Thematic Priority
1.4 Aeronautics and Space

WORK PROGRAMME
2002-2006

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1. AERONAUTICS

1.1 Introduction

World aeronautics is entering a new age of aviation –the age of sustainable growth– characterised by the need of more affordable, cleaner, quieter, safer and more secure air travel. European aeronautics is committed to play a prime role in shaping aviation for this new age. Research and technology development will be essential in responding to this challenge.

The aeronautics research work programme of the thematic priority "Aeronautics and Space" is planned in accordance with the relevant part of the Specific Programme 'Integrating and Strengthening the European Research Area' and with the Strategic Research Agenda[1] prepared by the Advisory Council for Aeronautics Research in Europe (ACARE)[2]. The Strategic Research Agenda has set out the directions for European research in the next decades towards fulfilling the ambition for the future of aeronautics established in the Report "European Aeronautics – a Vision for 2020"[3], as well as in the White Paper 'European transport policy for 2010 : time to decide', adopted by the Commission in September 2001[4].

Consequently, the aeronautics research work programme is set against the two top-level objectives identified in the Strategic Research Agenda and the Vision 2020 Report:

- To meet society's needs for a more efficient, safer and environmentally friendly air transport.

- To win global leadership for European aeronautics, with a competitive supply chain, including small and medium size enterprises.

1.2 Objectives, Structure and Overall Approach

Scope

The research work programme focuses on the aircraft vehicle, including its systems and components, for commercial transport (comprising regional and business aircraft as well as rotorcraft). With regard to the part of the work programme related to air traffic management (4th research area), both the on-board as well as the ground-based elements are included, in a "kerb to kerb" context.

Structure

The work programme is structured in four research areas that inter-alia will contribute to achieving the two top-level objectives. They respond to the major challenges identified in the Strategic Research Agenda for European aeronautics:

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1 ACARE. Strategic Research Agenda. Executive Summary, Volume 1, Volume 2. Published on October 2002. See www.acare4europe.org

2 See www.acare4europe.org

3 Report of the Group of Personalities established by Commissioner Busquin. Published in January 2001. ISBN 92-894-0559-7.

4 White Paper 'European transport policy for 2010 : time to decide', COM (2001) 370

- Research for **strengthening the competitiveness** of the manufacturing industry in the global market, responding to the challenge of delivering more economical, performant and better quality products and services.
- Research for **improving the environmental impact with regard to emissions and noise**, responding to the challenge of meeting the society's demand for sustainable transport.
- Research for **improving aircraft safety and security**, responding to the challenge of ensuring that irrespective of the growth of air traffic, air transportation will be even safer than before and the aircraft secured from hostile actions while in flight.
- Research for **increasing the operational capacity and safety of the air transport system**, responding to the challenge that airspace and airport utilisation will be able to accommodate rising traffic without undue delays, while preserving safety through a seamlessly integrated European air traffic management system, which would facilitate the achievement of the "Single European Sky" initiative.

Overall approach

The work programme comprises of the spectrum of research and technology development from basic research to technology validation. However, in line with ACARE recommendations, the emphasis is placed on:

- **Open upstream research** to further improve the technology base and develop innovative concepts and breakthrough technologies to pave the way for a step change in aviation. The relevant technical domains and objectives are described in Section 1.3.1. It is likely that these will be addressed by means of Specific Targeted Research Projects, however it is expected that as the implementation of the Thematic Priority progresses there will be an increased utilisation of the new instruments adopted in the 6th Framework Programme, particularly Integrated Projects.
- **Focused downstream research** integrating a critical mass of technical fields, activities and resources needed to achieve ambitious objectives. The projects will normally encompass the integration of technologies across a number of topics and will include their validation in large-scale test beds or simulators. They will preferably be implemented by means of the new instruments (Integrated Projects and Networks of Excellence). They are described in Section 1.3.2.

Participation of Small and Medium Size Enterprises

The aeronautics supply chain including small and medium size enterprises will have an important role to play in integrating and structuring the technological and scientific base. Their participation in Specific Targeted Research Projects, Integrated Projects and Networks of Excellence is encouraged. Specific measures to stimulate their participation will be implemented throughout the implementation of the Programme by means of Specific Support Actions, continuing the effort initiated in Framework Programme 5. There are technical domains such as design, manufacture, maintenance (see Section 1.3.1) and the relevant Integrated Projects (see Section 1.3.2) which will represent a concrete opportunity for their participation.

1.3 Technical Content

1.3.1 Open Upstream Research

In the following sections the objectives and technical content of the four research areas are described. Each research area includes a number of technical domains that will contribute to the achievement of its objectives. Under each technical domain, there are a number of research topics proposed for open upstream research, preferably by means of Specific Targeted Research Projects. Project proposals can address one or more research topics, where appropriate.

The proposed technical domains and research topics will likely be valid throughout the timeframe of the Specific Programme. However some new topics or domains could be added for further Calls for proposals or some of the present ones could be discarded.
The objectives indicated for the four research areas correspond to a medium term (5 to 10 years) or a long-term (15 to 20 years) perspective. They all take as a reference the present state-of-the-art.

1.3.1.1 Strengthening competitiveness

Objectives

1. To reduce aircraft development costs by 20% and 50% in the short and long term respectively.

2. To reduce aircraft operating costs by 20% and 50% in the short and long term respectively, through improved aircraft performance and reduction in maintenance costs and other direct operating costs.

3. To increase passenger choice with regard to travel costs, time to destination, on-board services and comfort.

Technical Content

In order to achieve the objectives, research should concentrate on the following technical domains and research topics:

a) Integrated design and product development

Advanced modelling and simulation tools, including virtual reality in support of virtual prototyping; knowledge-based design tools and methods; systems engineering methods, tools and processes; integrated, life-cycle based product definition, including modelling and simulation, in the multi-site enterprise.

b) Manufacturing

Flexible tooling; automated processes and assembly; advanced manufacturing methods to reduce recurring and non-recurring costs while supporting volume flexibility; in-process inspection and test techniques and knowledge-based diagnosis; processes with low or zero harmful emissions and harmful materials.

c) Maintenance

Continuous health and usage monitoring; smart maintenance systems including self-inspection and self-repair capabilities; methods for improved application of maintenance systems; methods and systems in support of failure tolerance; structural

integrity of ageing aircraft; maintenance processes with low or zero harmful emissions.

d) Aerodynamics

Advanced analytical and experimental tools; advanced and novel concepts and technologies for cost-effective aircraft aerodynamic design including adaptive wing, high lift design and airframe/ power-plant integration; concepts, technologies and systems for drag reduction.

e) Structural weight reduction

Advanced analytical and experimental tools; advanced structural concepts for increased and optimised use of new metallic materials, composite materials and metal laminates in primary structures; concepts, technologies and systems for application of "smart" materials, micro- and nano-technologies, and realisation of "smart structures"; aeroelasticity.

f) Equipment weight and power take-up reduction

Technologies and systems for a more-electric aircraft; landing gear and braking systems; integrated modular avionics technologies; advanced displays and sensors for flight deck related functions.

g) Propulsion

(See .1.3.1.2 a)

h) Crew workload reduction

Technologies for the automation of crew tasks with respect to flying and interfacing with the air traffic management system (pilot in supervisory role).

i) Cabin environment

Concepts, technologies and systems to suppress noise overall as well as for each passenger; techniques to reduce vibration and other unwanted dynamics effects of flight (ride comfort); technologies and systems for enhanced, healthier cabin environment including temperature, pressure, airflow and humidity.

j) On-board passenger services

Technologies to support the introduction and the on-board integration of office-like and home-like services for the passenger incorporating state-of-the-art communications and information technologies.

k) New aircraft concepts and breakthrough technologies

Novel concepts that represent a step change with respect to current conventional aircraft configurations and have the potential to deliver significant improvements in:

- Subsonic flight.
- Transonic/supersonic flight.
- Unconventional take-off and landing.

Breakthrough technologies in the following domains that will facilitate the introduction of such new aircraft concepts in the fields of:

- Propulsion and power.
- Airframe.
- Systems.
- Experimentation and simulation.
- Aircraft operation.

1.3.1.2 Improving environmental impact with regard to emissions and noise

Objectives

1. To reduce CO_2 emissions (and thus fuel consumption) by 50% per passenger-kilometre in the long-term through improved engine efficiency as well as efficiency of the aircraft and its operation.
2. To reduce NO_X emissions by 80% in the Landing and Take-off cycle with respect to the ICAO standard and to an Emissions Index of NOx of 5 gr. per kg. of fuel burnt in cruise in the long term (reduction to 10gr. per kg. of fuel burnt in the short term), and other gaseous emissions and particulates.
3. To reduce unburnt hydrocarbons and CO emissions by 50% in the long term to improve air quality at airports.
4. To reduce external noise by 4-5 dB and by 10 dB per operation in the short and long-term respectively. For rotorcraft, the objective is to reduce the noise footprint area by 50% and the external noise by 6 dB and 10 dB in the short and long-term.
5. To reduce the environmental impact of the manufacture and maintenance of aircraft and its components.

