contribute to the development and implementation of a European strategy regarding the second-generation satellite navigation and positioning systems (GNSS). Whereas in the space and ground control segments the focus of the work will evolve from policy decisions regarding international co-operation, in the application segment, research will aim at fostering the utilisation of satellite navigation and positioning systems across the value-chain of the transport sector. With regard to **second-generation satellite navigation and positioning systems** (Galileo), research and development will cover the following three areas in conjunction with the IST programme. First, the development of a technological and operational capability, enabling Europe to play a decisive role in future international, world-wide space co-operation agreements. In this context, appropriate co-ordination mechanisms will be implemented in order to ensure the maximum synergies with the work carried out by ESA and, where appropriate, potential users. Second, the development and implementation of a strategy for fostering the penetration of satellite-based navigation and positioning systems across the transport sector, as a performance enhancement in safety-critical applications, as a more cost-effective and operationally-efficient replacement of existing operational infrastructure, and as a means to support the creation of new value-added services, particularly in an intermodal context. Emphasis will be given to field demonstrations as well as to the consideration of the underpinning economic, institutional, legal and regulatory aspects. Third, the analysis of user requirements, opportunities and constraints linked to the specifics of the various transport modes and infrastructures.

In defining the **strategy and priorities** for December 1999 and the June 2000 calls for proposals, attention has been paid to relevant results from FP4 projects. Particular importance has been given to the integration, validation, demonstration and assessment of their results to facilitate transport policy decisions at European, national and local levels. Also the set of retained proposals in the first call opened March 1999 have been considered to guarantee coherence and continuity of the programme.

As far as Innovative Information Technologies activities are concerned the work will focus on the *deployment and integration of these technologies and their adaptation to applications relating* to[6] Sustainable Mobility and Intermodality.

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL

A number of **thematic networks** will be set up as a result of the first call. In the December 1999 call additional thematic networks are planned, ensuring continuity of the co-ordination effort between nationally and Community funded projects, and the main stakeholders in the proposed themes, including policy makers.

Priority will be given to the following thematic networks. (1) For *socio-economic scenarios*: Trans-Alpine crossing; and implementation of marginal cost pricing in transport. (2) For *infrastructures and their interfaces with transport means and systems* attention will be paid to airport activities. (3) For *modal and intermodal transport management systems* networking activities will be developed concerning air traffic management (ATM).

6 Council decision (1999/169/EC)

Priorities under the objective (1) **socio-economic scenarios** will include socio-economic impacts of transport investment and policies; and implementation of marginal cost pricing in transport.

With regard to (2) **infrastructures and transport means** priorities will be railway infrastructure capacity and access management tools; road pavement maintenance management; environment friendly shipping operations; new generation vehicles and propulsion systems; safety in tunnels; drivers and riders physical fitness and physical state; assessment of in-vehicle technologies and human-machine interaction for road transport; and education and training for revitalisation of railways.

For (3) **modal and intermodal transport management** the call will address the assessment of ship and shore traffic management and information systems (VTMIS); the integration of airfreight in the intermodal transport chain; and door-to-door services for non-unitised cargoes.

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

Concerning **Thematic Networks** priority will be given as follows. (1) For *socio-economic scenarios*, networks will address the European Transport Policy Information System (ETIS); public transport; and common research issues concerning Europe and North American Countries. (2) *For infrastructures and their interfaces with transport means and systems* attention will be paid to: transport and the environment; and assessment tools for road safety measures. (3) *For modal and intermodal transport management systems*, networking activities will be developed concerning strategies to promote waterborne transport.

For the third periodic call in June 2000, the tasks foreseen under the objective (1) **socio-economic scenarios** will include, as far as *quantitative tools for decision-making* are concerned, the development of the European Transport Policy Information System (ETIS); and design of a road accident investigation database structure. As far as *driving forces in transport* are concerned, the tasks will relate to implications of non-transport policies on mobility; conditions for sustainable development of transport; European transport visions beyond 2020; forecasting technological driving forces for new means of transport; and potential of intermodal freight transport for modal shift. For *policies for sustainable mobility* tasks will address development of non-technical measures towards transport policy objectives; local/regional mobility schemes; and freight transport in local transport policies.

With regard to **infrastructure and transport means**, tasks will cover the intermodal transport co-operation with CEECs; interoperability in intermodal freight transport (equipment, infrastructures and transport means); operations in intermodal freight terminals and at the European border crossings; integration of intermodal passenger terminal in transport networks; arrival/departure/ground movement integration in the air transport operation; optimisation of the railway network development; requirements and impact assessment of high speed vessels; and port operations and management to improve Quality Shipping. With regard to the *environment*, tasks will cover handling of dangerous goods in ports and other terminals; noise and emissions in urban areas; and vehicle/tyre/road noise abatement measures. For *safety*, tasks will address the aircraft passenger survivability; evacuation of very large aircraft; procedures and technologies to increase air transport system capacity, safety and environmental friendliness; and assessment tools for road safety measure. Finally, with respect *human factors*, research will address the accessibility between station platforms and trains for heavy rail.

For **modal and intermodal transport management**, this call will address, with regard to *traffic management systems,* prototyping and the operational and institutional issues of the European Railway Traffic Management System; an Operational Platform for the European air traffic management system (ATM); airport approach procedures; assessment of road traffic information systems; intermodal freight transport management and communication systems demonstration; operation of river information services; road speed management; and the

requirements of urban rail control command systems. As far as *transport and mobility services* are concerned, tasks will cover door-to-door services for less than container loads; long distance passenger services on railways; cross-border fast cargo trains; "intermediate" mass transport system for passengers; mobility services in low density rural areas; non-technical issues linked to cross-border intermodal information and services for railway passengers; and waterborne operations in support of a European Northern Dimension.

The above-mentioned priorities for both calls will be implemented through research projects and also through demonstrations. In certain cases, policy-driven research studies will be implemented through accompanying measures and will be funded up to 100% subject to the level of public interest.

Innovative proposals (i) not fully addressing one of the specific above-mentioned priorities, but (ii) aiming at the key action objectives and (iii) responding to priorities of the Common Transport Policy agenda, or (iv) answering a significant need of the transport sector opening a new research field, could also be submitted to the Accompanying Measure Open Call (Measure 2). See Section E of this Work Programme regarding *accompanying measures*.

Research on the Second Generation Global Navigation Satellite System (Galileo) will not be addressed in this call. A dedicated call on the definition phase of the Galileo project was opened in June 1999.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

The call planned for December 2000 is not expected to be open for this Key Action.

The call planned for June 2001 is expected to address the three research objectives of the key action, and will be further specified in the second revision of the work programme. To establish the priorities of the call, attention will be given to the emerging results from FP4 and first results from FP5, to the policy and societal needs, and to the research and technological state of the art. All research objectives will be open for Thematic Network and Concerted Action proposals.

KEY ACTION 3: LAND TRANSPORT AND MARINE TECHNOLOGIES

SOCIO-ECONOMIC OBJECTIVES AND EXPECTED OUTPUTS

The strategic aim for the land and marine transport sectors is to develop the technological infrastructure for the supply of future transport means and concepts. The overall aim is to support the expected growth in transport demands in a sustainable manner (covering urban, inter-urban and marine environments) and to maintain and consolidate the competitive position of the European road, waterborne-based, rail and intermodal supply industries. Measurable benefits to be brought by this key action are also linked to significant reductions in energy consumption and large increases in overall safety, reliability and availability. The objective should also be to prove commercial viability of technological solutions for a customer acceptable and integrated European transport system. For the maritime industry there are additional objectives of strengthening its economic and operational base though increased systemic innovation spanning the complete supply chain, since 50 to 80% of shipbuilding added valued is generated outside the yard.

The research effort will be considered and organised around (a) the development of critical technologies and (b) their integration and validation around advanced industrial concepts in order to attain the following main deliverables:

- *Improved fuel efficiency and reduction of emissions*: Contribution to the reduction of 30% in CO^2 emissions for new car fleet average, 20% for rail vehicles and 15 % of marine vessels by 2008 to 2012 time period against the 1995 state of art technologies for consumption of equivalent classes; Development and validation of Zero Emission Vehicles, and Equivalent Zero Emission Vehicles capable of market deployment by 2005/2010; Pass-by noise targets : 70 dBA for automobiles, 74 dBA for heavy vehicles based on standard homologation tests and reduction of 10 dBA in relation to present railway technology.
- *Improved performance*: For new and advanced vehicle, vessel and infrastructure concepts, improvements are sought of 30% to 50% in safety, reliability, maintainability, availability and operability. For railways increased reliability (by 25%) and availability (of 99% at peak traffic periods) is expected; Reference targets are reductions of life cycle costs and maintenance costs by 30%. For ships, sub-sea vehicles and marine infrastructure design improvements are sought to reduce time to market by 15-20%, and to increase efficiency and reduce operating costs by 30% to 40%. In the case of intermodal logistic interfaces, advanced concepts should aim at increased reliability, energy efficiency and adaptability while, significantly speeding up (up to 50%) logistic operations.
- *Improved system competitiveness*: Halving of time-to-market and of costs is expected for the development of vehicle concepts and main infrastructure components. Further improvements may be feasible through the full co-operation between manufacturers, component suppliers and sub-contractors; In the medium term, advances of practices in integration of design and production operations might lead to improvements in vehicle quality and reliability of about 50%.

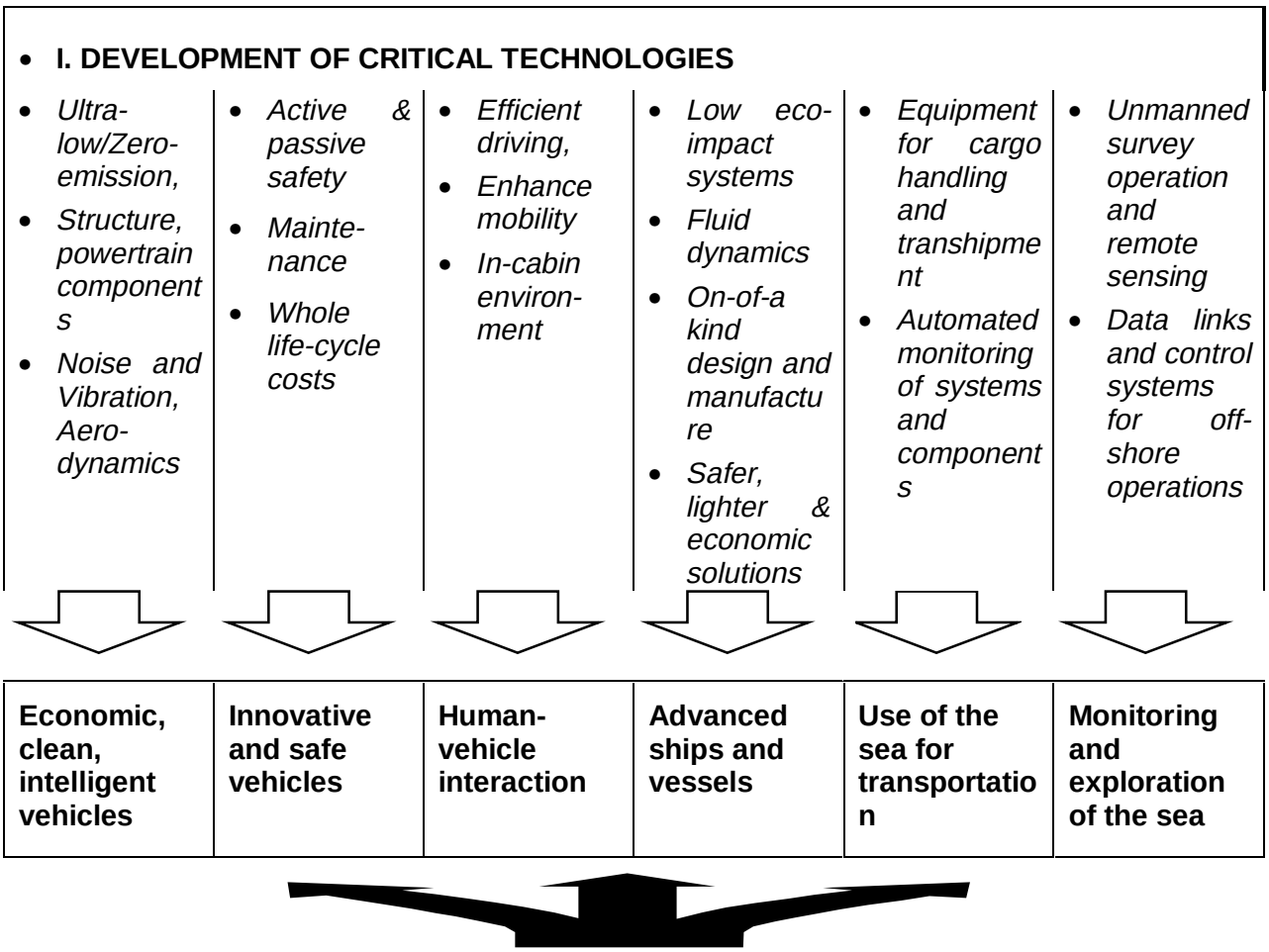
Where appropriate, for critical technologies common to land transport and marine technologies, opportunities will be sought to exploit the potential added value for cross-sectoral research activities.

