European Commission

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

Details of objectives and RTD priorities

GROWTH WORKPROGRAMME 2001-2002

This version of the Growth Workprogramme replaces and supersedes the March 1999 and December 1999 editions

Edition December 2000

COMPETITIVE AND SUSTAINABLE GROWTH

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ABOUT THIS DECEMBER 2000 EDITION

This third edition of the GROWTH work programme[1] replaces and supersedes the March 1999 and December 1999 editions. This version will be valid until the end of the Competitive and Sustainable Growth Programme.

It specifies the strategy and priorities for the remaining calls for proposals of the Programme, and in particular for the last two **periodic calls** (publication planned for 15 December 2000 and 1 June 2001) and for the on-going **open calls**. In the case of the **dedicated calls**, the topics on which proposals are invited are specified in the actual call (one such call is planned for 15 October 2001; another one specifically on food safety might still be added).

Changes compared with the previous edition relate to the objectives of some actions as well as to the modalities and to the schedule and content of future calls for proposals.

Some of the most significant changes in the description of the activities :

- Key Action 1: Re-focused *Targeted Research Actions*
- Key Action 2: New strategy
- Key Action 4: TP 7 and TP 8 re-defined; emphasis on areas 4.1.1 and 4.2.5
- Materials: focus on long-term issues
- Support to Research Infrastructures: Definition of Virtual Institutes better focused; priority for Objectives 7.2, 7.3 and 7.4

Significant changes in Programme Implementation :

– the recommendation (applying to all kinds of projects) to make use of new opportunities offered by information and communication technologies
– for KA1 and Materials, the last call is closed also for thematic networks / concerted actions (TN/CA); for KA2, TN/CA proposals must relate to the objectives specified in the calls;
– the December 2000 call will be open until 30 March 2001 for KA4 and until 15 May 2001 for KA1 and Materials (the closure date for the other activities remains 15 March 2001)

Areas open for each periodic call for proposals:

these areas are in several cases different from what was anticipated in the section "Priorities planned for future periodic calls" in the December 1999 edition of the work programme.
See the table below for a summary (RTD&D: RTD, demonstration and combined projects; TN/CA: thematic networks and concerted actions), and refer to the text and to tables F-5 and F-6 for details.

	December 2000	**June 2001**
KA1	TRA 1.5, 1.6, 1.7, 1.8, 1.9	Closed
KA2	Targeted actions CIVITAS and GALILEO	Targeted action SMART RAIL and priorities on 2.1, 2.2 and 2.3
KA3	RTD&D: CLOSED. TN/CA: all objectives.	RTD&D: 3.1, 3.2, TP1, TP6 TN/CA: all objectives.
KA4	RTD&D: 4.1, 4.2, 4.3, 4.4, 4.9, 4.11, 4.12 TN/CA: all objectives	RTD&D: CLOSED. TN/CA: all objectives.
Mat.	all objectives (focus on nano-technologies)	Closed
M&T	RTD&D: 6.1.2, 6.1.3, 6.2.3 TN/CA: all objectives	RTD&D: CLOSED. TN/CA: all objectives.

Users should consult in detail the text of the document to ensure that they take into account <u>all</u> changes which may affect them.

[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 to long term goals [2] to which this Key Action should significantly contribute include:

a) *Contributing to modernisation of industry and adaptation to the new economy*, 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 [3] 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 waste, use of hazardous substances and 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.
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 lifecycle 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. Priority will be given to medium to long term technological research activities, which meet the criteria described in this work programme.

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[2] The time horizon for research is generally 6 to 10 years after a project starts. However in some fast developing areas and for traditional SMEs six (6) years or even less might be considered as long term.

[3] 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 medium to long term 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 PERIODIC CALL FOR PROPOSALS, AND 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 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, and fast prototyping technologies. Attention should be given to lower barriers between designers, users and consumers and to support full integrated “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 performance (improved quality, less 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 focus 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, considering 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. RTD would be geared by life cycle, minimised use of resources and whole industrial system concepts.

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 cleaner and leaner 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 including development of novel processes for treatment, re-utilisation and safe disposal of waste. RTD in a systemic approach should aim at an optimisation of the entire "value chain", i.e. 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

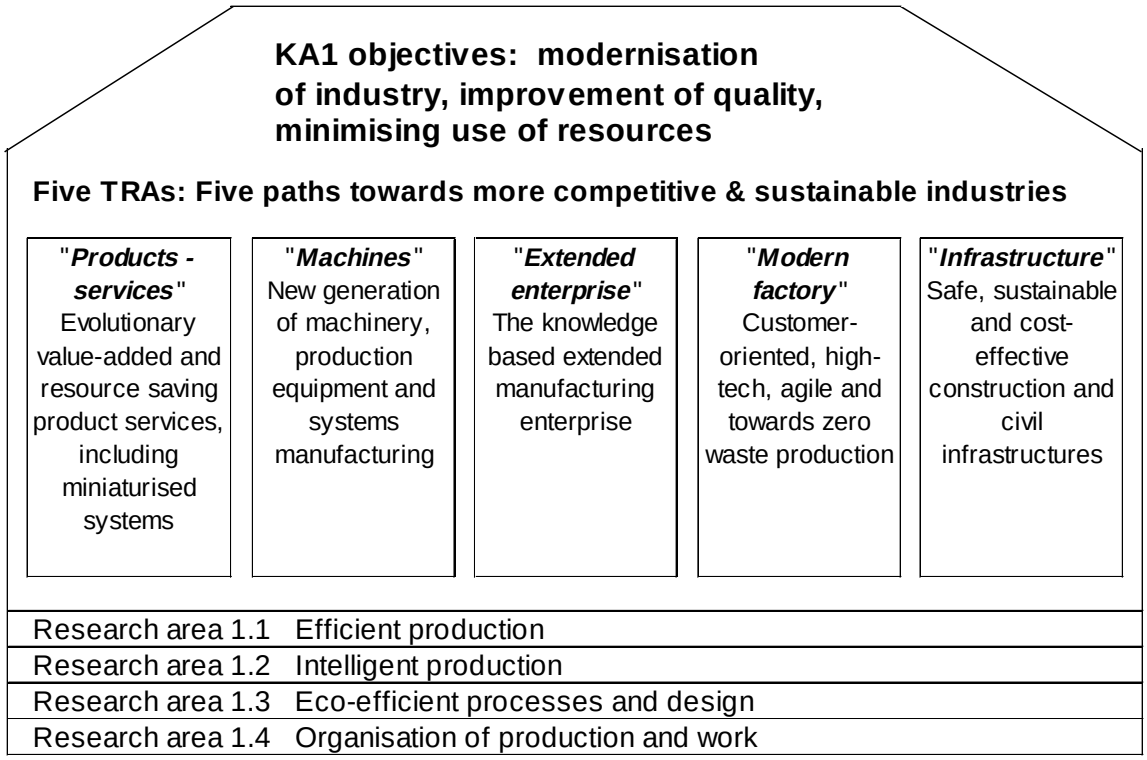
The aim is to develop new organisational and work practices together with developments in industrial products, processes and services, and the appropriate human capital, competence and skills. RTD should address methodologies and tools for efficient organisation, knowledge and technology management,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

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, in particular those that simultaneously improve the environmental and economic performance of industry, supporting where appropriate regulatory determinants. Research activities should help 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.

