PORTUGUESE
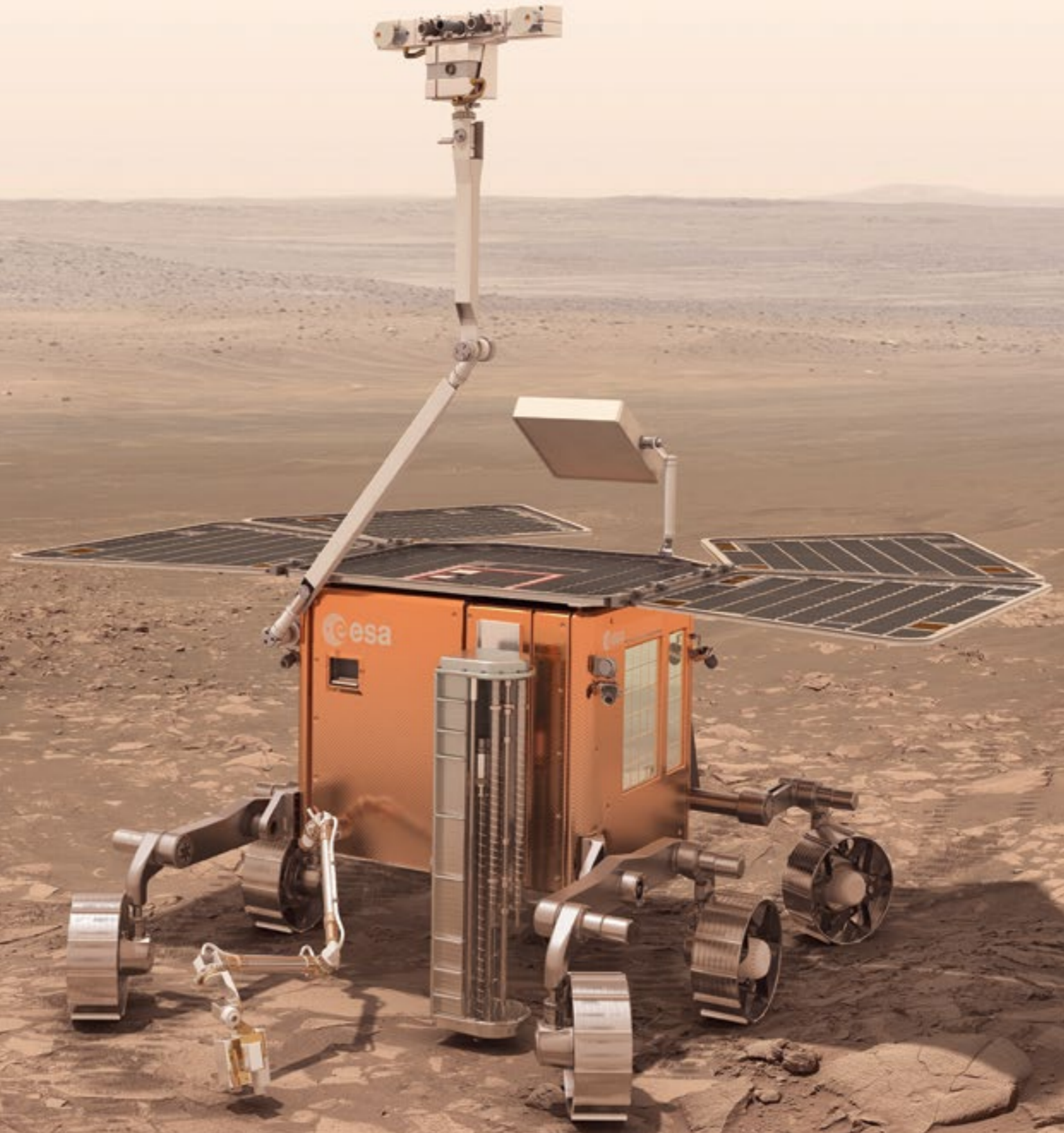# SPACE
CATALOGUE

PORTUGUESE SPACE CATALOGUE

FCT

Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Fundação para a Ciência e a Tecnologia (FCT) is the national funding agency for science and research in Portugal. FCT promotes internationally competitive and high impact science, technology and innovation across all areas of knowledge, including exact, natural and health sciences, engineering, social sciences and humanities.

The FCT Space Office addresses all space related issues. It is strongly committed to strengthening the participation of Portuguese researchers and entrepreneurs in space-related activities and in bringing the benefits of developing space sciences, technologies and its applications to Portuguese citizens.

Please reach us through space@fct.pt and on our website www.fct.pt.

Towards the end of 2000, Portugal became a member state of the European Space Agency, thus paving the way to full participation in ESA technology and applications programmes. The success achieved by Portuguese companies and research institutes in the European Union programmes, namely in FP7, Copernicus (formerly known as GMES) and Galileo is proof that Portuguese companies and academia are both competitive and reliable partners.

Indeed, Portugal contributes to most European Space programmes, covering key domains of space applications, ranging from satellite telecommunications, global navigation systems, Earth observation, space technology, space sciences and robotic exploration. The Portuguese Space Community is an active member of international networks, developing complex space technologies and participating in space science and exploration missions. This community is made up of innovative, knowledge-intensive companies, specialised research institutes and modern public institutions, all strongly engaged in advancing space science, technologies and their application in non-space sectors. Indeed, one of the success factors of the Portuguese Space Community is precisely the close links between companies and academia.

The pivotal and growing role of Space-based systems, services and applications in modern society is undisputable. The increasing ubiquity of space technologies in everyday modern life has been essential for the success of European Space Programmes, but has also led to a significant growth, in number and investment, in space research activities in China, India, and Brazil. These changes present new challenges and urge the need to prepare for new opportunities.

Portugal has already reaped the benefits of its investment in space programmes, as reflected in a significant economic multiplier effect, a particularly high-growth added value and an important internationalisation leverage effect. Furthermore, space science and technologies provide a powerful source of inspiration, enticing people to learn more about the Universe and engaging youngsters in scientific and engineering careers.

The Portuguese funding agency for science and research, Fundação para a Ciência e a Tecnologia (FCT), has a pivotal role in encouraging participation of Portuguese companies and research institutes in space activities and space missions. FCT supports advanced training of engineers in ESA and promotes technology transfer and business incubation. FCT also plays an important role in the coordinated actions of several Ministries contributing to ESA and other European space programmes.

The Portuguese Space Catalogue portrays a representative overview of the Portuguese Space Community, describing their main competencies in space science, space technologies and their corresponding applications. We hope that you will find it a useful guide for a deeper understanding of the varied and rich landscape of Portuguese companies and research institutes in the space domain.

MIGUEL SEABRA
President of the Fundação para a Ciência e a Tecnologia

INDUSTRY

proespaço

THE PORTUGUESE ASSOCIATION OF SPACE INDUSTRIES

PROESPAÇO was created in 2003 after Portugal joined the European Space Agency (ESA). The Association unites the Portuguese space industry, defending its interests through intensive dealings with the public administration, the government and international organisations. It plays a key role in defining Portugal's national strategy for the space industry and prepares the sector's industrial development strategy.

Given the highly institutional nature of the space industry market and the relatively small size of companies operating in the sector, PROESPAÇO promotes a wide range of space-related activities, bringing together the efforts of its individual members. It also represents its members in negotiations with public bodies and, when requested, in talks with major companies, when members' interests can be better defended by a common position.

PROESPAÇO currently represents more than 95% of the business contracted to the Portuguese space industry and is the only organisation that represents their interests.

Production and service companies operating in the space sector, namely in the areas relating to ESA, EUMETSAT, European Commission Framework Programmes and NASA, are welcome to join the association.

António Neto da Silva
President

ASSOCIATED COMPANIES TO PROESPAÇO

CONTACTS

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TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Advanced structural concepts and materials

Materials Processes - Advanced materials manufacturing

Thermal Protection

activeaerogels

Active Aerogels
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OVERVIEW AND GENERAL DESCRIPTION

Active Aerogels offers nano-structured materials for a wide range of applications such as thermal super-insulation, effluent treatment, and controlled drug release.

In particular, Active Aerogels develops thermal insulation solutions for low vacuum applications such as planetary rovers, launchers, re-entry vehicles, and tanks. These applications can be further used in other markets, e.g. oil & gas and construction.

FIELDS OF EXPERTISE

Active Aerogels is focused on synthesizing advanced materials for industrial applications. Active Aerogels provides testing and verification services to evaluate the performance of materials in space.

Active Aerogels expertise is sol-gel processed materials mainly development of aerogels. Active Aerogels delivers high performance materials based on techniques such as sol-gel synthesis, supercritical drying and freeze-drying. Active Aerogels also provides material characterisation services (physical, structural and thermal, compliance with ECSS standards).

MAIN PROJECTS, PRODUCTS AND SERVICES

PRODUCTS:
- SP-SIL-13 AC15 flexible aerogel, 15 W m-1 k-1 (10 mbar), 160 kg m-3
- SP- SIL-13 AM24 flexible aerogel, 24 W m-1 k-1 (10 mbar), 60 kg m-3
- Silica powders and beads - Custom made flexible super-insulation systems (aerogel based)

PROJECTS:

ESA-ITI – Proof of concept for aerogel applications (contract C19528) (2005-2008)
Aerogels were characterised in order to evaluate their performance in space environments and also compared with other insulation materials used in space applications.

ESA-ITI – AERTIS - Aerogel thermal insulation system (contract 4200022728) (2009-2012)
The encapsulation system was developed and venting design to avoid boiling during launching. The system was tested by DLR to simulate Martian environment conditions (pressure and temperature).

ESA-TRP – Adaptation of aerogel materials for thermal insulation (contract 4000105736) (ongoing)
Development of ambient pressure and supercritical drying silica-based aerogel processes for Mars applications; demonstrator 200 x 200 x 30 mm.

EU-FP7 – AERSUS - Aerogel European Supplying Unit for Space Applications (contract 284494)(ongoing)
The main objective of the AerSUS project is to create a European supplying unit for one of the critical space technologies for European strategic non-dependence: advanced thermal control materials.
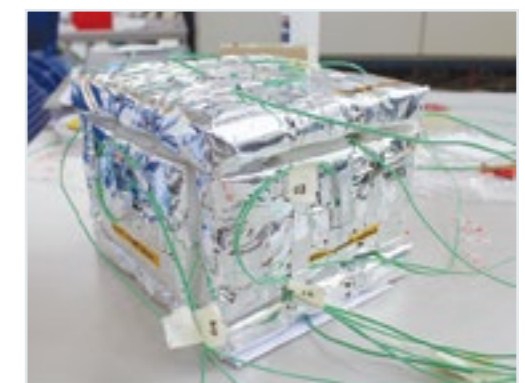
TECHNOLOGY DOMAIN   SEGMENT

Software

Hardware

Space Segment

Space-based Services

Ground Segment

SPACE TECHNOLOGY SUB-DOMAIN

Automation & Robotics components and Technologies

Control electronics technologies

Structural design and verification methods and tools

activespace
technologies

making space a global endeavour

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OVERVIEW AND GENERAL DESCRIPTION

Active Space Technologies provides state of the art mechanical and electronics engineering expertise, offering turn-key sub-systems, supplying the whole value-chain from requirements definition, design services, and modelling up to manufacturing and AIT.

Active Space Technologies takes on the most demanding projects, leveraging expertise acquired in the space sector and a range of engineering backgrounds of our staff, providing a multidisciplinary approach to your challenges. Following this vision, we have been working for the European Space Agency, Astrium, Thales Alenia Space, among others.

FIELDS OF EXPERTISE

Active Space Technologies offers added-value Engineering services in the fields of: Mechanical engineering (thermal, fluids, and structural analysis, design, precision CNC); Electronics engineering (automation & control, embedded systems, digital control).

- Thermal and fluids Engineering
- Structural Engineering
- Mechanical & CAD Design
- Prototyping & Manufacturing
- Automation & Control
- Digital Control
- Embedded Systems
- Materials R&D
- Product Development

MAIN PROJECTS, PRODUCTS AND SERVICES

Solar Orbiter
Active Space Technologies participates in the development of Solar Orbiter mission, namely providing the Feedthroughs, Boom, and Mass Thermal Dummies. Solar Orbiter is a significant step in the scientific program of the Agency. ESA Solar Orbiter is a significant step in the scientific program of the Agency. The mission presents several challenges as the solar flux is about 10 to 20 times higher than those found in Earth orbit. The objectives of the Solar Orbiter are to:
- determine in-situ the properties and dynamics of plasma, fields and particles in the heliosphere;
- measure with high precision the magnetized atmosphere of the Sun;
- identify the relationship between the activity on the solar surface and the evolution of the nucleus of the Sun.

BepiColombo
BepiColombo, an ESA cornerstone mission to the planet Mercury, is a joint mission by the European Space Agency and the Japan Aerospace Exploration Agency (JAXA). Active Space Technologies participated in the thermal, structural, and thermo-elastic design, modelling and analysis, further to 3D design and 2D layouts. Active Space Technologies was responsible for the development of MSASI-M (MERCURY SODIUM ATMOSPHERE SPECTRAL IMAGER), an instrument developed by Hovemere, which will be launched onboard the Mercury Magnetospheric Orbiter (MMO). Further, Active Space Technologies provides the Boom.
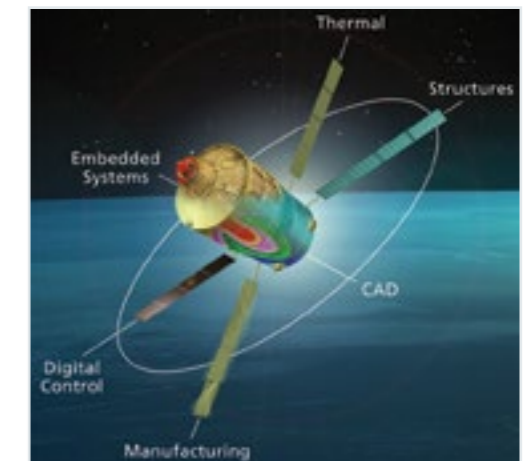
TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground segment

Space-based Segment

SPACE TECHNOLOGY SUB-DOMAIN

Structures Design

Composite Manufacturing

Thermo-Analysis

CEiiA

PUSHING MOBILITY®

CEiiA
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OVERVIEW AND GENERAL DESCRIPTION

CEiiA is an Innovation and Engineering Center focused at enhancing the competitiveness of mobility industries through international cooperation with main OEMs and Research & Development Centres towards market-oriented solutions for mobility sectors, such as aerospace, aeronautics and automotive.

FIELDS OF EXPERTISE

Design
▪ Metallic and Composite Structures
▪ Systems Installation

Structural Analysis and Simulations
▪ Static Analysis, Fatigue and Damage Tolerance
▪ Flutter, Thermal Analysis

Aerodynamics
▪ Body and Rotor fluid dynamics
▪ Aeroacoustic Analysis

Systems Engineering
▪ Systems integration
▪ Electrical, Mechanic, Propulsion and Navigation Systems

Testing
▪ Material Characterization and Testing
▪ Full Scale Static and Fatigue Testing

Prototype Manufacturing
▪ Autoclave, Clean and Prepeg Cutting Machine
▪ CNC Milling, Trimming Centre
▪ CMM and 3D Laser Scanner for Measuring and Control
▪ SLS Rapid Prototyping, 3D Printer Rapid Prototyping
▪ Low Pressure Injection Molding

Destructive Testing
▪ Fatigue testing
▪ Climatic Chamber and high temperature testing
▪ Certification testing of aerostructures

Non Destructive Testing
▪ Phase Array Ultra Sound A,B,C Scan
▪ Digital Radiography

MAIN PROJECTS, PRODUCTS AND SERVICES

1. Embraer KC390 Programme
▪ Components Development
▪ Preliminary and Detailed design
▪ Stress Analysis and structural validation
▪ Certification support for approval
▪ Integrated Product Development

2. AgustaWestland Programme
▪ System integration
▪ Modifications and Reverse Engineering
▪ Composite Tail Plane Analysis and optimization
▪ Electrical system architecture
▪ Reliability and certification support

3. Dassault Aviation Programme
▪ Falcon SMS Central Fuselage structural design and analysis, electrical systems design and installation

4. GALILEO ground antennas
▪ Development and manufacturing of GALILEO ground antennas

5. Development of new products and services for smart mobility

6. R&D Programmes:
i) ALICIA (All Conditions Aircraft)
ii) CleanSky's Green Rotorcraft (GRC), including the GRC1, GRC3 and GRC5 ITDs, where CEiiA plays an important role on Aeroacoustics, Aerodynamics and Electrical Systems on helicopter innovative technologies.

TECHNOLOGY DOMAIN

SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services
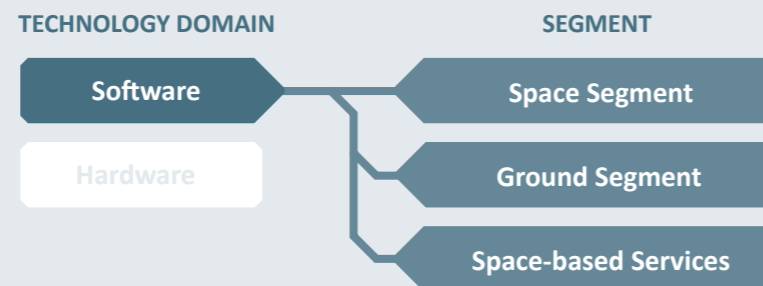
SPACE TECHNOLOGY SUB-DOMAIN

On-board Software Development

Independent Verification and Validation

Simulation and Mission Control Systems

Critical
software

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OVERVIEW AND GENERAL DESCRIPTION

Critical Software has been providing software services and products for mission-critical subsystems and segments since 1998. Working in the Space, Ground and Earth Observation areas, Critical Software has established itself as a reliable, proactive and cost-effective partner for customers seeking innovative solutions to their most demanding challenges.

