SPACE DIRECTORY 2021

LUXEMBOURG SPACE EXPERTISE

space-agency.lu

SPACE DIRECTORY 2021

CONTENT

01

LUXEMBOURG, A EUROPEAN HUB FOR COMMERCIAL SPACE

FOREWORD

In today's booming space sector, the next generation of space technologies is being designed and built by a steadily growing community of entrepreneurs, scientists, researchers and engineers.

Luxembourg is proving to be the European focal point for this 'new' space industry, and for good reason.

These space entrepreneurs need to be supported: they need access to research, finance and technical services. But if support is essential, cooperation is key. More than anything, today's space entrepreneurs need to be connected with one another, and with the world. Building bridges between businesses is the way towards new and rewarding projects that will lead to the next generation of space technologies.

This directory is designed to foster that process of discovery and connection. It showcases the capabilities of the space industry already established in Luxembourg and extends an open invitation to potential partners from around the world, inviting them to explore the rich potential for international research and business development which exists in the Grand Duchy.

In Luxembourg, the space industry is driven by a dynamic, multilingual and international work force. Many of the players presented here are known well beyond the borders of the Grand Duchy, their capabilities acknowledged by the international space community.

Since its first edition, this directory has charted the constant expansion and consolidation of the space industry in Luxembourg. We are happy to present the 2021 edition, which we strongly believe has a part to play in that story, helping to connect potential collaborators from around the globe in Luxembourg, the place for space development in Europe.

LUXEMBOURG : A GROWING SPACE ECO-SYSTEM

For more than three decades, Luxembourg has been at the forefront of commercial and co-operative initiatives that have shaped a vibrant space economy.

Today, the Grand Duchy is home to approximately 70 companies and research labs. The space sector's contribution to the nation's GDP is among the highest ratios in Europe.

Luxembourg's first foray into space came in 1985, with the creation of the Société Européenne des Satellites (SES), a landmark for satellite telecommunications and a global leader in this sector today. Further space-related services and businesses have developed alongside SES giving birth to an entire space industry in Luxembourg.
A second, important factor in positioning the country in the space sector was Luxembourg's accession to the European Space Agency (ESA), on 30 June 2005.

From then on, the space industry in the Grand Duchy has continued to grow and diversify, with three identifiable segments:

- The space segment: manufacturing of satellite and instrument structures, system integration of micro-satellites, electric propulsion for satellites, robotic payloads, in-space manufacturing, composites, RF payloads, FPGA
- The ground segment: ground stations development, mechanical and electrical ground support equipment, communication networks, operations
- The service segment: teleport services, satellite-based media and telecommunications services, risk management services, data analytics, environmental applications and services, aeronautical information services, analytics platform

SPACE RESOURCES

The accelerating pace of technological progress and the emergence of privately-funded commercial start-ups in the space sector have encouraged Luxembourg to explore more deeply the long-term economic potential of space. Launched in February 2016 and led by the LSA, the SpaceResources.lu initiative positions Luxembourg as a pioneer in the exploration and utilization of space resources. With this initiative, Luxembourg has defined a framework to promote and support the sustainable exploration and commercial utilization of resources from 'celestial bodies' such as the Moon and asteroids.

The Grand Duchy is the first European country, and the second worldwide, to offer a legal framework on the exploration and use of space resources, ensuring that private operators can be confident about their rights on resources they extract in space.

In years to come, the focus on space resource exploration and utilization will generate attractive opportunities in areas including materials science, additive manufacturing, remote sensing, communications, robotics, data analytics and artificial intelligence.

In November 2020, the European Space Resources Innovation Centre (ESRIC) has been established in Luxembourg, powered by the Luxembourg Space Agency (LSA), the European Space Agency (ESA), and the Luxembourg Institute of Science and Technology (LIST) to create additional opportunities for European and international innovation. ESRIC aims to become the internationally recognised centre of expertise for scientific, technical, business and economic aspects related to the use of space resources for human and robotic exploration, as well as for a future in-space economy.

The SpaceResources.lu initiative also brings an ethical dimension to the project, seeking to ensure that space resources utilization serves a peaceful purpose. It aims to ensure these resources are gathered and used in a sustainable manner, compatible with international law and for the benefit of humankind.

CONNECTING SPACE AND NON-SPACE

Another key element of Luxembourg's strategy is to broaden access to space-related data.

Huge data sets, gathered from space, represent an essential source of insight and opportunity for the space industry. Meanwhile, these same data sets are being used by non-space businesses searching for better ways to work on planet Earth. Data is the point of intersection for many high technology businesses.

The Luxembourg Space Agency Data Center was created in 2019 to support businesses in Luxembourg with reliable, fast and intuitive access to data streams from the European Copernicus Earth Observation programme.

The detailed optical and radar imaging data made available by this project can help us manage the environment, understand and mitigate the effects of climate change, and ensure civil security.

New products which make use of this data are of interest for businesses in many sectors including the environment, maritime, meteorology, agriculture, mobility, aviation and health, thus leading to a massive uptake of satellite-based products by end users.

FINANCING THE SPACE INDUSTRY

As well as human resources and innovation, space development requires serious financial input.

No business is going to get very far without funding. Luxembourg's unique cross-border expertise in international finance and the development of dedicated funding resources, have been crucial factors in the creation of a sustainable space industry.

The country is the global hub for fund distribution and 19 out 20 of the largest Private Equity firms have a presence in Luxembourg. Moreover, private-equity firms with focus on space and space-related industries, such as NewSpace Capital, have a presence in the country as well.

Together with a group of private and public investors, the Luxembourg Government has invested a stake in Orbital Ventures, an investment fund focused on early stage companies engaged in space activities.

Anchored in Luxembourg, the venture capital investment fund will provide equity funding for early stage space companies with ground-breaking ideas and technologies.

At the European level, Luxembourg contributes to the European Space Agency programs, which support the development of technology and of products, services and infrastructure in areas such as Telecommunications and Earth Observation. These contributions open the door for players in Luxembourg to access the space market in Europe.

The national space program (LuxIMPULSE) implemented in partnership with ESA, also plays a key role in financing groundbreaking technological developments with strong market potential.

TALENT FOR SPACE

The Space industry needs a huge array of skills and talent. Several initiatives have been initiated in Luxembourg to foster the development of the necessary skills and expertise needed by the growing space ecosystem. Among these, a two-year Interdisciplinary Space Master program has been launched by the University of Luxembourg in fall 2019.

Set up in collaboration with the Luxembourg Space Agency, the Interdisciplinary Space Master provides solid knowledge in all aspects of the space value chain, along with space engineering expertise. Using a project-based learning approach, graduates obtain a fundamental understanding of the scientific and technical basis, as well as business requirements of successful space missions. Courses touch upon space systems engineering, space operations, space resource utilization, space data mining and intelligent systems, satellite communications, and robotics.

Young graduates from Luxembourg also have the opportunity to enter the ESA training program (LuxYGT). This program, set up by LSA and the ESA, is an opportunity to gain valuable experience in the development and operation of space missions and to qualify for the many opportunities within Europe's space industry.

THE FUTURE

The pace of innovation in space related technology continues to accelerate. To make tomorrow's technical possibilities a reality requires practical support today.

In Luxembourg, the space industry finds a nurturing and supportive environment with an established community of high tech businesses, researchers, and entrepreneurs along with access to the necessary services and facilities.

02

COMPANIES

adwäisEO

CEO/
HEAD OF DEPARTMENT
Pierre De Gobert

CREATION DATE
2015

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 13
Space: 13

TURNOVER 2020
Total: € 2,617,560
Space: € 2,617,560

R&D
INTERNAL INVESTMENTS
€ 2,500,000 including hardware equipment and development of innovative EO data processing solutions in the cloud.

QUALIFICATIONS, APPROVALS
ISO9001 under way

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CORE BUSINESS

adwäisEO is a Luxembourg company specialized in Earth Observation (EO) IT services.

The company is one of the major European actors in the Space Ground Segment sector. Thanks to cutting-edge expertise in Earth Observed data and ICT the company offers performing and cost-effective solutions such as multi-Petabytes archives, intuitive geoportals, and efficient processing solutions in cloud and/or HPC environment.

The company is a provider of data and information services for space agencies, companies, public institutions, and research centres. adwäisEO is a subsidiary of ACRI-ST, a French company with other subsidiaries in UK, Spain, and Canada.

PRODUCTS AND SERVICES

adwäisEO provides data services for space agencies, companies, public and private institutions, NGO and research centres:

- Data collection, storage, dissemination and management, long-term archiving, to take care of your data respecting your privacy
- Data hubs, geo-portals, APIs and metadata generation and metadata standardizing to make the data easily accessible
- Cloud computing, HPC Cluster and efficient orchestrator for all your processing needs. Geo-Data mining and analytics, to extract valuable information from the data and produce knowledge

The company designs and develops HPC and/or cloud solutions in order to provide tailor made services and products.

TECHNICAL MEANS

The IT facilities of adwäisEO are hosted in TIER IV data centres in Luxembourg. The company uses the best of the available technology:

- Cloud-Storage and Cloud-computing for flexibility
- HPC cluster for brute power computational power (more than 1000 cores)
- Scalar storage for massive data archiving (> 34PB)
- LTO tape libraries for backup and preservation (>33PB)
- High speed internal network to feed processing node without delay and multiple 10 Gbps Internet lines for no waste while data are transferred

The company offers:

- A team of ICT specialists, remote sensing experts, data engineers in the team corroborated by environmental scientists in the Group
- A library of EO data processors tuned to the analysis of long-term series of geo-physical/chemical/biological/ecological global data
- Partners in the European, American and Australian scientific communities and space agencies

MAIN CUSTOMERS

Space Agencies, European Commission, Public Institutions, Private Companies, Research Centres.

MAJOR SPACE PROJECTS

LSA Data Centre

The largest collection and distribution system of Europe for the LSA. More than 26 PB of S1 and S2 data, online and ready for the user.

ESA Advanced Long-Term Archive (ALTA)

adwäisEO is responsible for the operations of one of the Copernicus ALTA for S1, S2 and S3 RAW and auxiliary data.

EO Data Archive Service (EODAS)

Secured infrastructure and efficient routines for preserving several PB of the ESA "EO Data Archive Service".

Copernicus Marine Environmental Monitoring Service (CMEMS-DU)

adwäisEO cloud solution and secured storage is used as Disaster recovery centre for all the Dissemination Units.

CMEMS

Processing and delivery of global ocean colour products.

ESA Climate Change Initiative Sea Surface Salinity (CCI+SSS)

HPC solution is the best when massive data needs to be produced in a limited time. adwäisEO is responsible for the production of salinity data.

Coastal Change Project

A cloud approach allows flexibility and security for a project dealing with different computational and data access requirements

Building Trust in the Digital Economy

Computational cloud services to identify potential impediments to upscaling commercial use of satellite imagery for scientific, social, and economic purposes.

EXPLORE and SciApps

Skilled DevOps engineers and Developers to deploy and make accessible new tools that enable and promote the exploitation of space science data.

Amphinicy Technologies

CEO/
HEAD OF DEPARTMENT
Frane Miloš

CREATION DATE
2002

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 15
Space: 15

TURNOVER 2020
Total: €1,230,292.18
Space: €1,230,292.18

R&D
INTERNAL INVESTMENTS
App €130,000

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CORE BUSINESS

Amphinicy Technologies (AT) is a valued provider of complex, tailor-made software solutions and all-round software support for the satellite industry. AT has been on the market for 20 years, with its Luxembourg office established in 2002. Amphinicy Luxembourg has high expertise in the fields of SatCom and Earth Observation. It provides enterprise solutions for big commercial and governmental projects.

Our primary field of expertise is in the ground segment solutions – Monitor and Control, Mission Operations, Simulations, Validation and Verification, Quantum encryption key management, EO data acquisition, Telemetry and protocol analysis.

PRODUCTS AND SERVICES

Products

- **Monica:** a modern monitoring and control built on the latest industry standards. It comes in two versions– as M&C solution for local ground stations (e.g. broadcasting teleport), or as ultra-scalable NMS solution for monitoring huge networks (e.g. VSAT networks, IoT, ...)
- **Blink:** an innovative software solution for ultra-fast EO telemetry acquisition and processing, using today's top-of-the-line commercial CPUs and GPUs and radically reducing costs, improving flexibility and maintenance
- **SatScout:** a handy, white-label mobile application, helps end users and professional installers in commissioning satellite VSAT terminals on site. It utilises augmented reality and mobile phone sensors

Services

Tailor-made software engineering and consulting services and all-round software support for the satellite and space industry.

TECHNICAL MEANS

AT employs top-notch, highly-qualified ICT and space engineers with expertise in the following ground segment domains:

SatCom solutions

- Monitor and control systems
- Ground segment simulations
- In-orbit testing systems
- Mission Operations
- Mobility – beam roaming and load balancing
- Embedded systems for ground segment
- Secure optical communication (Quantum encryption key mgm)
- Pooling and sharing mechanisms

Mobile solutions

- Antenna site survey and alignment (Augmented reality based)
- VoIP over satellite solutions
- Solar cells
- Professional UX visualization

Humanitarian projects

- SatLearning
- SatMedicine

Space Technologies / standards

- ECSS compatible
- CCSDS protocol and standards expertise
- SPELL language and standard

Extensive and valuable experience working on demanding ESA projects as well as on solutions for industry leaders in the fields of satellite operations, satellite services and satellite networks.

MAIN CUSTOMERS

- International space and humanitarian agencies (ESA, DLR, UNHCR)
- Leading satellite operators and global satellite service providers/ integrators (SES, O3b, Qinetiq, Airbus DS)
- Teleports and space mission operation centres (RSS) and
- Satellite equipment manufacturers (OHB, Newtec, iDirect)

MAJOR SPACE PROJECTS

Amphinicy Luxembourg provided software engineering services in the following flagship projects:

GOVSATCOM MOC

- Partnership with SES Networks
- Architecture and implementation of MOC
- Ground segment simulation

EDRS MOC

- System Orchestration
- Monitor and Control
- Simulation

AG1

SPELL procedures and translations

COPERNICUS

AIV for Sentinel communications modules

GHOST

Embedded system for spread spectrum modem

ST Engineering / iDirect Europe

Validation platform and services for VSAT networks

Arspectra SARL

CEO/
HEAD OF DEPARTMENT
Cédric Spaas

CREATION DATE
2018

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 10-50

CONTACT DETAILS
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CORE BUSINESS

Arspectra is specialized in the design and supply of Augmented Reality (AR) technology, with an initial focus on data visualization, teleassistance, and navigation in various applications. Arspectra's fully see-through AR data glasses and software project relevant data, instructions, and 3-dimensional images in the direct sight of the user. It allows to stay focused on the actual target and action while improving the performance of the professional user by the most natural and efficient integration of information and navigation data. This in-sight guidance naturally improves the precision, time-efficiency, cost, and outcomes of the various procedures.

By merging digital data and images into the real sight of its users, Augmented Reality is set to bring important changes in current visualization, training, and navigation solutions. Yet to truly benefit of the advantages brought by merging digital data seamlessly into the reality, the platforms must also perfectly fit to the performance and physical parameters demanded by the applications and users.

Arspectra designs modular Augmented Reality hardware and software platforms, delivering the most performant and adapted solutions to its partners and customers.
From lightweight Augmented Reality glasses for visualization and communication, up to high-performance navigation platforms, Arspectra's partners can select from various available solutions, to fully customizable developments. Supporting software plugins enable them to flexibly integrate their own software and applications.

A

PRODUCTS AND SERVICES

Proprietary glasses are developed in close collaboration with end users and enable a very flexible integration of various sub-technologies. Arspectra offers adapted solutions leading to increased performances, lower costs, and better procedure outcomes to different applications and usage scenarios. Due to the technologic novelty, current procedure standards can be disrupted by unprecedented advantages and very competitive prices.

Arspectra's hardware developments:

- Design of medical AR glasses with adapted form factor and sensor technology
- Setup of intra-operative 3D tracking systems
- Design of mobile processing units for various AR-supported use cases

Arspectra's AR devices run a proprietary software platform that serves as base layer on which partners can develop their own AR software and algorithms. Next to the standard platform several functional plugins are available:

- Gesture tracking
- Voice control
- Cellular communication
- Up to military grade cybersecurity & encryption

Arspectra's team is highly experienced in the flexible co-development and integration of AR capabilities for visualization and navigation in existing or in-development technologies and operations.

MAIN CUSTOMERS

- Medical technology companies and distributors
- Medical specialists and institutions
- Industries with healthcare-related applications
- Research institutions
- Industries in need of AR-based remote assistance platforms
- Industries in need of AR-based visualization and navigation platforms

MAJOR SPACE PROJECTS

TeleAssist ESA project

Globally connected healthcare delivery for emergency and humanitarian needs.

ArViCom SARL

CEO/
HEAD OF DEPARTMENT
Cédric Spaas

CREATION DATE
2020

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 1-10

CONTACT DETAILS
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CORE BUSINESS

ArViCom SARL develops cellular and satellite-based communication technologies and services into mobile Augmented Reality (AR) platforms in order to enable global remote collaboration based on AR visuals and interaction.

Classic verbal and video-based communications are often difficult to interpret by the remote expert and can be obtrusive to the action of the mobile agent. ArViCom enables remote visual validation, communication, expert overview, and senior interdisciplinary assistance through a secure, reliable communication, and access to expertise. It hereby offers improved procedure outcomes, a higher time efficiency, and reduced cost to unnecessary displacements of multiple agents and experts.

A first focus is placed on enabling a global reach to medical expertise for remote and mobile agents in humanitarian and remote medical use cases. Further applications to other industries are being developed through various partnerships. Each design transforms the end-user requirements and the technical and economic parameters into highly performant and adapted collaboration solutions with global access.

PRODUCTS AND SERVICES

The ArViCom devices are a combination of AR glasses, its mobile communication and processing units, and tailored software integrating global connectivity management.

As visual communication tool, it shares the same point-of-view observation as the mobile agent, but especially allows remote instructions and support to be delivered in the direct sight of the agent in action.

It offers the user real-time visual interaction and support of remote experts, regardless of geographical location.

It offers a more natural interpretation of the discussion subject and case by the remote expert, and a hands-free visualization of the instructions by the user. It significantly improves the focus, comprehension, and success of active professionals.

These advantages are delivered on a high-performance technology with market-leading visualization, global and secure connectivity, designed to perfectly fit to the specific user actions and requirements.

MAIN CUSTOMERS

- Humanitarian and remote healthcare agencies
- Telemedicine companies and agencies
- Ambulance agencies and services
- Research institutions
- Industries in need of AR-based remote assistance and collaboration platforms
- Industries in need of outdoor AR-based visualization and navigation platforms

MAJOR SPACE PROJECTS

TeleAssist ESA project
Globally connected healthcare delivery for emergency and humanitarian needs.

ArViGuard ESA project
Space in response to the Covid-19 outbreak.

Blue Horizon SARL

CEO/ HEAD OF DEPARTMENT
Jochen Harms

CREATION DATE
2018

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 5
Space: 5

TURNOVER 2020
Total: € 400 K
Space: € 350 K

R&D INTERNAL INVESTMENTS
€ 50 K

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CORE BUSINESS

Life science technologies and services in space, on planets and Earth.

PRODUCTS AND SERVICES

- Revitalisation of deserted areas on Earth using Biological Soil Crusts (BSC)
- Bio Reactors
- Earth Observation
- Micro Gravity Experiments
- Life Science support to manned missions to other planets
- Terraforming

TECHNICAL MEANS

- Bioreactors for Earth and space applications
- Growth of bacteria and algae
- Qualification of material
- Earth Observation and GIS systems

MAIN CUSTOMERS

- Ministry of Foreign Affairs, Luxembourg (LUXDEV)
- ESA
- LSA
- EU
- Private industry

MAJOR SPACE PROJECTS

Green Earth

The program, led by Blue Horizon aims at developing, marketing and sale of products and services related to the fertilisation of soils in arid and semi-arid areas. Our biological soil crust (BSC) capable of strongly reducing water and wind erosion and creates the basis for first pioneer plants. It also forms a CO_2 sink. After a laboratory phase, the BSC is currently tested in our open field test sites in Africa. At the same time, a site selection and monitoring system is developed using Earth Observation data. After the field test, the program will be rolled out in Africa.

OW INK

The project aims at developing printable material out of algae. First tests have been successful and the material is now qualified.

Micro Gravity experiments for health

Based on a feasibility study instruments are developed to monitor tumour and other cell cultures under Zero G conditions. A first instrument is developed supported by a number of well-known Luxembourgish and European partners from the health sector.

Bradford Deep Space Industries

deepspace industries

bradford space

CEO/ HEAD OF DEPARTMENT
Alexander Finch

CREATION DATE
2016

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 7
Space: 7

TURNOVER 2020
Total: € 535,000
Space: € 535,000

R&D INTERNAL INVESTMENTS
€ 300,000

CONTACT DETAILS
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CORE BUSINESS

Bradford Deep Space Industries develops technologies to export the NewSpace philosophy – and the increased value proposition it has already offered in LEO – to new applications in GEO, lunar and interplanetary space. This accelerates the cadence of scientific exploration and enables new business uses beyond LEO.

We offer **affordable, high-performance avionics for deep-space and Earth-orbiting smallsat missions.** The robust and performing nature of these makes them well suited for both deep-space and demanding LEO applications.

These avionics are a core part of the **Bradford Square Rocket**, a multi-mission bus that can take payloads of 30kg from the ground to anywhere in the inner solar system for an order of magnitude lower cost than, and less than half the development time of, traditional deep space missions.

Furthermore, we produce the **Comet Water Thruster.** Comet is a launch-safe and cost-effective electrothermal propulsion system that offers the ideal balance of cost and performance. This high-performance propulsion system unit uses water as propellant, making the system easy to work with and easy to fuel. Its highly-flexible interface is easy to integrate into small satellites, regardless of size and form factor, and easy to operate on orbit.

B

PRODUCTS AND SERVICES

- An **avionics solution** – a modular system suitable for deep-space or high-performance smallsats in the 30-300kg (dry) mass range with a 5+ year lifetime, consisting of any combination of:
  - robust flight computer
  - high performance computational platform (with full-scale OS)
  - power control and distribution unit (that supports high-power loads such as electric propulsion, radar payload or drive motors)
  - high-power radio transponder with navigational ranging that works out to 1AU
  - a propulsion RTU

- The **Comet** – a water thruster for small LEO spacecraft
  - Non-toxic, safe for humans and launch vehicles
  - More thrust with less electrical power
  - Highly-flexible interface suitable for a wide range of spacecraft sizes
  - Zero failure in-orbit heritage

TECHNICAL MEANS

Design, qualification and manufacture of electronic, RF and water propulsion systems.

MAIN CUSTOMERS

Commercial smallsat manufacturers, mostly US-based, including LeoStella, HawkEye360, UmbraLabs, Canadensys and Capella.

MAJOR SPACE PROJECTS

Design and developments of deep-space avionics.

Power distribution sub-modules of the avionics stack product

Comet 1000 water-based propulsion system

CGI

CEO/ HEAD OF DEPARTMENT
Guillaume Schott

CREATION DATE
2020

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total:
- Luxembourg: 200
- Global: 77500
- Space: +1000

QUALIFICATIONS, APPROVALS
ISO 9001, ISO 14001

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CORE BUSINESS

Founded in 1976, CGI is among the largest independent IT and business consulting services firms in the world.
With 77,500 consultants and other professionals across the globe, CGI delivers an end-to-end portfolio of capabilities, from strategic IT and business consulting to systems integration, managed IT and business process services and intellectual property solutions.

CGI delivers secure, mission-critical space systems including data processing and exploitation, satellite communications, orbit determination, command and control, ground segment engineering, navigation and situational awareness.

CGI's desire remains more than ever to **help space players in Luxembourg** increase the value of their investments and, more specifically, to use space data to solve their business challenges and drive business opportunities.

PRODUCTS AND SERVICES

Our end-to-end services provide industry and technology expertise, solutions, frameworks and tooling to enable our clients to drive business agility, competitive advantage, transformation and cost efficiencies. At CGI, we believe that having a deep understanding of our clients' business is absolutely fundamental to us being able to deliver the best possible service.