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

Competitive and sustainable growth is directly linked to increased value added in products. With an eye to the past decades, one can assume that 75% of next 15 years products and services do not yet exist today. Products are becoming more complex, for they integrate material, mechanical, electrical, electronic, information processing and service related components. Therefore, system approaches and medium to long term multidisciplinary research are needed to ensure future leadership. This can only be achieved, through the simultaneous consideration of the various components of a "product-service", optimising tangible aspects as well as improving the intangible ones such as information or intelligence. Such integrated, life-cycle and systemic research would support fast growing and dynamic markets for novel resource saving services and miniaturised products, as well as related production techniques. Potential exists in virtually all sectors ranging from consumer products - services, medical instruments, artificial organs, Information Society related products, safety monitoring, etc, to numerous other applications within more traditional sectors.

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

(a) improved design tools, manufacturing and organisation underpinning 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- or nano-components.

This TRA focuses on medium to long term RTD activities with multi-disciplinary, systemic and strategic research approaches (see areas 1.1 to 1.4). Particular attention should be paid to "de-materialisation" and life cycle aspects of future product-services and micro-systems.

Complementary and integrated materials research activities (see objectives 5.1 to 5.7) may also be necessary, in particular on crosscutting 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 and related service providers.

This TRA is complementary with the key action 2 "dynamic value constellations" and the action line "Microsystems" of key action 4 as well as with CPA10 of the IST programme. It is 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 new product-services, smaller production batches and more stringent users' requirements, the factories of the future will need new and more efficient physical production equipment. Particular attention should therefore be given to the development of new concepts and of intelligent, 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, production equipment and systems for manufacturingfulfilling 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 processes, including multiprocessing and fail-safe manufacturing systems;

(b) procedures, methodologies and technologies for efficient and intelligent design and engineering of production systems including connection and communication between modules, virtual prototyping 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.

This TRA focuses on medium-long term RTD projects normally addressing three principal steps, all covered in one single project or within co-ordinated projects: development of technologies, benchmarking and validation, and integration of technologies.

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. The increase on quality and reliability and substantial gain in set-up time and operational efficiency of such

production systems, giving also importance to social acceptance (impact of new methods of working), should be also aimed at.

This TRA is complementary to the key action 2 "intelligent workplaces" of the IST programme.

1.7 TRA "*extended enterprise*": the knowledge based extended manufacturing enterprise

A new paradigm for Europe is clearly emerging: *knowledge for and through e-economy*. In this context, multiskilled and knowledge intensive networked enterprises are at the very heart of "tomorrow's production systems". The move towards agile customer-driven networked industrial enterprises requires not only technology innovation but also careful attention to organisation. RTD needs are linked with integration of networked production activities (virtual) with better logistics inside and outside the industrial facility, effectiveness of supply chains and production networks (including optimised integration of suppliers, particularly SMEs), reinforcement of the European industrial base (e.g. knowledge management) and better social acceptance (e.g. life-cycle management and organisation, human-driven research on new working methods and products-services).

To this end, the present TRA addresses the integration and application of information society technologies for efficient management of networked production enterprises 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 that includes multi-cultural and/or multi-sites production infrastructures. The medium to long term RTD activities using a "problem solving approach" should aim at the development of:

(a) new and improved methodologies and middleware-based applications to facilitate integration of design and production activities and to improve logistics across the extended supply chain, taking into account product life cycle as well as transport requirements,

(b) tools and methods for enhanced management of human resources, of customers and society needs and of 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 using benchmarking exercises based on historical, socio-economic 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.

This TRA focuses on medium to long-term issues 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 optimal use of resources.

The creation of knowledge based extended manufacturing enterprises will require the development and deployment of tools and methods that use real-time and near-real-time access, interaction, transfer and archiving of data enabling the reuse of knowledge for the improvement of business processes.

The work under this TRA is complementary with the activities carried out in KA2 "sustainable mobility and intermodality" and in 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

Design of eco-efficient production systems for high added-value product-services is also a key factor for competitive and sustainable growth as well as for creation of a new image of industry, more attractive for the future workforce. Research should drive enterprises towards higher added value and cleaner production, including monitoring and on-line treatment technologies, as well as methods to codify knowledge, and measure performance and life-cycle impact of industrial systems. Competitive and sustainable growth can only be achieved through substantial modifications in the production and consumption patterns. Production industry is asked to recognise and understand consumers' and society 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 to better respond to these needs. 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.

Medium to long term 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, based on improved quality and agility, environmental friendliness and safety. Activities under this TRA should attempt to integrate research approaches in support of new and high-tech design and production schemes.

Problems of traditional sectors (supported by innovative integrated approaches upgrading production of final products as well as intermediate parts, components and related services) should be addressed in particular. 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 industrial ecology concepts. In particular environmental friendliness as well as socio-economic impactsshould be investigated further.

This TRA focuses on medium to long term RTD activities aiming at developing and, if appropriate, demonstrating

(a) Procedures, methodologies and technologies for efficient and intelligent design of industrial plants, including modelling, and simulation tools for "virtual" and "digital" factories as well as concurrent engineering, leading to agile global factory organisation;

(b) Procedures, methodologies and technologies for clean, safe, efficient, intelligent manufacturing and production, considering the overall factory and site environment, integrated management systems, life-cycle hazard and risk assessment (identification, reduction, avoidance, management), monitoring, maintenance, waste prevention, safety and integrity inspections, performance or quality measurement;

(c) Scientific (incl.social sciences) and technical knowledge facilitating the development of the next generation of eco-efficient production systems as well as process integration and intensification[4] and life-long learning of manufacturing organisations.

Medium to long term research 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.

Whenever possible, cross-sectoral research with multi-disciplinary approaches is encouraged. Activities may include as appropriate pre-normative and / or benchmarking work.

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[4] *Priority is given to recycling or recovery within the factory production cycle for zero waste production. Please note that the area of off-line recovery, i.e. end-of-life product recycling or waste processing technologies, is not a priority for RTD projects.*

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 as well as safety and environment assurance 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 facilities and help to respond to new production patterns at European level.

1.9 TRA "*infrastructure*": safe, sustainable and cost effective construction

Buildings and infrastructures play a key role in support of sustainable economic growth and have a very direct effect on the generation of wealth and quality of life in the EU. The aim of the TRA is to encourage long-term innovation in relation to the design, construction, maintenance, operation, rehabilitation and upgrading of such industrial products. The target is to address quality, efficiency, safety, sustainability and reliability aspects (see areas 1.1 to 1.4) if possible in an integrated manner. Particular attention will be paid to networking activities in areas of high societal value, like earthquake engineering, fire safety, work safety engineering, renovation, etc.

This TRA focuses on medium to long term research activities comprising the development and/or demonstration of technologies addressing:

(a) Design, modelling, and simulation tools for operational efficiency, health, safety and reliability of the built environment, considering hazard and risk assessment (identification, reduction, avoidance, management) and incorporating life cycle analysis.