Critical technologies and technology validation and integration

The priorities are to optimise the benefits of European-wide RTD by recognising the need for an integrated approach around two major strands of work:

i) ***development of critical technologies***, identified as providing the most effective leverage in the two main avenues corresponding to the objectives of the key action. For land transport, priority is placed on more efficient, intelligent, clean and safe vehicles. For marine technologies, priority is placed on more efficient, safe and environmentally ships and innovative marine technologies particularly for unmanned operations.

ii) ***technology integration and validation,*** is a fundamental element of the implementation of the key action with the coherent grouping of RTD projects around common strategic objectives. These targeted RTD activities will demonstrate the feasibility of attaining the strategic objectives of the key action. Such *Technology Platforms* (TPs) will bring together the necessary range of advanced technologies into project(s) aiming at demonstrating, at engineering concept level, their feasibility in achieving strategic key action objectives. They will bring together manufacturers, suppliers and other relevant stakeholders, with the task of developing and benchmarking engineering concepts for future vehicles, vessels, platforms components or systems whose functionalities will have to be demonstrated. In particular, integration and demonstration activities will be used to evaluate and further explore the potential of combination of technology packages in achieving economically viable alternatives of future land & marine transport concepts



RESEARCH OBJECTIVES

I. DEVELOPMENT OF CRITICAL TECHNOLOGIES

3.1 Critical technologies for road and rail transport

This section will cover R & D work on innovative on-board land transport vehicle technologies and systems which are to be integrated into future concepts of vehicle, including on-board systems for traffic management and control, aiming at improved environment, mobility, efficiency and safety performance. Traffic management activities will be undertaken where appropriate in liaison with the programme for a user-friendly information society and will include the application and validation of related information and integrated information systems.

3.1.1: Efficient, clean, & intelligent road and rail transport vehicle technologies

This research target focuses on propulsion, new low weight material and vehicle concepts, low noise and vibration suppression and improved aerodynamic performance. Key words include: ultra-low and near-zero-emission vehicle propulsion systems, powertrain optimisation technologies, technologies for vehicle structures and components, for vehicle noise and vibration suppression, for improved vehicle aerodynamics.

3.1.2: Innovative and safe road and rail transport vehicle concepts

This research target seeks to achieve 30-50% overall safety improvement through development of safety-associated vehicle features and technologies. Keywords include: vehicles' passive and active safety, vehicles' preventive maintenance, reduction of whole life-cycle costs. The aim is to increase vehicle capabilities for accident prevention while minimising passenger and pedestrian injuries.

3.1.3: Human/vehicle interaction

The research activities, which should result in a safe and friendly environment for driver and passenger, will involve multidisciplinary engineering, cognitive science and ergonomics and will be targeted at the development of tools and components for on- board systems. Key words are: microelectronics, micro-mechanics, optics, sensing, actuating, controlling. The objective will be the integration of enhanced human/machine interface systems, which allow the most effective driver/vehicle interaction, ensure reliable operation, support efficient management, and improve in-cabin ergonomics and overall comfort.

3.2 Critical marine technologies

The goal is to improve complex vessel and platform production and exploration processes through the development and application of new technologies and tools into multi-application marine environments. This should pave the way for the improvement of design methodologies and best practice at EU level.

3.2.1: Efficient, safe and environmentally friendly ships and vessels

Research will target at improved concepts for ships and vessels, and European approaches for concurrent and multi-site design, engineering or production specific to maritime industry. Key words are design technologies, manufacturing, decommissioning or dismantling, materials, powertrain and on-board systems linked to safety, clean environment and efficient marine operations.

3.2.2: Maximising interoperability and vessel performances

Research will target at improved concepts and innovative European approaches for vessels and port infrastructures, for reduction of operating costs, improvement of manoeuvrability of ships in restricted waters and ports, and efficient cargo handling and transhipment. Key words are: integrated technologies for fully automated vessel concepts, for effective vessel operation, maintenance and on-board monitoring, modular transhipment technologies.

3.2.3: Innovative technologies for the monitoring, exploration and sustainable exploitation of the sea

Research will seek to develop innovative technologies to ease accessibility to marine resources especially in difficult areas and conditions and facilitate the investigation of potential resources and monitoring of the sea and sea-bed [7]. Activities would therefore focus on innovative technologies in particular for unmanned surveying and in-situ monitoring and industrial operations in the sea.

II. TECHNOLOGY PLATFORMS

3.3 TP 1: New land transport vehicle concepts; Enhanced systems efficiency

The aim is the integration and validation of energy-efficient, ultra-low and near-zero emission, intelligent powertrains running on conventional or alternative fuels fulfilling requirements of maintanability, durability and manufacturability at competitive costs.
In the case of the hybrid/electric vehicles, the aim will be to demonstrate that emission free operation could be delivered via affordable, safe, reliable, and effective technical solutions..
The TP will cover the integration and prototyping of environmentally friendly vehicle technologies for improved efficient and significant reductions of gaseous (CO_2, NOs, CH, etc.), acoustical emissions, vibration and noise, as well as improvement of electro-magnetic compatibility supported by design, engineering and manufacturing tools.
Expected results will be validated powertrain systems with minimised environmental impact, allowing for enhanced efficiency, increased reliability and safety .
The integrated technological solutions would assist industry in showing the feasibility of innovative propulsion concepts and operational control at the vehicle level. They will explore and resolve conflicting trade-offs of contributing vehicle technologies.

3.4 TP 2: Advanced concepts for ships and vessels; Competitive shipbuilding

This system-configured ship concept deliverable will be the base for the integration of maritime related technologies and should bring together shipyards, suppliers, ship owners, operators and port authorities within the task of developing test elements in virtual or preferably real format whose functionalities will be demonstrated and proved under real operating conditions. RTD should help to demonstrate streamline and seamless vessel development processes and systems through application of the latest digital design, visualisation and prototyping techniques. This platform should also support advanced production systems which can improve ship manufacturers' customer response, product quality, manufacturing process flexibility and control, all major determinants of manufacturing competitiveness. Set against demanding constraints such as environment, work force situation, relative cost of production and material availability, it is essential that the new and/or improved processes for producing component parts and/or assemblies are properly matched with targeted efficiency and safety gains as well as product performance and environmental requirements.

3.5 TP 3: Enhanced design and manufacturing for road vehicles.

The effort will aim at integrating all necessary technologies to exploit multidisciplinary and concurrent approaches where different aspects of vehicle system engineering and their associated cost structures are converging. RTD should support the development of future vehicle concepts realising targets of safety, environmental impact, intelligence, reliability, maintenance and comfort. The activities would focus on the integration and prototyping of

[7] As a general guideline, proposals dealing with the monitoring and forecast of sea status and environmental related issues should be submitted to "Sustainable marine ecosystem". Proposals relating to technologies in the field of management of hydrocarbon reserves, as well as exploration and production technologies for hydrocarbons should be addressed to the key action "Economic and efficient energy for a competitive Europe."

tools, methods, systems, structures and organisational aspects for the supply of high quality, low cost vehicles. The approach will attempt to deliver methodologies and systems of production geared towards increased productivity, flexibility and quality of vehicle developmental processes.

3.6 TP 4: Sustainable and modular train

The aim will be the development and prototyping of new technological concepts and relevant systems that would lead to the new generation of railway vehicles which are both more environmentally friendly, as well as, cost and operationally efficient. The strategic approach will attempt to reconcile "top-down" system engineering approaches to product development with "bottom-up" problem-oriented technical activities aimed at solving significant service and operational questions. Aspects of sustainability and modularity have to effectively comply with the principles of intermodality, mass customisation, and flexible customer response. Activities are expected to combine at system level user requirements, systems' architectural design and life-cycle cost guided by cost-benefit analyses; at operational level, product certification procedures and operational management practices; at technical level, integration of key rolling stock technologies and systems such as propulsion, on-board automation, structures, dynamic performance systems, at cabin environment noise and vibration.

3.7 TP 5: Safe, efficient and environmentally friendly vessels and platforms.

The activity will support integration of critical technologies in delivering optimised concepts for safer, environmental-friendly and more efficient vessels and platforms. The goals to be fulfilled are: a) shortening the cycle for transport and handling of passengers, cars and rolling materials; b) improving the safety and realising the environmental impact during the transport and handling of dangerous cargo; c) improving the safety and comfort of passenger and comfort of passenger transport; d) developing new technology concepts for short sea, inland and polar shipping and validating the integrated solution they may provide ; e) improving the efficiency of production and off-loading of floating structures for oil and gas; f) improving the efficiency of service, rescue, combating and assistance in case of calamities and other operations which support transport activities, the exploitation of resources at sea, coasts and inland as well as maintenance of related infrastructures; g) improving and/or upgrading existing means and systems to prolong life time, enhance economic efficiency and operability, adjust for new or enhanced needs and comply with recent statutory requirements on safety, environmental protection and working conditions for new buildings, conversions, life time lengthening etc of existing ships and platforms. For the rapid up-take of results, effort will be concentrated on fast vessels for passengers, cars and cargo; deep sea ships mainly for passengers and unit cargo, deep sea floating structures for production storage and off-loading of gas; unmanned, autonomous and remotely operated survey vehicles; new concepts for short sea shipping and polar shipping.

3.8 TP6: Efficient interoperability and transhipment

Effort will be concentrated on integrating technological advances delivered through critical technology research for advanced concepts for unitised cargo and for ship types operating in coastal, restricted and limited waters. Due consideration should be given to the integration of supporting measures needed for these ships and infrastructure aspects of maintenance, storage, distribution and assistance. The strategic aim is to provide demonstrable optimised concepts of use of multimodal cargo units reinforcing intermodal links with special emphasis on easing, improving and facilitating cargo flows between inland and sea.

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL

The call will be open for all technical areas defined under objectives 3.1 "*Critical technologies for road and rail transpor*t", and 3.2 "*Critical marine technologies*", and for Technology

Platforms: TP1 "*New land transport vehicle concepts; Enhanced systems efficiency*" and TP2 *"*A*dvanced concepts for ships and vessels; Competitive shipbuilding*". All research objectives will be open for Thematic Network and Concerted Action proposals.

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

The call will be closed for RTD, demonstration and combined project proposals. However, all research objectives will be open for Thematic Network and Concerted Action proposals.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

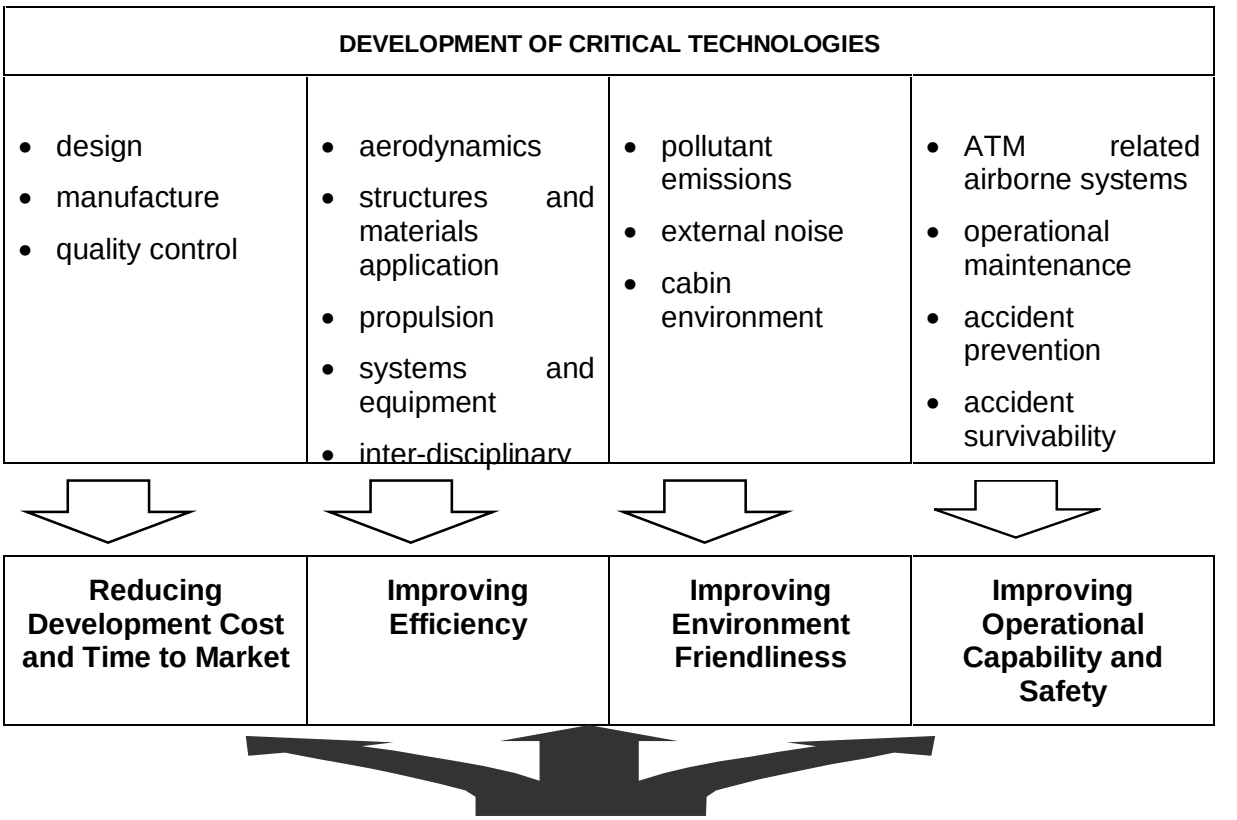
The call planned for December 2000 is not expected be open for RTD, demonstration and combined project proposals. However, all research objectives will be open for Thematic Network and Concerted Action proposals.