Technical Content

In order to achieve the objectives, research should concentrate on the following technical domains and research topics:

a) Propulsion

Concepts and technologies for improving engine thermal efficiency and reducing secondary air losses; concepts and technologies for improving engine propulsive efficiency; techniques and concepts to support the design of "smart" engine control systems; new and improved engine architectures and cycles; application of medium and high-temperature materials; concepts and techniques that will enable low-emissions flight procedures; investigation of the potential of alternative fuels including environmental effects (liquid hydrogen, biofuels and synthetic fuels) and the technologies necessary for their application; development of the technical basis for defining an aircraft efficiency index that accounts for the emissions produced.

b) Aerodynamics

(See 1.3.1.1 d)

c) Structural weight reduction

(See 1.3.1.1 e)

d) Equipment weight and power take-up reduction

(See 1.3.1.1 f)

e) Combustion

Tools for modelling and measurement of the composition of engine exhaust gaseous emissions and their impact on local air quality; analytical and experimental techniques for modelling the kinetics of combustion and related computational fluid dynamics; technologies for advanced combustor and injector systems with regard to NO_X, soot and unburned hydrocarbon; development of the technical basis for defining an engine emissions index that accounts for the whole flight cycle.

f) External noise

Concepts and technologies for reduction of noise at the source (engine and airframe) including adaptive and electronically assisted active methods; new aircraft architectures to provide low-noise engine/nacelle airframe integration; advanced rotor, mechanical transmissions and blade designs for rotorcraft; concepts and techniques that will enable low-noise flight procedures (fixed-wing and rotorcraft) to minimise noise in terminal areas; techniques for improved understanding of the impact of aircraft noise in the community.

g) Manufacturing

(See 1.3.1.1 b)

h) Maintenance

(See 1.3.1.1 c)

i) New aircraft concepts and breakthrough technologies

(See 1.3.1.1 k)

1.3.1.3 Improving aircraft safety and security

Objectives

1. To reduce the accident rate by 50% and 80% in the short and long-term respectively.
2. To obtain a 100% capability for avoiding or recovering from human errors.
3. To mitigate the consequences of survivable aircraft accidents.
4. To reduce significantly hazards of on-board hostile actions while in flight.

Technical Content

In order to achieve the objectives, research should concentrate on the following technical domains and research topics:

a) Human-machine interface

Techniques for improved understanding of human-machine interaction and crew performance in the cockpit context; concepts and technologies to develop error-tolerant systems; concepts and technologies in support of a holistic approach to safety management, optimising the human/systems integration.

b) Accident prevention

On board technologies for prevention of controlled flight into terrain; technologies to enable a full and permanent automatic approach and landing in all weather; on board technologies for protection against atmospheric hazards, such as windshear, wake vortex, clear air turbulence, icing; on board technologies for in-flight and on-ground collision avoidance; novel concepts and technologies enabling aircraft self separation assurance; techniques enabling the development of improved aviation safety metrics.

c) Accident survivability

Design techniques and structural concepts for improved protection against crash impacts and blast; design techniques and concepts for improved fire, heat and smoke protection, including aircraft evacuation procedures.

d) Airborne aircraft security

Concepts and techniques for disabling control of the passenger cabin and flight deck by hostile individuals; concepts and techniques, such as the extension of the functions

of ground collision avoidance systems, to protect flight trajectories against hostile interventions and avoid flight into protected areas; concepts and techniques enabling the safe automatic return to ground of aircraft in the event of hostile misuse.

e) New aircraft concepts and breakthrough technologies

(See 1.3.1.1 k)

1.3.1.4 Increasing the operational capacity and safety of the air transport system

A paradigm change in the way air traffic services are provided is required.

Research shall integrate collaborative decision making in a co-operative air and ground Air Traffic Management (ATM) end to end concept, validating through live trials in a complete ATM and Airport environment, whilst encouraging innovative research into a new paradigm supporting a more efficient Air Transport system. This takes into account and supports the achievement of the Single European Sky and Eurocontrol's ATM2000+ strategy. Objectives are:

1. *Improve today's safety levels* taking into account projected traffic levels, by providing better information to both the pilot and the controller on surrounding traffic;
2. Increase system capacity to safely handle three times more air movements by 2020 through an increased planning capability, coupled with a *progressive distribution of tasks and responsibilities* between the aircraft and the ground for separation, to satisfy projected traffic growth;
3. Improve on today's system efficiency and reliability, aiming to achieve an average maximum delay of one minute per flight, bearing in mind the optimum cost, performance, safety and capacity of the European Air Transport System;
4. Maximise airport operating capacity in *all weather conditions to support increasing traffic demand through improved systems to aid the controller and pilot.*

The proposed research combines human factors, safety and airport efficiency with harmonised (air & ground) validation methodologies providing for "implementation" decision-making, standardisation and regulatory frameworks, supported by business cases and safety assessments.

Technical Content

New generation ATM:

a) Co-operative Air Traffic Management

Concepts and technologies to optimise task distribution between aircraft and ground with a medium term perspective, including airborne separation assurance system applications; concepts and technologies to reduce uncertainty in the air traffic management system; to integrate air traffic flow management, airports, air traffic control centres, aircraft and airline operating centres in a strategic and dynamic layered planning system based on 4D-trajectory information, and defining and using collaborative decision making principles with related support systems and applications; associated system performance requirements, communication infrastructure and system wide information management; migration strategies for the

implementation of new co-operative air traffic management including technical and socio-economic aspects.

b) Advanced Airborne System Applications

Definition and operational validation of medium to long-term airborne separation assurance systems (ASAS) for optimising the task distribution between aircraft and ground including their procedures; enhancement of flight data processing, flight management system and decision support tools for controllers and pilots; concepts and technologies for automation of operations through the flight management system to optimise the ASAS benefits; applications based on GNSS enabled 4D flight trajectory information; integration of on-board communication, navigation and surveillance capabilities and advanced flight management and display systems to further optimise co-operative air traffic management operations.

c) Reduced Separation Minima

Reappraisal and revision of current ATC separation minima and the development, analysis and modelling of new air to air and surface (including manoeuvring areas, runways and A-SMGCS) separation minima based on advanced communication, navigation and surveillance systems, in co-ordination with C-ATM, AAA and A-SMGCS. Development of safety, efficiency and economic cases to support proposed changes to new and revised International (ICAO) standards **The Airport of the future**:

d) Airport Efficiency (AFF)

Definition of concepts and technologies to reduce passenger waiting time and improve the efficiency of land and airside aircraft turn-around from touchdown to take off which will use Collaborative Decision Making principles in conjunction with Co-operative ATM. Development of a common information management system. Realisation of a common platform and shared database exploiting and linking experimental and analysis tools in parallel (building on the 5FP) to permit the evaluation of different airport parameters through the simulation and analysis of both air and land side airport operations addressing safety, efficiency, capacity and environmental aspects. Validation of results through real and representative examples using actual data, and supporting extrapolation for future expansion. Extension of knowledge and best practice in this domain.

e) Advanced Surface Movement Guidance and Control System (A-SMGCS)

Development of concepts to efficiently use existing runway and taxiway infrastructures whilst harmonising European airport operational environments. Live trials shall exploit the development of an overall surveillance system and equipage of test aircraft with experimental systems and optimisation of existing tools and surveillance systems, whilst minimising the need for additional equipment. Concept development and system upgrade to integrate planning and routing functions to expedite the movement of aircraft between the runway and stand. Integrating on--board guidance equipment providing flight crew with traffic information, airport configuration, controller instructions and safety nets.

f) Technologies for Advanced Approach and Landing (TAL)

Development of all weather precision approach and landing capabilities and procedures using augmented GNSS and decision support tools to provide pilots with new ways to safely manage the aircraft approach and landing profiles. Development

of a new approach and landing concepts with associated operational procedures and technologies to optimise efficiency and minimise environmental impact.

Innovative Research:

g) Innovative Air Traffic Management Research

Novel concepts and technologies with a fresh perspective into a new air traffic management paradigm including all types of aircraft in support of a more efficient air transport system.

h) Co-ordination Action:

To ensure the management and dissemination of knowledge across work areas described under section 1.3.1.4, including external dissemination, addressing safety, human factors and validation. This will include safety enhancement issues, the development of assessment tools of the safety level of the ATM system and assessment of safety regulation implications of proposed concepts and technologies in the future ATM system. Defining common Human Machine Interaction principles and addressing stakeholder usability and acceptance issues of the proposed concepts and technologies. The action exploits and expands on 5th FP validation methodologies and manage validation knowledge whilst seeking to harmonise and standardise airborne, airport and ATC validation methodologies, including live trials.

1.3.2 Integrated Focused Downstream Research

1.3.2.1 Integrated focused research actions for the Calls for Proposals with 2003 deadline

1.3.2.1.A Research topics to be addressed preferably by means of Integrated Projects

In relation to the research area *Strengthening Competitiveness*:

1 Integrated, intelligent, multidisciplinary design in the extended enterprise.

Objectives: The work should aim at improving industry's ability to competitively develop new products and reduce development time and costs. The objective is to optimise the design decision process with a global and explicit vision of the product at any stage of its life cycle (virtual product) as well as to provide integrated means to share the virtual product across the supply chain (extended enterprise).

