Skywin
Aerospace cluster of Wallonia

2016-2017
MEMBERS DIRECTORY
SPACE

BELGIAN AEROSPACE

SKYWIN IN A NUTSHELL...

The Belgian aerospace cluster "Skywin Wallonie" is a group of companies, training centers and research units engaged in public and private partnership and building synergies around common and innovative projects in the Walloon region of Belgium.

Skywin Wallonie is fully supported by the Walloon regional Government and represents some 6,500 direct jobs and more than € 1,5 billion in revenue, exporting 90% of its products.
Skywin counts more than 130 members among which one finds more than 90 SME's: a proof that Wallonia is a dense and rich playground for innovation!

The Walloon Aeronautics Industry (1250M€, 5400 employees) is mainly focused on Aircraft Engines and Structure, Equipment, Simulation and Training.

The Walloon Space Industry (250M€, 1600 employees) is mainly focused on Equipment for satellite payload and launcher, System exploitation and Space application.

As a competitiveness cluster, Skywin's objective is to foster and promote the technological advance of Walloon aerospace companies and therefore supply competitive products and services, which are the mainstay of business development.

Since the redefinition of its strategic directions, in March 2013 and the last evolution of December 2015, the priorities and strategic orientations of the Skywin Cluster are defined as follows:

- Composite materials and Processes
- Metallic materials and Processes (including Additive Manufacturing process)
- Embedded Systems (for airplanes, satellites or drones)
- Airport Services
- Space and Drone Applications and Systems
- Modeling and Simulation (as transverse orientation)

Through more than 12 Calls for Projects, Skywin is currently managing 64 R&D, Investment or Training projects. These projects totalize about 300 contributions from innovation actors in Wallonia, led by Industry (with a strong involvement of our SME's). The total budget of those projects is nearly 215 M€.

At international level, Skywin has already established strong relations with more than 10 aerospace clusters or organization (in France, Canada (Quebec), Luxembourg, European Community, Russia, India) to improve international BtoB contacts of Skywin's members or to set up international collaborative R&D programs.

SPACE ACTORS & RESEARCH CENTERS... TOGETHER!

GROUND EQUIPEMENT & PREPARATION FOR SPACE

ACCESS TO SPACE

IN ORBIT

EXPLOITATION & SPACE APPLICATIONS

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SPACE INDUSTRY

ANY-SHAPE

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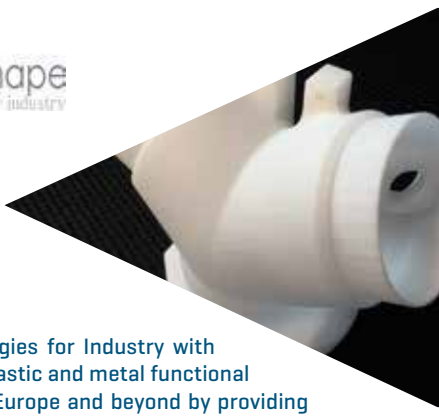

Any-Shape is a company dedicated to Additive Technologies for Industry with state-of-the-art equipments for the production of both plastic and metal functional parts. Our ambition is to be a leading industrial actor in Europe and beyond by providing our customers with the whole value chain in Additive Manufacturing, with a specific focus on Design for AM and Quality Assessment.

Any-Shape competitive assets are based on three main pillars:

- **Engineering, co-conception & design for additive manufacturing:** Any-Shape provides its customers with a professional support to exploit the full possibilities of industrial 3D printing while properly accounting for manufacturing constraints from the concept to the detailed design phase.

- **Metal and plastic parts serial production:** Any-Shape manufactures high value functional parts in both plastic & metal for highly competitive industries. Consistent state-of-the-art technologies are available: Selective Laser Melting (SLM) for metal powders, Selective Laser Sintering (SLS) for polyamide & composites powders and Multi-Jet Printing (MJP) for high-definition ABS-like plastic production.

- **Quality assessment:** Providing our customers with the best quality standards is our main concern as a way to favor the rapid introduction of 3D printed parts in highly demanding industrial applications. Each part is referenced and traceable in our quality management system. Detailed on-line and a posteriori process control is performed in parallel to rigorous part quality assessment.

AETHIS

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NETWORK AND CRITICAL INFRASTRUCTURES MONITORING

AETHIS offers unique tools, services and solutions to measure, analyse, report and alert on availability, performance, service level and security of critical communications and command/control infrastructures.

ACTIVITIES AND EXPERIENCE

With more than 15 years of experience in the aerospace sector, AETHIS builds solutions and supports its customers to efficiently monitor and control their ground segment assets.
The company provides solutions addressing the complete spectrum of managed components, from environmental supervision of physical devices in ground stations and in control centres to equipment and applications monitoring and control.

SKILLS AND TECHNOLOGIES

AETHIS offers its technology and associated services in network security, distributed monitoring, and management of the quality of service of ground segment networks and infrastructures:

- Design and development of **SNMP agents** for devices, systems and software applications
- Tailor-made and **integrated solutions** for monitoring and managing complex networks and infrastructure components
- **SNMPv3** security-oriented consultancy and training
- **TrafMon/TrafX** software tools providing detailed protocols performance analysis of time-critical or heavy-loaded traffic in ground segment communications networks
- **ISMEGA** for smoothly integrating remote management into distributed ground segment and mission control elements
- **SMON/SAMView** operational monitoring platform for mission control systems and applications.

AETHIS is also **reseller** of leading ICT performance reporting solution [**SevOne**], of smart alert dispatching solutions [**telAlert/MIR3**], of SNMPv3 software tools and development kits [**SNMP Research**] and of environmental and SCADA monitoring and control devices [**AKCP/ Asentria**].

AE-VALVES

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The Specialists in Advanced Cryogenic and High Pressure Ball Valve Designs for Rocket Engine Testing

- **Proven through ANSI 4500**
- **Advanced design tools and computer modeling**
- **Ultra-high speed operation**
- **Zero leakage**
- **Cleaning to IEST-STD-CC1246D300A**
- **Special materials**
- **Helium, Hydrogen, Oxygen, LNG**

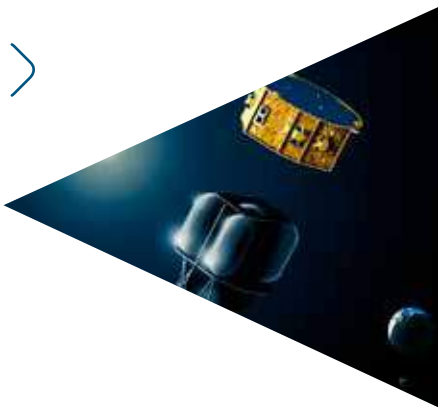
Advanced Engineering Valves is a firm dedicated to the design and manufacturing of high integrity, customized ball valves for cryogenic and high pressure applications for Rocket Engine Test and Rocket Launch Systems. Our valves feature advanced technical improvements allowing reliable operation under high speed of operation, extreme vibration and deep cryogenic temperature conditions where other valves fail.

The process starts with our experienced sales engineering team that collaborates with clients to fully understand the application requirements. Then our in-house expert design engineering team applies our proprietary expertise to evaluate the application with computer modeling tools developing customized valve solutions.

Order execution occurs in our state of the art design and manufacturing center of excellence in Verviers, Belgium. In our facility we operate advanced systems to ensure ultra-high quality and performance including in-house functional and cryogenic test laboratories including the ability to simulate real world conditions and deep cryogenic temperatures.

Experience is the key to success when applications are severe and reliability critical. Advanced Engineering Valves is a key supplier to many of the most advanced rocket engine test facilities in the world with references to validate our performance.

AKKA-MATIS BENELUX



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AKKA-MATIS Benelux, engineering consulting company is the Belgian and Dutch subsidiaries of the AKKA Technologies Group. The AKKA Group has about 12.200 employees and is based in more than 20 countries.

With more than 800 experts operating in Belgium and in the Netherlands, AKKA-MATIS Benelux is today the n°1 on the Belgian industrial engineering consulting market.

Since its creation in 1988, AKKA-MATIS Benelux has been involved in large-scale industrial projects on behalf of major clients in Belgium's main industrial sectors: Aeronautics, Railways, Pharmaceuticals, Automotive, Chemicals, Energy, Telecom, Multimedia Applications and many more.

AKKA-MATIS Benelux supports its clients by offering them the high-level expertise, responsiveness and flexibility they need to complete their industrial projects, in line with their quality and cost targets.

With more than 25 years of experience in these fields, AKKA-MATIS Benelux is one of the privileged partners for major companies in the aerospace and defence industries.

As a partner of CNES, Astrium and Thales Alenia Space, AKKA Technologies has been one of Europe's benchmark space companies for than 15 years. The Group works in a wide range of areas, from the scientific study stages and upstream of the launch into orbit: ground segment (space remote measurement simulation and processing, space imaging), on board computer systems (R&D studies, production of flight software), navigation, operations, space mechanical engineering (studies and R&D, design, analysis, testing), data evaluation, space antennae and missile guidance systems etc.

AMOS

Advanced Mechanical and Optical Systems

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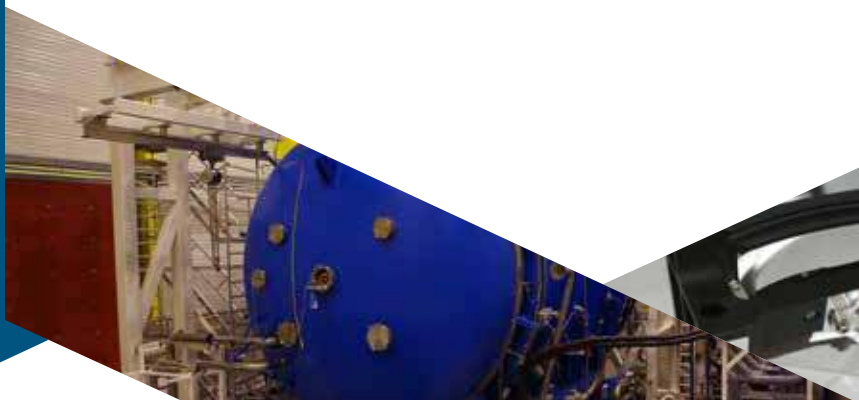
The company AMOS was launched in 1983, merging the mechanical machining expertise of "Ateliers de la Meuse" with the optical polishing know-how of the Institute of Astrophysics from the University of Liège.

A hundred employees are now specialised in designing and manufacturing very accurate optical, mechanical and opto-mechanical systems. AMOS customized equipment is mainly delivered to space industry, professional astronomy, vacuum industry and mechanical industry.

Optical, mechanical and opto-mechanical equipment designed and manufactured at AMOS mainly belongs to four categories:

- **Equipment for on-ground satellite testing** used to qualify scientific payloads or complete spacecraft in simulated flight conditions. This includes vacuum vessels for establishing an outer space environment, thermal panels for creating a flight temperature configuration or collimators to calibrate instruments.
- **On board equipment** for satellites and space probes. They are mainly mirrors, mounts, telescopes, structures, mechanisms or complete earth observation instruments.
- **Equipment for professional astronomy** involving medium and large telescopes, components or instruments installed within the largest observatories around the world and taking benefit from the unique capability of AMOS in merging the fields of high performance optics and extreme accuracy mechanics.
- **High-precision mechanical assemblies** for industry: vacuum coating chambers, assembly line, manufacturing tools, lifting and handling devices.



BARCO SILEX

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Barco Silex provides state-of-the-art electronic design services for digital signal processing intensive embedded systems, based upon high-end ASIC, FPGA, PCB and embedded software technologies. Main markets and applications include:

- **Aerospace, defence and security**
- **Industrial**
- **Telecommunication**
- **Broadcast**
- **Multimedia**

The company originally started as a ASIC/FPGA design house in Louvain-La-Neuve. It is now recognized, with a strong presence in Belgium and France, for proven expertise in complex and high speed design, for project management skills and reliable design methodology.

Barco Silex has been involved in several major European space programs as the partner of key players of the space industry like Thales Alenia Space or OHB, for the development of FPGA or ASIC solutions within satellite communication systems. Applications vary from base band modulators or demodulators to highly integrated GNSS receivers systems.

Barco Silex has also been selected by aerospace leaders for the development of DO-254 projects, ensuring them the highest level of quality and confidence for certification audits.

Barco Silex is well known on the market for their advanced competences in security and video. In these fields, they have developed a comprehensive range of silicon-proven video compression and encryption IP cores, which are valued by the market for their worlds' leading performance and compact footprint.

Barco Silex can interact at different stages in the development cycle of the product: from providing IP cores, reference designs and platforms, support on part of the integrated design to the delivery of full turnkey projects. The company provides all services needed to complement your own expertise and resources. Its experienced engineering team can design, prototype, manufacture, test, support and maintain a full range of custom solutions and services for a broad range of markets.

BRITTE

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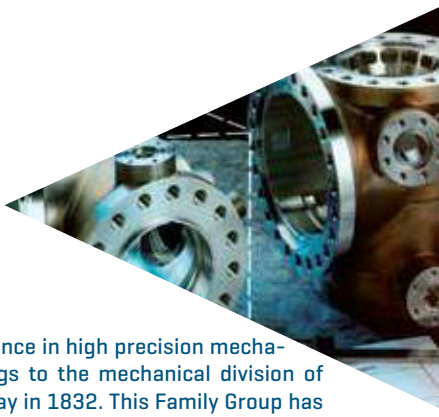


Today we could certainly say that we are a "Pole of excellence in high precision mechanics for Aerospace Components". "Britte-Mustad" belongs to the mechanical division of the family group MUSTAD UNITED GROUP founded in Norway in 1832. This Family Group has built his reputation, not only on the Quality of their products, their diversified and industrial strategy, but also on the respect of their commitments.

Britte-Mustad's main mission is:

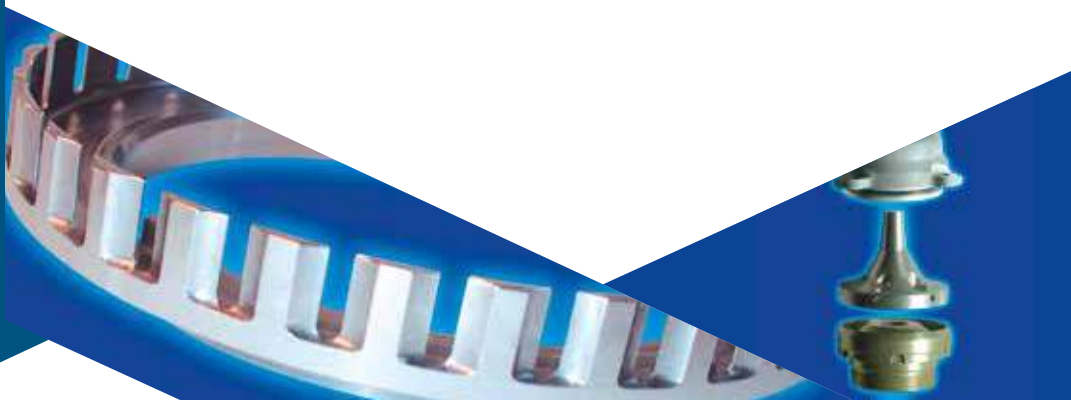
- to machine high precision mechanical components in all existing materials including composite, superalloys... Milling, turning, grinding and machining on CNC production centres constitute our basic tasks. We can manufacture prototypes or production components in very special alloys, providing high added value in terms of technology, competitiveness of price and service.

- to design and manufacture very complex tools, including measuring and control systems.

- to produce assemblies with final testing for all industrial sectors.

Our Main Customers are considered as key players in the Space World and we are machining critical and very complex parts for many of different engines for launcher: VULCAIN, HM7B, VINCI, PPS...

Our products are designed not only for Space but also for Defence, Aerospace, Energy, Transportation, and Machinery Construction.
In the association with the other nearby division "Mustad Belgium", which produces also mechanical components but by screw-cutting and machining on CNC production centres, we are able to cover a huge range of machining capability and a high level of technology.



CEGELEC

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Cegelec Infra Technics S.A. is one of the leaders in the sector of technological service for private and public companies.
The Business Unit Industrial Measure & Control Systems (IMCS) has developed expertise in the domains of:

- Automation and Process Control
- Measurement and Control
- Global Support Package
- Communication and Hard Real Time Software
- Functional Safety
- Cyber Security Assessment of Industrial Control Systems

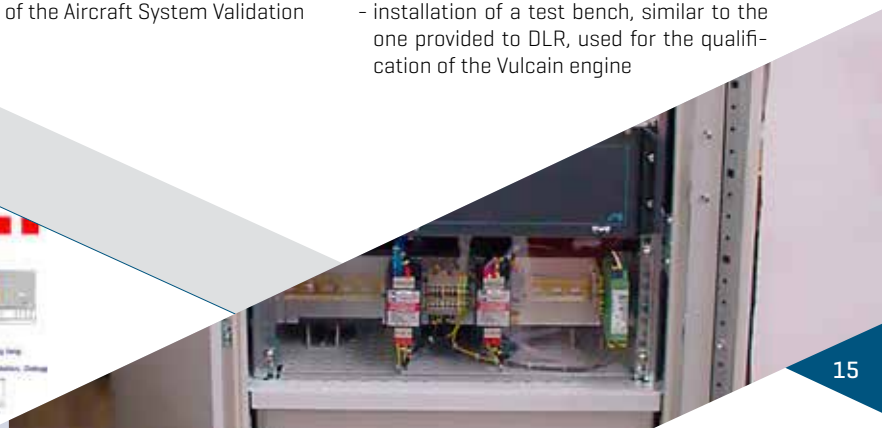
IMCS is used to provide those services in the aeronautic and space domains since more than 40 years. In order to closely match test facility project requirements, IMCS has designed and developed an innovative, scalable and real time measurement and control platform: MCS2000

The MCS2000 is a decentralized measurement andcontrol system:

- open system, always evolving to meet the customer needs and to integrate technological evolutions
- operating on multiple hardware and software platforms
- broad range of interfaces (standard and customized, high speed acquisition, industrial and specialized interfaces...)
- hardware-in-the-loop (HIL) simulation
- easy to use and intuitive configuration and programming software

Amongst the numerous deployment of MCS2000, these are the most significant and recent ones in space domain:

- SABCA in Brussels (Belgium)
  - several generic test benches provided in the frame of the Aircraft System Validation Rig (ASVR) project, to develop and qualify the Electro Hydrostatic Module (EHM) within the framework of the Power Optimised Aircraft (POA) programme
  - several test benches (100 logical and analog inputs/outputs, 1553 specialized interface) provided for the development and qualification of the various actuators of Vega launcher
  - upgrade of a Vega test bench for use in acceptance/qualification tests on the IXV FpCS subsystem
- DLR in Lampoldshausen (Germany)
  - installation of a high performance test bed (2000 logical and analog inputs/outputs, high speed analog acquisition and storage of up to 5,000,000 samples per second, multi-user programming software) to test the evolutions of the Vulcain engine
- Snecma (Safran group) in Vernon (France)
  - installation of a test bench, similar to the one provided to DLR, used for the qualification of the Vulcain engine



CITIUS ENGINEERING

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Citius is an engineering company specializing in design and realization of turnkey solutions for industrial facilities in production and testing.

In collaboration with its partners, Citius develops industrial solutions for turnkey projects and provides industrial engineering services. Its team offers key competences in mechanical, mechatronics, electrical engineering and automation.

Citius operates along three axes:

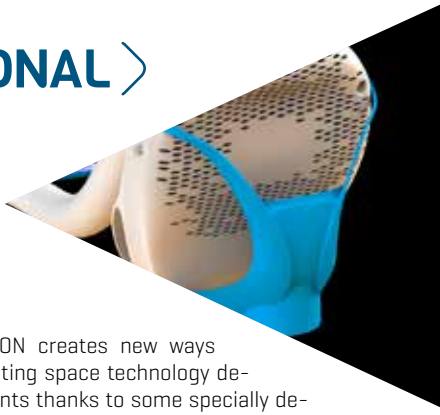
- **Advanced production systems, robots and vision.** Citius develops and integrates turnkey production means, from defining the need to final implementation. Citius also sets up complete solutions for handling industrial processes, thanks to its skills in automation, robotics, electricity, industrial computing and instrumentation.
- **Testing solutions.** Citius develops specific solutions for testing equipment, provides its customers with own integrated testing facilities, and proposes complete solutions of testing means based on its specialized skills in the instrumentation sector.
- **Engineering support and consultancy** based on recognized competences in the field of mechanical design, piping and structures, energies and technical project management.

Citius ensures the development of complete systems, from the early beginning by defining concepts, to the full development of the solution, as well as the commissioning and start-up of dedicated applications. Its works cover all aspects of a project:

- Design and studies of concepts
- Selection and integration of on-the-shelf components and systems
- Planning and follow-up of installations
- Testing, commissioning, start-up
- Quality aspects, procedures, regulation, security
- Project management

Rapidly growing since 2009, Citius Engineering is based on a strong team of 38 specialists representing a buoyant healthiness for this cutting-edge expertise.

CREACTION INTERNATIONAL



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CREACTION group is an engineering company dedicated to industrial innovation and in particular integrating space and other innovating technologies for new business generation.
Drawing on our 20 years of experience in innovation management we provide engineering consultancy in the field of creativity and technical innovation. The original approach of CREACTION is to consider four management sectors (marketing, technology, finance and IPR) in parallel during the development phase.

CREACTION focuses its activity from the very first stages of a projects to an industrial launch thanks to its own original tools and methodologies which accelerate the time to market.

1. Together with ESA, CREACTION has successfully developed a tool/approach called **CCDC (Creative Concept Design Centre)**:
   - identify potential users,
   - evaluate and select the best cost-effective business opportunity,
   - consolidate the matching of the original space technology with the needs of the market,
   - facilitate the transaction between those offering and those requesting the technology.
2. CREACTION creates new ways of exploiting space technology developments thanks to some specially dedicated tools and skills.
   Based on our transversal methodology, it consists of developing systems/sub systems in a generic manner to meet a wide range of space applications, such as:
   - Robotics and robots
   - Satellites and communication
   - Transport and life support
   - ...
3. CREACTION has proven expertise in the innovative development of complex information systems. It relies on scalable and reliable components. CREACTION can develop fast interfaces between existing components and data sources to allow quick early-stage system validation.

The objective is to be able to take decisions about the orientation of a new business and validate it on a case-by-case needs.