The call planned for June 2001 is expected to be open to all technical areas defined under objectives 3.1 and 3.2, and at least three technology platforms. The actual technology paltforms open will be specified in the next revision of the work programme, and will be based on the results of the December 1999 call. All research objectives will be open for Thematic Network and Concerted Action proposals.

KEY ACTION 4: NEW PERSPECTIVES IN AERONAUTICS

SOCIO-ECONOMIC OBJECTIVES AND EXPECTED OUTPUTS

Air transport is experiencing a remarkable growth and is expected to maintain and even increase growth rates over the following decades. Globally over 16000 new commercial aircraft worth more than € 1000 billion will have to be produced within the next 20 years to satisfy this demand. More than ever, it will be indispensable to respond to public demands for economical vehicles, with an optimum level of safety and environmental friendliness in relation to noise and pollution emissions. Europe's ability to provide answers to these challenges depends strongly on the level of its technologies and their incorporation by industry into products. The aim of this key action is to strengthen the competitiveness of the European aeronautic industry, including SMEs, while ensuring sustainable growth of air transportation with regard to environmental and safety issues.



TECHNOLOGIES INTEGRATION AND VALIDATION

1. novel rotary-wing aircraft configuration
2. power-optimised aircraft
3. low external noise aircraft
4. integrated and modular aircraft electronic systems

The overall aim of the key action is reflected into four priorities with corresponding technical objectives, which make up the main drivers of the European RTD action:

- *reduction of aircraft procurement costs*, with the target of reducing production costs by 35% and development time by 15 to 30%;
- *improvement of the efficiency and performance of aircraft,* with the target of reducing fuel consumption by 20% and general improvement of its reliability and direct operating cost;

- *reduction of impacts related to noise and climate as well as improvement of passenger environment.* Objectives are reduction of emissions of NOx by 80% and CO_2 by 20%, and decreasing external noise and cabin noise by 10 dB each;
- *improvement of the operational capability of the aircraft in the air transport system and of its safety*, with targets of increasing airspace capacity, reducing aircraft maintenance costs by 25% and decreasing accident rates by at least the same factor than the growth of traffic.

The quantified objectives correspond to a medium term of eight to ten years and should be regarded as guiding targets of the RTD action, taking the present state-of-the-art as the reference point. The aircraft is regarded as including its systems and components. The achievement of each objective will be the result of the combination of contributing technologies in a multidisciplinary and multisectoral activity. Research will bring together manufacturers and suppliers including SMEs, research institutes and academia, operators and regulatory authorities.

APPROACH: TWO MAJOR STRANDS

The work programme is structured in a way to optimise the benefits of European-wide RTD by recognising the need for an integrated approach. It distinguishes two major strands of work:

- ***development of critical technologies***, that with a medium and long term perspective will lead research to extend and improve the technology base on a number of critical disciplines; these are seen as providing the most effective leverage with respect to the socio-economic objectives of the key action;
- ***technologies integration and validation,*** which, with a shorter term perspective, is designed to reduce the risk associated to the application of innovative developments. This RTD work is most relevant to the technical complexity inherent in aeronautical products, which are the result of the combination of multiple systems and technologies. Within "*Technology platforms*", projects will normally be of a larger size than a simple RTD project; in most cases, they will encompass integration of technologies in test rigs, flying test beds or simulators.

RESEARCH OBJECTIVES

I. DEVELOPMENT OF CRITICAL TECHNOLOGIES

4.1: Reducing aircraft development cost and time to market

Research should aim at facilitating the introduction and combination of the newest technologies able to contribute to substantial gains in time-to-market and production costs. Advanced design approaches exploiting information technologies should facilitate concurrent engineering practices in support of the design for the whole product life cycle as well as distributed inter-company design environments. Novel manufacturing and assembly processes associated to advanced materials would achieve cost reduction and production flexibility while ensuring safety requirements. Development and deployment of technologies for distributed multi-site production systems would pave the way to increased industrial partnerships and reinforced co-operation across the supply chain.

4.1.1: Advanced design systems and tools:

RTD objectives are to help reduce time-to-market by 15 to 30 % and development costs by 35 % while ensuring improved response to market and society needs. RTD should address the development of concurrent engineering environments; development and validation of multi-disciplinary optimisation methods; advanced modelling and simulation tools, including

virtual reality, in support of virtual prototyping, and knowledge-based systems to support design activities.

4.1.2: Manufacturing:

Research objectives are to help reducing manufacturing costs by 30 % while improving working conditions and organisational capacities of enterprises. RTD should address the development and validation of intelligent and flexible manufacturing methodologies in support of advanced airframe assembly concepts and cost-effective manufacturing processes for airframe, engine and equipment parts best adapted to exploit the properties of advanced materials.

4.1.3: Product quality control:

The research emphasis should be on development of specific methodologies for continuous quality/cost control measures in the design and manufacturing stages. Particular attention should be given to the supply chain aspects. RTD should address the development of new inventory/configuration control procedures to deploy across the supply chain; advanced in-process inspection and test techniques; and development of knowledge based diagnosis.

4.2: Improving aircraft efficiency

The objective of the research work is to improve aircraft Direct Operating Cost through a substantial reduction in fuel consumption while ensuring and improving safety aspects. It will be possible by the combination of technology advances: (1) to reduce drag and improve lift-to-drag ratio by improved aerodynamic designs; (2) to reduce aircraft Operating Weight Empty by increased introduction of advanced lightweight, cost-efficient structures and of power-optimised and safer, integrated flight controls, systems and equipment; (3) to improve engine efficiency with higher performance propulsion systems and propulsion controls.

4.2.1: Aerodynamics:

Research objectives are to support reduction of aerodynamic drag by 20% in 10 years and improvement of the overall aerodynamic efficiency of the aircraft in take-off, climb, cruise, approach and landing. RTD should address the development and validation of high-performance technologies, systems and support tools for drag reduction; theoretical and experimental methods for prediction and control of boundary layer behaviour; systems and technologies to enable adaptive wing concepts; computational methods and novel technologies for high-lift aerodynamics at low-speed; CFD tools and integrated design methods.

4.2.2: Structures and materials application:

Research objectives are to help reducing weight by 20% in 10 years at no extra manufacturing cost and without reduction of structural life. RTD should address the development and validation of improved theoretical tools for the simulation of structural behaviour; new structural concepts for increased use of advance materials in primary structures; tools and technologies for application of "smart materials" and realisation of "smart structures" integrating sensors-structure-control-effector.

4.2.3: Propulsion:

RTD objectives are to support in 10 years fuel economy by 20% and consequently reduce emissions of greenhouse gases by the same factor, as well as to increase engine thrust-to-weight ratio by 40%. RTD should address new and improved engine cycle concepts; numerical aerothermodynamics methods for design of turbo-machinery components; application of medium and high-temperature materials; techniques and concepts in support of the design of "smart" engine control systems; technologies for improved mechanical transmission systems for rotorcraft and engines, as well as innovative concepts such as compound propulsion.

4.2.4: Systems and equipment:

Objectives are to reduce power take-up by 10% and weight by 20% of on-board systems with at least the current levels of safety, cost-effectiveness, reliability and maintainability, while meeting better functional requirements. RTD should address power generation and technologies in support of a more electric aircraft concept; low-power demanding flight control systems; improved modelling and design methods for landing gear and braking systems; techniques for improved reliability of fuel management systems; application of fibre optics to cabin utility systems, passenger services and avionic systems; development of underlying technologies and procedures for implementation of integrated modular concepts; application of advanced displays and sensors in cockpit functions.

4.2.5: Configurational and interdisciplinary aspects:

Research objectives are to provide analysis capability in support of improved as well as novel aircraft configurations. RTD should address methodologies and technologies for multidisciplinary analysis of unconventional aircraft configuration aspects; multidisciplinary airframe-engine integration; improved analytical tools for the prediction and technologies for the prevention of static and dynamic aeroelastic phenomena.

4.3: Improving environmental friendliness of aircraft

Considering the increasing society pressure with regard to environmental consequences of the projected growth in air traffic, aircraft size and emissions, research is needed to improve technologies for reducing engine emissions. Reduction of external noise is in addition becoming increasingly important for the growth of aircraft operations and aircraft size. It is also necessary to improve total cabin environment as a combination of physical aspects such as noise, vibration and air quality, as well as human-factor-related aspects. This research should help to ensure passenger and citizen acceptance of future vehicles.

4.3.1: Low pollutant emissions:

Research objectives are the development of combustor concepts to achieve a significant reduction of engine emissions of NO_x and particulates, as well as improving knowledge of the nature and effects of emissions in support of the development of a new emissions parameter for certification as recommended by ICAO/CAEP. The specific targets for NO_x reduction are: i) 80% in the LTO cycle, and ii) to an emission index of 8 gr. per kg fuel burnt in cruise/climb. RTD will address tools and technologies for low-NO_x combustors; efficient combustion systems; measurement and modelling of the composition of engine exhaust gas emissions and its distribution within the jet and plume; establishment and evaluation of a global inventory of 3-D distribution of emissions; development of the technical background in support of the development of new emissions parameter covering the whole aircraft operation.

4.3.2: External noise:

RTD objectives are to reduce external perceived noise by 10 dB in 10 years through new design technologies as well as through advanced active control technologies. RTD should address prediction methods and tools for reduction of noise at the source; technologies for active noise and vibration control; modelling of the far-field noise radiation; development of the technical background in support of improved noise certification parameters and procedures; modelling of sonic boom.

4.3.3: Cabin environment:

Objectives are to improve the environmental conditions in the cabin and cockpit and enhance crew and passenger comfort. Medium term targets concerning noise levels are a reduction of 5-10 dB for turbofan aircraft and 10-15 dB for turbo-propeller and rotary wing aircraft. RTD should cover advanced methods for prediction and reduction of noise and vibration in the cabin; development and validation of subjective noise and vibration criteria for cabin environments; concepts for enhanced global cabin environments; technologies for cost-efficient cabin humidification and removal of CO_2.

4.4: Improving operational capability and safety of aircraft

New technologies, including satellite based navigation and communications and new flight management systems, have the potential for changing significantly the way airspace is managed. To exploit this potential on-board technologies need to be developed and validated to equip the aircraft for future operational requirements. With the expected growth of air traffic and the foreseeable use of larger airliners carrying a greater number of passengers, the current accident rates must be improved so that aviation safety records continue at the highest standards. RTD work is therefore needed based in particular on an improved understanding of the causes of accidents, and of the human-machine interface aspects. Also the design of aircraft will have to incorporate the best knowledge to improve survivability in the event of accidents.

4.4.1: Air traffic management (ATM) related air borne systems:

RTD objectives are to increase airspace and airport capacity through a more autonomous operation of aircraft consistent with the future European ATM concept. RTD should address advanced on-board flight management functions optimising pilot's role and workload; integration of advanced on-board technologies in support of navigation in the approach, landing and ground movement; application and integration of on-board communication and surveillance technologies.

4.4.2: Operational Maintenance:

Objectives are to reduce maintenance costs by 25 % in the medium term and by 40% in 10 years while improving reliability of maintenance operations. RTD should address overall maintenance cost with improved maintenance systems; development of "smart" maintenance systems with self-inspection and self-repair capability; improved non-destructive test and analysis; methodologies to maintain integrity of ageing aircraft.