We are supported by a large group, with 40 years of experience, composed by more than 1000 experts in the space industry. We are able to **capitalize on this global experience locally**

- We've helped ensure that navigation systems are secure, reliable and fit for purpose

- We provide network, service and business management systems to many of the world's communications satellite operators; commercial and military

MAIN CUSTOMERS

European institutions, financial sector, private & public sectors, space agencies, industries...

MAJOR SPACE PROJECTS

In Luxembourg

- Support the development of custom gateways for GomSpace's Autonomous Operations Platform
- Implementation of a tool that controls satellites

Global references

- 200+ satellite missions supported by CGI software
- Designed and delivered the security solution for Europe's future space-enabled Air Traffic Control Network
- Largest independent supplier of security systems for Europe's Galileo satnav program
- Delivered the Galileo satellite constellation control facility that will control all of Galileo's 30 satellites
- Support the European Space Agency's (ESA's) climate change initiative
- European leader in military satellite communications ground segment systems
- Manage the maintenance and evolution of ESRIN's earth observation ground systems
- Designed, delivered and deployed the core infrastructure for Galileo Public Regulated System (PRS)

CONTEC Space SARL

CEO
Dr. Sunghee Lee,
CONTEC HQ in Rep.
of Korea

GENERAL DIRECTOR
Semi Park, CONTEC Space
SARL in Luxembourg

CREATION DATE
- **Foundation of CONTEC HQ in Rep. of Korea:** 2015
- **Foundation of CONTEC Space SARL in Luxembourg:** 2019

ORGANISATION TYPE
Small and Medium-Sized
Enterprise

NUMBER OF EMPLOYEES
Total: 2

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(General Director of
CONTEC Space SARL)

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CORE BUSINESS

Established in January of 2015, CONTEC is a spin-off company from KARI (Korea Aerospace Research Institute) and is offering Space Ground Station Services and Satellite Image Processing & Application Services as well as a whole ground integration solution. At CONTEC, we strive for excellence and we think that it is only with talented people that this goal can be achieved. Currently, 33 engineers work in two different offices in Korea and Luxembourg as subsidiary, and half of them have a superior education degree, along with great experience in the space industry. With these services and powerful manpower, we are trying to provide a meaningful value for prospective customers in the New Space Age.

PRODUCTS AND SERVICES

At CONTEC, we are currently providing space ground station services through our own ground station and partners' ground stations all over the world. Our engineers also created CONTEC ONE, a platform where satellite communications become child's play.

In addition, we offer restrain satellite imagery analysis and application services based on raw satellite image data by applying deep learning algorithms in order to detect several specific objects depending on the needs of our customers. We especially focus on applications for urban change detection of Smart Cities and try to provide the best service possible for local governments and therefore participate to urban development.

TECHNICAL MEANS

Hardware

- Design and integration of ground station
- Small antenna manufacturing for ground station
- Whole MRO service for ground station

Software

- Monitoring and Control Software for ground station
- Multi-mission operation system for ground station
- Web-based platform and cloud technology for ground station service
- High-speed satellite image processing
- Calibration and validation (CAL/VAL) of satellite imagery
- Object detection on standard satellite image data

MAIN CUSTOMERS

As the number of satellite (especially small-sized satellites) launches has continuously increased, the space market is open to many new businesses and its scale is growing simultaneously. CONTEC is taking advantage of this opportunity and aims at those satellite operators and satellite launchers who need to connect with their satellites.

As for its satellite imagery application service, CONTEC is especially working with local governments but does not restrain to this category. In conclusion, we can summarize our current and potential customers as below:

- KARI (Korea Aerospace Research Institute)
- Agency for defense department in the Republic of Korea
- Several government research institutes and commercial companies in the Republic of Korea
- Sejong local government (1st world smart city) in Republic of Korea
- KSAT in Norway
- RBC Signals in USA
- Perigee Aerospace and South Launch in Australia (for launch mission)
- Etc

MAJOR SPACE PROJECTS

CONTEC's own ground station is located in South Korea, more precisely in Jeju Island and benefits from an ideal environment (antenna picture). However, as is shown on the map below, our plan is to rapidly scale up our network by building new ground stations all around the world. Especially in:

- Northern Europe, UAE, North America and South America and so on
- CONTEC will build the 2nd ground station in Finland by the end of this year

Jeju ground station

Deployment plan

CREACTION

CEO/
HEAD OF DEPARTMENT
Jean-Paul Henry

CREATION DATE
1993

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total:
1 + 3 in-house consultants
Space: 1

CONTACT DETAILS
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Website:
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CORE BUSINESS

CREACTION group is an engineering office dedicated to industrial innovation and in particular integrating Space and innovating technology in non-space industrial sector. Its main assets are creativity to develop new concepts with strong added values and technology transfer, mainly through ESA Technology Transfer. The original approach of CREACTION is to consider four management sectors (marketing, techniques, finance and IPR) at the same time development for innovative success. For three years, CREACTION is also managing the ESA TTPO program of the Grand Duchy of Luxembourg. CREACTION has a proven expertise in the innovative development of complex information systems and products. 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. Sometimes the demonstrator structure is robust enough to be kept for definitive use.

PRODUCTS AND SERVICES

- Management of innovation advise and follow-up of companies new development projects strategic audit, integration of technological skills and the accompaniment of an innovative idea to a commercial product
- Management of technology transfer – audit of the owner or the request, implementation of TT specification: nuclear, medical, automotive, cybersecurity... and new materials sectors
- Management of private/public research centre assessment of R&D areas for the purpose of commercialization and spin-off activities
- Study conception of new products (modelling 2D-3D, prototyping and pre-series) to have a better vision of the future commercial

product. "Calculate the risk, save on time and money, your objective is our own"
- The Creativity Centre's objective is to create sustainable commercial business, focussed on high quality processes and products. It addresses on space and non-space customers, offering short-term creative immersion

TECHNICAL MEANS

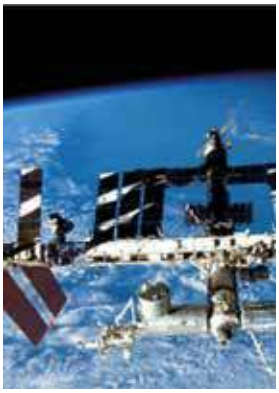
- Rapid prototyping competencies
- Validation and optimization tools for new applicative markets
- Space Creativity Centre for ESA BICs and industrial sectors

MAIN CUSTOMERS

- Private entreprises: Renault, Beckaert, John Zinck, Areva and other SMEs
- ESA/TTPO, ESRIN/EAC
- R&D centres

MAJOR SPACE PROJECTS

- ESA/TTPO since 2013
- The Technology Transfer Network consists of brokers across Europe who are working to identify novel uses for technology that has been developed as part of the ESA space program. They are also interested in identifying technologies in other sectors that could benefit the exploration and utilization of Space
- EM-SAT - IAP - DEMONSTRATOR 2018: Integrated Secured Crisis Management & Information Platform for Hazardous Industrial Facilities. EM-SAT is a monitoring, supervision and managing crisis centre sold as a service, offering a complete toolbox of features for SEVESO sites
- Improvement of new nuclear cask.
- HIGHT TEMPERATURE SMAs to reinforce the security in transport Improvement of new nuclear cask
- FIT4GROW program. Project stock energy. Creativity sessions in the field of transport with the aim to help think, identify, create and validate a new path of diversification in the utilities sector
- ERASMUS: Utop' Textile. Stimulation of ideas through innovative sessions, using high space technologies/process available during school training
- INTERREG PROGRAMME – PUSH GR: SHAPE YOUR PRODUCT DESIGN: Accelerator program to optimize and validate project/idea/service by integrating high value-added space technology. Organization of 2 workshops per year



Cybercultus

CEO/ HEAD OF DEPARTMENT
Farid Meinköhn

CREATION DATE
1999

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 5
Space: 2

TURNOVER 2020
Total: € 300 K
Space: € 100 K

R&D INTERNAL INVESTMENTS 2019 OR 2020
€ 100 K

QUALIFICATIONS, APPROVALS
City of Esch prize for innovation 2006

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CORE BUSINESS

Cybercultus focuses on providing the entertainment, cultural heritage and sustainable tourism sectors with innovative digital communication and content solutions by inventing the RAMO "Reactive and Adaptive Multimedia Objects" semantic layer that insulates content producers from the technical complexity of interactive communication and user immersive applications. The Cybercultus "eBusiness Solutions for the Art industry (eBSA)" aim at valorising entertainment, educational, cultural and tourism assets, as well as fostering human creativity through interactive, social and immersive technologies. Today, Cybercultus works with large industries and organisations in Europe and develops partnerships with public and private actors specialised in social / immersive applications (for TV programmes, cultural heritage, travel portals) and in GIS technologies (for spatial and temporal mapping of cultural, environmental and tourism geo localised multimedia assets).

PRODUCTS AND SERVICES

Culture

- eBSA expo suite (editor & run-time): 2D/3D organisation & display of cultural assets in virtual spaces
- eBSA museum suite (editor & run-time): cultural assets and art collections management, valorisation and geolocalisation

Tourism

- eBSA travel suite (editor & run-time): customised travel offers, virtual visits and planning, onsite support and on the move LBS application

Entertainment

- eBSA iTV suite (editor & run-time): immersive TV quiz show, immersive travel TV magazine, community TV content making
- eBSA iTV libraries: advanced interactivity enactment based on the RAMO model

TECHNICAL MEANS

RAMO (Reactive and Adaptive Multimedia Objects): based on the MPEG 7 open standard, development of platform independent software editors targeting "web, mobile and iTV" social & immersive applications. Open standards and technologies HbbTV, HTML5, MPEG 2, MPEG 7, XML, Java, PHP, Android, iOS

MAIN CUSTOMERS

- Entertainment, culture and travel partners
  SES, ARD / RBB (Germany), ORF / TW1 (Austria), RTBF (Belgium), ORT (France), Musée Albert Kahn (France), Instituto Latin America de Museos (Costa Rica), Agence culturelle luxembourgeoise (Luxembourg), European centre for eco agro tourism (The Netherlands), Siel Canada (Luxembourg), SAN Parks (South Africa), Peneda-Geres National Park (Portugal), Sense Inverse (Belgium)
- Industrial partners
  Thomson Multimedia (France), Philips (The Netherlands), GeoVille (Austria)
- Public research partners
  LIST (Luxembourg Institute of Science and Technology), ESA, INRIA Lorraine (France)

MAJOR SPACE PROJECTS

Entertainment & cultural applications

- Real Time Immersive TV Show (RTI-TVS): enables TV viewers to participate from their homes, via avatar representations, to an aired TV quiz show
- Immersive Satellite TV (IMSATV): allows TV viewers, via an avatar representation and using the remote control, to discover the rich content associated with an aired tourism TV documentary or magazine
- Community TV Content Making (COTV): enables TV viewers to partner with TV channels, co-producing TV content using smart phones for HD video capture & upload onto the TV programme and using networked TV facilities for team editing, publishing and rating of the co-produced TV content

Tourism application

- Online tourism à la carte: Trip à la Carte is an online tourism platform enabling travellers to build "à la carte" from a map their own trip, selecting in each locality the activities, the lodging and the local transport of interest. It also provides them with LBS (Localisation Based Services) while on the move
- Sustainable, environmental and safe tourism in protected areas (SENSA): a range of facilities for trip planning in natural parks, for "on the move" itinerary processing with offline routing and geo-localised awareness information, for travellers' safety with interactive/geo-localised satellite SOS messages and alert news from the park, and for optimal distribution of travellers in protected areas with real-time field observation reporting by visitors acting as preservation agents. The SENSA facilities make extensive use of advanced satellite communication, navigation and Earth observation capabilities
- Real-time interactions with parks authorities focus on nature preservation and travellers support using advanced satellite communication, navigation and earth observation

Databourg Systems SARL-S

CEO/ HEAD OF DEPARTMENT
Ahmad Gharanjik

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 3
Space: 3

CONTACT DETAILS
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CORE BUSINESS

Databourg Systems is a start-up companyconceived from innovative technologyfor environmental monitoring using satellite networks, developed at the University of Luxembourg. Databourg's mission is to provide the best rainfall intelligence to business and institutional users and to be recognized as "The Rain Company".

PRODUCTS AND SERVICES

Databourg Systems is focused on offering two services:

- Rain Monitoring System: Using existing satellite ground terminals, Databourg developed a real-time rain monitoring system. This system is currently operational in France and can provide affordable rain data in real-time
- Data Analytics for Satellite Network: Databourg Systems' patent pending, and proprietary technologies enable to provide satellite terminal Geo-localization and relevant data analytics

TECHNICAL MEANS

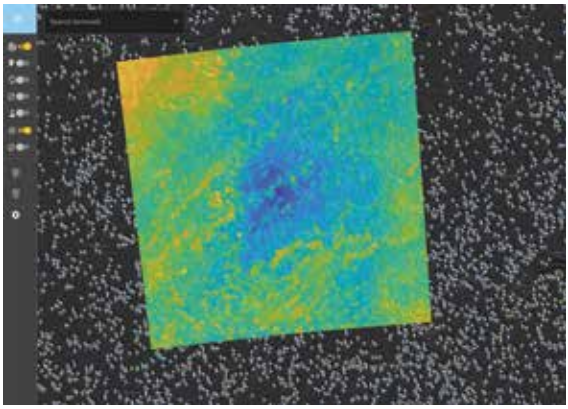
Patent pending and proprietary technologies

MAIN CUSTOMERS

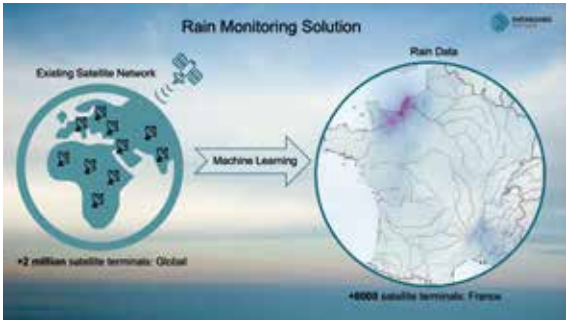
Satellite Operators, Space Agencies, Weather Industry, Agriculture.

MAJOR SPACE PROJECTS

- ESA kick-start CERASAT
- RAFAEL PoC (UniLu/FNR)
- LuxIMPULSE



Geo-Localization of a Satellite Terminal in a search region



Databourg's Rain Monitoring System

EarthLab Luxembourg SA

CEO/ HEAD OF DEPARTMENT
Thomas Friederich

CREATION DATE
2015

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 9
Space: 9

TURNOVER 2020
Total: 568,000€
Space: 521,000€

R&D INTERNAL INVESTMENTS
€ 95 K in 2019
€ 85 K in 2020

CONTACT DETAILS
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CORE BUSINESS

EarthLab Luxembourg was founded in 2015 to offer innovative services for professionals managing multiple hazards. It uses earth observation data with varied sources of information, such as aerial imagery, crowdsourced pictures, social media, trade and markets datasets, internal exposure databases, or ground sensors. We believe that platforms combining the latest technological developments, Artificial Intelligence, Big Data, and interoperability will standardize and bring a new definition of data-centric projects and a new community of users.

The Platform as a Service concept relies on our dedicated hybrid cluster allowing our customers to use our solutions to create new products, optimize their losses in case of extreme events, and adapt their strategies using predictive analytics. We offer a clear valorization of the data by creating multiple potential uses into one single central toolbox.

PRODUCTS AND SERVICES

We commercialize a highly flexible and data-centric platform that allows dealing with the landscape of global risks.

Our solutions are built on high-performance computing to support decision-makers in the event of risk manifestations, providing detailed, timely, and relevant information. A key advantage is that there is no ICT workload to set up, configure, and maintain with our platform. We provide a dynamic vulnerability scoring in terms of operations, the resilience of communities, supply chain, and environment. We use in-house simulations and A.I. models to anticipate the next landscape of significant risks. We enrich risk models by creating information thanks to automatic recognition into massive datasets to give context to risk assessment. We also

aggregate thousands of datasets from social and economic indicators in real-time, allowing us to predict the consequences of extreme situations (natural disaster, endemic accident, political event, pandemics, etc.).

TECHNICAL MEANS

EarthLab Luxembourg implements its products and services, relying on its private infrastructure. The implemented technologies follow the "Big Data" paradigms and fully subscribe to an elastic model ensuring future large-scale capacities.

Our approch relies on four different pillars: (1) strong data engineering and analytics, (2) data modeling and application of state-of-the-art A.I. algorithms, (3) optimization and automation with our Max-ICS platform and, finally, (4) an agile approach when building solution or project analytics.

MAIN CUSTOMERS

The current EarthLab Luxembourg's client base is insurance, financial services, industrial companies, and brokers about environmental risks and large industrial complexes concerning endemic hazards. We are processing highly innovating projects in collaboration with our four shareholders, coming from geo-information, telecommunications, and ICT: Telespazio France, e-GEOS, HITEC Luxembourg, and POST Luxembourg Group.

We are acting in the open-source and open data communities to share data science knowledge for communities.

MAJOR SPACE PROJECTS

Maritime Surveillance

It is crucial to analyze the surface activities & the comportment in dark-fish or preservation of protected maritime areas. E.O., GNSS, & A.I. are very important: it offers the possibility of systematically analyzing all the area images. Max-ICS platform helps create or improve the A.I. models & supports the automatically scaled deployment within a public cloud

Agriculture

During the COVID-19 crisis, agriculture came into the spotlight, helping to foster predictive solutions. Using different data sources & advanced analytics, EarthLab delivers various models and applications to support the domain

DroneAI

EarthLab has launched an innovative solution to push the use of space data and A.I. on disaster/humanitarian response: it combines E.O. open & commercial data to feed a data processing chain defined by the actors

EBRC

CEO/ HEAD OF DEPARTMENT
Yves Reding

CREATION DATE
2000

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 200

QUALIFICATIONS, APPROVALS
ISO 9001, ISO 20000, ISO 27001, ISO 270187 (BP), ISO 22301, ISO 14001, ISO 50001, PCI DSS Level 1,PFS of support (CSSF), HDS (Hébergeur de Données de Santé), Data Centres 3x Tier IV Design Documents, 2x Tier IV Facility Constructed

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CORE BUSINESS

Founded in 2000, EBRC aims at becoming a European Centre of Excellence and Trust Centre in the management and protection of sensitive information.

EBRC has developed a unique value proposition for its clients and partners focused on Trust and Cyber-Resilience: EBRC-Trusted Services Europe.

In order to provide the highest security and quality of service, EBRC has certified its services end-to-end: ISO 27001 (information security), ISO 22301 (business continuity), ISO 20000 (IT service management), ISO 9001 (quality), Health Data Hosting-HDS, PCI DSS level 1 (payment security). EBRC meets the financial sector regulation and holds "Professional of the Financial Sector" (PFS) accreditation.

From its three Tier IV certified Data Centres, EBRC operates its own sovereign European cloud, EBRC-Trusted Cloud Europe, offering public, private and hybrid deployment models connected to 100 international destination. EBRC provides the full range of ICT Managed Services EBRC -Trusted Managed Services. In addition, EBRC offers its EBRC-Trusted Advisory Services ranging from advice in Risk Management, Cyber-Resilience, Cyber-Security, Certifications & Compliance to IT Transformation & Move to the Cloud.

EBRC and its subsidiary Digora, employ over 340 experts and consultants based in Luxembourg, France, Belgium and Morocco.

With a strong historical presence in the international banking and financial sectors, as well as in the healthcare and international institutions markets, EBRC advises and operates clients in sensitive and critical businesses: e-commerce, industry, pharma & biotech, public sector, defense, space, energy, critical operators, large law firms, FinTechs & RegTechs, and sensitive start-ups.

PRODUCTS AND SERVICES

Trusted Advisory Services

- Risk Management, Cyber-Resilience, Business Continuity, Cyber-Security, Crisis Management, Data Centre Advisory, IT Transformation, Cloud Readiness Assessments, Move to the Cloud, ISO certification support, GDPR, Compliance with regulations, ...

Trusted Managed Services

- 24/24 Agile ICT Outsourcing Services, based on ITIL and international standards and best practices

Trusted Cloud Europe

- Fully certified European sovereign Cloud Services, offering 3 deployment models: public, private or hybrid cloud, all operated from EBRC secured Tier IV-certified data centres, connected to 100 international destinations

Trusted Security Europe

- Security Operations Services (SOC)

Trusted Resilience Services

- Business Continuity & Recovery Services, Work Area Recovery (800 seats on 2 distant interconnected Recovery Sites), Trading Rooms, Disaster Recovery as a Service (DRaaS), Trusted Backup & Recovery Services (TBRS), Cloud Recovery, Crisis Management

Trusted Data Centre Services

- High-availability Data Centre Services (3 Tier IV-certified Data Centres - 17.000 sqm IT server space)
- 100% Green Energy - ESR Commitment - ISO 14001 & ISO 50001 Certifications
- Largest neutral carrier hotel in Luxembourg offering large international connectivity
- European broadband connectivity (Low latency rates to major European hubs)

MAIN CUSTOMERS

The main client synergies within the space sector and its players are created with POST Luxembourg, AdwäisEO, SES, Signal Horn (formerly Digitaria) and EarthLab Luxembourg to complete a space value chain integrating information capture, transfer, treatment and dissemination.

EBRC's Tier IV certified Data Centre is located next to the SES ground base in Betzdorf. Its open and advanced facilities bring efficiency and flexibility to our continuous value chain making it possible to lead strong and deep-integrated projects. This Data Centre has been accredited by ESA and is ready to host ESA projects.

MAJOR SPACE PROJECTS

- EBRC, as member of the Consortium managed by AdwäisEO, is active within the Copernicus program
- The GSE project in Italy with Signal Horn for application layers and field deployment is dedicated to support and control production volume of renewable energy with a captured value coming from each wind, solar or hydraulic production point to create a complete follow-up and adapt the central production within a smart grid approach

EmTroniX

PRESIDENT & CEO
Cédric Lorant

CREATION DATE
2001

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 28
Space: 26

TURNOVER 2020
Total: € 2,159K
Space: €1,792K

R&D INTERNAL INVESTMENTS
€ 400,000

QUALIFICATIONS, APPROVALS
ECSS-ST-Q-70-08C and ECSS-ST-Q-70-38C

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CORE BUSINESS

EmTroniX is a dynamic Luxembourgish company providing technological expertise, engineering design, prototyping and production services in advanced electronics and embedded software to customers involved in the most demanding technological fields such as Space, Aeronautics and Automotive. Using state-of-the-art development tools, EmTroniX engineers are able to offer the most objective and cost-effective solutions to all customer's technological needs. The company offers the significant advantage of having in-house all the skills and experience required to handle different technical aspects of engineering development projects. Every year, the company is extending its competences and working on new projects. Among them, EmTroniX is currently involved in the development of high capabilities SDR payloads for various customers.

PRODUCTS AND SERVICES

Services

- Design, implementation and manufacturing of complex electronics, including software (embedded & FPGA) and mechanical aspects, primarily oriented for telecommunication purposes
- Radio Frequency transceivers, LNA, down-converters, up-converters up to Ka-Band and SSPA up to X-Band
- Advanced Digital Signal Processing, Software Defined Radio, real-time embedded software, automatic code generation, system modeling using rapid prototyping and optimized auto-coding
- Custom FPGA-based system, IP design and implementation (VHDL)
- Analog, digital, high-power driver and PSU electronic design
- High reliability, in-house automated SMT manufacturing

- Ultra-fast, In-house multilayer RF PCB/Filter prototyping up to Ka band

Products
- Multi-channels, high sensitivity ADS-B IP core
- Proximity-1 autonomous transceiver physical layer IP core
- AIS receivers
- ADS-B receivers

TECHNICAL MEANS

Production
- Autotronik Automatic SMT Stencil Printer
- MYPro MY300LX Pick & Place machine
- IBL Vapor Phase Oven
- Memmert Drying Oven
- Dr Storage Dry Storage Cabinet
- LPKF U4 high precision Laser Milling Machine for PCB/Filter prototyping, Galvanic Through Hole plating and Hydraulic Press for up to 8 multilayers PCB

Characterising & Testing
- Vector Network Analyzers (Dual & Quad ports, up to 24GHz)
- Spectrum & Signal Analyzers (1.8GHz / 7GHz / 43 GHz)
- RF Arbitrary Signal Generators (3GHz / 20 GHz)
- High Speed RF DSO (4CH – 20 Gs/s 6 GHz)
- Low & Medium Speed DSO (4CH – 100 MHz/300 MHz/500 MHz/1 GHz/1.5 GHz)
- Noise source
- Multi Channels Electronics Loads
- Battery Simulator (5A, 20V)
- Thermal Chamber (-30°/+130°C)

MAIN CUSTOMERS

Aerospace and aeronautics developers/ integrators (ESA, OHB, SES, Thales Alenia Space, QinetiQ, OIP, Airbus, KLEOS, OQ-Technology, Skyflox, IPAG, GomSpace), Military (NSPA), Automotive component manufacturers (Delphi, Honeywell, Faurecia, IFP, Ferrari, Hannon, Audi) and research institutions.