DELTATEC

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DELTATEC is a design house specialized in advanced hardware and software technologies. The company is active in various markets: TV broadcast, industry, multimedia... Space became a strategic activity in 2005 with the development of flight models performing image acquisition and processing for earth and sun observation.

SOLAR ORBITER – EXTREME ULTRAVIOLET INSTRUMENT (EUI)

Developed by CSL for ESA, the Extreme Ultraviolet Imager (EUI) is one of the six remote-sensing instruments accommodated inside the Solar Orbiter spacecraft that will be launched in 2017. DELTATEC develops the three Focal Plane Assemblies (FPA) which are the cameras ensuring mechanical, thermal and electrical integration of the image sensors and the proximity electronics.

PROBA-3 – CLS

CLS (Coarse Lateral Sensor) is a system taking part in the relative positioning of the 2 satellites of the PROBA-3 mission. The board developed by DELTATEC performs the acquisition of a picture composed of the other satellite and of the reflection of a laser beam. An FPGA performs the real-time extraction of the position of the laser beam, allowing the positioning of the satellites even when the sun is illuminating the sensor.

AIS MISSIONS: GLOBAL SHIP TRAFFIC MONITORING FROM SPACE

- **Vesselsat – Luxspace:**
  Development of two customs ultra-low power (2W) On-Board Computers.
- **SAT AIS – ESA & Luxspace:**
  Dual redundant On-Board Computers, and Payload Computer including software.

HYPERSPECTRAL PROGRAM

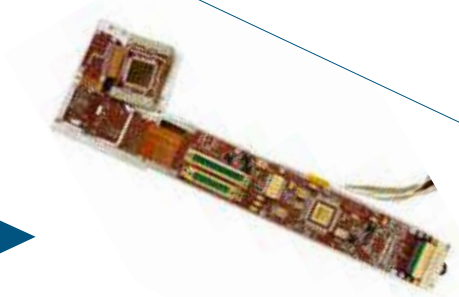
ESA Natural Resources, Environment and Disaster Monitoring Satellite. Development of Hyperspectral/Panchromatic focal planes. Custom CMOS sensor development.

CHIEM – COMPACT HYPERSPECTRAL IMAGER ENGINEERING MODEL

Development of high-speed read-out electronics. IMEC direct filter deposition technology on 12 Mpixel CMOSIS sensor. Xilinx Zynq SoC and EGSE for qualification campaign.

R&D PROJECTS - THE WALLOON MARSHALL PLAN

ACTIO - Améliorations, Composants et Technologies des Instruments d'Observation. Project leader.
THEO - Technologies for Hyperspectral Earth Observation. Project leader.



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A BELGIAN INCUBATOR DEDICATED TO THE SPACE SCIENCES AND TECHNIQUES

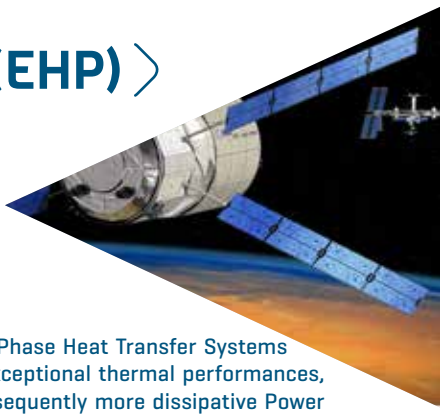
ESA BIC Wallonie Redu is hosted in the Galaxia Business Park (Transinne). It supports start-up companies in their creation and development through a wide range of services. The services include support for fund raising, technical support for products development, market technology analysis, team assessment, business plan drafting, IPR consultancy advices, leasing for equipment and prototype development, support for communication strategy, etc.

The organisation provides access to a wealth of technical expertise, a state of the art infrastructure as well as to a community of companies based within the Galaxia Business Park, including two world leaders, Vitrociset and SES (through Redu Space Services), two strong companies very who are keen to support newcomers and entrepreneurs.

ESA BIC Wallonie Redu is managed by WSLlux, resulting from the partnership between WSL, the Walloon incubator for engineering sciences, IDELUX, the sustainable economic development agency of the Belgian Luxembourg province and Luxembourg Développement, its financial partner.

INTERESTED IN RUNNING YOUR OWN BUSINESS IN SPACE?

EURO HEAT PIPES S.A. (EHP)



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Euro Heat Pipes (EHP) develops produces and sells Two-Phase Heat Transfer Systems (Heat pipes and Loop heat pipes) that, thanks to their exceptional thermal performances, are enabling the development of more powerful and consequently more dissipative Power Electronics.

FROM SPACE TO EARTH

Created in 2001, by externalizing the Two Phase Systems department of Sabca, EHP know-how is based on more than 30 years of heritage. Developed for Space, now available on Earth. This 100% European technology is leading the European cooling market for Space applications and is strongly developing on Aeronautical, Defense and Terrestrial markets. EHP proposes its two-phase cooling devices that will enable equipment manufacturers to increase their equipments reliability with the management of high power densities, low temperature excursion, compact packaging and remote cold sources.

FULL IN-HOUSE CAPABILITIES

Based on a staff of 50 persons, Euro Heat Pipes organization offers full in-house capabilities: Design and simulation capabilities, Industrial manufacturing, Quality control and Qualification and acceptance tests.

MAIN CUSTOMERS

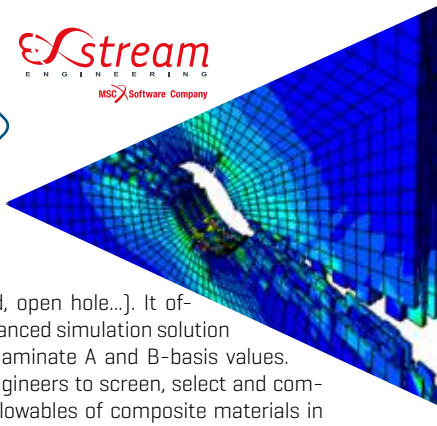
Main customers are ESA, CNES, AIRBUS Defense & Space, Thales Alenia Space, Tesat, IAI and Jaxa for space markets and Alstom, Airbus, Safran and PSA for non-space markets.

HIGH UNTAPPED POTENTIAL

The electronic improved reliability needs combined with the tendency to miniaturization associated to an increase of the dissipated power makes compulsory the use of new technologies as EHP Two-Phase Heat Transfer Systems and opens new high untapped potential markets.

EHP is ISO 9001 and EN 9100 certified.

E-XSTREAM ENGINEERING, MSC SOFTWARE COMPANY



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e-Xstream engineering is a software and engineering services company offering tools, solutions and expertise for many industries. e-Xstream develops Digimat which is a predictive software platform aimed at modelling the linear and nonlinear behaviours of multiphase materials.
This innovative analysis platform:

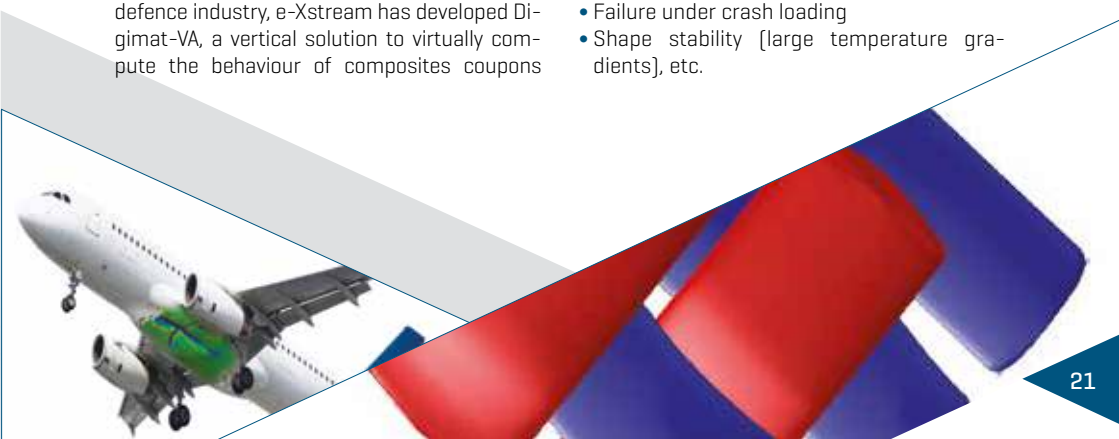
- is used by multiple industries (Aerospace, Automotive, Consumer electronics, Industrial products, etc.),
- enables the simulation of multi-material components,
- connects the complete value chain of the industries together (material suppliers, Tier-1 suppliers and OEMs).

Digimat enables engineers do both micro- and macro-scale analyses of composites materials, components and systems, predicting how they will perform by calculating their mechanical, thermal and/or electrical properties for use in all sorts of downstream FEA analyses. The use of Digimat allows engineers to model composite materials with the same level of confidence that they do with metals and reduces the need for experimental testing through simulation. A broad range of materials can be analysed, with the resulting model accounting for a broad range of conditions such as strain-rate or temperature dependencies, microstructure, or the presence of defects. For aerospace and defence industry, e-Xstream has developed Digimat-VA, a vertical solution to virtually compute the behaviour of composites coupons (unnotched, open hole...). It offers an advanced simulation solution to predict laminate A and B-basis values. It allows engineers to screen, select and compute the allowables of composite materials in less time and at less cost. More info: http://virtualallowables.com/

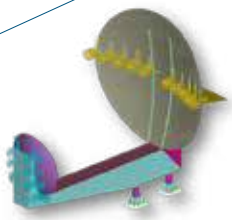
Using the DIGIMAT's fully coupled multi-scale modelling solution enables the composite part designer to use the composite microstructure as a "design parameter" at the component and system level accounting for the manufacturing process. The part engineer can explicitly change the matrix and/or fibre properties, the fibre content, length or orientation, and to evaluate the effect on the performance of the structure. The end-performance of the composite structure is thus explicitly and directly related to the composite material microstructure as influenced by the material processing. Digimat interfaces with all major FEA structural analysis codes, including Marc, Nastran, Abaqus, and Ansys.

Targeted performance:

- Structural stiffness
- Vibration frequencies and modes
- Damage under cyclic loading
- Failure under quasi-static loading
- Failure under crash loading
- Shape stability (large temperature gradients), etc.



FREE FIELD TECHNOLOGIES



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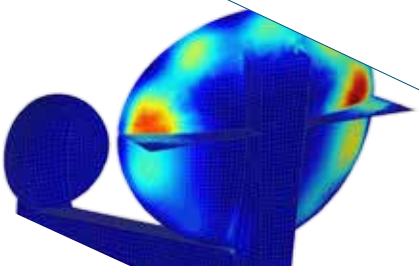
LEADING GLOBAL COMPANY FOCUSED ON ACOUSTIC SIMULATION AND ENGINEERING SERVICES

FFT is a subsidiary of MSC Software Corporation, leading provider in Virtual Product Development technology including simulation software and professional services. Actran, FFT' software suite, leads numerous technology trends of vibro-acoustic and aero-acoustic modelling. Actran is used all around the world by key actors of the Automotive, Aerospace, Shipbuilding, Home Appliance and Heavy Equipment industries as well as the Educational and Research sectors.

In the Space domain, FFT addresses various acoustics and vibration challenges. A typical application of Actran is to predict the acoustic fatigue behaviour of embarked devices on rockets. At rocket lift-off, payload components, such as solar array carried on launchers, are exposed to intense acoustic field that may damage their structures. To insure the integrity (and lifetime) of the systems, fatigue experiments are usually conducted on prototypes in acoustic reverberant chambers to evaluate mechanical stresses occurring in the structures. While those test campaigns are expensive and time-consuming, numerical simulations by Actran, with MSC Nastran and MSC fatigue, are faster, cheaper and enable simultaneous study of multiple parameters and designs.

Actran finds its applications also in research topics like acoustic modes in rocket combustion chamber and sonic boom sound propagation from supersonic aircraft.

Leading aerospace actors NASA, JAXA, Dutch Space, Thales Alenia Space, EADS Astrium and AVIO Group rely on the numerical simulation by Actran.



GDTECH

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THE MECHANICAL ENGINEERING SERVICES SUPPLIER & PARTNER

Global Approach = Design + Numerical Validation + Manufacturing + Testing = Ready-to-Use Equipment

- Design and stress analysis
- Tools design and manufacturing
- Technical documentation
- Project management
- Engineering consulting

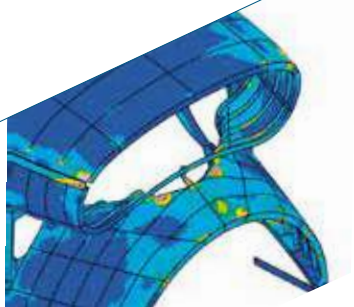
Since more than 20 years, GDTech has developed management and technical skills focussed on mechanical engineering with a strong experience legacy in multi-physic numerical simulation.

The GDTech group mission is to build an **integrated service offer covering the entire product development process**. Our knowledge of the state-of-the-art industrial techniques and our extensive experience ensure **a perfect balance between the services we offer and your project needs**. Flexibility, reactivity and thorough skills are our business-enhancing opportunities.

Thanks to our knowledge of the most advanced industrial technologies and our expertise, we provide you **a customized solution**.

In addition with the products development, GDTech is also involved in several R&D projects about **composite** materials, **additive manufacturing, topological optimisation, XFEM crack propagation, non-linear assemblies, non-linear** dynamic assessment, **high speed rotor** assessment, **H**igh **P**erformance **C**omputing...

Our assets = our expertise, our CAE complete offer and our quality commitment (**EN9100 certified**)



GILLAM-FEI SA

Gillam-FEi
FREQUENCY, ELECTRONICS & TELECOMMUNICATIONS

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Key partner in telecommunications, SCADA and military equipment.
GILLAM-FEi designs and produces world-class equipment in various fields as follows:

- **Precision time and frequency products for ground and space terminals and platforms**
- **Network synchronization products**
- **Rubidium Vapor Atomic Oscillator and hydrogen Maser**
- **Telecontrol and monitoring (SCADA)**
- **Various military equipment (Man Machine Interface, computers, fire sequencer...)**

GILLAM-FEi is a world leader in the design, development and manufacture of high precision timing, frequency control and synchronization products for space, military and terrestrial systems, including energy, wireline and wireless communications networks.

As the key partner in the synchronization area, certified ISO 9001:2008, GILLAM-FEi has developed successful and extremely reliable systems for the major telecommunications operators in Europe and in the USA and for ground satellite stations (GALILEO).

GILLAM-FEi also develops and delivers secure and adaptive turnkey systems for network supervision based on open and standard architectures (SCADA, RTU).

From the beginning, GILLAM-FEi has become the reference electronic partner for defence customers, in a EN-9100 context. It has also developed its expertise by creating smart Man-Machine interfaces.

Thanks to its vitality and to the excellent expertise of its teams, GILLAM-FEi is developing new products as the forefront of technology in highly demanding fields, such as hydrogen masers, extremely accurate synchronization systems for lasers...

GIM WALLONIE

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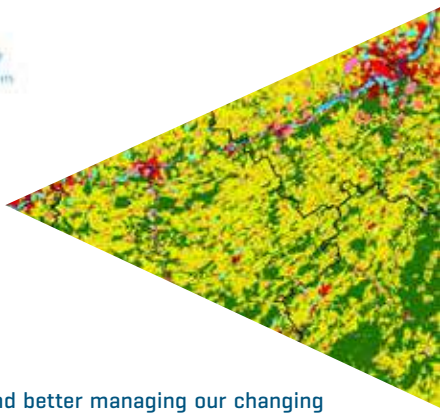

From satellite images to actionable insights

GIM helps public and private customers understanding and better managing our changing environment. GIM is able to build on over 15 years' experience in integrated solutions for processing and analysing countless types of satellite images, from optical to radar. We deliver solutions across the environmental, agricultural and urban sectors specializing in high and very high resolution satellite imagery and Object-Based Image Analysis.

OPERATIONAL SERVICES

GIM is at the forefront of developments in image processing with a particular focus on advanced processing chain automation. Time series of images are analysed in near real time to derive geoinformation supporting the business and decision making of our clients. Not only maps are produced but complex geostatistical and spatial analyses are applied to deliver information that can be directly integrated in the business practices of our clients. Information services are hence delivered in the precision farming, agro-forestry or eHealth application areas. GIM is serving large international industrial organizations, has a long track record in working with ESA and is also processing large volumes of very high resolution imagery as for instance for the prestigious Gates Foundation in the context of the Global Polio Eradication Initiative.

EO DATA DISTRIBUTION

GIM is an official distributor of imagery from most of the high resolution sensors available to date like GeoEye, WorldView, SPOT 1 to 7, Pléiades, RapidEye, Cosmo-Skymed, TerraSAR-X, etc. GIM also offers standard data pre-processing services (e.g. atmospheric correction, orthorectification, mosaicking).

WEB SERVICES, SPATIAL DATA INFRASTRUCTURE AND INTEROPERABILITY

GIM capitalizes on its geo-ICT expertise to design and deploy web services applications and data infrastructures based on Open Standards for the management and visualization of Earth Observation data and metadata for several of its customers

HIPPEROS

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HIPPEROS is an innovative provider of software solutions for embedded & real-time systems active in the aerospace sector. HIPPEROS creates high performance, security and reliability hard real-time operating systems (RTOS) for critical applications under constraints. HIPPEROS helps industries create safe, reliable and powerful applications in less time and with less effort. HIPPEROS is an ULB spinoff and is supported by WSL and ESA BIC. HIPPEROS technology is certifiable and 100% ITAR free

Our main product line is the HIPPEROS multicore RTOS family for critical applications. It can be applied in many domains such as aerospace, avionics, defence, automobile, robotics, industrial control and medical devices. Our strong scientific and technological expertise covers a wide range of computer science and engineering topics, and we help industries to turn new concepts from research into practical business advantages, enabling new markets and bridging the gap from theory to implementation.

HIPPEROS Core Competences include:

- RTOS design and development
- Embedded & real-time software development
- Modelling, validation, simulation & optimization
- Multiprocessor and multicore architectures
- Low power platforms
- Formal methods & algorithms
- Software security issues
- Software reliability, quality, certification & compliance
- Problem solving for R&D and software development

HIPPEROS's Team is made of senior industrialists, technologists and scientists, with 20+ years of internationally recognized achievements. Although we are a young company, our team members have successfully delivered products and services to companies such as Siemens, Infineon, IBM, STMicrolectronics, IMEC, Trasys, Boston Scientific, Arianespace...

HIPPEROS is the first company in Belgium dedicated to next generation multicore RTOS. HIPPEROS is located in Gosselies, Belgium. We operate worldwide in Europe, the US and Asia in all business sectors where our technology applies.

I-MAGE CONSULT SPRL

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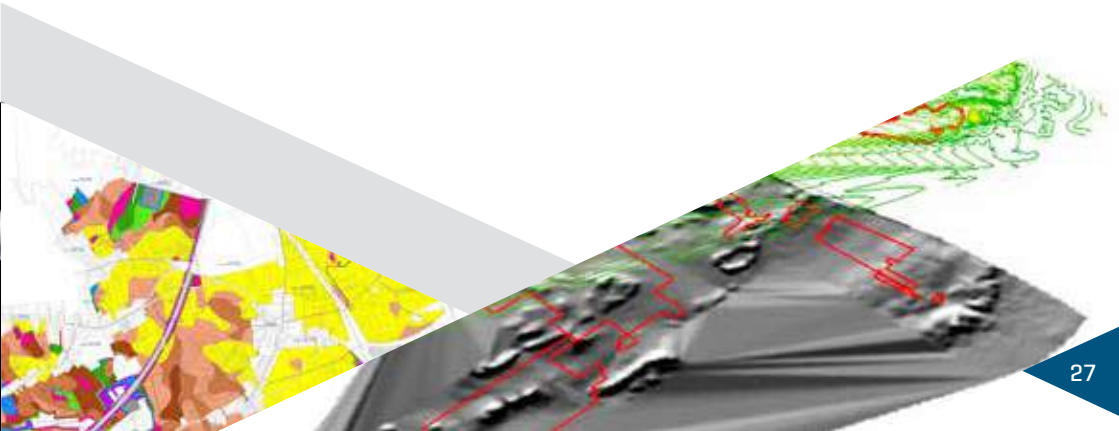
I-MAGE Consult is a private company founded in 1994, run by a multi-disciplinary team of engineers, geographers and computer scientists. The company has acquired a great number of experiences in the mapping of renewable natural resources in land management and in the field of Geomatics (GIS and satellite image processing).
The company has acquired a strong experience thanks to the numerous project conducted throughout the world.

I-MAGE Consult provides services and consultancies in the following areas:

- The development of GIS and EIS, data archiving, management and dissemination of information (Web Mapping and decision making tools);
- The collection (**field surveys**) and processing of remote sensing data;
- Earth observation derived data production and diffusion;
- **IT developments and implementation of software packages**;
- Environmental studies, land management;
- **Spatial analyses**, land-use mapping;
- **Capacity building and training**.

I-MAGE is delivering solutions (data and software products/services) in Earth Observation, Geographic Information Systems and Geo-informatics, R&D to private/public organizations.
The company has acquired a great deal of experience in the mapping of natural resources and the management and dissemination of information. Our expertise can be summarized through a workflow process that goes from the processing of satellite images through GIS implementation and data integration, thematic analysis and applications, technology transfer. **This leads to the development of dedicated applications and decision making tools eventually correlated to Web mapping interfaces. Free Open Source software are often favoured using standards solutions, although proprietary solutions are also developed when required.**

While a majority of the projects are referring to Africa (French speaking as well as English speaking), important projects have been achieved in Europe, Asia, the Caribbean and Oceania.



INCIZE

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Incize provides measurement, characterization and other services for radiation hardened devices and circuits as well as services for RF applications. Incize is a spin-off from Université catholique de Louvain (Belgium) where the know-how in RF and radiation hardness was accumulated. The know-how and the access to the state-of-the-art university labs enables innovation and optimization of our clients' products and processes.

Located only a few steps away from one of the best cyclotrons in Europe, Incize provides radiation hardness characterization and modelling services. The ability to characterize devices immediately after irradiation can be crucial in some experiments. Therefore, proximity of our labs to the cyclotron is an important added value.

