



Eye on Space

Space Research

*Space Research projects under the
7th Framework Programme
for Research
(4th call)*

Let's bring Space to the Eye of the European citizens



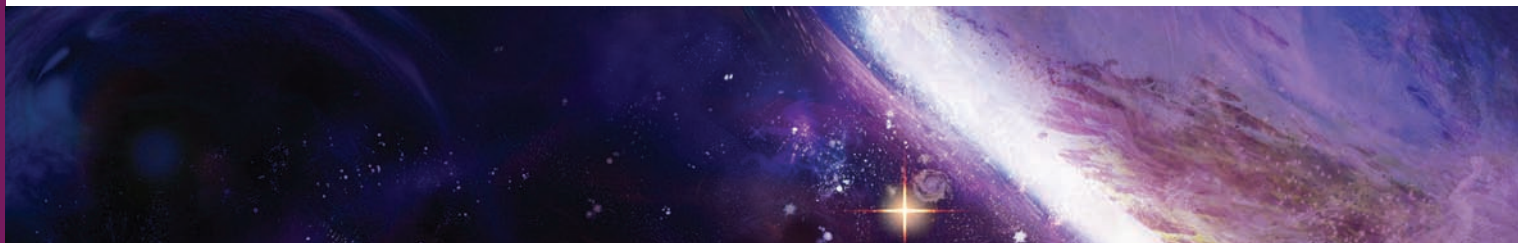
EYE ON SPACE

Space Research is both a source of inspiration and innovation, and a means of enhancing the quality of citizens' daily lives.

The **32 Space Research projects**, funded under the 4th Space call of the 7th Framework Programme (FP7) and featured in the "*Eye on Space*" brochure, reflect this diversity, with **Global Monitoring for Environment and Security services** (GMES), progressively taking form and bringing better air and marine quality services to citizens, whilst also monitoring natural hazards, and taking on the climate change challenge. Space-related applications can be used to support a wide range of activities and initiatives at European level, but are also crucial for understanding global issues. In Europe, space research activities are contributing to achieving domestic and international objectives in areas such as transport, agriculture, fisheries, emergency management and humanitarian aid. Their added value has been demonstrated in support of environmental policy and response to climate change. Applications and services based on Space Research contribute to the efficient functioning of today's society; satellites deliver live news broadcasts, enable modern navigation systems and provide medium and long term weather forecasts.

In parallel, projects conceived to strengthen **Space Foundations** represent the scientific and technological platform for all space activities (from space exploration to space technologies and transportation recognised as essential for future missions to the Moon and Mars). In space, Europe is developing critical technologies and cross-cutting activities that are of strategic importance for our industry, in order for it to stay competitive and innovative, break new technological barriers and secure high quality jobs.

Through the "*Eye on Space*" FP7 brochure, the EU and the space research community aim at bringing **Space to the "eye"** of the **European citizen** and encourage the audience to take a look at what happens above our heads, how FP7 projects contribute to tackling the space issue at EU and international level; learn more through the following pages about the projects, and meet the people behind the scene whose day-to-day work brings Europe closer to achieving its space ambitions.



Listed below are the projects co-financed by the European Commission and managed by the Research Executive Agency (REA) under the 4th call of the 7th Framework Programme for Space Research in the domains of GMES services and Space Foundations.

Global Monitoring for Environment and Security (GMES)

- Building Relationships and Interactions to Develop GMES for European Security ([BRIDGES](#))
- Monitoring Atmospheric Composition and Climate Interim Implementation ([MACC II](#))
- Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service ([MYOCEAN2](#))
- Operational wave modelling and forecasting ([MYWAVE](#))
- Network Of ground-based Remote Sensing observations ([NORS](#))
- OPERational ECology: Ecosystem forecast products to enhance marine GMES applications ([OPEC](#))
- Ocean Strategic Services beyond 2015 ([OSS2015](#))
- Stochastic Assimilation for the Next Generation Ocean Model Applications ([SANGOMA](#))

Strengthening Space Foundations (SSF)

- Aerogel European Supplying Unit for Space Applications ([AERSUS](#))
- AlGa_N and InAlN based microwave components ([AL-IN-WON](#))*
- Large Deployable Technologies for Space ([DEPLOYTECH](#))
- DESIgn Guideline for Imperfection Sensitive COMposite Launcher Structures ([DESICOS](#))
- Multi-wavelength Observational Data from Protoplanetary Discs ([DISCANALYSIS](#))
- Environment for Human Exploration and RObotic Experimentation in Space ([EHEROES](#))
- European Levitated Spherical Actuator ([ELSA](#))
- European Space Qualified Carbon Fibres ([EUCARBON](#))
- Platform for European CMOS Imagers - EUROCIS ([EUROCIS](#))
- Forward Acquisition of Soil and Terrain for Exploration Rover ([FASTER](#))
- Miniaturized Flow Control Unit ([μFCU](#))
- HYbrid ablative Development for Re-entry in planetary Atmospheric thermal protection ([HYDRA](#))
- Innovative Liquid Micro Pulsed Plasma Thruster system for nanosatellites ([L-μPPT](#))
- Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization ([MAARBLE](#))
- A Global Approach to Near-Earth Object Impact Threat Mitigation ([NEOSHIELD](#))
- Chemical-μPropulsion for an Efficient and Accurate Control of Satellites for Space Exploration ([PRECISE](#))
- 50 CubeSats for multi-point, in-situ measurements ([QB50](#))
- Solar and Heliospheric Collision less Kinetics ([SHOCK](#))
- Small Integrated Navigator for PPlanetary EXploration ([SINPLEX](#))
- Development of Rad Hard non volatile Flash memories for space applications ([SKYFLASH](#))**
- Very High Speed Serial Interfaces ([VHISSI](#))

* Project AL-IN-WON has been funded under the 1st FP7 call (2009)

**Project SKYFLASH has been funded under the 3rd FP7 call (2010)

Cross-cutting Activities

- Bridging Actions for GMES and AFRICA ([BRAGMA](#))
- Opportunities for Europe in future space exploration programmes ([COFSEP](#))
- Continuation Of the cooperation of Space NCPs as a Means to Optimise Services ([COSMOS+](#))
- Disruptive technologies for space Power and Propulsion ([DIPOP](#))
- European youth in space exploration ([ODYSSEUS](#))

“*Eye on Space*” is the fourth in an existing series of brochures featuring EU Space Research projects funded under the FP7. In a view of continuity, this publication is produced to include the projects supported mainly under the 4th FP7 Space call.



3rd call “A European Journey”



2nd call “Desire for Space”



1st call “Let's Embrace Space”

Electronic versions of the full brochure series and further information on the **FP7 Space theme** are available on the **Space Research and Development website** on the Europa at: <http://ec.europa.eu/embrace-space>

Prepared by the European Commission, Directorate-General Enterprise & Industry, Unit Space Research and Development (H2) - e-mail: entr-embrace-space@ec.europa.eu
Other useful space links at:

- Space newsroom, latest updates on events, initiatives and opportunities - <http://ec.europa.eu/enterprise/policies/space/news/>
- GMES - <http://ec.europa.eu/gmes>

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BRIDGES

Building Relationships and Interactions to Develop GMES for European Security



Support to EUFOR in Tchad.

ABSTRACT

BRIDGES will support the definition of the future governance of operational GMES services for Security applications and the possible roles of the European Union Satellite Centre in such governance, through a structured dialogue among stakeholders.

DEVELOPING GOVERNANCE OPTIONS FOR THE SECURITY DIMENSION OF GMES

In the context of the GMES Programme (Global Monitoring for Environment and Security), BRIDGES is developing scenarios and implementation options for the future governance of the security dimension of GMES. Taking into account the current institutional framework, the project will also consider the potential roles of the European Union Satellite Centre (EUSC).

GMES services for Security applications are approaching operational maturity. Pre-operational services in the fields of border control, maritime surveillance and support to external action have benefitted from development and user engagement through a number of projects funded under the EU Framework Programme. The EUSC could serve as the natural interface between GMES services and Common Foreign and Security Policy (CFSP)/Common Security and Defence Policy (CSDP) users. In addition, it could ideally, in the long term, take a coordinating role for Space data access in the Security field.

BRIDGES will therefore examine, by means of a structured stakeholder dialogue, the technical, financial and legal implications of several governance scenarios and implementation options in the context of future operational deployment of GMES services in the field of Security.



Denis BRUCKERT
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

BRIDGES aims to bring GMES services for Security applications closer to operational status by helping to shape appropriate governance options and by supporting the European Commission in projecting the technical, legal and financial implications.

Why is this project important for Europe?

The autonomy and decision making of the European Union would benefit from an independent Earth Observation capacity. The work on the governance of GMES Security Services will substantially contribute to the management of future operational services in the area of Border Control, Support to External Action and Maritime Surveillance. These policies are particularly important for European internal and external security.

How does this project benefit European citizens?

The citizens will benefit from services well governed and respecting the EU institutional framework as defined in the Lisbon Treaty.

BRIDGES

Building Relationships and Interactions to Develop GMES for European Security

LIST OF PARTNERS

- European Union Satellite Centre (EUSC), Spain
- Spacetec Partners sprl, Belgium
- Fondation pour la recherche strategique, France
- Istituto Affari Internazionali, Italy
- Centrum Badan Kosmicznych Ppolskiej Akademii Nauk, Poland
- E-Geos spa, Italy
- Infoterra limited, United Kingdom
- Indra Sistemas s.a., Spain
- GMV Aerospace and Defence sa unipersonal, Spain

COORDINATOR

European Union Satellite Centre (EUSC), Spain

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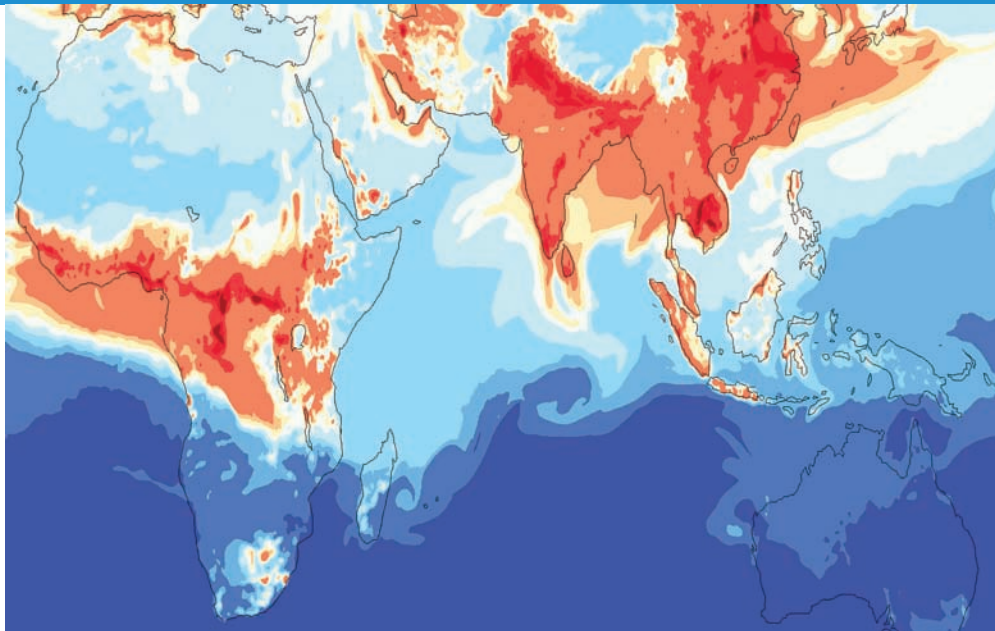
PROJECT INFORMATION

Building Relationships and Interactions to Develop GMES for European Security (BRIDGES)

Contract N°: 283499
Starting Date: 01/01/2012
Duration: 25 months
EU Contribution: € 1.000.000,00
Estimated total cost: € 1.253.675,93

MACC-II

Monitoring Atmospheric Composition and Climate - Interim Implementation



An illustration of global transport of pollutants, in this case carbon monoxide.



Vincent-Henri PEUCH
Project Coordinator

ABSTRACT

By combining Earth-Observation and in situ observations with advanced numerical models, MACC-II provides analyses and forecasts of air quality and atmospheric composition, and delivers high-quality environmental information to a wide range of users.

DELIVERING THE GMES ATMOSPHERIC SERVICE

With the acute societal concerns about air quality, climate change and their effects on health and ecosystems, there is an increasing need for comprehensive, reliable and fast information services on the atmospheric environment. This is also of importance for a range of policy-relevant applications at different scales, from international treaty verification to urban planning for instance.

MACC-II is building up the atmospheric service component of the Global Monitoring for Environment and Security (GMES) European programme. MACC-II provides information on atmospheric composition using satellite observations, ground-based observations, and numerical models. MACC-II not only monitors atmospheric composition over time, but also provides forecasts of air quality, dust storms, fire emissions and solar/UV radiation globally and in more detail for Europe. Furthermore, it supports studies of pollution events and possible responses to mitigate their effects, annual assessments of air quality, and the monitoring of greenhouse gases and their sources and sinks at the Earth's surface.

Users from most countries in the world already access and use MACC-II products from the website (www.gmes-atmosphere.eu). Using a fully user-driven definition of the products is key to the long-term success of the GMES Atmospheric Service. MACC-II will therefore in the coming years continue to closely interact with its users to tailor its products to their evolving needs.

QUESTIONS & ANSWERS

What is the project designed to achieve?

MACC-II aims at bridging the gap between the meteorological and environmental communities engaged in research and operational service provision on air quality, solar and UV radiation, the long-range transport of pollutants, greenhouse gases as well as on the ozone layer.

Why is this project important for Europe?

MACC-II integrates a wide range of remote-sensing and in situ observations in order to provide European decision makers with accurate insight on key environmental topics, which is needed to monitor international treaties and to develop well-adapted policies.

How does this project benefit European citizens?

Air quality and climate affect the daily lives of the European citizens. Raising awareness and informing people can help reduce health, economic and environmental impacts, as well as mitigate anthropogenic emissions of pollutants and greenhouse gases.

MACC-II

Monitoring Atmospheric Composition and Climate - Interim Implementation

LIST OF PARTNERS

- European Centre for Medium-Range Weather Forecasts, United Kingdom
- Academy of Athens (ECMWF), Greece
- Agencia Estatal de Meteorologia, Spain
- Association pour la Recherche et le Développement des Méthodes et Processus Industriels, France
- Aristotelio Panepistimio Thessalonikis, Greece
- Institut d'Aéronomie Spatiale de Belgique, Belgium
- Commissariat à l'Energie Atomique et aux Energies Alternatives, France
- Cambridge Environmental Research Consultants LTD, United Kingdom
- Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique, France
- Centre National de la Recherche Scientifique, France
- Deutsches Zentrum Für Luft und Raumfahrt EV, Germany
- Deutscher Wetterdienst, Germany
- Umweltbundesamt GmbH, Austria
- Joint Research Centre, European Commission, Belgium
- Ilmatieteen Laitos, Finland
- Instituto de Meteorologia, Portugal
- Institut National de l'Environnement et des Risques, France
- Universität Bremen, Germany
- Forschungszentrum Jülich GmbH, Germany
- King's College London, United Kingdom
- Koninklijk Nederlands Meteorologisch Instituut, Netherlands
- Meteorologisk Institutt, Norway
- Météo-France, France
- Max Planck Gesellschaft zur Förderung der Wissenschaften EV, Germany
- Norsk Institutt for Luftforskning, Norway
- National University of Ireland Galway, Ireland
- Rheinisches Institut für Umweltforschung an der Universität zu Köln EV, Germany
- Sveriges Meteorologiska och Hydrologiska Institut, Sweden
- Stichting SRON Netherlands Institute for Space Research, Netherlands
- Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands
- Met Office, United Kingdom
- Universität Leipzig, Germany
- University of Leicester, United Kingdom
- University of Leeds, United Kingdom
- Université Pierre et Marie Curie Paris 6, France
- Vereniging voor Christelijk Hoger Onderwijs Wetenschappelijk Onderzoek en Patientenzork, Netherlands

COORDINATOR

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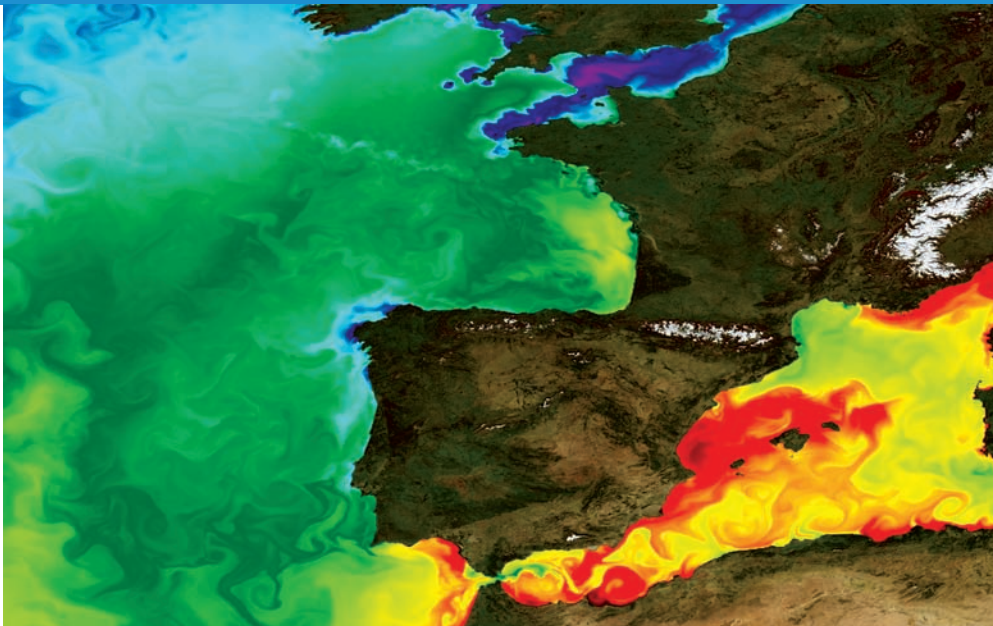
PROJECT INFORMATION

Monitoring Atmospheric Composition and Climate - Interim Implementation (MACC-II)

Contract N°: 283576
Starting Date: 01/11/2011
Duration: 33 months
EU Contribution: € 27.726.625,00
Estimated total cost: € 19.000.000,00

MYOCEAN2

Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service



The Atlantic Iberian-Biscay-Ireland area sea surface temperature in July 2010.



Pierre BAHUREL
Project Coordinator

ABSTRACT

MyOcean gives free access and provides state-of-the-art information on the Global Ocean and on European seas, based on the combination of space and in-situ observations, and their assimilation into 3D models, such as, temperature, salinity, currents, sea ice, sea level, wind and biogeochemical parameters.

DEVELOPING AND RUNNING A PAN-EUROPEAN AND SUSTAINABLE SERVICE FOR OCEAN MONITORING AND FORECASTING

Temperature, salinity, currents, sea level, ice coverage and thickness, or primary ecosystem characteristics are the main variables needed to depict the ocean state in real time and delayed mode, for both professional and private users. These are provided by MyOcean, a project responsible for the development and pre-operational validation of the Ocean Monitoring and Forecasting component of the GMES (*) Marine Service.

MyOcean is a direct answer to the requirement expressed in the Integrated Maritime Policy for the European Union ("The Blue Book") which emphasizes the need for cross-cutting policy tools, including data and information which should be used for better governance, expansion of added-value services and hence sustainable maritime development. This operational oceanography service relies on remote-sensing, on in-situ observation networks and on their sustainability. MyOcean involves 61 partners from 29 countries with major centres in Europe for ocean operational monitoring and forecasting and partners from the European maritime community.

MyOcean also works closely with other European Agencies. MyOcean users are service providers involved in four application areas: maritime safety, marine resources, marine and coastal environment and weather, seasonal and climate prediction. In December 2010, MyOcean opened a first marine service release (which has been regularly upgraded since then), providing access to a range of observation-based and model-based products in a single catalogue on a web portal (www.myocean.eu).

MyOcean ended in March 2012, when an operational prototype has taken over (MyOcean2). The move towards being fully operational is planned for 2014.

(*)European Earth Monitoring Programme : "Global Monitoring for Environment and Security".

QUESTIONS & ANSWERS

What is the project designed to achieve?

MyOcean2 aims at delivering reliable and accurate 3D depictions of the whole ocean in the past (25 years), present (real time) and future (10 days), to support and foster user applications related to the marine environment.

Why is this project important for Europe?

MyOcean2 gathers the best European skills, data and systems to offer state-of-the-art information on the ocean state and evolution. This unique and high-value information is key for supporting European decision makers in the environment and security domains, allowing Europe to get the most of investments, to support research in Earth observation and to foster new marine applications.

How does this project benefit European citizens?