Founded in Portugal in 1998, Critical Software currently has offices in Coimbra, Lisbon and Oporto, and subsidiaries in the UK (Southampton and Yeovil), USA (Chicago), Brazil (São Paulo), Mozambique (Maputo), Angola (Luanda) and Singapore.

FIELDS OF EXPERTISE

Critical Software´s activities range from system or solution development using best available technologies and modelling methodologies to specialised services such as independent product assurance (quality & product assurance, ISVV, RAMS).

Our activities span from the space segment to downstream services, including Embedded & Real-time, Command & Control, Verification, Validation & RAMS, Independent Software, Verification & Validation, Mission Control Systems, Payload Data Processing & Dissemination, On-board Software Development, Data Handling Systems, Ground Segment, and Earth Observation.

MAIN PROJECTS, PRODUCTS AND SERVICES

Solar Orbiter, Sentinel 2 and 3 on Board Central Development
Critical Software developed high integrity and real time central components of SOLO, Sentinel 2 and 3 on-board software and provided independent verification & validation teams.

Space Verification and Validation
Critical Software provided verification and validation services according to rigorous standards and mission requirements to several missions such as LisaPathfinder, CryoSat, CryoSat-2, GOCE, Sentinel-1, and AlphaBUS. Activities such as verification and validation, static and dynamic analysis, test design, implementation and execution, and development of specialised testing tools to improve productivity were performed.

Bepi-Colombo Simulator Development
Interdisciplinary Cornerstone Mission to Mercury (collaboration between ESA and JAXA). Critical Software offers a distinct software engineering background and a strong insight of operational simulators, to ensure the successful delivery of the Bepi-Colombo Simulator.

WBRIO: Assessing Rio de Janeiro Vulnerability to Natural Disasters
Need of providing reliable information allowing the identification of housing built in areas at risk of landslide and flooding, available land along new transport investments for urban development, vacant, under-utilized or industrial areas that could be redeveloped for infield development.

TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Mission Operation and Ground Data systems

Flight Dynamics and GNSS

Space segment Guidance Navigation and Control (GNC)

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OVERVIEW AND GENERAL DESCRIPTION

DEIMOS Engenharia is a Portuguese Aerospace Engineering company, delivering advanced design solutions and turnkey space software systems since 2002. Building on a solid team of highly motivated and specialized engineers, DEIMOS Engenharia is now a reference player in the European space sector.

The portfolio of customers and partners includes the European Space Agency, Eumetsat, Thales Alenia Space and EADS Astrium. The company is ISO 9001:2000 certified. DEIMOS Engenharia is part of ELECNOR DEIMOS Group, the technology arm of ELECNOR (www.elecnor.com).

FIELDS OF EXPERTISE

Guidance, Navigation and Control Systems
Development of autonomous navigation algorithms and systems, including rendezvous and hazard avoidance functions using innovative techniques and approaches, for application in interplanetary missions and other unmanned vehicles.

Global Navigation Satellite Systems
Development of new technologies for navigation receivers, applications and product prototypes, simulation and integrity of GNSS systems and concept studies for the evolution of the Galileo System.

Ground Segment Systems
Systems engineering and software for critical applications and data processing systems for novel mission concepts.

Earth Observation systems and applications
End-to-end observation systems and development of Earth Observation services and applications.

MAIN PROJECTS, PRODUCTS AND SERVICES

PROBA-3 Rendezvous Experiment
DEIMOS is developing a dedicated Rendezvous Experiment (RVX) to be flown by ESA's PROBA-3 mission. The RVX will be the in orbit demonstration of DEIMOS vision-based automated Rendezvous GNC concept in elliptical orbits, applicable to future exploration and space debris removal missions.

LUNAR GNSS
DEIMOS Engenharia is investigating the use of weak GNSS signals from existing GPS and future Galileo towards future lunar exploration missions for real-time position, navigation and timing information.

EDRS Mission Planning
DEIMOS is responsible for the design, development, integration and operational support of the Mission Planning System of the European Data Relay System (EDRS), a constellation of satellites which shall provide Data Relay Services to spacecraft in low earth orbit, in particular to the Sentinel 1 and 2.

Sentinels Synergy Framework
SENSYF is an FP7 project lead by DEIMOS to provide a specialised Sandbox Service with tools and development/validation platforms for the development and testing of new processing chains and methods for Sentinel and Copernicus/GMES contributing mission data on a continuous basis, and the delivery of higher-level products and services complementing the information provided by the operational services.
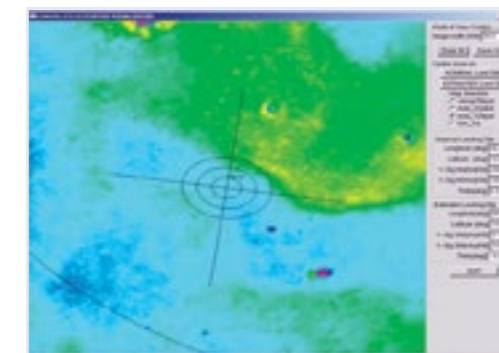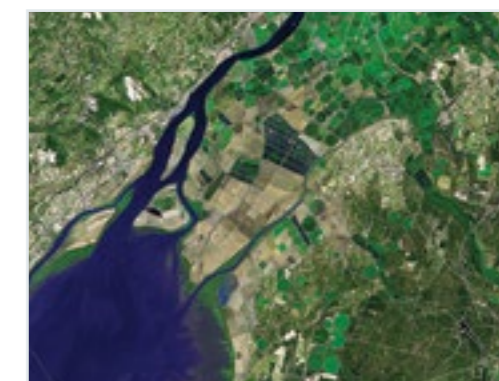
TECHNOLOGY DOMAIN   SEGMENT

Software	Space Segment
Hardware	Ground Segment
	Space-based Services

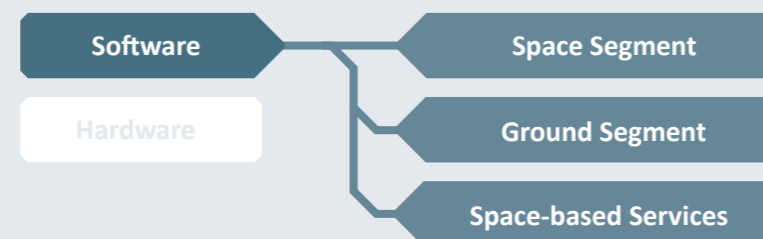## SPACE TECHNOLOGY SUB-DOMAIN

Satellite Navigation

Embedded Systems

Remote Sensing and Ground Segment

EDISOFT

DEFENCE & AEROSPACE TECHNOLOGIES

A **THALES** Group Company

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OVERVIEW AND GENERAL DESCRIPTION

Established in 1988, EDISOFT is the national leader in the domains of command and control systems, of information integration systems, of military logistic systems and space systems.

As a specialised company offering technologically advanced software solutions and highly qualified IT consulting services, EDISOFT holds a profound knowledge in the development of integrated space solutions, in the fields of Embedded Real Time Systems, Satellite Navigation, Remote Sensing and Ground Station Systems.

FIELDS OF EXPERTISE

From the beginning of its activity, EDISOFT has reached a wide recognition in software development, maintenance and upgrading in areas as sensitive as real-time information Space Systems, emergency networks and systems' integration. Throughout the years, EDISOFT has accumulated skills and expertise in:
▪ Embedded Real Time Systems;
▪ Satellite Navigation Systems;
▪ Remote Sensing;
▪ Ground Segment Systems;
▪ Command and Control Systems;
▪ Systems Integration and Acceptance;
▪ Integrated Information Systems;
▪ Spatial Data Infrastructure;
▪ Strategic Collective Security Systems.

Since 1994, EDISOFT has earned a solid reputation in the Space industry, providing expertise in the development of engineering solutions for Satellite Navigation, Remote Sensing, Embedded Systems and Ground Segment.

MAIN PROJECTS, PRODUCTS AND SERVICES

SATELLITE NAVIGATION
EDISOFT was the first Portuguese company joining the EGNOS project and, afterwards, the GALILEO program, from the Galileo Phase B2 up to today's activities. EDISOFT developed its GNSS activities both in connection with GNSS infrastructure and with GNSS applications.

REMOTE SENSING
Currently, EDISOFT holds responsibilities in the existing two Earth Observation Infrastructures in Portugal:
▪ EUMETSAT/IM LSASAF, Land Surface Analysis Satellite Application Facility;
▪ EDISOFT's Earth Observation Santa Maria Station, with daily services in maritime surveillance

EMBEDDED SYSTEMS
For ESA, EDISOFT has developed the RTEMS Support and Maintenance Centre (http://rtemscentre.edisoft.pt).
▪ EDISOFT RTEMS Tailored Version, Test Suite, Technical Support – Helpdesk, Remote and Local Consulting, Development and RTEMS Tools.

GROUND SEGMENT
The Santa Maria ground station is a dual mission station, ESA Tracking Station and Earth Observation Station, managed and operated by EDISOFT.
EDISOFT expanded the Station's capacity to receive EO SAR images from Envisat and Radarsat-1/2, thus enabling the Station to combine two missions: launchers' tracking and Earth Observation.
Since September 2012, EDISOFT was awarded for a Galileo Sensor Station hosting contract in Azores, at Santa Maria Island, a Galileo Sensor Station (GSS), used to receive the Galileo signal in space (SiS) sent by the satellites.

TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Electronic and Structural Design

Radiation Analysis

Thermal Design

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OVERVIEW AND GENERAL DESCRIPTION

Born in 1905, the EFACEC Group has its origin in "A Moderna" producing electrical motors. Renamed to EFACEC in 1962, is now the largest electrical industry Portuguese Group; employs over 4500 people in more than 50 countries and has a turnover of 1000 million Euros; exports almost 75% of its production that goes from industrial electronics to the biggest power transformers.

EFACEC's strategy focuses on the international market, concentrating on investments in innovation and in new technologies development, backed-up by its core technologies leading to a position at the forefront of markets.

FIELDS OF EXPERTISE

Focusing on INSTRUMENTS FOR SPACE, built expertise on:

Electronics design
▪ Project upon specification or idea
▪ Digital and analogue simulation
▪ Bread boarding with industrial and military components
▪ Test using up-to-date laboratory
▪ Qualification to ECSS standards
▪ Printed Circuit Boards design

Structural design
▪ Project upon specification or idea
▪ Mechanical Drawings
▪ FEM simulation and analysis
▪ Prototyping
▪ Qualification

Ground Support Equipment:
▪ Electronics and Mechanical hardware
▪ Labview software

Thermal design
▪ Project upon specification or idea
▪ TMM simulation and analysis
▪ Qualification

Radiation design
▪ Sectorial analysis TID and TNID

System Design and Integration
▪ System design
▪ Manufacturing using class 100000 clean-room
▪ Electrical, functional and EMC qualification

Specialized procurement for:
▪ EEE for Bread-boarding, engineering models and flight models
▪ Mechanical parts

MAIN PROJECTS, PRODUCTS AND SERVICES

EuTEMP
Is a temperature recording unit installed in the International Space Station. On the external platform of COLUMBUS, EuTEMP autonomously recorded successfully the temperature of the various EuTEF experiments. Downloaded its memorised data through the MIL-STD-1553 communications bus upon requested.

CTTB
Is a computerized equipment able to host up to three experiment boards sized 200mm x 110mm and an external payload feeding and monitoring their voltages and currents and communicate with them using the I2C protocol. CTTB is powered by the spacecraft 100V bus and communicates with the spacecraft On-Board-Computer through the MIL-STD-1553 communications bus.

MFS and BERM
Are radiation monitors. They are designed to detect, measure the energy and count energetic particles. Electrons from 300keV to 7MeV, Protons from1MeV to 200MeV and other heavier ions up to 400MeV per nucleon are in the range of these instruments detection. MFS is installed together with CTTB on the Alphasat TDP8 and BERM makes part of the BepiColombo mission to the planet Mercury. They will allow the scientists to understand better the space environment and engineers to select among more radhard parts.

Altimeters
Aiming a Mars mission, but able to be used into asteroids, are being designed one with a RADAR front-end and the other with a LIDAR front-end. A processor and a PSU connect the units to a host computer.

TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services
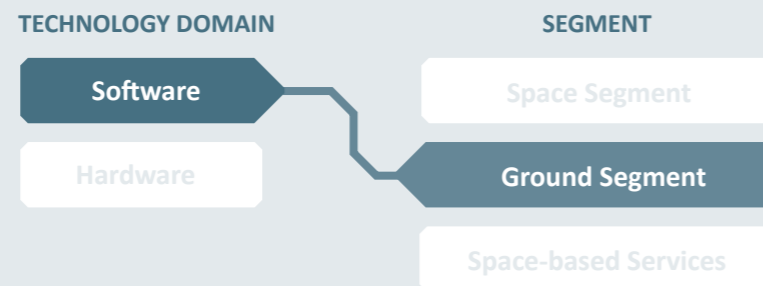
SPACE TECHNOLOGY SUB-DOMAIN

Bespoke Software Development

Telemetry and Geographical Referencing

High Availability and High Performance Systems

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OVERVIEW AND GENERAL DESCRIPTION

Eixo Digital is an international, fast growing IT company based in Portugal and focused on the international market, with customers and partners across Europe and Africa and specializing in mission-critical, high-availability, large database IT projects and the selling of Satellite Communication products and services.

FIELDS OF EXPERTISE

Complex and Large Scale Projects
Delivery of complex and large scale projects through implementation of known best practices for project and risk management.

High Availability and High Performance
Development of mission critical platforms, capable of handling high workloads, dealing with outages and meeting strict requirements.

Large Databases
Design of geographical replicated, shared-nothing clusters for database management systems, providing uncompromising scalability, uptime and agility.

Systems Integration
Solutions spanning the full range of IT and software development technologies, bringing together software, hardware, storage, networking and security subsystems into a whole.

Networking
Experience with major networking manufacturers equipment, from switches and routers to load balancers and firewalls.

MAIN PROJECTS, PRODUCTS AND SERVICES

Metry
Telemetry can bring significant cost reductions to any business, but its implementation can be technically challenging. With metry, you can build an end-to-end solution to collect vast amounts of data from multiple sensors, store it in a high-availability database, and display information using beautiful map displays and dashboards.
The Metry framework can scale from simple small business solutions, for internal use, to large enterprises wanting to build and sell value added services to multiple customers.

Appy
Eixo Digital Rich Internet Application framework enables the creation of beautiful, simple to use and maintenance-free user interfaces capable of running on any modern web browser. This product accelerates the development of most commonly used interface patterns - users and passwords with different profiles and access rights, menus, windows and desktops, advanced searches and charts, among other features.

Maritime Safety Data Services
Development of the Maritime Safety Server system, responsible for interfacing with Rescue and Coordination Centres, Maritime Safety Information Providers and Maritime Safety Terminals. Enables Maritime Safety Data Services such as Distress Alert, Priority Messaging, broadcast of Maritime Safety Information and Distress Chat in the Inmarsat BGAN network.
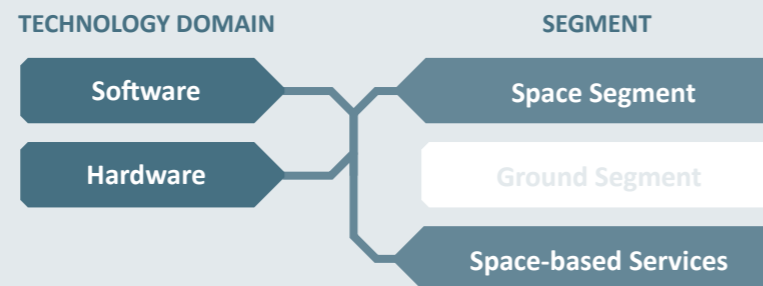
TECHNOLOGY DOMAIN   SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Payload Platforms - Mechanical, On-Board SW, CPU, PWR

Space System On-board SW and Data Processing

Spacecraft Electrical Power Conditioning distribution

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OVERVIEW AND GENERAL DESCRIPTION

EVOLEO Technologies is a SME investing in skills related to the design of critical and highly complex electronic systems. EVOLEO embraces five areas of activity: Space, Transportation, Energy, Health and Industry.

EVOLEO Technologies mission is to provide high-end and differentiated electronic engineering solutions, seeking continuous improvement, flexibility, quality and customer oriented innovation. We aim international recognition as a technological company for leveraging partnerships, added value enhancement and sustainable growth.

FIELDS OF EXPERTISE

FLIGHT
Payloads fast development
▪ On Board SW - Baseline solution over RTOS
▪ Data Handling & Processing - RadHard LEON3FT CPU
▪ Power Distribution - RadHard, LCLs, ON/OFF, Load monitoring.
▪ System Integration - Engineering analysis & integration
▪ Payload System - Baseline for experiments or simplified payloads

MISSION CONTROL
Payloads definition of flight mission procedures
▪ Flight Support Package - IOT & Commissioning baseline procedures
▪ Flight Operations Support - Flight procedures tool
▪ Scientific Data Centre - In-flight Data Analysis SW tool
▪ Flight Monitoring System - Commissioning & exploitation tool

TESTING
Debug, verify & validate all development
▪ EGSE - Independent Engines. Mission simulation
▪ Environmental Testing Support - Procedures support on EMC, Vib. & TVac
▪ System Check-Out - Support to payload SC integration
▪ SW Testing Framework - OBSW testing and simulating package

MAIN PROJECTS, PRODUCTS AND SERVICES

PROJECT ALPHASAT TDP8 FOR ESA
Evaluate electronic components in harsh space conditions and to record the radiation levels.
▪ On-Board SW - RTEMS, HK/Sci data, FDIR
▪ Electrical GSE - Used throughout all phases of project development
▪ Data Interface Board - Based on Aeroflex Gaisler LEON3FT CPU, onboard memory, digital/analogue I/O
▪ Power Distribution Unit - Distributes the secondary power to the TDP8 units, ON/OFF capability, LCLs, Loads monitoring
▪ Memory Test Board - Experiment board testing memories. Banks of SEL and SEU monitors and Flash demonstrators

PROJECT TDP8-CTTB In-FLIGHT DATA ANALYSIS
Web-based SW tool preparing TDP8 Sci data for analysis and correlations with external data-sets, validation and consistency check.