(b) Construction and rehabilitation processes with improved quality in terms of cost efficiency and reduction in delivery time, maintenance costs, energy consumption, pollution (including noise) health risks and accidents.

(c) Monitoring and maintenance, ensuring safety and efficiency through facilities management and automated on-line systems, as well as through safety and facility integrity inspections, performance or quality measurement

This TRA covers all the phases in the life of constructions[5]. It should address the impact on resources, environment and society in general. Attention must be paid to the broad involvement of end-users and owners in the research activities.

The activities under this TRA are complementary with generic technologies "materials and their technologies for production and transformation" as well as with Key Action 2 "Sustainable Mobility", with Key Action 4 of the EESD programme ("City of Tomorrow and Cultural Heritage"; see http://www.cordis.lu/eesd/home.html), and with Key Action 1 of the IST programme ("Systems and Services for the Citizen"; see http://www.cordis.lu/ist/home.html) concerning security of transport.

STRATEGY AND PRIORITIES FOR THE DECEMBER 2000 PERIODIC CALL

This will be the **last periodic call for KA1**; it will remain open until May 15, 2001. It will be open to all five TRAs as described here above for RTD projects, Thematic networks and Concerted Actions.

In addition to normal projects, large projects, are encouraged, aimed at reducing the risk associated to the application of innovative technologies, and encompassing, where appropriate, development, benchmarking and validation of technologies. They would normally be conceived in a way that integrates technologies, material and intangible issues, disciplines,

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[5] *Construction includes civil infrastructures i.e. buildings, roads, bridges, tunnels and underground facilities, dams, waste treatment systems, waste disposal sites, etc*

research actors and research users, modalities (e.g. RTD, networking, training) and sources of financing (e.g. synergies with and between national programmes) for solving common problems and ensuring overall efficiency. A large SME participation, either through participation in the performance of the research or through participation in user groups, is encouraged. Such projects are expected to be of a larger size than the average RTD projects' size[6]. They are particularly relevant to address European-wide problems and the technical complexity inherent to the development of new product or services, the next generation of machines, and the modern factory.

Projects, including demonstration and combined projects, addressing low risk, incremental research based on proprietary solutions which do not demonstrate a clear contribution to the large diffusion of innovative solutions and benefit solely the participants to the project, are strongly discouraged.

* * *

- The TRAs call for proposals with as wide a multi-disciplinary approach as possible and will not support proposals addressing topics, where provisions are made for support through other programmes or Key Actions. 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"

- Where appropriate and within the priorities covered by the call, more intensive use of next generation ICT is encouraged to improve the performance and management of research. Proposals involving the use of high capacity computing, networking, data sharing and data-storage are also encouraged. Examples of applications are (near) real time planning and scheduling, and high accuracy modelling and simulation.
- It is reminded that the call on IMS "Intelligent Manufacturing Systems" is re-opened up to September 2001 for RTD projects and thematic networks. Please note that proposals should have an "interregional" dimension (see specific information on IMS).

[6] The average EC funding for a simple RTD project has been in the past around 1.8 M Euro. Large projects are defined in the evaluation manual as projects with more than 10 M Euro total cost.

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[7]. 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 [8] 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 across Europe and to integrate information technologies and second generation satellite navigation and positioning systems in the transport sector.

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[7] 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.

[8] 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).

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, in line with the conclusion of the High Level Group on the reform of Air Traffic Management ("Single Sky"), to improve the operation of air traffic control systems, inter alia by 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.

STRATEGY

In defining the **strategy and priorities** for the December 2000 and the June 2001 calls for proposals, attention has been paid to the policy priorities established by the Commission, to the relevant results from FP4 (Fourth Framework Programme) projects and to the first steps of FP5 projects. Particular importance has been given to the integration, validation, demonstration and assessment of previous project results to facilitate transport policy decision-making and implementation at European, national and local levels.

The new approach for the implementation of all key action activities will focus on two main elements:

- **concentration** of a substantial fraction of the key action activities around a core set of Targeted Actions which are designed to facilitate the emergence of solutions with a measurable impact, high profile and direct relevance to EU policy objectives. Targeted Actions integrate multidisciplinary and multisectoral activities involving, wherever possible, private-public sector partnerships and end-users from the business, industrial and policy-making sectors;
- identification of a **limited number of priorities** of strategic importance to the EU, which are to be addressed by proposals related to the topics of the Work Programme.

The Commission wishes to give encouragement to proposals of outstanding quality; of appropriate size; which are able to contribute to achieving critical mass in priority topics; and which have the highest possible impact at European level. The Commission will make efforts in this sense.

Additional information will be made available upon publication of the calls. This information would be downloadable from http://www.cordis.lu/growth/home.html

STRATEGY AND PRIORITIES FOR THE DECEMBER 2000 PERIODIC CALL

This call will be open for two Targeted Actions: CIVITAS (CIty VITAlity Sustainability) and GALILEO (European satellite navigation system).

CIVITAS CIty VITAlity Sustainability

This Targeted Action will be opened in combination with the Call of the Key Action 'Economic and Efficient Energy for a Competitive Europe' of the Energy Sub-Programme.
The joint implementation of the two Programmes will lead to the co-financing of projects.

Applicants should pay particular attention to the fact that proposals must address the objectives of both programmes, and that the criteria for eligibility, the evaluation criteria and thresholds, as described in the work programmes and supporting documentation, of both programmes apply and will guide the joint evaluation process.

About three-quarters of the EU population lives in urban areas. Over 30% of all transport kilometres are made in towns. Energy consumption of transport in cities is increasing rapidly, with private cars and commercial vehicles being responsible for 98% of energy consumption in urban transport. Urban traffic is responsible for more than 10% of all CO_2 emissions in the EU.

The danger of unsustainable traffic growth, worsening living conditions as well as new political commitments such as the Kyoto protocol, emphasise the urgent need to reverse these trends. Radical change is required, based upon a mixture of technology and policy based measures. Research into the effectiveness of individual measures has a role to play, as has development and demonstration. However, there is also a critical role for demonstration and assessment projects that integrate a package of measures and are of a sufficiently large size to make a visible impact.

The objective of this Targeted Action is to assess the impacts on energy consumption, traffic conditions and pollution[9] in cities of radical new sustainable urban transport policy strategies, supported by innovative measures, technologies and infrastructures. These strategies should particularly aim at achieving a shift in modal choice of people, who have the option of car use, towards alternatives.

The proposals should combine energy-efficient, cost-effective and clean public and/or private vehicle fleets, based upon minimum the Euro-4 standard, and the necessary fixed infrastructure (e.g. fuelling), with a wider package of measures in order to cover both the transport demand and supply side. This package should include innovative demand management strategies based upon access restriction and integrated pricing; stimulation of collective passenger transport and new concepts for goods distribution; new forms of vehicle ownership and use; innovative 'soft' measures for managing mobility demand and awareness raising; and transport management systems and related information services.

The proposals should be prepared by cross-national partnerships comprising a small number of clearly committed local initiatives and must be capable of achieving a significant change in modal split across a whole city or city-region. Indicators for success and targets should be defined and monitored, experiences should be widely disseminated in order to support acceptance and normalisation.