European citizens are all concerned with environment and security. MyOcean2 services are useful for reinforcing safety at sea, combatting oil spills, monitoring water quality, assessing environmental impact, delivering data for climate change scenarios, protecting living marine resources, harnessing thermal water energy and predicting coastal erosion.

MYOCEAN2

Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service

LIST OF PARTNERS

- Management Unit of the Mathematical Model of the North Sea (MUMM), Belgium
- Institute of Oceanology-BAS, Bulgaria
- Cyprus Oceanography Centre (OC-UCY), Cyprus
- DFO (Fisheries and Oceans), Canada
- Danish Meteorological Institute (DMI), Aarhus University, Danish National Space Centre(DTI-Space), Danish Institute for Fisheries Research (DTU-Aqua), Denmark
- Marine Systems Institute (MSI), Estonia
- Finnish Meteorological Institute (FMI), Finnish Environment Institute (SYKE), Finland
- Mercator Ocean, CLS, IFREMER, CNRS, Météo France, ACRI, France
- Federal Maritime and Hydrographical Agency (BSH), Brockmann Consult (BC), IFM Geomar, Germany
- Hellenic Centre for Marine Research (HCMR), University of Athens (IASA-UAT), Greece
- Techworks Marine, Ireland
- Israeli Oceanographic and Limnological Research (IOLR), Israel
- National Institute for Geophysics and Volcanology (INGV), Italy
- Italian Council for Scientific Research (CNR), Italy
- Euro-Mediterranean Centre for Climate Change (CMCC), Italy
- National Agency for New Technology, Energy and Environment (ENEA), Italy
- Italian Agency for the Protection of Environment (ISPRA), Italy
- National Institute for Oceanography (OGS), Italy
- General Office for Air Space and Meteorology (USAM), Italy
- University of Latvia, Latvia
- Centre of Marine Research (CMR), Lithuania
- International Ocean Institute (UMT-IOI), Malta
- National Institute for Halieutic Research (INRH), Morocco
- National Institute for Weather and Climate Research (KNMI), Netherlands
- NANSEN Centre, IMR, Met. No, NIVA, Norway
- Marine Institute Gdansk (MIG), Poland
- Instituto Superior Tecnico (IST), EDISOFT, Portugal
- Romanian Marine Research Institute (NIMRD), Romania
- NIERSC (Nansen), Russian Federation
- National Institute of Biology (NIB-MBS), Slovenia
- Puertos del Estado, Starlab, JRC, Spanish Council for Scientific Research (CSIC), Spain
- Swedish Meteorological and Hydrological Institute (SMHI), Sweden
- Middle East University (IMS-METU), Turkey
- Marine Hydro physical Institute (MHI-NASU), Ukraine
- UK Met Office, CEFAS, Reading University, Plymouth Marine Laboratory (PML), University of Plymouth (UoP), European Centre for Medium-Range Weather Forecast (ECMWF), Natural Environment Research Council (NERC POL,NOC),HR Wallingford, United Kingdom

COORDINATOR

Mercator Ocean, France

CONTACT

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PROJECT INFORMATION

Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service (MyOcean)

Contract N°: 218812
Starting date: 01/01/2009
Duration: 39 months
EU Contribution: € 33.800.000
Estimated total cost: € 55.024.887

MYWAVE

A pan-European concerted and integrated approach to operational wave modelling and forecasting



Waves

© Einar Egeland



Øyvind SAETRA
Project Coordinator

ABSTRACT

To reach the goal MyWave will:

1. increase the use of Earth observation by improving data processing algorithms and data assimilation systems;
2. improve the physics in current wave models and provide a framework for coupled model systems (atmosphere/waves/ocean);
3. establish a new standard for probabilistic wave forecasts based on ensemble methods;
4. derive standard protocols for validation products.

RESEARCH ON WAVE MODELLING TO LAY THE FOUNDATION FOR A FUTURE MARINE CORE SERVICE THAT INCLUDING OCEAN WAVES

The project aims to review and propose service level and coordination requirements for a pan-European wave 'core service' complementing MyOcean, and thus allowing end users to access a complete view of the physical marine environment. This review will include user consultation and demonstration exercises with respect to appropriate service quality metrics and use of probabilistic forecast techniques. It is expected that the outcomes of this review will include a roadmap from which a service provider led consortium can define and provide the service as a follow-on operational system.

The project will improve the physics of the wave models in the aspects crucial for the atmosphere and ocean coupling and consequently the estimate of the surface exchanges. As a result, My Wave will provide a roadmap towards a future GMES service for ocean waves that may pave the way for an operational activity after 2015, with an expected marked improvement not only of the underlying physics, but also of the practical results.

The project shall manufacture and demonstrate techniques by which Earth observation data can improve and inform the latest generation of surface wave forecasts and which enable waves to be coupled to ocean forecasts (developed recently within the GMES MyOcean project) in order to improve the skill of both systems. Outcomes from these elements of the project will include a community code that will allow pull through of the research by existing wave service providers.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The project aims at improving the quality of wave forecasting and at laying the foundation of a marine core service that includes ocean waves.

Why is this project important for Europe?

Waves are the single most important environmental parameter and are of a fundamental importance for fisheries, off-shore industry, and leisure. Information must be provided by trained forecasters in private enterprises or in meteorological services.

How does this project benefit European citizens?

Ocean weather and surface waves are a key parameter in decision making for marine and coastal operations. Surface waves are an important part of the risk analysis in storm flood events. They also contribute to the rise in water level. Many accidents tend to occur in severe weather conditions and currents induced by wave-mean flow interaction. In this context, MyWave can provide useful forecasting elements (e.g.: oil drift calculations).

MYWAVE

A pan-European concerted and integrated approach to operational wave modelling and forecasting

LIST OF PARTNERS

- The Norwegian Meteorological Institute - Metereologisk Institutt, Norway
- European Centre for Medium-Range Weather Forecasts (ECMWF), United Kingdom
- Consiglio Nazionale Delle Ricerche (CNR-ISMAR), Italy
- Helmholtz-Zentrum Geesthacht Zentrum für Material-und Küstenforschung GmbH, Germany
- Met Office – United Kingdom
- Stichting DELTARES, Netherlands
- Koninklijk Nederlands Meteorologisch Instituut, Netherlands
- METEO-France, France
- Stato Maggiore Aeronautica - Ufficio Generale Spazio Aereo e Meteorologia, Italy
- Hellenic Centre for Marine Research, Greece
- Agencia Estatal de Meteorologia, Spain
- Istituto Superiore per la Protezione e la Ricerca Ambientale, Italy

COORDINATOR

The Norwegian Meteorological Institute, Norway

CONTACT

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PROJECT INFORMATION

A pan-European concerted and integrated approach to operational wave modelling and forecasting – a complement to GMES MyOcean services (MYWAVE)

Contract N°:284455
Starting Date: 01/01/2012
Duration: 36 months
EU Contribution: € 1.997.499
Estimated total cost: € 2.973.896

NORS

Demonstration Network of ground-based Remote Sensing Observations in support of the GMES Atmospheric Service



Sky clouds

© iStockphoto.com - Hadel Productions



Martine DE MAZIÈRE
Project Coordinator

ABSTRACT

NORS aims at demonstrating the value of ground-based remote sensing data from the Network for the Detection of Atmospheric Composition Change for quality assessment and improvement of the GMES Atmospheric Service products.

ASSESSING AND IMPROVING THE QUALITY OF THE PRODUCTS DELIVERED BY THE GMES ATMOSPHERIC SERVICE (GAS)

The principal objective of the NORS project is to assess and improve the quality of the products delivered by the GMES Atmospheric Service (GAS), using independent, well-characterised, ground-based remote sensing data from the international Network for the Detection of Atmospheric Composition Change (NDACC). NDACC is a global research network with a strong European contribution, providing high-quality reference observational data for understanding the physical / chemical state of the stratosphere and troposphere, and for assessing the impact of atmospheric composition changes on climate.

NORS focuses on a selection of NDACC data that has high priority in the different domains of GAS, namely 'ozone and UV', 'air quality' and 'climate'. The research planned in NORS aims at tailoring these NDACC products to the needs of GAS. It includes a full characterisation of the products and an evaluation of the consistency between the ground-based data and the satellite data assimilated in the GAS production chain.

As ground-based remote sensing data forms the ideal link between in situ surface concentration and satellite column data, NORS will investigate the development of integrated troposphere products and integrated ozone products. A web-based application for the operational validation of the GAS products will be built. NORS will also support the GAS long-term re-analyses – back to 2003. It will have strong links to the MACC-II project, the European Environmental Agency, Global Atmosphere Watch (GAW) and European Space Agency (ESA).

QUESTIONS & ANSWERS

What is the project designed to achieve?

NORS is designed to demonstrate an operational validation of GAS products using tailored data from NDACC, based on four pilot stations and a few target species. The longer-term goal is to get the whole Network and new candidate stations involved.

Why is this project important for Europe?

There are 2 major reasons:

1. The European stations of NDACC will take the lead in demonstrating the capability of the global NDACC Network to become an important player in GMES.
2. Europe will benefit from improved GMES atmospheric data products.

How does this project benefit European citizens?

By enhancing the quality of the GAS products, NORS will help to improve our knowledge of our atmosphere and its evolution. As such, we will be able to face environmental challenges, which have a significant socio-economic impact, with improved confidence.

NORS

Demonstration Network of ground-based Remote Sensing
Observations in support of the GMES Atmospheric Service

LIST OF PARTNERS

- Belgian Institute for Space Aeronomy, Belgium
- Eidgenössische Materialprüfungs- und Forschungsanstalt, Switzerland
- Instituto Nacional de Técnica Aeroespacial, Spain
- Universität Bern, Switzerland
- Karlsruher Institut für Technologie, Germany
- Centre National de la Recherche Scientifique, France
- Universität Bremen, Germany
- Université de Liège, Belgium
- Max Planck Gesellschaft zur Förderung der Wissenschaften E.V., Germany
- Ruprecht-Karls-Universität Heidelberg, Germany
- Science and Technology B.V., Netherlands

COORDINATOR

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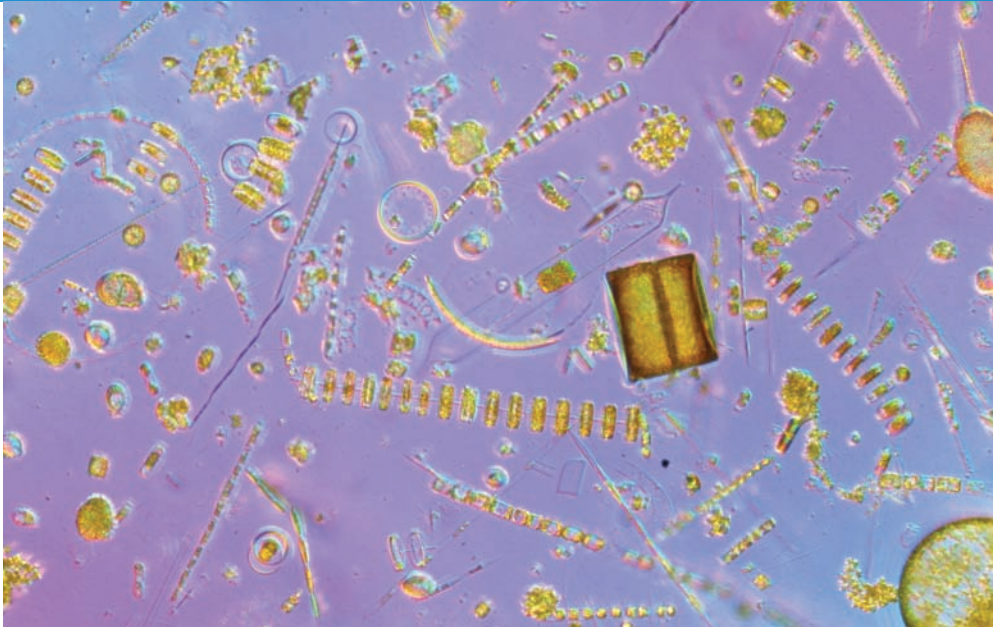
PROJECT INFORMATION

Demonstration Network Of ground-based Remote Sensing Observations in
support of the GMES Atmospheric Service (NORS)

Contract N°: 284421
Starting Date: 01/11/2011
Duration: 33 months
EU Contribution: € 1.999.999,50
Estimated total cost: € 2.833.512,40

OPEC

Operational Ecology



© OPEC

Plankton soup. Plankton is a key ecological variable in the models used through OPEC.

ABSTRACT

OPEC provides an enhanced capability to predict indicators of good environmental status in European regional seas.

ECOSYSTEM FORECAST PRODUCTS TO ENHANCE MARINE GMES APPLICATIONS

OPEC will undertake research and development to develop Operational Ecology to augment the capabilities of the GMES Marine Service. Using the Marine Service as a framework, OPEC will implement a prototype regional ecological Marine Forecast System in 4 European Regions (NE Atlantic, Baltic, Mediterranean and Black Seas) which include hydrodynamics, lower (plankton) and higher trophic (e.g. fish) and biological data assimilation.

OPEC will deliver 'new products' in terms of rapid environmental assessments as well as hind casts for environmental management. By assessing the potential spatial and temporal scales of predictability of seasonal forecast, appropriate to both lower and higher trophic levels, OPEC will also lay the foundations for the next generation of operational ecological products.

In doing so OPEC will provide high quality 3D ecosystem indicators covering a range of temporal and spatial scales, appropriate for different policy needs, as a new service aimed at supporting policy, environmental management and other downstream services.

OPEC will contribute directly to policy requirements, such as the Marine Strategy Framework Directive, CFP, and to the monitoring of climate change and the assessment of mitigation and adaptation policies. Through engagement with SMEs, OPEC will implement new water quality-related data products and delivery systems for downstream services. In addition, OPEC will define and deliver the S&T Roadmap and make recommendations for future data requirements for Operational Ecology.



Icarus ALLEN
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

OPEC will improve the quality of operational services for biogeochemical and ecological parameters and, in turn, our ability to protect the future status of European marine ecosystems.

Why is this project important for Europe?

Coastal and shelf seas provide many beneficial goods and services but also pose a risk to coastal populations. OPEC intends to help assess and manage these risks across European regional seas.

How does this project benefit European citizens?

OPEC will develop and evaluate practical operational tools to help assess and manage the risks posed by climate change and man's activities in marine environment and make these available through web applications.

LIST OF PARTNERS

- Plymouth Marine Laboratory (PML), United Kingdom
- Danmarks Meteorologiske Institut (DMI), Denmark
- Danmarks Tekniske Universitet (DTU), Denmark
- The Secretary of State for Environment, Food and Rural Affairs (Cefas), United Kingdom
- Istituto Nazionale di Oceanografia e Geofisica Sperimentale (OGS), Italy
- Hellenic Centre For Marine Research (HCMR), Greece
- Middle East Technical University (METU), Turkey
- PML Applications Ltd (PMLA), United Kingdom
- Brockmann Consult GmbH (BC), Germany

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Plymouth Marine Laboratory,
PML, United Kingdom

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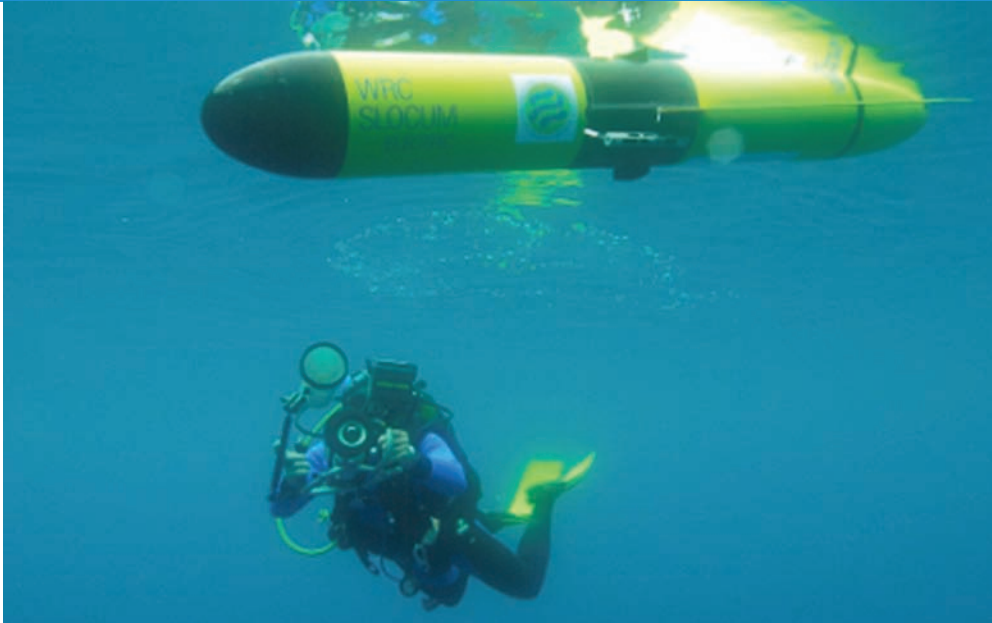
PROJECT INFORMATION

Operational Ecology: Ecosystem forecast products to enhance marine GMES applications (OPEC)

Contract N°: 283291
Starting Date: 01.01.12
Duration: 36 months
EU Contribution: € 1.999.678
Estimated total cost: € 2.604.649

OSS2015

Ocean Strategic Services beyond 2015



An OSS2015 Glider.

ABSTRACT

- OSS2015 will help development and validation of new tools for integration and/or assimilation of both EO and in situ data in biogeochemical models
- Several new validated products relevant to the biogeochemistry of the ocean will be processed and a 15 year time series at global scale will be distributed
- Several new prototype service lines will allow on-demand processing, like a match-up service that will provide the environmental conditions before, during and after a campaign at sea.

NEW TOOLS, PRODUCTS AND SERVICES FROM INTEGRATION OF Earth OBSERVATION, IN SITU DATA AND BIOGEOCHEMICAL MODELS

The OSS2015 project aims to carry out R&D activities for the development of new and innovative marine biogeochemistry products and services not currently available through the European Marine Core Service (MCS). The OSS2015 products and services will be derived from a combination of satellite and in-situ data as well as biological and bio-optical models. Uptake and usage of these new capabilities will be promoted among a wide range of users in the scientific, institutional and private sectors.

OSS2015 will combine the current state-of-the-art bio-profiler and Earth observation data in order to relate remotely detected surface optical properties and chlorophyll to their vertical distribution. OSS2015 will develop assimilation schemes to ingest Earth observation and in situ ocean colour data into cutting-edge numerical biological and biogeochemical models. Beyond the evaluation of these assimilation schemes, a very important outcome will be the optimisation of in-situ observation strategies using models and EO or EO data alone.

A major objective of OSS2015 is to generate advanced biogeochemistry products and to deliver a complete and rigorously validated 15-year time series at global scale, currently not planned in FP7-funded project MyOcean.

OSS2015 will develop a flexible product generation / data dissemination process that responds to user requirements and developing technologies.



Odile HEMBISE
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

The project will pave the way for future assimilation of Earth observation data into biogeochemical models for the next deployment phase of the Marine Core Service. New marine products and on-line services will be tested during the project.

Why is this project important for Europe?

The OSS2015 biogeochemistry products will significantly contribute to assess the state of marine ecosystems and to detect long-term trends and their possible link to change in the Earth's climate.

How does this project benefit European citizens?

OSS2015 will provide environmental indicators for hazards monitoring. It will help trans-boundary surveillance, better ecological follow up and modelling, as well as characterisation of environmental marine status.