PROJECT TDP8 GROUND SUPPORT
Planning and monitoring tools integrating near-real time monitoring based on I4S Inmarsat monitoring system in the SC Control Centre.

PROJECT AOLTB
Optical telecom payload of ultra-stable reference signals for bulky RF cables replacement.
▪ On-Board SW - RTEMS (asymmetric multiprocessing configuration) HK/Sci data, FDIR
▪ Electrical GSE - SW and HW platform used for system integration and verification
▪ Interface Control Unit - Based on Aeroflex Gaisler GR712C dual core CPU, onboard memory, digital/analogue I/O, 1553B
▪ Power Distribution Unit - Distributes secondary power to AOLTB optical link, ON/OFF capability, LCLs, Loads monitoring
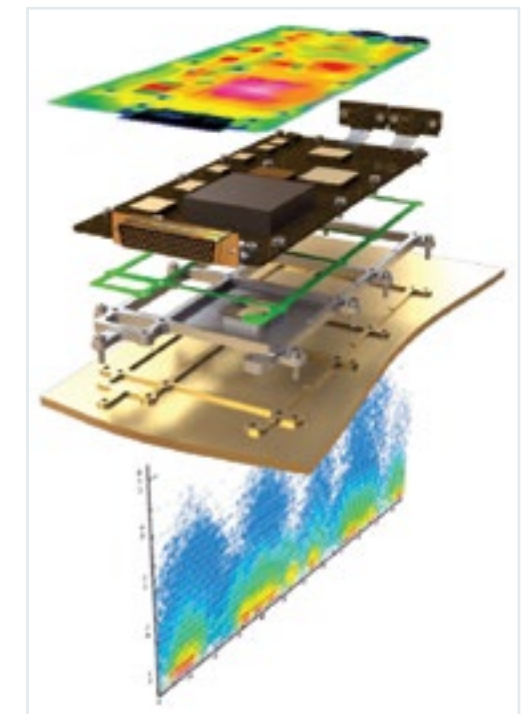
TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Instrumentation and monitoring

Telemetry sub-systems

Ground testing of structures

FiberSensing
Sistemas Avançados de Monitorização, S.A.

Fibersensing, Advanced Monitoring Systems
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OVERVIEW AND GENERAL DESCRIPTION

FiberSensing – Sistemas Avançados de Monitorização, S.A., is a spin-off SME company from INESC Porto devoted to the development and commercialization of optical Fibre Bragg Grating (FBG) based sensor systems for advanced monitoring applications.

It develops, commercializes and supports products (sensors, measurement units and software packages) and services (complete solutions) for instrumentation, being the main markets the ones of structural health monitoring in civil and geotechnical engineering, energy production and distribution, and aeronautics and aerospace.

FIELDS OF EXPERTISE

FiberSensing is completely focused in the field of FBG monitoring solutions.

The company designs, manufactures, tests and commercializes every element of the monitoring solution, from the inscription of the FBG element to the development of application-specific software running on proprietary interrogation units.

The company is supported by competences going from fibre optic technology to optoelectronics, digital electronics and instrumentation.

MAIN PROJECTS, PRODUCTS AND SERVICES

ESA PROJECTS

Satellite
ARTES5.1 project for the demonstration of the advantages of FBG sensing technology as part of a telecom satellite monitoring subsystem. Two demonstrators were designed, manufactured and tested for temperature monitoring in RF antennas and in high-voltage propulsion systems. The project was jointly developed by EADS CASA ESPACIO, FiberSensing and EADS Astrium CRISA and was successfully completed in 2008.

Avionics
FLPP Phase 2 project for the study of applicability of photonic technologies in Next Generation Launcher avionics. A demonstrator was implemented incorporating fiber optic technologies for digital high speed data transmission, fiber optic sensing and power delivery over fiber. All those capabilities were demonstrated over the same fiber optic cable. Performed solely by FiberSensing, the project was successfully closed in 2011.

FLPP TMSS FOS
FLPP Phase 3 project currently running with EADS CRISA and Astrium ST for increasing the TRL level of FBG technology in launcher environments.

ARTES5.2- FOS for telecom satellites
ARTES5.2 project currently running with EADS CRISA for increasing TRL level of FBG technology for telecom satellites.
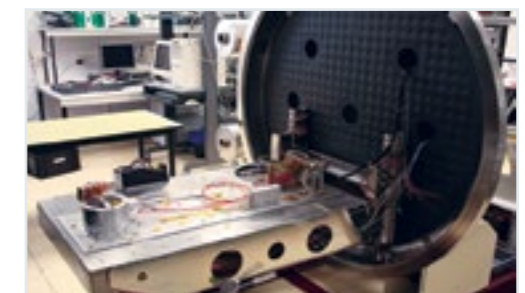
In addition, FiberSensing also collaborates with CNES, Thales Alenia Space and Astrium in directly financed projects for several applications, all of them related to FBG technology monitoring.
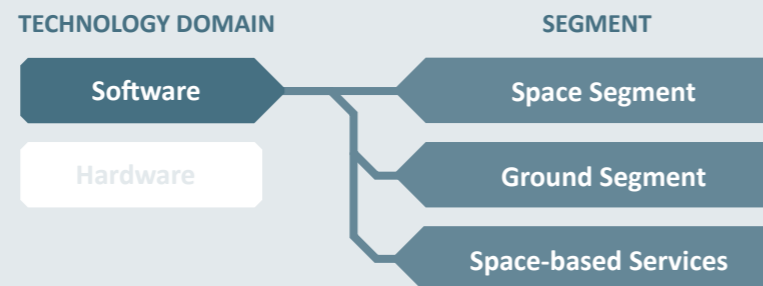
TECHNOLOGY DOMAIN

- Software
- Hardware

SEGMENT

- Space Segment
- Ground Segment
- Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

GNSS Systems and Technology

Space Segment: OBSW, ISVV, EGSE, Mission Analysis, GNC

Earth Observation Processing Systems, Apps and Services

GMVIS SKYSOFT, S.A.
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OVERVIEW AND GENERAL DESCRIPTION

GMV is a privately owned technological business group with an international presence, founded in 1984. In 2005, GMV incorporated the Portuguese company GMV-SKYSOFT. Established in 1998, it had space related activities even before Portugal joined ESA. Since that date, GMV has become the Portuguese leading company in business with ESA.

At GMV, we are committed to provide our customers with the best possible solutions to meet their needs. Locally, our strategy is to identify and secure niche market satellite technology positions that are sustainable on a long term perspective.

FIELDS OF EXPERTISE

Space Segment
Integrated Modular Avionics. On-Board Software and ISVV. EGSE: CCS, Satellite DB and AIT. Mission Analysis, Systems Engineering and Simulation studies. GNC Systems. Autonomy and Robotics.

Satellite Navigation Systems
GNSS system studies and engineering. Large Navigation Processing Facilities and Signal Generation. Precise Positioning. SBAS/GBAS solutions. GNSS test tools and SW Receivers. GNSS-based Applications. Indoor Navigation Systems.

Ground Segment
GS Engineering for Scientific and EO missions. EO PDGS & Science Operation Centres. Mission Planning. Ground Control Systems: Monitoring and Control.

Data Processing
Instrument Processing Facilities and Processors. Calibration and Quality Control Systems.

Satellite Communications
User segment, payload management, satellite networking, DVB-RCS.

User Segment and Space Applications
EO services, Integrated Applications.

MAIN PROJECTS, PRODUCTS AND SERVICES

Ground Segment GNSS
Galileo IOV & FOC: OSPF/ IPF RTMC SW and AIVP Platform, MDDN Networking SW. EGNOS: DAL C COTS & system support.

GNSS Engineering
NUSAR, DNURS, FASTTTFIX, ROCAT: SW receivers, tools and technology.
EGEP: Atomic Clocks, MLUTB/HISTB Test Beds and ARAIM.
Applications: security, indoor, transport, aeronautical, LBS, maritime.

Earth Observation PDGS and Applications
Processors & op. tools: IASI-L2 , Earthcare, MERISAT, AVHRR-SeaWiFS APS. LandSAF engineering. SSA: Data Centres.
GMES: MyWater, NEREIDS, SAGRES, G-MOSAIC, MARISS. Comm. services: security, mapping and agriculture.

Ground Control Systems
MAC: Monitoring and Control system.
GFC8/EFC1: Frame Contracts. hifly: inhouse GCS product.

Electronic Ground Support Equipment and DBs
GAIA and Solar Orbiter CCS. Sentinel 2 and Earthcare: CCS and instrument AIT support.
Herschel/Planck, Sentinel 3: Satellite DB.

Space Systems and Engineering
GNC, Mission Analysis. NLP: Trajectory Opt. GRAVMOD, NGGM: Gravitational Models and studies.

Satcom Engineering
SaNTA: D/L TCP accelerator. IRIS, ANTARES: Satcom system for SESAR. DVB-RCS satellite test bed. Satcoms for civil protection and for UAVs.

OBSW, Tools and Methodologies
IMA for Space. AIR: Integrated Modular Avionics OS. MOBARE: Dependability/ Safety Validation. Multicore processors. AURORA: Mars mission Avionics Architecture. Sentinel 3: OBSW Validation Functional Chain.

TECHNOLOGY DOMAIN

SEGMENT

Software

Hardware

Space Segment
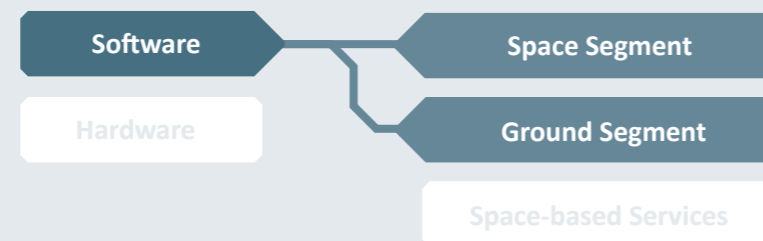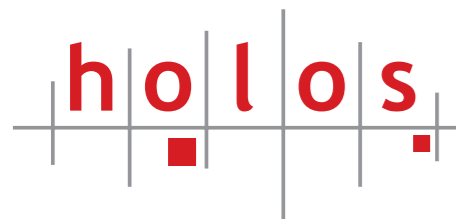
Ground Segment

Space-based Services
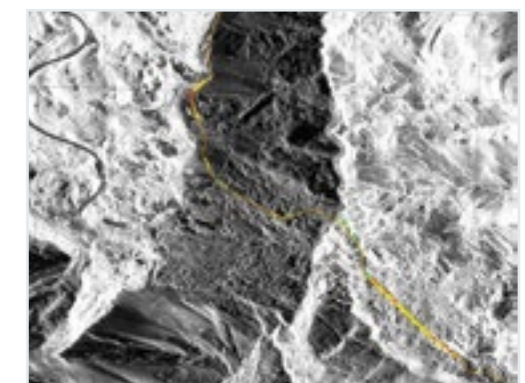
SPACE TECHNOLOGY SUB-DOMAIN

Ground Segment Software

Ground Data Processing

Ground Data Systems (MCS)

holos

www.holos.pt

**Holos, Sol. Avançadas em Tecn.
de Informação, S.A.
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OVERVIEW AND GENERAL DESCRIPTION

Holos develops Information Systems.
It has participated/coordinated ESA projects on the ground and space segments. Holos skills include sensor data processing, data warehousing and mining, inference systems to produce alarms.
It was founded in 1996 as a spin-off of Universidade Nova de Lisboa.
Working in Portugal, Europe and Africa, Holos targets Industry, Financial Services and Public Administration.
The company partnered with Google and SAS, and participates in associations like COTEC Portugal and DANOTEC. It is certified by the Ministry of Defense to handle/supply military grade technology.

FIELDS OF EXPERTISE

Research and Development
Holos participates in several national and international RTD projects, focusing on space technology, robotics and software agents.

Enterprise Risk Management
Risk management systems that control risk identification, assessment and mitigation, and reveal their impact in the organizations.

Business Intelligence
Solutions that include exploitation of large volumes of data and its organization, using data warehousing and data mining, and made available to the end user in accordance with business rules.

Decision Support Systems
Including systems for Business Process Management (BPM) and Enterprise Content Management (ECM) mainly in cloud computing or Software as a Service.

Google Enterprise Solutions
Comprehensive business solutions that include information search, Google Apps, geolocated solutions, Google Chrome devices and advertising.

MAIN PROJECTS, PRODUCTS AND SERVICES

SEISOP (ESA project)
System to monitor space weather by collecting spacecraft and space environment data in a data warehouse and provides them through web interfaces and APIs. Holos focused on the metadata knowledge base system, the alarm inference engine (interfaces with ESOC/MUST) and the rule editor for capturing mission knowledge.

CERTAIN (ESA project)
A flexible reporting tool for the CryoSat FCT with status reports of events, performance and the S/C status for non-manned periods. Provides diagnosis evaluations and remote alarms notification (via e-mail, SMS) to on-call operators. Holos was prime contractor.

H2RM (Product)
Integrated risk management solution including risk inspection, analysis and implementation of risk management programs, compliant with ISO 31000 and COSO Standards.

ServRobot (Product)
Autonomous service robot for surveillance and monitoring of infrastructures (oil pipelines, power generation or chemical plants).

Business Intelligence (services)
Data warehousing and data mining systems to take the best advantage from the information stored in the clients databases either through trends and behavior forecasts or through the automatic discovery of new patterns.

Google Maps and Earth (product/services)
Holos powers the exploitation of Google Maps and Earth features for geolocation of lands, buildings and monuments with asset management services and 3D modeling.

TECHNOLOGY DOMAIN

SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Thermal Protection Systems (MLI)

Structures and mechanical parts design and manufacture

Composite materials design and manufacture

HPS
High Performance Structures
Gestão e Engenharia Lda.
PORTUGAL

**HPS High Performance
Structures, Lda.
www. hps-lda.pt**

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OVERVIEW AND GENERAL DESCRIPTION

HPS-Portugal was established in 2007 as a joint venture between the German SME HPS-GmbH and the Portuguese R&D institute INEGI in Porto. HPS Lda and its staff of 15 is located in Porto, in the campus of the School of Engineering with access to a 10 000 class cleanroom, composites manufacturing facilities and generic test facilities such as material testing facilities. Since its foundation in 2007, HPS Lda has been active in the areas of thermal protection systems, hot structures and lightweight structures through either ESA TRP studies or industrial projects with its European partners.

FIELDS OF EXPERTISE

Design and Manufacturing of Thermal Blankets
HPS Lda designs and manufactures thermal blankets (MLI) for satellites and its payloads. HPS covers the complete product lifecycle of the MLI blakets, from initial thermal design up to integration on the actual flight item at the Customer premisses. Manufacturing is performed in a 10 000 class cleanroom.

Design and Manufacture of Structural Hardware and Mechanical Parts.
With its team of engineers and experienced manufacturing staff HPS can cover the design, manufacturing and inspection of complex mechanical parts and assemblies such as antenna feed clusters, MGSE, telescope optical baffles.

Composite materials and structures
Thanks tits experience in composite materials design and access to manufacturing facilities, HPS can design and manufacture and test up to 1.5 meter long composite structures and parts using traditional autoclave and RTM technologies.

MAIN PROJECTS, PRODUCTS AND SERVICES

Thermal Blankets for ESA's EXOMARS Entry and Descent Module
HPS is proud to be the preferred supplier of Thales Alenia Space Italy for the the thermal blankets of the flagship mission to Mars, Exomars. HPS' blankets will cover the outside and the inside of the EDM and will be manufactured in Portugal in 2013. Integration will take place end of 2013.

Thermal Blankets for German eRosita X-Ray Telescope
In 2012, HPS has manufactured and integrated thermal blankets on the German x-Ray telescope eRosita. This 3 meter tall telescope was covered on the outside and inside with aluminized and Black Kapton with blankets manufactured with great care in order to avoid contamination of the sensitive optical instruments.

Optical Baffle for German EnMAP mission
Together with the MLI for specific instruments, HPS has also been in charge of the design, manufacturing, assembly and verification of EnMAP's telescope baffle. This critical part had very stringent thermal stability requirements as well as very tight manufacturing tolerances.

Antenna Feed Cluster for Ku-Band Reconfigurable Broadcast Antenna
In 2012, HPS delivered to Italian company Space Engineering Spa. a 42 feed cluster as a demonstrator of a new Ku- Band Reconfigurable Broadcast Antenna. The feed cluster was designed and manufactured by HPS Portugal and had very tight manufacturing tolerances.

TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Structural design & verification methods and tools

Mission operations; launchers and re-entry vehicles

Hot structures; Electromagnetic technologies

ISQ Group
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OVERVIEW AND GENERAL DESCRIPTION

The ISQ is a private Portuguese entity, established in 1965, with a Group turnover, in 2012, of 87M€ (58% overseas) and a staff in the order of 900, a permanent presence in 9 countries and operations in around 20 countries. Some of ISQ areas of expertise are Engineering, Testing, Technical Inspections and Research and Development.

FIELDS OF EXPERTISE

1. TESTING
▪ Materials characterisation
▪ Vibration and shock
▪ Thermo-mechanical
▪ Static, structural and fatigue
▪ Non-Destructive and SHM
▪ Reliability / Climatic testing
▪ Electrical and EMC
▪ Metrology
▪ Design, manufacturing and operation of special test Benches
/ Development of tools for thermo-mechanical testing /
Instrumentation and electronics
▪ Management of multi-technological test programs

2. SUPPORT OF LAUNCH CAMPAIGNS AT THE EUROPE´S SPACEPORT
▪ Coordination of safety operations, safety support and quality inspections during payloads or spaceport Preparation Campaigns;
▪ Coordination of environment monitoring during payloads or spaceport launch Campaigns;
▪ Risk assessment and Systems Dependability

3. R&D

MAIN PROJECTS, PRODUCTS AND SERVICES

Herakles (Groupe SAFRAN): Performance of tests for the Critical Design Review of the IXV Vehicle (2009 - on going)
Test campaign including thermo-mechanical tests on attachment parts and on subscale composite (CMC) parts and dynamic tests with sine and random loads.