Our experts provide the following services:

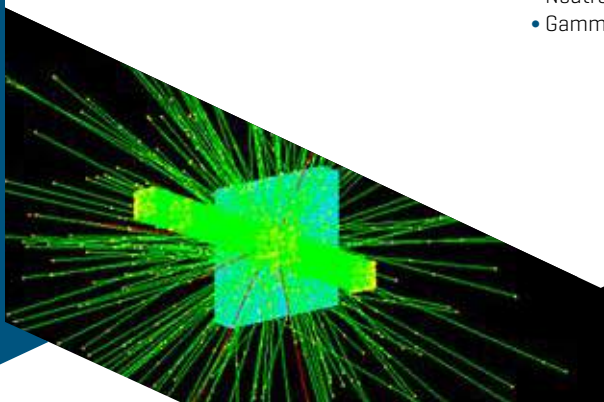
- Numerical simulations of devices and materials using TCAD and Geant4 tools
- Design and fabrication of PCBs for radiation tests
- Definition of radiation test plans and related characterization methodology
- Execution of the tests in the cyclotron
- Electrical characterization before and after irradiation
- Data analysis

Incize addresses the needs of research centres, semiconductor foundries, design houses and suppliers of electronic components for space applications through its finely chosen state-of-the-art services.

We have an excellent track record with our clients that include substrate suppliers, RF product suppliers, system houses and leading companies in the space and medical fields.

At the Cyclotron Resource Centre (CRC) in Louvain-la-Neuve we have access to the following irradiation facilities:

- Heavy ion
- Proton beam line
- Neutron
- Gamma



LAMBDA-X

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Lambda-X designs, develops and manufactures optical & metrology systems as well as sub-systems for Space, Defense & Industry.

Widely recognized as a key player in the space sector, Lambda-X has developed and manufactured more than 30 instruments which have been deployed in Space since 1996. The instruments engineered by Lambda-X are based on a broad range of optical technologies including:

- **Light Scattering**
- **Interferometry**
- **Tomography**
- **Microscopy, Hyperspectral applications**
- **Deflectometry (Patent: Phase Shifting Schlieren)**
- **And many more...**

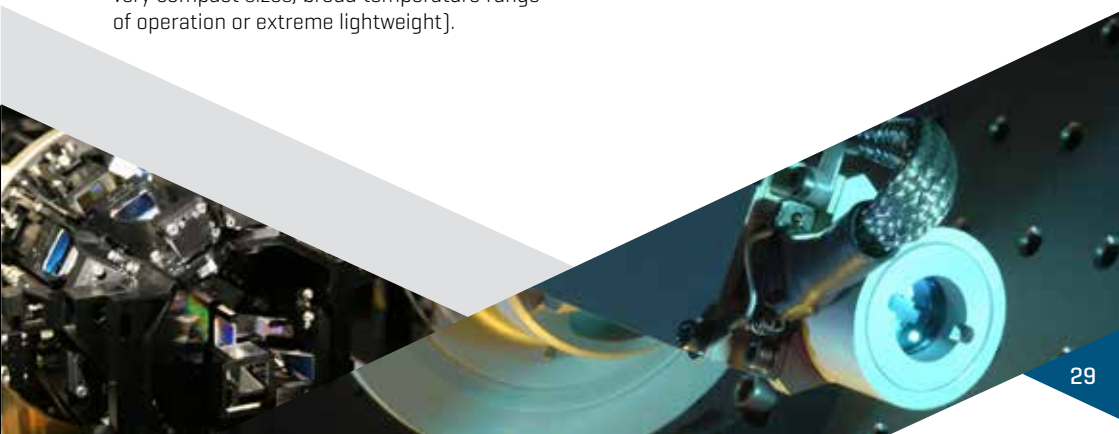
Thanks to its professional team, highly skilled in optics, mechanics, electronics and software but also to its huge experience in high level international project management, Lambda-X has the capability of handling entire projects from the very initial stage of the conception up to serial production. The activities also include Flight Models assembly.

The solutions implemented in Lambda-X's systems and sub-systems often combine several technologies into a single instrument which requires to take into account the most demanding constraints (to name just a few: very compact sizes, broad temperature range of operation or extreme lightweight).

The Space systems developed by Lambda-X find their applications in various domains:

- Earth and ground observation
- Exploration of the Martian atmosphere
- Solar pointers
- Scientific payloads
- ...

Lambda-X is certified ISO 9001:2008 & EN 9100:2009.



M3 SYSTEMS

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desenfans@m3systems.net - www.m3systems.net

SATELLITE NAVIGATION FOR INVENTING THE FUTURE M3 Systems Belgium provides a unique expertise in engineering services and technical solutions for satellite navigation applications.

M3 Systems Belgium brings its expertise in the definition and the assessment of innovative GNSS algorithms and GNSS receiver architectures, in real GNSS data collection, and in the analysis of GNSS performances.

Location-Based Services development
The applications of satellite radio navigation systems (GPS, GLONASS, GALILEO) have increased dramatically in recent years. M3 Systems Belgium has specialized in the development of location-based services that require a high performance level and the capability to provide a measure of the positioning information level of confidence.

Satellite signal processing
Signal spoofing and jamming are amongst the major threats of GNSS systems. M3 Systems Belgium has developed a recognised expertise in the assessment of GNSS systems vulnerability. Based on simulation and/or on real data collection, M3 Systems Belgium is capable of characterising the impact of interference on GNSS performances. The company has also developed competencies in advanced mitigation algorithms.

Performance evaluation
The ongoing GNSS upgrade, and the deployment of augmentation systems (WAAS, EGNOS, differential GPS, pseudolite...) have raised the need for performance evaluation. M3 Systems Belgium has become a renowned partner of institutional actors (such as ESA) for GNSS performance evaluation, including GNSS signal-in-space and receiver performances, data collection and analysis, test bench.

NSILITION

nSilition
Smaller, Smarter, Stronger

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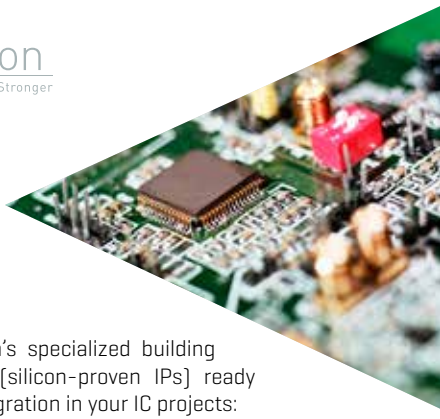

YOUR ELECTRONIC SYSTEM SMALLER, SMARTER, STRONGER

nSilition is a privately held company founded in 2006 by a team of experts in Analog and Mixed-Signal ICs. nSilition actively provides solutions from design to the production of Application Specific ICs (ASICs), where high reliability, operation in anomalous mode and possibly radiation hardening are required. nSilition delivers highly skilled engineering capabilities for products used in Telecom, Industrial Control, Space, Avionics, Transportation and Medical Equipment.

nSilition possesses the resources and expertise needed to design and produce high reliability, fault tolerant, and, if required, radiation hardened ICs and electronic systems (hardware combined with firmware).

Working with nSilition gives you access to:
nSilition's team: highly skilled and experienced engineers in analog and mixed signal IC projects.

- ✔ nSilition's specialized building blocks (silicon-proven IPs) ready for integration in your IC projects:
  - Data converters (DACs, ADCs, TDCs, etc.)
  - Timing circuits (PLLs, CDRs, etc.)
  - High speed IOs with embedded ESD protection
  - Advanced power management modules
  - Sensor interfaces
  - General purpose analog (LNAs, comparators, bandgaps, etc.)
- ✔ nSilition's testing services needed to validate your IC during the prototype phase.
- ✔ nSilition's testing facilities and to labs for advanced (cryogenic, exposure to radiation, etc.) validation tests.
- ✔ nSilition's expertise and proven track record in ICs and electronic systems for Automotive, Telecom, Medical, Avionics, Industrial and Space applications.
- ✔ nSilition's network of partner research centres (e.g., IMEC), universities (UMons, UCL, ULg, ULB) and silicon foundries such as TSMC, XFAB, ON Semiconductor, UMC, GlobalFoundry, SMIC, Altis, Silterra.

Many customers have recognized these benefits already and have engaged nSilition for design and contracting, such as major suppliers of industrial components and the European Space Agency (ESA).

NUMECA-NUMFLO

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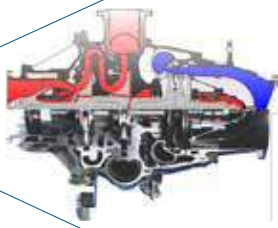

NUMECA International is a leading developer and provider of CFD ("Computational Fluid Dynamics") software systems for the Multiphysics design simulation and optimization of industrial products and processes. Its software is used for the simulation of fluids, acoustics and thermal systems in a wide range of applications. NUMECA has developed a leading position in the aerospace industry with prestigious references such as Airbus, Boeing, Safran (Snecma), Rolls- Royce, GE, Pratt & Whitney and many others.

Leader in the field of flow simulations and optimization for aerospace, power generation and propulsion applications (external aerodynamics, internal systems, aircraft engines, hydraulic, gas or steam turbines, compressors, pumps, wind turbines, etc.), NUMECA offers an extended suite of software covering a broad range of applications for both internal and external flows. Based on the most recent technology, NUMECA software systems are largely recognized for their application-driven features and interface, optimal solutions, multi-physics models, high accuracy, speed and general user friendliness.

NUMFLO is an engineering company active in the field of CFD simulations. NUMFLO is a subsidiary of NUMECA and offers advanced consultancy services for fluid flow analysis, design and optimization as well as dedicated technology solutions for multi-physics modelling. Our activities cover a wide range of applications: aeronautics, aerospace, turbomachinery, defence, energy, nuclear, combustion, cryogenics, cavitation, aeroacoustics, environment, marine, etc.

NUMFLO has a large experience in the field of aerospace engineering, for both external and internal flow analysis, using computational fluid dynamics and fluid-structure interactions.

For external aerodynamics, NUMFLO performs 3D supersonic and hypersonic flow calculations around space launchers and re-entry vehicles. The objective is to predict the aerodynamic behaviour of the devices, at the design stage. A large part of NUMFLO activities is focused on the propulsion engines, in particular of the ARIANE-5 launchers. 3D complex unsteady flow calculations are performed on the engine nozzle, to compute the fluid loads. The flow analysis also includes 3D flow simulations inside the engine turbopump. The performances of the liquid hydrogen pump are computed and optimized. Seal leakages are also studied. Complex unsteady calculations, with moving mesh techniques, are also performed to feed rotor dynamics predictions. NUMECA International and NUMFLO offer expertise in simulation design and optimization with dedicated teams and services for consulting, outsourcing and specific developments in CFD and Grid Generation. Thanks to the innovative CFD techniques implemented into NUMECA software, NUMFLO can have a considerable gain in engineering time and computational costs, compared to other CFD providers. NUMFLO can also benefit from the latest CFD developments from NUMECA team, which is a large advantage compared to competitors. NUMFLO has its own cluster with more than 2000 computational cores and can therefore be able to efficiently respond to the industrial time constraints. NUMECA International - NUMFLO are also actively involved in research and development for the implementation of Multiphysics and multi-disciplinary CFD optimization systems in strong interaction with SKYWIN and with the support from the Marshall Plan program.

OPEN ENGINEERING

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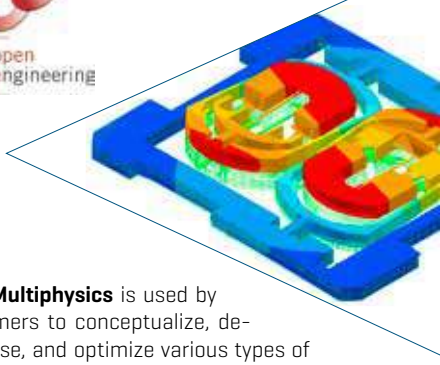


MULTIPHYSICS SIMULATION SOFTWARE & ENGINEERING SERVICES

In charge of simulation software activities within the GDTech Group, **Open Engineering** is a privately owned Belgian company, active in the Computer-Aided Engineering (CAE) market. We design, develop, and sell the **OOFELIE::Multiphysics** software solution. **OOFELIE::Multiphysics** is a 3D FEA package used to conceptualize, design, analyse, and optimize various types of systems before starting to time-consuming and costly build-and-test cycles.

MULTIPHYSICS SOFTWARE

Open Engineering's software tools are based on the **OOFELIE::Multiphysics** platform which is optimized for large, complex industrial multidisciplinary 3D design works. Our software package offers modelling capabilities for Multiphysics applications with emphasis on strongly coupled methodologies in the areas of linear and non-linear structural mechanics, vibroacoustics, piezoelectricity, heat transfer, thermoelasticity, electrostatics, electromagnetism... It allows the coupling of structure models with fluids, mechanics, temperature, and optics.

OOFELIE::Multiphysics is used by our customers to conceptualize, design, analyse, and optimize various types of systems before starting time-consuming and costly build-and-test cycles.
OOFELIE::Multiphysics's features are focused on three major domains where they are used to predict the behaviour of:

1. Sensors and actuators, including MEMS.
2. Optomechanical systems including MOEMS.
3. Multidisciplinary systems where an interaction exists between a fluid medium and a structure (F.S.I.).

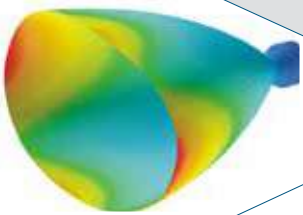
These activities encompass a broad range of products in the aeronautics, space, defence, automotive, and consumer electronics markets.

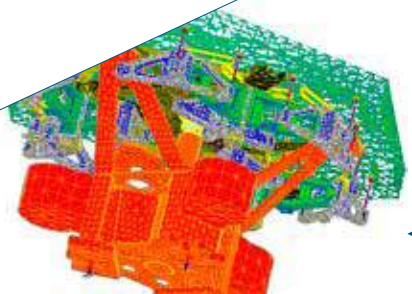
Open Engineering offers a comprehensive range of training courses.

Open Engineering works in partnership with **Siemens**, Numeca and **ZEMAX** companies.

SERVICES

Together with those software activities, Open Engineering provides customization services of its existing solution to customers' needs, and consultancy.





OSCARS

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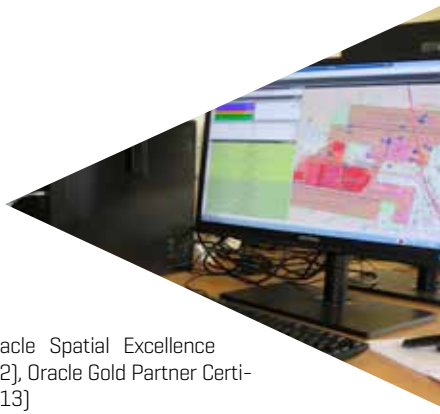

Oscars SA (Oracle Spatial Consulting and Resourcing Services) is a innovative and independent company specialized in Oracle Spatial. The company's objective is to provide a better integration between IT and GIS to make the most of the spatial component of the data.

Oscars is specialized in Georaster, MapViewer/MapBuilder, topology, geocoding, routing, networking, linear referencing, web services, 3D and OBIEE (Oracle Business Intelligence Enterprise Edition) for making better business decisions.

Oscars's flagship product, GIP for Geo Intelligent Platform, is used at airports for monitoring, in real-time, ground vehicle operations. Notifications are sent out when predefined events occur. The strength of GIP is the management of real-time geolocation.

Awards: Oracle Spatial Excellence Award (2012), Oracle Gold Partner Certification (2013)

References: Aéroports de Paris, NSI, Thales, TomTom, Autodesk, le Conseil Général du Département de la Meuse, Lille Métropole, la Mairie de Bordeaux

REDU SPACE SERVICES RSS

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Redu Space Services is a very dynamic and innovative company founded in 2007 by:

- Our dedication is the tailoring of Satellite Communication Solutions and the Operation and Maintenance of the related Antenna and communication systems.
- We provide satellite communication services to ESA as RSS operates the ESA Redu Centre including tens of antennas and operational satellite systems.
- Since 2014 ESA Redu Centre is considered as EU Critical Infrastructure and hence an ideal place to host space based activities, services and applications for Governments and Institutions with a high level of security, ranging from RPA and satellite communications applications, monitoring of critical infrastructure and assets using space capabilities to the associated space operations in the fields of security and safety.

WHAT ARE YOUR NEEDS IN SATELLITE COMMUNICATIONS?

a) Enabling Satellite Businesses, Innovative solutions. You have in mind services involving Earth Observation, Navigation and/or communications:

- We can help you with **turn-key projects** in the definition, development, integration and tests of the related satellite communications Infrastructure and services.

Case Study:

- EDRS-Mission Operations Centre -

- RSS is in charge of this turn-key project under the European Data Relay System Programme, including the design, development, AIV of an innovative EDRS-MOC for Astrium Services, managing a Consortium of international suppliers.

b) Satellite Operations. You are interested in efficient satellite operations or a back-up:

- We can help you by **Hosting and Maintaining & Operating** your satellite communication infrastructure. We deliver top-quality 24/7 services for satellite communication systems and back-ups.
- ESA Redu Centre is a highly **secured and RF protected** environment with redundant communications.

Case Studies:

- PROBA OPERATIONS, Earth Observation satellites -

- Payload and Platform Operations (SOC, MOC), several passes per day.

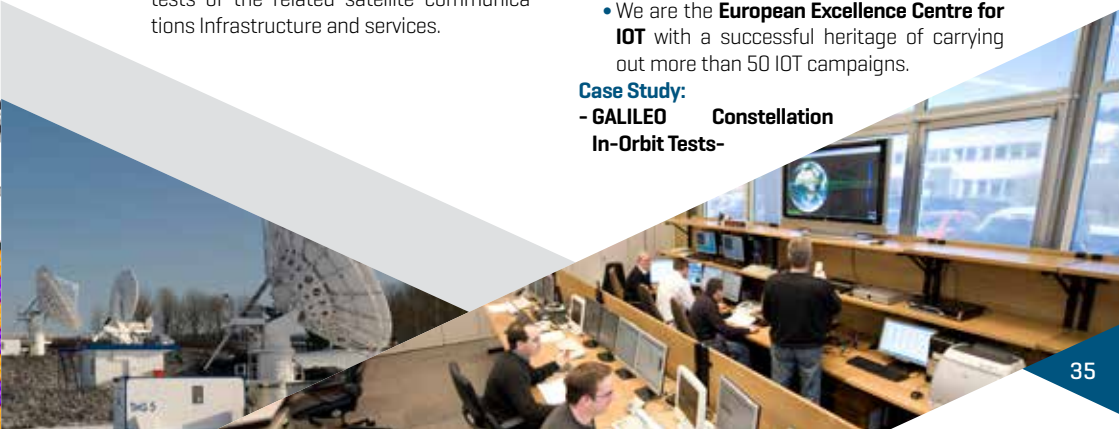
- HOSTING AND MAINTENANCE: SES BACK-UP CENTRE -

c) Payload IOT Solutions. You are looking for a leading company to carry out your In-Orbit payload tests:

- We are the **European Excellence Centre for IOT** with a successful heritage of carrying out more than 50 IOT campaigns.

Case Study:

- GALILEO Constellation In-Orbit Tests-



RHEA SYSTEM

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RHEA is a space system engineering consulting and software company that offers knowledge-based services and innovative solutions to the space industry since 1992. Our team and products support all phases of space mission lifecycle from payload and spacecraft design and engineering, through testing, verifying and operating the mission, to data management and cyber security.

RHEA supports a wide range of space missions with some 200 employees, working from its 9 offices and client sites in Europe and Canada. The vast majority of RHEA personnel consists of space system and software engineers as well as scientists, qualified with postgraduate degrees.

INNOVATIVE SOLUTIONS FOR SPACE

With RHEA's broad Space expertise, we deliver Professional Engineering Services, Tools to make the Life cycle of a Space project more effective (Concurrent Design, Secure Engineering tools and MOIS) focusing vastly on the domain of Space Systems, On-board, Ground Control Segment, User Ground Processing and Dissemination, Cyber Security.
RHEA provides the CDP™ - Concurrent Design Platform, the main engineering tool to support multidisciplinary teams to perform Efficient and Timely Optimization of the design saving time and money in the later phases of a mission.

RHEA's MOIS - Manufacturing and Operations Information System - is the industry leading suite of tools for spacecraft and ground segment testing, operations preparation and automation. MOIS allows spacecraft manufactures and operators to work on the same operations knowledge to better build, validate and fly a satellite mission.

In Cyber Security RHEA provides high quality Information Security Services and Tools, for infrastructure protection, cyber defence solutions, and risk management. Cyber Security is one of the major challenges in Space Systems.

Organizations of all sizes use cloud computing to reap number of benefits, including cost reduction, flexibility, agility and security. The RHEA Group with SixSq offers cloud products and services to help you take advantages of these benefits. User Segments do follow a paradigm shift from dedicated infrastructure towards Processing and Dissemination in the Cloud. Primary target markets are Earth Observation and Telecommunications.

ACHIEVING FOR TOP CLIENTS

RHEA supported over 80 missions for international and national agencies, commercial satellite operators, system integrators, satellite manufacturers and other space suppliers. Some of our clients include ESA, EUMETSAT, EU, CNES, DLR, ASI, CSA, EADS Astrium, Thales Alenia Space, OHB, and Intelsat.

SABCA

S.A.B.C.A.

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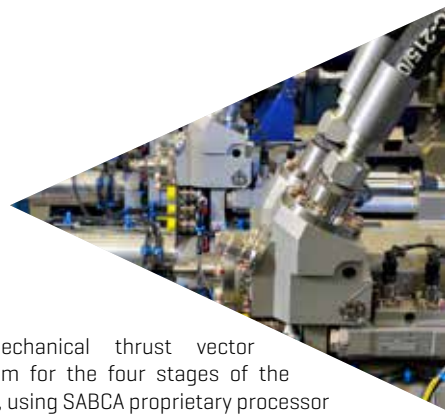

YOUR KEY PARTNER FOR CHALLENGING SPACE PROGRAMMES

Innovator and industry leader in the design, development and production of:

- thrust vector actuators and thrust vector control subsystems
- high stiffness highly loaded aerospace metallic and composite structures

for a wide spectrum of demanding space applications, (launchers, space vehicles...).

Sabca activities in Ariane 5 program cover design, development, qualification and production of:

- rear skirt and front skirt of the solid rocket boosters (SRB)
- electrohydraulic actuators for thrust vectoring of the SRBs, of the main cryogenic stage and of the upper stage
- laminated vibration damping device, filtering the vibrations generated by the SRBs in order to protect the payload from undesired vibrations.

In Vega program, Sabca has the responsibility of the design, development and qualification of:

- interstage 0/1, heavily loaded metallic structure located between launch pad and first stage
- electromechanical thrust vector subsystem for the four stages of the launcher, using SABCA proprietary processor HBRISC2.