MAJOR SPACE PROJECTS

- Proximity-1 Autonomous Transceiver (ESA): Software Defined Radio transceiver for Mars-Orbiter autonomous telecommunication HUB (automatic signal modulation, frequency and baud-rate detection).
- HERA's Juventas Radar (GomSpace): First Low Frequency Radar probe of an asteroid.
- MACSAT IOD (OQ-Tec): Complete payload transceiver and demonstration terminals.
- Triton-X (OHB): High-Speed downlink and OBC for the satellite avionic DVBS2X FPGA-based downlink modulator, including RF and X-band SSPA. Avionic's On-Board Computer.
- VesselSat 1 & 2 (OHB): Payload – Dual AIS receivers, telecommand receivers, OBC interface, GNSS receivers, 3D sun sensor.
- 4M (OHB): Manfred Memorial Moon Mission: First commercial satellite orbiting the Moon.
- Generic SDR (EmTroniX): Flexible, powerful and multi-platform Software Defined Radio payload for wide-range telecommunication purposes. Used in Juventas & MACSAT.

EURO-COMPOSITES SA

PRESIDENT & CEO
Rolf Mathias Alter

DEPUTY CEO AND HEAD OF DEFENCE & SPACE TECHNOLOGY
Christoph Herrmann

CREATION DATE
1984

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 785
Space: 21

TURNOVER 2020
Total: €130 MIO
Space: €5.5 MIO

QUALIFICATIONS, APPROVALS
AIRBUS Group, The BOEING Company, EASA Part 145, EASA Part 21 G, EASA Part 21 J, IRIS, DNV marine certification, DIN 6701 Class A1, EN 15085-2, ISO 14001, ISO 9001 & SAE AS 9100, NADCAP

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Website:
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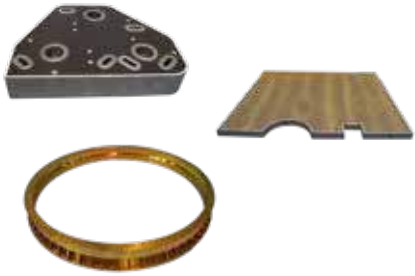
CORE BUSINESS

The EC-Group is a global player in the field of advanced and demanding composites products. We offer technical solutions based on advanced composites adapted to the needs of our customers: we are able to develop customized solutions to the required specification (build-to-spec), or we manufacture products according to the build-to-print approach. Just how it fits best for our customer and their needs.

PRODUCTS AND SERVICES

- Product development including structural and thermal analysis
- Advanced composite parts production
- High precision 5-axis CNC machining in a clean and climate controlled environment
- Formed composite parts
- Design and manufacturing of tools and moulds
- Completion of drop-in parts (inserts, reinforcements, extruded profiles, primed, grinded, coated/painted)
- Autoclave processing
- Resin infusion and resin transfer moulding processes for interior and structural parts
- Final assembly of complete units
- Kevlar®, Nomex®, Glassfibre, Carbon Fibre and Aluminium (5052, 5056, 3003) Honeycomb cores (with or without perforation)
- Sandwich panels (flat and curved structures)



TECHNICAL MEANS

- RI – resin infusion
- Autoclave
- FSW – friction stir welding
- Coating
- CAD/CAM software
- 5-axis CNC milling centres in climate controlled environment
- Sandwich panel production
- Honeycomb core production
- Quality control and measurement tools
- Laboratory for mechanical tests
- X-ray chamber
- Cleanrooms ISO 7 & ISO 8
- Ultrasonic inspection

MAIN CUSTOMERS

Airbus Defence & Space, ESA, QinetiQ Space, Boeing, Thales Alenia Space, MDA Corporation, Deutsches Zentrum für Luft- und Raumfahrt (DLR), SENER, IAI

MAJOR SPACE PROJECTS

Ongoing Projects

- PROBA-3: Aluminum structural panels, CFRP solar array substrates, Solar Array substrates
- PROBA-3: Optical benches
- ALTIUS Mission: Design & Engineering, Aluminium structural panels, CFRP solar array substrates, Bracketry, S/C environmental testing, S/C transport container
- SMILE MISSION: Payload Module Structure
- Skyflox: Radome design & manufacturing, final assembly
- 3D Honeycomb for Curved Structure Manufacturing
- ATHENA Mission: Low temperature radiator panel with embedded heat pipe
- Lagrange Mission: Components for the Heliospheric Imager (HI)
- Development of RF-transparent Glass Fibre Sandwich Panels for Space applications
- SAR satellite structure manufacturing, incl. painting and heat-pipes
- Large Telecommunication satellite manufacturing

Heritage

ESA PROJECTS

- EUCLID: Aluminum External Panels manufacturing
- PROBA Next (P200): Aluminum structural panels, CFRP solar array substrates, Solar Array substrates•
- Small Geo: CFRP and Aluminum Structural Panels, Transport boxes and Heat Pipe Test Panel for the Platform
- PROBA-V: Aluminum structural panels, CFRP solar array substrates, Solar Array substrates
- BepiColombo: High Temperature Aluminum Core (Flight Hardware)
- Perforated Honeycomb core: Qualification of perforated honeycomb types for Space application
- Quartz-Glass honeycomb core and sandwich panels: RF transparent glass fibre sandwich panels

Studies

- Light-weight, torsion-free structural panel with excellent surface properties
- Development of CFRP radiator panels with integrated fluid tubes
- Manufacturing of Honeycomb panel with embedded heat pipes for telecommunication satellites
- Study for structural CFRP thermal conditions

Projects

- Abrixas: Support panel for solar arrays
- BIRD: Solar Array support panels
- Herschel & Planck: Sub-Platform Test Dummy and Solar Panel Test Dummies
- Astrosat100: Structural Panel, Aluminum face sheets
- TET: Solar array panels, Payload panel
- DLR: DESIS CFRP box for ISS
- BOEING: parts for CST 100

e-Xstream engineering, part of Hexagon Manufacturing Intelligence Division

CEO/ HEAD OF DEPARTMENT
Dr. Roger A. Assaker

CREATION DATE
2013

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 70
Space: 15

TURNOVER 2020
Total: € 16 M
Space: € 4 M

CONTACT DETAILS
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CORE BUSINESS

e-Xstream engineering, part of Hexagon's Manufacturing Intelligence division offers the industry the most complete and integrated solution portfolio to leverage the full potential of ICME*. Our solutions are built on an integrated stack of state-of-the-art software, hardware and engineering expertise to model materials, manufacturing process and final part performance and their connectivity in the virtual world, the physical world and between the virtual and real worlds. ICME offers engineers across industries the ability to use the optimal combination of materials and manufacturing processes to innovate and maximize performance while reducing cost and lead time. ICME enables new design paradigms by modeling the strong coupling between materials, manufacturing and product performance.

PRODUCTS AND SERVICES

We provide software solutions dedicated to material modeling and materials data lifecycle management as well as consulting services around those topics.

* ***ICME:*** *Integrated Computational Materials Engineering*

TECHNICAL MEANS

Our solutions enable virtual material development & testing, material lifecycle management, to enhance predictivity & reliability for part's development, Materials Intelligence and last but not least sustainability by reducing the carbon footprint & material waste.

MAJOR SPACE PROJECTS

Recent major space projects are CompoSelector (Multi-scale Composite Material Selection Platform with a Seamless Integration of Materials Models and Multidisciplinary Design Framework), PSIDESC (Predictive Simulation of Defects in Structural Composites), and EXTREME (Dynamic Loading – Pushing the Boundaries of Aerospace Composite Material Structures)

Flawless Photonics, S.a.r.l – subsidiary of Flawless Photonics Inc.

CEO/ HEAD OF DEPARTMENT
CK Singla

CREATION DATE
2020

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 12

R&D INTERNAL INVESTMENTS
$ 2,6 M (US)

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CORE BUSINESS

Manufacturing of optical fibers and components in microgravity. Flawless Photonics produces the industry-leading SpaceFiber™, which is an optical fiber from a fluoride glass called ZBLAN, produced in microgravity conditions in Low Earth Orbit (LEO). From this fiber, improved and novel applications are produced for the photonics industry such as lasers, amplifiers, sensors, as well as superior optical fiber for the telecommunications industry.

PRODUCTS AND SERVICES

Flawless Photonics offers superior optical fibers of various geometries and performance capabilities, as well as components, products, and system-solutions such as lasers, amplifiers, LiDAR, and sensors based on the SpaceFiber technology.

TECHNICAL MEANS

Flawless Photonics controls 3 patents issued by the US Government on the equipment and process of manufacturing optical fiber in microgravity. Further, FP has conducted extensive research and development in the field of ZBLAN glass, MWIR optical theory and systems, AI and robotic automation, and other areas critical to the success of producing large volumes of commercial grade SpaceFiber for use across applications and across industries.

MAIN CUSTOMERS

Currently Flawless Photonics has one main customer in the form of the US Government, with approximately 100 potential customers at various stages of discussion to procure and utilize SpaceFiber once sufficient quantities and performance have been achieved.

MAJOR SPACE PROJECTS

Flawless Photonics is in the business of manufacturing commercial-grade SpaceFiber at scale. To this end, our entire business centres around one large "space project" in an effort to achieve this mission. Various facets of FP's business from R&D, to manufacturing, and supply chain are touched by the unique requirements and demands of transportation to LEO, being successful in the special conditions of microgravity, and safely returning our products to Earth for sale and fulfilment with our customers.

FTA Communication Technologies SARL

CEO/ HEAD OF DEPARTMENT
Christophe Perini

CREATION DATE
1991

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 20 in Luxembourg, 10 consultants (Poland, UK, Israel, India; South Africa, Brazil)

TURNOVER 2020
Total: €12.2 M

R&D INTERNAL INVESTMENTS
€ 903 K in 2019,
€ 900 K in 2020

QUALIFICATIONS, APPROVALS
CE, RoHS, SAT>IP

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CORE BUSINESS

Inverto is a leading supplier of broadcast reception equipment, remote monitoring and video streaming solutions serving major DTH operators across the world.

Leveraging on its strong R&D and software capabilities it has secured a leading position in a host of new breakthrough technologies including Ka/Ku Co-locate LNBs, dCSS, SAT>IP, cloud IoT, multiscreen video transcoding and mABR streaming.

Inverto has over 28 years of experience in the industry and is supplying millions of LNB, dishes, dCSS multiswitches and accessories every year to leading brands and tier-1 DTH operators. Inverto's broader expertise in digital video broadcast covering antenna, feed and microwave PCB design as well as mobile and real-time software in confined embedded environments allow for a truly holistic view on product design, sustaining innovation and guaranteeing world class quality.

PRODUCTS AND SERVICES

- LNBs: A supplier of choice for leading DTH operators across the world; the broadest product range in the industry covering Universal, band stacking or Unicable (dCSS) solutions for C band, Ku and Ka bands for single or multiple satellite reception (monoblock LNBs)
- Satellite Dish Antennas: A comprehensive range of satellite dish antenna and mounting accessories designed and engineered to meet the strictest performance and durability standards
- SatPal™ and SatWatch - Satellite installation and IoT remote monitoring solutions.
- SAT>IP Server/Client devices: The first SES-certified SAT>IP Server in the world

- Video transcoding and secure streaming solutions for IPTV / OTT services and mABR streaming gateways for 4G/LTE/5G-Satellite integration applications.
- Multiswitches: Most optimized and field proven designs of Unicable (dCSS) cascadable switches
- Accessories and Coax cables; RF splitters, combiners, power inserters and amplifiers for satellite TV distribution

F

TECHNICAL MEANS

- RF measurement and test equipment – signal generators, spectrum analyzers, oscilloscopes, noise figure meters, logic analyzers, DVB-S2 modulators
- Satellite signal measurements
- High speed PCB design and simulation tools
- Mechanical and product design tools
- Software development (embedded firmware, Linux, Windows, iOS, Android, cloud and web software applications)
- Systems engineering expertise

MAIN CUSTOMERS

- DTH operators worldwide eg TataSky, Multichoice, Serbia Broadband (Total TV), Airtel, Claro (CENAM), and Canal+ Luxembourg
- Distribution and OEM partners worldwide

MAJOR SPACE PROJECTS

ESA projects:

- MLNB
- SVC+VCM
- HTS-DBS
- Soon to be confirmed: 5G Emerge / European Broadcasting Union (EBU)

GlobeEye®

CEO/ HEAD OF DEPARTMENT
Dr. S. Pepino

CREATION DATE
2020

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 1-10
Space: 1-10

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CORE BUSINESS

GlobeEye®. Make Informed Decisions, Before Anybody Knows.

GlobeEye® operates at the intersection of New Space, Fintech and Climate Tech. It brings earth observation data to finance and the sustainable economy.

It specialises in the analysis of satellite and other remote sensing data to derive information for businesses and financial institutions, and aims at fostering sustainable growth. It leverages the technological frontier in satellite data, artificial intelligence, and big data to derive timely, accurate, actionable insights.

PRODUCTS AND SERVICES

GlobeEye develops ready-to-use indicators for the financial services industry and other businesses.

MAJOR SPACE PROJECTS

Macroeconomic and air pollutions indicators based on satellite data.

G

GomSpace Luxembourg SARL

CEO/ HEAD OF DEPARTMENT
Eduardo Cruz,
Country Manager

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 24
Space: 24

CONTACT DETAILS
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CORE BUSINESS

GomSpace Luxembourg is engages with two lines of business:

We are developing and offering Operations as a Service (OaaS) to owners of nanosatellites providing a scalable low-cost and fully automated solution that ensures high return on investment.

Further, we are developing Deep Space projects acting as the prime for ESA. The two missions M-ARGO and Hera/ Juventas will explore nearby asteroids and provide a wealth of new information facilizing future resource utilisation.

PRODUCTS AND SERVICES

Our main products is the Mega Constellations Operations Platform (MCOP) being the basis of our OaaS offering. Its features are:

- Our Mega Constellations Operations Platform (MCOP) is the only product designed from the ground up ready for constellations
- Cost effective both for single satellite in-orbit demonstrations to full-blown constellations in revenue services
- MCOP manages the entire ground segment, from antennas to end-users, allowing to optimise your assets at multiple levels
- Our continuous development and integration approach blends development and operations, ensuring our platform is fit for purpose - and adjust to your changing business priorities
- Our business model allows shifting CAPEX cost to OPEX; bringing down investment for enabling new space-based services
- Build for a cybersecure world. MCOP has a holistic approach to security that covers both space and ground segments all the way to your customers

MAJOR SPACE PROJECTS

Our MCOP project is a continuous development project where incremental updates are being released to the production environment adding new features and capabilities.

The M-Argo project is developing a 12U nanosatellite explorer expected to launch in 2024/2025 and independently navigate to an asteroid target and perform scientific investigations hereof. The project is pushing the state-of-the-art on almost any aspects of small satellite, including miniaturisation, autonomy and resiliency.

The HERA/Juventas is a 6U cubesat that will be part of the HERA mission and depart towards the Didymos asteroid system in 2022. The 6U carries a low-frequency radar payload that will probe into the interior of the asteroid. The mission will be managed through communications that goes through the HERA mother craft.

GovSat

CEO/ HEAD OF DEPARTMENT
Patrick Biewer

CREATION DATE
2015

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 16

TURNOVER 2020
Total: € 20.8 M

R&D INTERNAL INVESTMENTS
€ 120,000

QUALIFICATIONS, APPROVALS
ISO 9001, ISO 27001, NATO FSC, EU FSC, LUX FSC

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CORE BUSINESS

GovSat is a satellite operator and service provider. It is a public-private joint venture between the Luxembourg government and SES, the world-leading satellite operator. Its mission is to provide secure, reliable and accessible satellite communication services for governments – addressing the demand for connectivity resulting from defence and civilian security applications. Dedicated entirely to governmental and institutional users, the GovSat-1 satellite features high-powered fully-steerable spot beams and an X-band Global beam. It is equipped with anti-jamming features, encrypted telemetry and control, and uses assured frequencies. This enables an array of applications such as connectivity for theatres of operation, interconnection of institutional or defence sites, border control, ISR, as well as various types of communications for air, land and maritime missions.

PRODUCTS AND SERVICES

GovSat's portfolio of services covers key fields of expertise: capacity and coverage, anchor and teleport services, secure hosting solution and end-to-end solution offerings.

On the capacity side, GovSat-1 is a secure satellite capability featuring high-powered fully-steerable spot beams in X and Mil Ka-Band, and a Global X-Band beam. It is equipped with anti-jamming features, encrypted telemetry and control (TT&C), and is offered on a non-preemptible basis. Due to its orbital position at 21.5° East, GovSat-1's coverage reaches from 50°W to 90°E and 70°N to 70°S. GovSat offers capacity for short and long-term lease from MHz, transponders through to beams with full steering rights in X and Mil Ka-Band.

The architecture of GovSat-1 allows flexibility on how to anchor the traffic. Customers can use their own anchor facilities or the GovSat's high resilience anchoring service, as prime or back-up. It is also possible to offer access to other partners' teleports within the footprint.

TECHNICAL MEANS

GovSat-1 is positioned at the 21.5 East Orbital position with coverage areas spreading over Europe, Middle East, Africa and South West Asia with maritime coverage for the Atlantic, Baltic, Mediterranean and Indian Oceans.

The satellite has a so-called "global X-band beam" and fully steerable X- and mil Ka-band spot beams that will provide communication capabilities within the mission area as well as back to the associated headquarters. This means that the satellite coverage area can be fully adapted to the requirements of the user.

GovSat-1 features high-powered fully-steerable spot beams, an X-band Global beam and a total of sixty-eight transponder equivalent units. It is equipped with anti-jamming features, encrypted telemetry and control, and uses assured frequencies.

MAIN CUSTOMERS

GovSat is a new satellite communications capability dedicated to governmental and institutional users. It addresses the demands for connectivity resulting from defence and civilian security applications.

MAJOR SPACE PROJECTS

GovSat-1 was launched in January 2018 and is operational since March 2018.
Lifetime: >15 years

GRADEL SARL

CEO/ HEAD OF DEPARTMENT
Claude Maack

CREATION DATE
1965

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 62
Space: 29

TURNOVER 2020
Total: € 9.8 M
Space: € 4.2 M

R&D INTERNAL INVESTMENTS
€ 1.2 M

QUALIFICATIONS, APPROVALS
Certified ISO 9001, 14001 and 45001
EN 9100 planned for 2022 (ultra-lightweight structures)

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CORE BUSINESS

Since 2008 GRADEL is developing special purpose machines and tailored made solutions for the space domain. Due to our experience in electro-mechanical engineering, automation and dynamic axis control, GRADEL has developed extensive know-how for the realization of complex equipment, compliant to the specifications of our customers.

Our main product group in space is Mechanical Ground Support Equipment (MGSE), for which we have a complete range of equipment to handle S/Cs or parts of them.The following MGSEs are typical products of GRADEL: Multipurpose Trolleys, Hoisting Devices, Horizontal and Vertical Lifting Devices, Integration Stands and Adapter Rings for the assembly, integration and test of all types and sizes of satellites, as well as equipment of CATR facilities to test the antennas of satellites. GRADEL is providing MGSE elements for the instrumentation of S/C as well.

GRADEL is developing and manufacturing ultra-lightweight structures for flight hardware under the Trademark xFKin3D. The process Innovation xFKin3D is a highly flexible, versatile designed, cost-effective and sustainable fibre composite technology. A wide range of products or applications have already been realized for different industries and market segments. For space applications Gradel is the exclusive partner of AMC. XFKin3D includes a process to generate lightweight structures.

In 2021, GRADEL established a R&D joint laboratory with LIST for testing and qualification of flight hardware application.

PRODUCTS AND SERVICES

MGSE

Multipurpose Trolleys for satellites, fully automated with AGV-systems, Hoisting Devices for horizontal and vertical lifting of satellites, Integration Stands, automatized 0g supports for manufacturing, assembly, integration and test of satellites, equipment for Antenna Test Facilities, like adjustable supporting structures of high rigidity, Handling MGSE for instruments of a satellite and demanding mechanical parts for small satellites.

Multimaterial Flight Hardware

GRADEL engineers propose to major space players, new lightweight multi-material high-tech solutions for the flight hardware structures. **Ultra-lightweight structures & robotic winding equipments**:
Fasteners or so-called "Brackets" which are predestined for all possible shapes and applications preferably for 3-dimensional geometries. Multi-axial static and / or dynamic load cases are covered by the standardised process. The range extends from simple parts to relatively complex parts, which may also include additional functions and features. Rotationally symmetric components for transmission of extremely high dynamic torques can also be produced by this method. Dynamic moving masses are often a limiting factor in all kinds of machines where the xFKin3D technology can be used to remedy such problems, which are for example the increase of production speed of product lines.

The lightweight manufacturing process allows the production of small, mid & larger part sizes Luxspace.

MAIN CUSTOMERS

Airbus Defence & Space, ESA, OHB Systems, Thales Alenia Space, Euro Heat Pipes, Luxspace

HITEC Luxembourg

MANAGING PARTNER & CEO
Yves Elsen

SENIOR PARTNER & CTO
Philippe Osch

MANAGER MECHANICAL ENGINEERING
Yves Leiner

ELECTRICAL ENGINEERING
Tom Mathes

CREATION DATE
1986

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 54
Space: 16

QUALIFICATIONS, APPROVALS
ISO 9001
AQAP 2110
Made in Luxembourg
SGS USTC
SuperDrecksKëscht fir Betriber (in accordance with ISO 14024)
Charte de la diversité Lëtzebuerg

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CORE BUSINESS

HITEC Luxembourg S.A is a 100%-owned Luxembourg company and offers high technology solutions covering different business areas: satellite ground segment; equipment for testing and measuring of physical properties; traffic management and mission critical. HITEC Luxembourg serves private and public sectors at a national and international level.

The company offers, among others, satellite ground segment technology as well as innovative satellite-based products and ICT services to support public safety services in case of crises or disasters. Our range of Limited Motion (LM) and Full Motion (FM) high end antenna systems, operating in various frequency bands and supporting institutional and commercial satellites, is complemented by our performing antenna components such as antenna control units (HACU®) and servo control units (HSCU™). The company's services include project management, design, engineering, integration, installation, commissioning and maintenance of full antenna systems or antenna components

PRODUCTS AND SERVICES

- Limited and full motion ground station antennas, ranging from 3 to 14 meters in diameter and covering frequencies from L- to Q/V-band (HTS gateways, TT&C, IOT/LEOP, EO/data downlink) in particular 6m and 9m limited motion antennas in X- & Ka-Band and 4m to 13m full motion antennas from L- to Ka-band. Including options such as HVAC and de-icing
- Elevation over azimuth and equatorial mount positioners (e.g. for antenna arrays and optical telescopes respectively)
- Antenna components: HACU® Antenna Control Units (program, step, monopulse track) and HASK Antenna Servo Kits
- Nomadic Satellite Communication Systems: NoSaCo® Rapid and NoSaCo® Rack

- Mission Critical Information Management solutions for defence, emergency and humanitarian markets

Services:

- Project management and coordination
- Ground station system integration and turn-key supplies
- Ground station antenna refurbishment, retrofit and relocation
- Ground station antenna maintenance and ILS-ISS
- Quality assurance and RAMS analysis
- Customer specific design, simulation and manufacturing
- Commissioning and training

TECHNICAL MEANS

HITEC Luxembourg's facilities are easily accessible on the outskirts of Luxembourg city. The premises comprise engineering offices, equipped with state-of-the-art design and analyses SW and HW. The facilities also comprise a laboratory, used for testing, commissioning, and training purposes.
In addition, a small workshop and assembly area allow for rapid prototyping and troubleshooting. From its central location in Europe, HITEC Luxembourg is well connected to a proven network of suppliers, with whom all products are delivered to guaranteed quality standards.