Herakles (Groupe SAFRAN): Characterisation and thermo-mechanical robustness justification of an improved CMC nozzle extension (2011 - on going)

ESQS for CNES and ARIANESPACE

Services in the Area of the Quality, Safety and Environment for ARIANE, SOYUZ and VEGA launching systems - CSG-Kourou - French Guyana (2004 - on going)

Embraer: Materials characterisation, Chemical testing and Metrology (2012 - on going)

Airbus Military: Non Destructive Inspections on A330 aircrafts Dye penetrant, Ultra-Sonic; magnetic particles (2011 - on going)
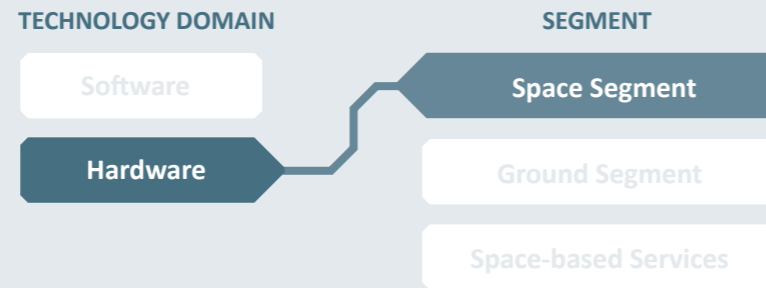
Tekever: EMC and ESD testing (2013)

Thales-Alenia Space: Versatile Thermal Insulation Tests for a Cryogenic Upper Stage (2010 - 2012)
Test campaign including thermo-mechanical tests and dynamic tests with sine and random loads on VTI sandwich panels.

Lusospace – Acceptance tests of Magnetometers for GMES satellites (2011-2013)
Test campaign including dynamic (Sine and Random) and EMC tests.

TECHNOLOGY DOMAIN	SEGMENT
Software	Space Segment
Hardware	Ground Segment
	Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Passive Components

Space Qualified Components

Tantalum SMD Polymer and MnO2 Components Technology

Electronic Components
KEMET
CHARGED.®

Kemet Electronics Portugal, S.A.
www.kemet.com

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OVERVIEW AND GENERAL DESCRIPTION

KEMET Electronics Portugal, SA, is a 100% subsidiary company from the US Company KEMET Corporation that manufactures Tantalum Capacitors Surface Mounted Devices with MnO2 and Polymer counter-electrodes and more recently Aluminum electrolytic capacitors.

The plant is located in Évora, south of Portugal and had the official opening at 4th September 1998. In April 2012 KEMET Portugal expanded the range of expertise starting up with aluminum electrolytic capacitors technology, with the introduction of a snap-in line followed shortly by a screw terminal line, being actually in fast ramp up.

FIELDS OF EXPERTISE

Capacitors are fundamental components that store, filter, and regulate electrical energy and current flow. They are found in all electronic application's and products used today, including computer, telecommunication, automotive, military and aerospace, medical, industrial/instrumentation, and consumer market segments.

"High Reliability" versions of KEMET Corporation capacitors were used in every important military and aerospace effort from the first Telstar to Viking, the Apollo moon landing, the Patriot missile, and the Mir and International Space Stations.

The market for capacitors covers a large and diverse group of original equipment manufacturers (OEMs), electronics manufacturing services (EMS) providers, and electronics distributors around the world.

For KEMET Portugal, the main area of expertise, has been telecom and automotive segment, including safety applications as ABS or airbags.

MAIN PROJECTS, PRODUCTS AND SERVICES

Solid Tantalum SMD Capacitors
Solid Ta capacitors are one of KEMET's main products, produced in Portugal with MnO2 and conductive polymer cathode technology.

Surface mount technology tantalum capacitors keep being used in new circuit designs due to their volumetric efficiency, basic reliability and process compatibility.

The steady-state and dynamic reliability of a Ta capacitor are influenced by several factors under the control of the circuit design engineer, such as voltage derating, ripple current and voltage conditions, maximum operating temperature and circuit impedance, as the electrical characteristics are determined by its structure, and are very dependent on design and materials.
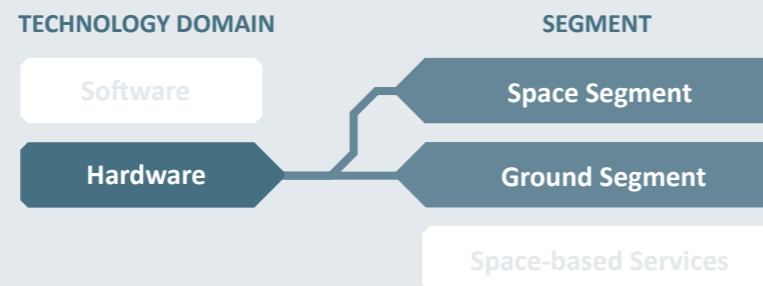
As part of KEMET strategy, Évora plant is developing projects to start mass production of high reliable solid Ta capacitors for Military and Aerospace industries, including the European Space.

Aluminum Electrolytic Capacitors
The aluminum electrolytic capacitor consists basically of two foils interleaved with an absorbent paper wound tightly into a cylinder. Their main advantage is the high capacitance per unit volume due to its internal construction which consists of a very thin dielectric layer and large effective surface area.

The reliability, low cost and wide selection of package size and combination of properties, have made them the starting point for capacitor selection in many applications.

TECHNOLOGY DOMAIN

- Software
- Hardware

SEGMENT

- Space Segment
- Ground Segment
- Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Opto-Electronics (Laser Communications, LIDAR, etc.)

MEMS/MOEMS

AOCS (magnetometers, magnetorquers, etc.)

lusospace

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OVERVIEW AND GENERAL DESCRIPTION

LusoSpace is a high-tech engineering company founded in 2002 in Lisbon.

With a multidisciplinary team of top-level engineers that was created to solve complex challenges in high-tech industries its experience reinforces the company's innovation capabilities and quality system that contribute to guarantee the desired level of reliability in critical systems.

LusoSpace develops, designs, prototypes and integrates very advanced technological systems and components being able to provide engineering solutions with the Inovation, Quality and Flexibility you look are looking for.

FIELDS OF EXPERTISE

Highly Critical and Complex Systems
LusoSpace has in-house capabilities for the development of advanced systems. From concept to design and ending in the manufacturing, integration and qualification, LusoSpace can meet the most demanding customer requirements. Equipments carrying LusoSpace know-how are right now active in space, playing a critical role in the success of high profile missions.

Micro Systems
Our unique expertise in qualifying MEMS technologies for space grants LusoSpace a front position in the MEMS market. Our activities in the design of new MEMS concepts are poised to reinforce this position in the sector.

Augmented Reality Systems
Since 2005, LusoSpace has been working on the development of augmented reality systems. Head mounted displays designed for astronauts can provide geo-referenced hands-free real time information in the user environment enabling a whole new world of interaction.

MAIN PROJECTS, PRODUCTS AND SERVICES

Laser Communications & Optics
- OCTAL
- TESLA
- 2.05 Microns Pulsed Holmium-Laser for Atmospheric CO_2 Monitoring

Augmented Reality
- Auxiliary Direct Visualisation of Information Tools for Space Applications
- Óculos de visão aumentada com sistema de navegação para o mercado de massas
- AR4LogFS – Augmented Reality for Logistics – Feasibility Study

M(O)EMS
- Optical MEMS for Earth Observation
- Procedures for MEMS Qualification
- Connectivity and Packaging of Systems-of-microsystems
- Miniaturization of a Magnetometer based on Micro Technology
- Validation and experimental verification of ESA MEMS qualification methodology

Thermal Analysis
- Sentinel 2 Multispectral instrument (MSI) programme: Thermal Analysis support

GSE
- GAIA PLM – FPA Test OGSE
- GMES Sentinel -3 Satellite OLCI RIS and Sun Simulator Monitoring OGSE

GN&C
- Vision-based Relative Navigation
- Imaging Lidar Technologies
- Algorithms for RV and FF in Non Circular Orbits
- Assessment and BreadBoarding of a Planetary Altimeter

AOCS
- Feasibility Study of a Low Cost Magnetometer
- Space Qualified Low Cost Magnetometer
- Magnetometers for AEOLUS, Sentinel 1,1B, 3, 3B, 5, SEOSAT/INGENIO and RADARSAT Constellation
- Marketing and Commercialization of a Space Qualified Magnetometer
- European Magnetometer Improvement
- High Performance Magnetorquer feasibility assessment

TECHNOLOGY DOMAIN

Software

Hardware

SEGMENT

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

High pressure gas storage for satellite propulsion

Energy storage solutions for satellite power systems

High altitude platforms

Omnidea, Lda.
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OVERVIEW AND GENERAL DESCRIPTION

Founded in 2003, Omnidea is an SME performing R&D in Space applications and energy concepts. Strategy focuses on technology ownership and tailor-made solutions. Main facilities are in Lisbon, PT.

Our team is made of engineers and scientists, with work experience in prestigious institutions such as ESA, VW, or EC/FP programs.

Omnidea is an exporting company, whose revenues now reach almost €1Mn/year. Having ESA as the preferred partner and client, other clients include Astrium, Magna Steyr, Swedish Space Corporation while partners include EDP, MCG Automotive, Rapp and Lankhorst Euronete.

FIELDS OF EXPERTISE

1. Space Propulsion
i) Design, development and production of hardware components in high pressure gas storage systems for electric propulsion in Satellites.
ii) Fundamental R&D into hybrid rocket engines.
iii) non-fusion joining techniques for dissimilar metals and materials (e.g. Magnetic Pulse Welding)

2. Fuel Cells and Electrochemical Systems for fuel production;
i) R&D into CO_2 electrochemical recycling back to high density hydrocarbons;
ii) conceptual analysis and testing of Energy Storage Systems

3. Lighter-than-air structures
i) Design, analysis, manufacturing and quality control of thin polymer film envelopes for LTA structures, as well auxiliary equipment for operation.
ii) Operational analysis of hybrid (buoyant and lift generating) airborne platforms with EO, Telecom and Navigation applications.

## MAIN PROJECTS, PRODUCTS AND SERVICES

INNOVGAS
Due to very high launch costs, storage of Xe and He for satellite propulsion, is complex and expensive, mandating light pressure vessels and high storage pressures. INNOVGAS aims to replace the titanium liner in COPV, with space grade aluminum, providing almost similar performance at half the cost, by using innovative production methods capable of producing the desired shape in a single operation and without structural welds.

ENERGON
The sharp increase in atmospheric CO_2 creates use opportunities for this gas such as recycling, deemed unattractive before the current emission restrictions and high fuel prices. Electrochemical reduction of CO_2 into energy dense hydrocarbons is possible and has been demonstrated, with a real possibility for usage in battery substitution by storing energy as hydrocarbons. Successful system integration is now the challenge at Omnidea.

BOREAS
Although satellites are the preferred choice for EO, Telecom and Navigation tasks, high altitude platforms allow much higher image resolution at lower costs and can replace terrestrial base stations, in remote areas, through on-board communication equipment. Using a hybrid (buoyancy plus dynamic lift) tethered platform, this technology lifts much larger payloads while offering unrivalled endurance, remaining airborne and under station keeping conditions, for several weeks.
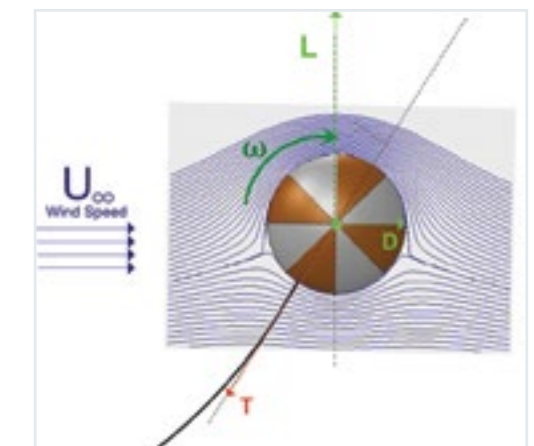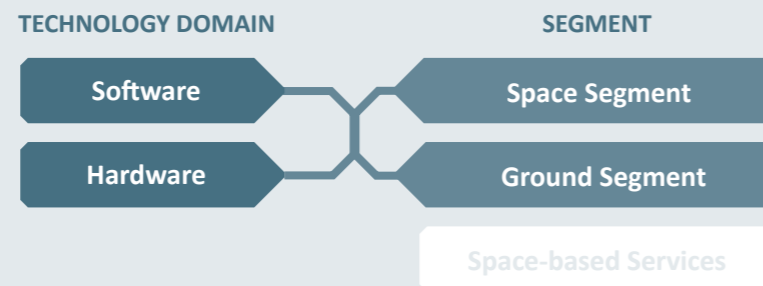
TECHNOLOGY DOMAIN

SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

GNC, detection systems and simulation; UAV applications

Non-explosive actuators

Ground segment hardware

spin.works

Spin.Works
www.spinworks.pt

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OVERVIEW AND GENERAL DESCRIPTION

Spin.Works is an aerospace company dedicated to the development and manufacturing of aerostructures and unmanned systems for the Aeronautics, Space and Defence markets, strongly involved in R&D activities since its foundation in 2006, both at national and European levels, and having as its main customer the European Space Agency.

Our mission is to create, develop and deploy innovative, multi-disciplinary and cost-effective solutions, in the areas of structures, mechanisms, guidance, navigation & control (GNC) systems, simulation, remote detection systems, and unmanned aerial vehicles (UAVs).

FIELDS OF EXPERTISE

Structural Solutions
Design, optimization, simulation, manufacturing and qualification of structural solutions for aviation, space, composites. Shelters for demanding environments.

Mechanisms
Design and development of non-explosive actuators for space applications.

Simulation
Hi-fi simulation of multi-body systems. Integrated framework for reconfigurable Mission Performance and Functional Engineering Simulation Tools.

UAV's
Family of proprietary UAV systems, micro (2kg) & tactical (25kg).

GNC
Family of MEMS-based navigation (IMU, AHRS, INS/GPS) systems with state-of-the-art navigation filters, for UAV's.
Flight Control Systems for UAV and space vehicles, including automated EDL.

Detection Systems
Image processing software for detection systems based on opto-electronic sensors. 3-D reconstruction, feature extraction, tracking and real-time decision making algorithms.
HDA systems for planetary landing.

MAIN PROJECTS, PRODUCTS AND SERVICES

GALILEO Up-Link Stations
Manufacturing, assembly and delivery of twelve metallic/composite large antenna dishes, sub-reflectors, as well as metallic support and pointing structure for the GALILEO GNSS Up-Link Stations (ULS). Design and manufacturing support of 5 all-weather electronic equipment shelters for the GALILEO ULS.

TAEM Guidance
ESA, Prime Contractor.
Development of Modern Terminal Area Energy Management Guidance systems for: space planes, lifting bodies and capsules.
Development of auto-landing guidance and control systems for a space plane. Verification and validation using 4DOF and 6DOF simulation.
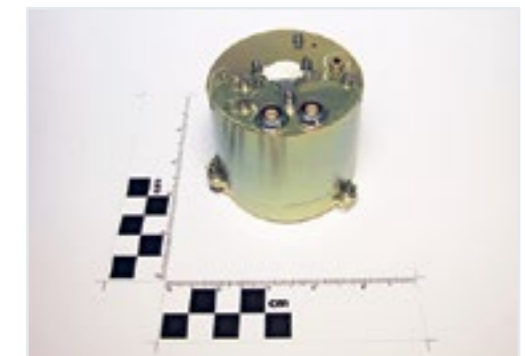
NEXT Lunar Lander
ESA, Sub-Contractor of OHB System
Mission Study for the NEXT Lunar Lander with In-situ Science and Mobility. Spin.Works responsible for the development of Hazard Avoidance strategies using real-time image processing of visual and LIDAR images, in order to avoid shadows, craters, rocks>0.5m height & slopes>15 degrees to safely land on the Lunar South Pole, where maximum sun elevation is 1.5 degrees.
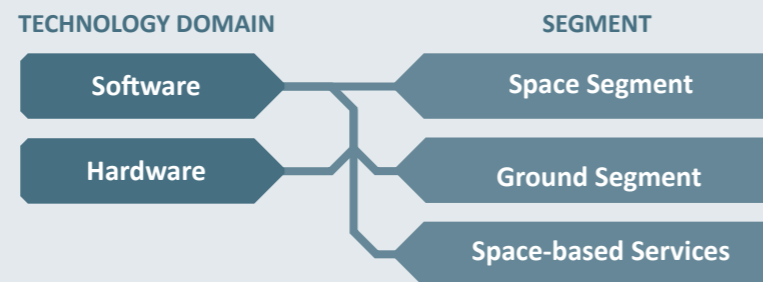
Non Explosive Actuator
ESA, Prime Contractor.
Development of a Non-Explosive Actuator for Hold-Down Release Mechanisms.

UAV Systems
Micro UAV system (2kg MTOW) with proprietary navigation and flight control system, real-time video and HiRes imaging. Custom-developed PC-based GCS.
Tactical UAV system (25kg MTOW) for larger payload and longer-range missions.

TECHNOLOGY DOMAIN

SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

SDR-based Space Communications

Space Technology Validation

Inflatable Space Structures

Tekever Space
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OVERVIEW AND GENERAL DESCRIPTION

TEKEVER Space (space.tekever.com) is a Portuguese company specialised in solutions involving small satellite technologies, ad hoc networking and software defined radio in space communications, advanced inflatable structures packaging and rigidisation techniques applicable to space structures.

Participated company of the TEKEVER Group, TEKEVER Space's mission is to design, develop and offer cutting-edge systems for the space market, a strategy focused on the build of small satellites as a platform to validate small payloads (communications, positioning and inflatable structures) in Space.