4.4.3: Accident prevention:

Objectives are to reduce aircraft accident rate by at least the same factor than the growth of air traffic. RTD should be centred around the development of improved aviation safety metrics; improved understanding of the human-machine interaction and crew performance in the cockpit; system design and technologies to reduce pilot workload and to improve situation awareness; application and validation of airborne technologies for in-flight and on-ground aircraft collision avoidance; methodologies and technologies for alleviation and avoidance of wake vortex formation and encounter; prediction, detection and monitoring of ice accumulation; technologies for protection against lightning effects.

4.4.4: Accident survivability:

Objectives are to effectively reduce the number of casualties or passengers injured in case of survivable accidents. RTD should address development of prediction tools as well as design techniques and structural concepts for improved airframe behaviour in case of crash; methodologies for prediction and mitigation of fires in the aircraft.

II. TECHNOLOGY PLATFORMS

The key action has identified Technology Platforms (TP) for technology integration and validation. Each TP would bring together a range of advanced technologies into a project representing a priority in the capability to develop future aircraft. Technology Platforms TP3, TP5, TP6 and TP9 are launched more immediately on the basis of existing technologies, whereas TP7 and TP8 will be considered for a further Call.

4.5 TP 1: Low-cost, low-weight primary structures

Already covered by the March 1999 Call, this TP is open only to Thematic Network and Concerted Action proposals, not to RTD proposals

This TP is the response to the challenge for the structural designer, particularly of the wing and fuselage of commercial aircraft, to select a cost-efficient combination of materials and structural concepts that can optimise weight while reducing development, production and operation costs. It will provide for the development, integration and validation of design and manufacturing concepts in full-scale primary structures. Principal technologies to bring around relate to: novel materials, multidisciplinary optimisation methods, manufacturing/assembling processes, simulation and numerical prediction tools, structural testing technologies, structural repair and monitoring techniques

4.6 TP 2: Efficient and environmentally friendly aero-engine

Already covered by the March 1999 Call, this TP is open only to Thematic Network and Concerted Action proposals, not to RTD proposals

This TP represents the European response to the double challenge of improving the competitiveness of its aero-engine manufacturing industry and actively contributing to curbing man-made climate change related to aviation. Consequently, the RTD activity will be based on a two pronged approach. The first will be focused on proving the technical feasibility of best available component technologies in an engine with a conventional performance cycle. The second will be targeted on significant emission reductions of NOx and CO_2, through the full-scale validation of an advanced engine performance cycle using an intercooled and recuperated engine core. Both approaches will be based on integration and validation of the critical technologies derived from research projects under previous Framework Programmes and newly proposed FP5 technology activities as well as from national and own industry programmes. RTD work should focus on development and integration of technologies in the following areas: aero-thermodynamics of the turbomachinery components including advanced CFD-tools, combustion including chemical kinetics, measurement techniques and cooling concepts, high temperature resistant and low weight/high strength materials, systems engineering including manufacturing techniques. The integration of technologies will contribute to an overall reduction of fuel consumption, pollutant emissions, maintenance costs and the first costs of ownership including delays and cancellations related to the aero-engine deficiencies. Due to the character of technologies at stake, the two approaches in the project might require different engine test beds

4.7 TP 3: Novel rotary-wing aircraft configuration

This TP is the response to overcome the limitations of current rotary-wing aircraft through the tilt-rotor concept, so providing for a high speed and cost-effective Vertical Take-off and Landing capability in European commercial aviation. The overall objective is to be able to deliver a performance in hover similar to an helicopter, a cruise speed comparable to current turbo-propeller aeroplanes and lower operating costs than modern helicopters while assuring improved passenger comfort levels. The research activities will be based on the development, integration of technologies and their validation at components level and on full-scale Ground Test Articles. This feasibility proof at ground test scale will represent an essential step prior to flight demonstration, which is beyond the scope of this TP. The full scale article and comprised technologies should correspond to an aircraft with Maximum Take-off Weight in the class of 10 tons, maximum range greater than 750 Nm (1390 Km) and maximum equivalent speed greater than 300 Kts.(556 Km/h). The TP will include two alternative approaches, one with a rotor tilting mechanism and the other with rotable wing segment and rotor. Both approaches will focus on the integration and validation of essential technologies in the following areas: main rotor system including hub, blades, power transmission and tilting mechanisms, flight control system including tilt control, nacelle and, where appropriate, wing structure, aero-elastic stability and wing-nacelle integration.

The validation activity will comprise three main phases and should be constructed in a building-block approach supported by extensive socio-economic studies: (a) *Systems definition.* Components and system specifications will include in particular: rotor performance in hover and cruise, gear box power requirements, cross-shaft and tilt mechanism design

criteria, rotor mount structural criteria, wing structural design criteria, wing aerodynamic download coefficient in hover, wing lift, drag and pitching moment coefficients, systems performance. (b) *Design, manufacturing, testing of components*, (c) *Integration and testing of full-scale Ground Test Articles* followed by a comparative assessment of the two alternative approaches.

4.8 TP4: More autonomous aircraft in the future air traffic management system

Already covered by the March 1999 Call, this TP is open only to Thematic Network and Concerted Action proposals, not to RTD proposals

This activity, focused on the airborne package of the system, represents the European response to the need for transforming research results into operational ATM procedures. It will select Communication Navigation and Surveillance (CNS) airborne technologies and integrate them in an avionics platform for validation in an ATM scenario defined in line with the European initiative. Although focusing mainly on the Airborne segment, RTD should take into account the ground segment, embracing its required new functions, in the definition of the ATM scenario. In particular, it should ensure interoperability with the integration and validation platform for the ground based ATM system developed under key action 2. Validation activities, in addition to flight testing, will make maximum use of existing facilities such as flight and ATM simulators and ATC centres equipped with pre-operational or modified platforms developed in the context of Eurocontrol or other EU funded projects. Validation will be established in terms of : i) feasibility of an economical implementation of the ATM related airborne system in existing transport aircraft; ii) human-machine interface aspects and iii) certification issues.

4.9 TP 5: Power-optimised aircraft

This TP is targeted at reducing non-propulsive energy consumption in response to the increased number and complexity of energy-consuming systems on board the aircraft. Efforts to optimise energy consumption of the different on board systems have tended to be focused at component rather than overall aircraft system level. Recent developments have also tended to use electrical power to replace hydraulic, pneumatic and mechanical power systems. The activity of this TP addresses the integration into aircraft system architectures of alternative power generation and utilisation technologies and the validation of the architecture and the systems for optimised power distribution and share. The project is aimed at proving the feasibility of a 25% reduction in non-propulsive peak power consumption while reducing weight and operational maintenance. The integration of the systems architecture will involve a common platform for systems simulation according to the “hardware-in-the-loop” concept as a central feature. The final proof of feasibility will be shown in “iron-bird” tests and selected flight tests. Aircraft systems affected will include: electrical and hydraulic power generation, conversion and distribution, power supply, propulsion, cabin environment, flight control, landing gear, anti-icing and fuel management. The project will incorporate the most advanced technologies resulting from on going or completed research projects funded under the EC framework programmes, national and industry RTD programmes.

The activity will comprise three main phases: *(a) Identification of candidate systems and definition of the validation strategy; (b) Architecture optimisation phase.* It will be based on the combined use of digital simulations and the progressive integration of individual systems in rig testing, minimising the need for extensive "iron-bird" testing; *(c) Final validation,* including “iron bird” testing and flight tests of selected systems on an aircraft test bed.

4.10 TP 6: Low external noise aircraft

This TP will represent a significant step to overcome one of the most important constraints limiting the future growth of air transport, which is the public reaction to external noise emitted by aircraft. During the last two decades the attention of noise reduction research has been placed mainly on the engine as the dominant noise source, resulting indeed in substantial decrease of noise levels. However further progress can only be achieved by the

combination of developments in several fronts: the engine source noise, nacelle technologies, airframe-generated noise and airframe-engine installation effects on one side and flight operational procedures on the other. The activity of the TP is targeted at the integration of developments achieved in these various fronts with research undertaken under the Framework programme, national and industrial RTD programmes. The objective of the platform is to demonstrate the feasibility of reduction of perceived noise levels by at least 5 decibel through application of low-noise airframe and power plant technologies, and at least 3 decibel through low noise operational procedures, by means of ground and laboratory tests and full-scale flight tests.

The project will comprise three principal phases: *(a) Identification and selection of viable component technologies*, including the establishment of measurable targets of noise reduction from individual contributions. Economical aspects as well as environmental and safety issues will be taken in consideration; *(b) Integration of noise reduction technologies for major sub-assemblies*, including the optimisation and demonstration by tests (ground, laboratory, wind tunnel) of noise reduction at the level of major subassemblies (power plant - fan, LP and HP compressors, turbine, nozzle- and airframe -landing gear, high lift devices-). In this phase, the gains and feasibility of flight operational procedures will be assessed in flight simulators; *(c) Full-scale validation of integrated noise reduction concepts,* including flight-testing.

4.11 TP 7: Low noise aircraft cabin

This TP will be considered in a future call

This TP is the response to the recognition that the noise level is one of the most important factors contributing to the passenger perception of cabin comfort, especially in medium and long distance flights. The importance of the noise issue will be exacerbated with the introduction of large commercial aircraft with more powerful noise sources and longer flight times. Many techniques for significantly reducing noise focused on the different links in the noise transmission mechanism, from the sources to the passenger, have been applied in the last years in a fragmented way with diverse degrees of success. The activity of this TP is centred at proving the feasibility of achieving the target noise comfort levels inside the passenger and crew cabins by the integration in a multidisciplinary approach of acoustic treatment solutions, while respecting overall cost and weight objectives. The project will incorporate technologies developed from research carried out under the EU Framework programme, as well as national and industry funded programmes. In particular, it will include the following: multidisciplinary structural optimisation including transmission loss criteria, active and passive structure vibration treatments, active and passive wide band noise reduction techniques for engine and aerodynamic sources, advanced damping treatments for fuselage skin including active skins, smart foams and low-weigh absorbent acoustic materials, advanced trim panel design integrating vibro-acoustic, environmental and aesthetics requirements, noise reduction techniques for air-condition systems. The project will demonstrate a reduction in both overall sound pressure level and speech interference level of 5 decibels in commercial turbofan aircraft cabins by means of full-scale flight tests supported with ground and laboratory testing, including the application of a comfort index taking into account noise and other related factors of comfort.

The project will comprise the following three main phases: *(a) Identification and selection of technologies for large-scale validation; (b) On-ground testing for optimisation and validation*, will include the validation of selected technologies on mock-ups or aircraft; *(c) Flight validation of design methodologies*, will be performed on a turbofan aircraft test bed.

4.12 TP 8: Novel fixed-wing aircraft configuration

This TP will be considered in a future call

Today’s commercial transport aeroplanes present the classical configuration consisting of a fuselage for the cabin, a wing to lift it and horizontal and vertical tailplanes at the rear part of

the fuselage for stability and control. This conventional configuration is fully adapted to traditional technologies developed in the last decades. Since then several technological improvements have reached a level of maturity in the domains of aerodynamics, structures, flight controls, multidisciplinary design, etc that will enable designers of civil aeroplanes to approach novel configurations that could represent a significant increase in aircraft operational efficiency. The activity of this TP is focused on the integration and the validation of novel aircraft configuration concepts for lifting and for flight stability and control in response to market demands for larger capacity aeroplanes. The TP will profit from preliminary design studies and configuration concepts developed by the European industry in its own programmes, such as the Three Surface Aircraft (TSA) of Airbus Industrie. The project will also incorporate technological advances developed under Community, national or industry funded RTD programmes related to stability, control and handling qualities, aeroservoelasticity, fly-by-wire, ride comfort, aerodynamic design optimisation, advanced composite and metallic structures, multidisciplinary design optimisation, etc.

The project will be structured in three phases: *(a) Configuration definition*, where detailed configurations will be identified taking into account aspects of overall architecture, environmental, safety and certification issues, and bench-marks established*; (b) Ground test validation*, where essential systems and assembles will be validated at component or system level in wind tunnels and ground test facilities, as appropriate; *(c) Integrated technologies and concept validation,* including full-scale flight tests

4.13 TP 9: Integrated and modular aircraft electronic systems

This TP will represent the response of the European aircraft integrators and avionics suppliers to the necessity to obtain cost-efficient, performant overall avionics architectures through an increased modularity and integration of avionics components. The formidable advances experienced in electronics technologies have caused the expansion of the range of their aeronautical applications as well as the increase in the number of avionics systems on board an aircraft. However, the development of the different electronic systems has tended to be done on an individual basis, focusing only on the fulfilment of their specific functionality, and so hampering modularity and integration. The TP will validate the feasibility of an integrated and modular avionics architecture able to perform all the required functionalities of its components satisfying both criteria of reliability and cost effectiveness. The objectives are reducing overall avionics system weight, volume and power consumption by 30%, while decreasing its development time and cost of ownership. It will represent also a decisive contribution to the evolution of international on-board electronics standards, particularly related to avionics packaging and integration, high-speed data buses, software reusability and flexibility and tools to measure compliance with required functions. The project will incorporate procedures, hardware and software technologies developed under the EU framework -especially the NEVADA project- as well as national and industrial RTD programmes.