OSS2015

Ocean Strategic Services beyond 2015

LIST OF PARTNERS

- ACRI-ST, France
- GIS COOC, Université Pierre et Marie Curie, France
- ARGANS Limited, United Kingdom
- NATO Undersea Research Centre, Italy
- Frontier Economics, United Kingdom
- Université du Littoral Côte d'Opale, France
- University College Cork, Ireland
- GEOMAR, Germany
- Dokuz Eylül Üniversitesi, Turkey
- Daithi O'Murchu Marine Research Station, Ireland

COORDINATOR

ACRI-ST, France

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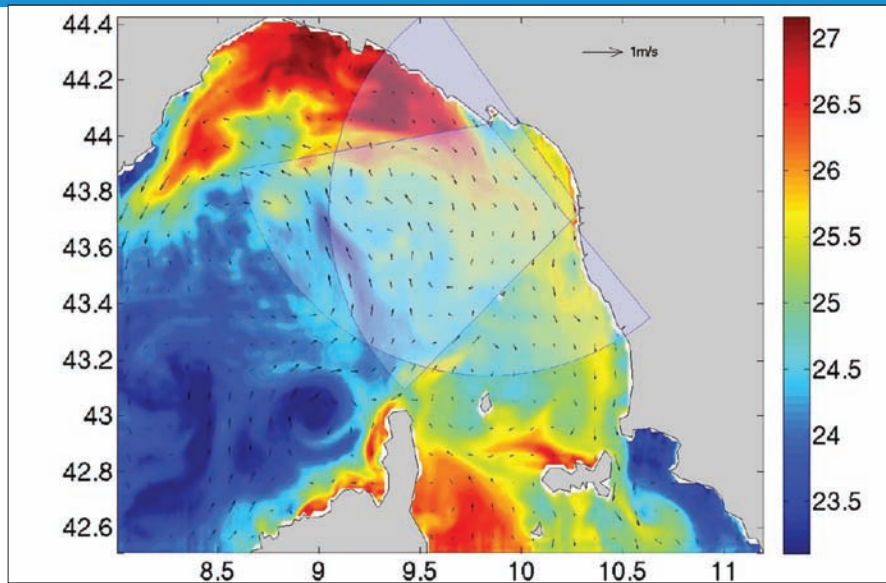
PROJECT INFORMATION

Ocean Strategic Services beyond 2015 (OSS2015)

Contract N°: 282723
Starting Date: 01/11/2011
Duration: 36 months
EU Contribution: € 2.000.000
Estimated total cost: € 3.357.235

SANGOMA

Stochastic Assimilation for the Next Generation Ocean Model Applications



© SANGOMA - project group GHER-ULg - Dr. Alexander Barth

Ligurian Sea modelled surface temperature and currents with indication of radar coverage used for data assimilation.



Jean-Marie BECKERS
Project Coordinator

ABSTRACT

SANGOMA works on new developments in data assimilation and prepares them so that future operational systems can use state-of-the-art data-assimilation and related analysis tools.

DEVELOPING NEW OCEAN DATA ASSIMILATION TECHNIQUES

SANGOMA will provide new developments in data assimilation to ensure that future operational systems make use of state-of-the-art data assimilation and related analysis tools. The consortium consists of a European network of expert teams in advanced data assimilation. The project will extend existing modular data assimilation systems that have high flexibility in type of ocean model and assimilation method. Following specific design rules, new modules can be used in different modular systems.

The systems will allow for efficient operational testing of the latest data assimilation methods, and quick comparison of assimilation methods for operational use. Furthermore, the project will develop and implement modules that objectively determine the impact of existing and new observation types.

The developments of SANGOMA will also serve customers of products of MyOcean, which is the first European project dedicated to the implementation of the GMES Marine Core Service for ocean monitoring and forecasting.

For this purpose, the project will concentrate on data assimilation methods that deliver probabilistic information on the products. To this end, existing ensemble methods will be included and new methods (which allow for non-linear and non-Gaussian systems) will be developed.

This dedicated web portal will allow access to validated products, including documented performances on a variety of test cases. Consolidated versions will be made available to the science community and Marine Forecasting Centres with indications on best practice implementation. Workshops and summer schools on advanced assimilation methods and modular systems will ensure fast and efficient training to the next generation of oceanographers, ensuring world-leading operational oceanographic products for customers and decision makers.

QUESTIONS & ANSWERS

What is the project designed to achieve?

A European network of expert teams in advanced data assimilation will extend existing modular data assimilation systems, which will allow for efficient operational testing of the latest data assimilation methods. Furthermore, SANGOMA will develop and implement modules to determine the impact of existing and new observation types.

Why is this project important for Europe?

MyOcean is the first EU project dedicated to the implementation of the GMES Marine Core Service for ocean monitoring and forecasting. SANGOMA will provide the necessary link to new developments in data assimilation to make use of state-of-the-art data-assimilation systems and related analysis tools.

How does this project benefit European citizens?

The project will ensure that future GMES products from operational applications will use state-of-the-art data assimilation to provide realistic estimates of errors of the ocean state and take uncertainties into account.

SANGOMA

Stochastic Assimilation for the Next Generation Ocean Model Applications

LIST OF PARTNERS

- University of Liège, Belgium
- University of Reading, United Kingdom
- Alfred Wegener Institute, Germany
- Delft University of Technology, Netherlands
- Centre National de la Recherche Scientifique (CNRS), France
- NERSC, Norway

COORDINATOR

University of Liege, Belgium

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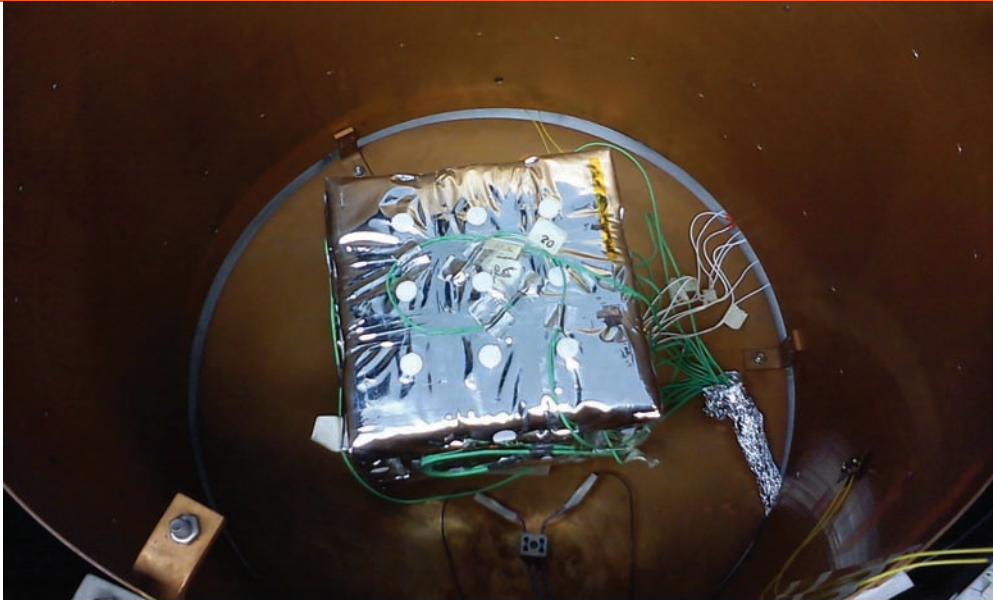
PROJECT INFORMATION

Stochastic Assimilation for the Next Generation Ocean Model Applications (SANGOMA)

Contract N°: FP7-SPACE-2011 project, Grant 283580
Starting Date: 01/11/2011
Duration: 48 months
EU Contribution: € 1.992.454
Estimated total cost: € 2.527.492

AerSUS

Aerogel European Supplying Unit for Space Applications



©AST SA

Aerogel thermal protection system during qualification tests



Augusto MEDINA
Project Coordinator

ABSTRACT

The main purpose of this project is to create a European Supplying Unit for one of the critical space technologies – advanced thermal control materials – thus improving European strategic non-dependence.

CREATING A EUROPEAN SUPPLYING UNIT FOR ADVANCED THERMAL CONTROL MATERIALS

Currently, the thermal protection of the hardware of spacecrafts is assured by underlying advanced thermal control materials, typically Multi Layer Insulations (MLI). One of the basic materials for MLI, the Kapton, is used in several thermal control applications and easily falls under access restrictions.

The aim of the AerSUS project is to develop manufacturing technology for aerogels, i.e. those materials considered to form the next generation of thermal insulation in space. Aerogels are the materials with the greatest potential to substitute MLI in thermal insulation of spacecraft, due to their low density, high thermal insulation efficiencies, and their ability to provide thermal insulation as a single material that can be industrially produced and tailored to different applications.

The combination of the know-how of the entities involved in the project will create synergies to enhance Europe's leading position as a supplier of the aerogels.

The collaborative efforts of the partners, which have been working in the aerogels development in recent years, are expected to allow the establishment of the required technical capabilities to supply aerogels for space applications such as (re)-entry vehicles, Mars rovers, cryogenic propulsion tanks and pressurized compartments.

QUESTIONS & ANSWERS

What is the project designed to achieve?

AerSUS aims at developing the manufacturing technology for aerogels – the material that is considered to be the next generation of thermal insulation in space.

Why is this project important for Europe?

Through AerSUS, Europe will reduce outside dependence on critical technologies and capabilities for future space applications. It is also expected that the results of the project will enhance the technical capabilities and overall competitiveness of the European space industry satellite vendors on the worldwide market.

How does this project benefit European citizens?

MLI represents a significant cost in spacecraft manufacturing. The development of aerogels will contribute to cheaper space access, providing services such as internet, communications, and navigation at more affordable prices.

LIST OF PARTNERS

- Sociedade Portuguesa de Inovacao – Consultadoria Empresarial e Fomento da Inovacao S.A., Portugal
- Active Space Technologies GmbH, Germany
- Thales Alenia Space Italia SPA, Italy
- Universidade de Coimbra, Portugal
- Association pour la Recherche et le Developpement des Methodes et Processus Industriels – Armines, France
- Active Space Technologies, Actividades Aeroespaciais S.A., Portugal
- Science and Technology Facilities Council, United Kingdom
- SEPAREX SA, France
- Deutsches Zentrum für Luft - und Raumfahrt EV, Germany

COORDINATOR

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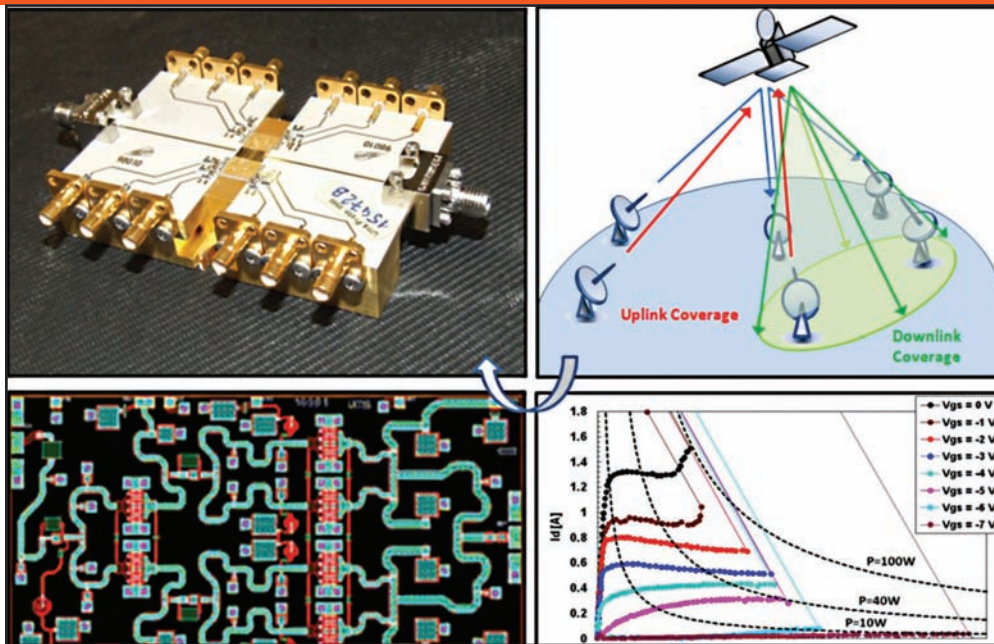
PROJECT INFORMATION

Aerogel European Supplying Unit for Space Applications (AerSUS)

Contract N°: 284494
Starting Date: 01/01/2012
Duration: 36 months
EU Contribution: € 1.952.090,06
Estimated total cost: € 2.565.625,21

AL-IN-WON

AlGaN and InAlN based microwave components



Courtesy of UMS

Benefits of Reliability improvement from semiconductor materials to circuits for Space applications.



Didier BAGLIERI
Project Coordinator

ABSTRACT

AL-IN-WON aims at comparing reliability and robustness of two GaN heterostructures: AlGaN/GaN and InAlN/GaN.

- HEMT will be processed and its short term reliability evaluated (lag effect for instance).
- AL-IN-WON will also evaluate the high frequency limits of GaN field effect transistors in terms of power generation and noise behaviour.

The reliability study will be compatible with the spatial requirement.

DEVELOPMENT OF NEW GENERATION OF WIDE BAND GAP GAN TECHNOLOGY FOR HIGH FREQUENCY SPACE APPLICATIONS

New semiconductors such as gallium nitride (GaN) are being developed for both civilian and governmental applications (which are expected to provide a high level of robustness and performance for RF) and microwave systems due to its intrinsic characteristics compared with conventional semiconductor technologies.

GaN technology is an ideal candidate for several applications on board satellite payloads. It is an answer to the need for high transmitted power, linearity and power efficiency under strong thermal constraints, overdrive operations, jamming conditions, radiations, etc.

The AL-IN-WON project would be the next step towards High Frequency GaN technology in synergy with the existing ESA roadmap. Also, some past developments at semiconductor material level will be re-used and especially optimized in order to address applications at higher operating frequencies (so called "Ka band").

The final objective will be the evaluation of InAlN/GaN compared to more conventional AlGaN/

GaN high power HEMT technology with very high breakdown voltage, high current and compliant with high power density. Regarding space applications, for which reliability and robustness are of major concerns, we expect to demonstrate the major breakthrough offered by GaN technology, and especially InAlN, if successful.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The main goal of this project is to evaluate the reliability level of the InAlN / GaN HEMT technology for space application. Europe has a lead on semiconductor technology.

Why is this project important for Europe?

The project addresses the issue of the independence of Europe regarding Gallium Nitride space components, a technology which is explicitly listed in the Space Work Programme 2009, as one which is critical for the future of Europe.

How does this project benefit European citizens?

This technology will address the needs for future on-board space communication systems in "Ka band" frequencies, which are foreseen as a major evolution in the next decade.

AL-IN-WON

AlGaN and InAlN based microwave components

LIST OF PARTNERS

- United Monolithic Semiconductors S.A.S, France
- XLIM, Limoges University, France
- UNIPD, University of Padova, Italy
- Microwave Electronic for Communications, MEC Italy
- III-V LAB, France
- Thales Alenia Space, France
- United Monolithic Semiconductors SAS, UMS SAS, France
- United Monolithic Semiconductors GmbH, UMS GmbH, Germany

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United Monolithic Semiconductors S.A.S, France

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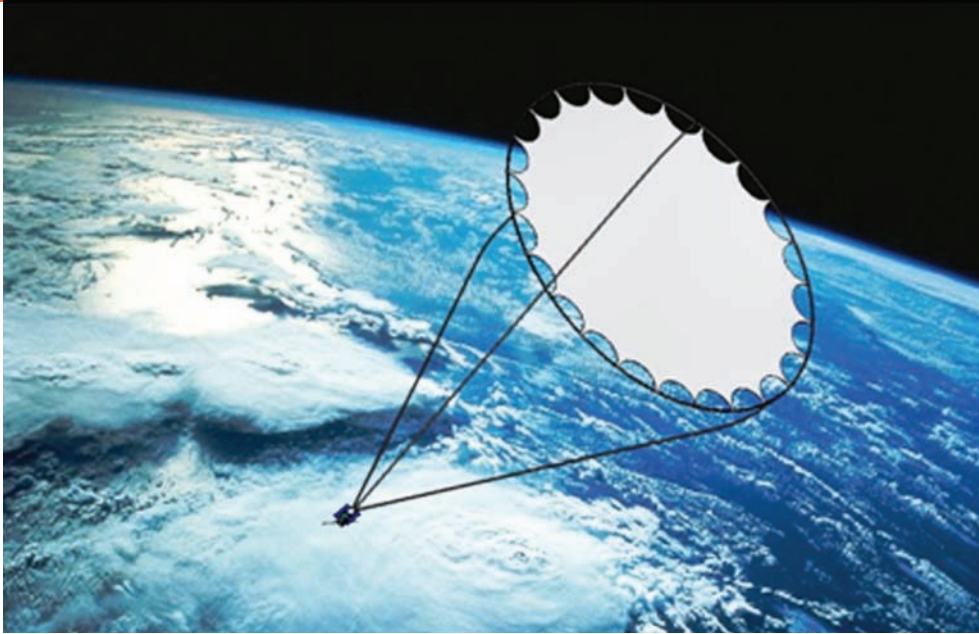
PROJECT INFORMATION

AlGaN and InAlN based microwave components (AL-IN-WON)

Contract N°: 242394
Starting Date: 01/11/2010
Duration: 36 months
EU Contribution: € 1.953.471,40
Estimated total cost: € 3.368.361,60

DEPLOYTECH

Development and Testing of Gossamer/Deployable Structures for Use in Space



©InflateSAIL - University of Surrey

InflateSAIL Deorbiting System



Vaios LAPPAS
Project Coordinator

ABSTRACT

The objective of DEPLOYTECH is to develop three specific, useful, robust, and innovative large deployable space structures to a TRL of 6-8 in the next three years. These include: a 5m x 5m sail structure that uses inflatable technology for deployment and support; a 5m x 1m roll-out solar array that utilizes bistable composite booms; and 14m solar sail CFRP booms with a novel deployment mechanism for extension control.

LARGE DEPLOYABLE TECHNOLOGIES FOR SPACE

Large deployable space structures are needed as the backbone for various space systems and as an integral part of large reflectors, Earth observation satellite antennas and radars, radiators, Sun shields and solar arrays. Advances in launch vehicle design have been limited to date, and have not resulted in an increase in fairing size in the last three decades.

Deployable structures come with the promise and capability of reducing mass substantially on spacecraft and allowing for very compact systems to be stored during the launch phase. Also, there is a current growing need for larger apertures, solar panels, thermal shields and gossamer sails. Hence, it is important that large deployable structures are further developed and de-risked. The Technology Readiness Level (TRL) of a great part of these technologies is still very low in the order of 2-3.

Thus, the objective of DEPLOYTECH is to develop three specific, useful, robust, and innovative large deployable space structures to a TRL of 6-8 in the next three years. These include: a 5m x 5m sail structure that uses inflatable technology for deployment and support;

a 5m x 1m roll-out solar array that utilizes bistable composite booms; and 14m solar sail CFRP booms with a novel deployment mechanism for extension control. Also, during this project several specific modeling activities will take place, from an analysis of proper folding for membrane and tube structures to the controllability of extension, modeling the deployment dynamics of several structures to an improved analytical model for bistable composite tubes.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The objective of this project is to develop 3 specific, useful, robust and innovative large space deployable technologies:

- 5m x 5m inflatable sail
- 1m x 5m deployable solar array
- 14m solar sail booms

The aim is to develop these technologies from a current TRL of 2-3 to 6-8 within the 3 years of the proposed DEPLOYTECH project.

Why is this project important for Europe?

Space deployable structures (gossamer structures) are complex and the development/testing of such systems can be challenging and expensive. The DEPLOYTECH project brings a group of world leaders, in the field, in Europe and will push the TRL of the technology through coordinated development of key technologies in order to mature deployable structure technology in the near term for future use in space.

How does this project benefit European citizens?

European citizens will be able to benefit from the use of new space technology, which can potentially enable more efficient, lighter (mass) and flexible space structures and systems to be used in space. New missions/space applications can be conveyed using ultra-light structures such as solar arrays, solar sail propulsion systems and deorbit systems in a more cost effective, flexible manner.

DEPLOYTECH

Development and Testing of Gossamer/Deployable Structures for Use in Space

LIST OF PARTNERS

- University of Surrey, United Kingdom
- DLR, Germany
- Astrium, France
- RolaTube, United Kingdom
- Cambridge University, United Kingdom
- Athena-SPU, Greece
- TNO, Netherlands
- CGG Technologies, Netherlands

COORDINATOR

University of Surrey, United Kingdom

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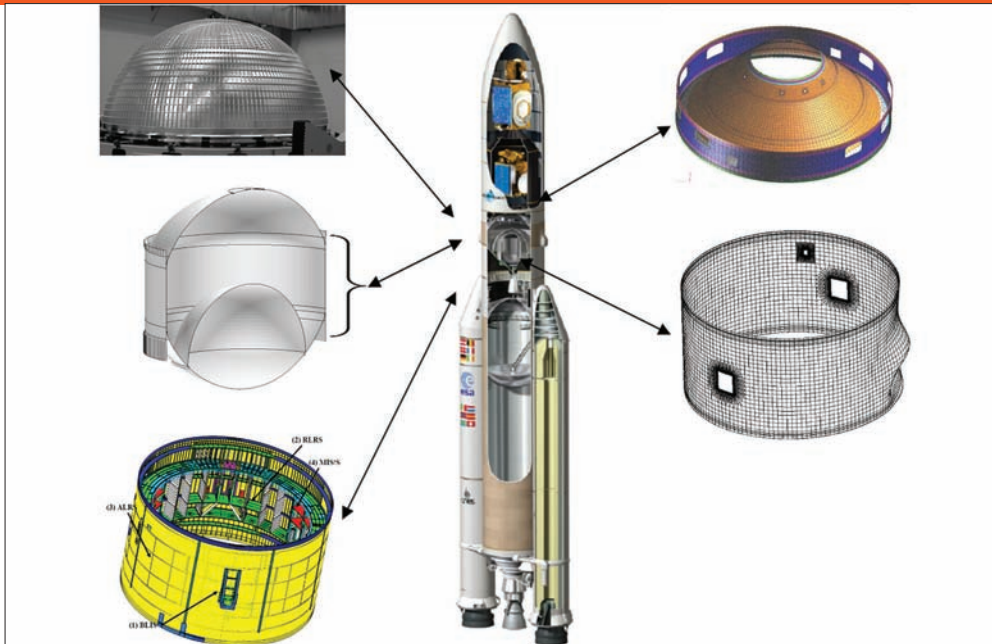
PROJECT INFORMATION

Development and Testing of Gossamer/Deployable Structures for Use in Space (DEPLOYTECH)

Contract N°: 284474
Starting Date: 01/01/2012
Duration: 36 months
EU Contribution: € 1.829.745,00
Estimated total cost: € 2.523.511,55

DESICOS

New Robust DESign Guideline for Imperfection Sensitive COmposite Launcher Structures



Richard DEGENHARDT
Project Coordinator

ABSTRACT

DESICOS develops a new design guideline for imperfection sensitive launcher structures made of composites. The structural weight will be reduced by 20% compared to the current guidelines.