Scope: Activities should include process engineering, systems engineering, knowledge based engineering, multidisciplinary design and optimisation, modelling and simulation in the extended enterprise, virtual environment, design supportability and maintainability, etc. The different processes and technologies should be integrated and validated through full-scale simulation of real case engineering and business scenarios.

Expected outcome: The project should deliver concrete steps towards a significant reduction in product development costs and time and methods for an effective multi-company and multi-culture design process including integration of the supply chain in product design and development.

2 Maintenance including smart health monitoring, damage detection and maintenance-free concept.

Objectives: The work should aim at reducing aircraft direct operating cost, increasing aircraft dispatch reliability and increasing safety by improved methods of maintenance that will include greater degree of automatism and 'smartness' in the monitoring and reparation.

Scope: Activities should range from upstream research to technology validation of multidisciplinary approaches such as: application of novel sensor technologies and signal processing techniques, health monitoring technologies detecting the through-life evolution of the monitored systems or components, smart maintenance systems including auto-diagnosis and self-repair capabilities. The different techniques and technologies should be validated through model and, where beneficial, full-scale tests in a test aircraft.

Expected outcome: Validation of the proposed technical solutions and proof of their applicability in a real environment.

3 Integrated, intelligent, flexible manufacture.

Objectives: The work should aim at improving industry's ability to competitively develop new products and reduce development time and costs. The objective is to develop and demonstrate technologies for short-lead time, low-volume manufacture and establish coherent integrated design and validation procedures that enable accelerating product development and evolution cycles without compromising product conformance and certification.

Scope: Activities should include work on flexible prototyping, digital testing and manufacturing, reconfigurable tooling and flexible manufacturing processes, test and validation methodology, design amendment procedures, quality acceptance standards and documentation. The different processes and technologies should be integrated and validated into a prototype system.

Expected outcome: The project should deliver an integrated system for agile design, manufacture and validation, which support rapid product development and process and material improvement throughout product lifecycle.

In relation to the research area *Improving Environmental Impact with regard to Emissions and Noise:*

4 Multidisciplinary approach to an environmentally acceptable supersonic transport.

Objectives: The work should aim at overcoming the environmental constraints that could stop the industrial development and production of economically viable commercial supersonic transport aircraft.

Scope: Activities should address the issues of noise reduction, pollution and efficiency, by developing and pooling advances in structures, propulsion and aerodynamics through multi-disciplinary optimisation. Key technologies should be integrated and validated through model and full-scale tests of components. It is expected that the experience and results of both National and EU projects will be exploited in this Integrated Project.

Expected outcome: acceptable pollutant emissions, particularly in the high atmosphere (<~ 5g NOX/kg fuel burnt); emissions at landing and take-off comparable to those of a subsonic aircraft of the same generation; substantial reduction of external noise (-8dB cumulative margin re ICAO Chapter 4), particularly at take-off, and reduction of the sonic boom signature over land.

5 Integration of technologies in support of a passenger and environmentally friendly helicopter.

Objectives: The work should aim at enhancing the environmental friendliness and public acceptance of helicopters by reducing external noise emission, by lowering gas exhaust and by decreasing cabin noise and vibration levels.

Scope: Activities should include optimised noise abatement operational procedures, noise optimised engine installation, active blade control through distributed optimal blade twist and camber and active control of cabin structures. The different technologies should be validated through model and full-scale tests.

Expected outcome: Substantial reduction of external noise (10 dB below current ICAO/JAA rules), cabin noise (below 70 dB(A)), cabin vibrations (below 0.05 g) and fuel consumption (by 20%).

In relation to the research area *Improving Aircraft Safety and Security:*

6 Airborne technologies integration for improved flight hazard protection and all-weather operation.

Objectives: The work should aim at increasing the safety of air transport by reducing the rate of fatal accidents in all weather operation during all phases of flight.

Scope: Activities should include integration and validation of an airborne system able to protect the aircraft from all flight hazards such as controlled flight into terrain, air collision, wake vortex, windshear, clear air turbulence, icing, cross-winds and adverse weather at and around airports. The validation activity should include in flight testing of integrated test platforms. Work should also include human factors issues such as man-machine interface, including enhanced display systems and the integration of sensor technologies using sensor-fusion techniques.

Expected outcome: Validation of the proposed technical solutions and proof of their applicability in solving the stated issues.

7 Security of aircraft operation

Objectives: The work should aim at enhancing the security of the air transport system by reducing the threat of a security breach and the impact of hostile action should any be taken.

Scope: Activities should include work on ways to hinder access of hostile persons and weapons to the aircraft cockpit as well as considering ways to deal with a hijack situation, such as remote control of aircraft or fully autonomous, aircraft centred fly-home capability. The work should include identifying weaknesses in the present system and definition of the main characteristics of required solutions and actions. The best adapted technologies and the most promising future ones

should then be developed, simulated and then tested in a real environment. Work should also include contribution to relevant international standards.

Expected outcome: Validation of the proposed technical solutions and poof of their applicability in solving the stated issues.

In relation to the research area *increasing the operational capacity and safety of the air transport system:*

8 Advanced approach and landing

Objectives*:* The work should aim at developing technologies and operational procedures to improve safety and capacity and reduce environmental impact of operation by optimising the approach and landing phases of flight.

Scope*:* Activities should include new procedures and technical applications needed to increase aircraft movement throughput and also address environmental issues. The research should exploit airborne surveillance, satellite navigation and 4-dimensional trajectories to implement flexible procedures for approach and landing to support aircraft continuous descent profiles and curved approaches to improve efficiency and reduce the environmental impact of aircraft in the vicinity of airports. Focus should be on the development of procedures for precision approach and landing capabilities up to CAT III, using ground based augmented global navigation satellite systems, including decision support tools to provide flight crew with new ways to safely and efficiently manage approach and landing profiles. Attention should be given to the development of specific procedures for rotorcraft. The research is interrelated with the operational concepts and technologies developed in advanced surface movement guidance and control systems, and co-operative air traffic management research. Validation should include analysis, modelling, simulation and trials in a full air and ground operational environment including a significant number of suitably equipped aircraft, including rotorcraft, involving human factors, safety, environment and efficiency research.

Expected outcome*:* Output will be a validated set of approach and landing procedures, decision support systems and technologies achievable from 2010 as one part of a first step to the 2020 vision.

9 Co-operative ATM (C-ATM) (Phase one will be open under the first call and phase two under the second call)

Objectives: Co-operative Air Traffic Management (C-ATM) will optimise task distribution between actors, improve decision making through Collaborative Decision Making principles and the development of an information network, reduce uncertainty, increase safety and create additional capacity.

Scope: Co-operative ATM targets the capacity problems of Air Traffic Management specifically in the domains of airspace and procedures, diversity of systems, air and ground human constraints. This necessarily includes the impact on safety, efficiency and the environment. C-ATM is the integration in a new airspace and route structure of Air Traffic Flow Management, Airports, Air Traffic Control Centres, Aircraft and Airline Operating Centres in a strategic and dynamic layered planning and tactical control system using distributed information, 4D trajectories and Airborne Separation Assurance Systems. This is achieved through

enhancement, integration and interoperability of on board systems (navigation, management, communication and display) and ground systems (flight data, processing surveillance, communication and decision support tools) using ground and air data links. Operational procedures, Collaborative Decision Making principles and enabling ATM technologies will be developed and evaluated, and task distribution will be optimised between actors to improve decision-making and reduce uncertainty. This work should be co-ordinated with other ATM validation including advanced applications of airborne separation assurance (AAA); separation minima for the airborne component of the ATM/Airport system and Technologies for advanced approach and landing (TAL).

Three phases, launched in separate calls, are envisaged in an iterative development and validation process:

Phase One. Initiation: project planning, operational concept integration, initial validation preparation and modelling.

Subsequent phases – proposals for Phase one shall detail requirements specific to this phase. However a clear indication is also to be provided as to how the complete (integrated) research topic including the subsequent two phases will be developed:

Phase Two. Preliminary Development: concept validation and modelling, overall system design and system architecture. Preliminary system development, integration, testing and initial concept trials.

Phase Three. Integration and Final Trials: full concept and system development, integration, testing (including output from Reduced Separation Minima, A-SMGCS and AAA) and validation through live trials on multiple sites of the final version of C-ATM in the full air and ground operational environment.

The rules for international co-operation apply for aircraft and avionics manufacturers.

Expected outcome: A validated end to end, air/ground ATM concept and system achievable from 2010 as a first step to the 2020 vision. The research will also provide large-scale live trial research test beds and mechanisms to support transition, certification, qualification and decision making processes.

10 Advanced Surface Movement Guidance and Control System (A-SMGCS)
(Phase one will be open under the first call and phase two under the second call)

Objectives: The research should make the most efficient use of existing infrastructures by introducing new operational concepts and improving air traffic management at airport. A common set of requirements and operational procedures should be developed to ensure that different installations, although site customised, present a harmonised operational environment to flight crew. A European performance baseline should be defined.

Scope: The 5th FP has demonstrated the validity of the concept and provided pre-operational performance requirements. Results obtained at two midsize airports in Europe need to be further validated through extensive operational field trials focussing on each of the major A-SMGCS functions. One or two airports should

be selected as trials' platforms together with test aircraft equipped with experimental systems. This work should be co-ordinated with other ATM validation including reduced separation minima, C-ATM and TAL.