MAIN CUSTOMERS

European Commission (DG Enterprise and Industry, DG Research and Innovation), European Space Agency (ESA), German Aerospace Centre (DLR), Luxembourg Government, Caribbean Disaster Emergency Management Agency (CDEMA), Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (URSZR), Civil Protection of the Friuli Venezia Giulia Region (PCRAFVG), SES Group, SES TechCom, LUXGOVSAT, Inmarsat, Lockheed Martin, POST Group, AIRBUS Defence & Space, Telespazio, CGDIS – Corps Grand-Ducal Incendie & Secours, Thales Alenia Space, GovSat, OHB, Luxembourg army

MAJOR SPACE PROJECTS

Satellite Ground Station Antennas

- Defence projects: Limited- and Full-Motion antennas (6.8m, 9.0m) in Ka-, X-, and S-Band
- DLR:
  - Full-Motion antenna in Ka-band (13m) for IOT
  - Wide-band Full-Motion antenna (5m) for GNSS monitoring
- ESA projects:
  - Q/V-band large aperture HTS gateway development
  - Antenna Control Units (program, step, monopulse track) development
  - GSTP design study for a 3-axis Full-Motion antenna in S-/K-band (14m) for Earth observation
  - SSA NEO: feasibility study and prototyping of telescope design for near Earth objects.
- EDRS: Limited-Motion antennas in Ka-band (6.8m) for TT&C, feeder uplink and data downlink
- Earth observation: 3-axis Full-Motion antennas in S/X-dual-band (6.8m)
- Galileo IOV: Full-Motion antennas in S-band (13m) for TT&C

Satellite-based ICT solutions

- emergency.lu: Deployment of worldwide available Rapid response solution for humanitarian aid and disaster relief, integrating, among other solutions NoSaCo® and DISP®
- ALPDIRIS – Assist search and rescue teams in the Alps by providing satellite based connectivity and software (DISP)
- Service to provide a rapid mapping solution based on earth observation

Hydrosat SARL

CEO/
HEAD OF DEPARTMENT
Royce Dalby

CREATION DATE
2018

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 6

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CORE BUSINESS

Hydrosat is a data analytics company based in Luxembourg that applies proprietary algorithms to satellite thermal imagery, combines it with data fusion capabilities and delivers insights into plant health and related applications for commercial and government customers around the world.

PRODUCTS AND SERVICES

Our team in Luxembourg is focused on developing two commercial products, both with significant commercial potential and offering substantial environmental benefits. The first focuses on early and accurate yield forecasts of all crops across the globe. Agribusiness companies, financial traders, governments and other customers will have unparalleled insights into what they can expect out of local and global production of everything from grains to coffee to sugar cane, allowing businesses to operate more efficiently. Our second product tells farmers exactly when and how much to water their crops. Hydrosat's own field studies, backed up by NASA research, have demonstrated that this will increase farm production by 20% while also substantially decreasing water usage – a win for the farmer and a benefit for the planet.

MAIN CUSTOMERS

- Food processors, packagers and distributors
- Commodity Traders
- Insurance Companies
- Government Agencies
- Corporate and Independent Farmers
- Humanitarian Organizations

MAJOR SPACE PROJECTS

Thermal Infrared Remote Sensing Constellation

Although there are many space imagery constellations in orbit and planned for launch, thermal imagery is missing. Consequently, Hydrosat is developing a constellation of four spacecraft that will provide a complete heat map of Earth every few days. The data from these satellites will enhance our products and give us unparalleled access to high-resolution thermal imagery to meet the needs of a wide range of commercial and government customers.

IBISA SARL

CO-FOUNDER
Jean-Baptiste Pleynet

CREATION DATE
2019

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 4
Space: 2

CONTACT DETAILS
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CORE BUSINESS

IBISA is a tech platform for insurance actors to unlock the agriculture microinsurance market worldwide. IBISA designs innovative weather-based index products and provides a platform to distribute and manage them in a cost-efficient and automated way using Earth Observation and blockchain technologies.

IBISA is tackling the problem of uninsurability of millions of farmers by enabling the next generation agriculture insurance.

500 million smallholders produce 70% of the food that is consumed worldwide worth 1.7 Trillion USD, yet, they do not have access to crop insurance and are exposed to weather related risks. Traditional insurance companies have not penetrated this market efficiently due to cost-structure problems that make microinsurance not viable for them.

PRODUCTS AND SERVICES

IBISA enables local mutual insurers, commercial insurers, cooperatives, and global companies to provide transparent and objective protection (weather index insurance) to their customers. Fully digital end to end platform that includes index design, policy management platform and automated remote loss assessment based on Earth Observation satellite data.

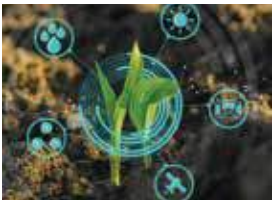
IBISA service comprises:
- Weather insurance product definition and pricing
- Loss Assessment as a Service
- Cloud-based platform and tools to distribute and manage the protection products

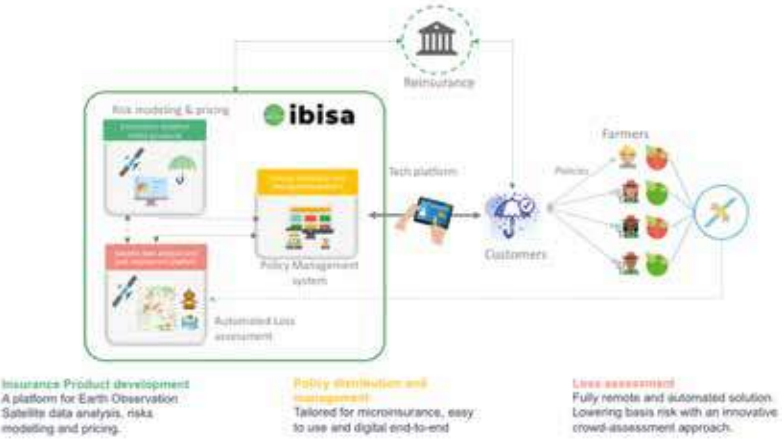
MAIN CUSTOMERS

Insurance actors, Finance Institutions and Global Companies.

MAJOR SPACE PROJECTS

ESA Business Applications.





Imagination Factory Luxembourg

CEO/ HEAD OF DEPARTMENT
Federico Masier

CREATION DATE
2016

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 6
Space: 4

TURNOVER 2020
Total: € 1 M
Space: € 880 K

R&D INTERNAL INVESTMENTS
€ 867 K

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CORE BUSINESS

We are a Multimedia Service Company having, in the broadest sense, any interest whatsoever in electronic media and the development of communication technology. Our aim is to be predominantly active in the communications area and to invest, directly or indirectly, in other companies that are actively involved in the dynamic industry of communication and multimedia applications.
We conduct research & developmental activities into potential expansion and development opportunities in the field of communication technology applied to multimedia applications and in auxiliary services.
We are headquartered in Luxembourg and operate worldwide through dedicated regional teams or qualified Business Partner.

PRODUCTS AND SERVICES

U Learning, a new generation software/ hardware platform that enables an enhanced, participative learning experience combining together physical and digital presence.
U Learning enables active participation versus a passive presence taking remote learning to a new degree and enabling a rich learning experience for all those students that, for logistic reasons, have no direct access to the physical facilities.
The main components of the product are:

- touch interfaces, interactive walls, tables and tablets devices
- blended context and adaptability
- content creation and distribution

Among these fields of application, here are some examples:

- school, primary and secondary
- university
- corporate training

3WayComm, an innovative triple-band VSAT maritime terminal for dual-use applications. The most innovative feature of the proposed satellite antenna is the ability to operate on X-band, Ku-band and Ka-band with automatic switching and no manual intervention, thus allowing unlimited operation and coverage areas in every possible operational scenario. While X-band is used mainly for encrypted military and civil operations, Ka and Ku bands are mainly used to enable broadband services aimed to ensure the on-board personnel's welfare. People on-board access the open Internet for information and entertainment purpose, to communicate with their families trough e-mail, social networks and voice/video over IP.

TECHNICAL MEANS

- Strong technical background in telecommunications: satellite communication X/C/Ku/Ka-bands, Wi-Fi and global 4G
- Operating through first class worldwide cloud infrastructures
- Specialized in the design and deployment of complex projects
- Specific competence in high level software design and implementation (Oracle, Java, XML, Web Services)

MAIN CUSTOMERS

- European Space Agency (ESA)
- Glasgow School of Art (GSA)
- Luxembourg Institute of Science and Technology (LIST)

MAJOR SPACE PROJECTS

U learning is an interactive learning framework which allows students to engage in ubiquitous, flexible, immersive, non linear learning.
It enables the collaboration between remote students and classrooms using a dedicated satellite layer which takes care of seamless content synchronization and live experience management.

3WayComm project consists of the design, development and prototype manufacturing of a innovative triple-band VSAT maritime terminal for dual-use applications under the ESA ARTES Competitiveness & Growth Programme.

The most innovative feature of the proposed satellite antenna is the ability to operate on X-band, Ku-band and Ka-band with automatic switching and no manual intervention, thus allowing unlimited operation and coverage areas in every possible operational scenario.

InTech SA

CEO/
HEAD OF DEPARTMENT
Fabrice Croiseaux

CREATION DATE
1995

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 130
Space: 8

TURNOVER 2020
Total: € 12.5 M
Space: € 0.5 M

R&D
INTERNAL INVESTMENTS
More than 1200 man Days

CONTACT DETAILS
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CORE BUSINESS

InTech is a POST Luxembourg Group subsidiary specialized in IT Consulting and Digital Application Development. InTech designs and implements software solutions combining specific developments and integration of generic components and combines skills of project management, functional and technical architectural consulting, technical expertise and development.

InTech supports its customers and partners in their digital transformation by providing innovative and pragmatic services and effective solutions for their strategic project. Historically meeting the needs of Luxembourg's financial sectors, administrations and institutions, InTech's current objective is to diversify especially by targeting the space segment, mainly with its Innovation pole and its expertise in Blockchain and Artificial Intelligence.

PRODUCTS AND SERVICES

IT Consulting, Development of digital applications.

TECHNOLOGIES

Open Source Development Tools, Blockchain, Artificial Intelligence, Machine Learning, IoT, Big Data.

MAJOR SPACE PROJECTS

- Blockchain for Secure Nano-Satellite Constellations with Distributed Authority
- SkyTrust: Trust digital assets using space data
- Lux5GCloud: Cloud hierarchical database platform

In-Space Services

CEO/
HEAD OF DEPARTMENT
Mateusz Pondel

CREATION DATE
2019

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total:
1+2 in-house consultants
Space: 1

R&D
INTERNAL INVESTMENTS
€180 K

CONTACT DETAILS
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CORE BUSINESS

In-Space Services aims to introduce the space technology to support primary and most important agriculture activities. Earth Observations (EO) data will be used to examine the quality and composition of the soil. This information will help farmers to reduce the amount of fertilizer, bringing economic and environmental advantages.

The company focuses mainly on hyperspectral data processing using AI technology. Working in close cooperation with clients, we will extract the most important information from the spaceborne sensors currently delivering EO data. Our mission is to bring space technology down to Earth and make it easily available and beneficial to the agriculture industry.

PRODUCTS AND SERVICES

Soil mapping

- Detecting basic soil composition elements using remote sensing
- Developing soil maps
- Developing fertilizer maps for farmers

Earth Observation data enhancement

- Resolution enhancement in post processing
- Data fusion from various sensors
- Data reconstruction

TECHNICAL MEANS

Strong technical background in the following data processing aspects

- Hyperspectral data processing
- Machine learning in Earth Observation data
- Satellite imagery resolution enhancement

MAIN CUSTOMERS

In-Space Services targets the global agriculture market. Our main customers are:

- Large farms >150ha
- Fertilizer providers
- Governmental institutions supporting agriculture and environmental protection

MAJOR SPACE PROJECTS

In-Space services is currently conducting the feasibility study for soil mapping services using hyperspectral spaceborne and airborne data.

ispace Europe

CEO/
HEAD OF DEPARTMENT
Julien-Alexandre Lamamy

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 19

CONTACT DETAILS
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CORE BUSINESS

ispace is a private lunar exploration company and a leading innovator in space robotics and data analytics.

ispace has a global presence with headquarters in Japan and offices in Luxembourg and in the US. The company is developing among the first lunar landers (spacecraft for delivery to the lunar surface) and lunar rovers (robots for surface mobility). These key technological solutions coupled with ispace's in-house capabilities and competences in data analytics and space resources are what sets ispace apart as one-stop shop for lunar transportation & exploration and expanding business opportunities on the Moon.

Our vision is to create a new ecosystem in outer space and expand the human living sphere beyond Earth.

PRODUCTS AND SERVICES

- Payload Delivery: We deliver payloads (cargo) to the Moon using our small and lightweight lunar landers and rovers
- Data Analytics: Using our lunar rovers, we will collect critical information about the lunar environment and its resources, and process them into valuable data products for space and non-space customers
- Partnerships: We offer opportunities for companies to join the lunar adventure through partnerships based on joint technology development, space business entry and corporate branding
- Resource Exploration Services: We provide services and expertise in fields such as mission planning, space resources and reserves evaluation, autonomous navigation systems and space resources prospection and exploration

MAIN CUSTOMERS

- Space agencies, research institutes, private space companies
- Non-space commercial companies willing to expand their business in outer space or to use space-based technologies for terrestrial applications

MAJOR SPACE PROJECTS

ispace Europe activities in Luxembourg include:

- Development of commercial lunar rovers
- Development of lunar data analytics solutions
- Development of methods to prospect, explore, extract and process lunar resources

itrust consulting SARL

CEO/ HEAD OF DEPARTMENT
Dr. Carlo Harpes

CREATION DATE
2007

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 16
Space: 1

TURNOVER 2020
Total: € 1,625 K
Space: € 100 K

R&D INTERNAL INVESTMENTS
€ 85 K

QUALIFICATIONS, APPROVALS
The Information Security Management System (ISMS) at itrust consulting is certified according to ISO/IEC 27001.

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CORE BUSINESS

itrust consulting s.à r.l., a 14-year-old, recognized actor in Luxembourg's and Europe's Information Security field, certified according to ISO 27001, consults its customers (public, financial, and private sector) to protect their information against divulgation, manipulation and unavailability. The company acquires know-how in engineering and sciences, enabling it to find the economically appropriate solution for specific security requirements. It applies and develops research projects, norms, security controls and information processing techniques, covering topics such as information security management systems, risk management, business continuity management, incident management, digital signature, cryptology, network security, internet security, critical infrastructure protection, space ICT, computer forensics, etc.

PRODUCTS AND SERVICES

Consulting services, sourcing and innovation studies

Management and guidance of security projects. Critical Infrastructure protection. Technology integration and assistance. Risk analysis (TRICK Service™). Forensic & malware analysis. DPIA following GDPR. Assistance to CISO & DPO. Monitor/manage security issues. Incident response team.

Hacking

Pentesting & vulnerability assessment of hard- & software, web applications, and access security.

Organizational audit

ISO/IEC 270xx, 20000, 27799. IEC 62443. Referential business (PSF, PSDC) & legal (EU directives, grand-ducal regulations, CSSF). Protection of personal data (CNPD).

Technical audit
Code review (OWASP, SANS…) & config. review. Critical infra., SCADA & wireless infra. PCI-DSS. ISO 15408. EuroPriSe, GDPR, CSSF & CNPD compliance.

Elaboration of security tools & services
LASP: provide assurance to location services that locations indicated are trustworthy; TRICK Service™ (risk assessment); TRICK Cockpit (real-time risk monitoring); ESA ECSS (software validation tool).

Training services
GDPR: intro./practical advice to comply; GDPR foundation certification; DPO certification; Risk Mgr. certified for DPIA (ISO 27005 guidance); Certified ISMS Lead Implementer ISO 27001; Certified ISMS Lead Auditor ISO 27001; PSDC – eArchiving training; etc.

TECHNICAL MEANS

TRICK Tester (pentesting platform); Galileo receiver; GPS repeater; Requirements engineering and software validation tool. Expertise in design and development of simulation tools for modelling classical/quantum systems and communication channel properties, e.g. in ground and space setups for quantum key distribution.

MAIN CUSTOMERS

EU institutions, financial service providers, critical infrastructure providers, e.g. energy distributors, ESA, Lux. Ministries, etc.

MAJOR SPACE PROJECTS

CRITISEC project
Developing security products, services and standards for edge networks in critical infrastructures. itrust consulting develops an intrusion detection system (IDS) and tailors it to an IoT environment.

QUARTZ project
Aims to develop a satellite-based quantum key distribution (QKD) service to distribute cryptographic keys to end users via satellite optical links.

H2020 bIoTope
Creating a SoS platform for connected smart objects (IoT).

ATENA
Advanced Tools to assEss and mitigate the criticality of ICT compoNents and their dependencies over Critical InfrAstructures.

CIPS SPARC project
The Space Awareness for Critical Infrastructure project analysed space phenomena as threats for Critical Infrastructures.

ESA LASP project
Localisation assurance service provider.

LuxLAUNCH projects (opportunity studies - Galileo applications)
Applications and Services on Broadband handheld devices.

Kleos Space SA

CEO/
HEAD OF DEPARTMENT
Andy Bowyer

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 40
Space: 40

R&D
INTERNAL INVESTMENTS
5.7 M in 2020

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CORE BUSINESS

Kleos Space SA. is an Earth Observation technology and data as a service company. Kleos Space will deliver global radio signal (RF) activity-based intelligence and geolocation as a service. The first Kleos Space satellite system, known as Kleos Scouting Mission (KSM) successfully launched in November 2019, will deliver commercially available data and perform as a technology demonstration for the constellation. The Scouting Mission will deliver targeted daily geolocation services with a full constellation delivering near-real-time global observation.

PRODUCTS AND SERVICES

Kleos' initial RF geolocation data products are available in three levels – Guardian RF, data from Kleos satellites at its most fundamental, unprocessed by Kleos geo-location algorithms - Guardian LOCATE, a Kleos processed data set to deliver geo-located RF activity, and - Guardian UDT (user defined data-type), a user defined, customized data set. Kleos data products can be pre-ordered by registered users on a monthly or annual basis and will be delivered to customers after data collection by the Kleos' mission satellites and having been processed through the Kleos' algorithms on the ground.

TECHNICAL MEANS

The multi-satellite Scouting Mission system is made up of 4x nano-satellites and will form the foundation of a constellation that delivers a global picture of hidden maritime activity, enhancing the intelligence capability of government and commercial entities when AIS (Automatic Identification System) is defeated, imagery unclear and targets out of patrol range. With the planned further 2 x clusters (12 nano- satellites total) in orbit by end 2021, temporal coverage will increase significantly leading to an even higher value data product. Future missions will include novel sensor deployment and missions involving in-space precision robotic manufacturing technologies.

MAJOR SPACE PROJECTS

- Kleos Scouting Mission (KSM1)
- Polar Vigilance Mission (KSF1)
- Polar Patrol Mission (KSF2)
- Futrism - Kleos' patented In-Space Manufacturing technology development

LMO

CEO/
HEAD OF DEPARTMENT
Michel Poucet

CREATION DATE
2018 UK
2020 Luxembourg

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 4

CONTACT DETAILS
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CORE BUSINESS

LMO is a young and dynamic company tackling the challenges posed by the growing space industry and in-space economy. By combining novel technologies with heritage space experience and practices LMO can provide innovative solutions to both heritage and emerging space companies.

With operations in Luxembourg and UK LMO provides Innovative Solutions for Small Satellite & In-Orbit Servicing Missions. LMO's core focus lies in the fields of Space Situational Awareness & Propulsion.

In Luxembourg LMO offers Space Situational Awareness payloads and software based on machine learning to enable Space Surveillance & Tracking and Autonomous Proximity Operations for In-orbit servicing.

In its UK daughter company LMO offers propulsion systems and components for small satellites and in-orbit servicing vehicles.

PRODUCTS AND SERVICES

- Computer Vision for Space Applications
- Embedded Software for Space Electronics
- Space Situational Awareness SW & Payloads for Space Resident Object Identification & Characterisation
- Space Situational Awareness SW & Payloads for Rendezvous & Proximity Operations

TECHNICAL MEANS

In Luxembourg LMO offers all necessity tools and capabilities to develop, embed and test algorithms for Space Applications such as Space Surveillance & Tracking, Proximity Operations, Autonomous Navigation and Earth Observation.

MAIN CUSTOMERS

LMO main customers are small satellite and in-orbit servicing vehicle manufacturers. LMO also collaborates with other subsystem providers to offer end-to-end solutions. Current customers include Astroscale, Exotrail, MDA and Nammo.

Luxsense geodata SARL

CEO/ HEAD OF DEPARTMENT
Dr. Gilles Rock

CREATION DATE
2015

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 4
Space: 4

CONTACT DETAILS
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CORE BUSINESS

Luxsense geodata is a young SME whose objective is to use innovative techniques from earth observation in research projects and to render services for the acquisition of reliable geodata. Further, the development of high level products for environmental studies, precision agriculture and engineering projects is one of the major goals of the company.

The use of UAVs (Unmanned Aerial Vehicles or drones) allows for a rapid intervention and the acquisition of extremely high resolution geodata. These characteristics of UAVs – combined with a multitude of different sensors – make these systems very powerful in the case of natural disasters or precision agriculture, where satellite data lacks the spatial or temporal resolution.

PRODUCTS AND SERVICES

Geodata acquisition

- UAV operation for data acquisition
- Data processing for LiDAR-, RGB-, multi- and hyperspectral data

Product development

- Development of customized data products
- Precision agriculture: weed and disease detection, biomass and photosynthesis
- Forestry: Remote sensing based inventories
- Construction site monitoring: volume estimation, 3D reconstruction, BIM and pipe detection

TECHNICAL MEANS

- Fixed-wing UAVs
  These UAVs allow data acquisition of larger areas in short time intervals for 3D reconstruction purposes (up to 100ha / 30min)
- Heavy lift UAVs
  In many research projects, multiple camera systems need to be flown simultaneously and combined with sensors for side parameters
- LiDAR
  A LiDAR scanner enables to collect 300pts/m² and allows to collect high precision digital elevation models, even below vegetation
- Multi- and hyperspectral sensors and high-resolution RGB-cameras
  The acquisition of the complete electromagnetic spectrum is required for the analysis of vegetation. The available sensor systems cover the spectral domain from 350 – 950nm
- Thermal camera
  This thermal camera captures long wave thermal infrared from 8-14µm and provides information about land surface temperature and emissivity.
- Field spectrometer
  The field spectrometer captures light in the spectral range from 350nm to 950nm. This data is used for research in vegetation studies and for cal/val of UAV data

MAIN CUSTOMERS

Luxembourg municipalities

Governmental administrations
- Administration de la nature et des forêts
- Administration des ponts et chaussées
- Administration de la gestion de l'eau

Research institutions
- LIST
- IBLA
- Universitiy of Trier

MAJOR SPACE PROJECTS

- SESAME - Secure and Safe Multi-Robot Systems
- MonESCA – Disease detection in grape vines
- mDrones4rivers – Biotope monitoring in riparian buffer zones

L

LuxSpace

CEO/
HEAD OF DEPARTMENT
Edgar Milic, Oliver Salisch

CREATION DATE
2004

ORGANISATION TYPE
Large Enterprise
(OHB Group Subsidiary)

NUMBER OF EMPLOYEES
Total: 50

TURNOVER 2020
Total: € 7,760,043

R&D
INTERNAL INVESTMENTS
€ 2,151,602 in 2019

QUALIFICATIONS,
APPROVALS
ISO 9001:2015

CONTACT DETAILS
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CORE BUSINESS

LuxSpace is an integrated provider of microsatellite and application solutions to the global institutional and commercial markets. The cornerstones of LuxSpace's core business are:

- Microsatellites – Leveraging the Triton product line, with a track record of 5 space systems successfully deployed including the Triton-2/ESAIL satellite launched in September 2020, LuxSpace delivers end2end space systems and subsystems. LuxSpace is also developing a novel highly scalable and more powerful platform called Triton-X, targeting maritime, aeronautical and terrestrial applications
- Satellite applications and services – With 15 years of experience in developing integrated data services for in-house processing of data collected from other satellites, LuxSpace places special focus on the Maritime and the more general Earth Observation domain

PRODUCTS AND SERVICES

LuxSpace delivers space systems and subsystems design, specification, procurement, manufacturing, integration and testing.
This includes:

- Triton product line - Microsatellites and subsystems in the 45-200 kg class for applications in the field of Earth Observation (EO), telecommunications, science, and technology demonstration
- Telemetry Telecontrol & Command subsystems for geostationary and Low Earth Orbit satellites
- AIS satellites and payloads for global vessel identification and tracking
- Avionics and payload electronics
- Embedded software
- Application software
- Simulator software
- Space systems related feasibility studies

Additionally, LuxSpace provides satellite applications and services in the AIS/ Maritime and Earth Observation domain and is expanding into further data areas such as Aeronautical applications.