NEW DESIGN GUIDELINE FOR FUTURE LAUNCHER STRUCTURES MADE OF COMPOSITES

The Space industry's demand for lighter and cheaper launcher transport systems has led to the setting up of DESICOS, which contributes to these aims by a new design approach for imperfection sensitive composite launcher structures, exploiting the Single Perturbation Load Approach (SPLA), which assumes that a large enough disturbing load leads to the worst imperfection. Currently, imperfection sensitive shell structures prone to buckling are designed according to the NASA SP 8007 guidelines using the conservative lower bound curve.

The guideline dates from 1968, and the structural behaviour of composite material is not considered suitable, in particular since the imperfection sensitivity and the buckling load of shells made from such materials depend on the lay-up design. This is not considered in the NASA SP 8007, which allows for the designing of only so called "black metal" structures. Here there is an increased need for a new precise and fast design approach. A recent investigation demonstrated that an axially loaded unstiffened cylinder, applying the new SPLA, leads directly to the design buckling load, which is 45% higher compared to NASA SP 8007.

This increased allowance in buckling load corresponds to 20% weight reduction, if the load is kept constant. With DESICOS the new methods will be further developed, validated by tests and summarized in a design handbook. The potential will be demonstrated by different industrially driven use cases.

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to develop new design methods for most relevant architectures of cylindrical and conical launcher structures made of composites. The methods will be validated by new tests and will be demonstrated within different industrially driven use cases.

Why is this project important for Europe?

The European Space industry is going to design future launcher structures made of composites. DESICOS contributes to this aim by new design approaches which allow the full exploitation of the reserve capacities.

How does this project benefit European citizens?

The application of the new tools will lead to more efficient and safer launchers. Thus, space based offers to the public become more affordable for a wider range of users and will bring people into closer connection by information exchange. In addition, reduction of weight directly reduces raw material and propellant consumption and thus contributes to quality of life.

DESICOS

New Robust DESign Guideline for Imperfection Sensitive COmposite Launcher Structures

LIST OF PARTNERS

- German Aerospace Center (DLR), Germany
- Astrium SAS, France
- Astrium GmbH, Germany
- GRIPHUS – Aeronautical Engineering for Manufacturing, Israel
- Technical University Delft, Netherlands
- Gottfried Wilhelm Leibniz University Hannover, Germany
- Private University of Applied Sciences Göttingen, Germany
- Politecnico di Milano, Italy
- Riga Technical University, Latvia
- RWTH Aachen, Germany
- Israel Institute of Technology (TECHNION), Israel
- Co-operative Research Centre for Advanced Composite Structures (CRC-ACS), Australia

COORDINATOR

German Aerospace Center (DLR),
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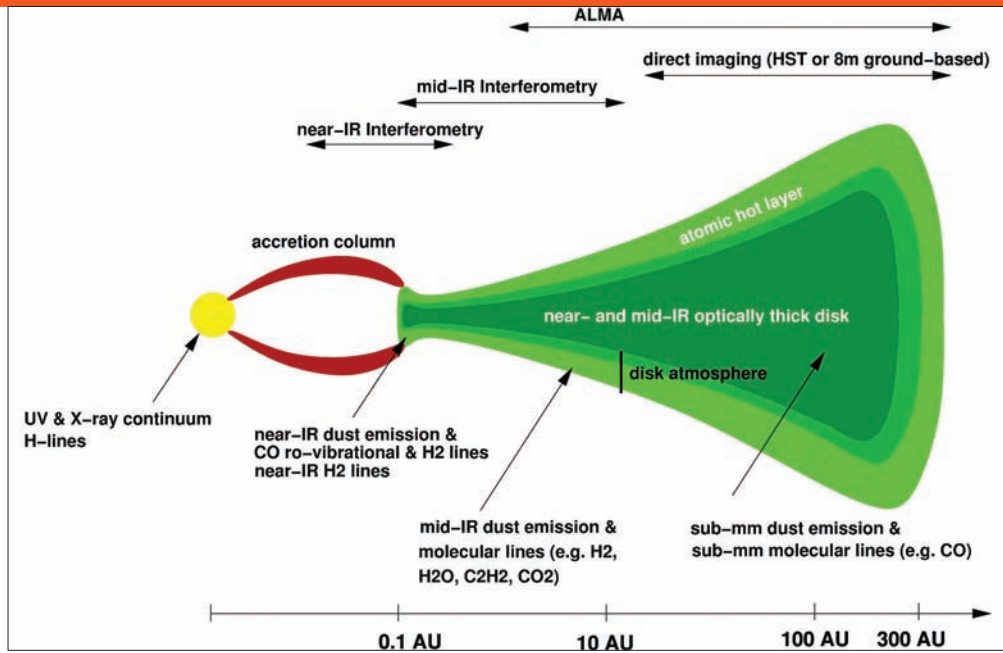
PROJECT INFORMATION

New Robust DESign Guideline for Imperfection Sensitive COmposite
Launcher Structures (DESICOS)

Contract N°: 282522
Starting Date: 01/02/2012
Duration: 36 months
EU Contribution: € 1.997.700,00
Estimated total cost: € 3.046.454,40

DiscAnalysis

Analysis and Modelling of Multi-wavelength Observational Data from Protoplanetary Discs



© Dr. Peter Woitke - St. Andrews University, UK



Peter WOITKE
Project Coordinator

ABSTRACT

DiscAnalysis will collect multi-wavelength observational data from the birth-places of planets, from X-rays to cm wavelengths, to probe the gas and dust properties in these systems. Our modelling of this data aims at a detailed understanding of the physical and chemical conditions for planet formation.

UNDERSTANDING THE BIRTH-PLACES OF PLANETS

The search for planets outside of the solar system, related to the question “are we alone in the universe?”, is undoubtedly one of the main science drivers for the current design of astronomical telescopes and instrumentation. In this FP7 project, we will study the birthplaces of such exo-planets, the so-called protoplanetary discs, by combining observational data for space-based telescopes with ground-based data, covering the whole electromagnetic spectrum from X-rays to cm wavelengths.

Large amounts of survey data exists, but are seriously under-utilised and usually not discussed in relation to each other. The project will mainly use FP7 resources for manpower to collect, analyse, and interpret the data by means of novel high-quality disc models. Besides archival data, our team has access to the latest results from ongoing observational key programmes (such as the Herschel space observatory, the Very Large Telescope VLT, and the Hubble space telescope HST), and these data need to be folded in to probe the conditions for planet formation, such as gas and dust density, temperature and chemical composition, over the discs’ full radial extent.

Our team covers the required modelling know-how to reach an unprecedented level of completeness concerning the inclusion of important physical, chemical and radiative processes to be modelled (astrochemistry, gas heating & cooling, dust evolution, continuum & line radiative transfer, non-LTE modelling).

We also aim for a breakthrough in wavelength-coverage and completeness as to how the models are compared to observations (photometry, interferometry, line fluxes, line profiles and images). Based on these multi-wavelength data sets and our detailed modelling efforts, we will be able to determine the physical and chemical structure of the discs, and answer a number of fundamental questions related to planet formation, for example, how the gas and dust in discs evolve in time, how important the stellar UV and X-ray irradiation is, and how the presence of planets alters the disc structure. We will capitalise on our unique team expertise in observations and modelling to make the best use of existing European space-mission data, to explore disc evolution and the initial conditions of planet formation.

QUESTIONS & ANSWERS

What is the project designed to achieve?

To unify the different perspectives from various wavelength domains in the scientific community and to develop disc models applicable to the whole electromagnetic spectrum, and to apply these models to existing multi-wavelength observational data.

Why is this project important for Europe?

European space missions produce observational data for protoplanetary disc and planet formation research. Through this FP7 project, we will establish a transnational collaboration to compile coherent multi-wavelength data sets for a well-defined sample of protoplanetary discs.

How does this project benefit European citizens?

Everybody wants to know how planets form, how the water came to planet Earth, and why some stars have planets. To answer these fundamental questions about our own existence, we need a new international effort to combine astronomical observations obtained from different platforms.

DiscAnalysis

Analysis and Modelling of Multi-wavelength Observational Data
from Protoplanetary Discs

LIST OF PARTNERS

- The University Court of the University of St Andrews, United Kingdom
- Universiteit van Amsterdam (Astronomical Institute Anton Pannekoek), Netherlands
- Rijksuniversiteit Groningen (Kapteyn Astronomical Institute), Netherlands
- Université Joseph Fourier Grenoble 1 (IPAG), France
- Universität Wien (University of Vienna), Austria

COORDINATOR

The University Court of the University of
St Andrews, United Kingdom

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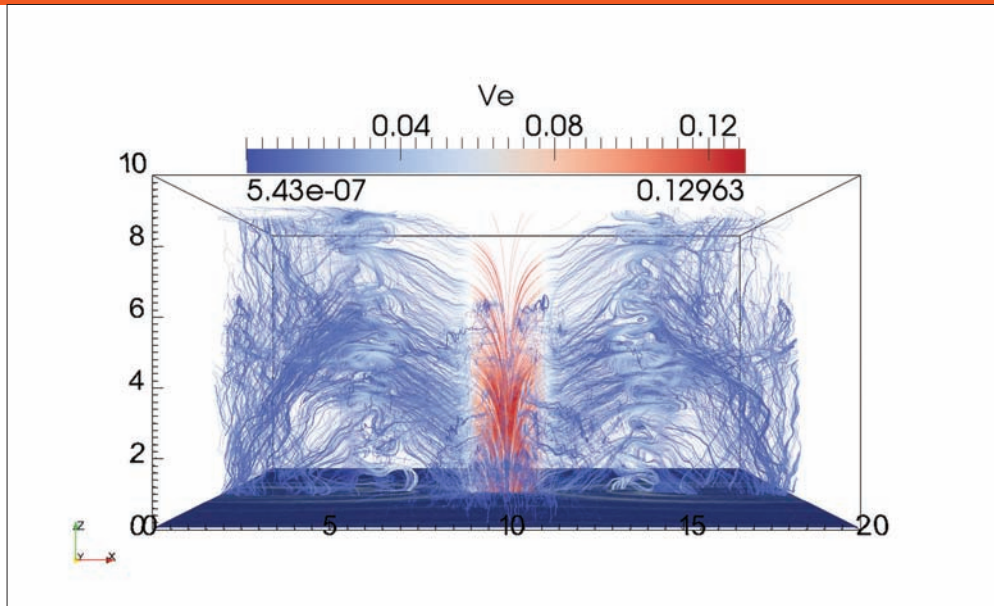
PROJECT INFORMATION

Analysis and Modelling of Multi-wavelength Observational Data
(DiscAnalysis)

Contract N°: 284405
Starting Date: 01/01/2012
Duration: 51 months
EU Contribution: € 2.609.621,60
Estimated total cost: € 1.993.622,00

eHEROES

Environment for Human Exploration and Robotic Experimentation in Space



© eHEROES project

Electron flow in a reconnection region where the magnetic field energy is released into kinetic energy.



Giovanni LAPENTA
Project Coordinator

ABSTRACT

eHeroes aims at characterising the space environment, its variability on long and short timescales, with the ultimate goal of understanding the threats to space exploration.

UNDERSTANDING THE LINK BETWEEN SPACE ENVIRONMENT AND SPACE EXPLORATION

Humans entering the Low Earth Orbits are exposed to lethal radiation. Extreme care must be put into designing the spacecraft, the space suits and in finding the right time frame to operate the missions.

Exploring space is a heroic endeavour for people and one which needs proper preparation and support. The consortium eHEROES intends to do all that is possible within the reach of modern science to make sure that such heroes will return safely to the Earth after a successful mission. In the words of President Kennedy, "(...) ...this nation should commit itself to achieving the goal, before the decade is out, of landing a man on the Moon and returning him safely to the Earth". The last part is as important as the first and eHEROES makes that its goal.

The consortium eHEROES aims at harnessing the existing data based on ground and satellite observations. It also aims to improve the existing knowledge (both in Europe and abroad) and to produce new value-added data products to provide the best estimate and prediction of conditions found in the space environment and its variation over time. The focus will, of course, be on the threats that missions of exploration will encounter in reaching beyond the Earth's orbit, to the Moon, to Mars and beyond. But eHEROES also takes a broader and deeper view by trying to use new and available data, models, theories and computer simulations to further our understanding of the space environment.

QUESTIONS & ANSWERS

What is the project designed to achieve?

eHEROES wants to understand and characterise the threats to space exploration coming from the dynamic nature of the space environment. We will improve existing knowledge and provide new data products to support the planning of future missions of exploration to the Moon and Mars.

Why is this project important for Europe?

Space is the final frontier. Europeans ventured across oceans to explore new continents. The exploration of space should see other Europeans breaking new records and pushing the limits of our knowledge. The reasons are economic as well as social. Taking new challenges leads to new economic leadership.

How does this project benefit European citizens?

Understanding the space environment is beneficial as a required step to explore and exploit space. But it is also a required step in understanding the impact of the solar variability on the Earth's climate. eHEROES will have a strong public outreach component, engaging the public, from young children to adults, in fun and educational activities.

eHEROES

Environment for Human Exploration and Robotic Experimentation
in Space

LIST OF PARTNERS

- Katholieke Universiteit Leuven, Belgium
- Space Research Centre, Polish Academy of Sciences, Poland
- NOVELTIS SAS, France
- P.N. Lebedev Physical Institute of the Russian Academy of Sciences, Russian Federation
- Oulun Yliopisto, Finland
- University College London, United Kingdom
- Universitaet Graz, Austria
- Royal Observatory of Belgium, Belgium
- Hvar Observatory, Faculty of Geodesy, University of Zagreb, Croatia
- Konkoly Observatory, Hungary
- Observatoire de Paris at CNRS, France
- University of Catania, Italy
- Istituto Nazionale di Astrofisica - National Institute for Astrophysics, Italy
- Schweizerisches Forschungsinstitut für Hochgebirgsklima und Medizin Davos, Switzerland
- Georg-August Universität Göttingen Stiftung Öffentlichen Rechts, Germany

COORDINATOR

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PROJECT INFORMATION

Environment for Human Exploration and Robotic Experimentation
in Space (eHEROES)

Contract N°: 284461

Starting Date: 1/3/2012

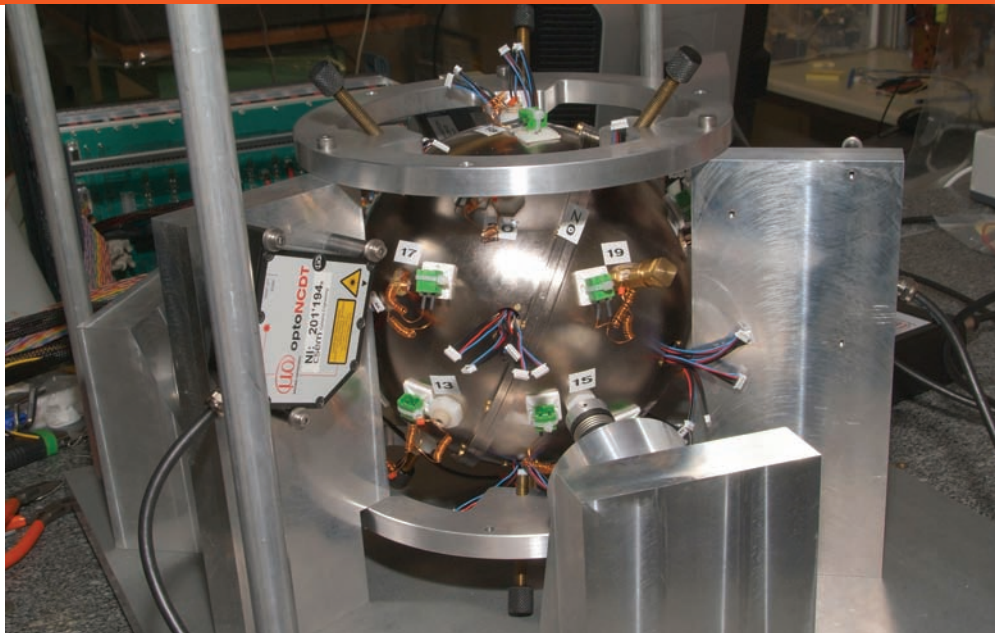
Duration: 36 months

EU Contribution: € 1.999.720,85

Estimated total cost: € 2.524.108,00

ELSA

European Levitated Spherical Actuator



Reaction sphere mounted on its test bench.

© 2012 - CSEM



Emmanuel ONILLON
Project Coordinator

ABSTRACT

ELSA aims at bringing the concept of Reaction Sphere to the level of an Elegant Breadboard. With enough maturity, a new concept of AOCS will be available on the European market, bringing an ITAR free AOCS.

DEVELOPMENT OF A NOVEL ATTITUDE CONTROL SYSTEM

Attitude and orbit control systems (AOCS) have been recognized since long as one of the main spacecraft subsystems, having a major impact on the efficiency and quality of commercial and scientific space missions.

The use of a single Reaction Sphere, held in position by magnetic levitation, is proposed in ELSA as a replacement to the currently used approach. The sphere can be accelerated in any direction by a three dimensional (3D) motor. Because of its unparalleled symmetry, a hollow sphere delivers constantly a maximum inertia independently of its current rotation axis.

Furthermore, a hollow sphere has the natural optimal multi axis useful inertia-to-mass and -volume ratios. It turns out that, with equivalent inertia capacities within the same volume, an arrangement with a single Reaction Sphere will offer the advantage of a reduction in mass of more than 50% with respect to a three-reaction wheel configuration. Moreover, a sphere can theoretically be used in reaction, momentum, and control moment gyro models at the same time.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The project aims at designing a novel concept of Satellite Attitude Control System (ACS), which brings higher performances and a gain in mass and volume in comparison to traditional ACS.

Why is this project important for Europe?

The ELSA development will bring to market an ITAR free Attitude Control System. The goal is to improve European capacity to independently manufacture commercial and scientific satellites by bringing a new actuator for attitude and orbit control systems to a higher level of maturity.

How does this project benefit European citizens?

As a result of improved ACS performances, the satellite pointing accuracy will be improved. The lower mass for a given performance will enhance reliability and will free up more mass for scientific experiments in future missions. The enhanced operational available modes compared to traditional reaction wheels will enable improved mission planning flexibility, which is expected to lead to a higher scientific return.

LIST OF PARTNERS

- Centre Suisse d'Electronique et de Microtechnique, Switzerland
- Maxon motor, Switzerland
- Sener, Ingenieria y Sistemas S.A., Spain
- Société Anonyme Belge de Constructions Aéronautiques, Belgium
- Centrum Badan Kosmic Znych Polskiej Akademii Nauk, Poland
- Redshift, Belgium

COORDINATOR

Centre Suisse d'Electronique et de Microtechnique
Switzerland

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PROJECT INFORMATION

European Levitated Spherical Actuator (ELSA)

Contract N°: 283223
Starting Date: 01/12/2011
Duration: 30 months
EU Contribution: € 1.966.305,00
Estimated total cost: € 3.143.391,50

EUCARBON

European Space Qualified Carbon Fibers and Impregnated Based Materials



EUCARBON

©ESA



Celeste Perreira
Project Coordinator

ABSTRACT

EUCARBON provides Europe with technical and manufacturing capabilities for high performance carbon fibres and pre-impregnated based materials.