Two phases, launched in separate calls, are envisaged:

Phase One. Initial implementation and upgrade: implementation of the overall surveillance system for the functional and operational test areas, optimising the use of existing tools and systems and minimising the need for additional equipment. System upgrade to integrate the initial planning and routing functions to expedite the movement of aircraft between the runway and stand;

Subsequent phases – proposals for Phase one shall detail requirements specific to this phase. However a clear indication is also to be provided as to how the complete (integrated) research topic including the subsequent phase will be developed:

Phase Two. Full planning, routing and on-board guidance: full planning and routing functions and on-board guidance functions and equipment will be implemented, providing traffic information and airport configuration, controller instructions and safety nets.

Expected outcome: The A-SMGCS research supports the development of pre-operational system, concept integration and demonstration to achieve the proposed paradigm change. The research will validate the performance requirements necessary to operate safely in all weather conditions. The research will also provide the large-scale live trial research test beds and mechanisms to support certification and qualification processes in order to achieve the implementation of systems before 2008.

11 Airport Efficiency (AFF) (Phase one only will be open under the first call)

Objectives: Airport efficiency to reduce passenger waiting time is wholly dependent on both air and land-side operations. An aircraft requires a seamless system from touchdown until it departs again, which depends on efficient gate and airport terminal systems such as baggage handling, customs and passenger information.

Scope: Many existing simulation and analytical tools are able to evaluate the efficiency of the airside of an airport as well as others dedicated to the evaluation of the passenger terminal operations. However, none of the tools are able to evaluate both sides of airport operations, furthermore they do not address safety, efficiency, capacity and environmental aspects in an integrated way.

In the 5FP this theme has already been addressed for that part which concerns the realisation of a common database for different tools, and a common platform capable of exploiting most experimental tools have been provided; however, further research and development is required to be able to implement multiple and parallel instances of tools.

The work shall also co-ordinate and extend airport efficiency and best practice to improve dissemination of knowledge and results.

Two phases, launched in separate calls, are envisaged:

Phase One. Initial development and analysis: development of a common information management system and requirements for a common platform and shared database exploiting and linking experimental and analysis tools in parallel.

Subsequent phases – proposals for Phase one shall detail requirements specific to this phase. However a clear indication is also to be provided as to how the complete (integrated) research topic including the subsequent phase will be developed:

Phase Two. Final database and platform: realisation of the final common platform and shared database, simulation and analysis, validation of results through real and representative examples using actual data, extrapolation for future expansion.

Expected outcome: A pre-validation platform will be provided for the correlation of multiple tools, both for the airside and land-side (terminal part) of an airport. The platform will link different tools to assess the optimisation of safety, efficiency, capacity and environmental impact in an integrated way.

1.3.2.1.B Research topics to be addressed preferably by means of Networks of Excellence

In relation to the research area *Strengthening Competitiveness*:

12 Wind tunnel testing for aeronautical applications and related advanced measuring technologies.

Objectives: The work should aim at building a lasting relationship and inter-dependency between major large wind tunnels of Europe, in order to offer to researchers and to the aerospace industry a comprehensive and integrated set of services with full coverage of their possible needs.

Scope: Create and maintain a wind tunnel testing network of European dimension to offer better and extended services at reduced costs to all potential users (researchers and industry) by exploiting synergies between its members, sharing investment costs, and developing jointly advanced measuring and testing technologies as well as wind tunnel operational and management procedures.

Expected outcome: A management structure and a joint programme of activities such as research and development of test methods and technologies including measuring technologies, common test results processing, handling and reporting, formation of a joint knowledge base, exchange of information on best practices, exchange of personnel, information policy on wind tunnel testing and measuring technologies, future joint investment plans.

13 Integration of experimental and analytical research capacities for fixed wing aircraft.

Objectives: The aim is building a lasting relationship and inter-dependency between the fixed-wing related analytical and experimental research activities of the aeronautical research centres of Europe.

Scope: Create and maintain a centre of competence through the co-ordination of the main research activities in all key technology areas of fixed wing aircraft such as:

- Aerodynamics, flight physics, aero-acoustics
- Structures and materials application
- Safety and human factors
- Environmental aspects (emission, noise)
- Simulation and testing

Expected outcome: A management structure and a joint programme of activities such as the development of new numerical and analytical methods and technologies, common validation and test programmes. It should harmonise the handling of documentation and reporting, develop the formation of a common data base system, exchange of information on best practices and an enhanced exchange of personnel.

In relation to the research area *Improving Environmental Impact with regard to Emissions and Noise:*

14 Integration of research capacities on the environmental compatibility of aviation with regard to the impact of aircraft emissions.

Objectives: The work should aim at strengthening scientific/technical excellence through closer and lasting integration and co-ordination of the available research capabilities across Europe in the field of emissions reduction.

Scope: Create and maintain a centre of excellence to cover the relevant research activities related to the total air transportation system including the aircraft and its operation. Issues of local and regional air quality around airports should be addressed. The aspect of global atmospheric effects of aviation should be linked with relevant atmospheric research supported under thematic priority 1.6.3.

Key areas to be addressed are:

- Emissions of major and minor pollutants including soot and particulates
- Engine plume and near field including contrails
- Airport air quality and measures for green flights
- Alternative fuels based on renewable energy
- Scenarios for a sustainable air transport system

Expected outcome: A management structure and a joint programme of activities such as research on analytical and experimental methods, common test result processing, handling and reporting, formation of a joint knowledge base, exchange of information on best practices, exchange of personnel, information policy.

1.3.2.2 Integrated focused research actions for subsequent Calls for Proposals deadlines

The subjects for subsequent calls for proposals to be addressed preferably by means of Integrated Projects and Networks of Excellence will be identified in due time, taking

into account the recommendations of the Advisory Council for Aeronautics Research in Europe (ACARE)[5] and further developments of its Strategic Research Agenda[6].

In relation to the research area increasing the operational capacity and safety of the air transport system, subsequent calls will likely include:

Co-operative ATM (C-ATM) Phase Three

Advanced airborne system applications (AAA)

Airport Efficiency (AFF) Phase Two.

1.4 Links to other Research Topics

In relation to the research area *"increasing the operational capacity and safety of the air transport system"* research activities will support the "Single European Sky" and Eurocontrol's ATM2000+ Strategy as an integral step towards the implementation of a future European Air Traffic Management system in support of the vision "2020." This should be co-ordinated with research undertaken by Industry, Member States, European and International bodies. Attention should be given to building on previous and current RTD and TEN-T initiatives (e.g. Gate to Gate, NUP, MFF, MA-AFAS).

5 See www.acare4europe.org

6 ACARE. Strategic Research Agenda. Executive Summary, Volume 1, Volume 2. Published on October 2002. See www.acare4europe.org

1.5 Implementation Plan and Related Issues: Aeronautics

ROADMAP – Thematic priority 4 "Aeronautics and Space"

Type of Activity **Focussing and integrating Community research**		**Date of publication in OJ - Deadline for submitting proposals** **Indicative budget**				**Type of instrument** **Open in each call** **IP** – integrated project **NE** – network of excellence **STREP** – specific targeted research project **CA**: co-ordination activity **SSA -** specific support action
Thematic Priority	**Area**	**Call 1A**	**Continuous Call**	**Call 2A**	**Call 3A**	
Aeronautics	*1.Strengthening competitiveness* *2.Improving environmental impact with regard to emissions and noise* *3.Improving aircraft safety and security* *4.Increasing the operational capacity and safety of the air transport system*	Dec 2002 - March 2003 240 M€	Dec 2002 - March 2006 7 M€ (Only for SSA)	Dec 2003 - March 2004	Dec 2004 - March 2005	IP, NE, STREP, CA, SSA
Thematic Priority	**Area**	**Call 1B**	**Call 2B**	**Call 3B**		
Aeronautics	*4.Increasing the operational capacity and safety of the air transport system*	Dec 2002- March 2003 19 M€	June 2003- Dec 2003 20 M€	June 2004- Dec2004		IP, STREP, CA

Number of participants and budget per instrument for each area in the call for proposals (deadline 2003)

Aeronautics

Instrument	Number of participants	Indicative % budget per group of instruments
Integrated Projects	See general Rules for Participation	65
Networks of Excellence	See general Rules for Participation	
Specific Targeted Research Projects	See general Rules for Participation	35
Co-ordination Actions	See general Rules of Participation	
Specific Support Actions	See general Rules of Participation	

1.6 Call Information: Aeronautics

Call 1A

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activity**: Priority thematic area of research "Aeronautics and Space".

3. **Call title**: Thematic call in the area of "Aeronautics 1A".

4. **Call identifier**: [7]

5. **Date of publication**[8]: 17 December 2002.

6. **Closure date(s)**[9]: 20 March 2003, at 17.00 (Brussels local time).