TECHNICAL MEANS

LuxSpace has equipped itself across the years with new state-of-the-art systems to deliver satellite solutions. Among them, LuxSpace has

- Electronic Laboratory covering digital, analogue and Radio Frequency developments and testing
- Thermal vacuum chamber (TVAC)
- Thermal test chamber
- Cleanroom for satellite integration
- Satellite simulation & design software laboratories
- Satellite data applications servers

MAIN CUSTOMERS

European Space Agency and other European Institutions (e.g. EMSA, DG MARE, DG ENTERPRISE, EUROSTAT, European Defense Agency), players inside European and global space sector like OHB, Orbcomm Inc., Thales Alenia Space, players inside maritime sector.

MAJOR SPACE PROJECTS

Microsatellites

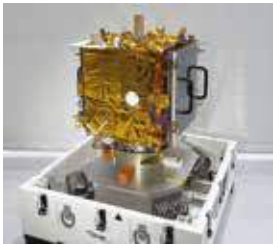
- Triton-X: Modular and scalable microsatellite platform
- Triton-2/ESAIL: Prime contractor under ESA's ARTES SAT-AIS program (launched in 2020)
- Triton-1/4M - Manfred Memorial Moon Mission (launched in 2014)
- Triton-1/Vesselsat 1 & 2 – the first satellites 'made in Luxembourg' (launched in 2011/12)
- Pathfinder 2 – company funded first AIS satellite (launched in 2009)

Satellite applications and services

- AIS data services and AIS added value service development for the maritime industry (e.g. fishery enforcement and safety and security)
- GIS and EO services:
  - LUCAS: Field survey data management and quality control
  - Copernicus Global Land Service: quality control for high resolution hot spot monitoring activities
- Space-based maritime reconnaissance & surveillance – vessel detection using NAVRAD radar

Telecommunication satellites

- Core team member for OHB's developed Small GEOstationary (SGEO) Satellite Platform: LuxSpace being responsible for the TT&C subsystem and the satellite simulator
- Currently three SGEO Projects: Hispasat AG1 (launched in 2017), European Data Relay System (launched 2019), ELECTRA (in progress)



LuxTrust SA

CEO/ HEAD OF DEPARTMENT
Fabrice Aresu

CREATION DATE
2005

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 70-80

QUALIFICATIONS, APPROVALS
Qualified Trust Service Provider on EU trusted list

CONTACT DETAILS
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CORE BUSINESS

LuxTrust is a Qualified Trust Service Provider and a Certification Authority. Established in 2005, the company implements and integrates innovative and multi-applicative solutions to secure online transactions, digital identities and electronic signatures for its customers, including governments, institutions, businesses and private individuals.

Its mission is to guarantee the digital identity and security of the electronic data of companies and citizens, and thereby increase trust in the digital economy to make life simpler and encourage business efficiency. LuxTrust has built and maintained a nation-wide digital identity ecosystem in Luxembourg and has expanded its business internationally, opening two offices in Brussels (Belgium) and Paris (France).

PRODUCTS AND SERVICES

Certified according to eIDAS regulation and acting in accordance with the latest European regulations and standards (PSD2, GDPR, ETSI), LuxTrust offers a wide range of trust services based on compliance, security and user convenience:

- Electronic Identities
  LuxTrust delivers strong eID that can be used for Qualified Signature through a face-to-face identification process (using a Registration Authority Network) or through a remote video identification.
- Strong Authentication
- Qualified Trust Services
  Qualified Electronic Seal, Qualified Electronic Signature, Qualified Timestamping, QWAC, Qualified Validation Service for Qualified Electronic Signature and Qualified Electronic Seal.

- Electronic Signature and Global Trust Services Solutions

  LuxTrust provides global trust services APIs and solutions, among those COSI, the trust services hub, enables companies to address specific business needs whilst being easily integrated in the legacy IT infrastructure.

MAIN CUSTOMERS

LuxTrust supports international customers from highly regulated sectors such as banking, insurance, financial services, institutions, health. References:
Banque Internationale à Luxembourg, BGL, Banque de Luxembourg, ING Luxembourg, POST Luxembourg, Raiffeisen, Spuerkees, the Government of the Grand Duchy of Luxembourg, DG Santé of the European Commission, LNS, Société Générale etc.

MAJOR SPACE PROJECTS

- Quantum Key Distribution
- Authentication and data encryption for EM-SAT, a comprehensive Secure Operation Centre for emergency situations in chemical plants

Maana Electric SA

CEO/ HEAD OF DEPARTMENT
Joost van Oorschot

CREATION DATE
2018

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 36

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CORE BUSINESS

Maana Electric aims to be the utility company of the solar system. We use our proprietary In-Situ Resource Utilisation (ISRU) technologies developed for the space industry to revolutionize the way in which solar panels are produced, on Earth and in space. MaanaBoxes are fully automated and transportable production facilities which use only locally available materials and solar electricity to produce fully functioning solar panels from sand on Earth, and regolith on the Moon or Mars. Within the MaanaBox family, there will be two initial product categories: the TerraBox which is specifically designed for large-scale utility solar farms in desert land areas, and the LunaBox designed for the Moon to enable the development of a lunar economy.

PRODUCTS AND SERVICES

- Solar cells (for Terrestrial & Space applications)
- Solar Panels (for Terrestrial & Space applications)
- Glass panes & components
- SRU equipment

TECHNICAL MEANS

Maana Electric is specialised in In-Situ Resource Utilisation (ISRU) and Solar Photovoltaic technologies, for both terrestrial and space applications. Our 2,000 sqm facilities include electro-chemical laboratories, clean rooms with vacuum chambers, regolith and sand analysis units, machining workshop and AIT dedicated areas.

MAJOR SPACE PROJECTS

Research & Development for ESA & LSA related to ISRU demonstrators and Off-Earth manufacturing and construction.

M

Molecular Plasma Group SA

CEO/ HEAD OF DEPARTMENT
Marc Jacobs

CREATION DATE
2016

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 16

TURNOVER 2020
Total: € 2,4 M
Space: € 10 K

R&D INTERNAL INVESTMENTS
€ 850 K

CONTACT DETAILS
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CORE BUSINESS

We develop customized solutions using our
- MolecularGRIP™ technology for improved adhesion between difficult-to-bond materials with custom-designed primer layers
- Leaf™ technology for nano-structured, water-repellent and non-stick coatings
- Virucidal & bactericidal coatings
- UV filter coatings

Our Molecular Plasma Technology enables single-step grafting of a wide range of one or more functional precursor molecules (organic, inorganic, nanoparticles, biomolecules,...) onto any surface using a scalable, dry, ambient, atmospheric process. The solutions we develop are easily scalable and we ensure a robust industrially implementation.

PRODUCTS AND SERVICES

Development and implementation of solutions for:
- Priming for improved bonding of inert materials (e.g. PTFE, Titanium, CFRP's, Polyolefins) in multi-material structures
- improvement of adhesion between any fibre and a polymer matrix
- non-stick, water-repellent and anti-corrosion solutions
- REACH-compliant, wet chemical primer replacement
- R&D equipment for RTO's, Universities and companies
- Pilot lines
- Small scale production
- Custom-designed industrial systems
- After-sales service and remote diagnostics

TECHNICAL MEANS

- Lab facilities for application development with Plasmaspot™ and Plasmaline™ equipment
- Small production runs & scale-up support
- Characterisation (cooperation with LIST)
- 3D printing for rapid prototyping
- Engineering of customised solutions

MAIN CUSTOMERS

ArianeGroup, Samsonite, Freudenberg, Valeo Research, Institutes and Universities such as LIST, KU Leuven (B), Centexbel (B), University of La Rioja, VTT (Fi), PICC (CH), FILK (D)

M

Odysseus Space

ODYSSEUS

CEO/
HEAD OF DEPARTMENT
Jordan Vannitsen

CREATION DATE
2016 (Taiwan)
2019 (Luxembourg)

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: ~10
Space: ~10

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CORE BUSINESS

We believe in a future in which goods and information are exchanged alongside human sustainable presence at Solar system scale. Our goal is to facilitate those flows. We see three features to reach this goal: **SOLVE · CONNECT · EXPLORE.**

To **SOLVE** our customers' challenges by supporting them at different phases of their satellite missions.

To **CONNECT** our customers' satellites in needs for high-data rates, secured and license-free communications with CYCLOPS, our end-to-end laser communication solution.

To **EXPLORE** the Solar system effectively, finding and transporting resources will be required. In addition to the expertise and other products developed by the company, ASTRAEUS, our autonomous deep space navigation solution, is a key-enabling technology to make such missions possible.

PRODUCTS AND SERVICES

ASTRAEUS - Autonomous Navigation

ASTRAEUS is a solution supporting autonomous guidance navigation & control capabilities to spacecraft anywhere in the Solar System. ASTRAEUS can possibly reduce mission cost and allow new kinds of mission profiles. Station keeping, interplanetary cruise, proximity operations & rendezvous to celestial bodies or spacecraft are potential applications.

CYCLOPS - Laser Communication

CYCLOPS satellite & ground laser terminals offer a Direct-to-Earth communication end-to-end solution. This is especially suitable for microsatellite constellations in Low Earth Orbit requiring to rapidly transfer a large amount of data from Space to ground.

Services

Market study, Mission Analysis & Design, System Engineering & Project Management consultancy, Launch Campaign support, Mission Operations, Earth Observation data.

MAIN CUSTOMERS

ASTRAEUS answers the needs of companies planning missions to the Moon and beyond wishing to reduce the cost of their mission. Companies in need for in-orbit services (e.g. refuelling, de-orbiting) could use an adapted version of ASTRAEUS too.

CYCLOPS answers the needs of Earth Observation microsatellite constellations in Low Earth orbit.

ODYSSEUS has been satisfying returning customers (mainly Space Agencies, National Laboratories and Universities in Asia and Europe) with its line of services for more than 5 years.

MAJOR SPACE PROJECTS

ASTRAEUS (autonomous navigation solution for space applications) and CYCLOPS (end-to-end laser communication solution for LEO applications) are the core products currently being developed by the company.

In parallel with its R&D activities, the company keeps providing small satellite related services to its customers to make their missions successful. With its international team of experts coming from Space Agencies, Industry and Research Laboratories, our team has already been involved in more than 15 small satellite missions in Asia and Europe.

OffWorld

CEO/
HEAD OF DEPARTMENT
Jim Keravala

CREATION DATE
2016

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 55
Space: 10

R&D
INTERNAL INVESTMENTS
€ 350,000

CONTACT DETAILS
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CORE BUSINESS

OffWorld has undertaken Research and Development in the field of extreme environment industrial robotics, initially applied to the mining and mineral processing sector. Applications are expanding into the construction and infrastructure markets. The objective is to establish an end-to-end collaborative robotic system comprising thousands of multi-species robots working together to achieve defined strategic objectives across mining, processing, fabrication, assembly, manufacturing and construction – essential elements for developing space infrastructure. Space operations require that these robotic systems undertake complex tasks autonomously or with minimal human intervention. OffWorld has developed a task agnostic machine learning framework to automate industrial processes. This approach enables operations in the space environment.

PRODUCTS AND SERVICES

OffWorld is currently at the rollout stage for its initial terrestrial mining robots. We are already developing our program to encompass modularity, massive scale production engineering, serviceability, forward and backwards compatibility and robustness. The first two prototypes were built in parallel within 5 months from final design to prototype 1.0 completion. The approach we are taking is that of mining as a service and currently in mine trials for our autonomous mining robots and direct energy beaming robots. The OffWorld platform is extending to space and lunar modules to begin development in our Luxembourg facilities.

TECHNICAL MEANS

OffWorld will refine its machine learning mining robots to make them lighter, increasingly modular, and lunar-surface-environment tolerant. This is necessary to reduce transportation cost to the Moon and be employed in mining ice bearing regolith located in permanently shadowed regions around the lunar poles. Each step in this ISRU process is envisioned as a stand-alone function within an autonomous robotic platform of multiple robotic units operating collaboratively together. Our autonomous robotic platforms are currently in development for Earth mining under internal funds with demonstration units already undergoing testing and development. Our ISRU Technology subsystem is a subset of OffWorld's overall concept for mining Moon and Mars regolith for volatiles and minerals.

MAIN CUSTOMERS

Due to the dual use approach taken by OffWorld, customers will be both space and terrestrial.

- In-space transportation companies
- Space Agencies
- Terrestrial mining, construction and manufacturing companies

MAJOR SPACE PROJECTS

Development, demonstration and deployment of lunar focused robust, scalable in-situ resource utilization robots.

OQ TECHNOLOGY

CEO/ HEAD OF DEPARTMENT
Omar Qaise

CREATION DATE
2016

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 5-10

R&D INTERNAL INVESTMENTS
€180 K

CONTACT DETAILS
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CORE BUSINESS

OQ TECHNOLOGY is a global 5G "Internet-of-Things" network operator providing the largest remote IoT data access and analytics platform and cutting costs of data transmission through satellites by a large factor by utilizing non-terrestrial networks (satellites, balloons, drones).

We serve the oil and gas, maritime, Industry 4.0 and transport segments particularly for the management and tracking of assets in remote areas. Whether this is digital oilfield applications, offshore monitoring, SCADA applications, asset tracking, fleet management, smart metering or predictive maintenance, we provide you with an innovative low-cost connectivity solution. We also help mobile operators extend their cellular IoT coverage to remote and rural areas where their cellular tower coverage cannot reach.

Our wireless technology is compatible with cellular IoT, particularly Narrowband IoT. The modules are cellular compatible plug & play, easy to install, have long battery life and connect you directly to our or your data cloud.

Security is important for us, and all our modules and data interfaces are highly secure and encrypted. We have our own network and we can customise our service according to your needs to guarantee the reception of data in your own country only.

PRODUCTS AND SERVICES

Connectivity Service: We offer highly secure managed 5G IoT connectivity service with large data plans and low cost compared to traditional solutions.

5G Sat M2M Modules: Hybrid cellular terrestrial and satlelite NB-IoT modules that can roam and switch between the mobile and satellite network anywhere in the world.

5G IoT Sat Terminals: It is a universal NB-IoT data aggregator that is designed to provide a gateway for IoT and M2M data and connects to any satellite, regardless of the platform used. Typical applications include SCADA, maritime, and remote industrial connectivity. It implements edge-computing, high security standard, and low power communication. IT can connect to any VSAT or other satellite terminal.

Data Analytics: Our secure data analytics platform gives you access to a wide range of meta data that together with highly targeted analytics algorithms offer you the necessary information needed for your critical business decision-making processes and for optimising your operations.

DSP House: Strong experience and skills in cellular transceiver and software stack development for mobile and satellite operators, NB-IoT over satellite IP own development product and patented under OQ.

Consultancy: we support customers' hi-tech and telecommunication projects at all stages, from the definition of requirements, initial studies, engineering processes, procurement and management tasks as well as operations through to the end of the project with archiving and lessons learnt. During the project establishment phases, we have the experience to support the requirements capture, the analysis, the identification of key drivers, the operations concept definition, the cost estimation and the specification of statements of work, and the writing of commercial bids and proposals. OQ TECHNOLOGY can also provide monitoring of industrial contracts for clients.

MAJOR SPACE PROJECTS

MACSAT Feasibility Study: OQ TECHNOLOGY successfully performed a detailed study and the system design of a global satellite system dedicated for Machine2Machine communication. The technology developed surpasses existing wireless technologies in meeting the extensive demands of IoT & M2M communication requirements. The study also included a detailed analysis of the M2M and IoT markets and target business models that allows such a technology to be rapidly implemented as a product and service.

Smart Automatic Model Based Architecture: The project aims to create a set of agile software tools implementing in their core Artificial Intelligence techniques and cognitive algorithms that support engineers in integral product design or complex processes by creating a modular framework. The software main objective is to be used to produce engineering test plans and routines in the automotive and aerospace industry, with minimal human intervention. It can be also used to manage the IoT networks. Using this tool customers can save up to 70% of the time and cost needed to develop conventional network optimization techniques. The AI training algorithm was successful in matching a human engineer work up to 93% in a specific scenario.

MACSAT In-Orbit Demonstration Mission: OQ TECHNOLOGY is the prime contractor of the MACSAT IOD mission, where it is designing, implementing, and building the first satellite to be launched to demonstrate the company's innovative IoT technology implemented in both the payload and user terminals.

TIGER-1 Mission: OQ Successfully tested NB-IoT over two LEO Cubesats, the mission was a technology proof of the feasibility of cellular IoT over LEO satellites and successfully tested the transceiver algorithms developed by OQ.

Orbitare

CEO/ HEAD OF DEPARTMENT
Luis Muñoz

CREATION DATE
2017 (Switzerland)
2020 (Luxembourg)

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 4
Space: 4

TURNOVER 2020
Total: €150,000
Space: €150,000

R&D INTERNAL INVESTMENTS
€200,000

CONTACT DETAILS
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CORE BUSINESS

Orbitare is a space company addressing the needs of people. We identify projects of large social impact which can only be made possible with the use of Space and make them happen by working on the three pillars of market, funding, and development. Spaceloop is our first large project, aiming at changing the market of personal satellite communications by providing universal access to IP messaging connectivity to keep people always safe and connected to those who matter to them.

PRODUCTS AND SERVICES

Connecting people via IP messaging over the Spaceloop satellite network.
Connecting communities with our IP-based data transport network integrated with the internet.
Network as a Product – we deliver turn-key satellite networks designed to meet the needs of specific applications or for dedicated customers.
Transfer of space experience – we are happy to share our long time experience in space with the vibrant community of new space.
In-space demonstration services of software payloads and communication systems in S-Band over our SDR payload.

TECHNICAL MEANS

- One SDR payload in space operating in S-Band
- Software tools to design and analyse advanced communication systems
- Spectrum analyser
- Low noise signal generator
- Flight representative Software Defined Radios
- Programmable satellite communication ground stations
- Antennas
- FPGA evaluation boards

MAIN CUSTOMERS

The main customers of Spaceloop will be adventure travellers, professional and recreational mariners, NGO personnel and journalists working in the field, the communities in the Earth Polar regions. We will also extend our network to provide communications to isolated communities across the world, with Governments as the likely customers.

MAJOR SPACE PROJECTS

In July 2020 we launched the first phase of the development of Spaceloop in our new office at Technoport in Luxembourg. As of June 2021, we have reached TRL 6 with our two in-orbit demonstration missions in partnership with Spire Global. We continue working towards completing the development, deploying the satellite fleet and ground system, and taking Spaceloop to the market in the first quarter of 2023. Spaceloop is meant to replace the offering of personal satellite communications of the incumbents, filling the gap between the satellite broadband and mega-constellation proposals, and the IoT initiatives.

POST Luxembourg

CEO/
HEAD OF DEPARTMENT
Claude Strasser

CREATION DATE
1842

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 4 697

TURNOVER 2020
Total: € 864 M
Space: not public

R&D
INTERNAL INVESTMENTS
not public

CONTACT DETAILS
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CORE BUSINESS

POST Luxembourg is Luxembourg's leading telecommunications and information services company. It was founded in 1842 as a public service and has been a wholly state-owned company since 1992. It is the country's largest provider of postal and telecom services and also offers financial and philatelic services.

As of 2020, POST Luxembourg Group is the largest employer in the country with 4.697 employees. It is also an innovative company that adopts an open-minded approach and embraces diversity, with its staff from 50 nationalities.

POST Luxembourg offers a large range of ICT services for residential customers (fixed and mobile telephony, Internet access, television), as well as standard and tailor-made services designed for business customers. In 2020, POST was the first operator in Luxembourg to launch 5G.

PRODUCTS AND SERVICES

POST Luxembourg Group offers a broad portfolio of ICT services and tailor-made solutions to business customers. The offering comes in six layers completing one another:

- Datacentre: Tier III & tier IV datacentres; on-premise, public & hybrid & private cloud solutions
- Infrastructure: Virtualization, compute, storage, network, connectivity (fixed, mobile, satellite), backup
- Service: Monitoring, automation, deployment, management
- Application: E-Mail, document management, collaboration, sync & share
- End-User: Workplace, printing, applications, mobile device management, support
- Security: Internet and network protection, device protection, data protection (including GDPR compliance), vulnerability and threat management including a Security Operations Centre

MAIN CUSTOMERS

POST Luxembourg serves all customer segments from residential customers to large corporate and public customers.

POST Luxembourg Group has the privilege of counting amongst its customers almost all major corporates from the financial, insurance, health, industry, commerce, space and transport sectors, as well as the national public sector and the institutions of the European Union.

MAJOR SPACE PROJECTS

POST Luxembourg provides ground station, hosting, satellite broadband and communications services to major corporate and public customers.

In a research project funded by ESA, POST Group aims to build and improve the trust in digital assets by securing their authenticity from creation on through a novel approach building on blockchain and satellite geo-localization amongst others.

POST Luxembourg participates in the Lux5GCloud research project (funded by SMC) investigating the potential of a combined approach towards a Smart Agriculture taking advantage of multiple technologies like 5G, satellites and IoT.

Furthermore, POST Luxembourg supports the space ecosystem development through the Luxembourgish space fund 'Orbital Ventures', which focuses on early stage companies engaged in space activities.

Redwire Space Europe

CEO/ HEAD OF DEPARTMENT
Jaroslaw Jaworski (General Manager for Europe)

CREATION DATE
2018

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 24
Space: 24

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CORE BUSINESS

The core business of Redwire Space Europe is the development & sale of robotic arms for space applications. Additionally, Redwire Space Europe also participates in collaborative R&D projects related to robotic arm applications in space and extreme terrestrial environments. By lowering barriers to sophisticated in-space robotics, Redwire Space Europe is helping introduce the next generation of space industrialization.

PRODUCTS AND SERVICES

Space-rated robotic arms offered by Redwire Space Europe are the company's main product.

The robotic arms are designed to carry out a range of functions which are widely applicable across space-based robotic missions. Satellite servicing, refuelling operations, station-keeping, manipulation of payloads, in-orbit assembly, planetary exploration, and in-situ resource utilisation (ISRU) can all be beneficially augmented with the use of Redwire Space Europe robotic arms.

In addition to providing robotic arms, Redwire Space Europe provides correlated services which include engineers to support integration of the arm to the spacecraft or rover, and a robotic arm software model for dynamic simulation. Redwire Space Europe also offers a prototype robotic arm for mock in-space operations which customers may use at the company's facilities in Luxembourg.

TECHNICAL MEANS

Redwire Space Europe's robotic arm has several key features.