PROVIDE EUROPE WITH SPACE QUALIFIED CARBON FIBER MANUFACTURING CAPACITIES

EUCARBON project aims at overcoming the present recognised needs of European made space qualified carbon fibre and pre-impregnated materials. These materials are building blocks for technological innovation in space research. Presently aerospace qualified carbon fibre is either produced outside Europe or produced by only one source in Europe under the supervision of foreign countries.

This issue weakens European competitiveness in space, mainly related to the increased delivery lead times and costs. In order for Europe to have free, unrestricted access to these materials, it is necessary that they are developed in European facilities under European supervision.

The following developments will result from the project:

- » high and ultrahigh modulus carbon fibres to be produced in Europe by a European manufacturer;
- » space qualified pre-impregnated materials involving the developed carbon fibres and epoxy resins inserted with carbon nanotubes.

These novel materials will address one of the main issues linked to the use of carbon fibres composites in space applications: their low thermal and electrical conductivity.

The above technologies will be demonstrated with the conception, production and testing of demonstrator parts for use as satellites and launcher components.

EUCARBON will also provide raw materials for other strategic sectors of industry in Europe like aircraft, automotive, and others.

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to overcome the present recognised need of European made space qualified carbon fibre and pre-impregnated materials. These materials are the building blocks for technological innovation in space research.

Why is this project important for Europe?

Presently, Europe does not have technical and manufacturing capacities for aerospace qualified carbon fibre. EUCARBON project will reduce European dependence on these critical technologies and will promote European competitiveness.

How does this project benefit European citizens?

The space sector is a strategic asset contributing to the independence, security and prosperity of Europe and its role in the world. Europe needs non-dependent access to critical space technologies, which is a sine-qua-non condition for achieving Europe's strategic objectives.

EUCARBON

European Space Qualified Carbon Fibers and Impregnated Based Materials

LIST OF PARTNERS

- INEGI – Institute for Mechanical Engineering and Industrial Management, Portugal
- Fibras Sintéticas de Portugal SA, Portugal
- EADS Casa Espacio SL, Spain
- CTL Tastail Teoranta Limited, Ireland

COORDINATOR

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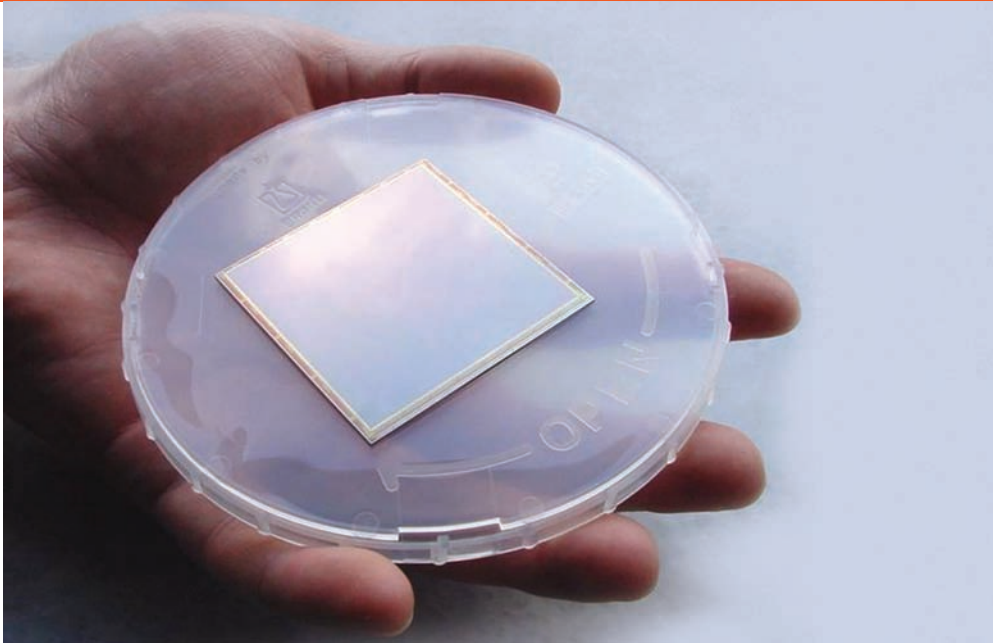
PROJECT INFORMATION

European Space Qualified Carbon Fibers and Impregnated Based Materials (EUCARBON)

Contract N°: 284500
Starting Date: 01/12/2011
Duration: 36 months
EU Contribution: € 1.997.446,98
Estimated total cost: € 3.197.683,88

EUROCIS

Platform for European CMOS Imagers



CMOS imager

© IMEC



Kyriaki MINOGLOU
Project Coordinator

ABSTRACT

Europe does not currently have a full supply chain of space worthy imagers. This issue is exactly addressed by EUROCIS. The project will develop a 'product platform' to serve imagers for space needs in the future without requiring manufacturing sources outside Europe. This is of great importance for Europe in terms of strategic independence.

CREATING A EUROPEAN PLATFORM FOR MANUFACTURING BACKSIDE ILLUMINATED CMOS IMAGERS

The main goal of this project is the creation of a European supply chain for state-of-the-art CMOS imagers. As identified by both the European Space Agency (ESA) and the European Commission, there is a need for such a supply chain for CMOS imagers for space applications which uses solely European (and hence ITAR-free) sources. This goal will be achieved using the proposed consortium as all partners have excellent know-how and track record in their fields of expertise.

A second goal of the project is to push the performance of CMOS imagers and match the requirements for the space applications (typically very demanding). Hence large area (much larger than commercial imagers) high sensitivity imagers will be developed using stitching technology and backside thinning. A key element here is the backside passivation process using laser annealing.

The outcome of this project is a CMOS imager design and manufacturing platform that can be used by the space industry (ESA, CNES, satellite manufacturers) for their future space imager needs. However, it will serve as well (and will be open for) other high-end imager needs in e.g. medical or security applications.

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to set up a supply chain for space imagers that will be fully European. Moreover this imager platform will be set-up such that there is non-restrictive access (i.e. no dependence on ITAR restrictions) to advanced imager technology within Europe.

Why is this project important for Europe?

Our focus is on backside illuminated large area CMOS imagers for which, currently, there is no existing manufacturing capability within Europe. EUROCIS can provide strategic benefits for Europe: beyond state-of-the-art high-end imagers will be developed and become available for the European Space industry.

How does this project benefit European citizens?

The advanced imager technology developed and brought to an industrial platform in EUROCIS will enable demanding applications in space (e.g. Earth-observation) but will also serve other high-end imaging applications such as medical, security, safety and scientific to the benefit of the citizens.

EUROCIS

Platform for European CMOS Imagers

LIST OF PARTNERS

- Interuniversitair Micro-Electronica Centrum vzw - imec, Belgium
- SELEX Galileo, Italy
- Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek - TNO, Netherlands
- Excico, France

COORDINATOR

Interuniversitair Micro-Electronica Centrum vzw
IMEC, Belgium

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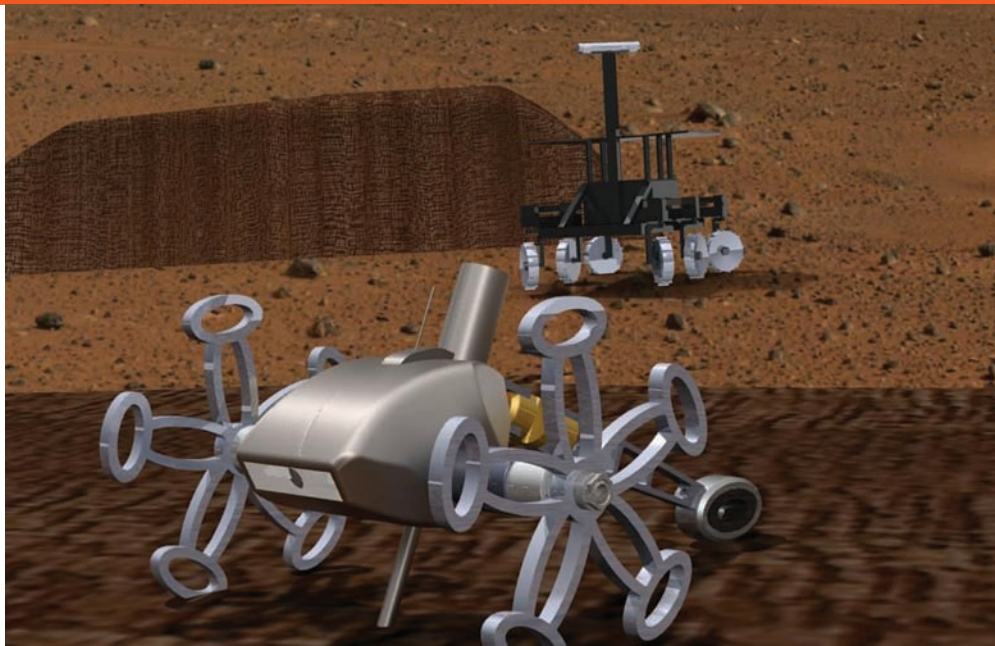
PROJECT INFORMATION

Platform for European CMOS Imagers (EUROCIS)

Contract N°: 284487
Starting Date: 01/11/2011
Duration: 36 months
EU Contribution: € 1.993.216,00
Estimated total cost: € 2.884.010,60

FASTER

Forward Acquisition of Soil and Terrain for Exploration Rover



© DFKI 2012

FASTER Scout Rover exploring the trajectory of the Exomars rover.

ABSTRACT

FASTER develops tools for the in-situ evaluation of soil and terrain properties on planetary surfaces to increase the efficiency of planetary exploration rovers.

MAKING PLANETARY EXPLORATION MORE EFFICIENT

In planetary exploration missions, robotic rovers must traverse vast and varied expanses of terrain. In most cases, the rovers have to venture into terrain, the trafficability of which can only be assessed based on relatively sparse remote sensing data. Sometimes, the estimates are wrong and a rover gets stuck in a stretch of soft sand or another obstacle. This happened to the otherwise very successful NASA Mars rover Spirit. To avoid such accidents, planetary exploration rovers today move very carefully, covering not more than a few meters per day.

Such slow travel velocities are not sufficient for future missions, where tens of kilometres have to be traversed in a few months. The planned ESA Mars Sample Return mission (MSR), for example, will require robotic rovers to cover 10 to 20 km in about 200 days.

To increase travel velocities, an in-situ physical examination of the planetary surface is necessary. FASTER, which is a European consortium of six partners from five EU Member States, develops and demonstrates concepts for an efficient in-situ acquisition of soil and terrain properties on planetary surfaces. Core technical components of the new FASTER system are a lightweight portable soil sensor mounted on a small all-terrain scout rover. The FASTER tools will be able to test the trafficability of the terrain on the path of a larger exploration rover (such as the MSR rover), enabling higher travel velocities and reducing the risk for the mother rover.



Thomas VÖGELE
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to develop the technical means to gather in-situ data related to the trafficability of planetary surfaces. The FASTER tools, an all-terrain scout rover and a light-weight soil probe, will enable planetary exploration rovers to move faster and more efficiently on unknown planetary surfaces, such as Mars or Moon.

Why is this project important for Europe?

The exploration of Mars, Moon and other extraterrestrial bodies is generally of great scientific and economic interest. FASTER will help to improve the efficiency and scientific results of future European space missions dedicated to planetary exploration.

How does this project benefit European citizens?

The technologies developed in FASTER strengthen the competitiveness of the European space industry and space science. In addition, an adaptation of the core technologies to terrestrial applications will improve the usability of terrestrial, professional service robots.

FASTER

Forward Acquisition of Soil and Terrain for Exploration Rover

LIST OF PARTNERS

- German Research Centre for Artificial Intelligence DFKI GmbH, Germany
- University of Surrey, United Kingdom
- Astrium Limited, United Kingdom
- Space Application Services NV, Belgium
- Liquifer Systems Group GmbH, Austria
- Astri Polska Sp. zo.o., Poland

COORDINATOR

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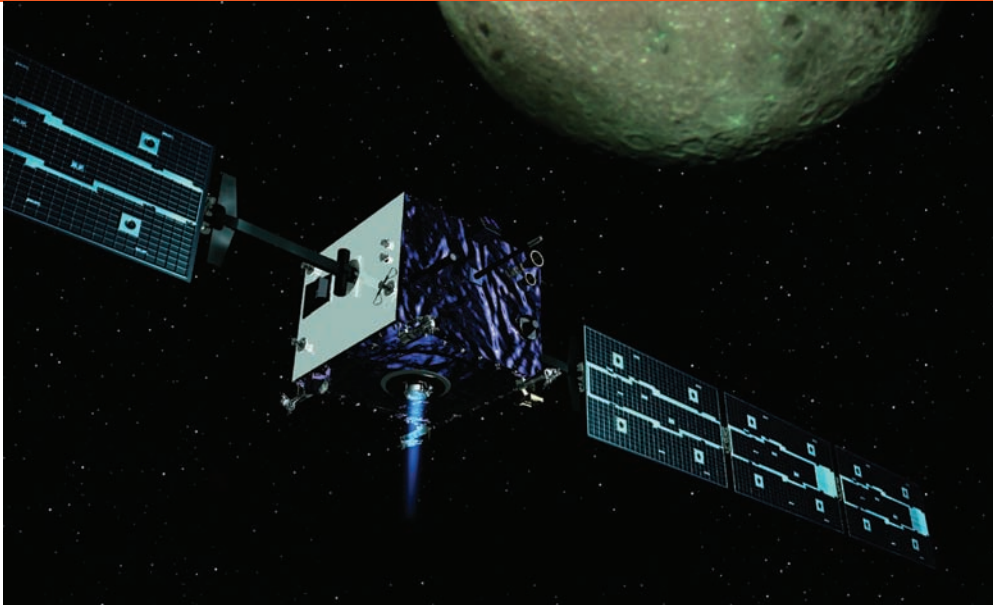
PROJECT INFORMATION

Forward Acquisition of Soil and Terrain for Exploration Rover (FASTER)

Contract N°: 284419
Starting Date: 01/11/2011
Duration: 37 months
EU Contribution: € 1.985.541,62
Estimated total cost: € 2.623.272,28

μFCU

Miniaturized Flow Control Unit



Artist impression of SMART-1

© ESA



Hans-Peter HARMANN
Project Coordinator

ABSTRACT

μFCU provides an improved flow control unit bringing technical leadership to Europe.

ENABLING FUTURE MICROPROPULSION SPACE MISSIONS

Electric propulsion (EP) is a key technology for future space missions and satellites. Most of the intended EP systems need controlled and steady flows of Xenon gas to supply the thrusters and neutralizers.

The μFCU project will develop and prequalify a miniaturized flow control unit (FCU).

This new development shall outperform existing technologies with respect to mass reduction, leak tightness, drift and long term stability. Furthermore, it shall reduce complexity, driver electronics requirements and AIT effort.

Such a small FCU will weigh less than 100 grams and controlling flows of 0.1 sccm and below. This allows mission designers to develop new micropropulsion systems as required for future space missions like LISA or NGGM.

Standard electric propulsion systems that are already used for large satellites and interplanetary space probes will benefit from the 90% mass and power reduction compared to existing FCUs. The μFCU concept uses only European sourced components to strengthen Europe's non-dependence in critical space technologies.

QUESTIONS & ANSWERS

What is the project designed to achieve?

A miniaturized control unit for ultra low gas flows (<0.1 sccm) shall be developed and built. The new concept shall be tested in close cooperation with future customers and users.

Why is this project important for Europe?

Europe plans advanced scientific space missions requiring an electric micropropulsion system. The μFCU gas flow control unit will be a core element of such a propulsion system.

For large telecommunication satellites electric propulsion is a state-of-the-art technology. The fully European-sourced μFCU will reduce the dependency from non-European suppliers.

How does this project benefit European citizens?

Electric propulsion is a key technology for tomorrow's spacecraft for science and commercial applications. With μFCU, Europe's position in electric propulsion will be further strengthened, giving European satellite manufacturers an advantage over their international competitors.

LIST OF PARTNERS

- AST Advanced Space Technologies GmbH, Germany
- Innovative Sensor Technology AG, Switzerland
- Staiger GmbH & Co. KG, Germany
- RHP Technology GmbH & Co. KG, Austria
- TransMIT Gesellschaft für Technologietransfer mbH, Germany

COORDINATOR

AST Advanced Space Technologies GmbH,
Germany

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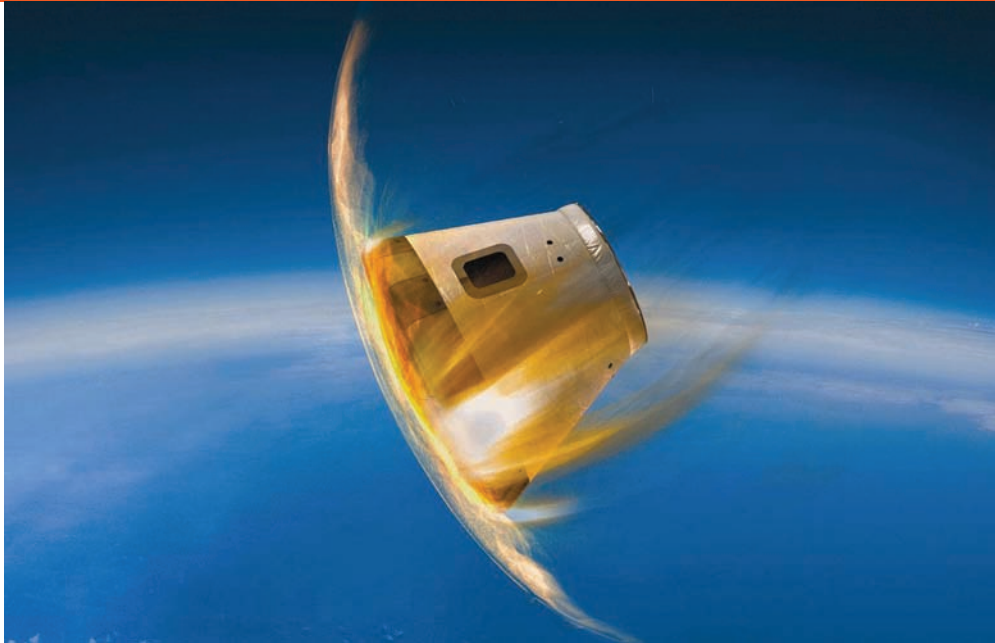
PROJECT INFORMATION

Miniaturized Flow Control Unit (μFCU)

Contract N°: 284100
Starting Date: 01/12/2011
Duration: 22 months
EU Contribution: € 1.428.212,00
Estimated total cost: € 2.074.753,60

HYDRA

Hybrid Ablative Development For Re-Entry In Planetary Atmospheric Thermal Protection



© Astrium GmbH

Artist impression of an environment where hybrid thermal protection systems are necessary.

ABSTRACT

HYDRA aims to develop hybrid thermal protection systems (TPS), with extreme oxidative environments and high temperature resistance, for their use in space applications such as hot parts of space vehicles for orbital entry, planetary probes and Near Earth Objects (NEOs) exploration.

DEVELOPMENT OF A NEW GENERATION OF HYBRID ABLATIVE/CERAMIC SHIELDS FOR PLANETARY RE-ENTRY

Space vehicles that enter into a planetary atmosphere (e.g. the Earth's) require the use of a thermal protection system (TPS) to protect them from aerodynamic heating. Otherwise the substructure or payloads of the vehicles would be damaged during the return from outer space. Currently there are two material families for the external wall of such systems: ablative or reusable materials.

Each of the two alternatives is carefully chosen depending on the specific needs of the mission. The ablative type of shield is a cost effective solution but offers only a single use as it protects the spacecraft by being consumed (or charred) during the entry phase. This is why a thick and heavy layer is normally required. On the other hand reusable solutions (which are mostly based on advanced ceramics) are light weight but normally far more expensive and therefore only suitable for higher budget missions. This has been the case for the recently retired US space shuttle programme.

For future space exploration, addressed to missions such as the exploration of Jovian planets (gas giants – Jupiter, Saturn, Uranus, Neptune) or sample return from another body to Earth, the demands for the thermal shield go beyond the current state-of-the-art. Such missions are extremely dependant on the amount of weight on the vehicle and therefore very hard to achieve. Moreover, the materials, that are most suitable for this kind of mission, have been developed from technologies that are in most cases more than 20 years old. Another big problem is actually being able to purchase these materials. Therefore the development of new materials and systems for future space applications able to withstand extreme heat loads and oxidative environments during the entry phase is absolutely essential.

The HYDRA project is aimed at developing a novel thermal shield solution based on a combination of ablative and reusable materials: a thin ablative layer on top of a reusable ceramic shield in order to reduce the overall mass of the system.



Jorge BARCENA
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

HYDRA is aimed at the development of a novel thermal protection system through the integration of an ablative outer-shield on top of advanced thermostructural ceramics and will provide an innovative technology solution consistent with the capacities of European technology providers.

Why is this project important for Europe?