7. **Total indicative budget**: 240 Million €, broken down as follows

Instrument[10]	€ (millions)
IP and NOE	149
STREP and CA	91

8. **Areas called and Instruments**:

Area	Topic	Preferred Instrument
1.3.1.1 *Strengthening Competitiveness*	Technical domains 1.3.1.1 a) to k)	STREP and CA
	Topics 1, 2 and 3	IP
	Topics 12 and 13	NOE
1.3.1.2 *Improving environmental impact with regard to emissions and noise*	Technical domains 1.3.1.2 a) to i)	STREP and CA
	Topics 4 and 5	IP
	Topic 14	NOE
1.3.1.3 *Improving aircraft safety and security*	Technical domains 1.3.1.3 a) to e)	STREP and CA
	Topics 6 and 7	IP
1.3.1.4 *Increasing the operational capacity and safety of the air transport system*	Technical domains 1.3.1.4 a), b) and g)	STREP and CA
	Topic 8	IP

[7] The call identifier shall be given in the published version of this call.

[8] The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[9] When the envisaged publication date is adavanced or delayed (see previous footnote), closure date(s) will be adjusted accordingly in the published call for proposals.

[10] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

9. Minimum number of participants[11]:

Instrument	Minimum number of participants
IP, NOE, STREP and CA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.

10. Restriction on participation: None.

11. Consortia agreements: Participants in RTD actions resulting from this call are required to conclude a consortium agreement.

12. Evaluation procedure:

- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. Indicative evaluation and contractual timetable:

- Evaluation results: estimated to be available within some 3 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after the closure date.

[11] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

Continuous Call

1. Specific Programme: "Integrating and strengthening the European Research Area"

2. Activity: Priority thematic area of research "Aeronautics and Space".

3. Call title: Thematic call in the area of "Aeronautics Specific Support Actions".

4. Call identifier: [12]

5. Date of publication[13]: 17 December 2002.

6. Intermediary and final closure dates[14]: 20.03.2003 and 19.09.2003, at 17.00 (Brussels local time)
Indicative intermediary and final closure dates of 2004, 2005 and 2006 will be found in the relevant updates of the work programme. The final closure date will be in March 2006.

7. Total indicative budget: 7 Million €
Total indicative budget for 2004, 2005 and 2006 will be given in periodic updates of the work programme.

Instrument[15]	€ (millions)
SSA	7

8. Areas called

Area	Topic	Instrument
All	Promoting SME participation	SSA
	Stimulating dissemination and exploitation of results	
	Realising the European Research Area	
	Promoting Candidate Countries participation	
	Stimulating international co-operation	
	Developing a EU research strategy in the sector	

9. Minimum number of participants:

Instrument	Minimum number of participants

[12] The call identifier shall be given in the published version of this call.
[13] The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.
[14] Where the envisaged of publication is advanced or delayed (see previous footnote), closure date(s) will be adjusted accordingly in the published call for proposals.
[15] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

SSA	1 legal entity from a MS or AS

10. Restriction on participation: None.

11. Consortia agreements: Participants in RTD actions resulting from this call are not required to conclude a consortium agreement.

12. Evaluation procedure:

- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. Indicative evaluation and contractual timetable:

- Evaluation results: estimated to be available within some 2 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 6 months after the closure date.

Call 1B[16]

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activities**:
- Priority thematic area of research "Aeronautics and Space".
- Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable energy systems"
- Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable surface transport"

3. **Call title**: Periodic call in the area of "Aeronautics and Space", "Sustainable energy systems" and "Sustainable surface transport".

4. **Call identifier**: [17]

5. **Date of publication**[18]: 17 December 2002.

6. **Closure date(s)**[19]:
- "Aeronautics and Space": 20 March 2003 at 17.00 (Brussels local time).
- "Sustainable energy systems": 18 March 2003 at 17.00 (Brussels local time).
- "Sustainable surface transport": 3 April 2003 at 17.00 (Brussels local time).

7. **Total indicative budget**: 140 Million €, broken down as follows
- "Aeronautics and Space": 19 Million¨€
- "Sustainable energy systems": 82 Million €
- "Sustainable surface transport": 39 Million €

Instrument[20]	EUR (millions)
IP	91
STREP and CA	49
SSA	

8. **Areas called and Instruments**:
- Aeronautics and Space

Area	Topic	Instrument
1.3.1 Open Upstream Research. Research Area 1.3.1.4 Increasing the operational capacity and safety of the air transport system	Technical domain 1.3.1.4 c)	STREP and CA
	Technical domain 1.3.1.4 h)	CA

16 Note that this call for 'Aeronautics and Space' will form part of a call including elements of 'sustainable energy systems' and 'sustainable surface transport'

17 The call identifier shall be given in the published version of this call.

18 The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

19 When the envisaged publication date is advanced or delayed (see footnote 1), closure date(s) will be adjusted accordingly in the published call for proposals.

20 IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

1.3.2 Integrated Focused Downstream Research	Topic 9 (phase 1)	IP
	Topic 10 (phase 1)	IP
	Topic 11 (phase 1)	IP

– Sustainable energy systems

Area	Topic	Instrument
Section 6.1.3.1.1.1 « Cost effective supply of renewable energies »	Large innovative wind turbines, components and design tools	IP
	Low cost photovoltaic modules with integrated dc/ac inverters that can feed directly into the grid	IP
	Innovative combinations of biomass and wastes with fossil fuels	STREP
	Innovative wind turbines, components and design tools	STREP
	New generation of PV technologies / products	STREP
	Geothermal energy	STREP
	All	CA and SSA
Section 6.1.3.1.1.2 "Large scale integration of renewable energy sources and energy efficiency"	RES-Electricity	CA and SSA
	Distributed electricity generation	CA and SSA
	Electricity storage systems	CA and SSA
	Heating and cooling	CA and SSA
Section 6.1.3.1.2.1 "Eco-buildings"	Innovative architecture aiming at low-energy demand buildings	IP and STREP
	Integration of renewable energy technologies and efficient technological solutions	IP and STREP
	Low energy construction and/or retrofitting materials, innovative components and technologies	IP and STREP
	Innovative building management systems (BMS)	IP and STREP
Section 6.1.3.1.3 "Alternative motor fuels"	Large scale integration of alternative fuels into the transport system. Considering resources, production, storage, distribution and use. Tools to monitor and stimulate demand.	IP, STREP, CA and SSA
	Assessment and monitoring of new and alternative fuel research activities	CA and SSA

– Sustainable surface transport

Area	Topic	Instrument
Objective 3 « Re-balancing and integrating different transport modes »	Freight Transport Corridors	IP
	City Logistics	STREP and CA
	Maritime navigation and information services	IP
	Maritime transport co-ordination platform	CA
	Accident analysis and injury analysis	IP

Objective 4 « Increasing road, rail and waterborne safety and avoiding traffic congestion » **9. Minimum number of participants**[21]:	Accident analysis and injury analysis	IP
	Road infrastructure safety	STREP

Instrument	Minimum number of participants
IP, STREP and CA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.
SSA	1 legal entity from a MS or AS

10. Restriction on participation: None.

11. Consortia agreements:
- Participants in IP are required to conclude a consortium agreement.
- Participants in STREP, CA, and SSA resulting from this call are encouraged, but not required, to conclude a consortium agreement.

12. Evaluation procedure:
- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. Indicative evaluation and contractual timetable:
- Evaluation results: estimated to be available within some 3 months after the closure date.
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after the closure date.

15. Additional terms:

- It is expected that this call should not result in more than 50 to 60 projects

[21] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

Call 2B[22]

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activities**:

- Priority thematic area of research "Aeronautics and Space".
- Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable energy systems"
- Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable surface transport"

3. **Call title**: Periodic call in the area of "Aeronautics and Space", "Sustainable energy systems" and "Sustainable surface transport".

4. **Call identifier**: [23]

5. **Date of publication**[24]: 17 June 2003.

6. **Closure date(s)**[25]**:** 17 December 2003 at 17.00 (Brussels local time).

7. **Total indicative budget:** 175 Million €, broken down as follows
- "Aeronautics and Space": 20 Million €
- "Sustainable energy systems": 107 Million €
- "Sustainable surface transport": 48 Million €

Instrument[26]	EUR (millions)
IP	115
STREP and CA	60
SSA	

8. **Areas called and Instruments**:

- Aeronautics and Space

Area	**Topic**	**Instrument**
1.3.2 Integrated Focused Downstream Research	Topic 9 (phase 2)	IP
	Topic 10 (phase 2)	IP

- Sustainable energy systems

Area	**Topic**	**Instrument**

[22] Note that this call for 'Aeronautics and Space' will form part of a call including elements of 'sustainable energy systems' and 'sustainable surface transport'

[23] The call identifier shall be given in the published version of this call.

[24] The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[25] When the envisaged publication date is advanced or delayed (see previous footnote), closure date(s) will be adjusted accordingly in the published call for proposals.