1) Standardized, open-source interfaces - simple integration of arm-to-system and open-source arm-to-end-effector connection interface
2) Easily-programmable software - enables seamless programming of robotic arm
3) Modularity and scalability - arm specifications can be customized based on customer requirements due to a simple, modular system
4) Tool changer and end-effectors - robotic arm features several tooling options and a changer which can use different end-effectors while in-operation
5) Affordable - robotic arm is mass-produced and commercially available

Caption: STAARK© robotic arm

MAIN CUSTOMERS

The main customers of Redwire Space Europe are companies and entities that need affordable robotic arms for industrial space applications and missions. These applications include orbital activities, such as satellite servicing and in-space assembly, as well those for surface activities, such as planetary exploration and ISRU. In addition to industrial space companies, Redwire Space Europe also works with R&D consortiums which are interested in refining robotic technologies for far-future missions (10+ years).

MAJOR SPACE PROJECTS

At this time Redwire Space Europe's efforts are dedicated to the development of the robotic arm product. In January of 2021 Momentus Space selected Redwire to provide a flight-qualified robotics system to be launched as early as 2022 on the Momentus Vigoride in-space transportation vehicle.

RespectUs

CEO/ HEAD OF DEPARTMENT
Patrick Goergen

CREATION DATE
2019

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 2
Space: 2

TURNOVER 2020
Total: € 6,000
Space: € 6,000

QUALIFICATIONS, APPROVALS
Graduate Fit4Start, 9th ed., Space vertical (2020)
Funded by Luxembourg Space Agency through an ESA Contract in the Luxembourg National Space Programme LuxIMPULSE (2021-2023)

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CORE BUSINESS

Export Control Compliance Daily.
RespectUs offers a SaaS (Software-as-a-Service) product to exporters of sensitive goods, their suppliers and banks.
All exporters of sensitive items (in Space vertical and other industries) face the challenge to determine the need to apply for and be granted a Governmental license when exporting, importing, transiting, brokering or transferring controlled goods, software and technology. It is their responsibility to obtain the license before proceeding, and an illegality puts (in the sense of, made without required license) put them at risk of heavy administrative and/or criminal sanctions, and civil liability.
To answer the question if a license is required, they need to process different checks and screenings: customer, end-use, product and transaction. Currently done mostly manually (or with Excel sheets), RespectUs provides them with a cloud-based digital platform allowing them to process and duly document and keep records of the checks and screenings.

RespectUs platform will offer:
- Protection against legal fines and/or business suspension
- Productivity gains (time, resources, money)
- Proper determination of license requirement
- Demonstration of overall compliance with export control regulations

PRODUCTS AND SERVICES

The RespectUs platform will be composed of different modules:
- **License Determination.** This module uses questions & answers and algorithms to ensure that a company gets to a concrete stage where a relevant answer is found, for a particular transaction, product, customer and end-use, and considering the applicable legislation, to the question if a license is required.

It takes into account information about the range of license types (including individual, global and general licenses) and controlled activities (including export, brokering, transfer and transit), and about the license application procedures relating to the applicable multilateral and national dual-use trade controls.

- **Product Classification.** Item classification is about determining whether the items are listed. This is done by comparing the technical characteristics of an item against the EU and national military, torture and dual-use control lists. This module helps to understand whether dual-use items, whether a physical product, software or technology, require a license for export
- **Customer Screening.** This module allows to know the customers and their end-use of the company's products. It stores customer profiles, due diligence reports, database screenings and end-use statements provided by the customer
- **Sanctions & Embargoes.** This module processes checks on embargoed, sanctioned or sensitive destinations and entities, and ensure that none of the involved parties (intermediaries, purchaser, consignee or end-user) or products or transactions are subject to restrictive measures (sanctions) by consulting the up-to-date sanctions lists
- **End-Use Checks.** In this module, platform users document their assessment of diversion risk indicators and of signs about suspicious enquiries or orders. This feature allows to deal with catch-all controls for non-listed dual-use items
- **Risk Assessment.** The risk assessment allows to determine a company specific dual-use and military trade risk profile. It will help the company to become aware of what parts of its business need to be covered by an internal compliance program and target this program to the company's specific circumstances.
- **Knowledge Base.** This module provides platform users with a complete and detailed overview of the legal and regulatory framework of export control compliance, with precise legal references and (legally justified) answers to precise questions. Includes keyword search by keywords and extended glossaries

Accessory professional services include: Training. Compliance Audits. License Management. Internal Compliance Programs (ICP). Transaction Structuring. Violations Management.

TECHNICAL MEANS

RespectUs is offering consulting services and a SaaS (software-as-a-service) product, that means a cloud-based computing software on a subscription basis and online access only.

MAIN CUSTOMERS

SMEs and large enterprises from the Space sector. Exporting companies and suppliers from other industries.

MAJOR SPACE PROJECTS

Export Control compliance for Space companies, and their suppliers.

R

RHEA System Luxembourg SA

CEO/ HEAD OF DEPARTMENT
Pascal Rogiest

CREATION DATE
2020 (RHEA Group created in 1992)

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 650
Space: 403

TURNOVER 2020
Total: € 66 M
Space: € 57.8 M

R&D INTERNAL INVESTMENTS
€ 238 K

QUALIFICATIONS, APPROVALS
2020: 3rd fastest growing company in Trends Gazelle Walloon Brabant

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CORE BUSINESS

RHEA Group is a professional engineering company providing tailored engineering solutions, system development and security services for mainly space, government and defence organizations. We have built a reputation as a trusted partner developing solutions that lead to sustainable added value for our customers.
For 30 years our staff have been working in the space, security and system engineering sectors, contributing to the development of solutions to the most complex systems and missions. We focus on end-to-end services in space and cybersecurity and deliver the highest quality in secure design development, testing, roll-out, training, operations, and maintenance for business-critical systems.
Headquartered in Belgium, RHEA Group employs over 650 people working at client's premises or RHEA offices throughout Europe and North America.
RHEA System Luxembourg focuses on implementing end-to-end services in Space and Cybersecurity, leveraging the competences of the RHEA Group

PRODUCTS AND SERVICES

- We provide full lifecycle engineering solutions, including design, integration and operation, for complex programmes
- We supply operations and ground system engineering services for missions including Earth observation, communications, scientific, navigation and space exploration helping both New Space and established organizations set up their operations infrastructure or introduce new ground segment technologies. Our GENI easily extracts and processes information from EO data using the latest advances in machine learning and data analytics.

- We develop complete cyber-resilient programmes, build SOCs and services to protect clients against cyberattacks, and deliver cyber-range capabilities to test and train teams
- Our concurrent design methodology significantly reduces both the cost and overall risk early in a project's lifecycle
- Cybersecurity managed services and Satellite end-to-end services are the focus of RHEA System Luxembourg, in the sectors identified as priority for the LSA strategy

TECHNICAL MEANS

- Our Concurrent Design product COMET enables multidisciplinary teams to work together efficiently on complex systems by analyzing requirements, carrying out calculations and validating models in real time
- Our Manufacturing and Operations Information System (MOIS) is a suite of tools used by spacecraft manufacturers and operators to optimize the processes of spacecraft validation, mission operations and preparation
- Cyber Integration, Test and Evaluation Framework (CITEF) provides an interactive emulation of an organization's local network, system, tools and applications. Its highly accurate representation of both information and operational technology assets powers RHEA's Next Generation Cyber-Range Services, which are used across industry for cybersecurity testing, planning and training

MAIN CUSTOMERS

Customers & Partners: Luxembourg Space Agency, Luxembourg Ministries, POST, LuxTrust, InTech, HITEC, the European Space Agency, SnT Uni.lu, the European Union Agency for the Space Programme (EUSPA), national space and defence agencies, other national institutes and commercial clients.

MAJOR SPACE PROJECTS

- SCCOE: the establishment of the Security Cyber Centre of Excellence, located in the European Space Security and Education Centre (ESEC), in Redu, Belgium
- Traleo 2: cyber testbeds for satellite to ground communications
- Numerous satellite and cybersecurity operations for commercial operators

R

RSS-Hydro SARL-S

RSS-Hydro

CEO/ HEAD OF DEPARTMENT
Dr. Guy Schumann

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 6
Space: 4

TURNOVER 2020
Total: € 150,000
Space: € 25,000

R&D INTERNAL INVESTMENTS
€ 25,000

QUALIFICATIONS, APPROVALS
Government-accredited private research institute

CONTACT DETAILS
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CORE BUSINESS

R&D in remote sensing applications and computer simulations of water risks. RSS-Hydro employs traditional methods and advanced machine learning models to extract actionable information from geospatial datasets and to simulate water risks at impact level scales. Our innovative remote sensing technology services, including drones and satellites as well as computer models are developed in-house to respond to the needs of our customer.

PRODUCTS AND SERVICES

- Remote sensing and computer simulations of water risks at local to global scales;
- Flood disaster response assistance with Earth Observation (EO) products and services
- Flood event re-analysis using EO data and computer models
- Expert consulting services in remote sensing and modelling of water risks and environmental applications
- Drone services and products for the natural and the built environments

TECHNICAL MEANS

- More than 15 years of expertise in academia and R&D in the field of remote sensing and computer simulations of water risks
- Our team members have many years of expertise in hydrology, geospatial data analytics, and machine learning applications
- Experience in IoT, in particular using open geospatial web services
- Expertise in drone technologies and services

MAIN CUSTOMERS

Applied research funding sources:

- Government departments
- Space agencies
- Private sector companies
- Public institutions (including universities)
- NGOs and international organisations
- European Commission

R&D services provision to:

- Government departments and other public sector entities
- City Councils
- Development aid organisations
- Humanitarian response organisations
- Private sector, including the (re)insurance sector

MAJOR SPACE PROJECTS

- ESA Incubed project "FloodSENS": Smart Mapping of Floods - *https://incubed.phi.esa.int/portfolio/floodsens/*
- Active R&D projects focus mainly on flood disaster response assistance using EO products and services
- Participation and mentoring in NASA/Europe Frontier Development Lab (FDL)
- Acquisition of high-resolution drone data and provision of services to a variety of sectors

R

SATURNE TECHNOLOGY

CEO/
HEAD OF DEPARTMENT
Walter Grzymlas

CREATION DATE
2001

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 13
Space: 2

TURNOVER 2019
Total: € 3,9 M
Space: € 210 K

R&D
INTERNAL INVESTMENTS
€ 2,4 M

QUALIFICATIONS, APPROVALS
Certificat ISO 9001: 2015
FR13/018059
Valid until 04/08/2021
Certificat ISO 9100: 2016
FR12/01276
Valid until 04/08/2021

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CORE BUSINESS

SATURNE TECHNOLOGY serves its clients and partners through experience and skills. The main objective is to meet the expectations and needs of customers, while respecting the three most essential points for effective partnership: quality, price, deadline.

The permanent challenge for all our customers is to quickly introduce new products on a changing market. Project managers, developers and designers use our services to validate a concept or the functionality of their parts or a prototype, detect possible design problems, present team marketing and convince their clients. They need to test different solutions, compare and confront them, validate industrial processes and optimise their knowledge to reduce manufacturing costs and, finally, confirm the launch of production in small, medium and large series.

PRODUCTS AND SERVICES

Additive manufacturing

Our selective laser process is the ideal solution for realising your functional parts. There is no loss of time between conception and getting your metal parts as parts are not obtained by removing but by adding material and additive manufacturing. We can make complex shapes and produce what was until recently inaccessible for the state of the art:

- Geometric forms without limit
- Conduits and internal canals, in any forms and geometries
- More efficient cooling systems
- Optimised lightening
- Moving mechanical parts (e.g. ball joints, etc.)

Laser welding

SATURNE TECHNOLOGY's laser welding machines allow the realisation of welding, point by point, as well as cords with high quality and perfect precision:

- with or without contribution of material
- speed and precision
- absence of mechanical constraints
- complex forms

Laser drilling

We can make small circular hole diameters, without moving the beam. Materials which can be drilled include steel, plastic, copper, ceramics, etc.

Laser cladding

With our reloading laser technology, we can deposit different types of alloys or materials on mechanical parts to increase their durability, hardness and profitability. Our deposits are realised with a "coaxial" head, allowing fine and/or important deposits, having a connection with the basic material, completed and without constraint.

Laser cutting

Our cut laser applies to different types of materials with complex contours which require a specific treatment, fast and without resistance. This method presents a number of advantages, the main one being the manufacturing without deformation in parts up to 3 mm in thickness. Our laser machines allow obtaining a precision lower than 1/100 mm on very diverse materials.

Precision engineering

To enable us to finalize the manufacture of parts in additive manufacturing or other parts made internally we have invested in a set of precision mechanics such as milling, EDM cutting, EDM drilling and grinding.

TECHNICAL MEANS

- AM Machines: **1 XSLM 500 HL, 2 X PROX 300**
- Machining: **Machining 3 & 5 Axis, Manual Milling, CNC Lathe Turning, Manual Lathe Turning**
- Non Destructive Testing: **CT Scanning, Radiographic Scanning, Blue Light Scanning, Laser Scanning, CMM**
- Post Build Processes: **Wire EDM, Blasting (wet/dry), Support Removal, Chemical etch (FOD removal), ULTRASONIC / Other, Powder removal, Behringer Band Saw / Giant Tumbeler**
- Vacuum Heat Treat
- Mechanical Testing: **Ambient Temperature Fatigue Testing, High Temperature Fatigue Testing, LCF, HCF, Crack Propagation Growth, Fracture Toughness, Ambient and High Temperature Tensile Testing, Impact Testing, Tensile Testing**
- Hardness Testing: **Rockwell Testing, Superficial Testing, Micro hardness Testing, Vickers Testing**
- Chemistry Lab Services: **ICP-OES, Interstitial Element N,O,H,C,S, Sub-ppm Elemental Analysis, Flow Test, Tap Density Test, True Density Test, Morphology Evaluation, Failure Analysis, Metallographic Evaluation, Preparation, Grain Size, Microstructure, Macro Etch/Micro Etch, Porosity/Density Evaluation, Particle Size Distribution, SEM w/EDS**

MAIN CUSTOMERS

Civil and military aeronautics, space, industry, armament, medical, automotive, nuclear, food-processing industry, art and jewellery, research and development.

MAJOR SPACE PROJECTS

Development and additive metal fabrication as well as laser welding of waveguides and satellite support. Development and additive metal manufacturing of engine components for rocket propulsion.

SES

CEO/ HEAD OF DEPARTMENT
Steve Collar

CREATION DATE
1985

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 2100

TURNOVER 2020
Total: €1,876 B

CONTACT DETAILS
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Website: www.ses.com/

CORE BUSINESS

As the leader in global content connectivity solutions, SES operates the world's only multi-orbit constellation of satellites with the unique combination of global coverage and high performance, including the commercially-proven, low-latency Medium Earth Orbit (MEO) O3b system. SES delivers high-quality connectivity solutions anywhere on land, at sea or in the air, and is a trusted partner to the world's leading telecommunications companies, mobile network operators, governments, connectivity and cloud service providers, broadcasters, video platform operators and content owners. SES's video network carries over 8,400 channels and has an unparalleled reach of over 361 million households, delivering managed media services for both linear and non-linear content.
The company is listed on Paris and Luxembourg stock exchanges (Ticker: SESG).

PRODUCTS AND SERVICES

SES leverages a vast and intelligent network that spans satellite and ground infrastructure to create, deliver and manage video and data solutions. The company has two business units, focusing on very distinct businesses.

The Networks business unit of SES provides market-tailored, fully managed solutions for customers in the telco, cloud, maritime, aero, energy and government segments. It is actively developing a partner ecosystem to drive automation, orchestration and standards-based networking capabilities.

Through the Video business unit, SES delivers high-quality video anywhere, anytime, and on any screen, via a comprehensive suite of distribution solutions using satellite, terrestrial, and IP networks.

Learn more about SES's video broadcast and data connectivity services by industry: *https://www.ses.com/find-service*

TECHNICAL MEANS

Satellite operation and services leveraging a multi-orbit fleet of GEO and MEO satellites, as well as extensive ground infrastructure.

MAIN CUSTOMERS

SES is trusted by public and private broadcasters, content owners, telcos, MNOs, enterprises, governments and institutions across the world.

MAJOR SPACE PROJECTS

SES's O3b MEO non-geostationary (NGSO) system has been operational since 2013, delivering low-latency fibre-equivalent data connectivity services to customers in 50 countries.

SES's next-generation MEO system O3b mPOWER will bring exponentially more capabilities. The highly flexible satellite system comprises an initial constellation of eleven low-latency, high-throughput MEO satellites, each with thousands of fully-shapeable and steerable beams. It will provide multiple terabits of throughput globally to drive digital transformation and cloud adoption virtually anywhere on the planet.

Among other SES's next-generation capabilities is the high-throughput GEO satellite SES-17, dedicated to services for the aeronautical, maritime, fixed and mobile broadband markets.

SkyfloX SARL

CEO/
HEAD OF DEPARTMENT
Emmanuel Rammos

CREATION DATE
2018

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 6
Space: 6

R&D
INTERNAL INVESTMENTS
€ 5 M

CONTACT DETAILS
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CORE BUSINESS

SkyfloX develops the ESA patented concept of ORCA: Optical and RF Constellations on Aircraft. ORCA proposes to use civil passenger aircraft to provide services such as those offered by satellites. ORCA lends itself specifically well to Earth observation applications that require high resolution data, in combination with high revisit.

PRODUCTS AND SERVICES

Earth observation is the initial application of ORCA, where ORCA can provide multiple daily, metric GSD Multitemporal Orthos, medium-high GSD Thermal Orthos, and high GSD Digital Surface Models (HiResDSM). The multitude of flights furthermore allow the production of True Orthos, along with fused products related to RGB, Thermal, and DSM data.

TECHNICAL MEANS

Payload design, aviation certification management, proprietary software for coverage simulations and statistics, ground segment development.

MAIN CUSTOMERS

Currently confidential, though SkyfloX is actively working with the largest EO analytics companies in the world for its upcoming pilot project.

MAJOR SPACE PROJECTS

SkyfloX cooperates with a team of international aerospace partners and users, including Transavia as major airline, to equip and fly the first ORCA Earth Observation payload on a Boeing 737-800 in the summer of 2021. It aims to raise its series A to equip a first constellation of 40 aircraft by the end of 2023.

space4environment

CEO/ HEAD OF DEPARTMENT
Stefan Kleeschulte

CREATION DATE
2007

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 7
Space: 6

TURNOVER 2020
Total: €1,800,000
Space: €500,000

R&D INTERNAL INVESTMENTS
€20,000

QUALIFICATIONS, APPROVALS
Organisme agréé pour l'environnement naturel

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CORE BUSINESS

space4environment is an independently owned SME focusing on adding the environmental dimension to Earth Observation in the land domain, respectively "using space data to provide space for the environment", as expressed in the company's motto.
At space4environment we are building our GIS and Earth Observation activities on three pillars of expertise:

- Sound knowledge of the data (at national and European level),
- Expertise in data handling, processing and scientific analysis,
- Policy related thematic assessments.

space4environment is applying this expertise on the one hand for the provision of quality control and quality assurance of Copernicus products, as well as in support of environmental reporting obligations and dataflows, and on the other hand to assess issues like environmental sustainability, the condition of ecosystems and their services or the state of environment in general.

PRODUCTS AND SERVICES

GIS and EO data processing

Satellite data processing & analysis - Land use / land cover mapping, change mapping - Database design, management & interactive query tools - Data analytics and visualization - Spatial modelling and software development - Digital cartography - Web mapping tools

Environmental assessments

Mapping and assessment of ecosystems and their services - Green Infrastructure - Land systems and land resource efficiency - Urban sustainability - Disaster risk mapping - LULUCF reporting and data analysis

Geodata provision and distribution
Official distributor of Eurogeographics data

Management and consultancy
Requirements analysis - Geographic information consultancy - Project definition and supervision

MAIN CUSTOMERS

International organisations
- European Commission (DG Environment, Eurostat, JRC, ESPON)
- European Environment Agency (EEA)
- European Space Agency (ESA – ESRIN)
- Airbus DS Geo
- Convention on Biological Diversity (CBD)

Luxembourg organisations
- Ministère de l'Energie et de l'Aménagement du territoire
  - Département de l'aménagement du territoire
- Ministère du l'Environnement, du Climat et du Développement durable
  - Département de l'Environnement
- Administration de l'environnement
- LISER

MAJOR SPACE PROJECTS

Copernicus
- Quality control of High Resolution Layers and Local Component products
- Quality assurance of Global Hot Spot Mapping products for Africa
- Quality assurance of the image data for the provision of a Very High Resolution (VHR) satellite image coverage of Europe (6 Mio sqkm)
- Development of a new European land monitoring concept (i.e. 2nd generation CLC or CLC+)
- COP4N2K – Copernicus for Natura2000: Development of an online information system for assessing land cover changes in protected areas between 1994 and 2018

Land cover mapping
- Update of the OBS Luxembourg for 2015
- Land cover 2018 – a very high-resolution land cover map of Luxembourg
- EO4CBI - EO data in support of the City Biodiversity Index
- Mapping of small linear landscape features (hedges, tree rows)
- Mapping of CLC Luxembourg: 2006, 2012 and 2018

Space Cargo Unlimited

CEO/
HEAD OF DEPARTMENT
Nicolas Gaume

CREATION DATE
2014

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 5

CONTACT DETAILS
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CORE BUSINESS

Space Cargo Unlimited is dedicated to seizing the potential of Space microgravity for commercial applications on Earth. Space Cargo Unlimited operates a variety of pressurized third party vehicles for round-trip missions to Low Earth Orbit, carrying payloads for research & manufacturing purposes.

PRODUCTS AND SERVICES

Space Cargo Unlimited offers turn-key pressurized round-trip missions from launch platforms around the world. With a portfolio ranging from suborbital missions on new space vehicles, as well as established platforms such as ISS, Space Cargo Unlimited offers a comprehensive range of modern science applications as well as manufacturing opportunities in space.

TECHNICAL MEANS

Building on strategic partnerships with vehicles operators and leveraging the high-level expertise of the European industry, Space Cargo Unlimited develops comprehensive expertise in complex microgravity project management and funding. Space Cargo Unlimited has partner teams in France, Germany, Italy, and the USA, with a network covering nearly all major actors in space infrastructures worldwide.

MAJOR SPACE PROJECTS

In November 2019, with mission ComμBioS SCU transported bottles of red wine to the International Space Station to age in Space for a year-long mission. The goal is to better understand the evolution of food taste and microorganic composition in the extreme conditions of Space. Wine being taken here as a proxy for complex liquid food systems.

In December 2019, with mission ALPHA SCU exposed vine calluses to weightlessness aboard a Blue Origin New Shepard spacecraft before returning to Earth. In this experiment, SCU commissioned a new scientific protocol called "Self-Guided Evolution" triggering a high evolutional rate of organisms in a Space environment.

In March 2020, with mission CANES SCU transported 320 vine plants to the International Space Station to be stored for a duration of 6 months. The goal is to trigger the plants to mobilize and resort to their inner defenses when threatened by the harsh environment of Space. CANES purpose is to discover the mechanisms at play in the plants inner defense systems to help plants adapt to harsher environments in the context of global climate change.

These missions are part of the larger Mission WISE (Vitus Vinum in Spatium Experientia). Space Cargo Unlimited's Mission WISE aims at developing new models and technology to tackle the future of agriculture and food by leveraging the effect of microgravity on complex biological systems. Mission WISE is the first comprehensive, privately led applied research program in Space, aimed at preparing the future of agriculture.

Spacety Luxembourg SA

CEO/
HEAD OF DEPARTMENT
James Zheng

CREATION DATE
China: 2016
Luxembourg: 2019

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 5 in Luxembourg
Space: 5 in Luxembourg

TURNOVER 2020
Total:
€150,000 in Luxembourg
Space:
€150,000 in Luxembourg

R&D
INTERNAL INVESTMENTS
Luxembourg: €100,000

QUALIFICATIONS, APPROVALS
Qualified in Small & Medium category by the European Space Agency

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CORE BUSINESS

Spacety is a global NewSpace company with 21 satellites launched and operated since founded in 2016 and more on the launchpad. It is a next-generation low-cost Earth observation data and service provider with its SAR (Synthetic Aperture Radar) satellite constellation and innovative data platform. It also provides fast, frequent, flexible, and low-cost space missions to support science experiments, Earth observation, and in-orbit demonstrations and/or validations of space technologies, products, or space systems.