The TP will comprise three main phases: *(a) Selection of standards, systems, functionalities and modular architecture*. The range of avionics systems to be considered will include, amongst others, the core avionics (flight management and control), utilities (fuel, landing gear, propulsion control systems, etc), electrical power management, operational data (aircraft condition and monitoring), data management and communication and passenger services; *(b) Definition of test environment and tool sets*, including the scenarios for validation at component, system and aircraft level; *(c) Integration and proof of concept*, including tests in simulators that could enable the experimentation of the complete architecture with the pilot in the loop.

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL

The call will be open for all technical areas described under 4.1 *Reducing aircraft development cost and time to market, 4.2 Improving aircraft efficiency, 4.3 Improving environmental friendliness of aircraft* and *4.4 Improving operational capability and safety of aircraft*. In the light of the results of the first Call, proposals are particularly encouraged on the 3 technical areas under 4.1 (Reducing aircraft development cost and time to market), on 4.2.5 (Configurational and interdisciplinary aspects) and on 4.4.2 (Operational maintenance).

The call will also be open for Technology Platforms: *TP3 Novel rotary-wing aircraft configuration, TP5 Power optimised aircraft, TP6 Low external noise aircraft and TP9 Integrated and modular aircraft electronic systems*.

All research objectives will be open for Thematic Network and Concerted Action proposals.

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

Key Action 4 New Perspectives in Aeronautics will be closed for RTD, demonstration and combined project proposals. However, all research objectives will be open for Thematic Network and Concerted Action proposals.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

The call planned for December 2000 is expected to be open for all *Critical Technologies,* and for the remaining *Technology Platforms* not opened yet (TP7 and TP8), or not adequately covered in the March 1999 and December 1999 periodic calls. All research objectives will be open for Thematic Network and Concerted Action proposals.

The call planned for June 2001 is not expected to be open for RTD demonstration and combined project proposals. However, all research objectives will be open for Thematic Network and Concerted Action proposals.

C. GENERIC ACTIVITIES

GENERIC ACTIVITY IA: MATERIALS AND THEIR TECHNOLOGIES FOR PRODUCTION AND TRANSFORMATION

RATIONALE AND SOCIO-ECONOMIC OBJECTIVES

RTD in this Generic Action will mainly be of a medium and long-term nature. One of the key aspects of medium and long-term generic research is that it is often not related to one specific application but to applications for more than one product or sector. Material properties and performance, including for natural materials, are also closely linked to materials production and transformation. Research on new and improved materials will therefore be carried out in parallel to, and closely integrated with, RTD on materials processing technologies. The main specific objectives are to:

Support advanced materials applications needed for improved quality of life. This includes characterisation, modelling and testing for functional or structural applications.

Develop sustainable materials production and transformation technologies, which can ensure quality, reliability, sustainability and cost-effectiveness of materials to allow optimum incorporation into new products, especially in the context of shorter production cycles.

Improve safety and reliability. Materials properties and degradation mechanisms have a major impact on society: e.g. structural integrity of buildings (e.g. subject to ageing or earthquakes) or transport vehicles as well as efficiency and reliability of industrial processes and products.

Promote the efficient use and reuse of materials. Focus on "full life-cycle approach" will lead to an increasing stream of high quality "secondary" raw materials. This should make a major contribution to a sustainable society.

RESEARCH OBJECTIVES

Specific objectives are important to be mentioned in relation with materials research.

The first one refers to research at the nanoscale (1-100 nm) and on surface technologies. This research has the potential for a wide variety of applications. In particular the use of nano-particles to improve material properties has large potential applications. Nano-structured materials may also allow further miniaturisation of electronic systems.

The second one refers to the rapid growth of the functional materials market reflecting their increasing importance for the industry and the society, in particular bio-materials or opto-electronic materials. RTD on functional materials involves a large spectrum of materials research (alloys, ceramics, polymers, surface or interfacial science).

Materials development is largely based on chemistry, and in particular on fine and specialty chemicals, characterised by relatively small production capacities. There is here a clear scope for materials and process improvement in efficiency, selectivity, flexibility and sustainability, as well as development of new synthesis routes and their specific process engineering. Processes allowing an increased use of renewable raw materials will receive particular attention**.**

For structural materials mechanical properties are a major issue. The basic understanding of degradation mechanisms is also a prerequisite. These materials are key to major industries, in particular for construction or transport. Extending properties and performance such as lighter weight, higher strength, higher temperature, fire and corrosion resistance, etc, while ensuring environment compatibility and recyclability, should be priority objectives.

Research on sustainable use of materials should aim at an integrated approach where the use of materials is optimised and where the use of recycled raw materials is increased by confronting the major technical barriers.

This implies the following four research priorities:

5.1: Cross-cutting generic materials technologies

RTD projects should demonstrate large impact(s) at European level, leading to multisectoral applications for products and processes with improved performance for the consumer or the user. This applies especially to molecular engineering and nanotechnology including processing of particles, layers and structures, as well as to surface engineering and interfacial science and technologies. Research is also needed to expand the limits of current techniques expected to lead to environmentally safe new production technologies for novel composites, lined, coated and/or surface treated materials through interdisciplinary approaches, including the integration of computational methods.

5.2: Advanced functional materials

RTD will focus both on the development and processing of improved and new functional materials, such as magnetic, electronic or electrochemical materials and devices, superconducting materials, materials for displays, sensors and actuators. Research should also focus on materials and devices for optical applications and opto-electronics. Another focus should be bio-mimetic materials and materials for bio-medical applications, such as artificial and hybrid tissues, materials for implants and minimally invasive devices, or for bio-sensors. Particular attention will be given to the environmental compatibility of these materials as well as the understanding of their behaviour.

5.3: Sustainable chemistry

RTD in this area is focussed on generic chemical issues, advanced polymers, and fine or specialty chemicals and solid state chemistry. The overall aim is to achieve a sustainable chemistry based on clean processing and synthesis routes and efficient use of resources, including the use of renewable raw materials, for example for the production of organic chemicals. Research is also needed towards higher added value and safer materials (e.g. “smart”, multifunctional, packaging materials). RTD tasks should include functional materials for chemical engineering, including catalysts and materials for separation technologies. They should also cover formulation engineering, new synthesis routes and alternative reaction media, supramolecular chemistry and chemistry for new materials, including colloidal systems and nanostructured materials.

5.4: Expanding the limits and durability of structural materials

Objectives are: to expand the performance characteristics (e.g. strength, temperature, toughness); to ensure environmentally friendly materials and production processes; to improve safety and reliability by understanding deterioration and failure mechanisms (e.g. wear, corrosion). RTD should focus on expanding the limits of structural materials, such as advanced metals and alloys, construction materials, metal-matrix composites, ceramics, polymers and ceramic or polymer matrix composites. Attention should also be given to the quality of recycled secondary raw materials[8], including compatibility of materials and environmental pollution.

[8] Sustainable use and processing of materials has a major relevance to support the key actions, in particular “innovative products, processes and organisation”. This Key action will give particular attention to the “products of the future” and to “customer-oriented high-tech, agile and towards zero-waste production”.

GENERIC ACTIVITY IB: NEW AND IMPROVED MATERIALS AND PRODUCTION TECHNOLOGIES IN THE STEEL FIELD

RATIONALE, SOCIO ECONOMIC AND RESEARCH OBJECTIVES

In view of the expiry of the ECSC Treaty in 2002, and the conclusions of the Amsterdam European Council (June 1997), there is an urgent need to speed up the progressive insertion of coal and steel research into the framework programme. The objective is to reduce costs, improve user satisfaction, and increase value added, to the benefit of both the iron and steel industry and suppliers, end users and other research partners.

5.5 Iron and steel production:

More added-value, cost-effective, flexible and environmental-friendly production routes are aimed at, such as new coal-based direct iron making and improved scrap-based steel making. Research in coke making for metallurgical reactors and up-grading of iron and steel making by-products are also addressed.

5.6 Steel casting, rolling and downstream treatment

Compact, flexible, clean, energy- and cost-effective production lines are aimed at, toward more customer-oriented products with higher quality. On-line, real-time analysis and measurements for improved process control, integrated information management and closed-loop processing are also addressed.

5.7 Steel Utilisation

More added-value and “intelligent” products are aimed at, such as steel grades with improved characteristics and in-service performance. Particular attention is paid to manufacturability (e.g. forming, joining), “de-materialisation”, life-cycle approach and eco-design.

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL

The call will be open for all research objectives (5.1 to 5.7).

Amongst proposals of comparable merit, preference will be given to RTD projects, Thematic Networks (e.g. for clustering of projects) and Concerted Actions aiming at:

(a) long-term generic and multisectoral aspects around the above mentioned materials research objectives,

and

(b) short to medium term objectives related to the research objectives of Key Actions 1, 3 and 4.

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

The call would be open for all research objectives (5.1 to 5.7).

Amongst proposals of comparable merit preference will be given to RTD projects, Thematic Networks (e.g. for clustering of projects) and Concerted Actions aiming at:

(a) long-term generic and multisectoral aspects around the above mentioned materials research objectives

and

(b) short to medium term objectives related to the research objectives of Key Actions 1, 3 and 4, and in particular TRA "*products*" of Key Action 1.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

The call planned for December 2000 is not expected to be open for RTD projects. However it may be open for Thematic Network and Concerted Action proposals for all research objectives.

The call planned for June 2001 is expected to be open for all research objectives and modalities.

GENERIC ACTIVITY 2: MEASUREMENTS AND TESTING

RATIONALE AND SOCIO-ECONOMIC OBJECTIVES

The three socio-economic objectives are:

Prenormative research and technical support to standardisation

Research will focus on the development and validation of measurement and testing methods and the production of scientific and technical data needed to define performance, reliability and safety requirements for products and services. Research will also be carried out on the development of certified reference materials needed in support of Community policies, in particular, for the implementation of directives.

The fight against fraud

Research will focus on the development of the measurement and testing methods that are needed in order to detect and prevent fraud and to protect the economic interests of enterprises and society and the health and safety of citizens. The long-term aim will be to keep the know-how and technology ahead of the defrauder.

Improvement of quality

Research will concentrate on the development of new and improved generic measurement and testing methods and the establishment of the international traceability and equivalence of measurements. Methodologies will also be developed to measure the quality of industrial products and services.

The Measurement and Testing activity supports the objectives of the Growth programme. Furthermore, the anti-fraud activities and research on reference materials give also support to other parts of the Framework Programme in order to facilitate the implementation of EU policies.

RESEARCH OBJECTIVES

The RTD activities needed to address the socio-economic objectives are:

the development of **instrumentation**;

the development of **methodologies** for Measurements and Testing;

the development of the know-how needed to produce and certify **reference materials**.

Table C-1 shows the resulting research objectives (described below) and the modalities used for their implementation (see chapter E).

Table C-1: Objectives and modalities[9] for Measurement and Testing

Socio-economic objective / Research objective	**Standardisation**	**Anti-fraud**	**Quality**
Instrumentation	Not forseen in the Programme	6.1.2 Periodic call	6.1.3 Periodic call
Methodologies	6.2.1 EOI+Dedicated call	6.2.2 EOI+Dedicated call	6.2.3 Periodic call

[9] In addition to the periodic and dedicated calls mentioned here, CRAFT projects and accompanying measures (permanently open calls) can be proposed for all research objectives.

CRMs	6.3.1 EOI+Dedicated call	6.3.2 EOI+Dedicated call	6.3.3 EOI+Dedicated call

6.1 Instrumentation

The research to be carried out will develop new and improved instrumentation and measuring systems, including software, with the capabilities required by the end-users, such as improved performance and reliability, intelligent operation, cost-efficiency and suitability for use in the field or on production lines.

6.1.1 Instrumentation in support of standardisation: Support of activities in this area is not foreseen in the Programme.

6.1.2 Sensors, screening systems and instruments for the fight against fraud: Instrumentation will be developed that is required for verifying the authenticity and origin of industrial products and materials, as well as paper documents, bank notes, and cultural artefacts. In addition, instrumentation will also be developed for detecting adulterations, toxic and illegally used substances and illegally traded goods, for the verification of the identity of persons, for identifying markers and objects indicating the origin of goods, and for verifying authenticity in the electronic transfer of currency.

6.1.3 Instrumentation for improvement of quality: Novel and innovative instrumentation will be developed that will improve the quality of measurements for industry and service sectors as well as that is required for the establishment of the international traceability of measurements. The activities will include not only hardware development, but also development and validation of metrological software.