HYDRA will contribute to the independence of Europe in space technology, as it aims at creating a non-dependent scenario (on technologies provided from outside the EU), to improve the access to critical space technologies and to strengthen the position of the European space industry.

How does this project benefit European citizens?

Space exploration will initially take advantage of the new HYDRA innovative thermal protection system technologies, one of the objectives of the activities funded by the European Space Agency. The ESA Technology Transfer Programme Office (TTPO) is focused on the technology transfer between space and terrestrial daily applications.

HYDRA

Hybrid Ablative Development For Re-Entry In Planetary Atmospheric Thermal Protection

LIST OF PARTNERS

- Tecnia Research and Innovation, Spain
- Astrium GmbH, Germany
- Astrium S.A.S., France
- Societe des Lieges HPK, France
- Deutsches Zentrum für Luft - und Raumfahrt EV, Germany
- Hps High Performance Structures Gestao E Engenharia, Lda., Portugal
- National Center for Scientific Research "Demokritos", Greece
- Institutul National De Cercetari Aerospatiale Elie Carafoli - I.N.C.A.S. SA, Romania
- Centre National de la Recherche Scientifique (CNRS), France
- Universität Stuttgart, Germany

COORDINATOR

Tecnia Research and Innovation, Spain

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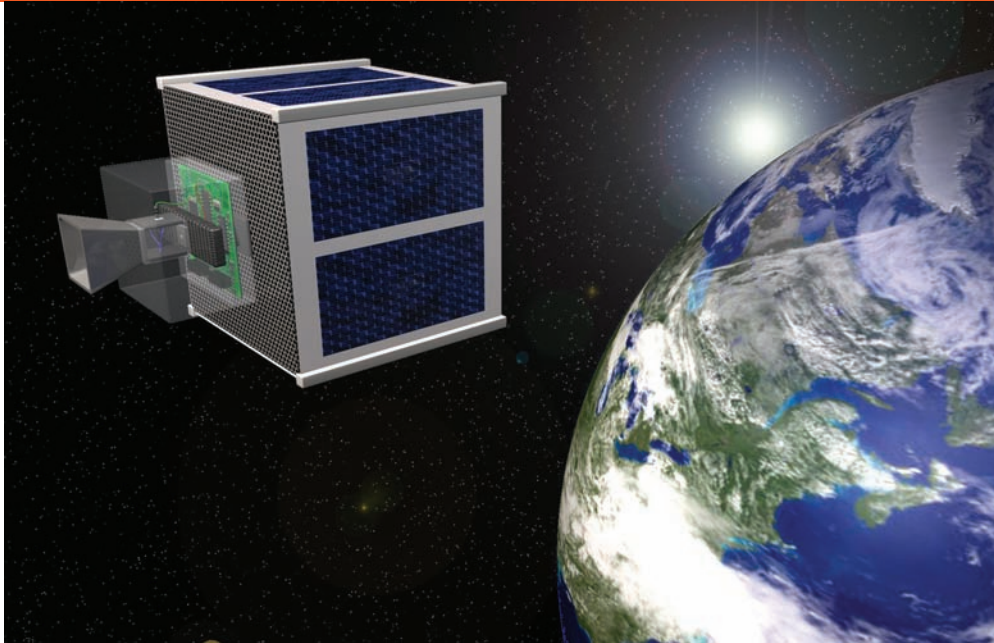
PROJECT INFORMATION

Hybrid Ablative Development For Re-Entry In Planetary Atmospheric Thermal Protection (HYDRA)

Contract N°: 283797
Starting Date: 01/02/2012
Duration: 37 months
EU Contribution: € 1.909.588,00
Estimated total cost: € 2.606.902,63

L- μ PPT

Innovative Liquid Micro Pulsed Plasma Thruster system for nano-satellites



Cubesat Thruster conceptual image.

© L- μ PPT



Eduardo Rémirez
Project Coordinator

ABSTRACT

L- μ PPT project is aimed at developing new thrusters initially for cubesats, in order to improve current mission profile and duration.

DEVELOPING AN INNOVATIVE LIQUID PROPELLANT PULSED PLASMA THRUSTER

The rapid emergence of new application domains and mission types has had a large impact on the evolution of spacecraft design. The current interest for micro-spacecrafts essentially follows from the wider availability of enabling technologies (micro/nano-fabrication), and from the desire to reduce development and launcher costs. Nanosatellites are also potentially useful as a means to increase a mission's reliability by distributing a large payload over a fleet of small spacecrafts.

However, the application range of micro-spacecraft is currently restricted by the lack of sufficiently compact, lightweight, high specific, impulse micro-propulsion systems. The L- μ PPT project will develop and assess the functionality of a novel PPT (Propellant Pulsed Plasma Thruster) technology based on liquid propellant, expected to enable significant improvements over Teflon-based PPTs in terms of propellant utilization and impulse bit predictability, through a tight control of the mass of propellant injected.

By leveraging state-of-the-art MEMS technologies, the L- μ PPT project will develop a compelling propulsion technology for micro-spacecrafts offering the scalability and robustness of conventional PPTs with performances on par with modern electric propulsion systems for large satellites. The L- μ PPT project roadmap is based on a two-step implementation which supports the development of a first prototype, followed by the design of a fully functional prototype.

Each prototype shall have an associated system specification phase, and subsequent design and development phases for each system sub-components (thruster, injector, electronics, thrust balance and vacuum stand). Six partners (four SMEs, an industry and a research organization) from three Member States (Spain, Poland, Sweden) and Switzerland will work together in different roles to advance in the development of PPT propulsion system.

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to develop a pulsed plasma thruster fuelled by liquid propellant, initially for cubesats. This thruster will increase the life span and mission capabilities of cubesats. By the end of the project duration we expect to have prototype thrusters tested on space conditions and ready for flight testing.

Why is this project important for Europe?

This project aims to improve and widen the mission capabilities of cubesats. As cubesats become of interest to other users in government and industry, a larger range of capabilities will be required, while maintaining the uniqueness of the cubesat platform. When this happens, Europe must have the technology to lead this new niche market.

How does this project benefit European citizens?

L- μ PPT will improve the mission profile of cubesats, hence improving the current cubesat industry for Europe. Promoting the cubesat industry in Europe will lead to job creation and future technology transfer.

L- μ PPT

Innovative Liquid Micro Pulsed Plasma Thruster system for nano-satellites

LIST OF PARTNERS

- JMP Ingenieros, Spain
- Najera Aerospace, Spain
- Mecartex SA, Switzerland
- Sunshine Technologies SP Zoo Organizacji, Poland
- Nanospace AB, Sweden
- Instytut plazmy i laserowej mikrosyntezy im. Sylwestra Kaliskiego, Poland

COORDINATOR

JMP Ingenieros, Spain

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PROJECT INFORMATION

Innovative Liquid Micro Pulsed Plasma Thruster system for nanosatellites (L- μ PPT)

Contract N°: 283279
Starting Date: 01/11/2011
Duration: 36 months
EU Contribution: € 1.930. 432
Estimated total cost: € 2.747.030,80

MAARBLE

Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization



Maarble Earth radiation

ABSTRACT

MAARBLE aims at shedding light on the ways the dynamic evolution of the Earth's radiation belt is influenced by ultra low frequency electromagnetic waves in geospace.

UNDERSTANDING THE DYNAMICS OF Earth'S RADIATION BELTS

The Van Allen radiation belts are two torus-shaped regions encircling the Earth, in which high-energy charged particles are trapped by the geomagnetic field. Radiation belt variability is of outstanding scientific interest and is also of relevance to any human endeavour in space, as it has direct impacts on spacecraft as well as on humans in space.

Although the radiation belts were discovered in the early years of the space era by the Explorer satellites, we still have no complete understanding of radiation belt dynamics. The MAARBLE project employs spacecraft monitoring of the geospace environment, complemented by ground-based magnetometer monitoring, in order to analyze and assess the physical mechanisms leading to radiation belt particle energization and loss. Particular attention is paid to the role of ultra low frequency electromagnetic waves, which are known to play a crucial role in the efficient energization of particles.

MAARBLE will contribute to the scientific understanding of radiation belt dynamics, with distinct merits for robotic and manned space exploration and for the establishment of a European space weather monitoring and forecasting capability. To this end, the project foresees:

- » the use of data assimilation techniques to guide the best estimate of the state of the electron radiation belts;
- » the creation of a database of ultra low and very low frequency (ULF and VLF) waves in the radiation belts;
- » the development of a statistical model of radiation belts' relevant wave activity.



Ioannis A. DAGLIS
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

MAARBLE aims at achieving a deeper understanding of the relationships between ULF and VLF waves and radiation belt dynamics, through the development of a statistical model of waves and the incorporation of particle measurements into data assimilation tools.

Why is this project important for Europe?

Most European satellites operate in regions where they can be exposed to intense fluxes of extremely energetic radiation belt particles. Understanding radiation belt dynamics will provide the means to mitigate risk to European space assets.

How does this project benefit European citizens?

MAARBLE will foster new knowledge on the radiation belts variability, which is of direct relevance to the smooth operation of the European satellite navigation system Galileo and numerous other service satellites of interest to European citizens.

MAARBLE

Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization

LIST OF PARTNERS

- National Observatory of Athens, Greece
- Office National d'Etudes et de Recherches Aéropatiales, France
- Institutet for Rymdfysik, Sweden
- Ústav fyziky atmosféry AV ČR, v.v.i., Czech Republic
- Natural Environment Research Council, United Kingdom
- University of Alberta, Canada
- University of California, Los Angeles, USA

COORDINATOR

National Observatory of Athens, Greece

CONTACT

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PROJECT INFORMATION

Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization (MAARBLE)

Contract N°: 284520
Starting Date: 01/01/2012
Duration: 36 months
EU Contribution: € 1.995.042,90
Estimated total cost: € 2.845.504,37

NEOShield

A Global Approach to Near-Earth Object Impact Threat Mitigation



© NASA

A near-Earth asteroid heads for the Earth's surface. NEOShield will help to prevent this scene becoming reality.



Alan HARRIS
Project Coordinator

ABSTRACT

NEOShield brings together an international team to address the global issue of hazardous NEO impact prevention. The feasibility of space missions to test our ability to prevent a potentially catastrophic impact will be studied and detailed designs of appropriate missions provided.

PREVENTING HAZARDOUS NEAR-EARTH OBJECTS FROM IMPACTING THE Earth

Collisions of asteroids and comets with the Earth have taken place frequently over geological history. Thousands of near-Earth objects (NEOs), mainly asteroids, have been discovered over the past 20 years and the reality of the impact hazard has been laid bare. Can we protect our civilization from the next major impact?

NEOShield will address in detail the open questions relating to realistic options for preventing the collision of a NEO with the Earth. Solutions will be provided to critical scientific and technical issues that currently stand in the way of demonstrating the feasibility of promising mitigation options via test missions. Detailed test-mission designs will be provided for the most feasible mitigation concepts, facilitating the rapid development of actual test missions at a later stage.

The NEOShield concept includes laboratory experiments and associated modelling to provide the necessary data pertaining to the behaviour of a NEO during a deflection attempt.

The experimental results and modelling will help to improve our understanding of the nature of NEOs and allow the feasibility of mitigation techniques and mission designs to be accurately assessed. An international response strategy will be considered for implementation when an actual impact threat arises. Account will be taken of complementary efforts currently in progress (e.g. by the UN, ESA, NASA). Colleagues outside the NEOShield consortium involved in such activities will be invited to contribute to the establishment of a broad international strategy.

QUESTIONS & ANSWERS

What is the project designed to achieve?

Physical parameters relating to the properties of NEOs will be determined from available observational data and the results of our laboratory experiments and computer simulations. Relevant technologies, such as autonomous spacecraft guidance, will be adapted and developed. Detailed designs of feasible demonstration missions will be presented.

Why is this project important for Europe?

NEOShield will work towards testing our ability to prevent the impact of a hazardous NEO. Europe has extensive experience in the development of relevant space technology. While to-date activities in this field have been dominant in non-European countries, NEOShield will establish Europe as a global player.

How does this project benefit European citizens?

Europe covers a large part of the globe, is densely populated, and has a sophisticated, highly networked society. Its risk of suffering catastrophic human loss and economic damage, as the result of an impact, is relatively high. NEOShield will make a significant contribution to preventing a serious impact.

NEOShield

A Global Approach to Near-Earth Object Impact Threat Mitigation

LIST OF PARTNERS

- Deutsches Zentrum für Luft - und Raumfahrt (DLR), Germany
- Observatoire de Paris, France
- Centre National de la Recherche Scientifique, France
- The Open University, United Kingdom
- Fraunhofer Ernst-Mach-Institut, Germany
- The Queen's University of Belfast, United Kingdom
- Astrium GmbH, Germany
- Astrium Limited, United Kingdom
- Astrium S.A.S., France
- Deimos Space, Spain
- SETI Institute Corporation Carl Sagan Center, United States
- TsNIIMash, Russian Federation
- University of Surrey, United Kingdom

COORDINATOR

Deutsches Zentrum für Luft -und Raumfahrt
(DLR), Germany

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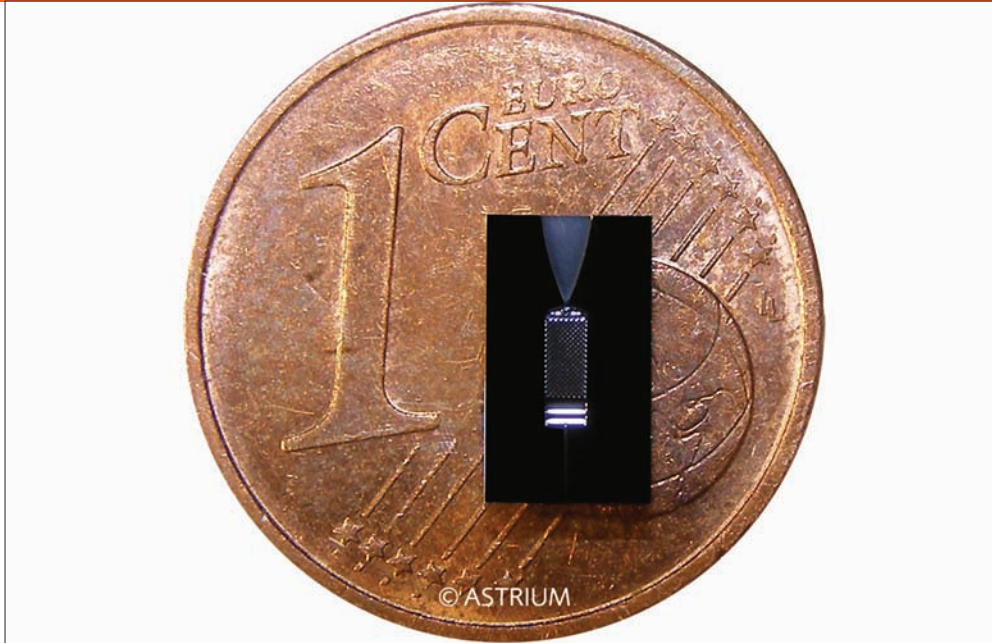
PROJECT INFORMATION

A Global Approach to Near-Earth Object Impact Threat Mitigation
(NEOShield)

Contract N°: 282703
Starting Date: 01/01/2012
Duration: 41 months
EU Contribution: € 3.963.009,20
Estimated total cost: € 5.843.115,40

PRECISE

Chemical- μ Propulsion for an Efficient and Accurate Control of Satellites for Space Exploration



© EADS Astrium Space Transportation, Germany

μ Thruster prototype with μ Catalyst.

ABSTRACT

PRECISE focuses on the research and development of a compact MEMS-based monopropellant micro Chemical Propulsion System (μ CPS) for accurate attitude control of satellites.

DEVELOPMENT OF A MEMS-BASED MICRO CHEMICAL PROPULSION SYSTEM

The availability of micro Chemical Propulsion Systems (μ CPS) forms the basis for defining new mission concepts such as formation flying, advanced robotic missions and rendezvous manoeuvres. These concepts require propulsion systems for precise attitude and orbit control manoeuvrability.

μ CPS has been identified by ESA to fill the gap between state-of-the-art electrical and chemical propulsion due to its compactness, low power requirements and low system weight. A revolutionary feature is its highly compact, lightweight and modular architecture, e.g. the micro thruster is etched on a silicon wafer and weighs only a few grams.

PRECISE combines European capabilities and know-how from universities, research organisations and experienced space companies for the research and development of a μ CPS for future market demands. Basic research will be conducted and aimed at improving crucial MEMS technologies required for the propulsion system. Research and development will also focus on the efficiency and reliability of critical system components.

System analysis tools will be enhanced to complement the development stages. In addition, application-oriented aspects will be addressed by two end-users who are planning a formation flying mission for which the propulsion system is crucial. Finally, the μ CPS will be tested in a simulated space vacuum environment. These experiments will deliver data for the validation of the numerical models.



Markus GAUER
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

The aim of PRECISE is to develop a μ CPS necessary for highly accurate attitude control of satellites. The project focuses on research of propulsion aspects, the development of crucial components, numerical tools and test facility diagnostics. Finally, hot gas tests will be conducted under space-like vacuum conditions.

Why is this project important for Europe?

PRECISE unites contributions from renowned European organisations, research centres and universities. The project promotes the access to μ CPS technologies for independent European space applications, reduces the dependence on overseas suppliers and fosters international competitiveness.

How does this project benefit European citizens?

PRECISE delivers European mission planners and universities a propulsion system sought for planned and future space exploration missions. The MEMS-based μ CPS is considered as one of the key technologies for future satellite missions due to its low power requirements and system weight.

PRECISE

Chemical- μ Propulsion for an Efficient and Accurate Control of Satellites for Space Exploration

LIST OF PARTNERS

- Deutsches Zentrum für Luft- und Raumfahrt e.V., Germany
- EADS Astrium Space Transportation, Germany
- Centre National de la Recherche Scientifique (CNRS), France
- NPO Mashinostroyenia, Russia
- Nanospace AB, Sweden
- University of Surrey, United Kingdom
- Universiteit Twente, Netherlands

COORDINATOR

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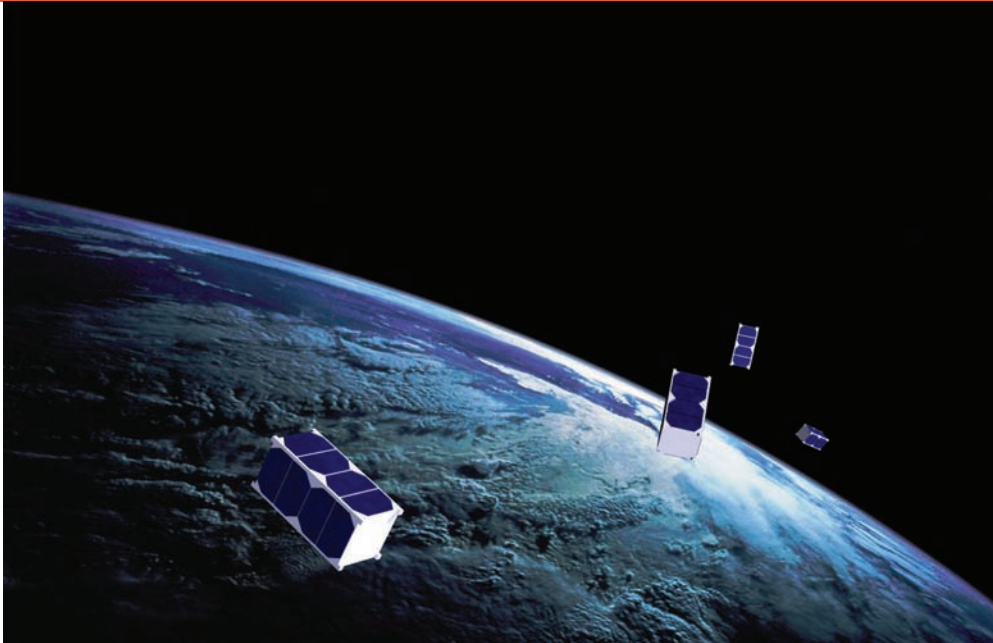
PROJECT INFORMATION

Chemical- μ Propulsion for an Efficient and Accurate Control of Satellites for Space Exploration (PRECISE)

Contract N°: 282948
Starting Date: 01/02/2012
Duration: 24 months
EU Contribution: € 1.829.367,00
Estimated total cost: € 2.830.429,20

QB50

An international network of 50 CubeSats for multi-point, in-situ measurements in the lower thermosphere and re-entry research



© EADS - Astrium GmbH

Artist impression of a cubesat network.

ABSTRACT

QB50 aims to be the first network of nano-satellites (CubeSats) in orbit, to carry out scientific measurements in the undersampled lower thermosphere and to perform in-orbit demonstration of key technologies and payloads. Fifty universities worldwide will provide 50 CubeSats to the QB50 project. QB50 is an ambitious international project driven by Europe, with major education and outreach impacts.