FIELDS OF EXPERTISE

SDR-based Space Communications
TEKEVER Space is evolving its terrestrial software defined radio (SDR) platform for the space segment, in order to develop innovative products that support satellite communications, inter-satellite communications and vehicle positioning and attitude determination.

Space Technology Validation
TEKEVER Space is dedicated to the development and space validation of communications, positioning and inflatable structures. To validate products in space, the company applies its expertise to the build of small flying vehicles (CubeSats), the platform to validate small payloads.

Inflatable Space Structures
Inflatable structures impacts volume packages, mass savings and reduced launch costs. TEKEVER Space researches and develops analytical models for inflatable structures, packaging and deployment techniques, and is now tackling the production of small-scale composite prototypes.

MAIN PROJECTS, PRODUCTS AND SERVICES

TEKEVER Space Portfolio

TEKEVER Space offers small satellite, ad hoc networking, SDR-based space communications and advanced inflatable space structures' packaging and rigidisation (solar arrays and sails, communications antennas, habitation modules).

Space R&D Projects

Project GAMALINK aims to create the first large scale space-based ad hoc network, linking CubeSats through a common on-board communications platform that leverages SDR technology to support Inter-Satellite Links, GPS and ground communications.

Project SWIPE explores the potential of mobile and wireless ad hoc network technologies for space communications, aiming breakthroughs in surface planetary exploration.

Project HEWS researches the use of SATCOM for multicultural epidemic risk detection, early warning and monitoring, as well as multi-organisational intervention command and control, benefiting from the fusion of remote sensing data, positioning data and GIS.

Project QB50 studies in situ the temporal and spatial variations of key parameters in the lower thermosphere with a network of 40 double CubeSats.
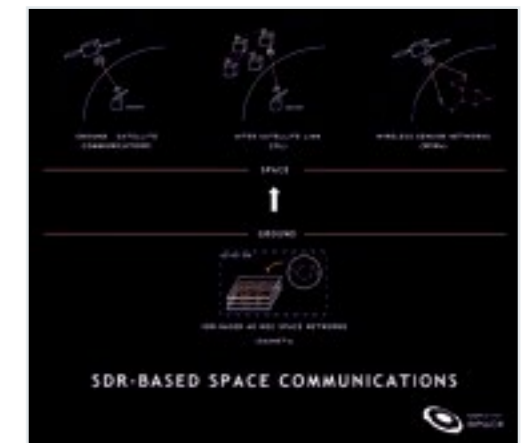
The ARISE R&D Nucleus is dedicated to SDR-based space communications and new space applications: space observatories, inflatable habitats, solar sails, orbital transfer vehicles, space-based antennas, space-based radars, debris shielding and smart materials for spacecraft protection against hypervelocity impacts.

TECHNOLOGY DOMAIN　　　　SEGMENT

Software

Hardware

Space Segment

Ground Segment

Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Integration of Mission Ground Data Systems

Verification and Validation of Ground Software

Development of Space related applications

VISIONSPACE
TECHNOLOGIES

VisionSpace Technologies
www.visionspace.com

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OVERVIEW AND GENERAL DESCRIPTION

VisionSpace is a multi-national company with its headquarters in Portugal created in mid 2010, and operates in the aerospace sector. Our entrepreneurial spirit allows to deliver high-performance solutions, through innovative thinking and development that address our clients expectations.

In 2011 the company become a new member of the engineering support activities in the ESA Ground Segment, and as a new Qualified Partner in 2012. In the same year, a new office was established in Germany.

Space industry demands quality management, so VisionSpace acquired its ISO 9001:2008 certificate in 2013.

FIELDS OF EXPERTISE

Simulation Infrastructure
The Mission preparation phase goes through the development of an operational simulator. We support architecture design and development of ground Simulation infrastructure using best practices for modelling and configuration of mission specific requirements.

Mission Control System
We have a wide experience in modelling, configuration and deployment of Spacecraft Control and Operations System infrastructure, the control system used by the European Space Agency. Subsequently, VisionSpace has been involved in supporting Mission with integration and validation activities.

Quality Management
In an industry where space software demand quality control and assurance policies, VisionSpace staff evolve a QMS able to satisfy our client's needs, through development of automated tests, integration, verification and validation of mission specific and infrastructure software.

MAIN PROJECTS, PRODUCTS AND SERVICES

EGOS User Desktop
The next generation infrastructure, EGOS, aims to define a common architectural pattern to improve reliability and cost effectiveness for the whole Ground Segment Systems. VisionSpace is involved in the development and quality process of EUD, which aims to provide a common UI to interface with various back-end systems used at ESOC.

SIMULUS
The SIMULUS software suite is composed of the SIMSAT, a Runtime Framework used by Missions to run their Operational Simulator, and a set of libraries specifically designed to support design and development of a reference architecture.
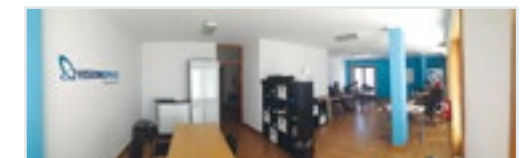
TEVALIS
Ground Systems Test and Validation infrastructure (GSTVi) is a validation and test suite for a complete ground systems end-to-end test environment. VisionSpace experts are skilled to design and configure test scenarios for validating operational systems.
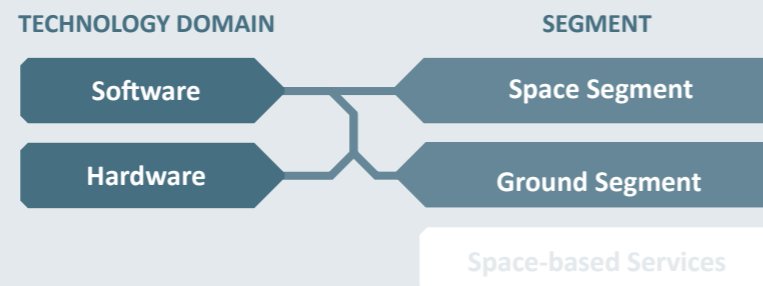
MICONYS
The MICONYS project aims to bundle mission control software into one single software suite. The core functionalities is the processing, storage and display of telemetry and the issuing of spacecraft commands.

ColorBox
The solution ColorBox is designed as a framework comprising a series of components with the aim to support the management and quality assurance of critical software products during the project life-cycle. Its core functionality is to generate automatically automated test using the white box approach.

TECHNOLOGY DOMAIN   SEGMENT

Software		Space Segment
Hardware		Ground Segment
		Space-based Services

SPACE TECHNOLOGY SUB-DOMAIN

Robotics

Intelligent Sensing and Actuation

Ubiquity computing

YDREAMS
ROBOTICS

YDreams Robotics, S.A.
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OVERVIEW AND GENERAL DESCRIPTION

YDreams Robotics (YDR), with offices in Lisbon and Fundão, is focused on pervasive robotics. It has developed internationally recognized projects, such as robot swarms at the Santanders' Financial City Visitors Center. YDR is involved in research projects in smart spaces, robots as tutors and wearable robotics.

Aiming to bring robots into people's lives, YDR is developing innovative, low-cost robotic technologies for consumer, health, sports, education, and military segments. YDR is adding intelligence to materials, objects, and tools, targeting the creation of new products for different markets.

FIELDS OF EXPERTISE

Smart Spaces
YDR develops technologies to embed actuators, sensors, and networking into materials and objects.

Cooperative Robots
Using proprietary technologies, YDR brought state-of-the-art robot swarms into complex environments.

Smart Materials for Embedded Sensing and Actuation
Application of smart materials for sensing and actuation, such as piezoelectric and Shape Memory Alloy materials.

Human-robot interaction
Innovative technologies on natural user interfaces for robotic systems include deployed solutions for human gestures recognition, complex image processing and robot behaviors coordination.

Robot Sensing and Control
YDreams' YVision middleware allows for rapid and robust integration of a large variety of sensors and actuators, supporting multiple operating systems (for PC and smartphones).

MAIN PROJECTS, PRODUCTS AND SERVICES

SmartLamp: 2013-
One of YDR mass market consumer products expected for release by the end of 2013. A lamp that becomes alive and intelligent, by using robotics to augment its capabilities.

MONARCH: 2013-
FP7 project proposes a novel framework for mixed human-robot societies using a network of heterogeneous robots and sensors, in the pediatric area of an oncological hospital.

EMOTE: 2012-
FP7 project is creating a new generation of artificial embodied tutors having perceptive capabilities to engage in empathic interactions with learners in a shared physical space.

BRADESCO: 2012
Brazilian bank project uses technologies such as natural user interfaces, biometrics, augmented reality and robotics.

Invisible Networks: 2011-
Project partners' annual sales represent 3% of Portuguese GDP.

SIGA: 2010
The Santander Interactive Guest Assistants (SIGA), which appeared on WIRED magazine, are a ground breaking mix of technology and design for a swarm of cooperative robots that operate continuously since 2010 in Santander's headquarters in Madrid, working as guides for visitors.

TMN ROBOTIC DISPLAY: 2009
A robotic system for TMN flagship stores, to showcase a mobile phone catalog.

J&B INTERACTIVE SHELVES: 2008
Shelves use light, sound and motors to draw consumers' attention to a product.

Bragança Science Center: 2007
Two robotic snails in a fanny race powered by the energy generated by two cyclists.

RESEARCH INSTITUTES

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Computational Intelligence

Advanced Software Technologies

Mission Operations

CA3 - Computational Intelligence Research Group
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OVERVIEW AND GENERAL DESCRIPTION

The CA3 - Computational Intelligence Research Group is integrated in the Centre of Technologies and Systems of UNINOVA. It joins researchers with interests in Computational Intelligence, Data Mining & Machine Learning, Visual Analytics & Image Processing. Our main focus is on the application of the research topics to projects in industry and services, with special emphasis in the Space domain.

Since Portugal joined ESA, our group has developed over 19 projects for the various ESA establishments, as well as being involved in several projects for the European Union and national entities.

FIELDS OF EXPERTISE

The UNINOVA-CA3 activities have a strong research focus within a Computational Intelligence domain as well as the necessary expertise in supporting software development technologies. The CA3 group is composed of a research and development team and a group of qualified scientific advisors directly involved in R&D projects. We also have a variable number of visiting scientists and collaborators working with us.

We highlight the following fields of expertise:
- Computational Intelligence
- Early Warning & Monitoring Systems
- Intelligent Decision Support Systems
- Visual Analytics and Image Processing
- Knowledge Discovery and Data Mining

MAIN PROJECTS, PRODUCTS AND SERVICES

IPSIS - Intelligent Planetary Site Selection
Intelligent dynamic multi-criteria decision model for planetary landing of spacecraft. Development of a hybrid metaheuristic for non-exhaustive realtime site selection during landing.

MODI - Fuzzy Monitoring and Diagnosis for Mars Lander
Prototype for intelligent monitoring of the drill device for the ExoMars also capable of recognizing terrain hardness.

KD-LADS - Knowledge Discovery in Large Data Sets
Development of a general Knowledge Discovery tool for handling Large Data Sets to support scientific exploratory data analysis, during and after a mission.

SEIS - Space Environment Information System
Decision Support System providing monitoring and reporting services to spacecraft operations. Integrates Space Weather information, S/C orbital positions and Telemetry data.
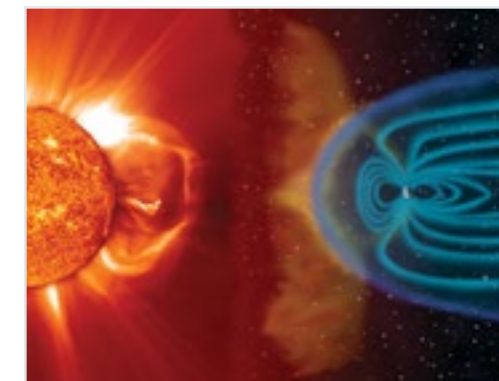
Gaia - DPAC
Preparation of the data analysis for Gaia mission. Specifically UNINOVA-CA3 is providing expertise for knowledge discovery (unsupervised algorithms) for variable objects and implementation of bias estimation algorithms.

SmartAtlas
Intelligent image processing to create a Moon Atlas using SMART-I mission images.

VA-4D
Design of a conceptual system for an intelligent Visual Analysis framework for large datasets of 4-Dimensional fields. Exploration of complex large data sets(including uncertainty in data) in 2D (slices), 3D (volume) and 4D (volume analysis along time).

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Astrophysics and Cosmology

Planetary Atmospheres

Optical Instrumentation: metrology

**Centre for Astronomy and Astrophysics
Faculty of Sciences of the University of Lisbon**

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OVERVIEW AND GENERAL DESCRIPTION

CAAUL is a research center of the Faculty of Sciences of the University of Lisbon, located at the Astronomical Observatory of Lisbon. CAAUL's research focus on the study of the Universe, from planets to cosmology. It includes some of the most relevant fields in Space Sciences, with a strong observational component involving international observatories, such as ESO, and participation in ESA missions, both scientifically and technically. CAAUL assumes a strong national and international research role and also guarantees undergraduate and post-graduate teaching in Astronomy and Astrophysics at FCUL.

FIELDS OF EXPERTISE

Origin and Evolution of Stars and Planets
Research focus on observations and modeling of planetary atmospheres, the chemistry of the Interstellar medium, and the earliest stages of star-formation in the Galaxy.

Galaxies and the Evolution of the Universe
The research aims at understanding the processes behind galaxy formation and evolution, using the deepest astronomical observations. We play a pivotal role in the definition and planning of the up-coming generation of radio-telescopes and their surveys. Cosmological studies are performed, focusing on weak gravitational lensing, Einstein's equations and modified theories of gravity, and include the participation in ESA's Euclid mission.

Optical Instrumentation for Astrophysics
Design and construction of instruments for ground and space observatories, in particular ESO-VLT instrumentation (CAMCAO, ESPRESSO, MOONS) and ESA missions (PLATO, GAIA).

MAIN PROJECTS, PRODUCTS AND SERVICES

Planetary Atmospheres
The planetary group's research interests are focused on planetary atmospheres in the Solar System and on exoplanets. Recent research addressed different aspects of the dynamics of the atmosphere of Venus, in particular wind measurements with the cloud-tracking technique, based on imaging data from the Venus Express VIRTIS instrument, and with the Doppler velocimetry technique, based on solar reflected spectra data from the VLT. With CAAUL's instrumentation team we have been involved in several mission payload proposals submitted to ESA's Cosmic Vision programme.

Galaxies and Cosmology
Detection and characterization of Active Galaxies in the Primordial Universe, through the use of the most advanced observatories (HST, VLT, GMRT, ALMA). Support for the planning and use of the Atacama Large Millimetre Array and design of future radio surveys using the next generation of radio telescopes. Observational studies of modified gravity and dark energy with cosmological weak lensing, study of systematics in preparation of upcoming weak lensing surveys (e.g. EUCLID) and theoretical cosmology and gravitation.

Optical Instrumentation for Astrophysics
Concept, simulation, project, integration and testing and data processing, an activity largely supported by ESA (currently with PLATO, GAIA, PROBA 3) and ESO (ESPRESSO, MOONS).

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Dynamics and control of space systems

Space propulsion

Aerospace materials and structures

UNIVERSIDADE DA BEIRA INTERIOR
Covilhã | Portugal

CAST - Centre for Aerospace Science and Technology University of Beira Interior

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OVERVIEW AND GENERAL DESCRIPTION

The Centre for Aerospace Science and Technologies (CAST) was created in 1994 and now is involved in high-level international collaboration, scientific networks, and prestigious professional societies. CAST is a Member of the International Astronautical Federation. We develop studies in Energy, Mechanical and Aerospace Engineering. CAST research is developed within four main multidisciplinary thematic areas:

- Dynamics and Control of Space Systems (DyCoSS)
- Aeronautical Materials and Structures (AeroMaS)
- Energetic systems (SiNerge)
- Technological Forecasting and Industrial Management (TeFIM)

FIELDS OF EXPERTISE

DYNAMICS AND CONTROL OF SPACE SYSTEMS
Spacecraft space flight dynamics and control;
Dynamics and control of large space structures.

AEROSPACE MATERIALS
Characterization of hybrid composites with nano-enhanced matrix;
Ceramic composites with nano-enhanced matrix for high-performance applications;
Materials that apply the reuse concept and nanotechnology.

NUMERICAL COMPUTATION OF MHD PLASMA FLOWS
Computation of hypersonic plasma flows typical of MPD applied-field or self-field electric propulsion thrusters;
Computation of MHD turbulent flows using RANS turbulence models.
Prediction of special features of compressible MHD flows, such as relaminarization.

TECHNOLOGICAL FORECASTING
Development of modern integrated foresight methodologies to conduct studies for the construction of global scenarios for technological innovation, evolution of the aerospace sector, international security, etc.

MAIN PROJECTS, PRODUCTS AND SERVICES

CODIS - Space Systems Dynamics and Control, PTDC/CTE-SPA/64123/2006.
Partners: CAST-UBI, UP, National Institute for Space Research, Brazil (INPE), Technological Institute of Aronautics, Brasil (ITA), Keldysh Institute of Applied Mathematics, Moscow (KIAM). Study of spacecraft attitude control and stabilization.

CoDMoS - Controlo e Dinâmica de Movimento de Satélites,
Partners: UP, CAST-UBI, INPE, and ITA. Analysis of spacecraft attitude and orbital dynamics, solar sail dynamics, attitude dynamics and control of flexible structures.

ODySSea - Orbital Dynamics of Space Systems, PTDC/CTE-SPA/098030/2008
Partners: UBI, FCUP, FCUL, Dorodnicyn Computing Centre of the Russian Academy of Sciences, INPE, KIAM. Study of motions for a satellite subject to various perturbations, e.g., orbit eccentricity, interaction with geomagnetic field or a variable mass distribution. Attitude dynamics of a system of several connected bodies. Analysis of sailcraft orbital and attitude dynamics. Structural analysis of a compound sail in order to examine its feasibility.