Spacety Luxembourg is Spacety's international headquarters. It provides all the Spacety's satellite-based services to the global market and develops innovative technologies to enable next-generation satellite-based services.

PRODUCTS AND SERVICES

Delivering solutions enabled by our capabilities and systems of low-cost and high-quality cubesats and smallsats.

- One-Stop-Shop Satellite Solutions
  Complete satellite services, including design, construction, integration, testing, launch and operation
- Satellite Hosting and IOD/IOV Services
  End-to-end services to host customer's hardware/software on board our satellite platforms for science experiments, services and in-orbit demonstration/verification
- Satellite Data-as-a-Service
  Satellite optical and SAR imagery for applications in agriculture & forestry, oil & gas, environment and pollution monitoring, water management, natural disaster management, ocean & marine, infrastructure and building monitoring

• Space Training and Education
Hands-on experience with in-orbit satellites for young generation to stimulate their interest in space and STEM

TECHNICAL MEANS

Spacety has strong technical capabilities in low-cost and mass-produced small satellites. It has launched and operated 21 satellites over the past 5 years. These satellites have enabled scientists to do world class research in space, companies to flight test and demonstrate new space technologies and products, and satellite data to be provided to solve the problems we face on Earth every day. Research results were published in the world's leading scientific journal **Nature Astronomy**. Successful IOD/IOV missions have enabled companies to penetrate the global markets with new space products. The world's first miniaturised C-band SAR satellite with a phased-array antenna and 1 m resolution, HiSea-1, demonstrates Spacety's innovative way of designing and building sophisticated satellite systems.

MAIN CUSTOMERS

Spacety has a wide range of customers worldwide, including space companies, research organizations, universities and governmental organizations. Our satellite data products reach data end-users of variety of industries.

MAJOR SPACE PROJECTS

Spacety Luxembourg is newly established. It has already provided satellite hosting services in Europe to fly innovative space technologies and products. A good example is the in-orbit demonstration of the world's first iodine electric propulsion system developed by ThrustMe.

We are focusing on developing an innovative data platform to make trade and use of satellite data easy and secure. Meanwhile, we are working with local companies and the university to develop next-generation space technologies for future space systems and services.

SPARC Industries SARL

CEO/
HEAD OF DEPARTMENT
Dejan Petkow

CREATION DATE
2017

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 10
Space: 10

TURNOVER 2020
Total: ~ € 800 K
Space: ~ € 800 K

R&D
INTERNAL INVESTMENTS
Several € 100 K

QUALIFICATIONS, APPROVALS
RDI Certificate

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CORE BUSINESS

SPARC Industries has two core business areas. Number one is accelerating our customers' satellite thruster technology and product development in order to be at market as early as possible - at lower cost and risk. We achieve this by

- reducing the number of experimental test campaigns common in our customers' business
- reducing the overall time for test preparation, conduction, and interpretation
- reducing the overall cost for material, operation, and personnel
- reducing the overall risk associated with the supply chain
- reducing the overall risk associated with long term personnel availability

This is implemented with the support of our self-developed plasma simulation software "Tech Zero" which fulfils space industry requirements as well as ESA requirements. The confidence in the simulation results is enhanced by respective reporting allowing a much easier interpretation of the results, primarily based on novel, ESA-rated metrics. This lifts the credibility of simulation results used in research proposals and the competitivity of consortia using such metrics.

Tech Zero has been invented not only for accelerated EP thruster optimization but more generally for plasma technology exploration, specification, and IP generation. Thus, number two of our core business is IP exploitation by licensing the designs to customers who have strong interest in being first. Product development and commercialization can be done jointly.

One example of such a technology is given under "Products and Services". Others are in the pipeline. They all share one requirement: having breakthrough potential.

PRODUCTS AND SERVICES

Products

Our ESA-rated plasma simulation software is designed for industrial use. The product requirements are derived from intense discussions with EU and US space industry members (propulsion developers and satellite manufacturers mainly), plasma simulation experts, and ESA.

The product is available as turnkey solution, i.e., it comes with matching hardware. The software is pre-installed, pre-configured, and burn-tested. The hardware has the newest CPU and GPU technology for maximum productivity at lowest cost and time. The product includes documentation and user manual, data bases, maintenance, and engineering support. Customers have access to free online tutorials. The plasma simulation software has not only general gas and plasma simulation capabilities, but also pre-configured propulsion designs for Hall Effect Thrusters and Ion Optics based acceleration stages. Thus, the client can start being productive on the day of delivery. Additional design templates and functionalities can be provided upon request. The product delivers data in formats that are readable by satellite manufacturers' tools for satellite contamination and charging.
The product allows helps doing two things much faster but at lower cost and risk: improving plasma technology designs, and innovating plasma technology designs.

An own thruster technology currently under development has the unique property of igniting a plasma inside while remaining in stealth mode during operation: Invisible to optical observers, and invisible to the satellite – the latter enhancing the satellite's lifetime due to lacking plasma-thruster interactions. This technology can be tailored to work with existing thruster technologies.

Services

Engineering support with a broad spectrum of elements, e.g., direct consultancy, participation in consortia projects, performing and interpreting simulations.
Our core expertise is in the field of gas and plasma flows at low pressures as they occur inside satellite thrusters, nuclear fusion devices, several surface treatment processes (coating, de-coating, structuring), around satellites in very low Earth orbits and polar orbits in general, as well as during atmospheric (re-)entry at high altitudes.
The approach we are using is based on the software we are offering as a product. The software is equipped with a high level of automation for the sake of finding targeted technology specifications that not only match your requirements, but also with features that allow effective generation of IP.

We also offer maintenance service for NSD-Gradel neutron generators to end customers and manufacturers.

MAIN CUSTOMERS

Developers of electric satellite thrusters both start-ups as well as established companies. Due to the strong interdependences among members of the value chain of satellite development, we target also satellite manufacturers, incubators (hosting plasma propulsion developing start-ups), Universities with or without EP labs, independent plasma propulsion labs, and public research labs.

Spire Global

CEO/ HEAD OF DEPARTMENT
Peter Platzer

CREATION DATE
2012 (San Francisco, California, USA)
2018 (Luxembourg)

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
300-500

CONTACT DETAILS
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CORE BUSINESS

Spire is a global provider of space-based data and analytics that offers unique datasets and powerful insights about Earth from the ultimate vantage point so organizations can make decisions with confidence, accuracy, and speed. Spire uses one of the world's largest multi-purpose satellite constellations to source hard to acquire, valuable data and enriches it with predictive solutions. Spire provides this data to organizations around the world so they can improve business operations, decrease their environmental footprint, deploy resources for growth and competitive advantage, and mitigate risk. Spire's growing Luxembourg footprint includes key operations across its business units, including Spire Aviation, Weather, Earth Intelligence, Space Services, and Maritime.

PRODUCTS AND SERVICES

Spire collects, analyzes, and enriches information gathered from our custom constellation of satellites, using it to create a priceless repository of insights not available anywhere else.

- Spire Aviation: provides historical flight data, ADS-B tracking, and up-to-date data on weather that impacts aviation operations
- Spire Weather: offers a proprietary weather forecast model powered by our radio occultation data and custom predictive models
- Spire Maritime: is providing Intelligent maritime tracking and monitoring solutions, unique coverage of high traffic zones and maritime weather forecasts
- Spire Earth Intelligence: offers rich and unique data sets about our planet's surface and its atmospheric layers fuelling research and development programs and inspiring new services and applications

- Spire Space Services: using our integrated space and ground infrastructure and state-of-the -art in-house manufacturing process, we enable other innovators, commercial organizations and governments to deploy their own applications and sensors into space

TECHNICAL MEANS

- More than 300 years of space flight heritage, having launched 110+ multi-payload nanosatellites across 28 launch campaigns on 9 unique vehicles
- Largest RF sensing fleet and largest producer of radio occultation and space weather data
- Multi-payload satellites equipped with a variety of sensors incl. Automatic Identification System (AIS), Automatic Dependent Surveillance-Broadcast (ADS-B), Global Navigation Satellite System (GNSS) Radio Occultation (RO) and Reflectometry®.
- Global network of 29 ground stations

MAIN CUSTOMERS

Spire's customers range from small logistics analytics companies to large enterprises, governmental agencies, national and international institutions, R&D organisations.

MAJOR SPACE PROJECTS

We are rapidly scaling our team in Luxembourg in order to carry out a wide portfolio of scientific and engineering projects, including:

- Provision of a Data Lake containing all data generated by Spire to public research institutions in Luxembourg and local start-ups
- Provision of data to European research institutes through the ESA's Earth Online portal
- Determination of the feasibility of soil moisture data from nanosatellites
- Provision of space services to luxembourg space ecosystem
- Safer maritime services - integration of multiple data streams collected from space to offer improved maritime awareness and improve safety at sea
- Development of a sea ice monitoring solution to monitor the state of ice in the poles

Telindus Luxembourg

CEO/ HEAD OF DEPARTMENT
Gérard Hoffmann

CREATION DATE
1978

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: 750

QUALIFICATIONS, APPROVALS
ESA Qualified Partner under
GFC8 – Ground System Software related activities

CONTACT DETAILS
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CORE BUSINESS

Telindus is a brand of Proximus Luxembourg SA. Telindus Luxembourg supports all companies and public administrations in their digital transformation by providing them with holistic ICT and telecom solutions as well as tailor-made support services.
Its areas of expertise include fixed and mobile telecommunications, ICT infrastructure, multicloud, Fintech solutions, cybersecurity and managed services. Through its Training Institute, Telindus addresses all of its customers' challenges and enables professionals to remain at the forefront of best practices and ICT technologies.

PRODUCTS AND SERVICES

FIXED, MOBILE & BROADBAND
Mobile, telephony, unified collaboration, connectivity, 5G

CLOUD
Housing, private cloud, hybrid cloud, cloud applications

CYBERSECURITY
Ethical hacking, strategy, risks & consultancy, security operations centre, Network and security solutions

TRAINING CENTRE
Tailor-made Training, Coaching, Development, Audit of files

ICT SOLUTIONS
Infrastructure, user workplace, applications

MANAGED SERVICES
Infrastructure services, workplace, managed services, applications, service desk, outsourcing, governance services, professional services

DIGITAL TRUST SOLUTIONS
SmartChain, DigitalKYC, DigitalKYT, SmartPSD2, Digital Client Management

EMERGING SOLUTIONS

Artificial Intelligence, Internet of Things, Big Data, 5G, RPA

MAIN CUSTOMERS

Major companies from all sectors: Finance and Insurance, Commerce, Industry & Transport, Publics services, Services and E-Business.

MAJOR SPACE PROJECTS

- TC Authentication and Data System Security to qualify the security of applications
- Mission Control System Security Study to assess the security of SCOS-2000
- Data System Security Risk Analysis on ESOC's Operations Data
- Study on Cryptographic Design to evaluate cryptographic configurations for TM/TC protocols
- Standards, specifications and processes for space software and hardware development
- Analysis of GMES security requirements fulfilment
- Generic Secure Ground Architecture to generically authenticate and encrypt communications between ground stations and spacecraft
- Generic Application Security Framework to introduce application security aspects into software development lifecycles
- PenBox, implementation of a prototype to automate penetration testing.
- SSE4Space, framework to guide and enforce security throughout a systems lifecycle

Thales Alenia Space Luxembourg

THALES ALENIA SPACE CEO
Hervé Derrey

CEO OF THALES ALENIA SPACE IN LUXEMBOURG
Etienne Barritault

CREATION DATE
Thales Alenia Space: 2007
Thales Alenia Space in Luxembourg: 2020

ORGANISATION TYPE
Large Enterprise

NUMBER OF EMPLOYEES
Total: Thales Alenia **Space:** 7700 employees / Thales Alenia Space in **Luxembourg:** 3 employees. Initial recruitments on-going

TURNOVER 2020
Total:
Thales Alenia Space: €1,850 Bn /
Thales Alenia Space in Luxembourg: NA
Space:
Thales Alenia Space: €1,850 Bn /
Thales Alenia Space in Luxembourg: NA

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CORE BUSINESS

Drawing on over 40 years of experience and a unique combination of skills, expertise and cultures, Thales Alenia Space delivers solutions for telecommunications, navigation, Earth observation, environmental management, exploration, science and orbital infrastructures. Thales Alenia Space sees space as a new horizon, helping to build a better, more sustainable life on Earth.
#SPACEFORLIFE
Thales Alenia Space in Luxembourg is a brand new Digital Competence Centre dedicated to space activities.

PRODUCTS AND SERVICES

Thales Alenia Space in Luxembourg develops state-of-the-art digital solutions for all space domains.

We leverage big data, artificial intelligence and cybersecurity technologies to address complex end-to-end systems' challenges, while fostering UI/UX excellence.

Our expertise covers innovative design and implementation approaches with customers, minimum viable products development, design and development of key digital building-blocks of space systems, roll-out and operations of solutions, experimentation of new technologies and concepts.

Our current projects encompass: Digital Twins, Secured Digital Platforms for Earth Observation, Data Valorisation engines...

TECHNICAL MEANS

A joint venture between Thales (67%) and Leonardo (33%), Thales Alenia Space is a global space actor operating 18 sites in 11 countries. Thales Alenia Space in Luxembourg is built and organized after the model, working environment, and proven practices of Thales Digital Factory.
Our development environment is cloud native and Software as a Service oriented.

MAIN CUSTOMERS

Thales Alenia Space in Luxembourg serves customers and partners in Luxembourg, Europe and world-wide with the support of the Business Lines of Thales and Thales Alenia Space. Our solutions address all space market segments, including telecommunications, observation, exploration and navigation.

Governments, institutions and private industry alike count on Thales Alenia Space to design satellite-based systems that provide anytime, anywhere connections and positioning, monitor our planet, enhance management of its resources, and explore our Solar System and beyond.

MAJOR SPACE PROJECTS

Some of Thales Alenia Space flagship programs: Iridium NEXT, Space Inspire, Copernicus Sentinels, Meteosat, Wekeo, COSMO-SkyMed, EGNOS & Galileo, International Space Station pressurized modules, Planck, ExoMars 2022, ALMA (Chile), Stratobus.

WEO SAS

CEO/ HEAD OF DEPARTMENT
Imeshi Weerasinghe CEO
(Charlotte Wirion CTO)

CREATION DATE
2020

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 4
Space: 4

TURNOVER 2020
Total: 0 (50k fit4start grant)

CONTACT DETAILS

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CORE BUSINESS

WEO SAS, founded and registered in Luxembourg in 2020, was formed with an aim to improve global water management and vegetation management, to enable a more sustainable society. WEO develops deep learning algorithms and products which use broad Earth Observation (EO) image information from a range of satellites and other sources to intelligently process into usable, accessible and accurate products. The company is currently developing commercial products for water management, and urban tree management. It has specific expertise in Lidar, SAR, Optical and thermal data processing, as well as harmonisation and fusion of various datasets.

PRODUCTS AND SERVICES

Our main products are maps and services related to water resource management and tree management for sustainable cities and agriculture using open access data from space (sentinel missions mainly). A list of our products and services include:

- Tree management (Tree extent, tree height, tree location, tree growth and tree health)
- Mapping of potential for green roofs in urban areas
- Mapping of potential to convert permeable surfaces (i.e. parking spaces) to impermeable areas for water infiltration
- Land surface temperature mapping (urban heat of different surfaces)
- Flood risk mapping
- Soil moisture mapping

TECHNICAL MEANS

Both cofounders, Charlotte Wirion, CTO and Imeshi Weerasinghe, CEO have PhD topics focused around water resource management in the urban or agricultural fields using remote sensing (space) data. Charlotte Wirion is also Guest Professor in Urban Hydrology and Remote Sensing at the Vrije Universiteit Brussels.

MAIN CUSTOMERS

- Ville de Luxembourg
- Luxembourg Water Agency (AGE)
- European Space Agency (ESA)

MAJOR SPACE PROJECTS

Smart Urban Tree Feasibility Project with ESA, LSA and Ville de Luxembourg LuxImpulse – Sustainable Water Resource Management (SWARM) with ESA, LSA and Luxembourg Water Agency.

Yuri GmbH

CEO / MANAGING DIRECTOR
Maria Birlem

COO/ MANAGING DIRECTOR
Christian Bruderrek

CTO
Philipp Schulien

CCO / MANAGING DIRECTOR
Mark Kugel

CREATION DATE
2019

ORGANISATION TYPE
Small and Medium-Sized Enterprise

NUMBER OF EMPLOYEES
Total: 15
Space: 15

TURNOVER 2020
Total: € 270,000
Space: € 270,000

R&D INTERNAL INVESTMENTS
€ 100,000

CONTACT DETAILS
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CORE BUSINESS

By offering a one-stop-shop for any service in microgravity, we not only enable research in microgravity but also make it accessible to any industry.
We enable efficient life science research in microgravity - on the ISS, rockets and parabolic flights.
We offer an end-to-end service to take life science experiments, e.g. cell culturing or protein crystallization to microgravity - mostly to the ISS, but also on suborbital rockets or parabolic flights.
Our modular and reusable hardware system makes it possible to offer ISS experiments in less than 6 months and less than € 100.000 instead of taking several years of preparation and costing 1 million euros.

PRODUCTS AND SERVICES

We develop fully automated micro-labs with the size of a wallet and launch them on behalf of scientists around the world to the International Space Station (ISS), on orbital and suborbital spacecraft, on parabolic flights, and on drop towers.

TECHNICAL MEANS

- ISS Mission Execution
- Mechanical Design (CAD)
- Structural Analysis (FEM)
- Technical and Safety Documentation
- Systems Engineering
- Fracture Control
- Project Management

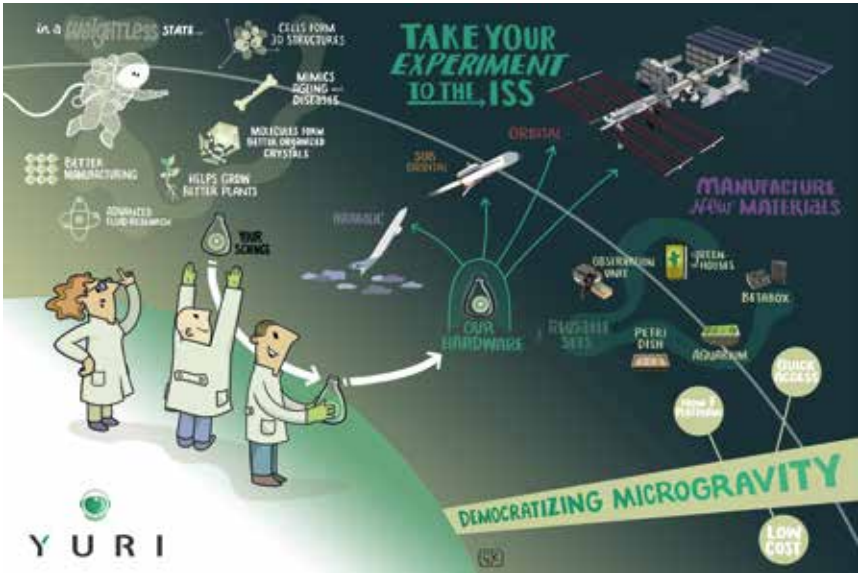
MAIN CUSTOMERS

Customers we have already acquired and some of whom we have already "taken into space":

- NASA
- University of California Los Angeles (UCLA)
- GlaxoSmithKline
- University of Zurich (UZH)
- University of Technology Sydney (UTS)
- University of Jena
- ZF Friedrichshafen
- German Aerospace Centre (DLR)
- Luxembourg Space Agency
- Charité Berlin
- Goethe University Frankfurt

MAJOR SPACE PROJECTS

- Cellbox-3 (ISS)
- JIA (ISS)
- ARA (ISS)



03

PUBLIC RESEARCH ORGANISATIONS

EUROPEAN SPACE RESOURCES INNOVATION CENTRE (ESRIC)

CEO/ HEAD OF DEPARTMENT
Dr. Mathias Link,
Director (ad int.)

CREATION DATE
2020

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 12
Space: 12

CONTACT DETAILS
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CORE BUSINESS

ESRIC is the first research, business and innovation centre exclusively focused on the use of space resources in support of human and robotic space exploration and the creation of an in-space economy. ESRIC is a joint initiative of the Luxembourg Space Agency (LSA), the Luxembourg Institute of Science and Technology (LIST) and the European Space Agency (ESA).

ESRIC's activities are based on four main pillars: space resources research and development, support for economic activities, knowledge management and community management. ESRIC connects leading academic, industrial and entrepreneurial talents in this field. It contributes to economic growth by supporting commercial initiatives and start-ups, offering a business incubation component and enabling technology transfer between space and non-space industries.

PRODUCTS AND SERVICES

Research and development

ESRIC aims to develop research activities all along the value chain of space resources utilization. It focuses on the following four thematic areas of research:

- ISRU value chain
- Prospecting and Mining
- Processing and Supplying
- Construction and Manufacturing

The initial focus is on enabling sustainable space activities using gases and metals derived from lunar regolith.

Business

ESRIC seeks to develop partnerships with established companies and start-ups. The ESRIC start-up support programme supports early-stage start-ups in the space resources sector to refine their business plan, attract their first customers and secure their first investment.

Knowledge management

ESRIC monitors the progress in space resources science, technology and markets. Additionally, it provides a source of up-to-date information on developments related to space resources utilization.

Community management

ESRIC helps to connect the space resources community by creating an open and collaborative environment to encourage dialogue and exchange of ideas.

TECHNICAL MEANS

ESRIC hosts key research infrastructure, enabling ground-based R&D along the value chain including the prospecting, extraction, processing, storage, delivery and utilization of space resources (Dry Chemistry and Analytical suite, Wet Chemistry suite, End to end oxygen demonstrators and assembly suite). This infrastructure is accessible to European industry and academia, as well as international partners.

Additional equipment will be added to the laboratories of ESRIC depending on the evolution of European research needs in this domain, including a Dirty Thermal Vacuum Chamber.

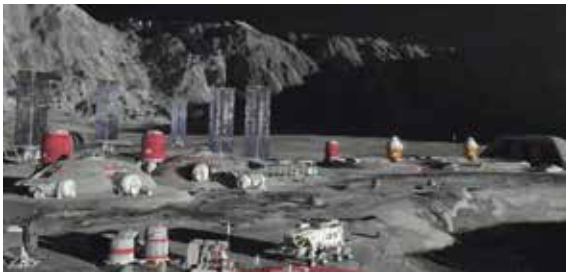
MAIN CUSTOMERS

ESRIC partners with public and private international players in order to create a hub of excellence for space resources in Europe.

- Research and technology organizations
- Universities
- Commercial space companies
- Non-space commercial companies keen to expand their business into space resources
- Space agencies
- International organizations

MAJOR SPACE PROJECTS

- Lunar regolith processing for the production of consumables such as water, oxygen and metals (in partnership with ESA)
- ESRIC start-up support program, offering business and technical support, incubation and access to non-dilutive funding
- ESA-ESRIC space resources challenge, supporting innovative technical methods for prospecting resources on the Moon
- Space resources knowledge management and sharing platform
- Space Resources Week, an annual event covering general, scientific, technical, business, legal and economic topics



LUXEMBOURG SPACE AGENCY

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY LIST

esa

Environmental Research and Innovation (ERIN) department Luxembourg Institute of Science and Technology (LIST)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

CEO/ HEAD OF DEPARTMENT
Prof. Dr. Lucien Hoffmann

CREATION DATE
2015

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 620
Space: 25

CONTACT DETAILS
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CORE BUSINESS

The Environmental Research and Innovation (ERIN) department is active in the use, processing, and interpretation of remote sensing data from multiple sensors installed on space- and airborne platforms of Earth Observation (EO) data for environmental management, precision agriculture and viticulture, maritime surveillance and risk management applications. The focus is geared towards a better use of EO data in operational management tools and to integrate remote sensing data together with global navigation satellite systems for near real-time eco-hydrological, hydraulic, and crop growth modelling. Eventually, it also aims to integrate remotely sensed information with in-situ data, process-based models, and leverage on satellite communication and IoT Low Power Wide Area Network technology to provide evidence-based decision support tools.