- » DEVELOPING LOW-COST ACCESS TO SPACE TOOLS FOR SMALL SCALE RESEARCH MISSIONS
- » REALISING THE FIRST NETWORK OF CUBESATS
- » PERFORMING IN-SITU, MULTI-POINT AND LONG DURATION SCIENTIFIC MEASUREMENTS IN THE UNDERSAMPLED LOWER THERMOSPHERE
- » PERFORMING AFFORDABLE IN-ORBIT TECHNOLOGY AND SCIENCE DEMONSTRATIONS
- » UNDERSTANDING THE PHYSICS OF SATELLITE DE-ORBITING, RE-ENTRY AND DISINTEGRATION

The QB50 project will demonstrate the possibility of launching a network of 50 CubeSats built by CubeSat teams all over the world as a primary payload on a low-cost launch vehicle, to perform first-class science and in-orbit demonstrations in the largely unexplored lower thermosphere. Space agencies are not pursuing a multi-spacecraft network for in-situ measurements in the lower thermosphere because the cost of a network of 50 satellites built to industrial standards would be very high and not reasonable in view of the limited orbital lifetime. No atmospheric network mission for in-situ measurements has been carried out in the past or is planned for the future. A network of satellites for in-situ measurements in the lower thermosphere can only be achieved by using very low-cost satellites, and CubeSats are the only realistic option.

The project will demonstrate the sustained availability of a low-cost launch vehicle, a Russian Shtil-2.1, for launching small payloads into low-Earth orbits. These could be microsattellites or networks of CubeSats or nanosats or many individual small satellites for scientific, technological, microgravity or biological research. QB50 will include the development of a deployment system for the deployment into orbit of a large number of single, double or triple CubeSats.

Once the system is developed for QB50 it can be easily adapted to other missions. QB50 will also provide a launch opportunity for key technology demonstration CubeSats and for the Gossamer-1 solar sail technology demonstration package for rapid de-orbiting. All 50 CubeSats will be launched together into a circular orbit at 320 km altitude. Due to atmospheric drag, the orbits of the CubeSats will decay and progressively lower and lower layers of the thermosphere will be explored without the need for on-board propulsion, perhaps down to 90 km. QB50 will be the first CubeSat network in orbit.



Jean MUYLAERT
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to develop the necessary tools to launch 50 CubeSats into a circular orbit at 320 km altitude. The 50 CubeSats coming from different teams all around the world will carry identical sensors and will form the first network of CubeSats to perform scientific research. Other than this, affordable in-orbit demonstrations of key technologies will be possible as well.

Why is this project important for Europe?

QB50 is an ambitious international project, driven by Europe. More than 50 teams will join their resources and efforts to realise the QB50 project, the first network of CubeSats in space. This breakthrough in the modern space science and technology will put Europe in the lead of small scale affordable satellite development activities.

How does this project benefit European citizens?

Similar to the evolution of Personal Computers (PC), the small satellites are becoming more and more part of our daily lives. This project will demonstrate that building satellites is now possible by universities, high-schools and independent research organisations. Thanks to impressive outreach and dissemination activities, the citizens of Europe will gain awareness to space benefits and will have the chance to be a part of developing space assets.

QB50

An international network of 50 CubeSats for multi-point, in-situ measurements in the lower thermosphere and re-entry research

LIST OF PARTNERS

- Von Karman Institute for Fluid Dynamics, Belgium
- Innovative Solutions in Space, Netherlands
- Surrey Space Centre at University of Surrey, United Kingdom
- Mullard Space Science Laboratory at University College London, United Kingdom
- École Polytechnique Fédérale de Lausanne, Switzerland
- Delft University of Technology, Netherlands
- Belgian Institute for Space Aeronomy, Belgium
- Leibniz-Institute for Atmospheric Physics at Rostock University, Germany
- SA Khristianovich Institute of Theoretical and Applied Mechanics of Siberian Branch of Russian Academy of Science, Russia
- Astrium S.A.S, France
- German Aerospace Center DLR, Germany
- Stanford University, USA
- Northwestern Polytechnical University, PR China
- SLLC P. Papadopoulos, USA
- EADS Astrium Space Transportation GmbH, Germany

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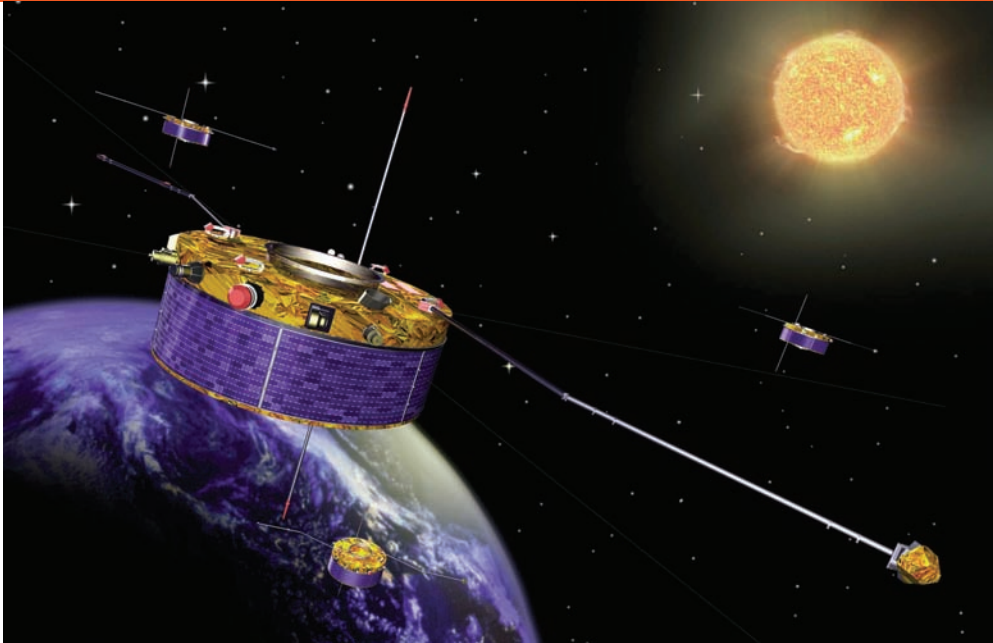
PROJECT INFORMATION

An international network of 50 CubeSats for multi-point, in-situ measurements in the lower thermosphere and re-entry research (QB50)

Contract N°: 284427
Starting Date: 01/11/2011
Duration: 42 months
EU Contribution: € 7.998.703,85
Estimated total cost: € 11.029.927,06

SHOCK

Solar and Heliospheric Collisionless Kinetics



© ESA

The Cluster Constellation

ABSTRACT

To advance our knowledge of the Sun to Earth plasma system by increasing the use of kinetic simulation in the analysis of space data.

ENABLING DATA ANALYSIS OF THE SUN TO Earth PLASMA SYSTEM WITH KINETIC MODELLING

This project brings together leading European groups working in the area of kinetic modelling of space plasma, to enhance and accelerate the effective scientific exploitation of existing space plasma datasets and to maximize the scientific return of future space missions, both European and international. The fundamental concept of the project is to take advantage in the European context of the synergies between space plasma modelling and data analysis.

At the present time there is a vast store of collected data from robotic space plasma missions. There is also an increasing awareness that kinetic processes at small length scales and short time scales are crucial for a proper understanding of the fundamental processes which govern the dynamics of solar system plasmas from the solar corona outwards.

The project will provide a focus for the increased use of kinetic simulations in enhancing space data analysis for European Space Agency (ESA) missions, such as Cluster, BepiColombo, and Solar Orbiter, but also for international missions such as Themis, MMS, Solar Probe Plus. SHOCK will also refine the state-of-the-art in research using kinetic plasma simulations of space plasma systems, so that new models are developed and exploited, allowing the synergies between data analysis and code validation to emerge.

Our aim is to improve our knowledge and understanding of the Sun to Earth plasma system, and fundamental processes such as turbulence, shocks, particle acceleration and reconnection, which have relevance in other astrophysical environments.



David BURGESS
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

We will improve the knowledge of the Sun to Earth plasma environment using kinetic computer simulations and increasing the use of modelling for data analysis from European Space Agency (ESA) missions such as Cluster, BepiColombo, and Solar Orbiter.

Why is this project important for Europe?

Europe invests in major projects to study the evolution and interactions of plasma from the Sun, giving us an improved view of our place in the Solar System. The scientific rationale of SHOCK is to leverage the data analysis for these projects with improved computer modelling.

How does this project benefit European citizens?

Space science in Europe is at the highest technological level and inspires both the general public and students in their interest in understanding how the Sun affects the solar system environment. SHOCK will enable the general public to engage with space by opening up access to data and simulations.

SHOCK

Solar and Heliospheric Collisionless Kinetics

LIST OF PARTNERS

- Queen Mary and Westfield College, University of London, United Kingdom
- Astronomický ústav AVCR VVI, Czech Republic
- Sprinx Systems AS, Czech Republic
- The University of St Andrews, United Kingdom
- Centre National de la Recherche Scientifique, France
- Università degli Studi di Firenze, Italy

COORDINATOR

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PROJECT INFORMATION

Solar and Heliospheric Collisionless Kinetics: Enabling Data Analysis of the Sun to Earth Plasma System with Kinetic Modelling (SHOCK)

Contract N°: 284515
Starting Date: 01/01/2012
Duration: 48 months
EU Contribution: € 1.998.104,00
Estimated total cost: € 2.602.739,60

SINPLEX

Small Integrated Navigator for PLanetary EXploration



Rosetta's Philae lander on comet nucleus.

© ESA - AOES Medialab



Stephan THEIL
Project Coordinator

ABSTRACT

SINPLEX develops the technology for a low mass vision-based navigation system. It will be based on functional integration and the utilization of micro and nanotechnologies.

DEVELOP A LOW MASS HIGH PERFORMANCE NAVIGATION SYSTEM FOR PLANETARY EXPLORATION

The main goal of SINPLEX is to develop an innovative solution to reduce significantly the mass of the navigation subsystem for exploration missions which include a landing and/or a rendezvous and capture phase. It is a contribution to the strengthening of the European position for space exploration. It targets at increasing the scientific return of exploration missions, enabling new types of missions and reducing launch cost and travel time.

Future space exploration missions target asteroids, comets, planets and planetary moons. They will bring robotic vehicles to these targets and will provide the capability to return samples to Earth. In general, for all space missions, but in particular, for this kind of mission, mass is one of the most critical factors. Therefore, reducing the mass of components or complete subsystems of an exploration vehicle is a key enabling factor for the future exploration of our solar system and beyond.

The mass reduction is achieved by applying functional integration of the different sensors, utilizing micro and nanotechnologies for compacting electronics, and using sensor hybridization approaches, to improve the performance of the complete navigation subsystem.

The project objectives are: the development of integrated novel navigation subsystem architecture, the production of a breadboard and the demonstration of its applicability for object-relative robotic navigation for space applications.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The project aims to develop a miniaturized vision-based integrated navigation subsystem for planetary exploration with a substantial mass reduction compared to existing conventional systems. The target total mass shall be below 3kg.

Why is this project important for Europe?

The miniaturized SINPLEX system will add new capabilities to future exploration missions. The used miniaturization approach is a pathfinder for miniaturization of other spacecraft subsystems, thus allowing more mass-efficient space missions.

How does this project benefit European citizens?

The miniaturization of space components and subsystems is a key for creating more mass-efficient spacecrafts. New exploration mission targets can be reached or more scientific instruments can be placed on planet surfaces with the same or less effort.

SINPLEX

Small Integrated Navigator for PLanetary EXploration

LIST OF PARTNERS

- Deutsches Zentrum für Luft- und Raumfahrt (DLR), Bremen, Germany
- Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands
- Cosine Research BV, Netherlands
- ÅAC Microtec AB, Sweden
- SystematIC design B.V., Netherlands

COORDINATOR

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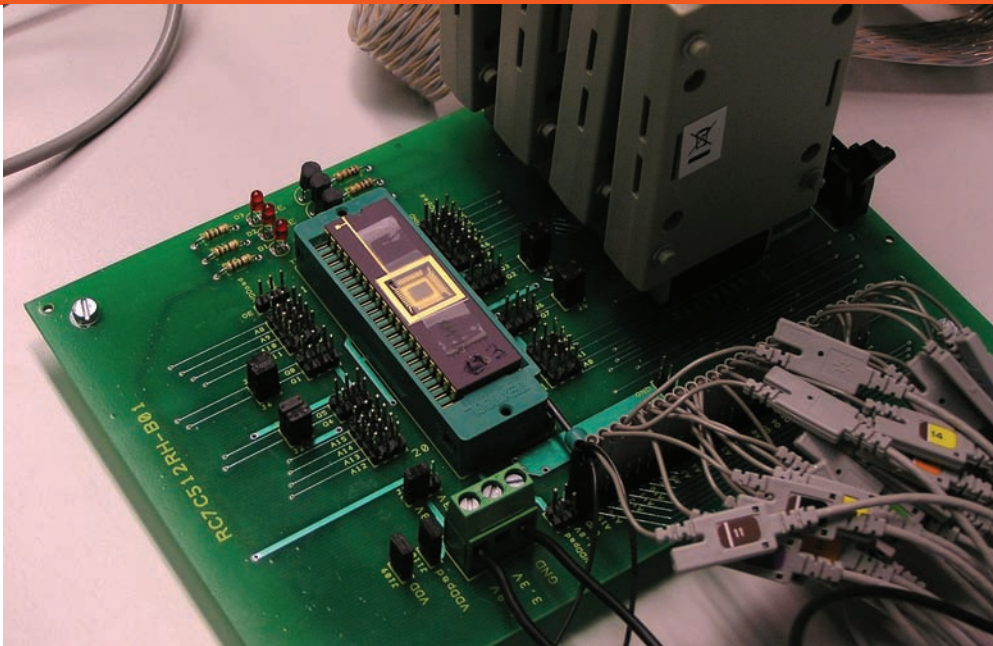
PROJECT INFORMATION

Small Integrated Navigator for PLanetary EXploration (SINPLEX)

Contract N°: 284433
Starting Date: 01/01/2012
Duration: 24 months
EU Contribution: € 1.998.619,00
Estimated total cost: € 2.614.981,87

SkyFlash

Development of Rad Hard non-volatile Flash Memories for Space Applications



RedCat chip components and test equipment.

© RedCat Devices



Cristiano CALLIGARO
Project Coordinator

ABSTRACT

SkyFlash project aims to develop a strong Rad-hard by design (RHBD) methodology for the development of non-volatile flash memories with standard CMOS 180nm processes using memory cells based on floating trap ONO (Oxide-Nitride-Oxide) approach (Flash memories). The methodology will be focused on environments affected by radiation due to protons, electrons and high energy ions (heavy ions), such as low and high orbits (satellites) or deep space (probes).

RAD-HARD NON-VOLATILE MEMORIES FOR SPACE APPLICATIONS

The project aims to realise a strong methodology for the development and design of non-volatile memories using standard CMOS silicon process actually used for consumer electronics. Since standard silicon memories, such as other silicon devices for the consumer market, fail under irradiation, two different approaches are envisaged. The first one is to develop specific technological processes able to sustain heavy ions and other charged particles, while the second one is more devoted to use specific design and architectures.

The first approach, also known as Radiation Hardening by Process (RHBP), is very expensive and tied to technological issues which can be faced only by large companies and, due to the very low amount of final devices to be realised, very difficult to follow (great deal of effort for a small niche market).

The second approach, also known as Radiation Hardening by Design (RHBD), takes the best from standard CMOS consumer processes and, using very accurate design methodologies, mitigates radiation effects on silicon processes.

Actually both volatile and non-volatile memories are integrated using standard processes and standard architectures acting on one side on Rad hard packages and on the other side on the level of qualification of the single die. This means that the final device is typically Rad-tolerant and not Rad-hard and failure during mission is avoided using Error Correcting Code techniques including redundancy (more devices of the same type are used in voting manner) at board level. The basic goal of the project is to give a methodology for the development of a generic Rad-hard non-volatile memory with the features actually used in consumer market and deliver a prototype (1Mbit Flash Memory) in order to validate the approach.

QUESTIONS & ANSWERS

What is the project designed to achieve?

SkyFlash aims to provide methodologies and design techniques to develop semiconductor memories to be used for space applications. The basic platform is represented by a standard CMOS fabrication process, which comes directly from silicon foundries' production lines in order to have mature and consolidated technologies to be used for specific circuit architectures and layout design.

Why is this project important for Europe?

Semiconductor devices are critical for space applications since they have to be resilient to radiations. Actually the major part of Rad-hard devices belong to the US and are restricted by ITAR (International Traffic Arm Regulation) rules related to military market and limiting the export to foreign states. SkyFlash aims to contribute, at a more general Europe level, to provide a basic ITAR-free technology.

How does this project benefit European citizens?

The availability of ITAR-free semiconductor non-volatile memories can guarantee more efficient (and powerful) electronics to be used in satellite applications, such as communication, weather and, more in general, Earth observation. In particular, those applications requiring data storage in a low-power regime will benefit from SkyFlash efforts.

SkyFlash

Development of Rad Hard non-volatile Flash Memories for Space Applications

LIST OF PARTNERS

- RedCat Devices, Italy
- University of Milano, Italy
- University of Padova, Italy
- Tower Semiconductor, Israel
- University of Jyvaskyla, Finland
- University of Cyprus, Cyprus
- University of Uppsala, Sweden
- University of Santiago de Compostela, Spain

COORDINATOR

RedCat Devices, Italy

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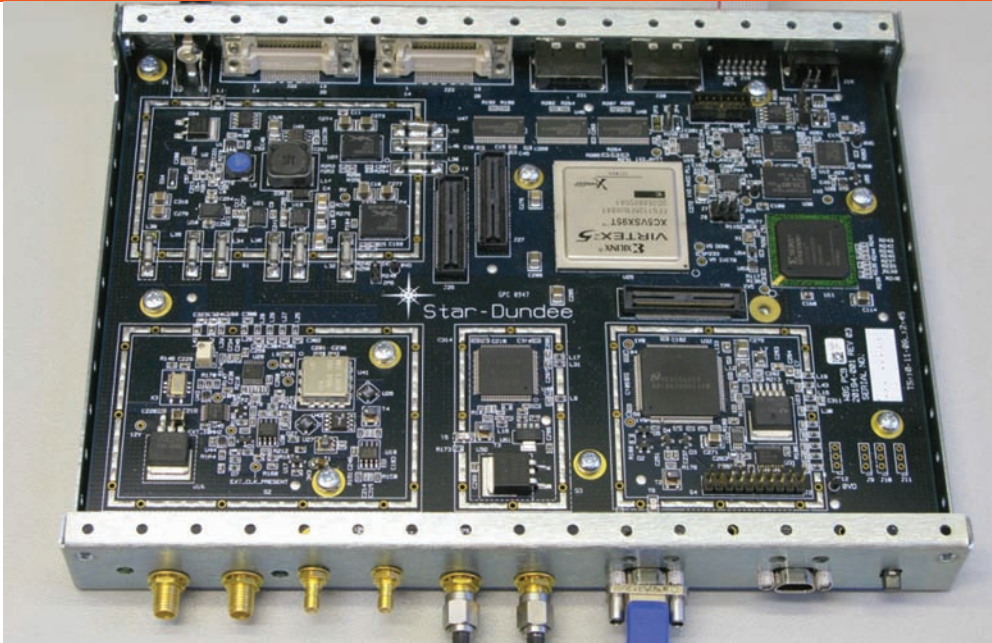
PROJECT INFORMATION

Development of Rad Hard non volatile Flash memories for space applications (SkyFlash)

Contract N°: 262890
Starting Date: 01/09/2011
Duration: 30 months
EU Contribution: € 1.052.478,80
Estimated total cost: € 1.543.760,00

VHiSSI

Very High Speed Serial Interfaces



© Steve Parkes

A prototype instrument processing board using an early version of SpaceFibre.



Steve PARKES
Project Coordinator

ABSTRACT

VHiSSI aims to create very high-speed data-interface technology, suitable for a wide range of demanding space applications. This is a critical component technology for telecommunications and Earth observation spacecraft.

VERY HIGH-SPEED DATA-INTERFACE TECHNOLOGY FOR DEMANDING SPACE APPLICATIONS

Scientific instrumentation currently under development and space-based Earth observation will push the limits of on-board data-handling technology. Several future space-based instruments, for example synthetic aperture radar (SAR) and hyper-spectral imagers, will be capable of producing data at data rates of several Gbits/s.