SABCA has been awarded the complete electromechanical thrust vector control subsystem for all the stages of the upcoming Ariane 6, including the actuators, the control units (ECU) and the power units (EPU).

In the same way, Sabca has recently started the development of such electromechanical thrust vector subsystem (EMTVC) for the new stages of the upcoming Vega-C launcher.

For those two applications (Ariane 6 and Vega-C), the core of the electronic control unit is the new generation, called CLP (Control Loop Processor), of a proprietary processor space radiation hardened by design and fully developed by Sabca. This deterministic microprocessor constitutes a new approach for motorised motion control. This new version (CLP) is considered an Application Specific Standard Product by the European Space Agency.

Both technologies (Electromechanical actuation and HBRISC2 processor) have been successfully used for the flaps control system of the experimental re-entry vehicle IXV launched in February 2015.

SAFRAN AERO BOOSTERS

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EUROPEAN LEADER FOR SPACE FLOW REGULATION VALVES

Safran Aero Boosters designs, develops and produces modules, equipment and test cells for aerospace engines. The company equips most commercial aircraft currently in service, as well as the Ariane 5 and future Ariane 6 launchers.

SPECIALIST IN LIQUID PROPULSION VALVES

Safran Aero Boosters is the European leader for the design and manufacture of valves and flow regulation equipment for liquid propulsion of space launchers. Its competence in engineering covers all propulsion system fluids, from extreme cryogenics to combustion gas (nitrogen, helium, hydrogen, oxygen, hydrazine, UDMH, methane,). The range of products notably includes shut-off valves, check valve, proportional control valves, bistable and mono stable electro valves, as well as complete pressurization systems. To date, more than 12,000 pieces of flight equipment have been delivered with an operational reliability of 100%.

OPTIMIZATION OF SYSTEMS

On a space market that calls for the highest technological requirements with controlled mass and cost, beyond the role of designer and manufacturer, the company offers to accompany its customers and partners in the optimization of their systems. It dedicates a very significant portion of its research efforts to maintaining its technological edge, particularly in the areas of tribology and sealing, new materials, functional modelling, electrical design optimization and actuator control, as well as small propulsion for satellite platforms. Development on manufacturing process such as Additive Manufacturing is as well ongoing to optimize production costs.

Safran Aero Boosters is selected as a partner with prime contractors ASL in the major future launcher programs.

SAMTECH 〉 SIEMENS

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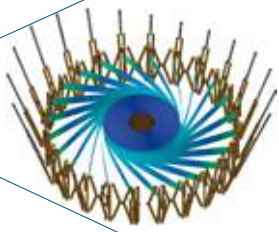


SAMTECH s.a. is a Belgian subsidiary of Siemens PLM Software. SAMTECH is based in Liège Science Park (Spatiopôle) and develops the LMS Samtech Samcef FEA software that has been used for more than 40 years by the European Space Industry to solve critical performance issues and complex space problems with the help of the 3D modelling and simulation.

For the story, SAMTECH is a spin-off created in 1986 from the aerospace laboratory of the University of Liege (Belgium), for the commercialization of the general Finite Element Analysis (FEA) package LMS Samcef developed at University of Liege since 1965.

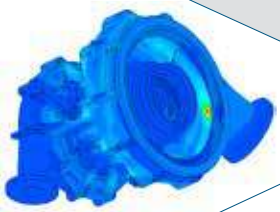
Numerical simulation disciplines covered by SAMTECH software in space domain are numerous with linear and non-linear composite or metallic structures analyses, non-linear flexible mechanisms simulation, thermal analysis, coupled thermo-mechanical analysis, fracture mechanics, analysis of structures tolerance to damage, prediction of structures fatigue, rotor dynamics simulation, parametric analysis and structural optimization.

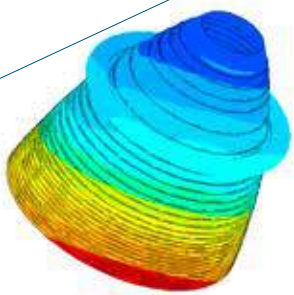
Typical space applications of SAMTECH top class simulation technology are the sizing and the optimization of launcher body structures, the thermal and mechanical analyses of launcher propulsion engines (turbopumps, nozzles, valves...), the simulation of satellites deployable appendices like solar.

Arrays, reflectors, telecommunication antennas, booms, the analysis of inflatable space structures...

The mathematical modelling and numerical simulation technology of SAMTECH benefits of an unequalled reputation and is recognized by ESA as preferred nonlinear solution allowing in particular performing numerical simulations of very large deployable and inflatable space structures.

Other typical customers of SAMTECH aerospace industry are Airbus Defence & Space (F), CNES (FR), Snecma (Safran) (F), Thales Alenia Space (I), Cryospace (F), Air Liquide (F), Airbus Group Innovations (F), SABCA (B), SONACA (B), Techspace Aero (Safran) (B)...





SHUR-LOK

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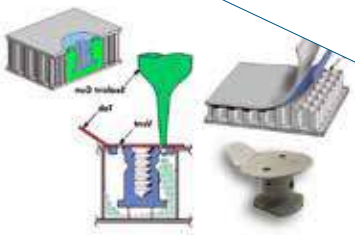
Shur-Lok International is a world leader in the design and manufacture of critical performance Fasteners which have become industry standards for Aerospace civil and military applications.
Shur-lok International has been recognized as a pioneer in Space panel inserts for 50 years (NAS1832, NAS1834, NAS1836, etc...) with also a strong expertise in producing hard metal machined parts for Aircraft engine & airframe or Helicopter components.

Shur-Lok International is EN9100 & NADCAP certified and processes all aerospace materials, specifically high-alloyed steels, stainless steels, high-temperature-resistant steels, titanium or aluminium.

Shur-Lok International is part of SPS Fastener Division, Precision Castparts Corp. (PCC) a worldwide, diversified manufacturer of complex metal components and products.

Precision Castparts Corp. is leader in structural investment castings, forged components, and airfoil castings for aircraft engines and industrial gas turbines. Airbus, Boeing, GE, Rolls-Royce, and many other leading manufacturers depend on us for critical airframe, engine, power generation, medical, and general industrial components.

With few exceptions, every aircraft in the sky flies with parts made by PCC.



SONACA sonaca

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In synergy with its main business of aero structures development, manufacturing, assembly, testing and qualification, SONACA is an appreciated partner in challenging space programs covering large satellite platforms, payload structures, atmospheric re-entry, ISS infrastructure, planetary exploration and other scientific projects.

Major customers include AIRBUS Defence & Space, Thales Alenia Space, ESA and CNES.

RELIABILITY: OUR KEY COMMITMENT

Over the last 30 years, SONACA built a reputation for top notch performance on all aspects of the development of advanced structures for a wide scope of space applications, such as HERMES, the Atmospheric Re-entry Demonstrator (ARD), and the BEAGLE 2 Mars lander equipped with a "Made in SONACA" CFRP Frontshield.

Leading Earth Observation satellites, such as CSO, PLEIADES and SPOT5, scientific missions such as COROT all involving mission-critical structures are projects developed and produced by SONACA. Since 2015, SONACA is also involved in the development and manufacturing of the structure of several instruments in the MetOp SG program.

SPACE FOR INNOVATION

Through ESA's FLPP programme, SONACA has developed an innovative cryogenic upper inter-stage composite ring demonstrator for new space launchers receiving the JEC 2016 world innovation award in the space category.

FULL-SCOPE CAPABILITY

SONACA offers its Space Customers the best of both worlds: the flexibility of a highly experienced core Space Team, using large in-house resources of its Engineering, Tests and Production infrastructures, to serve a wide range of structural applications.

SPACEBEL

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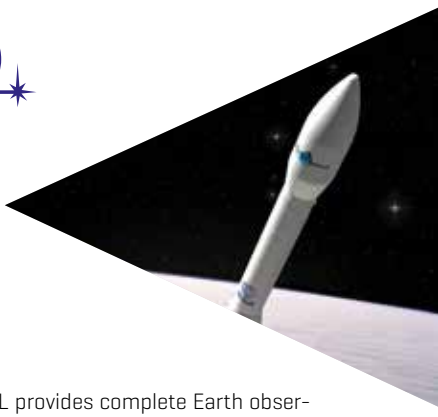


"REACHING INTO SPACE TOGETHER"

Established since 1988, SPACEBEL is a Space systems and software engineering company that has grown in the Space market to become a trusted developer of advanced IT solutions and a related service provider.

Today, SPACEBEL is in the international mix of small satellite system suppliers.

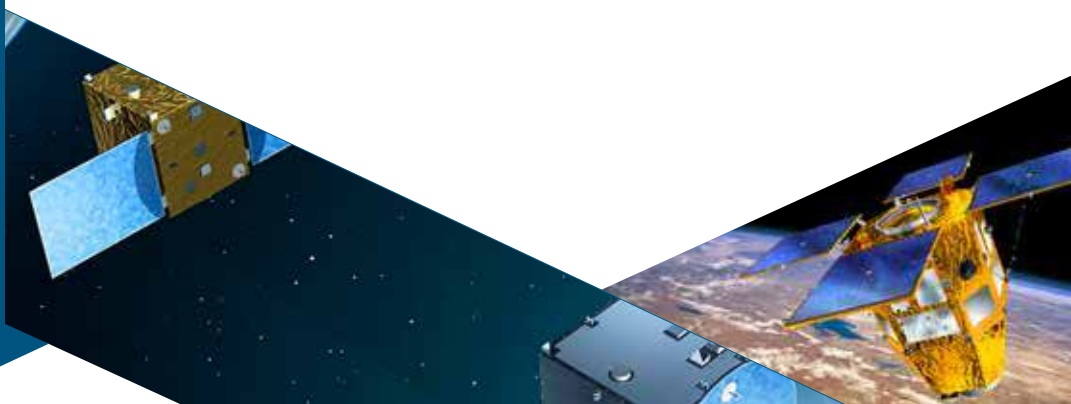
The company operates in the Space and Earth monitoring applications sectors, serving Space agencies, government departments, major aerospace companies, European institutions as well as the commercial market.

SPACEBEL is active in several domains including Earth observation, Space flight, science, telecoms, navigation, exploration, launchers, balloons and space situational awareness.

Our skills range from the mission definition and analysis of Earth observation minisatellites, over the design, development, integration, validation of IT systems for the Space industry to geospatial information systems.

- SPACEBEL provides complete Earth observation solutions, including user requirements and system definition.
- SPACEBEL delivers on-board control and data handling software for satellites and space vehicles, satellite simulators, control and mission centres as well as EO Web services provisioning infrastructures. So far, SPACEBEL has contributed to the success of more than 40 Space missions aimed at better understanding the Earth and the Universe.
- SPACEBEL offers Earth observation services for forestry, water, industrial risks, atmosphere, mine exploitation and natural resources management and contributes to help decision makers worldwide in protecting and improving people's life sphere.

SPACEBEL offices are located in Belgium (Liège, Brussels) and in France (Toulouse).



TAS BELGIUM

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www.thalesaleniaspace.com

A WORLD LEADER OF ON-BOARD AND POWER ELECTRONICS FOR LAUNCHERS AND SATELLITES

Thales Alenia Space Belgium is a subsidiary of Thales Alenia Space, the European leader in satellite systems and a major player in orbital infrastructure. Thales Alenia Space is a joint-venture of Thales and Leonardo-Finmeccanica and is a world reference in the fields of telecommunications, radar and optical Earth observation, defence and security, navigation and science.

LEADER IN POWER UNITS FOR SATELLITES

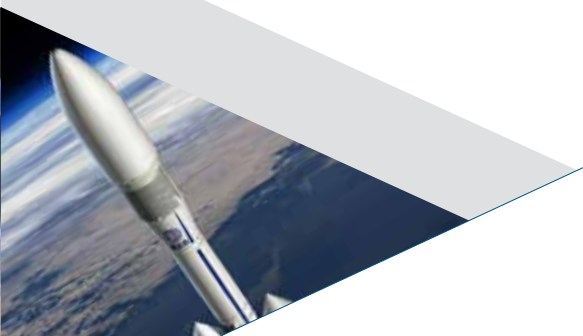
Since 1963, Thales Alenia Space Belgium has contributed to the most European space programs.

The company is a World leader in satellite power conditioning and management from micro-satellites up to large GEO satellites. Thales Alenia Space Belgium enjoys a position at the forefront of flight electronic products: battery and solar array regulators, power supplies for travelling wave tubes, control electronics for plasmic propulsion thrusters...

A few references: The Galileo navigation satellites, the earth observation satellites Sentinel, Meteosat and Pleiades, the ATV for the International Space Station, the scientific missions with Herschel & Planck, Rosetta, Exomars, and a large number of telecommunication satellites, including the constellations Globalstar, O3B and Iridium Next.

FIRST SUPPLIER OF ELECTRONICS FOR EUROPEAN LAUNCHERS

Thales Alenia Space Belgium delivers 50% of the on-board electronics for Ariane 5. The company also produces the safeguard system for Ariane 6 and the Russian launcher Soyuz launched from French Guyana. Thales Alenia Space Belgium also delivers equipment for the Vega launcher. And last but not least, the company develops control benches for the Ariane family and specific check-out systems for satellite platforms and payload equipment. Based in Charleroi and Leuven, Thales Alenia Space Belgium employs 700 staff.



TIMELINK MICROSYSTEMS

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TimeLink Microsystems is an engineering company set up in 1978 in Toulouse (France) with a Belgian office since 2013. TimeLink Microsystems offers a complete range of dedicated products for high precision Time and Frequency systems, taking in account synchronization and datation of signals. The products are: Atomic reference clock, Time and frequency generator disciplined by GPS or multi-constellations GNSS, Time distributor and transcoders, NTP & PTP time server, Optical transmission module and equipment, Multiprotocole display... We also set up of solution following specifications.

TimeLink Microsystems partners with all the major brand names of the defence and space market: AIRBUS, ASTRA, ASTRIUM, DCNS, CNES, EADS, ESA, EUTELSAT, NATO, TELESPAZIO, THALES, ZODIAC...

Teaming for success on major programme's:

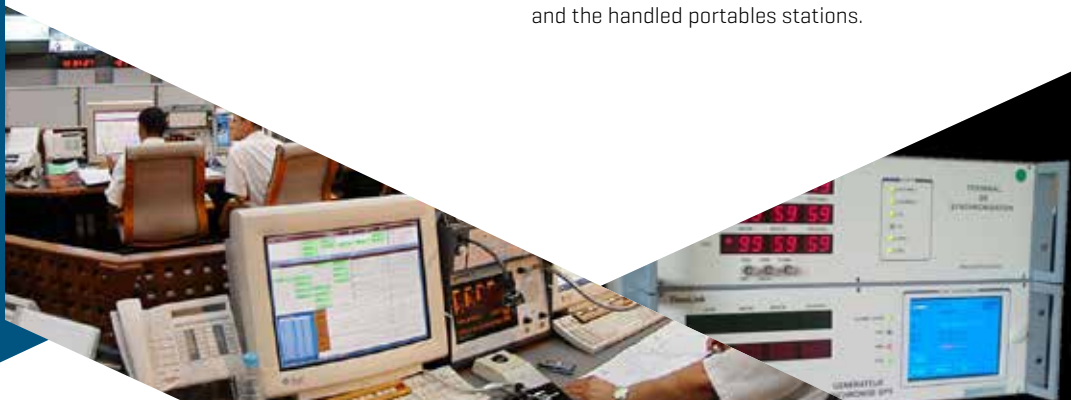
ESA Europe's Spaceport – Synchronization system of the Kourou Space Centre: Synchronization System of the Centre Spatial Guyanais (CSG). Synchronization of all launch base operations, UT, Countdown & HO (launch time) generation and distribution. Frequency reference distribution for localization, trajectography, telemetry. Timing precision < 50 µs Frequency stability (DF/F) better than 1E-11.

ESA – VEGA new launch rocket: Time/Frequency system for the new launch base in Kourou.

ESA – SOYOUZ T/F system of the new SOYOUZ launch base in Kourou, including interfaces between Russian and European systems through IP/HDLC network gateways.

EGNOS atomic reference of the RIMS stations (Ranging and Integrity Monitoring Stations) providing high stability and high frequency accuracy to the converters and ranging equipments.

DGA – THALES-SYRACUSE program (Syracuse III will provide autonomous high-speed communication services and connectivity for all types of military telecommunication networks). TIMELINK provides the Time/Frequency sub-systems for the metropolitan base stations, the sheltered mobile stations and the handled portables stations.



V2I

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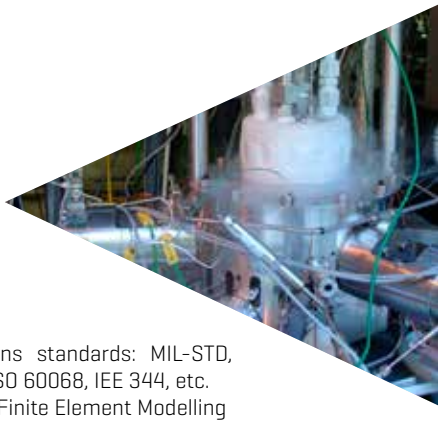


V2i provides a full range of services in the field of mechanical vibrations

- Based on researches of international repute of the University of Liege in the field of structural dynamics
- Continuously improved and updated by massive R&D programs in close collaboration with Universities

Thanks to its complementary expertise in numerical modelling and experimental testing, and thanks to innovative tools, V2i offers to its customers the integration of simulation and testing in customized solutions.

- **Finite Element Modelling:** all types of analysis: linear or nonlinear, static, dynamic, harmonic, time and spectral responses
  - Fatigue: lifetime prediction, cumulated damage
  - Virtual Shaker Testing
  - Rotor dynamics
  - Model correlation thanks to experimental modal analysis and measurements

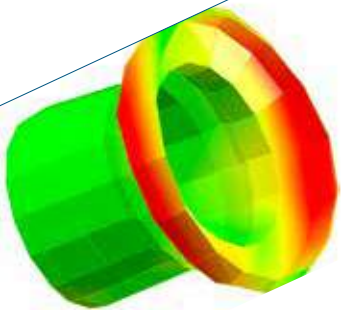
- **Shaker Testing:** wide range of test facilities (13 kN to 120 kN): hydraulic, electrodynamic, and piezoelectric shakers, climatic chamber
  - Excitations: sine, random, combined, shocks
  - Vibrations standards: MIL-STD, RTCA, ISO 60068, IEE 344, etc.
  - Link to Finite Element Modelling
  - Vibration tool design and manufacturing

- **Vibration Measure**
  - Modal analyses and Operating Deflection Shapes
  - On the field or in the lab
  - Wide range of instrumentation and measurement systems
  - Rotating machinery diagnostic
  - Link to Finite Element Modelling for correlation

- **Turnkey Monitoring Solution:**
  - Fully customized hardware and software for special applications
  - Measurement Systems for test benches
  - End of Line testing systems
  - System Condition Monitoring
  - Data acquisition, processing and analysis
  - Any acquisition kind

- **Certifications:**
  - ISO 9001
  - Safran - Rolls-Royce
  - 3 Certified LabView Developers

National Instrument Alliance Partner



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More than 30 years of experience in the field of Space Operations Service & Engineering activities, providing a significant contribution to the most major Space programmes of the European Space Agency. We work on the ground to build bridges into space, contributing to the success of ambitious missions.

THE ONE-STOP SHOP IN SATELLITE GROUND INFRASTRUCTURE

WHO WE ARE

With a 1,2 Million € capital and more than 100 employees, we operate from Belgium with two permanent establishments - in Germany and The Netherlands, close to the operational (ESOC) and technological (ESTEC) centres of ESA – and with project in Italy, Spain, France and UK. We are involved in the most important European space projects ensuring the highest standards of quality, safety and reliability.

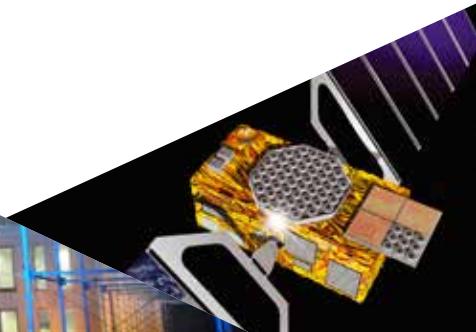
WHAT WE DO

Our offer is aimed at highly competitive markets - from defence to satellite navigation, up to space and telecommunications - and is constantly enhanced through continuous investments in R&D, as well as in human capital.

Since our inception, we have participated to the most representative ESA programmes in the Telecommunication, Earth Observation and Scientific missions, contributing with skilled operational and engineering services, systems and software tools for Ground Data Network. We are deeply involved in the Galileo Programme with significant contribution in the Ground Mission and Control Segment.

OUR CAPABILITIES

- Satellite Ground System
- Software Ground System
- Operation and System Engineering
- Users Applications
- Expert Support and Services



WALPHOT

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USER-DRIVEN AND DETAILED GEO-SPATIAL PRODUCTS AND SERVICES

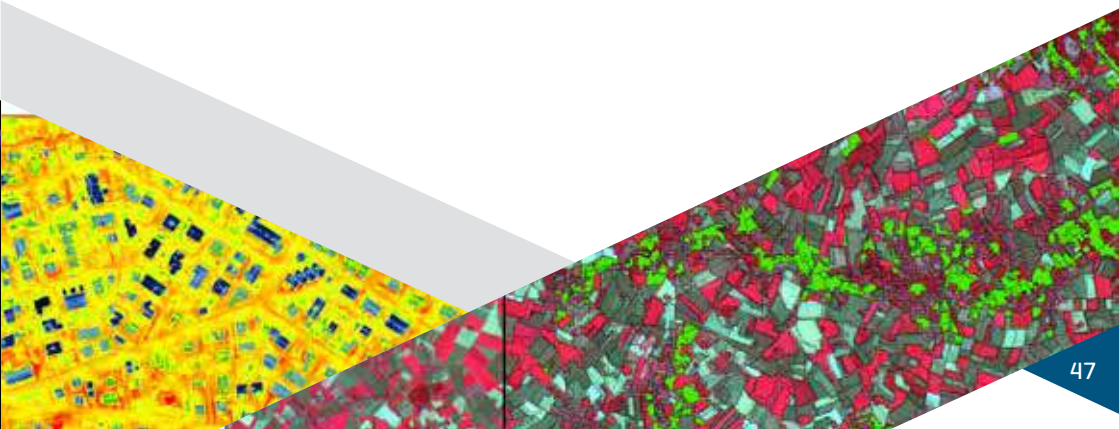
In support to local and regional authorities as well as private customers, WALPHOT develops remote sensing services in Belgium, Luxembourg and within European projects since more than 35 years. WALPHOT is the specialist of the whole chain of geographic data processing from the acquisition of information (spaceborne or airborne) to the supply of tailor-made solutions in mapping, geodatabase and spatial modelling.