GALILEO New generation of satellite navigation services

Based on the Council resolution (1999/C 221/01) regarding the European involvement in a new generation of satellite navigation services under the title of GALILEO, a dedicated call was launched in June 1999. The objective of this call was the definition of the overall architecture of the GALILEO system. In order to obtain the optimum results, appropriated mechanisms of synergies are being implemented with the European Space Agency and potential operators and users.

The definition phase, which ends in December 2000, and will provide an assessment of the system trade-offs in order to bring convergence between user requirements (users have been consulted on a large scale through appropriate forums) and the service to be provided. Furthermore, very efficient work has allowed the necessary frequencies spectrum for satellite navigation to be obtained and the results of international negotiations have provided a clearer European position at global level.

This Targeted Action on Galileo will focus on some aspects, which are critical to the efficient implementation of the Galileo infrastructure and its use in numerous applications, within the framework of the overall development of the Galileo system.

The objectives of the present Targeted Action are grouped in two areas. Firstly, the development phase of Galileo is based on *refined analysis of some system elements* in the overall satellite navigation context. This covers complementary definition of local elements; impact of interoperability on system definition; and standardisation activities. Secondly, *activities enabled by satellite navigation* need particular attention in the domains of: development and optimal use of satellite navigation for all modes of transport; detailed service analysis; and the development of the regulatory framework.

This Targeted Action is linked to the next December Transport Council decision on Galileo. In case this decision will alter the objectives of this Targeted Action it will be adapted accordingly.

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[9] This includes emissions and noise

In the event of budgetary resources being available as a consequence of the former, the tasks not satisfactorily covered from previous calls could be launched in the June 2001 call. Information in this respect would be made available through the additional information upon publication of the call.

STRATEGY AND PRIORITIES FOR THE JUNE 2001 PERIODIC CALL

The June 2001 call is oriented towards a Targeted Action on Railways (SMART RAIL) and a limited number of priorities across the programme research objectives.

SMART RAIL Single market for rail transport services

This Targeted Action is based on the Union objective to create a single market for rail transport services as proposed in the so-called Railway Infrastructure Package (including the Trans-European rail freight network – TERFN), the directive on interoperability of conventional rail under discussion, and a planned directive on railway safety. All actors, both historical and new, of the railway market should consider participating.

The Targeted Action covers two groups of priorities. The first one is a new approach to *railway safety management*. It comprises a Thematic Network involving all relevant stakeholders (railway operators, infrastructure managers, supply industry, certification and regulatory authorities and users), which steers this first priority and co-ordinates with Member States activities. It also comprises two research actions the first of which addresses the development of integrated approaches to railway safety management which should be based on a coherent life-cycle framework that embraces all relevant planning, organisation, monitoring and evaluation. The second deals with the development of staff qualifications and training methods and supporting tools for cross-border train operations.

The second group of priorities is a set of *demonstration activities in one or more corridors of the Trans-European* Network, covering the following features: implementation of a new approach to more efficient use of infrastructure (e.g. dynamic timetable planning and slot allocation); transparent and non-discriminatory charging schemes and performance regimes that embody efficiency incentives; solutions for improved service reliability/quality for cross-border freight trains, including aspects such as data exchange; improvements in the efficiency and service quality of the European wagonload system. This should include a clustering activity with a common users group as well as a common approach/methods for the evaluation and monitoring of rail transport services.

Priorities across single work programme objectives

Socio-economic scenarios for sustainable mobility

In the area *of tools for decision making* priority should be given to: the completion of the ETIS (European Transport policy Information System) with the development of the ETIS agent; and a European Airport System performance observatory.

In the area of *transport driving forces* priority should be given to the understanding of the use and effects of e-life and e-commerce in general in the transport sector. The use of Internet and IT will have an impact on the overall transportation of goods and of people. The effect on urban areas would be of particular concern. It is also important to analyse its effects in mobility decisions choices.

In the area of *policies for Sustainable Mobility* priority should be given to: the use of revenue from transport pricing policy; and the institutional issues in transport policy implementation with particular attention given to the situation in the Accession Countries.

Infrastructures and their interfaces with transport means and systems

In the area of *environment* priority should be given to the definition of strategies to influence the road fleet composition.

In the area of *transport safety* priority should be given to: further development of road safety standards with particular attention to the protection of vulnerable road users; life-cycle safety impact assessment of road planning design, construction, operation and maintenance; the development of methodologies to collate flight/operational and human factors data to improve safety trend analysis taking into account the conclusions stemming from the High Level Group on the reform of Air Traffic Management ("Single Sky"). *Tunnel safety* aspects are being extensively researched at national level and by other Key Actions of the Framework Programme. A comprehensive action to support policy development integrating results stemming from on-going research efforts is deemed as high priority.

In the area of *transport security* priority should be given to the establishment of security/safety procedures for intermodal freight transport operations.

In the area of *human factors* priority should be given to strengthening the professional knowledge of local and regional transport planners.

Modal and intermodal transport management systems

In the area of *traffic management systems* priority should be given to Intelligent Shipping operations.

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Where appropriate and within the RTD priorities covered by each call, applicants are encouraged to extensively use the tools offered by ICT, ranging from the creation of websites, intranets and extranets to the digital collaboration, sharing/accessing remote databases, and grid concept as a new infrastructure for handling, computing and solving complex applications.

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.