6.2 Methodologies for Measurements and Testing

RTD to be carried out will cover not only the development and the improvement of measurement and testing methods, but also the development and the improvement of sampling strategies and data bases and the production of scientific and technical data needed for the definition of performance, reliability and safety requirements.

6.2.1 Methodologies to support standardisation and Community policies: RTD activities, co- and pre-normative, related to the objectives of this programme will cover the development, improvement and validation of measurement and testing methods as well as the production of scientific and metrological data needed to define performance, reliability and safety requirements for industrial products and services[10].

Priority will be given to solving problems related to technical trade barriers, to a sustainable production, and to research needed for the implementation of New Approach Directives[11] (Directives where some of the standards will need research include those on explosive atmospheres, safety of machinery, construction products, electromagnetic compatibility, packaging and packaging waste, pressure equipment, personal protective equipment and toys).

The selection of the topics will take the priorities of the relevant standardisation bodies into account.

6.2.2 Measurements and testing anti-fraud methodologies: Methodologies will be developed for quick screening as well as for providing the reliable evidence required for successful prosecution, and for supporting the development and implementation of anti-fraud regulations. The methodologies developed will enable the authenticity and the origin of products, components and materials, including cultural artefacts, to be checked. They will also enable illegally used substances or components, forbidden drugs in sport, illegal drug trafficking and illegal trading to be detected, and the identity of persons to be confirmed.

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[10] Pre- and co-normative research in the areas of agriculture, food, health care and the environment, will be the responsibility of the relevant thematic programmes.

[11] A list of New Approach directives is given in the Commission Report to the Council and the European Parliament on “Efficiency and accountability in European Standardisation”.

They will also allow products to be correctly categorised with respect to the application of custom tariffs and the control of quotas and subsidies. The long-term aim of all the activities will be the harmonisation of methodologies.

6.2.3 Measurement and testing methodologies in support of quality:

Methodologies will be developed to improve the traceability and reliability of measurements and to exploit techniques with potential to become the basis for new measurement techniques of industrial importance. RTD will focus on development and validation of measurement and testing methodologies that are needed for (traditional, new and emerging) industrial products, processes and services, as well as for monitoring production and working conditions and for controlling effluents and emissions. New tools will be developed such as novel calibrants, transfer standards, reference methods, software, chemometric methods, expert systems, and sampling techniques.

Methodologies will be developed to enable the customer perceived quality of industrial products and services to be measured, and to ensure a sound and comparable basis for rating products and services.

6.3 Support to the development of Certified Reference Materials (CRMs)

Certified reference materials (CRMs) are used as reference specimens for identification, as calibrants to provide traceability, and as tools for quality control in physical, chemical and biological measurements and testing. Research will develop the ability to produce and certify reference materials that are fit for purpose. The planned exploitation of the results of the projects has to aim at the production and certification of the RMs in compliance with prevailing international quality standards (in accordance with the general contract rules the research consortia can transfer the intellectual property rights for the production and certification of CRMs to a third party, e.g. the Commission, see also objective 7.4).

6.3.1 CRMs to support standardisation and Community policies: Particular CRMs representative of manufactured products will be developed to verify quality and safety standards and for testing of materials following a standard method. CRMs will also be developed that are needed in support of directives and Community policies, in particular, in the fields of agriculture, food, health care and the environment.

6.3.2 Reference substances and materials for anti-fraud: CRMs will be developed that are required for checking the authenticity of materials and components, for the control of subsidies and quotas, for the verification of product categorisation in relation to custom tariffs, for the detection of illegal substances or species and of dangerous goods, for the detection of illegal drugs in sport, for the determination of the origin and age of cultural artefacts, for the identification of persons.

6.3.3 CRMs for traceability and calibration: CRMs will be developed that are needed for the calibration and performance testing of instruments, for material testing, for product testing and process monitoring, for chemical and biological analyses of industrial importance.

STRATEGY AND PRIORITIES FOR THE DECEMBER 1999 PERIODIC CALL[12]

The call will be open for research objective: 6.1 *Instrumentation*. Amongst proposals of comparable merit, preference will be given to those related to the fight against fraud (6.1.2). All research objectives will be open for Thematic Network and Concerted Action proposals

STRATEGY AND PRIORITIES FOR THE JUNE 2000 PERIODIC CALL

The call will not be open for RTD, demo and combined project proposals. However, all research objectives will be open for Thematic Network and Concerted Action proposals.

PRIORITIES PLANNED FOR FUTURE PERIODIC CALLS

The call planned for December 2000 is expected to be open for objectives 6.1 *Instrumentation* and 6.2.3 *Measurements and testing methodologies in support of quality*. However all objectives will be open for Thematic Network and Concerted Action proposals.

The call planned for June 2001 is intended, for example, to enable joint calls and/or to address emerging priorities. Its scope (which will be defined in the next version of the work programme) is not yet identified, but may be very restricted. However all research objectives will be open for Thematic Network and Concerted Action proposals.

[12] Research objectives not covered by periodic calls are covered by the call for Expressions of Interest (EoI), which remains open until April 30, 2001. Two dedicated calls are planned for the year 2000 based on the selected expressions of interest (see *Roadmap*, table F.4).

D. SUPPORT FOR RESEARCH INFRASTRUCTURES

OBJECTIVES

Activities would aim at (i) the optimum utilisation of geographically dispersed medium / large scale research facilities, (ii) the rapid transfer and implementation of RTD results into industrial applications, and (iii) the improvement of interoperability and common protocols. Community support will be directed towards creating a synergistic use of European infrastructure. Emphasis will be also put on increasing cohesion between Member states on strategic R&D needs and exploitation of results.

This part of the programme will be implemented through dedicated calls, using mainly the modality of thematic networks.

7.1 Support activities to medium and large scale facilities

These activities will aim at identifying the needs and creating networks for optimum use of medium and large scale facilities having a strong and innovative scientific, technical or socio-economic relevance to the Programme.

7.2 Setting up of virtual institutes

The objective of the activity is to facilitate the rapid exploitation of RTD-results into industrial applications. Geographically dispersed complementary research and industrial capabilities will be linked creating entities with a potential to become independent and self-supporting. These virtual institutes, created from departments of industries, service companies, research centres, universities and laboratories, etc., will use advanced Information and communication and knowledge management tools to provide the industry, notably SMEs, with high standard services for research, technology transfer and exploitation of RTD results in relevant and advanced technology fields.

7.3 Reference data bases

Reference databases have been identified as a means to support the development of the European research fabric. Efforts will include the cataloguing of databases of priority interest to European industry and services and the setting-up of networks of relevant data bases and their stakeholders. Focus will be on accessibility, comparability and quality of databases.

7.4 Measurement and Quality Management Infrastructures

The aim is to develop and strengthen the European metrology infrastructure, to reinforce traceability and to improve cohesion of metrology systems.

Priority will be given to technical support to international mutual recognition agreements and to initiatives to prepare the laboratories in the candidate new Member States for their future role in the enlarged single market.

Activities will also aim at promoting a harmonised approach to quality management in organisations and enterprises, in particular SMEs. Support may also be given to innovative new developments in metrology such as a unified European CRM system.

Another important activity will be to support the production of Certified Reference Materials in cases where the research consortia transfer the IPR to the Commission thus entrusting the Commission services with this task (see research objective 6.3)[13].

[13] A special modality is being developed for this purpose in co-operation with JRC-IRMM.

STRATEGY AND PRIORITIES

The call for expressions of interest remains open. All research objectives (7.1 to 7.4) will be included in the four dedicated calls that will be open in 2000 and 2001.

E. PROGRAMME IMPLEMENTATION

CALLS FOR PROPOSALS

Implementation of RTD activities is carried out mainly through the following types of calls for proposals:

Periodic calls

Periodic calls have a fixed deadline and are open for submission of proposals within a defined scope. The scope of each call is defined in the sections "Strategy and priorities for the calls for proposals" of the work programme, and specified in the call published in the Official Journal.

Open calls

Open calls have been launched at the start of the programme for SME Specific Measures (exploratory awards and "CRAFT" co-operative research), Marie Curie Fellowships, accompanying measures and IMS. They remain open until the last year of the Framework Programme, with periodic evaluations (2/3 per year). The open call also invites the submission of Expression of Interests (EoIs) for the needs of the European research community in Support for Research Infrastructures.

Dedicated calls

Dedicated calls are normally published once or twice a year and are restricted to a number of very specific topics and/or activities with supporting documents available to specify objectives of required activities. At the start of the Programme the Commission has published a *call for Expressions of Interest* inviting interested parties (including Commission services) to suggest ideas for topics (RTD and infrastructure related needs) in some of the areas to be covered by these calls (see objectives 6 and 7).

Additional information may be provided at the announcement of a call, in particular on tasks to be launched in relation to Key Action 2.

The indicative timetable and deadlines for the calls are outlined in the "road map" section of this document (section F), and will be specified in each call published in the Official Journal.

MODALITIES

The programme is implemented in accordance with the Council Decision of 22 December 1998 concerning the rules for participation and dissemination (Official Journal L26 of 1/2/99, page 46). The main implementation modalities (presented in more detail in the *GROWTH Programme Guide for Proposers*) are:

RTD, demonstration and combined RTD/demonstration projects

These projects are carried out by industrial or service organisations, universities and research centres and are targeted on strategic objectives with significant potential for socio-economic and industrial impact. They need to respond to the objectives specified in the call, which described in detail in the work programme.

Co-ordination and "*Clustering*" of such projects is encouraged in order to achieve greater critical mass and impact (see section below "*Co-ordination Activities*").

The integration of socio-economic research in proposals for RTD, demonstration or combined RTD/demonstration projects, is encouraged where appropriate to complement or support technical research.

SME Specific Measures

The programme will implement special measures to facilitate and encourage the participation of SMEs in RTD, demonstration and combined projects that show great potential as regards innovation. These measures consist of Co-operative Research (CRAFT) and Exploratory Awards

An Exploratory Award is intended to prepare a complete project proposal: either a CRAFT project proposal that is submitted in response to the open call, or an RTD, demonstration or combined project submitted in response to a periodic call.

Co-operative Research proposals and Exploratory Awards proposals aimed at Co-operative Research may fall within the overall objectives of the thematic programme. In other words, they do not have to relate to the specific objectives and priorities of the key actions and generic technologies. As such, these measures allow for a "bottom up" character since proposals may be submitted for the objectives and priorities of the thematic programme in its entirety.

Exploratory Award proposals intended to prepare **non-CRAFT** projects must address priorities identified in the work programme regarding the periodic call envisaged for the submission of the resulting project proposals. In addition, they must be submitted sufficiently in advance of the closing date of the envisaged periodic call (i.e. at least 9 months between the chosen cut-off date for the submission of the Exploratory Award proposal and the closing date of the periodic call). Non-CRAFT project proposals prepared through Exploratory Awards must conform to the priorities of the periodic call in response to which they are submitted (even if these priorities have changed compared to those on the base of which the Exploratory Award proposals were selected).

The implementation of the SME specific measures follows the common rules established in the horizontal programme "Innovation and the participation of SMEs", in order to ensure transparency for the beneficiaries. These rules include common contractual and proposal evaluation, a single complementary entry point for the reception of proposals for SME specific measures, common rules for eligibility and for scientific and technological evaluation; common legal and financial provisions as well as a harmonised and rapid feedback to applicants.

- "Co-operative Research" proposals (CRAFT) enable at least three mutually independent SMEs from at least two different Member States, or one Member State and an Associated State, to jointly seek the resolution of their common technological problems by entrusting it to third legal entities (the "RTD performers"), including industrial entities, with appropriate research or technological validation capacities. In the context of Co-operative Research projects, those SME contractors which are able to carry out part of the research work themselves may do so up to 60% of total project costs, leaving the remainder (40% or more) to be executed by the RTD performer. The total cost of Co-operative Research projects may not exceed 2 Meuro, of which the Commission may fund up to 50%. Their maximum duration is 24 months. Co-operative Research projects may include a validation phase.
- "Exploratory Awards" allow at least 2 SMEs from 2 different Member States, or one Member State and an Associated State, to obtain financial support from the Commission to prepare a complete project proposal. The total cost of an Exploratory Award may not exceed 30.000 Euro, of which the Commission may finance up to 75% (or 22.500 Euro). The maximum duration of an Exploratory Award is 12 months.

Marie Curie Training Fellowships

Marie Curie Training Fellowships are defined in the programme *"improving the human research potential and the socio-economic base*", and need to be related to the objectives of this programme. The following types are offered: **Industry Host Fellowships** (post-graduate and post-doctorate) and **Experienced Researchers Fellowships** ("category 40").

INCO Bursaries

When submitting a research proposal, an application can be made at the same time for support of a young researcher from a Developing Country to work for up to 6 months in a European research institute participating in the project (see GROWTH Guide for Proposers for further details).