GEO-INFORMATION AND MAPPING SOLUTIONS

WALPHOT supports customers in their spatial management needs. Pro-actively and in response to regional and national tenders, to European directives and policies and to International regulations, WALPHOT provides 3D mapping solutions to various planning authorities. Our applications cover a wide range of domains including border management, land planning, industrial emergency, railway network management, large-scale mapping, heat loss studies or regional airfields maintenance plans.

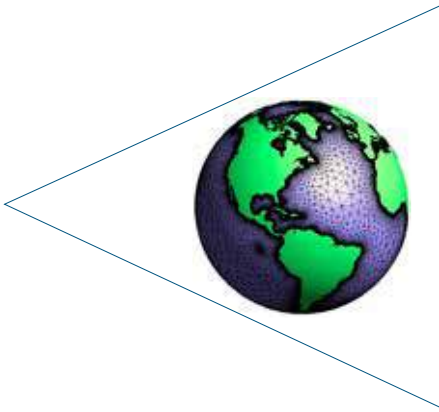
CUSTOMIZED RESPONSES FOR SPATIAL MANAGEMENT

Thanks to the expertise in precise aerial photography and very high resolution imagery, WALPHOT produces high quality 2D/3D customized geographical products. Involved in several European Commission and European Space Agency projects, the company offers products and services using aerial and/or satellite imagery (optical and radar) as input data for the Copernicus program. Contact us to set up your own geo-spatial solution.



UNIVERSITIES

APPLIED MECHANICS POLE



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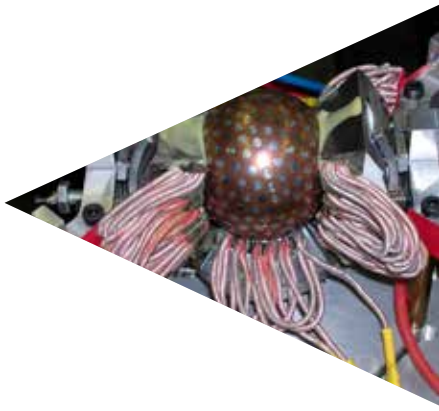
vincent.legat@uclouvain.be - www.uclouvain.be/mema

The research objective of the Applied Mechanics Pole of UCL is the theoretical prediction of the behaviour of solids and fluids, with the help of new mathematical modelling and computer simulation techniques. Applications concern new materials and their forming processes. The main research topics are:

- Fluid mechanics
- Solid mechanics (composites materials, damage mechanics)
- Simulation of industrial processes (extrusion, injection moulding)
- Numerical methods (finite element, adaptive and stochastic methods)
- Algorithms for scientific computations

CENTRE FOR RESEARCH IN MECHATRONICS



Place du Levant, 2 - L5.04.02
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info@cerem.be - www.cerem.be

The Centre for Research in Mechatronics focuses on design, modelling, simulation, optimization and prototyping of mechatronic systems.

The CEREM combines its various fields of expertise in solving the technological challenges arising from new applications. The modelling, design and prototyping of mechatronic devices involving sensors, actuators and control systems is central. The goal of the CEREM is to grasp the problem specifications and propose an integrated and optimal solution, in various fields, like mobile robotics, medical robotics, multibody system dynamics, aeronautics, or high performance actuation.

CENTRE FOR SPACE RADIATIONS

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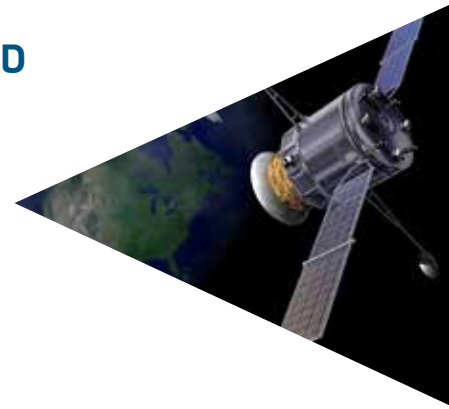
Tel.: + 32 (0) 10 47 34 02
mathias.cyamukungu@uclouvain.be - www.csrsrv1.fynu.ucl.ac.be/csr_web/index.php

The Centre for Space Radiation (CSR) conducts research aimed at providing the Space Physics community (research scientists, instrument developers, aerospace industries) with the most accurate characteristics of the space radiation environment. It is mainly active in the:

- design and characterization of space radiation detectors (collaborations with ESA)
- analysis of space radiation data (energetic particles...)
- theoretical studies of the radiation belts
- simulation of particle interaction with matter (using GEANT-4)

COMMUNICATION SYSTEMS AND NETWORKS



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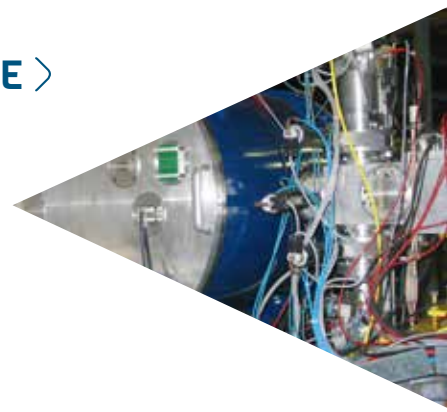
Luc.Vandendorpe@uclouvain.be - www.uclouvain.be/en-352438

The Communication Systems and Networks group in the UCL ICTEAM institute performs interdisciplinary research integrating electromagnetics, signal processing, electronics and computer science.

The main research areas cover communications systems for mobile radio (including satellite UMTS), microwave remote sensing (from satellite radars, SAR and radiometers), signal processing, image processing and coding, antennas and numerical electromagnetics.

CYCLOTRON RESEARCH CENTRE



Cyclotron Research Centre - Chemin du Cyclotron, 2
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nancy.postiau@uclouvain.be - marc.loiselet@uclouvain.be - www.cyc.ucl.ac.be

The main activities of the Cyclotron Research Centre of UCL can be classified in two categories:

- Research and development in the field of particle accelerators, ion sources and their applications
- Production of accelerated ion beams for nuclear physics, chemistry, medicine, isotope production, and technological applications

In this context, different beams of CYCLONE, the cyclotron of Louvain-la-Neuve and its Cobalt-60 irradiator are used by space agencies and manufacturers to perform electronic device testing.

ELECTRONIC CIRCUITS AND SYSTEMS

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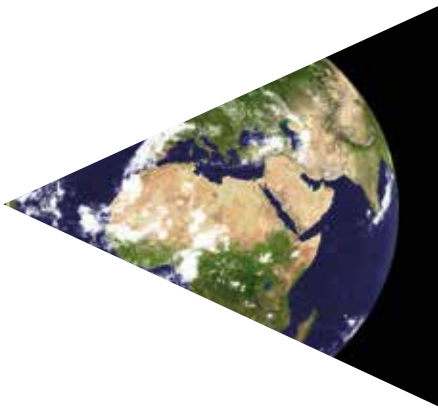
Denis.Flandre@uclouvain.be - www.uclouvain.be/en-352440

The research in Electronic Circuits and Systems (ECS) in the UCL ICTEAM Institute spreads over all levels of abstraction in electronic design: from nanoscale CMOS process technology to disruptive analog/digital/RF circuit building blocks, to complex mixed-signal systems-on-chip (SoCs) and PCBlevel embedded systems.

- The activities are the design, fabrication, prototyping and characterization of the targeted devices, circuits and systems, which are carried out in collaboration with application experts in various fields (smart and energy-harvesting sensors, aerospace, communication...).
- Design and prototyping are done with professional CAD tools and methodologies, for fabrication in industrial process down to 28nm SOI CMOS.
- For the fabrication of non-standard semiconductor devices, the UCL-ECS is supported by the associated 1000-m2 WinFab cleanroom.
- Complete multi-disciplinary characterization and modeling of devices, circuits and systems with respect to wide temperature operation (from 4 to 600 K) and to irradiation is performed at WELCOME facility.

ENVIRONMENTRICS AND GEOMATICS GROUP >



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Pierre.Defourny@uclouvain.be - www.uclouvain.be/en-elie

The research team in Environmetrics and Geomatics aims to develop quantitative methods of space-time data analysis, satellite remote sensing interpretation, GIS and process-based modeling applied to environmental issues.

The research focuses on optical and SAR remote sensing to estimate biophysical variables (vegetation and soil) and to monitor land cover dynamics in a relevant manner for the agriculture and forestry sectors.

INSTITUTE OF NEUROSCIENCE / ICTEAM >

IONS:
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Tel.: + 32 (0) 2 764 53 67
Jean-Louis.Thonnard@uclouvain.be
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ICTEAM:
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Philippe.Lefevre@uclouvain.be
www.uclouvain.be/en-icteam

The Institute of Neuroscience strongly collaborates with the Institute of Communication, Technologies, Electronics and Applied Mathematics since several years in order to unravel the sensory-motor mechanisms being active during object manipulation. This collaboration will culminate very soon in the launch of our experimental setup on the International Space Station.

The fields of research focus on:
- complex interactions between feed-forward and feedback mechanisms in the control of dexterous manipulations;
- eye-hand coordination;
- mechanical properties of fingertip-object contact.

These researches are conducted on normal subjects under unusual environment like microgravity. Similar researches are also conducted on patients presenting neurological disturbances.

LABORATORY OF FOOD AND ENVIRONMENTAL MICROBIOLOGY

UCL Université catholique de Louvain

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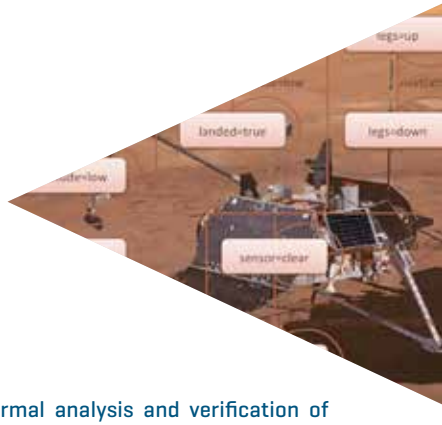
jacques.Mahillon@uclouvain.be - www.uclouvain.be/en-elim

The laboratory of Food and Environmental Microbiology researches are focused on the study of the genetic flexibility of opportunistic and pathogenic bacteria, in relation with their differential virulence.

In this context, the laboratory of Food and Environmental Microbiology also studies bacterial genetic transfers occurring in confined environments such as the ISS with the aim to assess the bacterial contamination of spacecrafts.

LOUVAIN VERIFICATION LAB



UCL Université catholique de Louvain

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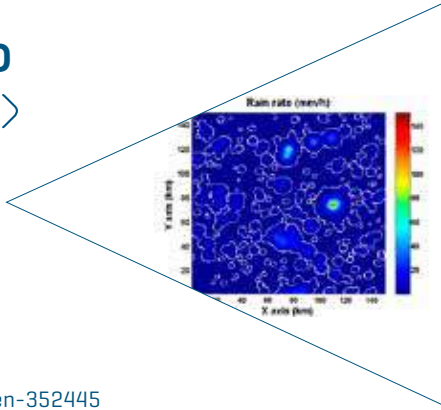
LVL investigates principles, tools and applications of formal analysis and verification of safety-critical computer systems

The research at LVL mainly revolves around the automated verification technique known as model checking. We devise new analysis methods and algorithms, implement them into software tools, and assess them on actual case studies and applications.

The following fields of interest are particularly relevant for space applications:
- Verification of Human-Computer Interaction (mission control, automated flight guidance systems, automation surprises),
- Analysis of Observability and Diagnosis (on-board selfdiagnosis, sensor placement),
- Verification of Autonomous and Intelligent Systems (autonomous space probes, planning and scheduling).

MICROWAVE ENGINEERING AND APPLIED ELECTROMAGNETISM



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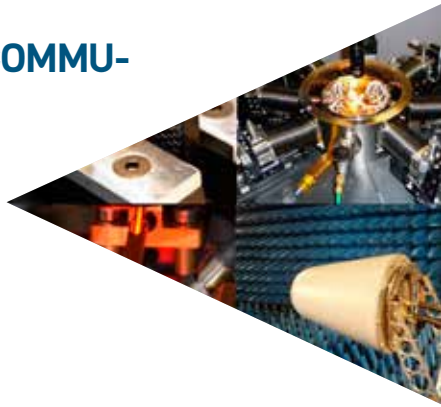
Danielle.Vanhoenacker@uclouvain.be - www.uclouvain.be/en-352445

The group forms a multidisciplinary team, involving diverse aspects related to Microwave Engineering and Electromagnetics: design and measurements of microwave and millimetre-wave devices and materials, satellite and wireless propagation and sensing, antenna technology and numerical electromagnetism.

The main research activities are

- Modelling of Land-Mobile Satellite channel using measurements and development of models for the tropospheric degradations in earth-space channels. The models use meteorological parameters as input and are used for geostationary and non-geostationary satellites, from L to V band
- Microwave remote sensing of the ocean
- Antenna and antenna arrays technology

WALLONIA ELECTRONICS AND COMMUNICATIONS MEASUREMENTS



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pascal.simon@uclouvain.be - www.uclouvain.be/welcome

The Welcome technological platform at UCL provides multidisciplinary tools in the field of electronics and communications. A wide panel of characterization techniques under various stimuli are available for testing novel technologies in the aeronautics and space sectors.

Extending from molecules to signals, WELCOME offers through a broadband and unified approach a wide variety of electrical and electromagnetic measurements techniques, going from the physical behavior of materials, sensors and devices, to systems architectures and signal propagation between them.

Welcome brings together research, education, and services to the industry.

ACTIVE STRUCTURES LABORATORY

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1050 Brussels - BELGIUM
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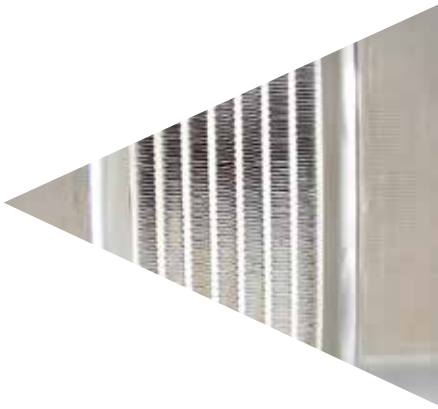
andre.preumont@ulb.ac.be - www.ulb.ac.be/scmero/

Adaptive Optics - Telescope - Vibration Isolator - Robotics - Space Applications

- Vibration Isolation and Damping: Hard and Soft Stewart Platforms for Payload Isolation and Steering
- Robotics: Walking Machines, Active Compliance, Gait Control, Micro Robots
- Portable Haptic Interfaces: Haptic Interfaces Development for Space Applications (ESA)
- Telescopes: Adaptive Optics for Space Telescopes and Terrestrial Extremely Large Telescopes
- Space Structures: Active Damping of Flexible Structures

AERO-THERMO-MECHANICS DEPARTMENT



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patrick.hendrick@ulb.ac.be - http://atm.ulb.ac.be

Fluid mechanics - Lubrication - Aero-engines - CFD - UAV's - Heat exchangers - Space propulsion - N2/O2 separation

The main research themes concern space air breathing propulsion, hybrid rocket propulsion, gas turbine engine lubrication systems, gas turbine propulsion, UAV's, hydrogen combustion and liquid hydrogen storage, high enthalpy flows (including re-entry) and numerical flow simulations.
The laboratory has test benches for gas turbine engine lubrication equipment, heat exchangers, two-phase flow separation systems and hybrid rocket engines.
Several projects in FP7, JTI Clean Sky and Wallonia Marshall Plan.

BIO, ELECTRO AND MECHANICAL SYSTEMS – MECHATRONICS AND VIBRATION CONTROL 〉

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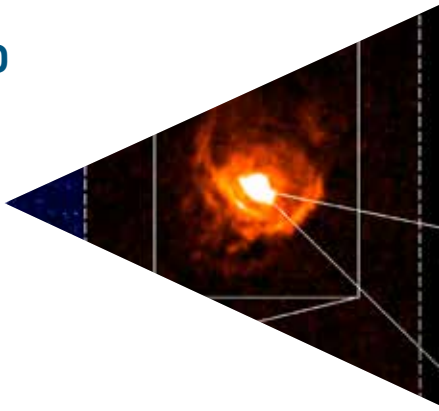
ccollett@ulb.ac.be - www.beams.ulb.ac.be

Active vibration isolation and damping - Mechatronic architectures - Vibration sensors

The group is conducting researches in the following fields:
- Active isolation of payloads from launcher disturbances
- Vibration damping and shape control of large deployable space telescopes
- Interferometric inertial sensors
- Vibration control of gravitational wave detectors
- Multi-degree-of-freedom nanopositioning systems
- Magneto-rheological dampers

Our laboratory has state-of-the-art equipments and facilities for validating experimentally the proposed solutions.

INSTITUTE OF ASTRONOMY AND ASTROPHYSICS 〉



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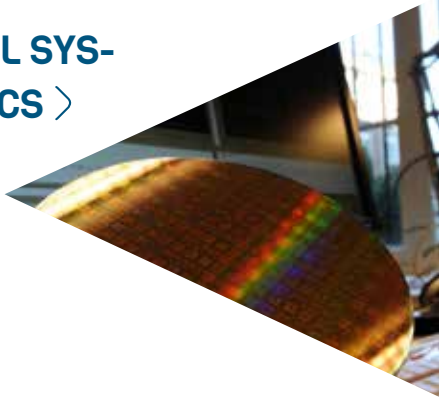
Alain.Jorissen@ulb.ac.be - www.astro.ulb.ac.be

Astrophysics - Stars - Space astronomy - Nuclear astrophysics – Nucleosynthesis - Cosmochemistry

The research interests cover various fields, among which nucleosynthesis, nuclear astrophysics, stellar evolution and chemical composition, binary stars, neutron stars, modified Newtonian dynamics...

Some projects:
- PRODEX: Processing of the Gaia data for non-single stars and exploitation of Herschel data (PRODEX)
- ARC: Heavy elements in the universe: Stellar evolution, nucleosynthesis and abundance determinations
- IISN: Microscopic nuclear models for evolution and stellar nucleosynthesis

BIO, ELECTRO AND MECHANICAL SYSTEMS – EMBEDDED ELECTRONICS 〉



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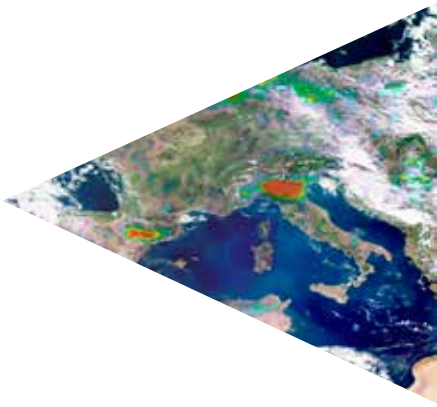
frrobert@ulb.ac.be - www.beams.ulb.ac.be/beams/intro.html

Embedded Systems - Digital Electronics - Power Electronics - FPGA

The main research activities concern:
- Digital system design using micro-controllers, DSP and FPGAs
- Hardware/software integration and optimization
- Embedded Multi-Processor Systems-on-Chip (MPSoCs)
- Advanced IC manufacturing technologies at device and package level and system co-optimization
- Real-time hardware platforms and operating systems

QUANTUM CHEMISTRY AND PHOTOPHYSICS 〉



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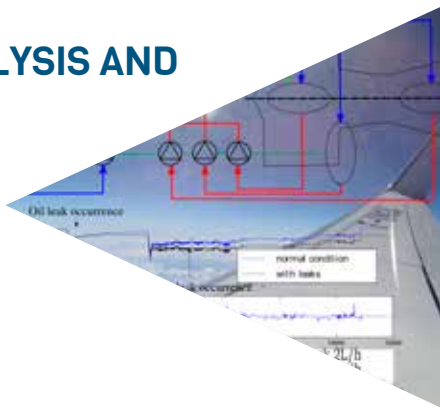
pfcoheur@ulb.ac.be - www.ulb.ac.be/cpm/

The activities at CQP (Quantum Chemistry and Photophysics) concern gaseous atoms and molecules, isolated or in natural atmospheres. They find applications in atmospheric, planetary and astrophysical sciences.

The CQP bridges three fields of expertise: ab initio calculations,high resolution spectroscopy and atmospheric remote sensing.
CQP contributes to Earth observation satellite missions and prepares future space programs. It has leading expertise in infrared remote sensing and carries out in that framework pioneering research. It is deeply involved in the IASI mission:Applications include global pollution monitoring, the assessment of environmental impacts, air quality forecasting and volcanic surveillance.
The CQP is indirectly involved in planetary missions such as Venus Express

DEPARTMENT OF SYSTEM ANALYSIS AND CONTROL ENGINEERING



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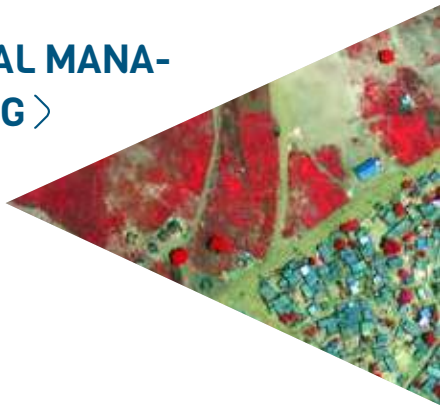
Automatic control, Condition monitoring, Fault tolerant control

The research interests cover condition monitoring, control over networks, predictive control, fault tolerant control, and force feedback in robotic applications.
Through collaboration with application experts we apply the methodologies for the design of control or condition monitoring systems in various fields including aeronautics and space.
Examples of applications include the condition monitoring of the lubrication circuit for aircraft engines and the digital power control for satellites.

INSTITUTE FOR ENVIRONMENTAL MANAGEMENT & LAND-USE PLANNING



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ewolff@ulb.ac.be - http://igeat.ulb.ac.be/fr/unites-de-recherche/details/unit/analyse-geospatiale/

Earth observation image analysis to map and monitor human structures (land cover, land use...)

High level expertise in the interpretation and the understanding of spatio-temporal human structures such as urban growth, refugee camps, humanitarian demining... based on remote sensing data (aerial photos and satellite images).