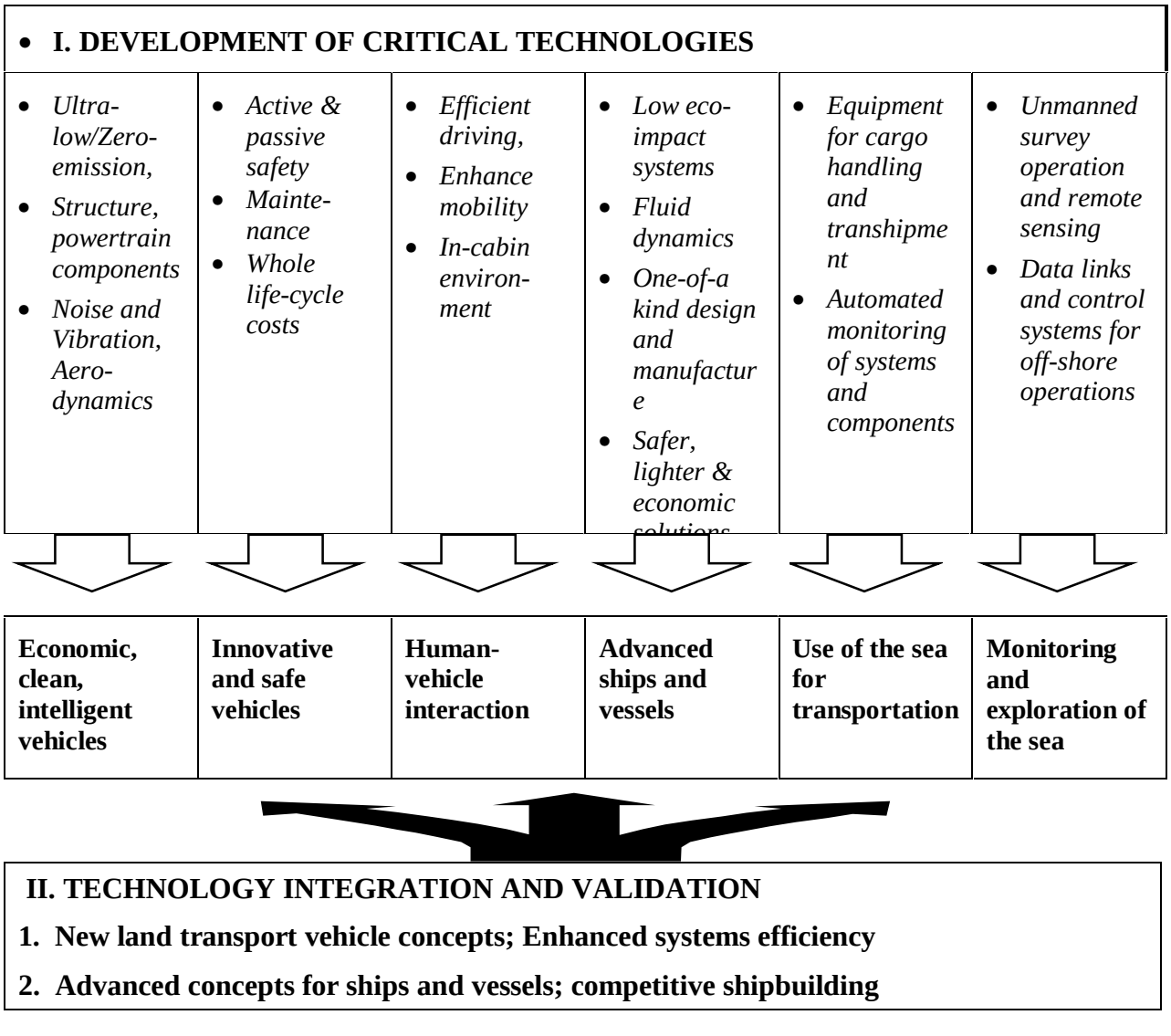
Critical technologies and technology validation and integration

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 [10]. 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,

[10] 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."

maintenance and comfort. The activities would focus on the integration and prototyping of 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 2000 PERIODIC CALL

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

STRATEGY AND PRIORITIES FOR THE JUNE 2001 PERIODIC CALL

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

For RTD, demonstration and combined projects, the call will be open for all technical areas defined under objectives:

3.1 “Critical technologies for road and rail transport”, and
3.2 “Critical marine technologies”

and for Technology Platforms:

TP1 “New land transport vehicle concepts; Enhanced systems efficiency” and
TP6 “Efficient interoperability and transhipment”.

* * *

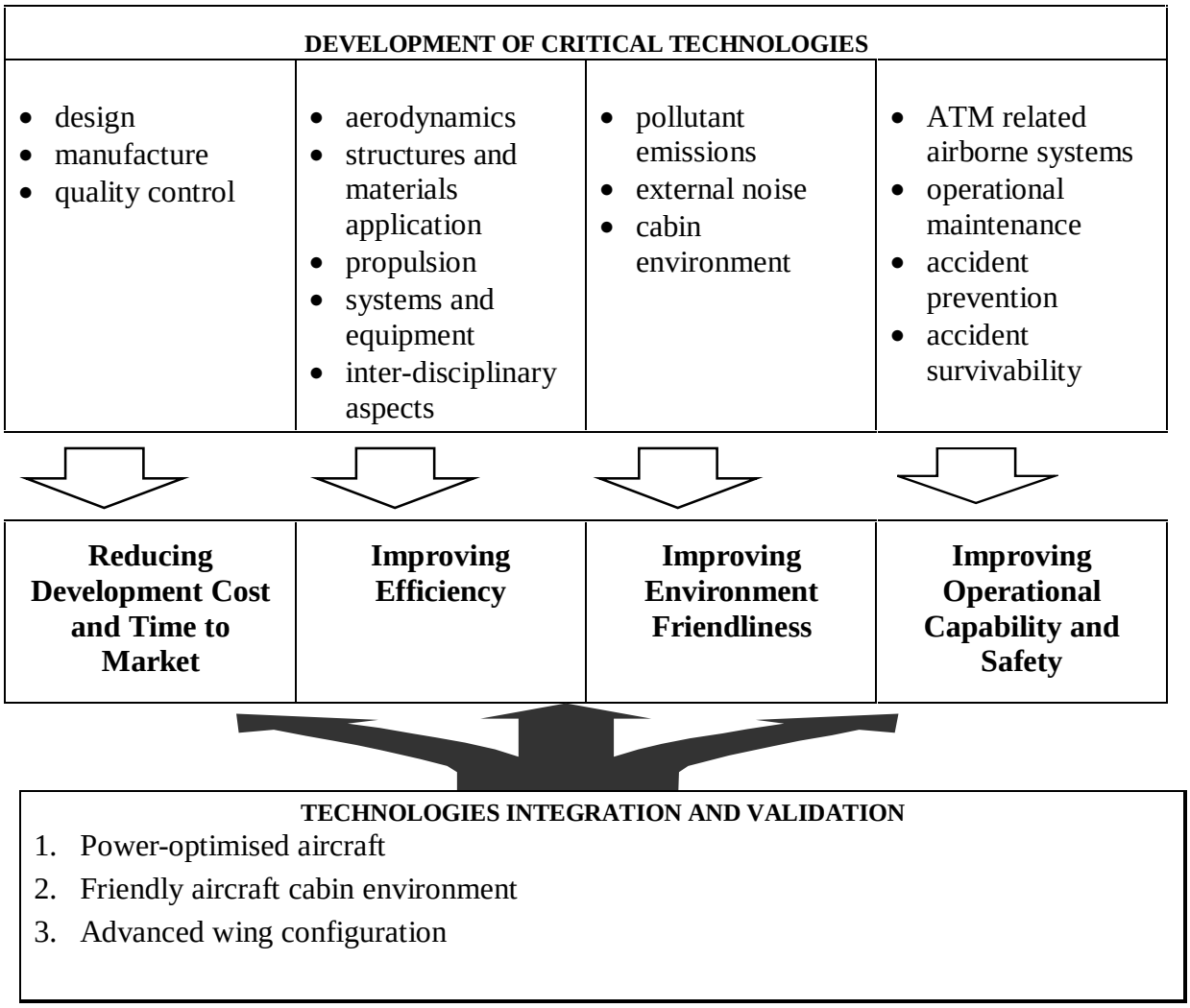
Where appropriate and within the priorities covered by each call, applicants are encouraged to use the tools offered by ICT, ranging from the creation of Websites, intranets and extranets to the digital collaboration, sharing/accessing remote databases, and grid concept as a new infrastructure for handling, computing and solving complex applications. Typical domains given as examples are CFD, modelling and simulations, early design tools, safety assessment, structural science.

Another important perspective will be integration through clusters of projects involving critical technology development or technology platforms. Integration of research activities represents an important step towards the accomplishment of the European Research Area.

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.



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, including extensive use of the tools offered by ICT, 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; advanced technologies for improved propoeller and rotor performance.