PRODUCTS AND SERVICES

Algorithms to enable the automated production of environmental variables:

- Evaporation and transpiration from thermal remote sensing data (STIC)
- Leaf area index, canopy chlorophyll, nitrogen content, plant disease detection from multi- and hyperspectral field, drone, and satellite data
- Time series analysis toolbox as web interface with automated processing
- Water bodies and floodwater variations from SAR data
- Flood hazard from multi-temporal remote sensing data
- Urban flood mapping from InSAR data
- Vessel detection and coastal delineation from SAR data

- Geospatial software technologies and platforms for web based data integration
- Training

Integration of remote sensing data with in-situ data and process-based environmental models.

Software enabling IoT-based collection of environmental data.

TECHNICAL MEANS

- In-situ sensors: field spectrometers ASD Field Spec-3 and Spectral Evolution RS-3500 and sensors for crop state parameters Li-COR 2200 and Minolta SPAD
- Ground-based and airborne hyperspectral thermal sensor
- UAV platforms equipped with thermal (Teax ThermalCapture Fusion Zoom), hyperspectral VNIR/SWIR (Headwall Nano and Headwall M384 and LIDAR sensors
- IoT-satellite integrated testbeds

MAIN CUSTOMERS

ESA, LSA, CNES, Ministry of Environment, Ministry of Agriculture, Luxspace, HITEC Luxembourg, Terrasphere, Aerovision BV, VITO, TELOPS-Canada, KU Leuven, TU Vienna, University of Bristol, adwaïsEO, SES, EarthLab, Cybercultus, Blue Horizon, Hydrosat, World Bank, ISARDSAT, CIMA Research Foundation, Earth Observation Data Centre, Wageningen University, Gomspace, Agroptimize, WASDI, RSS-Hydro, Fadeout Software, Service des médias et des communications, Luxsense, Geodata, POST

MAJOR SPACE PROJECTS

LANDCOVER CCI
Global land cover map development for climate modelling applications

SENSECO
Optical synergies for spatiotemporal sensing of Scalable ecophysiological traits

CASCADE
Combining earth observation with a large-scale model cascade for assessing flood hazard at high spatial resolution

ESHAPE
Satellite Earth Observation-derived water bodies & floodwater record over Europe

GFMS
Global flood monitoring service

ECOSTRESS
Developing the EUROPEAN ECOSTRESS HUB

SMARTIES
Real time smart irrigation management for multiple stakeholders' levels

Lux5GCloud
Luxembourg 5G Smart Country Data Cloud

OVERSEAS
Multi-source Earth Observation-based maritime traffic monitoring

IT for Innovative Services (ITIS) department

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

CEO/ HEAD OF DEPARTMENT
Francesco Ferrero (ad interim)

CREATION DATE
2015

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 144
Space: 9

QUALIFICATIONS, APPROVALS
ECSS-E-40 (European Cooperation for Space Standardisation – Software Engineering Guidelines for the Telecom Applications Projects)

CONTACT DETAILS
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CORE BUSINESS

The IT for Innovative Services (ITIS) department of the Luxembourg Institute of Science and Technology (LIST) has as objective to support the digital transformation of organisations, with a focus on the role of digital 'big data' for improving the performance of: Processes, Infrastructures and People

Its experts arrange numerous multi-disciplinary skills for optimal R&D realisations on IT-enabled business services, service system architectures quality, information intensive service, data and business analytics, collaborative learning and decision support.

PRODUCTS AND SERVICES

Distributed Systems Architectures

- IT Services oriented architectures
- Distributed architectures and multi-agents' systems
- Interfaces and communication between IT applications
- Mobiles and ambient infrastructures
- Wireless and mobile data communication, incl. satellite communications

Critical Information Management in Data Intensive Systems

- IT/IS systems and data/information security and privacy
- Protection strategies for critical information
- Techniques and tools to search, analyse and manage formal and informal information
- Knowledge modelling and ontologies
- Business analytics and artificial intelligence

Data Sciences

Data analytics and (explainable) Artificial
- Intelligence
- Machine Learning

- Knowledge modelling and ontologies
- Visual Analytics
- Scalability issues in data sciences
- Advanced Statistics
- Combining data-driven and physics-based modelling in complex problem solving

Cognitive systems

- Human-Computer Interaction
- (Large-scale) Visualisation
- Personalisation of services
- User Interfaces Design
- Augmented and Virtual Reality
- Situational Awareness
- Engineering and management of collaborative learning
- Assessment environments

MAIN CUSTOMERS

ESA, SES, HITEC Luxembourg, LuxSpace, Cybercultus.

MAJOR SPACE PROJECTS

- TRANSCOMAS (ERDF Interreg) – Creating a cross-border Network of AeroSpace Measure and Control facilities, to allow interested Space actors to benchmark their products and services and thus to improve fulfilment of highly requesting requirements of the Aerospace sector
- CARLINK (Celtic) – developing an intelligent wireless traffic service platform between cars supported by wireless transceivers beside the road. The primary applications are real-time local weather data, urban transport traffic management, and urban information broadcasting. Cars (using SAT based location services) have integrated wireless transceivers to communicate with base stations located beside the road. In addition, cars may also communicate between each other as members of an ad-hoc network. Base stations provide real-time information (e.g. local weather) to the cars driving past. At the same time, cars gather real-time data (weather, traffic density) and deliver this information back to base stations
- DG-Trac (ESA) – Dangerous Goods Tracking & Tracing Feasibility study on a tracking and tracing system for dangerous goods transport in the medical sector
- SENSA (ESA) (participating) – Sustainable, Environmental and Safe Tourism in Protected Areas Safety services and real-time touristic information for travellers in protected parks in South Africa. SENSA uses satellite trackers with other networks and dedicated mobile applications to help the tourists connect in all situations with the parks authorities
- DMSS (ESA) (participating) – Advanced data analytics and visualisation of spacecraft telemetry data (joint project with KU Leuven).
- Publimape (FNR) (participating) – Publimape analyzes the semantic and the quality of data contributed on the social networks, focusing on multimodal content in social platforms, notably tweets featuring both text and picture. It develop a tool chain for building operational knowledge and using it for the monitoring of major environmental event and crisis. The project includes the test of the novel approach on a real-scale pilot use-case consisting in a major flood event. (joint project with Remote Sensing Group of LIST)

Luxembourg Institute of Science and Technology (LIST) Materials Research & Technology (MRT) department

CEO/ HEAD OF DEPARTMENT
Dr. Damien Lenoble

CREATION DATE
2015

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 200
Space: 10

QUALIFICATIONS, APPROVALS
Space qualification: Super-black technology

CONTACT DETAILS
Name: Dr. Damien Lenoble

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CORE BUSINESS

The Materials Research and Technology department (MRT) is a department of the Luxembourg Institute of Science and Technology (LIST). MRT pools its skills and technologies to improve materials technologies for the industry, including the space sector.

Our research and technology activities rely on the following fields of expertise:

- Nanomaterials and nanotechnology
- Composite materials
- Manufacturing technologies
- Scientific instrumentation

PRODUCTS AND SERVICES

Specific to the space sector, MRT activities target five priority technologies:

- **Advanced manufacturing for space applications**, aiming at manufacturing new (multi-)functional, lightweight or durable composite materials, by a combined approach of instrumented and robotized processes, adequate numerical modelling and testing.
- **Thin Film technologies.** Based on a large panel of industry-scalable deposition technologies, MRT develops thin film technologies for a wide range of surface functionalities.
- **Technologies for energy,** targeting more powerful, lightweight and safer energy storage, generators and innovative energy harvestors.
- **Autonomous Sensors.** MRT develops miniaturized temperature, mechanical & chemical sensors based on innovative sensing technologies and printing technologies.

- **Scientific Instrumentation for space,** focusing on miniaturized instruments and sensors platforms, for space exploration, autonomous in-space manufacturing and in-habitat monitoring.

TECHNICAL MEANS

Up-scalable processing technologies

- (bio-based) Raw materials refining and modification
- Synthesis of nano-structures, nano-particles and organic chemistry
- Powder engineering
- Thin-film processing, engineering and devices
- Polymer Processing
- Composite manufacturing

Advanced characterisation & Functional measurements

- Molecular analysis
- Elemental and isotopic analyses
- Structure, morphology and topography
- Non-destructive Inspection
- Mechanical testing
- Accelerated ageing
- Thermal analysis
- Characterization of optical & electrical properties

Numerical simulation

- Commercial codes (finite element, molecular dynamics, crystal plasticity)
- In-house codes (finite element, composite, boundary element method, e-Xtended finite element, XEFG)

MAIN CUSTOMERS

Airbus DS, Axon' Cable, CNES, CSL, ESA, Euro-Composites, Gradel, I-space, KLEOS, Luxspace, Molecular Plasma Group SA, NASA, SouthWest Research Institute, Thales Alenia Space.

MAJOR SPACE PROJECTS

- Super-black coating technology for complex opto-mechanical systems
- Miniaturized mass spectrometers for space exploration
- Miniaturised chemical sensors for the monitoring of molecular contamination on payload surfaces.
- Anti-static ETFE based nanocomposite
- Improved thermal conductivity of epoxy resin
- Carbon-based solutions for super-capacitors, Li-ion batteries and fuel cells
- Software tool enabling numerical analyses of composite space structures
- Fully integrated stress-temperature sensors for structural health monitoring
- Antibacterials-antifungal coatings for in-orbit habitat
- In-space pultrusion manufacturing

SnT - Interdisciplinary Centre for Security, Reliability and Trust

securityandtrust.lu

CEO/ HEAD OF DEPARTMENT
Prof. Björn Ottersten

CREATION DATE
2009

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 365
Space: 80

TURNOVER 2020
Total: € 24 M
Space: € 6 M

R&D INTERNAL INVESTMENTS
€ 7.7 M

CONTACT DETAILS
Name:
Interdisciplinary Centre for Security, Reliability and Trust (SnT)

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CORE BUSINESS

The Interdisciplinary Centre for Security, Reliability and Trust (SnT) at the University of Luxembourg conducts internationally competitive research and PhD education in information and communication technology (ICT) with an emphasis on creating socio-economic impact.

Space-related research features prominently among its strategic priorities, with current projects including work in satellite communications, space resources and space vehicles - in the centre's unique space laboratories, SnT researchers develop new space technologies with partner companies.

SnT scientists conduct both long-term research and engage in demand-driven projects; an interdisciplinary approach allows them to tackle problems not only from a technical perspective, but also to address organisational, human and legal issues. Through SnT's Partnership Programme, researchers currently work in collaboration with over 55 private and public organisations, addressing the key challenges facing industry and the public sector in ICT.

The Centre has undergone a rapid development since its launch in 2009; recruiting top scientists, launching over 98 EU and ESA projects, protecting and licensing IP, launching six spin-offs, and creating a dynamic interdisciplinary research environment with some 365 people.

PRODUCTS AND SERVICES

Our expertise in satellite communications, autonomous systems, orbital and planetary robotics, small satellites, space systems design and mission-critical software makes us the ideal centre of excellence to support Luxembourg's commitment to space exploration and in-situ resource utilisation (ISRU).

We collaborate with public and private partners through an established model: **our Partnership Programme.** Companies of all sizes, entities and agencies work with us to achieve their innovation and optimisation goals. In return, our researchers receive access to relevant challenges, real-word data, and systems to test their research results. Every project is different, but usually the outcome is a prototype working in the partner's real environment. Companies work alongside specialised staff ready to hire at the end of the project, if needed. Our partners also receive access to the latest research methodologies and state-of-the art equipment. SnT supports projects with co-financing, as well as support for third-party research grant applications.

TECHNICAL MEANS

We have 7 space labs: Concurrent Design Facility, CubesatLab, Lunalab, Zero-G Lab, SatcomLab, CommLab and 5G-SpaceLab. Our technical expertise covers a wide range of capabilities:

- Ground station development
- Mechanical and electrical ground support equipment
- Communication networks
- Operations
- Manufacturing of satellites
- Electric propulsion for satellites
- Robotic payloads
- In-space manufacturing
- Composites
- Satellite-based media
- Telecommunication services
- Risk Management services
- Data Analytics
- Environmental applications and services

MAIN CUSTOMERS

Around 70% of SnT's income stems from competitive research funding and over 100 MEUR external funding has been secured since SnT's creation. Through the SnT Partnership Programme, large numbers of partners have proved willing to invest in joint research activities, ultimately improving their competitiveness through new and improved services and systems. The programme currently counts over 55 partners.

MAJOR SPACE PROJECTS

- SES Partnership - Research Program in Satellite Systems
- VHTS: User Terminal Wideband Modem for Very High Throughput Satellites, ESA.
- LiveSatPreDem: Live Satellite Precoding Demonstration, ESA.
- FlexPreDem: Demostrator of Precoding Techniques for Flexible Broadband Systems, ESA.
- SIERRA: Spectral efficient Receivers and Resource Allocation for Cognitive Satellite Communications, FNR-ANR.
- PROSAT: on-board PROcessing techniques for high throughput SATellites, FNR.
- MOSIS: Model-Based Simulation of Integrated Software Systems
- INSTRUCT: Integrated Satellite-Terrestrial Systems for Ubiquitous Beyond 5G Communications

UNI.LU GEODESY AND GEOSPATIAL ENGINEERING

UNIVERSITÉ DU LUXEMBOURG

CEO/ HEAD OF DEPARTMENT
Prof. Felix Norman Teferle

CREATION DATE
2017

ORGANISATION TYPE
Public Research Organisation
University

NUMBER OF EMPLOYEES
Total: 8
Space: 5

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CORE BUSINESS

The Team Geodesy and Geospatial Engineering specializes in geodetic high-precision measurements and Earth Observations (EO) within various multi-scale geophysical, environmental and engineering applications. We also investigate improvements in the involved measurement techniques, e.g. GNSS, SAR remote sensing, photogrammetry and LiDAR, and their data analyses (machine learning/deep learning). Our applications include GNSS-derived crustal deformations for studies of sea-level rise, glacial isostatic adjustment and plate tectonics, GNSS-derived atmospheric parameters for applications in meteorology and climatology, multi-platform digital photogrammetry and LiDAR for the computation of high resolution digital terrain/elevation models for flood hazard modelling and city modelling, high-precision multi-sensor geodetic monitoring for infrastructure applications, multi-sensor 3D reality capture for Building Information Models (BIM) and digital twins.

PRODUCTS AND SERVICES

We are GNSS specialists and can provide a variety of related products (station coordinates, atmospheric parameters and satellite orbit and clock products as well as Earth Rotation Parameters). In the past we have provided coordinate solutions for reference GNSS networks on national to global scales. Our background in remote sensing and geospatial engineering allows also for classic topographic survey products, the generation of digital terrain and elevation models, building information models (BIM), city models, as well as deformation maps of geophysical features/infrastructure and subsidence/uplift maps of cities and regions. We are an International GNSS Service (IGS)

Tide Gauge Benchmark Monitoring (TIGA) working group analysis and combination centre. We provide near real-time hourly GNSS tropospheric products to EUMETNET eGVAP for assimilation into numerical weather prediction models.

TECHNICAL MEANS

We operate permanent GNSS stations at Findel Airport and Campus Kirchberg (G.D. Luxembourg), Walvis Bay and Lüderitz (Republic of Namibia) and the South Atlantic Ocean islands of South Georgia (South Georgia and the South Sandwich Islands), St. Helena and Tristan da Cunha (Ascension, St Helena and Tristan Da Cunha).
We maintain a variety of scientific GNSS software (Gamit/Globk, Bernese GNSS Software, PRIDE, Napeos, RTKLib), as well as various geospatial software suits (e.g. Leica GeoOffice, Trimble Business Centre, Hexagon Geospatial Suite, PCI Geomatica, ESRI ArcGIS, nFrames SURE, PointCap Pro 3D), which we run on our in-house workstations or on the UL High Performance Computing Facility (ULHPC). For projects also available are our GNSS RTK kits, reference GNSS kits, terrestrial laser scanners, a drone and state-of-the-art surveying equipment.

MAIN CUSTOMERS

Administration du cadastre et de la topographie (ACT), Administration de la navigation aérienne (ANA) – MétéoLux, RSS-Hydro S.a.r.l., National Oceanography Centre (NOC), British Antarctic Survey (BAS), GeoForschungsZentrum Potsdam (GFZ), International Oceanographic Commission (IOC), Hartebeesthoek Radio Astronomy Observatory (HartRAO), Astronomical Institute University of Bern (AIUB), University College London (UCL), Luxembourg Institute of Science and Technology (LIST), Maxar/DigitalGlobe, PCI Geomatics, Hexagon Geospatial.

MAJOR SPACE PROJECTS

Almost all of our data is space based. However, we have also participated in the NASA Frontiers Development Lab (FDL) in 2017, 2018 and 2019:

- Lunar Resources (Water & Volatiles)
- Space Weather Challenge 02, Improve ionospheric models using GNSS/GPS data
- Disaster Prevention, Progress and Response, final topic: Flood detection in orbit (onboard a cubesat)

UNI.LU GEOPHYSICS LABORATORY

UNIVERSITÉ DU LUXEMBOURG

CEO/ HEAD OF DEPARTMENT
Prof. Olivier Francis

CREATION DATE
2005

ORGANISATION TYPE
Public Research Organisation

NUMBER OF EMPLOYEES
Total: 10
Space: 9

TURNOVER 2020
Total: € 150 K
Space: € 100 K

R&D INTERNAL INVESTMENTS
€ 50 K

CONTACT DETAILS
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CORE BUSINESS

The Geophysics Laboratory focuses on climate, sea level variability and geodynamics. The primary goals include satellite geodesy of new remote sensing applications, obtaining reliable geodetic measurements of environmental change and assessing the influence of human and natural factors in those changes. To do so, the group has developed a patented differential free-fall gradiometer as part of our activities in scientific metrology, advanced high-accuracy Global Navigation Satellite Systems (GNSS) techniques, provided interpretation of time variable gravity from space and improved the modelling of environmental effects on geodetic observations.

PRODUCTS AND SERVICES

The gravity instrumentation can be used for metrology. We have the ability to measure the acceleration of gravity to 1-2 microgal (1 microgal = 10-8 m/ sec2).
Global Navigation Satellite Systems can be used to monitor positions of stationary and moving objects with high accuracy on a global scale. We have the ability to apply different GNSS processing strategies for absolute and relative positioning, and modelling depending on client requirements to achieve millimeter to centimeter level precision and accuracy.
In addition, GL uses GNSS signals of opportunity to retrieve environmental variables such as sea level in polar regions.

TECHNICAL MEANS

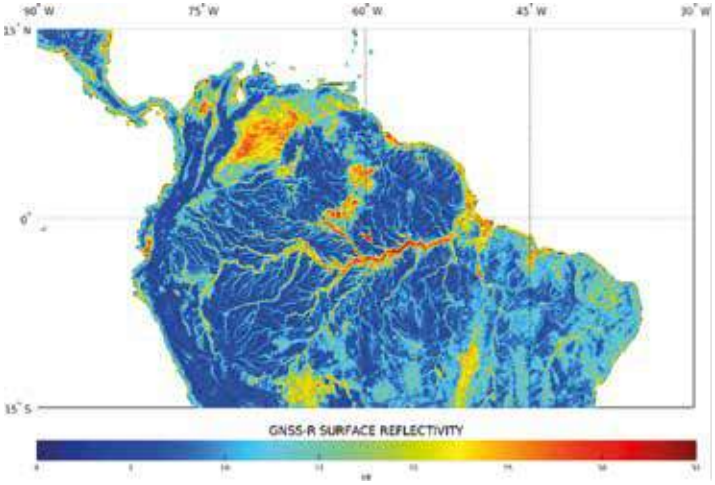
- Absolute Gravimeter: the portable instrument has the ability to measure the acceleration of gravity to 1-2 microgal (1 microgal = 10-8 m/sec2)
- Relative Gravimeters: the portable Scintrex Relative gravimeter has a precision of about 3 microgal (it is sensitive to height changes of 20 mm)
- Superconducting Gravimeter: non-portable relative instrument that primarily records changes in gravity due to solid Earth and ocean tides and atmospheric pressure; it is valuable in monitoring short- period changes in gravity
- GNSS Equipment: The GL have a range of state-of-the-art geodetic grade GNSS receivers which have the ability to observe all current GNSS signals

MAIN CUSTOMERS

NASA, ESA, LSA, Spire Global, ILNAS.

MAJOR SPACE PROJECTS

We use satellite imagery data but also satellite gravity, GNSS observations, and altimetry for our research. The Geophysics Laboratory developed ground-based GNSS reflectometry to detect changes in soil moisture, snow depth, and sea-level for scientific applications.
GL have developed algorithms for spaceborne GNSS-R for soil moisture. GL uses grazing angle GNSS-R (GG-R) for sea-ice studies.



UNI.LU RUES

UNIVERSITÉ DU LUXEMBOURG

CEO/ HEAD OF DEPARTMENT
Prof. Stephan Leyer

CREATION DATE
2003

ORGANISATION TYPE
University

NUMBER OF EMPLOYEES
Total: 120
Space: 10

CONTACT DETAILS
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www.uni.lu

CORE BUSINESS

Within the University of Luxembourg, a leading institution of advanced research and higher education, the Research Unit in Engineering Science (RUES) – covering civil, mechanical and electrical engineering, as well as geophysics – recognises the socio-economic needs and challenges of both society and industry. To address these, the research unit has committed itself to becoming the Greater Region's education and research leader as well as a global player in its core research areas. A special focus will be placed on energy, environment and sustainable growth, contributing to, among other things, the European Strategic Technology Plan and the European Union's emphasis on creating an Innovation Union in Europe. The aim is to provide an innovation-driven research environment and to seamlessly integrate research and education to form future leaders and critical thinkers. Our research activities can be organised in three main areas:

- Construction and Design: research into civil and mechanical engineering structures, fatigue behaviour, dynamic testing methods and development processes
- Energy and Environment: research into energy efficiency of buildings, energy consumption and renewable energies
- Automation and Mechatronics: research into mechatronic systems, dynamics of electromechanical systems

The majority of projects have an applied as well as a fundamental character and are executed in close collaboration with industry. The focus can be on the technology, or on the process of its development, simulation and validation.

All research activities are integrated into a network of national, regional and international public and private research institutions.

PRODUCTS AND SERVICES

- Satellite control
- Space robotics
- Improvement of development processes
- Dynamics of mechanical structures
- Energy consumption
- Communication

MAIN CUSTOMERS

EURO-COMPOSITES, HITEC Luxembourg, DKE Aerospace, Goodyear, ISS, Husky, IEE, Delphi

MAJOR SPACE PROJECTS

- **Galileo:** DMGA (Dynamic Modeling of Ground Antennas) The goal of the DMGA project is to obtain a very accurate and optimised static and dynamic model of large satellite ground antennas including the closed loop full motion control by integrating modern computation tools like CAD, FEM analysis, Multi-body systems and regulation simulation software. The simulation models are validated by measurements on the real antenna on site
- **Satellite Control:** research is carried out in the area of modelling and advanced control of satellites, especially attitude and orbit control systems, with a special focus on micro satellites
- **Space Robotics:** modelling, simulation and control of robotic manipulators for spacecraft and satellites. Applications are in the area of space debris removal and on orbit servicing

Further research is carried out in the area of systems engineering and the improvement of development processes for micro satellites.

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USEFUL CONTACTS

ABOUT THE LUXEMBOURG SPACE AGENCY

The objective of the Luxembourg Space Agency is to develop the space sector in Luxembourg by fostering new and existing companies, developing human resources, facilitating access to funding and supporting academic research.

The agency implements the national space economic development strategy, manages national space research and development programs, and leads the *SpaceResources.lu* initiative. Furthermore, the LSA represents Luxembourg within the European Space Agency and space-related programs of the European Union and the United Nations.

LUXEMBOURG SPACE AGENCY – ECONOMIC DEVELOPMENT TEAM

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