[26] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

Section 6.1.3.1.1.2 "Large scale integration of renewable energy sources and energy efficiency"	CONCERTO – Managing energy demand and renewable energy supply in high performance communities	IP
	All	STREP, CA and SSA
Section 6.1.3.1.2.1 "Eco-buildings"	CONCERTO – Managing energy demand and renewable energy supply in high performance communities	IP
Section 6.1.3.1.2.2 "Polygeneration"	CONCERTO – Managing energy demand and renewable energy supply in high performance communities	IP
Section 6.1.3.1.3 "Alternative motor fuels"	Testing implementation and transition strategies for Clean Urban Transport – CIVITAS II	IP and SSA

– Sustainable surface transport

Area	Topic	Instrument
Objective 1 « New technologies and concepts for all surface transport modes (road, rail and waterborne) »	Testing implementation and transition strategies for Clean Urban Transport – CIVITAS II	IP and SSA
Objective 3 « Re-balancing and integrating different transport modes »	Implementation of change in the European Railway System	CA
Objective 4 « Increasing road, rail and waterborne safety and avoiding traffic congestion »	European service for electronic fee collection on roads	IP and/or STREP
	Costs of transport infrastructure use	STREP, CA and/or SSA
	Optimal investments and charging	STREP, CA and/or SSA

9. Minimum number of participants[27]:

Instrument	Minimum number of participants
IP, STREP and CA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.
SSA	1 legal entity from a MS or AS

10. Restriction on participation: None.

11. Consortia agreements:

- Participants in IP are required to conclude a consortium agreement.
- Participants in STREP, CA, and SSA resulting from this call are encouraged, but not required, to conclude a consortium agreement.

[27] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

12. Evaluation procedure:

- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. **Indicative evaluation and contractual timetable:**

- Evaluation results: estimated to be available within some 3 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after the closure date.

15. Additional terms:

It is expected that this call should not result in more than 40 to 50 projects.

2. SPACE

2.1 Introduction

Europe has been active for several decades in the space sector, which encompasses a wide spectrum of activities ranging from launchers to application satellites. The primary objective is to support the European Strategy for Space[28] with appropriate application oriented research activities in collaboration with European Space Agency. These research activities shall foster the exploitation of the technical capabilities of the space community with the objective of seizing market opportunities and meeting the demands of our society. Because of the capacity of space-based infrastructures to offer simultaneous services to the whole European region, the enlargement of the Union can draw direct benefits from the envisaged applications and capabilities.

An optimal combination of space-based systems and terrestrial infrastructure, as well as the integration of future space-based information and communication systems and services, creates further application perspectives.

Against this background, the following areas are supported by the thematic priority:

- Satellite Navigation, positioning and timing systems for the Galileo programme.
- Global Monitoring for Environment and Security[29] (GMES).
- Satellite telecommunications[30].

Emphasis will be put on activities complementing those of the space agencies concerning the integration of terrestrial and space systems and services in view of validation of end-to-end services.

2.2 Objectives, Structure and Overall Approach

Satellite systems are a unique and globally available data source and facilitate local, regional and global applications and related services. The general objective of the work programme aims at reaping the benefits for markets and society. The selected research areas (Galileo, GMES and satellite telecommunications) will support this general objective and have specific objectives in view of their respective application fields:

- Galileo as strategic European infrastructure shall radically change the transport sector and foster related services.
- GMES will establish operational capabilities providing information to the user community as specified in the EC Action Plan[31] (2001-2003).
- Satellite telecommunications shall provide affordable and economically viable services to the largest possible customer base.

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28 COM(2000)597 Europe and Space: Turning to a new chapter

29 COM(2001)264 15 April 2001 A sustainable Europe for a Better World: A European Union Strategy for Sustainable Development

30 COM(2002)263 final e-Europe 2005 An Information Society for all

31 COM(2001) 609 final GMES: Outline EC GMES Action Plan

The orientation of the three areas towards marketable products and pre-operational services qualify GMES as a central pillar of the Space work programme. Navigation and satellite telecommunication are important areas also providing enabling technologies in support to the GMES priority themes.

The Galileo activities will be managed by the Galileo Joint Undertaking. In this context the European Commission will provide each year a grant to the Joint Undertaking that will proceed with the Calls in the areas indicated in the Work Programme. Future activities under the 6th Framework Programme for RTD, ESA Programmes and national programmes will be co-ordinated by the Joint Undertaking. Further contribution to the GMES activities is expected from other thematic priorities (1.2, 1.6, 1.7) and the Joint Research Centre (JRC) activities. The respective priorities are co-ordinated and are prepared for possible joint and/or synchronised calls. The structuring and integrating effects of the new instruments (Integrated Projects and Networks of Excellence) will ensure consolidated projects.

All areas of the Space part of the work programme will be closely co-ordinated with the European Space Agency (ESA).

In accordance with the general rules of participation, the contribution of SMEs to the work programme activities is encouraged, when appropriate, through all FP6 instruments.

2.3 Technical content

The work programme is presented for each of the three areas Galileo, GMES and Satellite Telecommunications and gives a description of the topics for which proposals are invited, indicating which funding instrument is considered to be most appropriate to cover the goals.

2.3.1 Area: Galileo

The research areas for Galileo relate to applications, user segment, standardisation and certification, and deployment of local elements. The development of GNSS-based (Global Navigation Satellite System) applications and services will be necessary during the Galileo System design, development and validation (2003-05).

- ***Applications.*** The early development of GNSS based applications will be the main driver for the introduction of Galileo into the market place. Demonstrations capabilities have been already initiated over the last few years as an illustration of what improvements Galileo could provide in every day life. Therefore, Galileo applications will help to implement the service provision chain with the involvement and support of the user community, SMEs and service providers including multipurpose service chains and their integration for intermodal transport (e.g. vessels and cargo monitoring). It will also allow European manufacturers and service providers to develop a competitive knowledge in the navigation domain. Activities planned in the short term are still based on the EGNOS system, the European augmentation of GPS. Interoperability of systems and location based services in different user environments (terminals, telecom networks) pave the way to mass market applications.
- ***User segment.*** The user segment and in particular the *user receiver* is at the heart of business opportunities. Recognising that Galileo is just one of the enabling technologies for location enhanced services, tools (including advanced user terminals and multi-beam antennas) and systems adapted to user requirements will

be developed enabling the optimal integration of these technologies for applications (timing, positioning, and navigation) into everyone's life.

- ***Standardisation and certification*.** The success of Galileo services and applications largely depends on the ability to reach standards easily applicable and replicable in myriad applications. Development of pre-certification and certification frames will be essential for early introduction of reliable Galileo services and application into the market.
- ***Deployment of local components***. The ambition of Galileo "to be more" than the existing positioning services largely depends on the deployment of the local elements that will add critical patterns to space received signal (e.g. indoor positioning). Galileo local components include support and assisting systems and services for satellite positioning including research on potential infrastructure solutions like wireless local area networks (WLAN) and Bluetooth.

Some specific domains such as Location Based Services (LBS), Vehicle Telematics *Indoor* applications as well as tracking and tracing (i.e. automatic detection), route guidance and travel planning should be given special attention and research on niche applications should continue. The issue of synergy with other space or terrestrial technologies related to SATCOM and GMES should be refined.

The research activities to be supported should build on previous and on-going work in all areas of community policies, notably transport and information society projects (including the IST work programme).

A strong emphasis will be given to activities that will allow wide demonstration of the potential of satellite navigation and the market-readiness of users. Priority will be given to activities allowing the development of commercially viable innovative applications and the introduction of satellite navigation tools in the consumer and professional markets. However, activities to be supported should be associated to the development of specific applications not already foreseen in a commercial framework.

The following orientations optimise the overall process in terms of schedule, effort and integration of results:

- Demonstrate the capacity of satellite navigation, allowing a smooth transition to the setting-up of the **Galileo Concession Scheme** (public and private funding);
- Build on the results of **previously performed work** and other on-going activities on Galileo and EGNOS[32] (mainly 5th FP and ESA initiatives);
- Use as much as possible the **EGNOS Signal In Space** availability (starting from 2004) to anticipate some Galileo User Segment related assessment (for applications, services, market, regulatory, standards, legal and operations aspects);
- Use as much as possible the **Galileo System Test-Bed** ("V2") and **In-Orbit Validation Signal** In Space availability to run practical experiments on the Galileo User Segment (receivers, user terminals, local elements, frequencies issues, etc);

[32] EGNOS : European Geo-stationary Navigation Overlay Service

- Allocate effort for the period post-**In-Orbit Validation** (mid 2006-2008) during which the incremental deployment of Galileo Satellites will allow the use of a fully representative environment;
- Take into account the **Galileo development programme** main milestones (Critical Design Review in 2004, System Qualification Review in 2005 and In-Orbit Validation Review in 2006) and reserve flexibility to re-direct work according to new exigencies;
- Allocate effort to activities such as standardisation, pre-certification and certification, legal and market analysis issues.

As far as Galileo is concerned, the European Union through the **Trans-European Transport Networks (TEN-T)** will support, jointly with the **European Space Agency**, the development phase of Galileo (2002-2005). This phase will be managed by the **Galileo Joint Undertaking**, set up in May 2002[33], following the Council Decision of 26 March 2002.

2.3.1.1 Selected research actions for 2003 deadline

The objectives of the first group of activities to be launched by the Joint Undertaking are:

- Demonstrate the market potential of the Galileo satellite navigation services.
- Prepare the Galileo User Segment for the In Orbit Validation (IOV), develop breadboard and prototype Galileo receivers for selected applications, develop prototype Common Building Blocks for the Local Elements, prepare dedicated test campaign for different applications;
- Assess the GNSS SoL applications using the EGNOS Signal in Space (SIS) (practical test on integrity and accuracy);
- Continue the effort on horizontal activities (user segment road map, standardisation, certification, legal, market analysis, Local Elements support for various markets, Galileo Services assessment);
- Support dissemination tasks, harmonise activities and facilitate the co-ordination to be performed by the Galileo Joint Undertaking. Dedicated initiatives (development of common elements for the demonstrations, promote the Galileo System Simulation Facility as reference for simulations scenario and data interface, develop an application data base, set-up an application/service help desk.