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; improved measurement techniques in hazardous environments; 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 and other advanced 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 avionics systems; development of underlying technologies and procedures for implementation of integrated modular concepts; utilisation of multimedia passenger services; 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 fixed-wing and rotary-wing aircraft configurations, such as blended-wing-body, box-shaped wings, compound helicopters, tilt-rotors, etc; multidisciplinary airframe-propulsion integration (including fixed-wing aircraft and rotorcraft); 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 address 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 climate control including humidification and air quality; human-centred utilisation of multimedia passenger services.

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 and single radiation 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.

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 currently closed.

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.

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 need to cope more efficiently with 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 as well as the validation of the architecture and the systems for optimised power distribution and share. The project is aimed at demonstrating 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 aircraft representative rig tests and selected flight tests, where required. Aircraft systems under consideration 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* 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 aircraft representative rig testing and, if required, flight tests of selected systems on an aircraft.

4.10 TP 6: Low external noise aircraft

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

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.

4.11 TP 7: Friendly aircraft cabin environment

This TP is the response to the recognition that the noise and vibration as well as air quality and thermal environment are fundamental factors contributing to the passenger perception of cabin comfort, especially in medium and long range flights. These factors are also important for the health of passengers and crew on board. The importance of these issues will be exacerbated with the introduction of large commercial aircraft with more powerful engines, longer flight times and multimedia passenger services. Many techniques for significantly reducing noise and vibration focused on the transmission mechanism, from the sources to the passenger, have been applied in the last years in a fragmented way with diverse degrees of success. Similarly, techniques for improving air quality and thermal environment have been approached in the recent past focusing mainly on equipment operation and on its application in general closed spaces. In addition, studies have also been conducted to define multimedia environments for aircraft cabin.
The activity of this TP is centred at proving the feasibility of achieving the target comfort levels inside the passenger and crew cabins by the integration in a multidisciplinary approach of acoustic/vibration treatments and air distribution design solutions, while respecting overall cost and weight objectives and enabling user-friendly application of multimedia services. 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: (i) 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 material requirements, noise reduction techniques for air-condition systems, multimedia systems applications for noise environment reduction and improved comfort; (ii) new air conditioning features to reduce air contaminants such as dust, bacteria/viruses, CO_2, CO, Ozone, as well as thermal-hygrometrical comfort including temperature, humidity, air flow speed and cabin pressure. The project will demonstrate a reduction in both overall sound pressure level and speech interference level of 5 decibels, as well as an improvement in applicable air quality comfort indexes of 20% in commercial turbofan aircraft cabins by means of full-scale flight tests supported with ground and laboratory testing. The project will include the application of a novel comfort index to take into account noise and air quality factors of comfort.
The project will comprise the following three main phases: *(a) Identification and selection of viable technologies for large-scale validation; (b) Integration* of technologies in an aircraft design, including optimisation and validation in laboratory, mock-up or on-ground aircraft tests; *(c) Full-scale validation of design methodologies*, including flight tests performed on a turbofan aircraft test bed.

4.12 TP 8: Advanced wing configuration

Today's commercial transport aircraft present wing configurations 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, flight control systems, structures, multidisciplinary analysis, etc. which will enable designers to approach the integration of this technologies into novel wing configurations that will represent a significant increase in aircraft operational efficiency.
The activity of this TP is centred on the multidisciplinary integration and validation of promising technologies, such as: (i) adaptive wing concepts through multifunctional control surfaces, (ii) large blended winglets and other novel wingtip devices, and (iii) active and passive wake vortex control devices. These technologies can independently bring substantial advantage in terms of wing performance. Furthermore, as they are strongly interrelated, their benefits will be optimised through integration. The Platform will demonstrate significant improvements in

take-off and climb performance (7% increase in L/D), drag reduction by optimised wing lift distribution throughout the entire flight as well as gust and manoeuvre loads alleviation (mission fuel burn reduction of 5%), lower aerodynamic noise during landing and take-off (2 EPNdB reduction) and wake vortex strength reduction thereby improving airport runway capacity. The project will incorporate concepts and technologies developed in research carried out under Community, national and industry programmes in the fields of aerodynamics, stability and control, aeroelasticity, composite and metallic structures, flight test measurement methodologies, etc. Full scale flight test validation of each of the technology elements of the Platform will be conducted on suitable test aircraft and, where technically required, on the same aeroplane during a common flight test campaign.
The project will present three phases: *(a) Configuration definition and integration,* where the comprised technologies will be integrated taking into account aspects of overall architecture, environmental, safety and certification issues; *(b) Ground test validation,* where systems and assemblies will be validated at component or system level in wind tunnels and ground test facilities, as appropriate; *(c) Full scale flight test validation.*

4.13 TP 9: Integrated and modular aircraft electronic systems

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

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.

STRATEGY AND PRIORITIES FOR THE DECEMBER 2000 PERIODIC CALL

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

For RTD, demonstration and combined projects:

I. Development of Critical Technologies:

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*.
However, in the light of the results of the previous Calls, the December 2000 Call places a particular emphasis on 4.1.1 (Advanced design systems and tools), as well as on multidisciplinary analysis of unconventional configurations and aeroelastic phenomena under 4.2.5 (Configurational and interdisciplinary aspects), and tiltrotor related technologies in general. Applicants are encouraged to present proposals on these technical subjects.
Also proposals on subjects of interest to SMEs in relation to all the technical areas are encouraged.

II. Technology Platforms:

The call will be open for Technology Platforms: *TP5 Power optimised aircraft, TP7 Friendly aircraft cabin and TP8 Advanced wing configuration*.

STRATEGY AND PRIORITIES FOR THE JUNE 2001 PERIODIC CALL

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

* * *

Where appropriate and within the priorities covered by each call, applicants are encouraged to extensively use the tools offered by ICT, ranging from the creation of websites, intranets and extranets to the digital collaboration, sharing/accessing remote databases, and grid concept as a new infrastructure for handling, computing and solving complex applications. Examples of applications are CFD, aerodynamics, windtunnel testing, inflight testing, modelling and simulations, safety assessment, structural science.

C. GENERIC ACTIVITIES

GENERIC ACTIVITY 1A: 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.

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

(2) 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).

(3) Materials development is largely based on chemistry, and in particular on fine and specialty chemicals. 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 should receive particular attention**.**

(4) For the development of new structural materials the basic understanding of degradation mechanisms is also a prerequisite. These materials are key to the future of major industries, in particular for construction or transport. Extending life-cycle 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 recyclable materials is optimised.

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. Particularly encouraged are novel multidisciplinary approaches, focusing on the development of nano-structured materials to support applications in the health and biological sector, in data processing, storage and communication, and in the chemical and industrial sectors. Research is also needed on surface engineering and interfacial science and technologies 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.
RTD in the area of biomaterials will cover all organic and inorganic materials potentially interesting as implant basis, for medical devices or instruments as well as for general technical applications. Focus is to be given to the whole life-cycle impact of these materials as well as the understanding of their behaviour, including their biocompatibility and viability with the human body.

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 micro-reaction technologies, 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 materials

Objectives are: to expand the performance characteristics (e.g. strength, temperature resistance, toughness) while ensuring environmentally friendly materials and production processes; to improve safety and reliability by understanding deterioration and failure mechanisms (e.g. wear, corrosion). RTD through innovative approaches should focus on expanding the limits of advanced materials (such as metals,alloys, ceramics, polymers), advanced construction materials, metal-matrix composites, ceramic or polymer matrix composites. Attention should also be given to the processing and recyclability of those new materials[11], considering the above mentioned objectives.