Co-ordination Activities

Thematic Networks and **Concerted Actions** are designed to facilitate networking of organisations, co-ordination of activities and exchange and dissemination of knowledge so as to optimise research efforts, reach critical mass, and enhance impact at European level. They bring together industry, universities, research centres, users, research infrastructures, and other relevant stakeholders around a common S&T objective related to the priorities of the programme.

Please note that Thematic Networks and Concerted Actions can not provide funding for actual RTD activities.

Thematic Networks are used:

a) to **co-ordinate** a group (or "*cluster*") of projects funded at Community level. This may include relevant projects from more than one Key Action and from other EU programmes and, where appropriate, activities funded at national level or in other European frameworks. Participation is on a voluntary basis.

   The Thematic Network proposal may be submitted simultaneously with the group of project proposals, or at a later stage if intended to co-ordinate on-going projects. Following a call for proposals, the GROWTH Programme itself may encourage the formation of project *clusters* linking several successful projects with common or interrelated objectives, and where the co-ordination of their activities would lead to clear added value.

b) to carry out activities addressing the objectives set out in the section **"Support for Research Infrastructures"**, which is implemented through a 2-stage process (Expressions of Interest and dedicated calls).

c) to establish and develop **networking activities** other than those defined above, which can contribute significantly to achieving the objectives of the Key Actions and Generic Technologies.

Concerted Actions are used for the co-ordination of research activities already funded within individual Member states, in order for instance to channel efforts efficiently, to exchange and complement experience, to disseminate results.

Thematic Network and Concerted Action proposals submitted **in response to periodic calls** are not restricted to the priorities published in the call, and therefore can address any research objective specified in the work programme (except *Support for Research Infrastructure,* in which case proposals can only be submitted in response to a dedicated call). In the case of Key Action 1, they may only address the *Targeted Research Actions*.

Thematic Network and Concerted Action proposals submitted **in response to a dedicated call** must address the objectives specified in the call.

Accompanying measures

Accompanying Measures are implemented according to Annex III of the specific programme. They contribute to its effective implementation, to the up-dating of the work programme, the

preparation of future activities and the dissemination of results. They encompass activities for the monitoring of the programme, the assessment of RTD impacts as well as studies and recourse to external expertise, including setting up of monitoring or evaluation panels and expert groups. They allow support to international co-operation activities (e.g. IMS). They include activities to provide specific training, information and assistance and innovation support actions to promote the diffusion, exploitation, transfer and take-up [14] of RTD results, aimed at the broad user community, notably SMEs. They also cover support to scientific and technical meetings as well as innovation support events (e.g. investment fora), publications, web sites, etc. They can also consist of support activities (e.g. production of CRMs) or collaborative research studies contributing to initiatives of public or policy interest in relation with the Key actions.

The accompanying measures implemented through an open call published[15] at the start of the programme cover (see GROWTH Programme Guide for Proposers for further details):

- **Measure 1**: Studies contributing to the implementation of Key Actions, Generic activities or Support for Research Infrastructures
- **Measure 2:** Studies in preparation of future activities, addressing with a European Perspective RTD policy issues related to industrial competitiveness and sustainable growth or focussing on important specific socio-economic problems, emerging technologies, industrial sectors, etc
- **Measure 3:** Innovation support actions to promote and facilitate the diffusion, transfer, exploitation and broad use of results
- **Measure 4:** Awareness, assistance and information exchange actions
- **Measure 5:** Training actions in support of RTD activities of the programme (other than Marie Curie Fellowships)

Accompanying measures consisting of policy driven research contributing to specific priorities of Key Action 2 “sustainable mobility and intermodality” are implemented through periodic calls. Some accompanying measures addressing specific topics may also be included in dedicated calls.

PARTNERSHIPS

As a general principle, partnerships should include the *stakeholders* **relevant** to the development and ultimate implementation of the RTD results. This includes research centres and universities, product or technology developers, component and material providers, service companies, industrial users, policy makers, regulatory and standardisation authorities, and consumer organisations. SME participation in partnerships is particularly encouraged.

[14] Take up measures involving significant technical work should normally be included in RTD, demonstration or combined RTD / demonstration projects submitted in response to periodic calls

[15] Certain accompanying measures will be implemented through other processes. Services to the Commission (e.g. studies) will be carried out following specific calls for tenders, to be launched as appropriate. In particular cases (see Objective 7.4), Certified Reference Materials can be produced via a modality being developed for this purpose in co-operation with JRC-IRMM. Recourse to external experts will be based on calls for candidates. Exceptionally, unsolicited applications for a subsidy may also be supported.

PROGRAMME CO-ORDINATION

The co-ordinating forum for all research elements within FP5 that relate to this programme, in particular transport research topics, will be the « Board of Directors » of the GROWTH programme.

Co-ordinating arrangements within and between the different key and generic actions as well as with other programmes will follow the framework defined in annex III of the programme. They may take one or several of the following forms: common management structure (e.g. for SME related activities); co-ordinated calls, including where appropriate joint calls; co-ordination in the evaluation and selection procedure, including where appropriate joint evaluation and transfer of proposals; co-ordinated implementation of projects and cross-programme clusters of projects. Co-ordination with the other thematic programmes is based on the principle that activities linked with development of life sciences, or technologies for energy, environment or the Information Society will be concentrated in the relevant programmes. Activities dealing with integration and adaptation of these technologies in applications relating to competitive and sustainable growth will be conducted in this programme.

The **international dimension** of the programme will complement the actions of the Programme "*confirming the international role of Community research*". Activities that may be implemented jointly with other frameworks (e.g. COST, Eureka, IMS) will be carried out in accordance with the rules established for FP5. Activities would normally be focused on the exchange of information. This programme will be open to participation by researchers from outside the EU and Associated States according to the rules of participation set out in the Decision pursuant to article 130J of the Treaty. The programme 'Confirming the International Role of Community Research' provides funding for bursaries to young scientists from Developing Countries (including Emerging Economies and Mediterranean partner Countries) to come to Europe to work in projects of this programme for a period of up to 6 months.

The "competitive and sustainable growth" programme will place special emphasis on the **dissemination, transfer, utilisation and/or exploitation of R&D results** leading to innovation. To this end the programme will carry out activities in co-ordination with the "*Innovation and the participation of SMEs »* programme, inter-alia, to promote the transfer and exploitation of EC RTD results, to provide information on EC RTD results, to assist in preparing management tools to promote the exploitation of EC RTD results by the consortia and to monitor with the help of adequate tools, such as the Technology Implementation Plan and technology audits, the further use of RTD results, to assist with the assessment of the efficiency and effectiveness of the assistance network for technology transfer, of joint actions between the thematic programmes and the horizontal programme and of the Innovation Units or Innovation/SME units.

Thematic Programme 3 domains	**Examples of areas for possible co-ordination with other programmes in FP5**
KA1	*Microsystems, networked enterprises and knowledge management* with Thematic Programme 2
KA2	*Traffic management and GNSS* with Thematic Programme 2 *Emissions and land use planning* with Thematic Programme 4 *Health related aspects* with Thematic Programme 1
KA3	*Advanced vehicle concepts* with Thematic Programmes 2 & 4 *Sustainable management of the sea* with Programme 4
KA4	*On board systems* with Thematic Programme 2 *Control of emissions* with Thematic Programme 4
Generic Technologies	*Materials* with Programmes 1,2 & 4 and the JRC *Anti-fraud* with Programmes 1 & 2 and the JRC

	Reference materials with Programmes 1 & 4 and the JRC *Support to standardisation* with Programmes 1, 2 & 4
Support to research infrastructure	*Access to facilities* with Activity 4

The horizontal programme "*Improving the human research potential and the socio-economic knowledge base»* establishes the common rules for the implementation of the **Marie Curie Training Fellowships**, in order to ensure the consistent high quality and prestige of the schemes. These rules include a common definition of Marie Curie Fellowships, a Single Entry Point for the reception of all Marie Curie Fellowship proposals, common rules for eligibility and for evaluation, common legal and financial provisions as well as a harmonised feedback to applicants and monitoring of the fellows.

Support for **research infrastructure** is provided by thematic programmes, as well as by this horizontal programme which has the responsibility of drawing up and publishing on a regular basis a "map" showing for all classes of research infrastructure to which specific programme(s) they may apply for support. Specific measures will also be taken by this horizontal programme to ensure co-ordination of the socio-economic research to be implemented within the current programme. Socio-economic research can be funded as well by the key action on « improving the socio-economic knowledge base » and the horizontal programme, which will draw up an annual report on socio-economic research in the Fifth Framework Programme.

Exchange of information and collaboration with the direct actions of the **JRC**[16] will be developed, where appropriate, in particular in areas related to materials research, fight against fraud and production of **Certified Reference Materials** (CRMs).

[16] For information on the JRC Work Programme, visit the JRC home page at http://www.jrc.org.

F. ROAD MAP

This section presents a *road map* for the execution of the Programme[17]

The tables given in this section present indicative budgets, dates and priorities for the various calls for proposals for the Programme, as currently planned.

A further revision of the work programme is planned after the June 2000 call covering the two subsequent calls which are planned. The RTD priorities and objectives will be adapted to technological, social or economic developments, while taking into account the results of the previous calls.

[17] The competent Director General can advance or delay the opening date for the calls within the limit of one month. In this case a notice will be published in the Official Journal at the date initially scheduled for the call.

Table F.1 Budget per research domain

	KA 1	KA 2	KA 3	KA 4	MAT(1)	M&T	INFRAST.	TOTAL(2,3)
Total (Meuro)	731 (27,0%)	371 (13,7%)	320 (11,8%)	700 (25,9%)	410 (15,2%)	136 (5,0%)	37 (1,4%)	2705 (100%)

(1) Including "phasing in" of steel research.

(2) Total amount decided by the Council, including personnel & administration costs (max 6.5%), EUR 18 million for calls for tenders and 20 million for production of CRMs.

(3) An additional ~6% to be added corresponding to the contribution from EFTA countries and other Associated States. This results in ~2700 million available for periodic, dedicated and open calls, of which a minimum of 286 million is to be allocated to SMEs.

Table F.2 Indicative calendar and budgets for periodic calls

Periodic call	Opening date	Closing date	Objectives and priorities	Budget of call (Meuros)
1	*16 March 1999*	*15 June 1999*	***CALL CLOSED** (see work programme March 1999 edition for details of objectives covered)*	*730*
2	*15 December 1999*	*31 March 2000*	*Indicated in the sections corresponding to the relevant Key / Generic Actions of this work programme (see also summary table F.5)*	*595*
3	*2 June 2000*	*15 September 2000*	*Indicated in the sections corresponding to the relevant Key / Generic Actions of this work programme (see also summary table F.6)*	*260*
4	*15 December 2000*	*15 March 2001*	*Will be specified in future revised work programme. (Tentative indications given in the sections corresponding each Key / Generic Actions in this work programme).*	*320*
5	*1 June 2001*	*17 September 2001*	*Will be specified in future revised work programme. (Tentative indications given in the sections corresponding each Key / Generic Actions in this work programme).*	*380*

Table F.3 Indicative calendar and budget for the open calls

Call published in the Official Journal of the European Communities, 16, March 1999, C 72/31

Type of action	Opening/closing dates	Proposals are evaluated by batches according to the following deadlines for receipt	Indicative budget(1) (MEuros)
Marie Curie Fellowships: - Industry Host Fellowships - Experienced Researchers Fellowships	16 March 1999 / 20 March 2002	02/06/1999, 19/11/1999, 22/03/2000, 18/09/2000, 21/03/2001, 19/09/2001, 20/03/2002	12
SME specific Measures: - Exploratory Awards	16 March 1999 / 18 April 2001	14/04/1999, 15/09/1999, 12/01/2000, 26/04/2000, 13/09/2000, 17/01/2001, 18/04/2001	200
- Co-operative research (CRAFT)	16 March 1999 / 17 April 2002	15/09/1999, 12/01/2000, 26/04/2000, 13/09/2000, 17/01/2001, 18/04/2001, 19/09/2001, 16/01/2002, 17/04/2002	
IMS (RTD Projects)	16 March 1999 / 15 Sept 2000(2)	15/06/1999, 15/12/1999, 01/04/2000, 15/09/2000	35
Accompanying measures	16 March 1999 / 15 March 2002	15/06/1999, 15/11/1999, 15/03/2000, 15/09/2000, 15/03/2001, 15/09/2001, 15/03/2002	28
Call for Expressions of Interest for the needs for research: - Measurements and Testing (objectives 6.2.1, 6.2.2, 6.3.1, 6.3.2, 6.3.3) - Support for Infrastructure (objectives 7.1 to 7.4)	15 March 99 / 30 April 2001	30/4/99, 15/6/99, 15/12/99, 15/6/2000, 30/4/2001	0 (see dedicated calls)