Numerical MHD Numerical Modelling in nozzles of MPD thrusters for space propulsion (Grants PTDC/CTE-SPA/114163/2009 and SFRH/BD/60285/2009).
Partners: UBI/ESA. Analysis and design of AF-MPD thrusters, in particular the nozzle component.

RESEARCH DOMAIN

| Space Sciences | Earth Sciences | Applied Sciences and Engineering |

SPACE TECHNOLOGY SUB-DOMAIN

Fundamental Space Sciences

Astronomical Data Reduction & Analysis

Mission Simulation & Modeling

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OVERVIEW AND GENERAL DESCRIPTION

The Centro de Astrofísica da Universidade do Porto (CAUP) is the largest astronomy research institute in Portugal, strongly contributing for space science and technology. CAUP's mission is to support and promote Astronomy, through:
▪ research
▪ education at the graduate and undergraduate levels
▪ activities for schools
▪ science outreach of Astronomy

Currently CAUP has a total over 60 researchers, participating in several comities in ESO & ESA, plus many MSc and BSc students and regular visitors.

FIELDS OF EXPERTISE

Origin and Evolution of Stars and Planets
The study of important issues of the fundamental physics driving the formation and evolution of stars and planets. Both observational and theoretical components are addressed.

Galaxies and Observational Cosmology
Understanding the origin and evolution of the universe and its structures. Focus on the observational aspects of cosmology, theory, phenomenology, and high-performance computing.

Astronomical Instrumentation and Surveys
Scientific participation and technical development of Astronomical Instrumentation, which transverses both major scientific areas in CAUP, including national leadership and project managing of ESO and ESA programs.

MAIN PROJECTS, PRODUCTS AND SERVICES

The expertise of CAUP in space science and technology:

Data Reduction Software
Image calibration and treatment at all levels. CAUP is actively contributing to the development of data reduction software for ground based instruments (ESPRESSO/ESO and HARPS-N) and contributions to ground segment space missions (CHEOPS/ESA, EUCLID/ESA).

Mission Survey Operations Planning
CAUP is contributing with this expertise for the EUCLID/ESA space mission. More specifically CAUP participates for the mission survey definition and optimization, developing and implementing specific algorithms for that purpose.

Electronics control software
CAUP is presently responsible for the development of a significant part of the control software for the ESPRESSO/ESO instrument, done within the VLT/ESO software framework.

Scientific Exploitation of Space Data and Surveys
Several international projects such as the GAIA-ESO Survey, the Kepler/NASA, Planck/ESA, XMM/ESA and HARPS/ESO are already providing state-of-the-art scientific data which are being analyzed for the development of the main scientific topics in CAUP.

Simulation & Modeling of Astrophysical systems
CAUP contributes with this essential expertise for the preparation of future missions. These contributions were recently provided for CoRoT, Planck/ESA, XMM/ESA, ALMA/ESO.
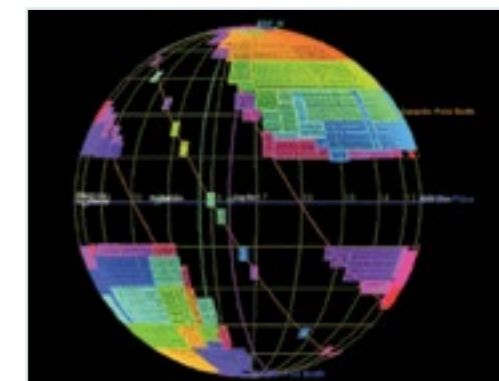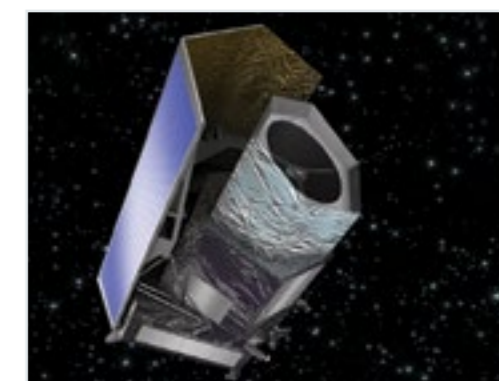
RESEARCH DOMAIN

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Acoustics, acoustic fatigue, combustion stability

Atmospheric and spacelight dynamics and stability

Aerothermodynamics and magnetohydrodynamics

TÉCNICO LISBOA

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OVERVIEW AND GENERAL DESCRIPTION

The CCTAE (Center for Aeronautical and Space Science and Technology) is related to the academic unit ACMAA that coordinates all degrees of Aerospace Engineering at 1ST (B.Sc. M.Sc. and Ph.D).

The group at CCTAE/ACMAA has 30 years of experience in research in aeronautical and space science and technology, including 8 books, 113 articles in journals, 210 communications to symposia and 30 internationally funded research projects.

It operates an aeroacoustic wind tunnel and a six-degree-of-freedom flight simulator. It has 20 years of experience of flight testing, of more than 12 types of aircraft.
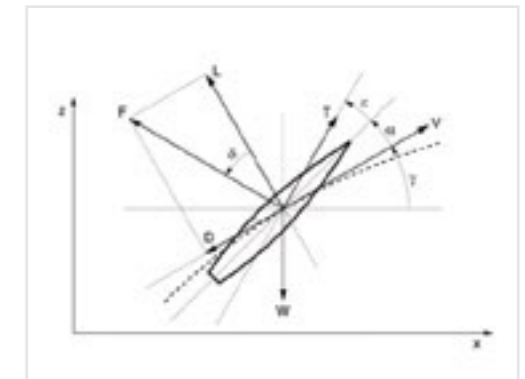
FIELDS OF EXPERTISE

Some areas of activity:

▪ trajectories of launch vehicles: calculation and optimization of trajectories, including atmospheric effects on lifting designs, orbital insertion;

▪ aerothermodynamics: modelling of heat transfer between high-speed viscous thermally conducting flow and thermal stresses in a structure, including effects of ablative material and internal cooling;

▪ modelling of acoustic fatigue of structures subject to intense random or stochastic pressure fluctuations and loads due to turbulent flows and engine exhausts;

▪ thermoacoustic coupling and combustion instability;

▪ atmospheric entry and re-entry of satellites or probes, including ionization and chemical reaction effects at high-speed of payload return missions;

▪ magnetohydrodynamics of the solar atmosphere and wind:

▪ stellar models and data analysis based on coupled acoustic-magnetic-gravity effects.

MAIN PROJECTS, PRODUCTS AND SERVICES

The following is a sample of projects in research programs sponsored by the EU, ESA and Eurocontrol:

▪ P-3 Orion - Structural loads monitoring; RNAF/FAP - NLR / 1ST.

▪ ENABLE - Transmission of boundary layer noise; EU - Dassault.

▪ JEAN - Noise of turbulent jets; EU-TCD.

▪ SILENCER - Liners with non-uniform impedance for engine inlets and exhausts; EU-SNECMA.

▪ ROSAS - Installation effects on engine noise; EU - EADS France.

▪ VELA - Optimization and control of flying wing aircraft; EADS - Germany.

▪ NEFA - Control coupling and de-coupling of V-tailed aircraft; EU - Airbus France.

▪ SEFA - Reduction of aircraft noise around airports; EU - Dornier.

▪ FRIENDCOPTER - Generation of helicopter noise and transmission to the ground; EU - Eurocopter.

▪ NACRE - Flight dynamics and noise of new aircraft configurations; EU - Airbus France.

▪ EGNOS - Monitoring of accuracy and integrity of satellite navigation signals - EU/ESA/Eurocontrol - ANA/IST.

▪ X3-NOISE - Aeroacoustics network; EU - SNECMA.

▪ FLPP - Calculation of trajectories of lifting re-usable launch vehicles through the atmosphere into orbit; ESA - Astrium/Deimos.

▪ COSMA - Atmospheric propagation and in¬door transmission of aircraft noise; EU - EADS Deutschland.

RESEARCH DOMAIN

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Earth Dynamics

Solar System Sciences

Geophysics

CGUC
CENTRO DE GEOFÍSICA
UNIVERSIDADE DE COIMBRA

Centre for Geophysics of the University of Coimbra
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OVERVIEW AND GENERAL DESCRIPTION

We are the only Portuguese center that is dedicated to research the Solar System as a whole and at all scales. This translates to strongly interdisciplinary regards over the Sun, Venus, Earth, Mars, Titan, and smaller bodies – for now.

We are a medium-dimension team – 29 researchers – with training in geophysics, geology, physics, mathematics, astronomy and astrophysics.

We are housed at the Geophysical and Astronomical Observatory of the University of Coimbra, the only one in Portugal with this broad spectrum of competences.

FIELDS OF EXPERTISE

We host three new laboratories: Glaciology, Tectonophysics and Space Weathering and we have ongoing projects in the domain of Planetary Geosciences, Geophysics and Astrophysics.

We have strong collaborations with several prestigious universities and institutions, for instance: ESA, Sta Barbara and UCLA, Smithsonian Institute, USGS and IRIS (USA); Observatory the Paris and Observatory Cote d'Azur, University Paul Sabatier (France), Queens University and Manchester University (UK); University of Buenos Aires (Argentina); URGS, UFRJ and UFSP (Brazil), IRSPS (Italy).

We are a recognized Collaborating Laboratory by the European Space Agency.

We are behind one of the longest uninterrupted data series on the Sun (since 1926) and the Earth, including climate (since 1864), geomagnetism (since 1866), and seismology (since 1906).

MAIN PROJECTS, PRODUCTS AND SERVICES

We are hosted by the Geophysical and Astronomical Observatory of the University of Coimbra and we base our research on the observational data acquired by this institution, namely, solar, seismic, meteorologic and magnetic. The combination of this information is used by our group in order to provide information about space weather.
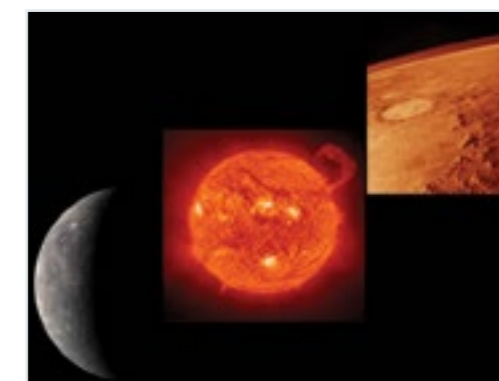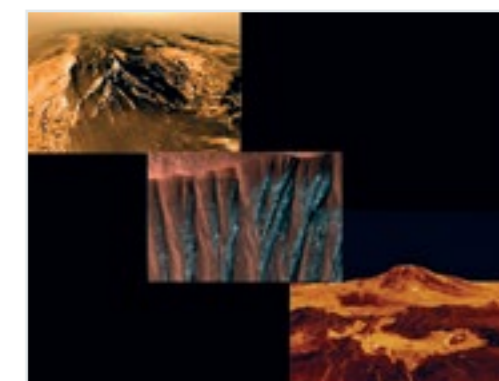
Here below we refer other space projects (ongoing and finalized):

Ongoing
▪ Project CAMEL - Characterization and Classification of Dune Fields on Mars Based on Earth Analogues (PTDC/CTE-SPA/117786/2010)
▪ QG-APLIC - Quasi-geostrophic Approximation in Planetary Liquid Cores (PTDC/CTE-GIX/119967/2010)
▪ Project Gaia - National Participation in the Data Processing and Analysis Consortium (DPAC) and Early Science Preparation (PTDC/CTE-SPA/118692/2010).

Finalized
▪ ANAPOLIS - Analysis of polygonal terrains on Mars based on terrestrial analogs – (FCT, 2010-2012)
▪ TREPOLI - Automatic recognition and characterization of polygonal terrain on Mars – (FCT, 2007-2010)
▪ MAGIC - Mars Geophysical Imagery Classification – (ESA, 2004-2009)

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Remote sensing - Earth seen from space

Global Navigation Satellite Systems (GNSS)

Space Weather

U.PORTO
FACULDADE DE CIÊNCIAS
UNIVERSIDADE DO PORTO

Centro de Investigação em Ciências Geo-Espaciais Faculdade de Ciências da Universidade do Porto

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OVERVIEW AND GENERAL DESCRIPTION

CICGE is the Centre for Research in Geo-Space Sciences of the Faculty of Science of the University of Porto, one of the 19 Research Centres and Laboratories associated with the Faculty. Its main mission is to actively participate in research applied to Space Sciences and their application to the human activity on Earth and in the near-Earth environment.

The activities of CICGE belong to different areas of the Earth and Space Sciences, including pure and applied scientific research, advanced teaching and education, promotion of science and services to the community.

FIELDS OF EXPERTISE

Space Weather
Studies on solar energetic particle propagation models, electromagnetic emissions linked with coronal mass ejections, and ionospheric perturbations affecting GNSS signals.

Reference Systems
Using global astrometry from GAIA space mission.

Surface and Terrain Modelling
Image orientation and DEM extraction from high resolution satellite images, Geometric Corrections of Satellite Imagery.

Coastal Zones
GIS and GNSS used to study coastal zone erosion, estuarine dynamics, beach morphological classification, harbour stability.

Vegetation dynamics
Field measurements, remote sensing, and modelling are used to infer interactions between vegetation, their abiotic environment and climate change.

Ecological niche modelling
GIS, Remote Sensing, and Spatial Statistics used to study the influence of life on Earth, from species distributions to the study of landscape connectivity.

MAIN PROJECTS, PRODUCTS AND SERVICES

SEP propagation
A software package for the modelling of particle propagation in the heliosphere. Synthetic particle profiles provided on request.

Gaia
We are involved in the selection of QSOs. A list of well studied QSOs will help defining the alignment with other celestial reference frames.

PhenoSat
A software package for the analysis of time-series of satellite sensor data, in particular the seasonality of satellite time-series data and their relationship with vegetation dynamics. Available for public use.

GEONET
GNSS Permanent Network with 5 receivers at different sites in the Portuguese mainland. Collaboration between several institutions (FCUP, FCTUC, IICT, IPG and AFA). Data available on request.

Digital Surface and Terrain Modelling
Modelling of surface and terrain using different methods and types of data. Data include terrestrial, aerial and satellite images, RADAR, airborne and terrestrial laser scanning and topographic data.
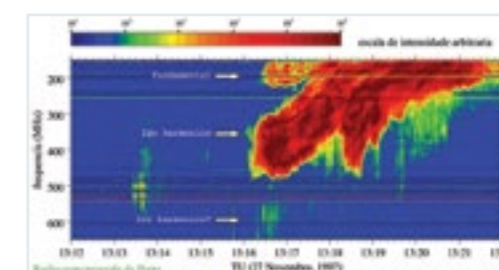
RIVER PLUME SIZE
Estimation of the Douro river plume size based on image segmentation of MERIS scenes (ESA, Earth Observation Program).

SANDY
Cabedelo SANd Spit MorphoDYnamic Evolution and Modelling using IKONOS data – Douro River, Portugal (ESA, Earth Observation Program).

Agriculture tools
Tools and methods developed for using remote sensing in irrigation management, vineyard monitoring, and estimation of crop yields.

RESEARCH DOMAIN

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Environmental Sciences

Biological Sciences

Geographic Information Science and Technology

Azorean Biodiversity Group
CITA-A / University of the Azores
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OVERVIEW AND GENERAL DESCRIPTION

The Azorean Biodiversity Group (ABG) is one of the four research groups of the Research Centre CITA-A (Centro de Investigação em Tecnologias Agrárias dos Açores). This centre is included in the University of Azores and is mainly sponsored by the Portuguese Foundation for Science and Technology (FCT) and the Azores Regional Fund for Science (FRC, former DRCT). The Azorean Biodiversity Group / CITA-A conducts basic and applied research in Biological, Environmental, Social and Geographic Information Sciences in order to understand and predict the functioning of Oceanic Islands communities and ecosystems.

FIELDS OF EXPERTISE

BIOLOGICAL SCIENCES:
▪ Ecology (Study of the species environment and patterns of diversity, distribution and abundance)
▪ Biogeography (study of species distribution at several scales with emphasis on the insular biogeographical models)
▪ Evolution (linking ecological, genetic and evolutionary processes)
▪ Taxonomy (discover and classify the Azorean species),
▪ Pest Management And Control (with emphasys on urban termites)
▪ Conservation Biology (Protected Areas Assessment, Planning and Management).

SUSTAINABILITY SCIENCES
(potential for long-term maintenance of well-being, which has environmental, economic, and social dimensions):
▪ Risk Communication
▪ Environmental Education
▪ Sustainable Development Strategies and Policies
▪ Science Communication
▪ Public Participation

GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGIES
▪ Land & Coastal Assessment Planning And Management
▪ Applied GIS
▪ Remote Sensing
▪ Modeling

MAIN PROJECTS, PRODUCTS AND SERVICES

NETBIOME - Europe - FCT NETBIOME/0003/2011: ISLAND-BIODIV "Understanding biodiversity dynamics in tropical and subtropical islands as an aid to science based conservation action" (2012-2015)

NETBIOME - Europe - FCT: MOVECLIM "Montane vegetation as listening posts for climate change" (2012-2014)

AGRICOMAC: "Transferencia de Tecnologías al Setor Agrícola de la Macaronesia" - MAC/1/C047 (2009-2011)

FCT-PTDC/BIA-BEC/100182/2008 "Predicting extinctions on islands: a multi-scale assessment" (2010-2013)

FCT-PTDC/BIA-BEC/099138/2008 "Conflict between human activities and the conservation of island endemics in a Global Biodiversity Hotspot" (2010-2013)

PTDC/BIA-BIC/119255/2010 "Biodiversity on oceanic islands: towards a unified theory" (2012-2014)

DRCT-M2.1.2/I/005/2011 "Implications of climate change for Azorean Biodiversity" - IMPACTBIO (2012-2014)

DRCT-M2.1.2/I/008/2011 "Biomonitoring air pollution: development of an integrated system" - BIOAIR (2012-2014)

DRCT-M2.1.2/I/027/2011 "Mapping coastal and marine biodiversity of the Azores" - ATLANTIS-MAR (2012-2014)

DRCT-(M3.1.7/F/002/2011) "Impact of Land-Use changes in the arthropod fauna of the Azores" (2012-2015)

United Nations University - RCE-Azores, UNESCO Research Centre of Expertise (2009-2014)

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Nanomaterials

Carbon fibre based composites

Thermal and fire protection

INEGI
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OVERVIEW AND GENERAL DESCRIPTION

INEGI – Institute for Mechanical Engineering and Industrial Management is a nonprofit and autonomous organization, financed by private and public funds. The Institute was founded in 1986 and has developed links with institutions located in Portugal and Europe. INEGI has a long experience in R&D projects commissioned by private and state owed companies, public services and European programs (BRITE, COMETT, SPRINT, ESPRIT, GROWTH, FP6, FP7 and ESA).