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[11] *Sustainable use and processing of materials has a major relevance to support the key actions, in particular “innovative products, processes and organisation”.*

GENERIC ACTIVITY 1B: NEW AND IMPROVED MATERIALS AND PRODUCTION TECHNOLOGIES IN THE STEEL FIELD

RATIONALE, SOCIO ECONOMIC AND RESEARCH OBJECTIVES

Through medium- and long-term multi-disciplinary and multi-sectorial reasearch, 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:

Innovative, value added, cost-effective, flexible and environmental-friendly production routes are aimed at, with on-line, real-time analysis and measurements for improved process control and closed-loop processing. Research in coke making for metallurgical reactors and up grading of iron and steel making by-products can also be addressed.

5.6 Steel casting, rolling and downstream treatment

Compact, flexible, clean, energy- and cost-effective integrated 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, welding), "de-materialisation", life-cycle approach and eco-design.

STRATEGY AND PRIORITIES FOR THE DECEMBER 2000 PERIODIC CALL

This will be the **last periodic call for Materials Technologies**; it will remain open until May 15, 2001. It will be open to all research objectives (as described here above: 5.1 to 5.7) for RTD projects, and Thematic networks and Concerted Actions.

For RTD projects, short-term, incremental projects are discouraged; preference will be given to proposals on emerging materials technologies with long-term objectives and very wide European impact. Amongst proposals of comparable merit, preference will be given to projects aiming at generic and multisectoral aspects.

It is expected that up to twenty five (25) Mio EUROs (out of the budget of 65 Mio Euros) might be allocated to high quality research projects on nano-technologies[12].

* * *

- Proposers are informed that a similar call is organised by the National Science Foundation (NSF - USA – cf. http://www.nsf.gov/). If appropriate joint proposals can therefore be submitted.
- Where appropriate and within the priorities covered by the call, projects involving the use of high capacity computing, networking, data sharing and data-storage are encouraged. Examples of applications are modelling and simulation in the field of materials processing as well as tools that allow reliable, secure, complete and fast access to materials data. The use of next generation ICT is also encouraged to improve the performance and management of research.

[12] RTD proposals can be also submitted to the IST and Quality of Life programmes depending on how proposal objectives fits with the goals of those programmes. Moreover, proposals on the mobility of researchers in nano-technologies (Research training networks and Marie Curie Fellowships) can be submitted through the IHP programme. For further information, please refer to the respective work programmes and information documents.

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[13] for Measurement and Testing

Socio-economic objective / Research objective	**Standardisation**	**Anti-fraud**	**Quality**
Instrumentation	Not foreseen 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
CRMs	6.3.1 EOI+Dedicated call	6.3.2 EOI+Dedicated call	6.3.3 EOI+Dedicated call

(*) Anti-fraud projects addressing at the same time and in a balanced way objectives 6.1.2 and 6.2.2 may be submitted to the periodic call covering 6.1.2.

[13] 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.

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, including sensors, 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[14].
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[15] (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. 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.

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[14] 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.

[15] A list of New Approach directives can be found in http://www.newapproach.org

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 PRORITIES FOR THE DECEMBER 2000 PERIODIC CALL[16]

All research objectives will be open for Thematic Network and Concerted Action proposals. For RTD, demonstration and combined projects, the call will be open for objectives 6.1.2, 6.1.3 and 6.2.3. Proposals covering at the same time, and in a balanced way, objectives 6.1.2 and 6.2.2 can also be submitted to this call covering 6.1.2.

STRATEGY AND PRIORITIES FOR THE JUNE 2001 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.

* * *

[16] Research objectives not covered by periodic calls are covered by the call for Expressions of Interest (EoI), which remains open until April 30, 2001, see *Roadmap*, table F.4.

Where applicable and within the RTD priorities covered by the call, applicants are encouraged to extensively take advantage of the tools offered by ICT, ranging from the creation of websites, intranets and extranets to the digital collaboration, sharing / accessing remote databases, and grid concept as a new tools for handling, computing and solving complex application problems.

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 as emphasised in the Commission's communication "Towards a European Research Area" 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

A virtual institute is defined as a new capability that is created by linking geographically scattered complementary research and industrial expertise in order to rapidly transfer and implement research results into (primarily) industrial applications. The setting up of virtual institutes represents a new concept and the created structures can be understood as knowledge based, market orientated networks. After the setting up period, the virtual institute should become an independent and self-financing legal entity, carrying out services for European customers. The access threshold should be kept as low as possible, to stimulate customers to benefit from the facilities, know-how, and technologies available in the virtual institute. The virtual institutes are encouraged to make intensive use of the new advanced ICT tools.

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.[17]

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.

STRATEGY AND PRIORITIES

The call for expressions of interest remains open until April 30, 2001. Priority will be given to topics related to objectives 7.2, 7.3 and 7.4.

For all the activities covered, applicants are encouraged to extensively take advantage of the tools offered by advanced ICT, ranging from the creation of websites, intranets and extranets to the digital collaboration, sharing / accessing remote databases, and grid concept as new tools for handling, computing and solving complex application problems.

[17] Thus, the creation of databases is not supported under this activity.

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 Measurement & Testing RTD objectives not covered by the periodic calls (see table C-1) and 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). Dedicated calls published for those objectives are based solely on the results of the periodic evaluations of the Expressions of Interest.

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.

Web address for Growth calls for proposals: http://www.cordis.lu/growth/src/callmain.htm

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.

Web address for SME specific measures: http://www.cordis.lu/sme/home.html

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").

Web address for Marie Curie fellowships: http://www.cordis.lu/improving/src/hp_mcf_intro.htm

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 - web address: http://www.cordis.lu/growth/src/library.htm).

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.

Guidance notes are available from the Growth document library at the web address :
http://www.cordis.lu/growth/src/library.htm

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.

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 [18] of RTD results, aimed at the broad user community, notably SMEs. They also cover support to scientific and

[18] 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

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[19] 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 are encouraged in the following areas:

- Development and diffusion of technology/innovation management methods in Europe in specific sectoral or cross-sectoral areas
- Investigation of needs for industrial standards and related research in support of the deployment of new technologies
- Investigation of the applicability of the New Approach principle to new industrial sectors
- Assessment of specific Intellectual Property Right, ethical and regulatory issues affecting the exploitation of new technologies
- Investigation of obstacles and good practices regarding the development and deployment of technologies contributing to more sustainable production/consumption in specific sectors
- Investigation of measures to increase the co-operation between regulatory authorities
- Actions to promote synergy and enhancement of co-ordination between programme activities as well as between national activities in Member States, Associated States and where appropriate, other countries (in particular in the context of S&T co-operation agreements) in specific areas of strategic importance
- Evaluation of socio-economic impact of EU projects in specific areas of strategic importance in Europe, including the development of appropriate methodologies.

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.