Example of applications include population estimation by remote sensing, estimation and mapping of impervious surfaces, urban sprawl and ecological corridors, risk and vulnerability mapping, development of geospatial tools to support humanitarian demining...

LABORATORY OF NEUROPHYSIOLOGY & MOVEMENT BIOMECHANICS

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1070 Anderlecht - BELGIUM
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gcheron@ulb.ac.be - www.cheron.be

Led by Professor Guy Cheron, the LNMB has performed groundbreaking research and developed expertise in the fields of Human Space Science, Brain Computer Interfaces and fundamental Neuroscience. He is supported by a highly qualified international research team.

Main study areas:
- EEG and evoked potential studies during virtual navigation (Neurocog) and docking (Neurospat) in space missions and in microgravity on board the ISS (International Space Station)
- Dynamic Recurrent Neural Networks exploring the relationship between EMG (Electromyogram) and Kinematics of motion
- Movement research in adults and children involving EEG, EMG and Kinematics to better understand locomotor development

Industrial application fields:
- Brain Computer Interfaces
- Rehabilitation therapy
- Pilot performance monitoring and assistance

MICROGRAVITY RESEARCH CENTRE

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Holographic microscopy - Optical metrology - Microgravity - Parabolic flights – Aerosols

The main research activities concern the physics of fluids and interfaces (evaporation and condensation phenomena, thermo diffusion phenomena, aerosols physics). The laboratory has a high level of expertise in optical diagnostics, digital holographic microscopy, image processing, non-destructive testing by digital holography and optical metrology.
- Parabolic flight facilities
- Several projects, studies and experiments performed under microgravity conditions (ESA, NASA)

OPERA DEPARTMENT WIRELESS COMMUNICATIONS >

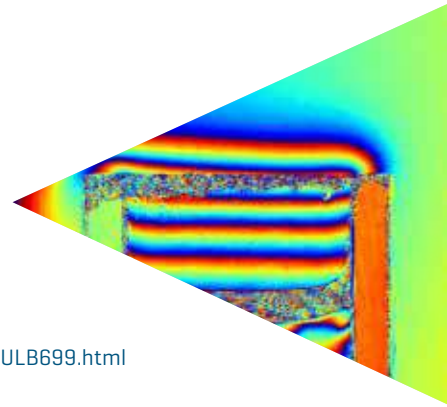
Avenue F.D. Roosevelt, 50 - CP194/05
1050 Brussels - BELGIUM
Tel.: + 32 (0) 2 650 67 41
fhorlin@ulb.ac.be - www.opera.ulb.ac.be/opera/

Communication systems - Satellite - Digital Video Broadcasting Second Generation (DVB-S2)

The team develops new signal processing solutions for emerging digital communications systems, aiming especially at the system integration and terminal implementation.

Current project: Digital compensation for analog front-end impairments in the emerging satellite communication links.

TIPS - FLUID PHYSICS UNIT >



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pcolinet@ulb.ac.be - www.ulb.ac.be/rech/inventaire/unites/ULB699.html

Microgravity - Multiphase systems - Mixing - Gas-liquid mass transfer - Dynamics of interfaces - Heat transfer – Crystallization

The main goal of the research is to develop new theoretical, numerical and experimental methods allowing to understand and predict the behavior of multiphase systems, and to design or optimize industrial processes dedicated to the transformation of matter (mineral, organic or biological) and energy.

Some of these research activities involve the development of experiments in microgravity (sounding rockets, Space Station).

Many projects funded by FP7 and ESA.

LABORATORY OF PHYSIOLOGY AND MOLECULAR GENETICS OF PLANTS

Campus de la Plaine - Boulevard du Triomphe - CP242
1050 Bruxelles – BELGIUM
Tel.: + 32 (0) 2 650 54 12
nverbru@ulb.ac.be - www.ulb.ac.be/sciences/lpgmp/ULB-LPGMP-ADS-home.html

Plant nutrition - Plant physiology - Plant adaptation to (extreme) environment

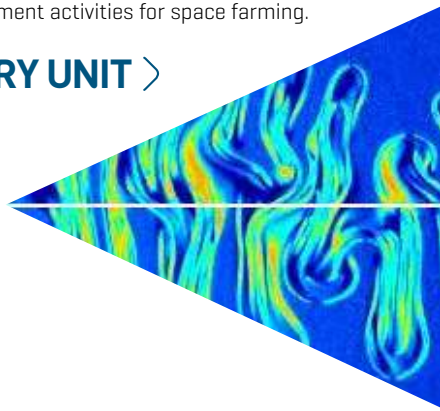
LPGMP (Laboratoire de Physiologie et de Genetique moléculaire des Plantes) is developing an expertise in plant mineral nutrition and adaptation to environmental stress.

Our research activities focus on:

- components of nutrient use efficiency in plants
- mechanisms of trace element accumulation (nutrients or non essential elements like cadmium) in order to prevent food chain contamination
- evolution of plants in extreme environments
- interplay between circadian rhythm and mineral nutrition
- photosynthesis processes energy_ and carbon_fixing reactions)
- trace gas emission by plants

In the frame of MELISSA, our team has taken part in development activities for space farming.

NONLINEAR PHYSICAL CHEMISTRY UNIT



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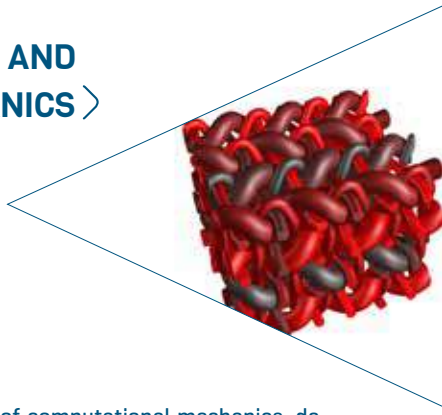
adewit@ulb.ac.be - www.ulb.ac.be/sciences/nlpc/

Theoretical and experimental studies of chemo-hydrodynamic patterns and instabilities due to the coupling of chemical reactions with buoyancy and Marangoni-driven flows.

On earth, convective flows due to combined density, viscosity and surface tension gradients are often quite complex. To help discriminate the relative role played by these various effects in convective dynamics, we perform laboratory-scale experiments supported by theoretical analysis on model systems. In particular, we study the influence of chemical reactions on hydrodynamic instabilities with emphasis on applications in material science, nonlinear science, chemical engineering and environmental systems like oil recovery, CO_2 sequestration and convection in sea ice.

In the framework of the ESA Topical Team Chemohydrodynamic patterns and instabilities, experiments are performed in microgravity to discriminate Marangoni effects from buoyancy-driven flows in reactive solutions.

BATIR DEPARTMENT - STRUCTURAL AND MATERIAL COMPUTATIONAL MECHANICS



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thmassar@ulb.ac.be - http://batir.ulb.ac.be

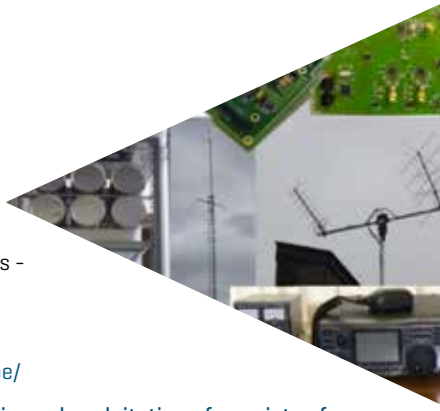
BATir - SMC is a research department active in the field of computational mechanics, developing methods and tools for the simulation of complex problems with an emphasis on multi-scale modelling and optimization

BATir-SMC is active in various fields of computational simulation related to spatial and aeronautics applications such as:

- Simulation tools for the development and characterization of complex composite and material systems (deformation and failure, multiscale modelling)
- Modelling of coupled phenomena in materials and structures
- Optimization of materials and structural properties by computational methods

BATir-SMC is partner of several research initiatives in the field of computational simulation among which the Erasmus Mundus Joint Doctorate programme SEED (Simulation in Engineering and Entrepreneurship Development - www.cimne.com/emjd-seed/)

INTELSIG



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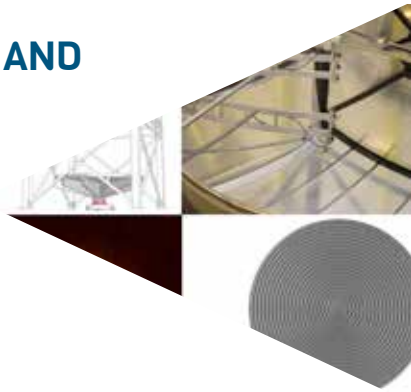
Tel.: + 32 (0) 4 366 49 94
jacques.verly@ulg.ac.be - http://intelsig.montefi ore.ulg.ac.be/

INTELSIG specializes in the acquisition, processing, analysis, and exploitation of a variety of signals and images for a variety of applications.

It routinely deals with audio, acoustics, sound spatialization, biomedical signals, medical imaging, radar signals and images, stereoscopic 3D images, ladar images, video analysis, motion analysis, etc.

The educational OUFTI-1 nanosatellite was born from the interaction of INTELSIG with the local space industry. INTELSIG provides much of the electronics expertise for the design and construction of the OUFTI-1 ground and space segments. It is the home of a fully operational satellite control and communication ground station, which will be used to control the OUFTI-1 CubeSat.

EXTRAGALACTIC ASTROPHYSICS AND SPACE OBSERVATIONS (EASO) 〉



Université de Liège

EASO Extragalactic Astrophysics and Space Observations

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Tel.: +32 (0) 4 366 97 83
JSurdej@ulg.ac.be - www.aeos.ulg.ac.be/

The EASO group of astronomers is involved in several fields of research related to astrophysics, ground-based and space observations, and instrumentation.

Our main fields of research concern:

- studies of multiply imaged quasars caused by gravitational lensing with the aim of determining the values of cosmological parameters,
- high angular resolution imaging of extra-solar planetary systems based upon coronagraphic and interferometric techniques with very large telescopes,
- extragalactic astrophysics related to investigations of large scale structures in the Universe and observations with the HST, XMM, Herschel and the future Euclid and JWST space missions,
- construction and observations with the 4m International Liquid Mirror Telescope at the Devasthal Observatory (India).

AEROELASTICITY AND EXPERIMENTAL AERODYNAMICS 〉

Université de Liège

AEA

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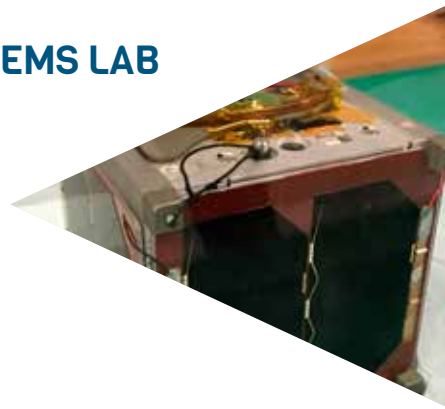
gdimitriadis@ulg.ac.be - www.ltas-aea.ulg.ac.be/cms/

The Aeroelasticity and Experimental Aerodynamics Group of the Aerospace and Mechanical Engineering Department of the University of Liège conducts cutting edge research in the areas of experimental and theoretical aeroelasticity and aerodynamics, with particular applications to the areas of fl utter and stall fl utter, bluff bodies and flapping flight.

The group participates in numerous regional, national and European research projects in several different areas of application, such as rotorcraft and tilt-rotor aircraft, Unmanned Air Vehicles, civil engineering structures (bridges, towers etc), wind turbines, animal flight and validation of Computational Fluid Dynamic simulations. The group has partnerships with most major European aerospace companies and research centres.

SPACE STRUCTURES AND SYSTEMS LAB (S3L) ›



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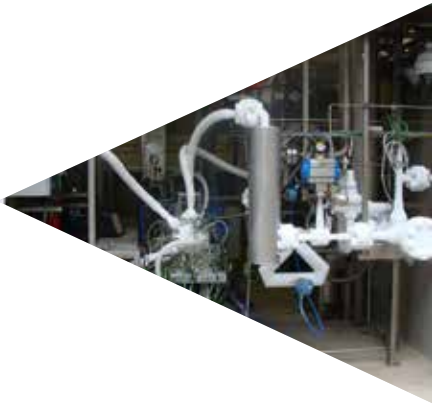
g.kerschen@ulg.ac.be - www.ltas-s3l.ulg.ac.be/cmsms

The Space Structures and Systems Laboratory research activities include spacecraft structures, nonlinear vibrations, astrodynamics and low-energy spacecraft transfer trajectories, ray tracing methodologies for thermal radiation, system identification, structural health monitoring and vibration mitigation.

The S3L mission is to prepare engineers in the fundamental principles and disciplines necessary for the design, implementation, and operation of space and related engineering systems. We encourage and offer hands-on involvement of students in real space missions, and in particular in nanosatellite design (i.e., OUFTI-1 and QB50 projects).

CRYOTRIBOLOGY ›



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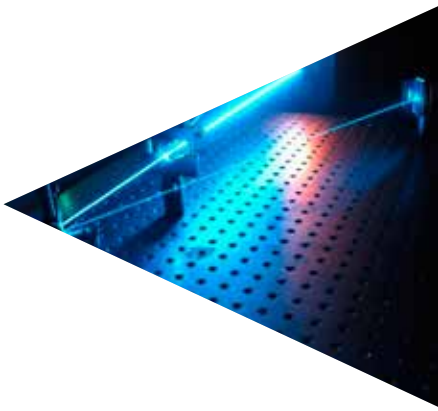
jlbozet@ulg.ac.be - www2.ulg.ac.be/tribolog/

The main activities of the lab are:

Physical and chemical properties of environment friendly lubricants, self lubricating function of porous bearings, a simple surface treatment to improve the tribological behaviour, numerical solutions of non steady-state conditions of lubrication in internal combustion engine bearings, calculation of non contacting face seals used in space and aeronautic environment, comparative analysis of the tribological behaviour of industrial coatings, characterization of couples of materials used in space applications...

HOLOLAB



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shabraken@ulg.ac.be - www.hololab.ulg.ac.be

Hololab has built a strong expertise in diffractive optical elements.

Our research activities are both fundamental and applied and cover a wide field.

- In the frame of space or astronomic instrumentation, we develop diffraction gratings (for spectroscopy) and achromatic phase masks (for coronagraphy) with rigorous modeling and holographic recording processes.
- We conduct optical metrology researches based on interferometry techniques (moire, speckle, and shearing).
- Based on innovative Fresnel lens combinations, Hololab demonstrates efficient solar concentration solutions.

Both scientific and industrial projects are conducted.

LPAP - LABORATORY FOR PLANETARY AND ATMOSPHERIC PHYSICS

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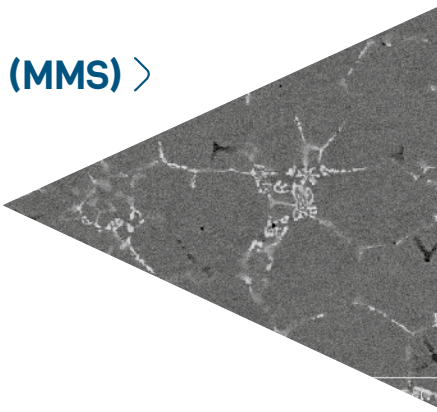
d.grodent@ulg.ac.be - www.ago.ulg.ac.be/Sci/plane_e.php

The Laboratory for Planetary and Atmospheric Physics (LPAP) focuses on physical and chemical processes occurring in the atmospheres and magnetospheres of Earth, Venus, Mars, Jupiter, Saturn and their moons.

Researchers take advantage of planetary spacecraft like Venus Express, Mars Express and Cassini (Saturn). They are actively involved in the Juno NASA mission (Jupiter) as well as in UV observations from the Hubble Space Telescope.

LPAP is deeply involved in industrial activities of CSL through different planetary missions. This synergy builds on the international scientific renown of LPAP which is granting CSL access to NASA and ESA missions, and provides LPAP with privileged access to the most recent scientific databases.

METALLIC MATERIALS SCIENCE (MMS) 〉



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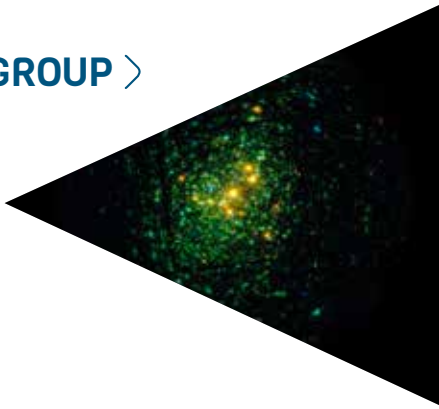
Jacqueline.Lecomte@ulg.ac.be

The MMS research activities cover, among others:

Study of relationships between microstructure and macroscopic mechanical property of metallic materials; analysis of phase transformations (solidification and thermal treatment); measurements of thermophysical properties (α , α , Cp) up to 1300°C; study of microstructure developed through advanced processes (powder metallurgy, thixoforming, laser cladding, laser melting, friction stir welding and fabrication of thin foil by vacuum deposition); characterisation of damage due to static and dynamic stresses (fractography), corrosion and wear.
The MMS mission is to prepare engineer in the fundamental principles of physics of materials necessary for selection of materials in engineering systems.

HIGH-ENERGY ASTROPHYSICS GROUP 〉



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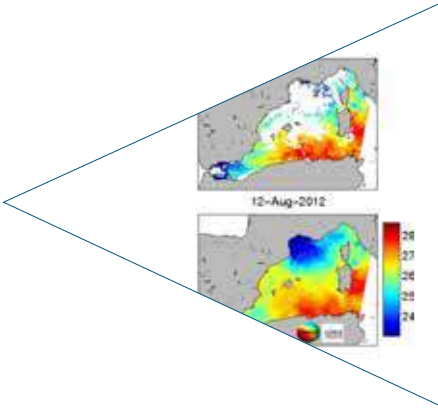
g.rauw@ulg.ac.be - www.gaphe.ulg.ac.be

The most violent and spectacular phenomena in the cosmos can often be seen in X-rays or gamma-rays.

The Earth's atmosphere blocks these rays so that their observation can only be performed from space-borne observatories.
The High-Energy Astrophysics Group uses satellites such as XMM-Newton, Chandra, and Swift to study massive stars and their interactions with their environment. These studies are complemented by observations in the ultraviolet, visible, and infrared domains using ground-based and space-borne telescopes.
Furthermore, we contribute to the development of the analysis software of ESA's astrometry mission GAIA and the development of ESA's next generation X-ray observatory, Athena.

GEOHYDRODYNAMICS AND ENVIRONMENT RESEARCH



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a.alvera@ulg.ac.be

The Ocean from space

Measuring the oceans from space has become an essential part in the study of the global climate. Remote sensing of the ocean allows scientists to better understand and predict the ocean. Several variables are now routinely measured or derived from satellite sensors: temperature, salinity, hlorophyll-a concentration, suspended matter, sea surface height, winds... These measurements are statistically analysed and also merged with ocean model results to provide the best possible view of the ocean state.

PALAEOBIOGEOLOGY/PPP LAB GEOLOGY DEPARTMENT

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Ej.javaux@ulg.ac.be - www.palaeobiogeo.weebly.com

The Palaeobiogeology team within the PPP (Palaeo-geobiology-botanypalynology) group focuses on early life traces & evolution, and the implications for Astrobiology (the study of the origin, evolution and distribution of life in the Universe).

Our expertise includes the characterization of biosignatures on the early Earth, in extreme environments, and beyond Earth, the co-evolution of life and Earth, and the conditions for and evolution of planetary habitability. Diverse projects include ERC StG ELiTE, IAP PLANET TOPERS, ICDP (Int. Continental drilling programs), IGCP, ESA EXOMARS 2018, NSFR projects, and teaching and vulgarisation of Astrobiology at national and international levels.

GEOPETRO

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jvdauwera@ulg.ac.be - www2.ulg.ac.be/geopetro/index.html

Research activities of the GEOPETRO group are focused on magmatic rocks; from the production of magmas at their source region to their crystallization and final emplacement.

Compositions of magmatic rocks on terrestrial planets, provided by meteorites, returned samples, and surface compositions acquired by spacecraft missions, are used to decode crystallization/melting processes and crust/mantle differentiation of rocky bodies. Methods combine experimental petrology (using furnaces and presses) with geochemical and thermodynamic modeling.

APPLIED AND COMPUTATIONAL ELECTROMAGNETICS (ACE)

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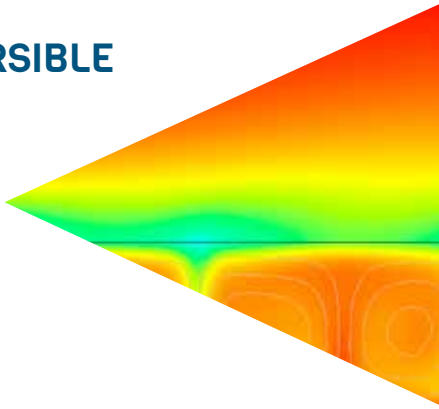
cgeuzaine@ulg.ac.be - http://ace.montefi ore.ulg.ac.be

The ACE group is involved with various aspects of design, modelling and testing of electromagnetic phenomena and devices.

The expertise of its members ranges from static and quasistatic electrotechnics to wave scattering and optics, as well as a wide variety of coupled multiphysic problems involving electromagnetic phenomena.

With more than 150 industrial references, ACE's Electromagnetic Compatibility (EMC) laboratory comprises a semi-anechoic room fully instrumented up to 26 GHz, and a new reverberating chamber. It recently started covering MIL STD 461 and part of RTCA DO 160, which are of particular interest to the aeronautic and space communities.

THERMODYNAMICS OF IRREVERSIBLE PHENOMENA (TPI) >



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PC.Dauby@ulg.ac.be - www2.ulg.ac.be/thermoir/

The TPI group is active in several areas of macroscopic physics. In particular we have a long experience in the study of fluid instabilities in microgravity.

We are presently involved in the ESA-EVAPORATION program which aims at studying evaporation and evaporative convective patterns in space.
The behavior of fluids in space is an important issue for most space missions. Our expertise in this area will be useful in the development of new instruments and technologies.