2.3.1.2 Indicative research actions for subsequent Call for Proposals

The objectives of the second group of activities to be launched by the Joint Undertaking are:

- Assess the applications and market developments taking into account the current 5th Framework Programme Pilot Projects results, the outcomes of the First Call

[33] Council Regulation (EC) No 876/2002 of 21 May 2002 setting up the Galileo Joint Undertaking, published in the Official Journal L 138 of 28 May 2002, p.1.

projects and the SoL applications assessment results. Few medium/large size projects are required for this purpose;

- Use the Galileo User Segment related prototypes during the IOV (operations of the deployed Local Elements, test campaign with Galileo prototype receivers, SOL applications using GPS/EGNOS/Galileo);
- Develop breadboard/prototype User Terminals integrating Galileo, GPS, GSM, GPRS, UMTS and other receivers and sensors;
- Prepare the Galileo service framework (GOC, Added-value service providers, and users) for the different aspects technical and non-technical; This activity shall include an "integration" of the service chain.

The objectives of the third group of activities to be launched by the Joint Undertaking are:

- Optimise the Service chains (Galileo Service Centre, Service Providers, Users) for each assessed Galileo application;
- Prepare the GNSS SoL application certification;
- Other objectives will be identified on the basis of the outcomes of the GalileoSat programme, 6th FP 1st and 2nd Call-related initiatives, and the Galileo IOV campaign.

2.3.2 Area: GMES

To reach the envisaged pre-operational capabilities for environment and security, the work programme foresees the integration and the pre-operational validation of:

- existing research results obtained through previous initiatives of EC, ESA and national entities,
- planned research and technological development results, as they become available, within the other relevant FP6 thematic priorities, ESA[34] and national entities.

Existing national or international capabilities will be taken into account to develop synergies and avoid duplication. Projects should be user driven and take into account their needs concerning information and services. EU policies, directives and standardisation initiatives[35] should be taken into account. Projects should include activities having the goal of increasing public awareness of the results achieved through the use of space technology.

In the long term, these pre-operational capabilities should become appropriately resourced autonomous operational capabilities providing in a given GMES priority themes[36], the relevant information to individuals or user communities.

The work programme, for the build-up of the pre-operational capabilities, includes also the following cross topics:

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34 The GMES Services Element work and outcomes.

35 e.g. INSPIRE initiative of DG ENV, DG RTD, EUROSTAT (www.ec-gis.org/inspire)

36 GMES priority themes. Annexed to COM(2001)609 final and reviewed by the GMES Steering Committee.

- data validation and fusion from multiple sources
- data assimilation and data integrity
- data delivery processes of observation systems (satellite, in-situ)
- interoperability and interconnection of the data processing and delivery systems
- organisation and system architecture

The GMES priority themes have been restructured in six application fields in order to bundle together similar topics and avoid dispersion of objectives. Hence projects are expected being built around the following application fields:

– Land Cover and Vegetation

– Water Resources

– Ocean and Marine Applications

– Atmosphere

– Risk management

– Security

2.3.2.1 Selected research actions for 2003 deadline

a) Ocean and marine applications

Oceans and coastal areas are of major importance for economic activities (transport, food supply, natural resources) and at the same time are subject to environmental stress (chemical pollution, oil spills). The project should enable the use of physical (evaporation, currents, temperature, heights, and winds); chemical (salinity, pollution, oil spills); biological data (from plankton to marine animals) and provide high-value information relevant to the following domains: fisheries and vessel monitoring; maritime traffic and security; coastal zones and open ocean; ice monitoring. Preference will be given to an Integrated Project.

b) Risk management

The aim is to improve the provision of satellite based data in support to risk management and their integration into information systems[37]to support the decision making chain of risk management throughout the risk lifecycle. The solutions must be applicable at global and regional levels and be able to ingest all type of data issued from Earth observation satellites, in-situ measurements and field data. The Space/GMES work programme ensures the co-ordination with the other thematic priorities[38] and contributes with specific added-value services.

The work programme includes:

- the collection and harmonisation of the requirements expressed by users and other services[39] of the Commission.
- the consideration of national and international initiatives with the set-up of proper interfacing mechanisms.

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37 Research and development of advanced information and communication technologies for risk management are dealt under IST 1.1.1 3 Improving Risk Management

38 Namely 1.6.3 Global Change and ecosystems and 1.2 IST/Improving Risk Management

39 Mainly DG RELEX, DG ENV, ECHO

- the expression of the overall system specifications and operational constraints in order to ensure the rationalisation of the organisation required for the production of adequate information, particularly considering the intrinsic characteristics and lifecycle of each risk. Specifications for standards will be prepared.
- the inclusion of available risk-related research[40] results and building blocks.
- the validation of the implemented systems and services for users (humanitarian assistance organisations, external aid institutions, civil protection agencies, NGOs, citizens, etc.).

Specific risks to be covered are: man-made hazards (including conflicts); earthquakes; tropical storms; drought; floods; volcanic eruptions; forest fires; landslides; other natural phenomena generating hazards (including space weather). Preference will be given to an Integrated Project.

c) Land cover and vegetation

The aim is to provide large to small-scale/multiple-use maps, statistics, trends, over different land cover objects with the adequate periodicity building on existing knowledge and the experience gained through previous EC funded activities on the land cover mapping in Europe[41]. Vegetation monitoring is a major application at regional and global levels. Standardisation of the output information is necessary to facilitate the integration of data into models (especially through assimilation techniques) and/or geographical information systems.

The specific observation systems to be used, deal with: ecosystems (forests, sensitive mountain areas), bio-diversity and landscapes; agricultural lands; vegetation (forests at global scale, food security, carbon stocks in the biosphere, heat, water and gaseous exchanges); soil quality and soil degradation; desertification; length of growing season in boreal forests; burnt areas; nature protection sites; urban areas; coastal zones and coastal erosion; snow and ice monitoring. Preference will be given to an Integrated Project.

d) Security[42] (Global Information Network for Security)

A network of organisations should be built up with the following goals:

- To master and improve the existing collection, processing, displaying, interpreting and archiving solutions geared towards the strengthening of stability and security using earth observation, in-situ and airborne sensors data.
- To identify at European level organisational scenarios enabling the timely communication and exchange of critical information and proper decision-taking mechanisms.
- To support external security operations (within the context of conflict prevention, crisis management and humanitarian assistance) such as

40 Research on risk assessment and management methodologies is dealt under 1.6.3

41 i.e. the CORINE Land Cover programme.

42 The work should take into account the output of the GMES Steering Committee Working Group on Security.

damage assessment, monitoring of protected areas, maintenance of law and order by police forces, border surveillance.

- To support verification of international treaties[43] concerning biological, chemical, radiological and nuclear (BCRN) weapons as well as to address transport, energy and telecom infrastructures vulnerabilities.

The work should be performed through the exchange of knowledge and experience particularly on the use of models for early warning and alert triggering as well as the input data capture, processing, validation and archiving mechanisms.

The network should issue, when appropriate, recommendations and requirements related to the above topics with a particular emphasis on the process of data and information exchange between organisations and the means to be used before, during and after the crisis. Preference will be given to a Network of Excellence.

e) Overall system integration and architecture

The overall coherency of activities related to GMES in different FP6 work programmes is ensured through Priority 1.4. The objectives to ensure overall coherence of the global architecture, the infrastructure of the Application Fields[44] and the interfaces with data providers, service centres and users. Recommendations on the optimal architecture for the integration of the different Application Fields should be provided. Verification and validation of the interfaces and the system performance should be carried out[45]. The expected outcome is the definition of the overall system to be developed in order to support the GMES objectives. Preference will be given to a Specific Support Action.

2.3.2.2 Indicative research actions for Call for Proposals in 2004

a) Water resources

Operational monitoring and assessment of water resources in terms of quantity, quality and its usage (mainly in agriculture) is a major challenge in Europe but a critical subject of vital importance in most developing countries.

The activities should focus on the use of various sources of observation to improve knowledge of water resources through the operative combination of satellite radar and optical observations with in-situ measurements. The major objective is to channel and integrate, in a coherent way, available research and development results covering water resources monitoring, mapping, inventory and support to the management at local, regional levels, particularly in developing countries. Preference will be given to an Integrated Project.

b) Atmosphere

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43 Examples of international treaties are: the Nuclear Weapons Non-Proliferation Treaty (NPT); the Comprehensive Nuclear-Test-Ban Treaty (CTBT); the Treaty on Conventional Forces in Europe (CFE) and the Chemical Weapons Convention (CWC).

44 The requirements prepared under the INSPIRE initiative for the European Spatial Data Infrastructure could be linked to application fields related Integrated Projects.

45 Research on information technology architectures are dealt under IST

Number of interactions influences the composition and dynamics of the atmosphere and requires efficient monitoring and assessment. Data required to perform these activities are available from satellites and from in-situ measurements (in the atmosphere and on ground).