NOTE ON THE E-EUROPE ACTION PLAN

The Communication “Towards a European Research Area” points out the need to better use broadband electronic networks for research and to ensure the progressive establishment of digital co-operation. The e-Europe action plan launched by the European Commission in

[19] 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. Recourse to external experts will be based on calls for candidates. Exceptionally, unsolicited applications for a subsidy may also be supported.

December 1999 and adopted at the European Council in Feira calls for the exploitation of the potential of Information and Communication Technologies (ICT) resources in the context of the specific programmes.

Applicants in the next calls for proposals are therefore encouraged to extensively use new opportunities offered by ICT in performing, managing and networking RTD activities.

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.

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*" (web address: http://www.cordis.lu/inco2/). 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 (web address: http://www.cordis.lu/innovation-smes/), 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»* (web address: http://www.cordis.lu/improving/) 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** (home page: http://www.jrc.org) will be developed, where appropriate, in particular in areas related to materials research, fight against fraud and **Certified Reference Materials** (CRMs). (IRMM home page: http://www.irmm.jrc.be/)

F. ROAD MAP

This section presents a *road map* for the execution of the Programme[20]. The tables given in this section present indicative budgets, dates and priorities for the various calls for proposals for the Programme, as currently planned.

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%) and EUR 18 million for calls for tenders.
(3) An additional ~6% to be added corresponding to the contribution from 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 (Meuros)
1	*16 March 1999*	*15 June 1999*	***CALL CLOSED*** *(see March 1999 edition of the work programme for details of objectives covered)*	*713.5*
2	*15 Dec. 1999*	*31 March 2000*	***CALL CLOSED*** *(see December 1999 edition of the work programme for details of objectives covered)*	*589*
3	*2 June 2000*	*29 September 2000*	***CALL CLOSED*** *(see December 1999 edition of the work programme for details of objectives covered)*	*260*
4	*15 Dec. 2000*	*15 March 2001 (KA2, KA3, M&T); 30 March 2001 (KA4); 15 May 2001 (KA1, Mat.)*	*See sections corresponding to the relevant Key / Generic Actions of this work programme (see also summary table F.5)*	*567.5*
5	*1 June 2001*	*17 September 2001*	*See sections corresponding to the relevant Key / Generic Actions of this work programme (see also summary table F.6)*	*143*

20 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.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 *(2)*	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 and Thematic Networks)		16 March 1999 / 15 Sept 2000	15/06/1999, 15/12/1999, 01/04/2000, 15/09/2000	30
		... *(3)* / 15 Sept 2001	15/04/2001, 15/09/2001	
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 the Associated States.
(2) proposers who intend to prepare a proposal for a periodic call should carefully check if they will be able to submit before the closing date of that call
(3) a new call will be published

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 (call closed) 14/4/2000-15/9/2000 (call closed) 13/10/2000-15/3/2001 15/10/2001-15/3/2002	4 10 11 11 10.7
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 (call closed) 14/4/2000-15/9/2000 (call closed) 13/10/2000-15/3/2001 15/10/2001-15/3/2002	2 8 6 14 7

(*) A dedicated call targeting urgent needs in the area of food safety may also be published during 2001.

Table F.5 Priorities and indicative budgets for the December 2000 Periodic Call

	RTD areas and priorities for the December 2000 periodic call	***Indicative budget (MEuro)***
KA 1	For all types of projects: 1.5 TRA "*products - services*": evolutionary value-added and resource-saving products-services 1.6 TRA "*machines*": new generation of production equipment and systems for manufacturing 1.7 TRA "*extended enterprise*": the knowledge based extended manufacturing enterprise 1.8 TRA "*modern factory"*: customer-oriented, agile & towards zero-waste production 1.9 TRA "*infrastructures*": safe, sustainable and cost-effective construction	*190*
KA 2	Targeted actions: CIVITAS and GALILEO	*45*
KA 3	For Thematic Networks and Concerted Actions: all objectives. For RTD, demonstration and combined projects: CLOSED	*2,5*
KA 4	For Thematic Networks and Concerted Actions: all objectives. For RTD, demonstration and combined projects: 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: 4.9 TP 5: Power-optimised aircraft 4.11 TP 7: Friendly aircraft cabin environment 4.12 TP 8: Advanced wing configuration	*230*
MAT	For Thematic Networks and Concerted Actions: all objectives. For RTD projects: 5.1: Cross-cutting generic materials technologies 5.2: Advanced functional materials 5.3: Sustainable chemistry 5.4: Expanding the limits and durability of new materials 5.5: Iron and steel production 5.6: Steel casting, rolling and downstream treatment 5.7: Steel Utilisation	*65* *(of which up to 25 for nano-technologies)*
M&T	For Thematic Networks and Concerted Actions: All objectives For RTD, demonstration and combined projects: 6.1.2 Sensors, screening systems and instruments for the fight against fraud 6.1.3 Instrumentation for improvement of quality 6.2.3 Measurement and testing methodologies in support of quality	*35*
TOTAL		*567.5*

Table F.6 Priorities and indicative budgets for the June 2001 Periodic Call

	RTD areas and priorities for the June 2001 periodic call	***Indicative budget of call (Meuro)***
KA 1	**Closed**	*0*
KA 2	Targeted action SMART RAIL and priorities on: 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	*39*
KA 3	For Thematic Networks and Concerted Actions: all objectives. For RTD, demonstration and combined projects: 3.1 Critical technologies for road and rail transport" 3.2 Critical marine technologies" TP1 New land transport vehicle concepts; Enhanced systems efficiency TP6 Efficient interoperability and transhipment	*98*
KA 4	For Thematic Networks and Concerted Actions: all objectives. For RTD, demonstration and combined projects: CLOSED	*4*
MAT	**Closed**	*0*
M&T	For Thematic Networks and Concerted Actions: all objectives. For RTD, demonstration and combined projects: CLOSED	*2*
TOTAL		143

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	*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, partnership & management		Quality of approach for project execution and management
		Quality of partnership, including efficient involvement of users
		Appropriateness of financial aspects and RTD related resources
Stimulating Community Added Value		Contribution to solving problems with a European dimension
		Support to EU policies as well as to norms, standards & reglementations
		European added value of the consortium / Complementarity / transnationality of consortium
Answering to societal needs		Implication on quality of life, health and safety
		Implication on employment prospects as well as on training, skill use and skill development
		Implication on environment & resources
Economic development and S&T perspectives		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**.*
EESD	*Energy, Environment and Sustainable Development programme (web address: http://www.cordis.lu/eesd/home.html)*
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. (Web address: http://www3.eureka.be/Home/)*
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.*
High Level Experts Group	*The role of the High Level Experts Group is to provide the Commission with independent advice concerning the content and direction of research work to be carried out under the **Generic activity Measurements and Testing**.*
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.*
ICT	*Information and Communication Technologies*
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.*
IST	*Information Society Technologies Programme (web address: http://www.cordis.lu/ist/)*
JRC	*Joint Research Centre of the European Commission. (web address: http://www.jrc.org)*
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	*A new capability that is created by linking geographically scattered complementary research and industrial elements in order to rapidly transfer and implement research results into (primarily) industrial applications.*
Work programme	*A description of the research objectives and priorities required to achieve the strategic objectives of a **Specific Programme**.*