The Laboratory of Polymers and Multifunctional Composites belongs to the Composite Materials Group that is one of the largest R&D unities of INEGI.

FIELDS OF EXPERTISE

The Laboratory of Polymers and Multifunctional Composites team has expertise in the following main areas:

New composite materials development
▪ New polymers formulation
▪ Carbon fibre reinforced polymer (CFRP) composites for high demanding applications
▪ New composite materials for thermal and electrical management
▪ Semi-products based on carbon fibres and carbon nanotubes (CNT)
▪ Application and development of new processing technologies: pre-impregnation, vacuum infusion, RTM, pultrusion and other techniques

Materials characterisation
▪ Polymers viscosity and reactivity studies.
▪ Quality inspection of products and semi-products: gel-time, fibre content and distribution, curing state and glass-transition temperature determination Mechanical and thermal properties assessment: elastic modulus, glass-transition temperature, specific heat, etc.
▪ Fire reaction properties evaluation

MAIN PROJECTS, PRODUCTS AND SERVICES

**1. Non-conventional Matrix/Carbon Nanotubes Reinforced Composite for Applications in Space**
ESA Contract, TRP study (2007-2013). Team: HPS (DE), FutureCarbon (DE), ARC Seibersdorf (AT), INEGI (PT), Universiy of Patras (GR) and INVENT (DE). The main objective of this project is to develop and characterize carbon nanotube (CNT) based nanocomposites. Nano modified composite materials, especially CNT reinforced composite materials offer a high potential for successful applications in space. Some potential uses of these materials could be in manufacturing lightweight structures, laser transmitters and their components or even as part of laser diodes, with the purpose of acting as heat sinks.

2. Dual-Gridded Carbon Fibre Reinforced Plastic Reflector
ESA Contract, ARTES 5.1 Program (2011-2013). Team: HPS (DE), INEGI (PT), INVENT (DE), IABG (DE), Nikon, University of Applied Sciences Munich (DE). The main objective is to develop a new reflector concept for telecommunication satellites with a CFRP rod based front and rear grid for Ku-band applications. Key development is the manufacturing processes for the shaped rods (done by INEGI).

3. EUCARBON- European space qualified carbon fibers and pre-impregnated based materials
FP7-Space Contract (2011-2014), website: www.eucarbon-project.eu. The main objective is to develop European carbon fibers and pre-impregnated materials for satellites sub-systems.
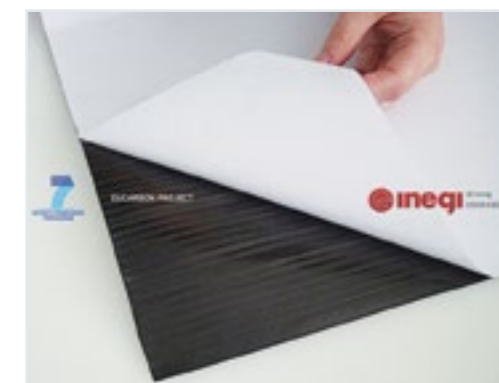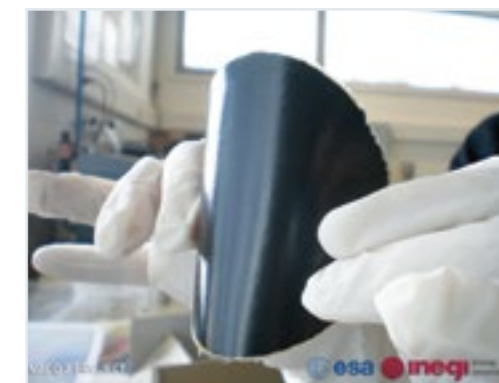
Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Remote Monitoring and Surveillance Solutions

Electronics Intrumentation and Systems Development

Communication Networks & Cyber Security

INOV INESC Inovação
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OVERVIEW AND GENERAL DESCRIPTION

INOV was founded in the course of a restructuring started by INESC and officially started its activities on January 1, 2001, as a private non-profit association.

INOV positions itself in the market as the biggest national technological infrastructure in the field of the Information Technology, Electronics and Communications.

The mission of INOV is to support the national economy, via various activities in the field of technology transfer and expert advising.

INOV portfolio of customers and partners includes: Governments of States; multinational companies; Portuguese and International SMEs.

FIELDS OF EXPERTISE

The concentration of efforts and specific resources, in a structured, coherent and professional way, allowed INOV (while autonomous technological infrastructure) to focus almost exclusively on its central competences, organised in four strategic areas:
▪ Monitoring, Command & Control;
▪ Communications;
▪ Electronics - Monitoring, Navigation and Control;
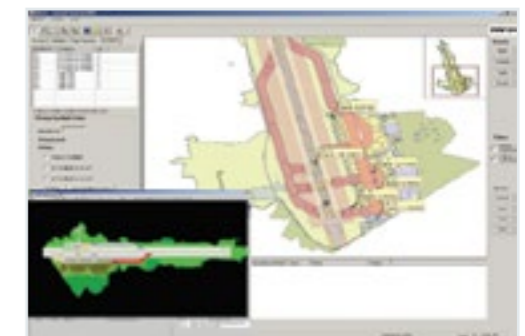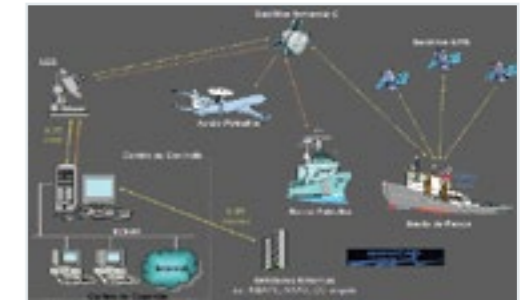▪ Information and System Technologies.

INOV has strategically concentrated significant efforts in the area of Security and Defense technologies and has qualified people and installations with National, EU & NATO Security Certification. INOV has also a long historic record of projects and activities related with safety, security and defense. Over the years INOV has been involved in studies and projects with Portuguese Ministry of Internal Affairs, Portuguese Armed Forces, ESA, NATO, etc. and participated in R&D National and European funded projects.

MAIN PROJECTS, PRODUCTS AND SERVICES

Due to its innovation and technological capacity and as a booster of the interactions and synergies between Universities/Industry, INOV mostly promotes and commercializes the development abilities and know-how in the following technologically advanced areas and the capacity for integration of different technologies in an innovative way:
▪ Network Management and Safety;
▪ Telecom Equipment, Services and Architecture;
▪ Speech and Image Systems and Technologies;
▪ Positioning, Navigation and Fleet Management Systems;
▪ Remote Monitoring and Surveillance;
▪ Electronics, Telemetry and Domotics;
▪ Command and Control Systems;
▪ Information Technologies and Organizational Engineering.

Developments in the area of electronics and the experience obtained enables INOV to be a major player and develop a variety of electronic systems, ranging from simple to complex, which correspond to diverse offers of the domestic and international markets. As an example product, dtFLY card is a multiplatform fiber channel interface, which provides high reliability, high bandwidth and low overhead data transfer solutions while maintaining a simple design and easy integration. It uses some well known standard protocols such as PCI Express®, Aurora and S-Link.

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Atmospheric entry plasma physics

Spacecraft thermal modeling

Institute for Plasmas and Nuclear Fusion
Instituto Superior Técnico
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OVERVIEW AND GENERAL DESCRIPTION

Instituto de Plasmas e Fusão Nuclear (IPFN), a research unit of Instituto Superior Técnico (IST) is the present outcome of an ambitious research programme started in January 2008, after the merging of the former Centro de Fusão Nuclear (CFN), and Centro de Física de Plasmas (CFP).

This programme is made possible by: the contract of Associated Laboratory (LA) granted, in November 2001 by the Fundação para a Ciência e a Tecnologia (FCT), to CFN with participation of CFP; The Contract of Association signed on January 1st 1990 between the European Atomic Energy Community (EURATOM) and IST (CA-EURATOM/IST).

The resulting framework has provided a unique setting for world-class research, fostering scientific and technological excellence in an internationalized context.

FIELDS OF EXPERTISE

IPFN space-related research covers a broad range of multi-disciplinary topics related to space, taking advantage of over 20 years of experience in research on the physics of plasmas. Since 2001, ESA has been a regular customer for the services provided by IPFN, which include:

▪ Aerothermodynamics and reentry technologies, including plasma kinetics and radiation. Numerical modeling in large-scale computers and Experimental reproduction of entry plasmas in the new European Shock-Tube for High Enthalpy Research (ESTHER) for support to the sizing of thermal protections in ESA missions. Development of reflectrometry diagnostics for the determination of plasma densities in atmospheric entry configurations.
▪ Spacecraft thermal analysis, force balances and influence in interplanetary trajectories
▪ Fundamental Physics in Space. Gravitational map of the Solar System, scale dependent gravity, description of dark matter and dark energy.
▪ Laser Propulsion and Electric Propulsion Technologies (Hall Thrusters). Electrostatic Systems & New Concepts (Artificial magnetospheres for propulsion and Space Crew protection)
▪ Optics and Optoelectronics, Laser Ranging and Imaging including Altimeters and Lidar Systems

MAIN PROJECTS, PRODUCTS AND SERVICES

Aerothermodynamics of Spacecraft Reentries
IPFN routinely carries radiative heating predictions for atmospheric entry spacecrafts, departing from supplied hydrodynamic flowfields. The radiative fields are calculated using the SPARTAN code and an associated radiative transfer code in a 8 processor, multicore machine, with the application of parallelized radiative routines, using a ray-tracing method. The radiative heat fluxes whistood by the Mars entry of the ESA EXOMARS spacecraft have been recently predicted using this method.
IPFN also develops CFD codes (SPARK code) and state-specific kinetic models for the appropriate description of the fluid dynamics and physical-chemical properties of such flows, allowing the improvement of the accuracy for the predicted convective fluxes impacting the thermal protections of a reentry vehicle.

**European Shock-Tube for High Enthalpy Research (ESTHER)**
IPFN is developing the first space research facility in Portugal, a Kinetic shock-tube which will be able to reproduce the conditions of spacecraft entries at velocities in excess of 10km/s. This facility, funded under two 1.75M€ contracts from ESA, will support the agency upcoming planetary exploration missions.

Spacecraft Thermal modeling
Fully analytical computation, straightforward sensitivity analysis, geometrical and material modeling, reflections using analytical methods. Application: Pioneer anomaly

Fundamental Physics in Space
Scientific objectives: Gravitational map of the Solar System; Kuiper Belt mass prole. Design of space missions: Galileo Science Advisory Committee; Scientific Advisory Group of the Gravity Advanced Package (GAP) instrument. Theoretical and phenomenological studies: Description of dark matter and dark energy; DM/DE interaction and unification; Generalized Chaplygin gas; Generalized f (R) theories; Non-commutative quantum mechanics.

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN
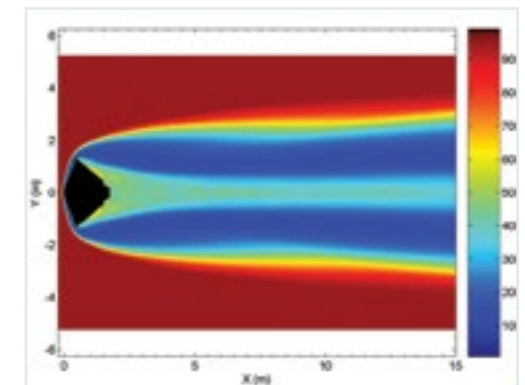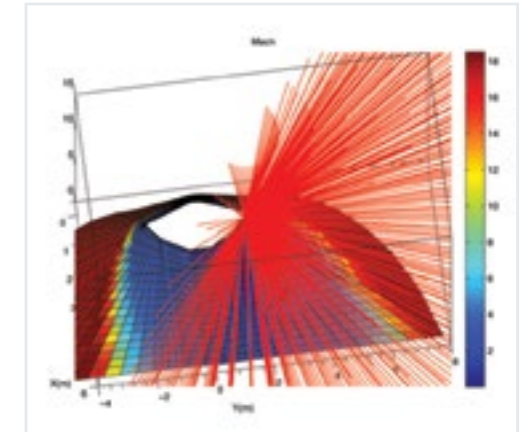
Automation and Robotics

Wear, Testing and Materials

Information Technologies

IPN INSTITUTO PEDRO NUNES

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OVERVIEW AND GENERAL DESCRIPTION

Instituto Pedro Nunes (IPN) promotes innovation and technology transfer, being the main link between the University of Coimbra and the business sector. IPN has its own specialized teams and technological infrastructures dedicated to R&TD projects in multiple sectors (IT, health, space, mobility, automotive, ceramics, environment, etc.). IPN has also a business incubator/accelerator that supports the creation of technological spin-offs and startups from the private sector and from scientific institutions, as was the case of Critical Software and Active Space Technologies.

FIELDS OF EXPERTISE

Research & Technological Development
IPN integrates six R&TD laboratories also offering consultancy and specialized services: LED&MAT - Wear, Testing and Materials; LIS - Information technology and Systems; LAS - Automatic and Systems; LEC - Electroanalysis and Corrosion; LABGEO - Geotechnical Engineering; FITOLAB - Phytopathology.

Business Incubation
IPN-Incubator supports the creation of innovative technological spin-offs and startups, mostly from the University of Coimbra, supporting fund raising, mentorship, networking, Intellectual Property, internationalization, connection with R&TD and other services to entrepreneurs.

Training
IPN provides high level continuous training services to professionals, young entrepreneurs and unemployed graduates, in strong connection to the University of Coimbra and other R&D institutions, and to companies within IPN network.

MAIN PROJECTS, PRODUCTS AND SERVICES

Laboratory of Automatic and Systems (LAS) develops projects responding to problems on different subjects such as: electronic instrumentation, Wireless Sensor Networks (WSN) design and development, RFID, delay tolerant networks, vision computing, active vision systems and development of mobile robot platforms (unmanned vehicles).

Main Projects, Products and Services:
▪ AIR-SEAL: second generation RFID security seal, capable of monitoring the integrity of an aircraft galley trolley
▪ Move: autonomous electric vehicles (no driver) for people and goods transportation
▪ InovWine: Modular and plug and play WSN for precision environmental monitoring

Wear, Testing and Materials Laboratory (LED&MAT) has expertise in:
▪ Surface modification of materials by PVD magnetron thin film deposition: self-lubricating surfaces, low friction coatings, coatings for sensors, energy/thermal applications, optical/wear protection;
▪ Thermal insulation and energy flow management materials: light weight, super insulation, intelligent insulation (cryogels, nano-structured materials).
▪ Main Projects, Products and Services:
▪ Materials Characterization: thin films, surface behavior; morphologic, physical and chemical characterization; materials/systems thermal behavior;
▪ Production of engineering of prototypes: concept development, mechanical project, construction and validation of prototypes for specific applications.
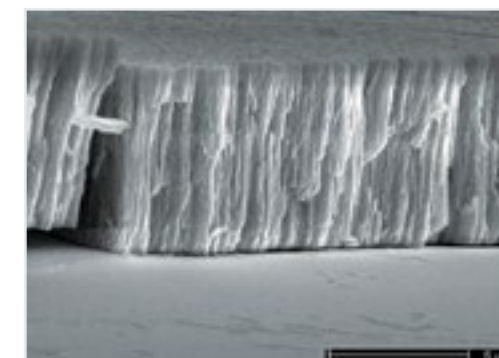
Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Robotics, AI and Computer Vision

Systems and Control Theory

Signal Processing

Instituto de Sistemas e Robótica LARSyS
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OVERVIEW AND GENERAL DESCRIPTION

The Institute for Systems and Robotics (ISR) is one of the units of the Associate Laboratory of Robotics and Systems in Engineering and Science (LaRSyS), since May 2011. It is located at Instituto Superior Técnico (IST), Technical University of Lisbon.

The institute has a large infrastructure of computers and robots of different kinds (indoor, outdoor, aerial, sea and land, all-terrain, humanoids).

ISR-IST members include about 40 PhD IST faculty (full-time professors or researchers) and a large number of (international) Master and Doctoral students.

FIELDS OF EXPERTISE

ISR-IST fields of expertise include:

Robotics
Mobile aerial, sea and land autonomous robots integrating guidance, navigation and control systems, task planning and execution, sensor fusion and different locomotion capabilities.

Systems and Control Theory
Modeling and control of complex systems, mostly aerial and underwater robots (such as helicopters, quadcopters and submarines), but also biological systems.

Signal Processing
Large range of research topics, including image processing (e.g., bio-medical, surveillance, 3D for environment reconstruction), large wireless sensor networks, and acoustic communications.

Computer Vision
Vision-in-the-loop in robot systems, camera networks, reconstruction from motion and visual SLAM.

Artificial Intelligence and Intelligent Systems
Cognitive humanoids, natural interaction with humans, bio- and neuro-inspired robot systems, cooperative robotics.

MAIN PROJECTS, PRODUCTS AND SERVICES

The research areas at ISR-IST are supported by fundamental and applied research.