The objective is the integration and validation of the available results in order to reach a coherent and validated GMES infrastructure serving the user community. Preference will be given to an Integrated Project.

c) Security

The objective is to build progressively on the results of the Network of Excellence related to security aspects, as they become available. Preference will be given to an Integrated Project.

2.3.3 Area: Satellite Telecommunications

The objective of research in this field is to support key EU policies and validate space technology for some public services, i.e., health (tele-medicine), education (distance-learning), emergency systems and transport.

The synergy achieved by combining space telecommunications and positioning capabilities can provide not only efficient infrastructure to GMES and Galileo users and operators but also a number of creative possibilities of transactions between entities that must communicate or exchange data in a precise geo-referenced environment such as for disaster relief and rescue operations.

The research is complementary to the actions targeted under the ESA ARTES programme, the research activities in the Information Society Technology (IST) Thematic Priority, and national activities supported either by space agencies or by national research programmes. Innovative work and applications that integrates research activities carried out in these environments is encouraged.

Three core technological domains in support of these objectives have been identified:

- **Network and Service interoperability**

  The aim is the seamless integration of satellite telecommunications infrastructures with terrestrial systems. Those activities take advantage of the emergence of novel networking technologies and systems, such as IPv6[46], DVB-RCS[47], edge caching and networking, MPLS[48] or VHE[49].

- **End-to-end satellite telecommunications systems**

  The aim is the integration and validation of innovative and low-cost satellite communications technologies and systems where satellite communications technologies may have a potential edge over terrestrial infrastructures. Large-scale distributive applications, or applications needing to address remote, isolated or rural areas are typical applications where satellite communication technology may be the most appropriate communication platform to provide connectivity in

[46] Internet Protocol version 6
[47] Digital Video Broadcasting-Return Channel System
[48] Multi Protocol Label Switching
[49] Virtual Home Environment

the fields of transport, education (distance-learning), emergency systems and health (tele-medicine).

- **Convergence and integration of satellite communications with other Space application domains**

  The target is the integration of satellite telecommunication capabilities with Galileo and GMES infrastructures and the development of optimised architectures and technologies through the coupling of different satellite services. This is envisioned in view of providing significant communication and processing capabilities particularly in risk management and security applications where rapid deployment of reliable communications is required.

2.3.3.1 Selected research actions for 2003 deadline

a) End-to-end satellite telecommunications systems for transport applications

Provision of integrated services and applications to users travelling on board trains, ships or aircraft[50]; these three transport means being typical market segment for mobile satellite systems. Preference will be given to an Integrated Project.

b) End-to-end satellite telecommunications systems for tele-education and tele-medicine applications

Provision of integrated tele-education and tele-medicine services and applications where there are a large number of distributed sites (rural areas, campuses or hospitals) to be interconnected. Preference will be given to an Integrated Project.

c) End-to-end satellite telecommunications systems for rural areas applications

Provision of integrated services and applications covering the rural area needs. Preference will be given to an Integrated Project.

2.3.3.2 Indicative research actions Call for Proposals in 2004

a) Convergence and integration of satellite telecommunications with GMES

Development of the architecture and performances to facilitate the emergence of an integrated network, possibly comprising other capabilities such as GIS (Geographical Information System) or positioning systems. Insofar as possible, commonality with terrestrial Private Mobile Radio standards (e.g. TETRA) shall be sought. It is envisioned that this application context can be used to validate the technology used in new-generation platforms and the suitability for combining missions. Preference will be given to an Integrated Project.

b) Convergence and integration of satellite telecommunications with Galileo

Development of low-cost satellite receivers, advanced user terminals and applications having a capability to communicate through advanced mobile satellite systems. Build up of capacity to provide users with global or wide regional coverage. Preference will be given to an Integrated Project.

[50] The related work may be co-ordinated with the aeronautic work programme.

2.4 Links To Other Research Topics

The Space part of the work programme is linked to other thematic priorities. The co-ordination in terms of content of calls and timing, will ensure the integration of research and development activities from the different priorities, which is essential to achieve the overall GMES targets.

The other priorities, linked to the Space part of the work programme, are:

1.2 Information Society Technologies
- Broadband access for all
- Mobile and wireless systems beyond 3G
- Improving Risk Management

1.6.2 Sustainable surface transport

1.6.3 Global Change and Ecosystems

1.7 Citizens and Governance in knowledge based society

- Resolution of conflicts and restoration of peace and justice

The ESA activities in the GMES service elements should complete integration by providing the space data and information through adequate services.

A schematic representation of the inter-thematic priority links for GMES is given hereunder. The cells having identical shading or bordering indicate the major links and potential complementary or joint calls.

1.6 **Sustainable Development, Global Change and Ecosystems**	**1.4.2** **Space / GMES**	**1.4.2** **Space / Satellite Telecommunications**	**1.2** **IST**
other	Land Cover and Vegetation	Network & Services	other
	Water Resources	Applications	Broadband access for all
and Ecosystems	Applications	Integration	Mobile and wireless systems beyond 3G
	Atmosphere	other	other
other	*Risk management*	other	*Improving Risk Management*
other	*Security*	other	other

The development of Galileo applications is a subject clearly related with most of the research avenues to be developed within sub-priority 6.2 'Sustainable surface transport' (freight management systems development, train locations, waterborne transport).

Galileo RTD activities are in addition linked to **satellite telecommunications capabilities**: links with priority 2 'Information society technologies' could be established in the frame of receiver developments.

2.5 Implementation Plan and Related Issues: Space

ROADMAP – Thematic priority 4 "Aeronautics and Space"

Type of Activity		Indicative budget (m€) Date of publication in OJ[51]: *[date]*			Type of instrument Open in each call **IP** – integrated project **NE** – network of excellence **STREP** – specific targeted research project **SSA-** specific support action
Focussing and integrating Community research		**Deadline for submitting proposals**			
Thematic Priority	**Area**	**March 2003**	**2004**	**2005**	
Space	Galileo	20[52]			[53]
Space	GMES	45			IP, NE, STREP,SSA
Space	Satellite Telecommunications	15			

[51] The Galileo activities will be managed by the Galileo Joint Undertaking. In this context the European Commission will provide each year a grant to the Joint Undertaking that will proceed with the Calls in the areas indicated in the Work Programme.

[52] Dates could be revised in function of the effective installement of the Galileo Joint Undertaking

[53] Specific instruments will be determined by the Galileo Joint Undertaking

Number of participants and budget per instrument for each area in the Call for Proposals with 2003 deadline

Space (GMES and Satellite Telecommunications)

Instrument	**Number of participants**	**Indicative % budget per group of instruments**
Integrated Projects	See general Rules for Participation	86
Networks of Excellence	See general Rules for Participation	
Specific Targeted Research Projects	See general Rules for Participation	14
Co-ordination Actions	See general Rules for Participation	
Specific Support Action	See general Rules for Participation	

Space (Galileo)

Instrument[54]	**Number of participants**	**Indicative % budget per group of instruments**
Integrated Projects	See general Rules for Participation	100
Networks of Excellence	See general Rules for Participation	
Specific Targeted Research Projects	See general Rules for Participation	
Specific Support Action	See general Rules for Participation	

[54] Specific instruments will be determined by the Galileo Joint Undertaking

2.6 Call Information: SPACE

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activity**: Priority thematic area of research "Aeronautics and Space".

3. **Call title**: Thematic call in the area of "Space 2003".

4. **Call identifier**: [55]

5. **Date of publication**[56]: 17 December 2002.

6. **Closure date(s)**[57]: 20 March 2003 at 17.00 (Brussels local time).

7. **Total indicative budget**: 60 Million €, broken down as follows

Instrument[58]	EUR (millions)
IP and NOE	52
STREP, CA and SSA	8

8. **Areas called and Instruments**:

Area	Topic	Preferred Instrument
GMES	Ocean and Marine Applications	IP or NOE (IP preferred)
	Risk Management	IP or NOE (IP preferred)
	Land Cover and Vegetation	IP or NOE (IP preferred)
	Security	IP or NOE (NOE preferred)
	All topics	STREP, CA and SSA
	Overall system integration and architecture	SSA

[55] The call identifier shall be given in the published version of this call.

[56] The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[57] When the envisaged publication date is advanced or delayed (see previous footnote), this deadline will be adjusted accordingly.

[58] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

Satellite Telecommunications	End-to-end satellite telecommunications systems for transport applications	IP or NOE (IP preferred)
	End-to-end satellite telecommunications systems for tele-education and tele-medicine applications.	IP or NOE (IP preferred)
	End-to-end satellite telecommunications systems for rural areas applications.	

GMES and Satellite Telecommunications	Promoting SME participation	SSA
	Promoting Candidate Countries participation	

9. **Minimum number of participants**[59]:

Instrument	Minimum number of participants
IP, NOE, STREP and SSA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.
SSA	1 legal entity from a MS or AS.

10. **Restriction on participation**: None.

11. Consortia agreements: Participants in RTD actions resulting from this call are required to conclude a consortium agreement.

12. **Evaluation procedure**:

- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. **Evaluation criteria**: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. **Indicative evaluation and contractual timetable**:

- Evaluation results: estimated to be available within some 3 months after the closure date;

[59] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after