Telecommunications satellites also have to handle many Gbits/s data on-board. To support the growing demand for on-board communications network bandwidth, ESA has been developing a standard multi-Gbits/s network technology called SpaceFibre. At present this important ESA technology is dependent upon the USA for the radiation-tolerant physical layer devices. USA International Trade in Arms Regulations (ITAR) severely restricts the use of these technologies on European space missions.

The VHiSSI research programme aims to create very high-speed data-interface technology. Leveraging prior and concurrent research on the emerging ESA SpaceFibre on-board communication standard, it will provide a complete solution for spacecraft on-board data-links and networks. It will also provide a non dependent (ITAR free) technology, allowing unrestricted use on European spacecraft and creating substantial export opportunities.

Non-space applications expected to benefit from the anticipated technological advancements and resultant European capability include terrestrial avionics, robotics, and automobile networks.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The VHiSSI research programme will leverage prior and concurrent research on the emerging ESA SpaceFibre standard to provide a complete solution for spacecraft on-board data-links and networks, including robustness and quality of service.

Why is this project important for Europe?

It aims to provide Europe with important network technology for on-board spacecraft use. This will enhance the technical capabilities and overall competitiveness of the European space industry, enabling it to compete effectively on the world market.

How does this project benefit European citizens?

VHiSSI will provide an immediate competitiveness benefit for the European space industry, in the field of European non-dependence in critical technologies.

LIST OF PARTNERS

- Space Technology Centre, University of Dundee, United Kingdom
- STAR-Dundee Ltd, United Kingdom
- ACE-IC Ltd, Israel
- Ramon Chips Ltd, Israel
- IHP GmbH, Germany
- Astrium GmbH, Germany
- Euro Instruments Trading S.R.L., Italy

COORDINATOR

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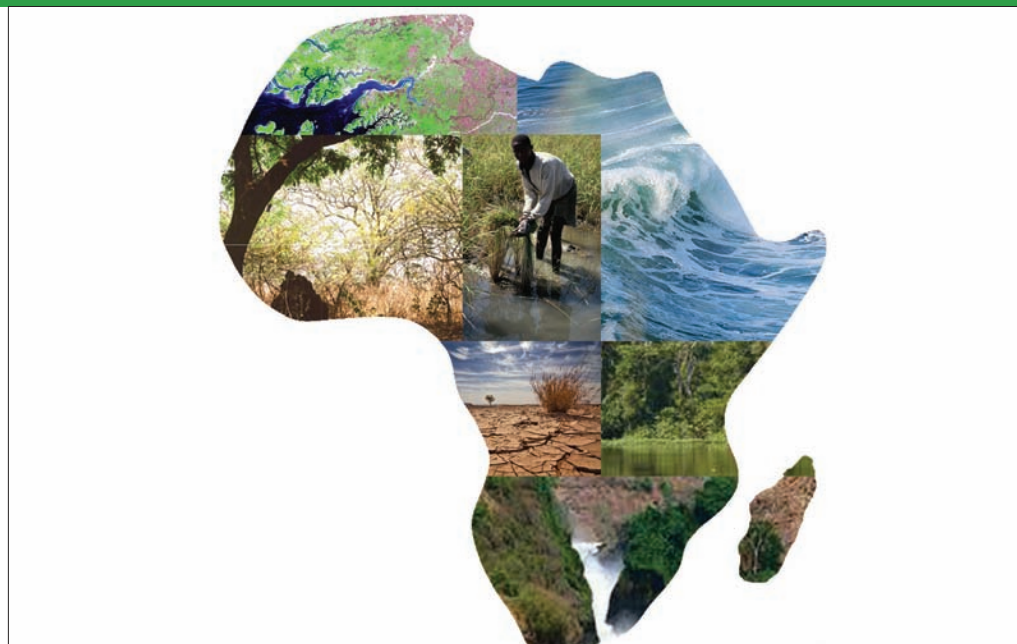
PROJECT INFORMATION

Very High Speed Serial Interfaces (VHiSSI)

Contract N°: 284389
Starting Date: 01/01/2012
Duration: 30 months
EU Contribution: € 1.999.998,98
Estimated total cost: € 2.630.218,84

BRAGMA

Bridging Actions for GMES and Africa



Earth observation applications in GMES and Africa.

© IICT



Ana MORGADO
Project Coordinator

ABSTRACT

BRAGMA supports the development and implementation of "GMES and Africa" - an Africa-wide Earth observation system through a strong and long term partnership between EU and Africa.

STRENGTHENING THE "GMES AND AFRICA" PARTNERSHIP

The "GMES and Africa" initiative establishes a long term partnership between European and African stakeholders, in accordance with the Lisbon Declaration. Its aims are to work together on the development and implementation of Earth Observation (EO) applications in the context of the Africa-EU partnership, to promote sustainable development and scientific cooperation. "The initiative strengthens Africa's capacity and ownership of EO activities and acknowledges the importance of past and present programmes, recognising the need to coordinate actions to avoid duplication, increase synergies and enhance complementarities.

"Bridging Actions for GMES and Africa" (BRAGMA) will support and facilitate the necessary dialogue to implement the process, through improved coordination and adequate information flow, strengthening the partnership via the following actions:

- Keep building momentum for "GMES and Africa" through consultation and dissemination processes including major awareness raising events in Africa;

- Reinforce the coordination group of stakeholders and entities responsible for leading the initiative and contribute to regional support aligned with the implementation mechanisms agreed in the partnership;
- Promote wider international awareness of results and likely impact of relevant current and planned "GMES and Africa" related activities;
- Provide an annual review of how GMES services could contribute to African requirements on EO capabilities.

QUESTIONS & ANSWERS

What is the project designed to achieve?

BRAGMA aims to support the successful implementation of the "GMES and Africa" initiative and to assure its sustainability through dialogue between African and European stakeholders, to significantly improve the availability, access and conditions of use of Earth Observation information.

Why is this project important for Europe?

Europe has a long record of working with Africa on Earth Observation related activities. BRAGMA will give visibility and enhance the consistency and continuity of past, present and future cooperation between both continents.

How does this project benefit European citizens?

BRAGMA contributes to "GMES and Africa" as a framework to facilitate informed participation on Earth Observation applications in the wide Africa-EU partnership aiming at the increment of scientific cooperation for sustainable development.

BRAGMA

Bridging Actions for GMES and Africa

LIST OF PARTNERS

- Instituto de Investigação Científica Tropical, Portugal
- Institut de Recherche pour le Développement, France
- Musée Royal de l'Afrique Centrale, Belgium
- Paris-Lodron Universität, Salzburg, Austria
- Department of Science and Technology, South Africa
- National Authority for Remote Sensing and Space Sciences, Egypt
- Centre d'Etudes et de Recherche des Télécommunications, Tunisia
- National Space Research and Development Agency, Nigeria
- Ministry of Higher Education, Science and Technology, Kenya
- IIMC International Information Management Corporation, Ireland
- Aavanz - Inovação, Unipessoal Lda., Portugal

COORDINATOR

Instituto de Investigação Científica Tropical,
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PROJECT INFORMATION

Bridging Actions for GMES and Africa (BRAGMA)

Contract N°: 284422
Starting Date: 01/01/2012
Duration: 24 months
EU Contribution: € 998.631
Estimated total cost: € 1.119.960

COFSEP

Analysis of Cooperation Opportunities for Europe in Future Space Exploration Programmes



ISS - The International Space Station

© ESA - NASA



Rachel VILLAIN
Project Coordinator

ABSTRACT

COFSEP provides a gap analysis of the European space exploration programme, comparing objectives and industrial capabilities for exploration worldwide, to develop cooperation scenarios with international partners in the next 15 years.

PROVIDE THE EUROPEAN COMMISSION WITH A COMPREHENSIVE SET OF INFORMATION TO POSITION EUROPE'S EXPLORATION OBJECTIVES AND CAPABILITIES WITHIN THE INTERNATIONAL CONTEXT FOR THE NEXT 15 YEARS

Considering that exploration is typically a first area of cooperation between countries, future initiatives for Europe in space exploration will be determined not only by its own ambitions and capabilities but also by those of its international partners. Therefore, it is essential for the European Commission to monitor and anticipate these ambitions and capabilities in order to be in a position to take decisions in the coming years and coordinate with stakeholders (other space agencies in Europe, the industry, international partners, etc.).

The objectives for COFSEP are to provide the European Commission with information to position Europe's objectives and capabilities within the international context for the next 15 years to support its role in defining the future direction of the European space exploration programme.

To do so, the study will be based on a detailed international benchmark of the European space exploration programme conducted at two levels:

1. benchmark of space exploration programmes and initiatives worldwide, to identify current and future directions, objectives, missions and projects for space exploration;
2. benchmark of industrial capabilities, with the objective to map current and future expertise and capabilities in critical technology areas required to pursue future projects.

This benchmark assessment will result in a gap analysis where objectives and capabilities will be compared, in order to develop scenarios for future cooperation opportunities.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The project is designed to support the European Commission in defining the future direction of the European space exploration programme based on an international benchmark of space exploration programmes already in place.

Why is this project important for Europe?

The identification of critical space technologies supports the objectives of the European industrial policy, especially for the technological non-dependence of Europe and for strengthening the EU's position as a major player at an international level.

How does this project benefit European citizens?

COFSEP achievements have indirect economic benefits for the European citizens as space exploration technologies generate new products and new forms of industrial cooperation and contribute to competitiveness, growth and job creation.

COFSEP

Analysis of Cooperation Opportunities for Europe in Future Space Exploration Programmes

LIST OF PARTNERS

- Euroconsult SA, France

COORDINATOR

Euroconsult SA, France

CONTACT

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PROJECT INFORMATION

Analysis of cooperation opportunities for Europe in future space exploration programmes (COFSEP)

Contract N°: 284424
Starting Date: 01/11/2011
Duration: 8 months
EU Contribution: € 80.000
Estimated total cost: € 90.722,60

COSMOS+

Continuation Of the cooperation of Space NCPs as a Means to Optimise Services



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COSMOS organizes the official Information Days for the annual Space, bringing together experts from different countries and topics.

ABSTRACT

Via info-days and conferences, the Space NCPs provide networking opportunities. Joint trainings and activities reinforce the links between the NCPs and ensure a cross-country knowledge exchange which provides fast access to information. The research and innovation funding programme, "Horizon 2020", will bring many changes that have to be learnt. The research community will be informed about the new funding opportunities at regional awareness events. Country independent support will be provided via the project website www.space-ncp.net.

NETWORKING NATIONAL CONTACT POINTS FOR SPACE

COSMOS+ is the network of National Contact Points (NCPs) for Space from Member States of the European Union and Associated States to the EU Framework Programme (FP) for Research. Twenty two Space NCPs are members of the consortium. The remaining Space NCPs are involved as third parties who will be invited to joint trainings and events like information days for Space Calls. Additionally, Space faring non-FP countries are involved in the activities of the project. The COSMOS+ partners support the implementation of sustainable contacts in those countries as interfaces between both, European and non-FP country participants of the FP Space programmes.

The project builds on the forerunner project "COSMOS" which was funded for the first time by the European Commission from 2008 on, as the official networking activity of Space NCPs. COSMOS+ now reinforces what was begun within "COSMOS". Given the fact that FP7 will end in 2013, one new and major issue of COSMOS+ is the preparation of the NCPs and the Space research community on "Horizon 2020", the next phase of European Space funding from 2014.

At the same time the project partners are observing the integration situation within Europe to avoid that some countries or regions lose track of Space in the FP. A more balanced support service on Space in the FP can be found on the project website www.space-ncp.net, where country independent information and a help-desk are provided. This helps lowering the entry barriers of participation in Space in FP7 and "Horizon 2020".

One major component of COSMOS+ is outreach through events. The international information days for the FP7 Space Calls within "COSMOS" have already taken place as official Information Days of the European Commission. COSMOS+ continues with this endeavour and further develops the matchmaking aspect of those events as this was considered highly important by the majority of the participants so far. In addition to these relatively big events, for the first time a series of regional awareness events are introduced in COSMOS+ to get through to a higher total number of participants. SMEs are particularly targeted and are welcome to profit from COSMOS+ and its additional services.



Adrian KLEIN
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

COSMOS+ is designed to achieve a smooth transition of NCP services from FP7 to "Horizon 2020". This will be done by continuing, reinforcing and widening the Space NCP network and according joint activities.

Why is this project important for Europe?

"Horizon 2020" will bring major changes so that even experienced participants will have to learn new space funding opportunities, instruments and rules. This is very much eased with a nationally based support service networked at European level.

How does this project benefit European citizens?

COSMOS+ is a network of National Contact Points for Space. It will allow improved information and support services and thus catalyse more and improved proposals. This will finally support finding the best available research consortia in the Space field to make the most out of the available funding resources.

COSMOS+

Continuation Of the cooperation of Space NCPs as a Means to Optimise Services

LIST OF PARTNERS

- Deutsches Zentrum für Luft- und Raumfahrt eV, (DLR), Germany
- Technologické Centrum Akademie věd České republiky, Czech Republic
- Foundation for Research and Technology Hellas, Greece
- Centre National d'Etudes Spatiales, France
- Agenzia per la Promozione della Ricerca Europea, Italy
- Instytut Podstawowych Problemów Techniki Polskiej Akademii Nauk, Poland
- Fundação para a Ciência e a Tecnologia, Portugal
- Türkiye Bilimsel ve Teknolojik Araştırma Kurumu, Turkey
- Space and Solar-Terrestrial Research Institute, Bulgaria
- Remote Sensing Application Center, Bulgaria
- Verein Euresearch, Switzerland
- Research Promotion Foundation, Cyprus
- Sihtasutus Archimedes, Estonia
- Centro Para El Desarrollo Tecnológico Industrial, Spain
- Matimp, Israeli Industry Center for Research & Development, Israel
- The Icelandic Centre for Research, Iceland
- Mokslo Inovacijų Technologijų Agentūra, Lithuania
- Rigas Tehniskā Universitāte, Latvia
- Romanian Space Agency, Romania
- Ministry of Education and Science, Republic of Serbia
- Institut Jozef Stefan, Slovenia
- Beta Technology Ltd, United Kingdom

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PROJECT INFORMATION

Continuation Of the cooperation of Space NCPs as a Means to Optimise Services (COSMOS+)

Contract N°: 284434
Starting Date: 01/05/2012
Duration: 27 months
EU Contribution: € 999.978,98
Estimated total cost: € 1.181.831,80

DiPoP

Disruptive technologies for space Power and Propulsion



Aurora rework

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ABSTRACT

DiPoP is an assessment study on disruptive space power and propulsion technologies as well as their applications. The aim of project DiPoP is to formulate recommendations and roadmaps for the next Framework Programme (under “Horizon 2020”) to enable an independent, European long-term space leadership.

SPACE POWER AND PROPULSION

Development of space technologies in the European space sector has resulted in many advantages for its citizens in the form of: weather data, knowledge of our universe, understanding of Earth and its environment, global positioning for transport methods and long distance communication. The European space sector is working continuously to improve these space technologies. Much of the time, progress is through incremental innovations on the dominant technology, leading to small improvements in performance, reliability and cost. Although there is considerable benefit from incremental improvement, any significant progress still relies on major, innovative technical developments.

Key to these radical innovations is the exploitation of disruptive technologies, which significantly improve upon the performance of a dominant technology. They are so fundamentally different that they can be seen as a new technology within the same technology domain.

The disruptive space power and propulsion technologies covered by DiPoP are:

- » continuous detonation wave engine;
- » space and ground nuclear fission (power 30 kWe to 200 kWe, including “Rules for Public Acceptance with Launch & Operations Constrains”);
- » solar and fuel cells, batteries;
- » Power-MEMS (Power Micro- Electro-Mechanical System);
- » Advanced Propulsion Systems and Power Processing Units;

Space power and propulsion applications covered under DiPoP could contribute to the EU Space Work Programme, addressing space transportation (including re-entry, interplanetary flight, micro-propulsion systems, robotics), space exploration (mobility on planetary surfaces, habitation, life support), space power, long term security and related areas.



Christophe R. KOPPEL
Project Coordinator

QUESTIONS & ANSWERS

What is the project designed to achieve?

We aim to generate a roadmap for a set of disruptive technologies in the domains of power and propulsion in Space and within the scope of the project.

Why is this project important for Europe?

Europe has to derive benefit from knowing the most appropriate disruptive and innovative technologies that may emerge in the future in the domain of space power and propulsion.

How does this project benefit European citizens?

The project will provide strategic resources for European companies involved in disruptive technologies validated by the roadmaps set-up in DiPoP. The entire project is dedicated to support the European space industry and thus the European economy for the benefit of all of its citizens.

LIST OF PARTNERS

- KopooS Consulting Ind., France
- Space Enterprise partnership, United Kingdom
- German Aerospace Center, Germany
- University of Stuttgart (IRS), Germany
- Christian-Albrechts-Universität zu Kiel, Germany
- ISIS R&D, Italy

COORDINATOR

Christophe R. KOPPEL , KopooS Consulting Ind.,
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PROJECT INFORMATION

Disruptive technologies for space Power and Propulsion (DiPoP)

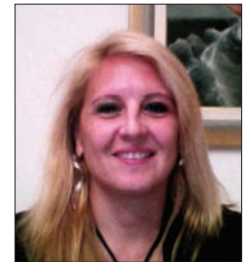
Contract N°: FP7-SPACE-2011-284081
Starting Date: 01/11/2011
Duration: 14 months
EU Contribution: € 294.703,00
Estimated total cost: € 349.281,20

ODYSSEUS

Engage and Inspire the European Youth in Space Exploration through a Scientific Contest



Planet Parade - Odysseus contest website



Elena TAVLAKI
Project Coordinator

ABSTRACT

- To inspire and motivate the students in scientific education through an innovative and well-designed Contest.
- To familiarize with and educate the students in intriguing scientific issues, enhancing their eagerness for space exploration.
- To enhance collaboration and disseminate its principles, as the space exploration is a collaborative activity at a global scale.
- To build capacities and develop problem solving students' skills.
- To create awareness and motivate the community, where the school is the central reference point, in scientific issues.
- To demonstrate effective ways for the creation of virtual communities of learners, students, teachers, museum educators and researchers who will be involved in the project contest activities.
- To lead to behavioral change for students and the community around them.

COORDINATING AND IMPLEMENTING A PAN-EUROPEAN SCIENTIFIC CONTEST FOR STUDENTS ON SPACE EXPLORATION THEMES

The Odysseus project engages and inspires the European youth in the "New Frontier", by coordinating and implementing a pan-European Scientific Contest for young people on Space exploration themes, combining creativity, intelligence and innovation.

The project aims to integrate ongoing educational activities on space in a pan-European perspective, providing the opportunity for young students to compete with their peers from different European countries. This action is enhancing the concept of multinational cooperation, an element necessary in the space exploration field. All participants are allowed to enter the contest individually and have to be between 14 to 18 years old. The participants will have to create a collaborative team with five (5) members maximum in total, to design and demonstrate an innovative project. Each team will appoint a leader.

The Odysseus Contest will focus on three major space theme categories:

- » Solar System
- » Spaceship – global cooperation
- » Co-evolution of life

The participants, mainly young students, are expected to design, develop and implement projects and activities in the above themes, related to space activities. These projects will have to be innovative in approach, seeking answers to scientific issues and formulate their final viewpoint. The Contest will be organized in two phases, culminating in a central European Exhibition and an Award Ceremony for the three finalist teams, one for each theme.

QUESTIONS & ANSWERS

What is the project designed to achieve?

The Odysseus project aims to engage and inspire the European youth in the "New Frontier", by coordinating and implementing a pan-European Scientific Contest for young people on Space exploration themes, combining creativity, intelligence and innovation.

Why is this project important for Europe?

The future Europe in space is envisaged. Therefore, we cannot make it reality without inspiring the new generations to science conquest and space education. It is an imperative to cultivate and constantly monitor the eagerness of young people to become science aware and to take up a scientific career.

How does this project benefit European citizens?

The Odysseus project achievements will have crucial benefits for Europe. It intends to expand the boundaries of knowledge of young students in space exploration, providing them with the opportunity to become aware of a whole new world of scientific excellence.

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ODYSSEUS

Engage and Inspire the European Youth in Space Exploration through a Scientific Contest

LIST OF PARTNERS

- Signosis Sprl. Research and Consultancy, Brussels - Belgium
- Ellinogermaniki Agogi Scholi Panagea Savva A.E., Greece
- European Physical Society Association, France
- Stichting Noordwijk Space Expo, Netherlands

COORDINATOR

Signosis Sprl. Research and Consultancy,
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PROJECT INFORMATION

Engage and Inspire the European youth in Space Exploration through a scientific contest (ODYSSEUS)

Contract N°: 284441
Starting Date: 01/11/2011
Duration: 18 months
EU Contribution: € 299.813
Estimated total cost: € 335.510,40