Marine Science
Marine science applications have been a strong research drive, and over the years ISR-IST has built several autonomous sea vehicles, including two autonomous catamarans and one small submarine, as well as a 12ton fully autonomous, long range, oceanographic vessel.

Computer and Robot Vision
Computer and Robot Vision is one of the key enabling technologies to which ISRIST has devoted a special effort, with applications ranging from mapping and visual reconstruction to navigation and visual tracking, often associating vision with other sensors, such as laser range-finders.

Autonomous Land Robots
Mobile land autonomous vehicles are another major area of interest, concerning both individual and multi-robot systems, with activities including the design of autonomous robots for surveillance, search and rescue, networked mobile and static sensors, and soccer-playing robots.

This research has been developed in the scope of national and large international projects, namely funded by the European Union. ISR-IST coordinated an ESA project on spacecraft formations guidance, navigation and control and in other space-related projects, including an EUCLID project on high-resolution remote observation by interferometry.

Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Telecommunications

Radio Communications for Space Applications

it

instituto de telecomunicações

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OVERVIEW AND GENERAL DESCRIPTION

Instituto de Telecomunicações (IT) is a private, not-for-profit organization, of public interest, a partnership of universities and companies with research and development expertise in the field of Telecommunications, which was set up in 1992. IT's mission is to create and disseminate scientific knowledge and foster higher education and training in the field of telecommunications and associated technologies. IT has more than 200 researchers with PhD degree and hosts about 400 MSc and PhD students. In recognition of its achievements, IT was awarded the status of Associate Laboratory in 2010.

FIELDS OF EXPERTISE

Expertise at IT spans four main areas: wireless communications, optical communications, networks and multimedia, and basic sciences and enabling technologies, and all are backed by advanced, laboratory facilities. Most of the research is performed in the framework of national and international R&D projects (about 150/year), involving companies in Telecom business (operators, equipment manufacturers, service providers and even final users) and other associated enabling technologies and science.

IT has been very active in research and development in key telecommunication areas that are relevant for space applications, even before the official partnership of Portugal with ESA. In wireless communications IT researchers at Aveiro and Lisbon have strong record on antenna design and testing, millimetre-wave, microwave and RF circuit and system design, and circuit and system analysis.

MAIN PROJECTS, PRODUCTS AND SERVICES

Antennas for Space and Aeronautical Applications
The focus is on low cost reliable antenna solutions for broadband wireless access satellite systems, both for ground mobile terminals and for the space segment. The labs are equipped for antenna measurements up to 110 GHz. Contact: Carlos Fernandes (Carlos.Fernandes@lx.it.pt)

GaNSpace- GaN technology in Space
This project will support the validation GaN technology in space applications. It involves the design and construction of a GaN oscillator and a RF power measuring device for GaN technology monitoring. This system will be the first test of European Technology GaN semiconductors in space environments.
Contact: Nuno Borges Carvalho (nbcarvalho@ua.pt)

R&D for space radiometry and radioastronomy
Activities bulk in the development of high performance components suitable for space prototyping tested in i) GEM project cryocooled receivers to map with high sensitivity the radio emission from the Milky Way to serve space and sub-orbital experiments of Cosmic Microwave Background and inter-planetary missions with on-board radio instruments that need calibration and foreground subtraction (through IT 9-m telescope). ii) Phased arrays for space weather and planetary scintillation probing in radio from P-L bands (Moura SKA project).
Contact: Domingos Barbosa (dbarbosa@av.it.pt)
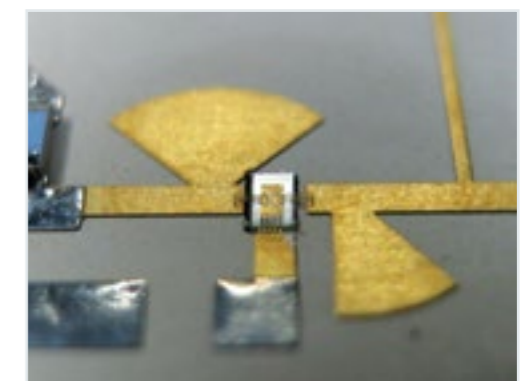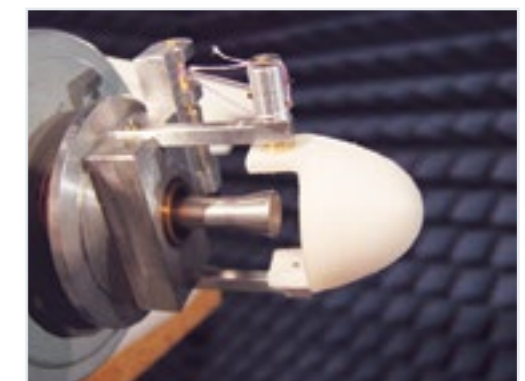
Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Applications of Meteorological Satellites

Monitoring of land surfaces

Weather surveillance and climate monitoring

instituto português do mar e da atmosfera

Land-SAF
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OVERVIEW AND GENERAL DESCRIPTION

Instituto Português do Mar e da Atmosfera (IPMA) is a State Laboratory dedicated to scientific research, technological development, innovation and services in the Ocean and Atmosphere, aiming the implementation of national strategies in those areas.

IPMA includes, amongst others, the roles of the former Instituto de Meteorologia (IM). As such, IPMA is now responsible for: (i) monitoring weather and climate in Portugal; (ii) issuing weather forecasts / meteorological warnings; (iii) maintaining the network of meteorological stations; (iv) developing R&D in the field of Earth Observation.

FIELDS OF EXPERTISE

Land Surface Applications:

1. Research and Development
Development of algorithms for land surface variables and parameters: land surface temperature; radiation budget; surface fluxes; wild fires. These activities include validation of algorithms and products.

2. Services
IPMA provides a set of land surface products, as part of EUMETSAT Ground Segment, including: components of the surface radiation; parameters describing the vegetation state and stress; wild fires detection, emissions and risk. IPMA is also contributing to Copernicus Atmosphere and Global Land services.
These activities include up-to-date documentation, continuous assessment of product quality, and user support.

3. Training
IPMA is regularly involved in the organization of workshops, training courses, and in the preparation of modules for e-learning, all focusing the use of remote sensing data for land surface applications.

MAIN PROJECTS, PRODUCTS AND SERVICES

LSA SAF
IPMA leads the Satellite Applications Facility on Land Surface Analysis (LSA SAF), a consortium which develops and maintains algorithms to retrieve land surface parameters (e.g., temperature, albedo, energy fluxes, wild fire and vegetation parameters) from remotely sensed data. The LSA SAF targets the use of EUMETSAT satellites.
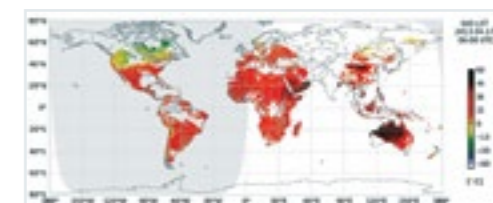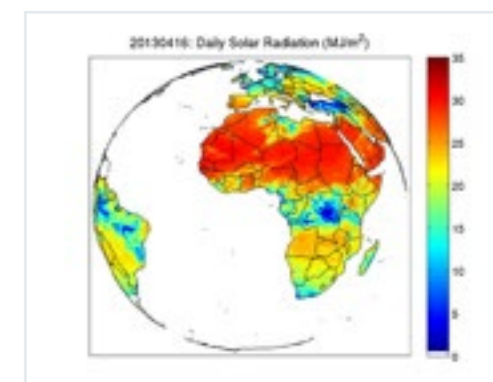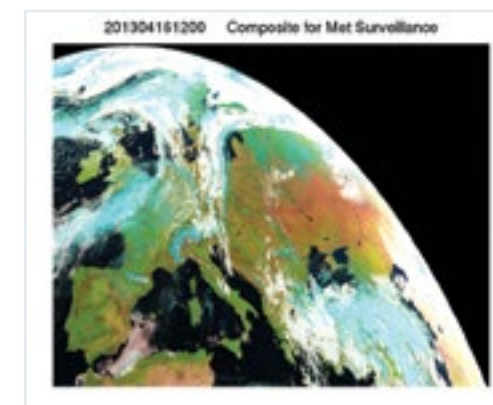
Copernicus Global Land
The Copernicus Global Land (GL) Service is built on the BioPar group of geoland2 FP7 project. Within Copernicus GL, IPMA provides land surface temperature products for a constellation of geostationary platforms merging MSG data with non-European satellites.

Copernicus MACC-II
MACC-II is the current pre-operational Copernicus Atmosphere Service, providing data records on atmospheric composition and provide forecasts a few days ahead. IPMA is responsible for the production of fire radiative power from geostationary data, allowing the estimation of an important source of in land emissions.

WACMOS-ET
WACMOS-ET is an ESA funded aiming the improvement of predictive skills for evapotranspiration, an essential variable to support climate research, water management and agriculture. Given its experience in the development and production of land surface temperature (LST) and emissivity, IPMA is responsible for improving ATSR LST algorithms and for the experimental design of LST obtained from sensors with different spatial and temporal resolutions.

Space Sciences

Earth Sciences

Applied Sciences and Engineering

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OVERVIEW AND GENERAL DESCRIPTION

LIP is a scientific and technical association of public utility for research in the fields of experimental high energy physics and associated instrumentation. LIP's research domains also encompass astroparticle physics, radiation detection instrumentation, data acquisition and processing, advanced computing and applications to Medical Physics and Space. LIP is an Associated Laboratory with units in Coimbra, Lisboa and Minho, where it has specific agreements with the Universities for the sharing of resources. LIP was assessed as "Excellent" in four successive evaluations by international panels.

FIELDS OF EXPERTISE

Space Radiation Environment
Radiation environment simulations with the Geant4 simulation toolkit: in space, in-orbit, on planetary atmospheres, surfaces and underground.

Radiation Effects
Components: modelling of SEE in EEE components in space; EEE component testing (ground/space), Radiation Hardness Assurance. Human spaceflight: simulation of the radiation environment in manned missions (Moon,Mars); prediction of radiation hazards and assessment of mitigation strategies.

Radiation Monitors
Detector design and optimization through dedicated Geant4 simulations of detector response for mission specific cases, detector calibration and data analysis.

Astrophysics Instrumentation (LIP-Coimbra)
X and gamma-ray detectors for space: testing and development Semiconductor Detectors (CdTe) and Gas filled detectors for spectrometry, imaging and polarimetry; mass model simulation tools (Geant4 and MGGPOD).

MAIN PROJECTS, PRODUCTS AND SERVICES

MarsREM
LIP was part of an international consortium, for the development of the Martian Energetic Radiation Environment Models, under a contract with ESA (2006-2008). dMEREM, a Geant4 based radiation environment model for Mars, Phobos and Deimos was developed by LIP and it is available in SPENVIS (http://www.spenvis.oma.be).

CTTB preparation
Alphasat radiation Environment and Effects Facility Component Technology Test Bed, Preparation of In-Flight Data Analysis (2011-2012) was a contract between ESA, EFACEC EVOLEO and LIP. LIP tested and calibrated RADFETs to be used by the CTTB experiment and analyzed ground data of the EEE components to be tested in space.

Single Event Effects modeling
The outcome of the "Integrated Radiation Environment, Effects and Component Degradation Simulation tool, CODES III" (2009-2012) contract between ESA and LIP is CODES: a Geant4 web-based framework developed to provide tools for analyzing and predicting radiation effects in electronic components, with focus on SEE.

Radiation Monitors
LIP collaborated with EFACEC in the "Design study for an energetic particle spectrometer for planetary missions" (2005).

Astrophysics Instrumentation
DUAL and Gamma-Ray Imager mission proposals were submitted respectively in 2010 and 2007. ESA XIPE (X-ray Imaging Polarimetry Explorer) mission proposal was submitted to ESA S mission call in 2012.
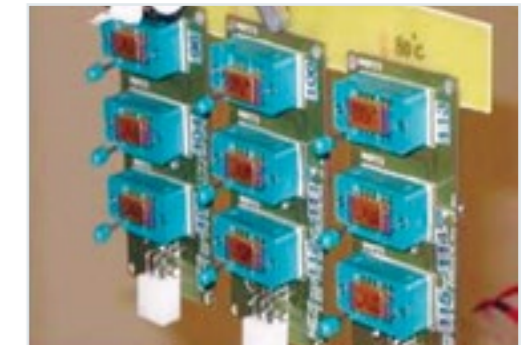
Space Sciences

Earth Sciences

Applied Sciences and Engineering

SPACE TECHNOLOGY SUB-DOMAIN

Optical instrumentation: imaging & metrology

Optical navigation and S/C autonomy

Optical metrology: constellations, formation flying

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OVERVIEW AND GENERAL DESCRIPTION

In Space, LOLS has been active in different areas since 1986:
- Optical Navigation of satellites
- Optical Metrology for formation flying, constellations and multi-aperture instruments
- Instrument processors and instrument simulators
- Remote sensing
- Micro-satellites
- Space system and instrumentation innovative concepts

Currently affiliated at FCUL, LOLS team was integrated at INETI until 2009 - LOLS was the R&D institute with the largest number of ESA contracts in Portugal.

FIELDS OF EXPERTISE

Optical Navigation: imaging of stars, planets, asteroids and small bodies, supplying their LOS to the GNC system, by: camera design, tradeoffs analysis, image simulation and processing. Applications: autonomous navigation, S/C relative navigation, rendezvous and docking, hazard maps for planetary landing, terrain-relative navigation.

Optical (internal) metrology for formation flying, constellations and multi-aperture instruments, by frequency sweeping interferometry, fs and ps laser pulses; emphasis on laser control and stability to improve accuracy.

Instruments and instrument processors for Earth Observation and astrophysics: end-to-end simulation; optical design, integration and testing; signal and image processing and restoration; development of OGSE for instrument testing.

Space system concepts: decentralization control, autonomous orbit transfers, attitude dynamics equilibrium.

MAIN PROJECTS, PRODUCTS AND SERVICES

1. OPTICAL NAVIGATION (ESA, FP7)
- Simulation of optical instruments and image processing: AutoNav, AEROFAST, PlaNav, VBrNav, PROBA 3
- Feature detection for terrain-relative navigation: NPAL
- LIDAR or optical processing for hazard mapping and planetary landing: LiGNC, VBrNav, HASE, LAPS
- Relative navigation and RVD: VBrNav, GNCO, GNCOMAT
Main partners: EADS Astrium (Fr), Deimos Engenharia (P), Lusospace (P), Solscientia (P), VisionBox (P), University of Dundee (UK) and GMV (Sp)

2. OPTICAL METROLOGY FOR FORMATION FLYING (FF) AND CONSTELLATIONS (ESA, EDA, FCT)
- Frequency sweeping interferometry (VIS and NIR): HPOM (Darwin), HROSS (HR surveillance from GEO for defense), FPMET
- Multi-sensor geodetic evaluation of constellations: HPOM
- Pulsed (mode-locked) lasers distance metrology: HAALDM, MODE-LOCKED
- Compensation of FF-derived artifacts: HROSS
- Angular metrology: ANGOM
Main partners: Alenia (It), TNO (NL), EADS Astrium (Fr and Ge), CSL (Be)

3. EARTH OBSERVATION INSTRUMENTS AND PROCESSORS (ESA, EUMETSAT)
Processing chains, data fusion and uncertainty propagation: IASI (METOP), GAIA-FPASS, MIRAS (SMOS)
Main partners: GMV (PT), EADS Astrium (Fr), Deimos Engenharia (PT), Critical Software (PT)

4. ASTROPHYSICAL INSTRUMENTS (ESO, ESA)
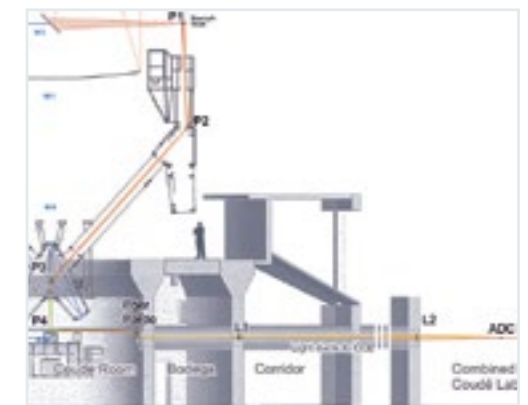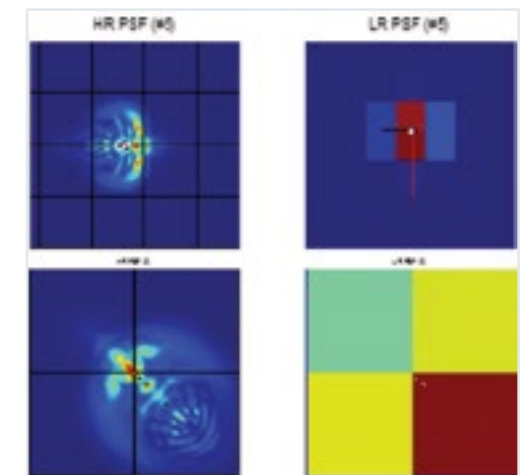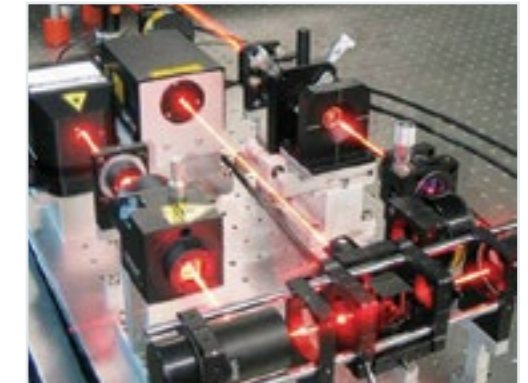Optical instruments engineering and implementation (ESO): CAMCAO, ESPRESSO, MOONS
Optical Ground Support Equipment (OGSE) for instrument testing (ESA): PLATO, GAIA

The Portuguese Space Catalogue is
also available to download from the
FCT website at www.fct.pt.

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