LTAS - VIBRATIONS AND STRUCTURES IDENTIFICATION >

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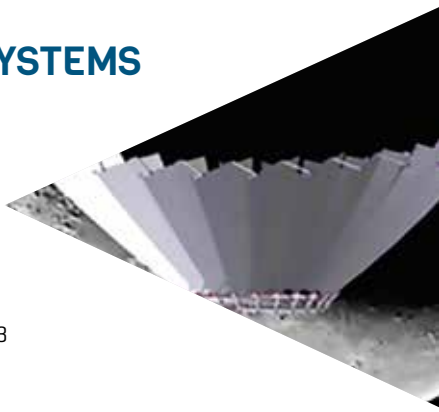
jc.golinval@ulg.ac.be - www.ltas-vis.ulg.ac.be/

The "LTAS-Vibrations et Identification des Structures" (LTAS-VIS) research group carries out research in the field of structural dynamics, mechanical vibrations and rotordynamics.

The main topics on which LTAS-VIS has developed a strong research as well as teaching expertise are the following:
- mechanical design of aircraft engines;
- turbomachinery rotordynamics;
- vibration testing and experimental modal analysis;
- identification of linear and nonlinear mechanical structures;
- structural health monitoring.

Research developments are performed most of the time with the aim of implementation in industrial finite element programs such as SAMCEF. Experimental activities are closely related to the setting-up of vibration testing facilities within the LTAS-VIS research group which led to the creation of the V2i company in 2004.

MULTIBODY & MECHATRONIC SYSTEMS LABORATORY



Quartier Polytech 1 - Allée de la Découverte, 9 - Building B52/3
4000 Liège - BELGIUM
Tel.: + 32 (0) 4 366 91 84
o.bruls@ulg.ac.be - www.ltas-mms.ulg.ac.be

The main research activities are simulation methods for the analysis of complex dynamic systems, with a particular focus on the kinematic and dynamic analysis of mechanical systems, advanced numerical solvers, model order reduction techniques, optimization methods, motion and vibration control, mechatronics, multiphysics systems, biomechanics and humanmotion analysis.

The Multibody & Mechatronic Systems Laboratory develops computer-aided tools for the mechanical and control design of deployable space structures, large telescopes, robots, machine tools, wind turbines, vehicle suspensions, powertrains. The team is also involved in the Laboratory of Human Motion Analysis of the University of Liège.

LTAS - TURBOMACHINES AND AEROSPATIAL PROPULSION

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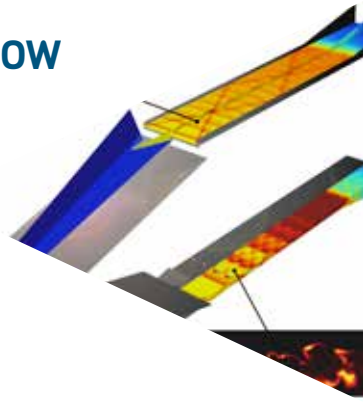
o.leonard@ulg.ac.be - www2.ulg.ac.be/turbo/

The main activities of the lab are applied thermodynamics, flow in turbomachines and health monitoring.

Its expertise is related to the design of hydraulic turbines and hydraulic machines.
The applications are the design methods for turbomachines and the health monitoring of gas turbine engines.
Some achievements of the lab are:

- Development of through flow codes for aerodynamic design of turbomachines
- Development of simulation models for lubrication systems of jet engines
- Development of diagnostic algorithms for gas turbine engines...

MULTIPHYSICS AND TURBULENT FLOW COMPUTATION



Université de Liège

MTFC
RESEARCH GROUP

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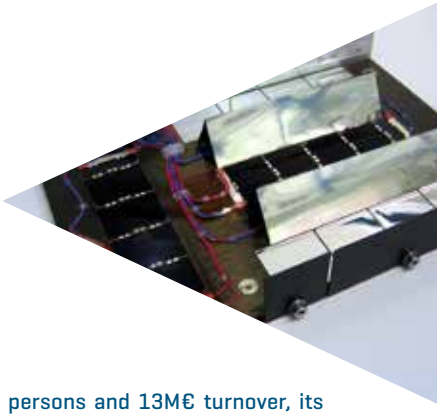
vincent.terrapon@ulg.ac.be - www.mtfc.ulg.ac.be

MTFC is specialized in computations of turbulent flows and complex multiphysics covering a broad range of applications in aerospace and other fields.

The MTFC research group focuses on the development of robust and efficient numerical tools, and large-scale simulations at different levels of fidelity (DNS, LES, DES, RANS) to better understand the physics and to develop predictive models in order to optimize engineering systems. The interest area of the research group is very broad with applications like supersonic combustion for scramjets, steady and unsteady aerodynamics, fluid-structure interaction and aeroelasticity, heat transfer, etc.

CENTRE SPATIAL DE LIÈGE



Université de Liège

CSL
CENTRE SPATIAL DE LIÈGE

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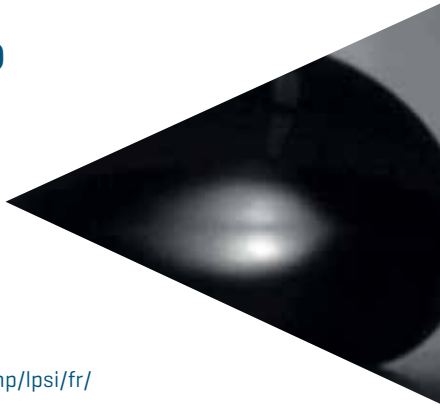
Tel.: + 32 (0) 4 382 46 00 - Fax: + 32 (0) 4 367 56 13
csl@ulg.ac.be - www.csl.ulg.ac.be

CSL is a research group in space technologies. With 110 persons and 13M€ turnover, its funding comes at 100% from industry contracts or R&D projects.

CSL activities are organized in 3 programs:

- **Tests:** characterization and qualification of space hardware in severe environment.
- **Space Systems:** definition, design, integration, ground and flight calibration of scientific payloads under the authority of Space Agencies (ESA, NASA, JAXA...).
- **Technology:** research & development support in the following fields: Optical Design & Metrology, Mechanical & Thermal Engineering, Electronics, Surfaces Micro & Nano engineering, SAR data processing.

LABORATORY OF SURFACE AND INTERFACIAL PHYSICS >



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joel.deconinck@umons.ac.be - www.hosting.umons.ac.be/php/lpsi/fr/

Laboratory of Surface and Interfacial Physics (LPSI) is a multidisciplinary team. They specialize in the study of interfaces and solid surfaces.

Functional characteristics of materials are to a large degree determined by the properties of their surfaces and the interactions of these surfaces with surrounding media. As a result, the performance of a material in terms of its function in coating, wetting, adsorption, friction and wear, optics, etc.
Can be manipulated by introducing surface layers of molecular thickness.

BIOSCIENCES – UMONS RESEARCH INSTITUTE FOR BIOSCIENCES >

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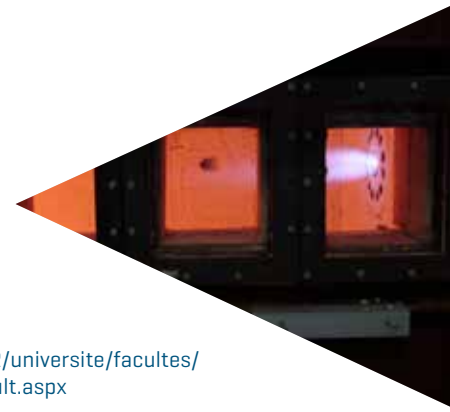
biosciences@umons.ac.be - www.umons.ac.be/biosciences

The UMONS Research Institute for Biosciences (IBS) is dedicated to scientific studies in basic and applied biological sciences with themes focused primarily on concepts of evolution, adaptation and interactions that address molecular, cellular and organismal aspects.

Expertise and Research Topics developed by the Institute focuses on five interrelated themes:
- Biological Molecules. Understanding the structure-function relationships of biological molecules and molecular complexes for the development of biomimetic approaches.
- Biosensors development.
- Applied Biochemistry – Biotechnology and Environmental processes.
- Organism and Cell Adaptation: chemical communication and the mechanics of the cytoskeleton and the molecular basis of mechanotransduction.
- Ecophysiology – Environmental Biology and Microbiology
- Ecophysiology – Ecology of Populations, Biodiversity and Education.
- The Research Institute's activities decipher the natural diversity of living organisms by studying their mechanisms of change over time.

THERMAL ENGINEERING AND COMBUSTION DEPARTMENT



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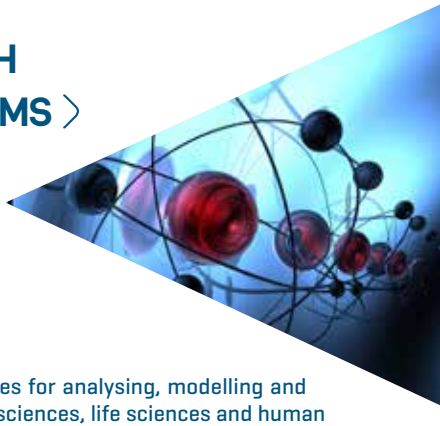
Paul.lybaert@umons.ac.be - https://portail.umons.ac.be/FR/universite/facultes/fpms/recherche/GR_SER/SERV_TERM_COMB/Pages/default.aspx

UMONS research efforts concentrate on the study and simulation of any type of flow. Research is mainly carried out with advanced CFD (Computational Fluid Dynamics) software. Numerical simulation methods for radiative heat transfer in absorbing media are also developed in UMONS as well as combustion gases spectral properties modeling.

Main study areas:
- Radiative heat transfer: simulation methods, spectral behavior
- Flameless combustion – low NOx burners - Pilot furnaces for testing of gas burners
- Modelling – simulation of industrial furnaces

COMPLEXYS – UMONS RESEARCH INSTITUTE FOR COMPLEX SYSTEMS



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7000 Mons - BELGIUM
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complexys@umons.ac.be - www.umons.ac.be/complexys

The Complexys Institute possess the required competences for analysing, modelling and simulating complex systems in pure science, engineering sciences, life sciences and human and social sciences.

Complexys Institute's computer science researchers and mathematicians specialise in the modelling of information and communication systems (software, databases, networks, etc.) and in the development of tools and techniques for numerical analysis, dynamic systems,probability and statistics, game theory, operational research, automata theory and mathematical logic.
Biologists, chemists and physicists of the COMPLEXYS Institute focus their research on ecosystem stability, the interaction and manipulation of light with complex materials (photonics and plasmonics), the multi-scale modelling of structures and optoelectronic properties of materials, the behaviour of liquids at interfaces, the creation of novel architectures from thin structures (filaments, plates and shells), the modelling of fundamental interactions at atomic and subatomic scales, the mechanics of the mechanics of the cytoskeleton of a cell and the creation of organs by living organisms.

ENERGY – UMONS RESEARCH INSTITUTE FOR ENERGY 〉

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Tel.: + 32 (0) 65 37 42 06
energy@umons.ac.be - www.umons.ac.be/energy

The UMONS Research Institute for Energy originates from the Energy Research Centre of the Faculty of Engineering, which was established in 2005. It now organizes research activities in the field of energy at UMONS.

The themes covered by the Institute are those of the Joint Programmes carried out by the European Energy Research Alliance (EERA) and more specifically:

- Biofuels and combustion.
- Carbon capture and storage.
- Photovoltaic technologies.
- Smart Cities.
- Energy storage.
- Materials and processes for energy applications.
- Wind power.
- Smart grids.
- Geothermal energy.

INFORTECH – UMONS RESEARCH INSTITUTE FOR INFORMATION TECHNOLOGY AND COMPUTER SCIENCE 〉

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infortech@umons.ac.be - www.umons.ac.be/infortech

The INFORTECH Institute works in the domains of computer science and engineering science. It promotes and carries out research activities in the fields of information technology and computer science, as well as in industrial applications.

The Institute offers technological and scientific expertise in:

- the gathering, formatting, transmission, processing and use of digital information (data and signals) and its diffusion,
- the modelling, simulation, design, optimisation, and verification of the architecture of hardware and software systems, as well as information and communication systems,

This expertise has been applied in various fields, at which point we can highlight:

- the use of ICT in education with thte development and study of teaching and learning methods,
- mobility, transportation and logistics,
- business intelligence,
- the development and study of open-source software.

Other areas of application, including health, digital arts, energy management and complex systems, are covered by the other UMONS Research Institutes, with whom INFORTECH regularly collaborates.

MATERIALS – UMONS RESEARCH INSTITUTE FOR MATERIALS SCIENCE AND ENGINEERING

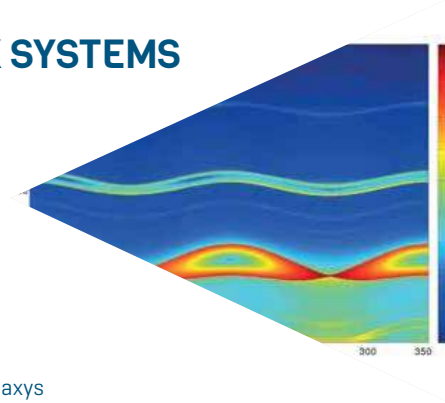
Place du Parc, 20
7000 Mons - BELGIUM
Tel.: + 32 (0) 65 37 44 31
materials@umons.ac.be - www.umons.ac.be/materials

The Research Institute for Materials Science and Engineering combines the activities in materials science and engineering from three research centres; two from the Faculty of Science: the Centre of Innovation and Research in MAterials & Polymers (CIRMAP) and the Research Centre in Materials Physics (CRPM), and one from the Faculty of Engineering: the Materials Engineering Research Centre (CRIM), formerly known as the "Pôle Matériaux".

The main research themes of the Institute vary considerably:

- new polymer materials and (nano)composites,
- material devices for organic electronics,
- nanotechnologies and nanoparticles,
- plasma processes,
- surface functionalisation,
- dynamics of interfaces: coating, wetting, dewetting, microfluidics,
- self-organisation of thin structures,
- material engineering for the living,
- nanophotonic and micro materials,
- metal alloys, coatings and manufacturing processes,
- electrochemistry of functional coatings and smart surfaces,
- gas sensors, ions and stress sensors, biosensors,
- ceramic materials,
- adsorption and heterogeneous catalysis,
- geomaterials,
- structures and building materials.

NAMUR CENTRE FOR COMPLEX SYSTEMS (NAXYS)



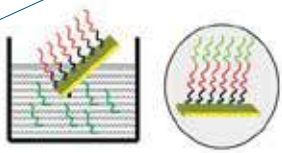
Rempart de la Vierge, 8
5000 Namur - BELGIUM
Tel.: + 32 (0) 81 72 49 28
renaud.lambiotte@unamur.be - www.unamur.be/sciences/naxys

From the space debris to the whole universe, in the solar and extrasolar systems, the centre naXys of UNamur is renowned for its numerical and analytical approaches of space dynamics.

NaXys has a strong research component in orbital motions, space geodesy and physical cosmology. It is a partner of several space missions (BepiColombo, Euclid, Juice, Cheops, Plato). The expertise of naXys includes the modeling of the dynamical problems and observables, as well as the building and refining of suitable numerical software and tools (frequency analysis, efficient algorithms, statistical forecasts, chaos detection, stability criteria).

In aeronautics, research activities of naXys aim at improving a system (e.g., by decreasing aircraft weight) by modifying its decision variables subject to constraints. Strong focus is given to the practical and theoretical aspects of the numerical solution of such optimization problems, in particular to non-convex and large-scale instances.

LABORATORY OF CHEMISTRY AND ELECTRO-CHEMISTRY OF SURFACES (CES) >



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Tel.: + 32 (0) 81 72 52 30
Zineb.mekhalif@unamur.be - www.unamur.be/sciences/chimie/cesa/

Research objectives are the design and elaboration of surface and interfacial materials (thin and ultra-thin organic and inorganic films on metal, oxide and polymer substrates) by chemistry processes (electrochemistry, self-assembly, sol-gel film deposition...).

The goal is to obtain structured surface materials with new and/or improved properties obtained due to the control of processes and interactions at the molecular level.
The main topics are:

1- to chemically graft organic mono- or multilayers on various substrates - noble metal and (re) active metals - by bifunctional molecular connectors (X-spacer-Y), X being a group selected to preferentially react with the surface substrate and Y is chosen to impart either specific end-properties to the modified substrate (lubrication, anti-wear, corrosion resistance...) and/or (re) activity for additional surface processes.
2- to functionalize carbon nanotubes for composites elaboration, to modify surfaces for biomaterials applications, and to make electro-deposition in ionic liquids.

RESEARCH CENTRE IN PHYSICS OF MATTER AND RADIATION (PMR) >

Rue de Bruxelles, 61
5000 Namur - BELGIUM
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Laurent.houssiau@unamur.be - http://pmr-namur.be/

Laboratories from PMR draw on powerful and modern instrumentation to develop materials, processes, devices and modeling thereof.

It includes the development and applications of many spectroscopic techniques, the quest for new materials, the study of thin films, nanostructures and hybrid (nano)-systems. A selection of examples includes research on self-cleaning surfaces, photovoltaic cells, organic light emitting diodes and new transparent conducting oxide layers.

The research is focused on the study of materials, radiations and their interactions. LISE and LARN laboratories investigate surface deposition and/or modification of materials by ion implantation, physical deposition or RF plasmas. The surfaces and interfaces of those innovative solid materials are investigated by up-to-date optical, electron and ion spectroscopies. Quantum chemical calculations are also performed.

PRECISE RESEARCH CENTRE IN INFORMATION SYSTEM ENGINEERING

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jean-noel.colin@unamur.be - www.unamur.be/en/precise/

The PReCISE research centre is dedicated to all areas of software engineering, from requirement engineering to testing, using modeling techniques to reason and design complex software systems both from functional and dataoriented perspectives.

Quality and Measurement: PReCISE centre develops innovative techniques, methodologies and tools dedicated to the quality modeling of complex software systems. Relying on software measurement and taking into account the complex relationships between software products (from requirements and design documents to tests and documentation), these techniques offer a more efficient understanding of software quality that benefits from customers to developers.

Model-based Engineering and Quality Assurance for Variability-Intensive Systems: For more than 10 years, the PReCISE centre has developed techniques to specify, analyze, verify and test variability-intensive systems, a large class of systems regrouping software product lines and highly configurable software challenging current engineering techniques by the combinatorial explosion such configurability induces. Efficient quality assurance techniques and formal definition of variability-aware domain–specific languages are the keys to such challenges.

LIFE; RESEARCH UNIT VIPER (VITAL SIGNS AND PERFORMANCE MONITORING, ROYAL MILITARY ACADEMY)

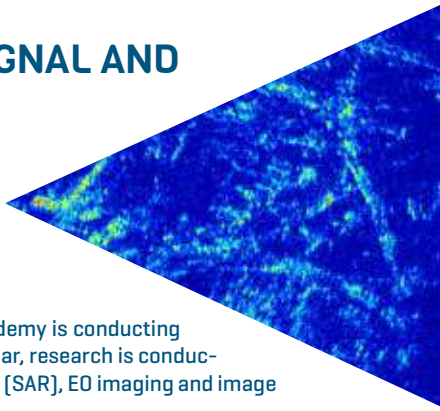
Avenue de la Renaissance, 30
1000 Bruxelles - BELGIUM
Tel.: +32 (0) 2 441 37 38
Fax: +32 (0) 2 443 91 87
nathalie.pattyn@rma.ac.be
http://viper.rma.ac.be

VIPER is a multidisciplinary research unit bridging engineering and life sciences to investigate Human Factors from an integrative perspective.

The ultimate goal in performance research is to accurately monitor or predict the quality of performance. However, performance is a multidimensional construct, both physiological and psychological, for which measurement standards still need to be defined. Our activities range from applied to fundamental research: whether it is about predicting performance of soldiers in elite units; understand the cognitive performance of pilots and astronaut in conditions of operational stress; enhance performance in top athletes or investigate sleep in Antarctica.

ROYAL MILITARY ACADEMY / SIGNAL AND IMAGE CENTRE

Avenue de la Renaissance, 30
1000 Bruxelles - BELGIUM
Tel.: + 32 (0) 2 441 40 41
Xavier.Neyt@rma.ac.be
www.sic.rma.ac.be



The Signal and Image Centre (SIC) of the Royal Military Academy is conducting research in the broad domain of Remote Sensing. In particular, research is conducted in the domain of Radar Signal processing, Radar imaging (SAR), EO imaging and image exploitation (persistent surveillance, EOD Early Warning...).

In the field of Radar Signal Processing, the SIC is performing research on scatterometer calibration and cross-calibration in the framework of the SCIROCCO project funded by the European Space Agency. That project aims at setting up a scatterometer competence centre to consolidate the methodologies for scatterometer data processing, calibration and validation in order to promote the long term data preservation.
In a related field, the SIC has developed an opportunistic bistatic radar that uses transmissions from spaceborne C-band SAR instruments (Radarsat1/2, Sentinel-1A/B) to produce bistatic SAR images. In doing so, the azimuth resolution is enhanced providing images with a better spatial resolution than the monostatic images produced by the instrument itself.
The SIC is also participating in the EORegions! project financed by the Walloon Region and aiming at developing a framework for remote-sensing-based services. The SIC is in charge of the processing of the radar images from Sentinel-1 and the optical images from Sentinel-2 to contribute to change detection exploiting the hypertemporal data cube.

GEODESY & NAVIGATION (GENA) 〉

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alain.muls@rma.ac.be
www.rma.ac.be/ciss/en/
www.sic.rma.ac.be/index.html

Research Unit "Geodesy & Navigation" (RU GeNa)

In the past, military geodesy was largely involved with the practical aspect of the determination of exact positions of points on the Earth's surface for mapping or artillery control purposes. Combined with satellite geodetic techniques such as precise GNSS (Global Navigation Satellite Systems) relative positioning, surveying allows an accurate determination of the relative or absolute position of terrestrial objects in 3D space.

The BE-GPIOS Project (Funded by BELSPO)

Galileo is Europe's own Global Navigation Satellite System (GNSS) system, providing a highly accurate, guaranteed global positioning service under civilian control. The fully deployed Galileo system consists of 27 satellites, positioned in three circular Medium Earth Orbit (MEO) planes at 23 222 km altitude above the Earth, and at an inclination angle of 56 degree with respect to the equator. The Galileo Public Regulated Service or PRS is an encrypted navigation service designed to be more resistant to jamming, involuntary interference and spoofing. It is similar to other Galileo services, but ensures continuity of Service (CoS) to authorised users when access to other navigation services is denied, increases the likelihood of continuous availability of the Signal-in-Space (SiS) and provides an authenticated Position Velocity Timing (PVT) service. The Binary Offset Code (BOC) modulation used by the PRS navigation signals move the signal power away from the band centre, thus offering the potential for better code-tracking accuracy and multipath rejection.