(1) An additional ~6% to be added corresponding to the contribution from EFTA countries and other Associated States.
(2) may be extended following the revision of the work programme

Table F.4 Indicative calendar and budgets for the dedicated calls

Key Action / Generic Action	Type of action	Objectives	Call	Opening/closing dates	Indicative budget of call (Meuros)
Measurements and Testing	RTD projects to: -develop methodologies within policy-driven parts of Measurement and Testing -support the development of Certified Reference Materials	Strictly limited to topics specified in the call. Topics will have been selected through evaluation of expressions of interest submitted for objectives 6.2.1, 6.2.2 and 6.3. For each topic, a supporting document will be published at the time of the call setting out the objectives to be met	1 2 3 4 5	15/7/99-15/12/99 (call closed) 15/10/99-15/3/2000 14/4/2000-15/9/2000 13/10/2000-15/3/2001 13/7/2001-17/12/2001	4 10 11 11 6.5
Support for Research Infrastructures	Support for Infrastructures, mainly implemented through network type activities.	Strictly limited to topics specified in the call. Topics will have been selected through evaluation of expressions of interest submitted for objectives 7.1 to 7.4. For each topic, a supporting document will be published at the time of the call setting out the objectives to be met	1 2 3 4 5	15/7/99-15/12/99 (call closed) 15/10/99-15/3/2000 14/4/2000-15/9/2000 13/10/2000-15/3/2001 13/7/2001-17/12/2001	2 8 10 10 7

Table F.5 Priorities and indicative budgets for the December 1999 Periodic Call

	RTD areas and priorities for the December 1999 periodic call	*Indicative budget of call (Meuro)*	Modalities
KA 1	**Targeted Research Actions:** 1.6 TRA "*machines*": new generation of machinery, production equipment and systems for manufacturing 1.7 TRA "*extended enterprise*": the knowledge based extended manufacturing enterprise 1.8 TRA "*modern factory*": customer-oriented, high tech, agile and towards zero-waste production 1.9 TRA "*infrastructure*": safe and cost effective industrial facilities, construction and civil infrastructures	*180*	*RTD, demonstration and combined projects* *Thematic Networks* (1) *Concerted Actions* (1) *Specific Accompanying Measures (for KA 2 only)*
KA 2	2.1: Socio-economic scenarios for mobility of people and goods 2.2: Infrastructures and their interfaces with transport means and systems 2.3: Modal and intermodal transport management systems	*25*	
KA 3	**Critical Technologies:** 3.1: Critical technologies for road and rail transport 3.2: Critical marine technologies **Technology Platforms:** 3.3 TP 1: New land transport vehicle concepts; Enhanced systems efficiency 3.4 TP 2: Advanced concepts for ships and vessels; Competitive shipbuilding	*100*	
KA 4	**Critical Technologies:** 4.1: Reducing Aircraft development cost and time to market 4.2: Improving aircraft efficiency 4.3: Improving environmental friendliness of aircraft 4.4: Improving operational capability and safety of aircraft **Technology Platforms:** 4.7 TP 3: Novel rotary-wing aircraft configuration 4.9 TP 5: Power-optimised aircraft 4.10 TP 6: Low external noise aircraft 4.13 TP 9: Integrated and modular aircraft electronic systems	*200*	
MAT	5.1: Cross-cutting generic materials technologies 5.2: Advanced functional materials 5.3: Sustainable chemistry 5.4: Expanding the limits and durability of structural materials 5.5: Iron and steel production 5.6: Steel casting, rolling and downstream treatment 5.7: Steel Utilisation	*80*	
M&T	6.1 Instrumentation (emphasis on antifraud)	*10*	
TOTAL		*595*	

(1) Thematic Network and Concerted Action proposals may address all objectives covered in the work programme (except *Support for Research Infrastructures*); in the case of Key Action 1, proposals must address one of the four Targeted Research Actions open in this call, indicated above.

Table F.6 Priorities and indicative budgets for the June 2000 Periodic Call

	RTD areas and priorities for the June 2000 periodic call	*Indicative budget of call (Meuro)*	Modalities
KA 1	**Targeted Research Actions:** 1.5: TRA "*products*": evolutionary value-added and resource-saving products-services, including miniaturised systems	*70*	*RTD, demonstration and combined projects* *Thematic Networks* (1) *Concerted Actions* (1) *Specific Accompanying Measures (for KA 2 only)*
KA 2	2.1: Socio-economic scenarios for mobility of people and goods 2.2: Infrastructures and their interfaces with transport means and systems 2.3: Modal and intermodal transport management systems	*102*	
KA 3	**Open only for Thematic Networks and Concerted Actions (for all objectives)**	*2*	
KA 4	**Open only for Thematic Networks and Concerted Actions (for all objectives)**	*5*	
MAT	5.1: Cross-cutting generic materials technologies 5.2: Advanced functional materials 5.3: Sustainable chemistry 5.4: Expanding the limits and durability of structural materials 5.5: Iron and steel production 5.6: Steel casting, rolling and downstream treatment 5.7: Steel Utilisation	*80*	
M&T	**Open only for Thematic Networks and Concerted Actions (for all objectives)**	*1*	
TOTAL		260	

(1) Thematic Network and Concerted Action proposals may address all objectives covered in the work programme (except *Support for Research Infrastructures*); in the case of Key Action 1, proposals may address any of the Targeted Research Actions.

G. CRITERIA FOR SELECTION

RTD actions have to be selected according to criteria reflecting the overall objectives of the programme. These criteria, to be respected by all research activities, have been designed applying the selection criteria set for FP 5. They are grouped in five categories. Any proposals evaluated below set thresholds (specified in the Guide for proposers) in those categories will not be considered for funding:

Ensuring Scientific &Technical excellence			**Quality of approach, partnership &**			**Stimulating Community Added Value**			**Answering to societal needs**			**Economic development and S&T perspectives**		
For RTD activities including accompanying measures, those five categories would normally be given equal weight.														
Scientific & Technological quality and relevance to programme objectives	Adequacy of the scientific & Technological approach	Degree of innovative character	Quality of approach for project execution and management	Quality of partnership, including efficient involvement of users	Appropriateness of financial aspects and RTD related resources	Contribution to solving problems with a European dimension	Support to EU policies as well as to standards & reglementations	European added value of the consortium / Complementarity / transnationality of consortium	Implication on quality of life, health and safety	Implication on employment prospects as well as skill use and skill development	Implication on environment & resources	Strategic impact / contribution to competitiveness / partners and users interest	Contribution to growth / usefulness and range of applications / exploitation plans	Contribution to technological progress / dissemination strategies

These criteria should also be respected during the execution of the research activities in order to achieve overall excellence and consistency. They will be used to assess activities and help quantify impacts, providing information that will enable a timely and appropriate programme management response. The evaluation of the potential impact of new knowledge, technologies, products, processes or materials resulting from RTD actions will be a permanent activity of this programme, ensuring in this way an effective implementation of the Council decision.

ANNEX: GLOSSARY

Accompanying measures	*Actions contributing to the implementation of a **specific programme** or the preparation of future activities.*
Cluster	*A cluster is a group of synergistic and technically related projects.*
Concerted actions	*Actions co-ordinating **RTD** projects already funded by the **Member States.***
CORDIS	*Community Research and Development Information Service. The service (http://www.cordis.lu/) consists of an internet site providing information on Community **RTD**, together with paper-based and electronic information services.*
COST	*European Co-operation in the Field of Scientific and Technical Research, founded in 1971. It now comprises two types of projects; a) concerted action projects forming an integral part of a community R&D programme, which are open on a multilateral basis to COST third state participation. b) concerted action projects, not forming part of a Community programme, proposed either by COST states or by the Commission.*
CRAFT	*Co-operative Research Action For Technology. A special measure designed to encourage the participation of **SMEs** in European research projects. It enables at least three mutually independent SMEs from at least two **Member states** to jointly commission research carried out by a third party.*
Direct RTD actions	*Actions carried out for the Commission by the **JRC**.*
ECSC Treaty	*"European Coal and Steel Community" Treaty signed in 1951 which comes to an end in 2002.*
EEA: European Economic Area.	*A Treaty signed on 2 May 1992, creating between the EU Member States and the member countries of EFTA (except Switzerland) a single economic area for the free movement of goods and services and co-operation in particular on research. Members participate in the **Framework Programme** as **Associated States**.*
Eureka	*A framework set up in 1985 through which industry and research institutes from 25 European countries and the European Commission develop and exploit technologies crucial to global competitiveness and a better quality of life.*
External Advisory Group (EAG)	*The role of the External Advisory Groups is to provide the Commission with independent advice concerning the content and direction of research work to be carried out under the **key actions** of the Fifth **Framework Programme**.*
Framework Programme (FP)	*A multi-annual (normally five-year) programme defining EU **RTD** policy, priorities and the overall budget to be allocated. It is implemented through **specific programmes** making up the four **activities** mandated by the Treaty.*

FP5 Activity	*The **framework programme** is divided into four activities: (1) implementation of **RTD** programmes; (2) promotion of co-operation in the field of Community RTD with third [countries and international organisations;(3) dissemination and optimisation of the results of Community RTD; (4) stimulation of training and mobility of researchers in the Community.*
Horizontal Programme	*A **specific programme** of the **framework programme** covering an aspect of research applicable to all research domains, such as international co-operation, innovation, and training.*
IMS – Intelligent Manufacturing Systems	*IMS is an industry-led, international RTD initiative established in 1995 to develop next generation of manufacturing and processing technologies. It is open to EU Member states and Norway as well as Australia, Canada, Japan, Switzerland, United States.*
Indirect RTD actions	*Actions carried out by external contractors (all actions called for in **FP5** except the **direct actions** of the **JRC**).*
Industrial enterprises/industries	*Undertakings, public or private, which are subject to market forces and create wealth by exploiting processes, producing materials and products or furnishing industrial services. Research centres and consultancies are normally not considered as industrial enterprises.*
JRC	*Joint Research Centre of the European Commission.*
Key action (KA)	*The Fifth **Framework Programme** consists of s**pecific programmes which** are divided into 19 key actions (plus activities allowing RTD on **generic technologies** and support to **research infrastructure**). Each key action has its defined set of objectives, addresses critical problems and ensures an integrated, problem-solving approach. It targets many and varied aspects of economic and social issues, and normally supports the entire spectrum of disciplines and activities, ranging from basic research, through applied and generic research, to development & demonstration.*
Long term	*For most domains, greater than eight years.*
M&T	*Generic activity on Measurement and Testing*
MAT	*Generic activity on Materials and their technologies for production and transformation and New and improved materials and production technologies in the steel field.*
Medium term	*For most domains, between five and eight years*
Outputs	*Direct and indirect impacts emerging from RTD project execution. Outputs are also understood as practical outcomes of RTD activities, in particular the Key Actions.*
Short term	*For most domains less than five years*

SME	*Small and Medium-sized Enterprises. A common definition at the Commission level is: a maximum of 250 employees, a turnover of less than 40 mio EURO or a balance sheet of less than 27 mio EURO, and less than 25% owned by one, or more, non-SMEs - except an investment or venture capital company not exercising control. For the purpose of the SME specific measures, an eligible SME is not a research organisation nor a consulting company.*
SME Exploratory awards	*Support, lasting no longer than 12 months, for an exploratory phase of a potential **RTD** project.*
Specific programmes	*Detailed **RTD** programmes that implement the **framework programme**. They set out the RTD areas to be supported and the budgets available for such support. See also **Thematic Programmes** and **Horizontal Programmes***
Targeted Research Action (TRA)	*A programme implementation concept, which aims at focussing research activities around strategic priority areas of a **key action**.*
Take-up measure	*Activity stimulating diffusion and utilisation of technologies implemented by RTD projects or accompanying measures.*
Thematic network	*Contractual modality allowing for the co-ordination of a) organisations; b) RTD projects.*
Technology Platform (TP)	*A programme implementation concept, defined in the **Work Programme**, which aims at integrating technologies to attain the strategic objectives of the **Key Actions**. It should bring together manufacturers, suppliers and other relevant stakeholders with the task of developing and benchmarking engineering concepts for future vehicles, systems or components, whose functionalities should be validated.*
Thematic Programme	*A **specific programme** of the 5th **FP** covering a particular, though broad, research area such as the life sciences or information society. The framework programme's first activity comprises four thematic programmes. They are again divided into a number of **key actions**, RTD on **generic technologies** and Support to **research infrastructures**.*
Virtual institute	*Main objective is to link research organisations or departments using advanced information and communication technologies for a service oriented content, i.e. providing comprehensive **RTD** answers to industrial needs, notably **SME**s. A virtual institute should be capable of becoming a self-financing legal entity.*
Work programme	*A description of the research objectives and priorities required to achieve the strategic objectives of a **Specific Programme**.*