A main objective of the BE-GPIOS is to get a better understanding of the PRS navigation services, the security concerns related to the key management and key distribution, the concerns and expectations that Belgian users and user groups have. The Royal Military Academy–Department of Communication, Information, Sensors & Systems (RMA-CISS) will become and act as a centre of competence for the Belgian Government and public entities that have interest in the use of the PRS navigation service for their operational use.


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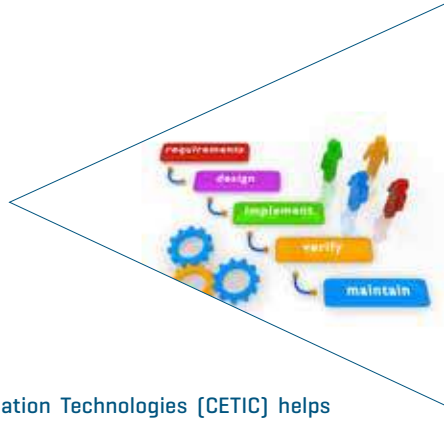
RESEARCH CENTERS

CETIC



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business@cetic.be - www.cetic.be

The Centre of Excellence in Information and Communication Technologies (CETIC) helps companies to enhance software-based solutions and to integrate ICT innovations into their products, processes and services. CETIC continually develops its expertise through collaborative research projects involving regional and European actors.

CETIC provides expertise in three complementary axes: software engineering, ICT technologies and embedded systems.

CETIC can support the Aeronautics sector with methods and tools
- for developing high-quality IT solutions;
- for Model Driven software engineering;
- to enhance software reliability, safety or security;
- for compliance with international standards, where software or embedded systems development life-cycle are impacted.

CENAERO

Rue des Frères Wright, 29
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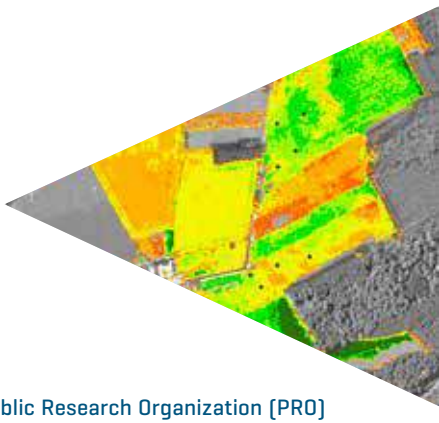
Tel.: + 32 (0) 71 91 09 30
info@cenaero.be - www.cenaero.be

Cenaero is a private applied research centre providing to companies involved in a technology innovation process simulation methods and tools to invent and design more competitive products.

Internationally recognized, in particular through its research partnership with Safran, Cenaero is active in the aeronautics, energy & buildings and biomedical sectors. Cenaero operates a top supercomputing infrastructure with 14,000 computing cores, and experimental facilities in composite manufacturing and prototyping.

Cenaero's 50+ researchers, 50% of them holding a Ph.D. degree, provide expertise in multidisciplinary simulation, design and optimization in the fields of mechanics (fluid, structure, thermal and acoustics), manufacturing of metallic and composite structures as well as in analysis of in-service behavior of complex systems and life prediction.

CRA-W



Rue de Liroux, 9
5030 Gembloux – BELGIUM
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v.planchon@cra.wallonie.be – www.cra.wallonie.be

The Walloon Agricultural Research Centre (CRA-W) is a Public Research Organization (PRO) offering a multidisciplinary scientific expertise in the fields of the agriculture and the agro-food industry

The Agriculture and Natural Environment Department and the Production and Sectors Department cover various activities:

- Technico-economic research on GNSS-based systems and TIC (busCAN, ISOBUS) for agricultural machinery (navigation aids, auto-guidance, field operations) to reduce inputs (pesticides, fertilizers, energy) while increasing worker's comfort.
- Applications of the Earth Observation to the crop management at field and regional levels (biomass assessment and environmental indicators), models and Decision Support Systems (e.g. crop nitrogen status) using temporal, multi-sensors information and assimilation techniques.
- Earth Observation services for crop growth monitoring and crop damage assessment Systems for crop yield estimations and natural risk management.

ISSEP

Rue du Chéra, 200
4000 Liège - BELGIUM
Tel.: + 32 (0) 42 29 83 11 - Fax: + 32 (0) 42 52 46 65
n.stephenne@issep.be - www.issep.be

The Scientific Institute for Public Services (ISSeP) is a Public Research Organisation carrying in-situ measurement of environmental data since 1990.

Successor of the Mining Institute, ISSeP has a legacy of over 100 years of research. The institute supports administrations and private companies in risk assessment and environmental metrology, with networks for air, waters, soil, waste, sediments, and ionizing radiations. Since 2016, a new unit integrates in-situ and remote sensing data in environmental decision making. Current studies focus on land monitoring, risk assessment and geodata integration through WebGIS.

MATERIA NOVA

Avenue Nicolas Copernic, 1
7000 Mons - BELGIUM
Tel.: + 32 (0) 65 55 49 02
info@materianova.be - www.materianova.be

MATERIA NOVA brings collective intelligence to economic, environmental and social challenges with positive impacts in our region.

MATERIA NOVA is an innovation centre offering R&D based on advanced or disruptive technologies, as well as consulting and services to businesses. The main expertise areas are: Sustainable Materials, Multifunctional Surfaces, Materials for Energy and Cells for Materials and Materials for Cells. Materia Nova formulates new materials, develops specific surface treatments and performs life cycle assessment of all projects.

MULTITEL

Parc Scientifique Initialis - Rue P. et M. Curie, 2
7000 Mons - BELGIUM
Tel.: + 32 (0) 65 34 27 19
commercial@multitel.be - www.multitel.be

Multitel is an innovation centre, leading applied research and development activities for industry leaders, SMEs and spin-off.

Multitel's mission is to promote innovation by providing market-driven scientific and technical support for developing, implementing and monitoring new technologies, in a variety of technological domains including Photonics, Networking, Embedded Systems, Signal and Image Processing.

More precisely for aerospace sector, activities of Multitel could concern:

- prototyping of optical fibre sensors for SHM (Structural Health Monitoring), fibre lasers (for LIDAR applications), material processing (composite materials, surface texturisation) and non-destructive characterization (THz, OCT)
- development of multimodal speech centric man-machine interfaces
- real time asset tracking systems based on RFID technologies for localization of people and objects
- image processing (for aerial/remote sensing images), nondestructive video-based testing (quality control)

SIRRIS

sirris

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4102 Seraing - BELGIUM
Tel.: +32 (0) 498 91 93 77
Jean-claude.noben@sirris.be - www.sirris.be

Sirris, is the technology centre of the Belgian manufacturing industry since 1949. It helps companies to identify, develop and integrate technological innovation in products, processes and business models.

As a competence integrator in innovative projects, Sirris helps set up and manage multi-competence R&D consortia with its network of 2500 Belgian industrials, academic partners and innovation support organisations in Wallonia.

With 150 collaborators, amongst which 55 in Wallonia, Sirris is an R&D partner providing expertise and up to date equipment in additive manufacturing for complex plastic, metal or ceramic parts (Ti, CrCo, SiC...), in Smart products development (micromanufacturing, circuit on foil, ɹreplication...) and in industry 4.0 problematics in close collaboration with the sectorial organization Agoria.

TRAINING CENTERS

EURO SPACE CENTER

Rue Devant les Hêtres, 1
6890 Transinne - BELGIUM
Tel.: +32 (0) 61 65 64 65 - Fax: +32 (0) 61 65 64 61
info@eurospacecenter.be - www.eurospacecenter.be

Opened in June 1991, Euro Space Center is a discovery and recreation centre on the theme of space exploration and its impact on our daily lives.

Euro Space Center has become a leader in Belgium for the dissemination of knowledge about space sciences and technologies.

Euro Space Center is open to the general public all year round and also welcomes trainees from 30 different countries. The goal is to spark a love for the sciences and innovation.

Euro Space Center and its high-tech environment are unique in Europe.

They enable young people and adults to learn about astronomy, robotics, space engineering and more. Euro Space Center also lets people (re)discover an exceptional human adventure: mankind's conquest of space.

TECHNIFUTUR

Liège Science Park - Rue du Bois St-Jean, 15-17
4102 Seraing - BELGIUM
Tel.: +32 (0) 4 382 45 00 - Fax: +32 (0) 4 382 45 46
info@technifutur.be - www.technifutur.be

Training, awareness, advising, e-learning and e-business are our assignments. They cover various fields, such as aeronautics, assembly, automation, design, measurement and inspection, machining, image and multimedia, etc. They meet the requirements of the regional, national and international industrial environment.

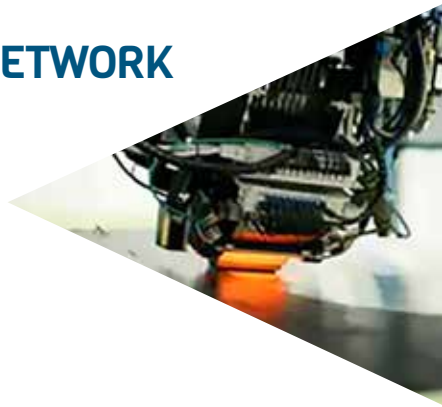
We target company staff, job seekers, teachers and students (for more information, go to our website www.technifutur.be).

More particularly and for more than 10 years now, Technifutur has been providing training to aircraft maintenance mechanics in the aviation sector. In 2007, the "Service Public Fédéral de la Mobilité et du Transport Aéronautique" granted the PART 147 approval, officially acknowledging Technifutur's competency and their right to conduct training and examination and to issue certificates for aircraft maintenance mechanics in accordance with the requirements of PART 66 levels A1, A2, A3 and A4.

On the basis of this recognition, of the acquired experience and the needs expressed by the aircraft industry, Technifutur now aims at expanding their skills and achieving the approval to provide levels B training and examination.

Technifutur is also recognized worldwide for its welding and non-destructive testing training courses.

WALLONIE AEROTRAINING NETWORK (WAN) ›



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6041 Gosselies - BELGIUM
Tel.: +32 (0) 71 34.81.80 - Fax: +32 (0) 71 34 8181
info@wan.be - www.wan.be

The WAN is an "assembly ground" of training. The WAN relies on different partners, such as centres of competency, aeronautical schools, Belgian Air Force and major players of industry (SONACA, SABCA...). The WAN covers all the needs of the aerotechnical sector.

PRODUCTION. All technologies and methodologies linked to design, manufacture, repair and inspect cells, engines, avionics. Such as: CAD/CAM (CATIA v5), analysis and functional dimensioning, operating gamuts, process understanding and assembly techniques (metallic/composite), non destructive testing, finite element analysis and resolution methods (SAMCEF/NASTRAN), quality (EN9100/EN4179), Lean Manufacturing, SPC methodologies...

MAINTENANCE. Trainings for jobs in airports or industrial aeroplane workshops, propulsion mechanisms, onboard equipment. Approved as official training centre (EASA BE.147.002), the WAN provides recognised (meets EASA Part-147 requirements) basic training for Part-66 Aircraft Maintenance License A1, A2, B1.1, B1.2, B2 and aircraft type training for Airbus or Boeing ranges for B1.1, B2 and C. Many others tailored courses and exams are possible in French or English. For its training, lectured by highly qualified senior instructors, the WAN owns a functional Boeing 727 and various aircraft parts, engines, avionics.

AUTOMATED FIBER PLACEMENT. An AFP machine manufactures complex shapes using composite material. An Ingersoll AFP is installed at SONACA facilities. The centre is able to conduct research for advanced aerospace applications and industrial process development. The WAN's main target is to train specialised people using AFP technology.


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NETWORKS

TECHNOLOGICAL AND SCIENTIFIC INTERMEDIATION NETWORK

Are you looking for a solution to a technological problem? Do you want to launch out further into research and technological innovation?
Do you want to enhance your technologies? The technological and scientific intermediation network is at your service!

CEQUAL
Helps you to integrate Quality, Safety and Environmental Management Systems to improve your competitiveness
www.cequal.be

DGO6
The operational Directorate General for the Economy, Employment and Research (Research Department) offers a range of incentives and forms of assistance to increase the technological potential of researchers based in the Walloon Region.
http://recherche-technologie.wallonie.be

EEN NETWORK
Assistance to your SME to develop and exploit your technological expertise by setting up European partnerships
www.wallonieeurope.be

INNOVATECH
The coach for your technological innovations witch helps you to structure your technological innovation projects from the emergence of the idea until its commercial exploitation.
www.innovatech.be

LIEU NETWORK
Provides access to the resources and competences of universities and higher education institutions
www.reseaulieu.be

NCP-WALLONIE
Free professional assistance at every stage of your European research project.
www.ncpwallonie.be

PICARRÉ ASBL
Decision-making assistance for developing a management policy for your intellectual assets.
www.picarre.be

SPOW
Science Parcs of Wallonia: Places where your innovative business is a priority
www.spow.be

WAL-TECH
Federates the Walloon research centres, promotes its technological resources and strengthens the synergies between them
www.wal-tech.be

WALLONIA CLUSTERS
Network of technological clusters active in Wallonia
http://clusters.wallonie.be

WALLONIA FOREIGN TRADE AND INVESTMENT AGENCY (AWEX)

The Wallonia Foreign Trade and Investment Agency (AWEX) is the governmental agency in charge of foreign trade promotion and foreign direct investment attraction in Wallonia (Belgium).
The agency has a worldwide network of 109 Economic and Trade Commissioners. AWEX has been certified ISO 9001 since April 2002.

As a foreign trade agency, AWEX carries out a mission of promotion and information for the benefit of both Wallonia and the foreign business community.

Upon request, AWEX assists buyers, decision-makers, importers and foreign prospects by:

- Providing economic data on Wallonia and its export potential
- Disseminating information on products and services from companies located in Wallonia
- Identifying companies in Wallonia for international partnerships
- Distributing lists of exporters from Wallonia

As an export partner for Wallonia-based companies, Awex offers a wide range of export-oriented services and activities:

- General and commercial information on foreign markets
- Market studies tailored to specific areas upon request
- Organization and planning of marketing activities (international trade shows, economic missions, sector-based contact days...)
- Establishing contacts with international organizations
- Promoting Wallonia's export potential abroad
- Financial support and export financing
- Training in international careers

Its Foreign Direct Investment Branch has an overall responsibility for the attraction of foreign investment in Wallonia.

This includes seeking out and providing information to potential foreign investors. The Agency also offers a pro-active follow-up service to investors already established in Wallonia. In addition, it is in charge of identifying new foreign investors for the acquisition of industrial sites under restructuring process.

Wallonia.be
EXPORT
INVESTMENT

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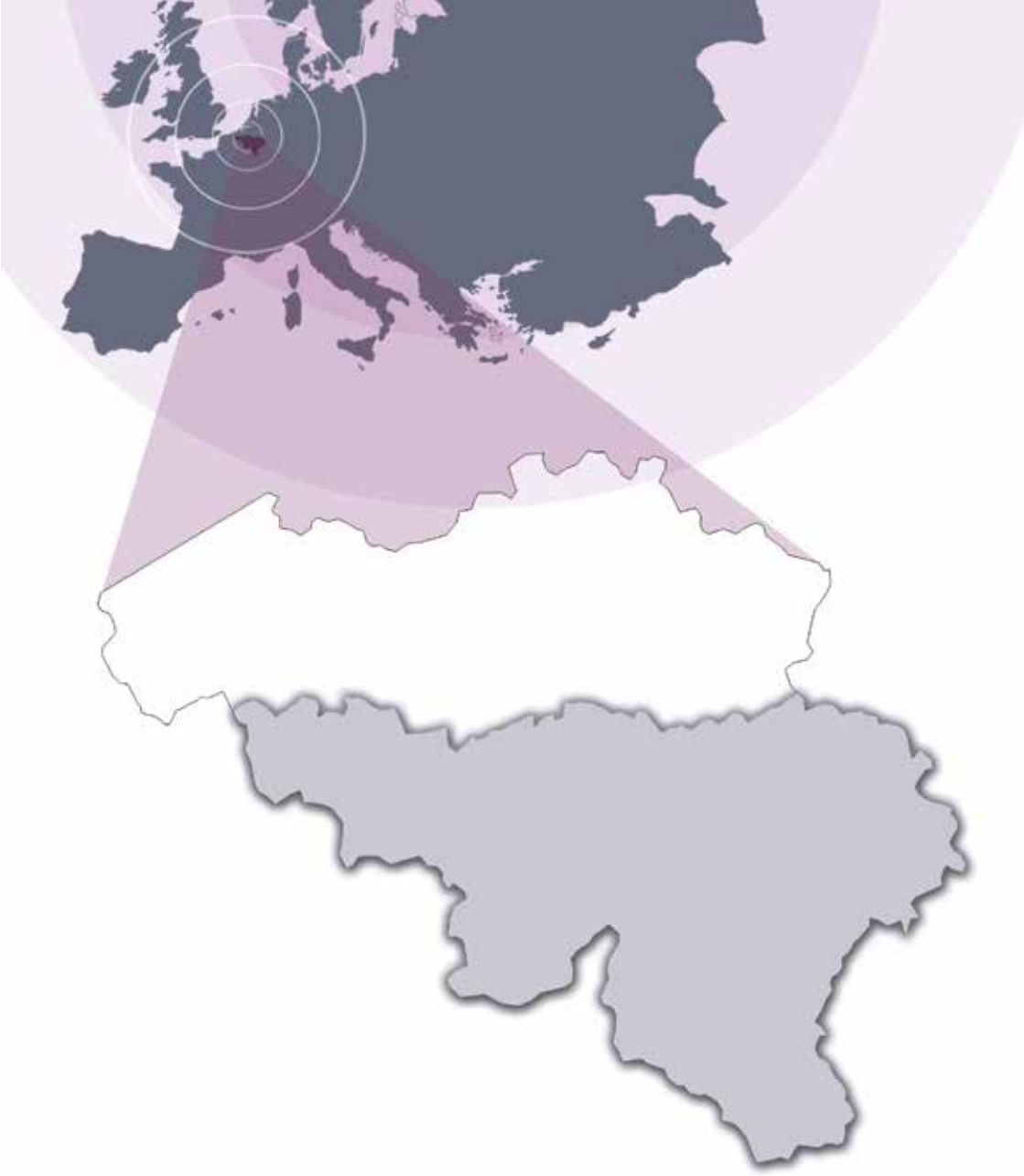
1080 Brussels - BELGIUM
Tel.: +32 (0) 2 421 82 11 - Fax: +32 (0) 2 421 87 87
mail@awex.be - www.wallonia-export.be - www.wallonia-international.be



Skywin
Aerospace cluster of Wallonia

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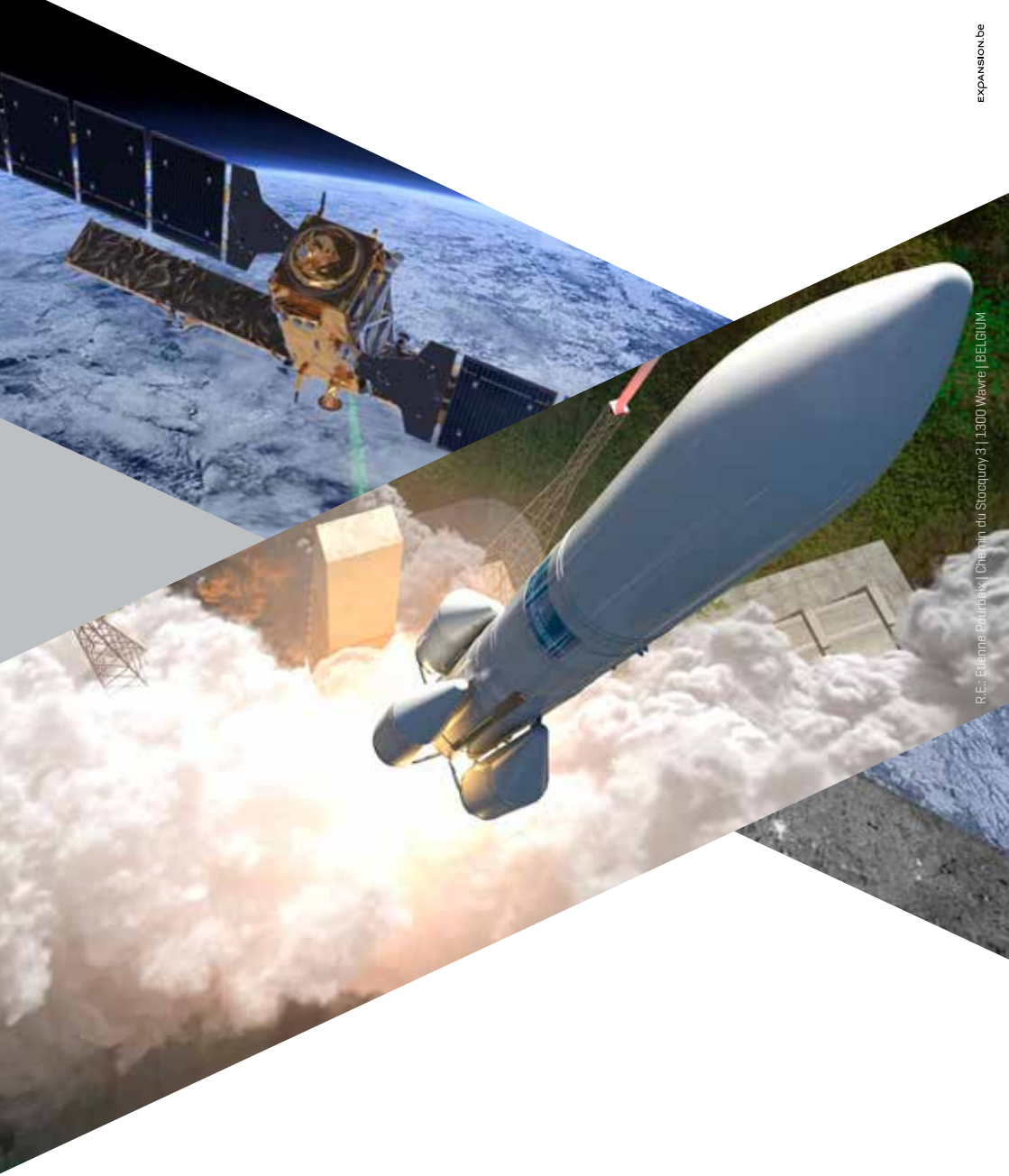

Skywin
Aerospace cluster of Wallonia

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