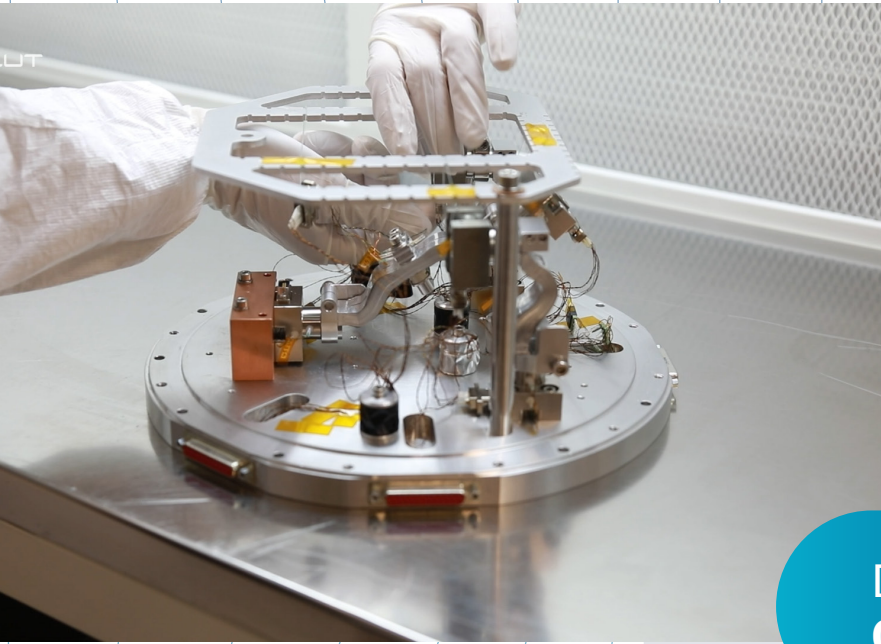
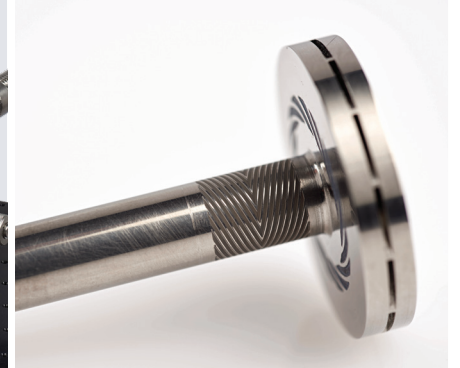
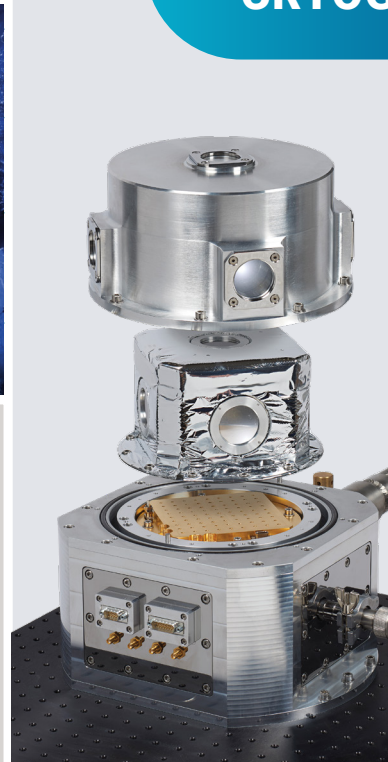
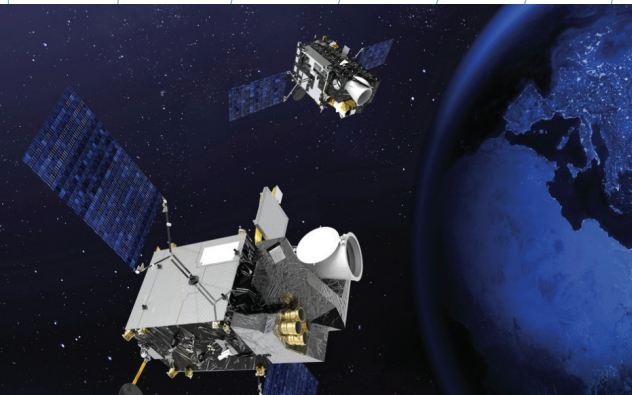


# ABSOLUT SYSTEM

INNOVATIVE CRYOGENIC SOLUTIONS



DESIGNER OF YOUR  
CRYOGENIC SYSTEMS



# ABSOLUT SYSTEM

INNOVATIVE CRYOGENIC SOLUTIONS

Founded in  
**2010**

**+ 75%**  
growth in  
workforce by 2023

**77**  
engineers

French SME, Absolut System **designs, optimizes, tests and qualifies innovative solutions** ranging from components such as **cryocoolers, heat exchangers or thermal links**, to integrated systems such as vacuum test chambers.

Many other technologies are being developed to prepare future European space programs and to **accelerate the energy transition**.

The diversity of the sectors and technologies mastered, combined with a large experience feedback, allows us to offer our customers the best technological choice combining the highest level of quality with the agility of an SME.

## ADVANTAGES OF A SME

SME: proximity, agility, adaptability.

### High management capacity:

- Management of industrial programs
- Product insurance (audited by Primes)

## MARKETS OPERATED

- Scientific and industrial research
- Space (imagery, research, components...)
- Energy
- Aeronautics
- Superconductivity and electronics
- Medical



**Thierry TROLLIER**

CEO



**Jérôme LACAPÈRE**

General Manager



**Julien TANCHON**

General Manager

# STRONG VALUES AT THE CORE OF OUR DNA

Audacity, expertise, synergy and integrity form the identity of Absolut System. Every day, these shared values guide our actions and our relations.



## AUDACITY

At Absolut System, we have the audacity to **undertake the development of innovative cryogenic systems**. Motivated by challenges and with a strong creative capacity, our teams are able to innovate and break the technological barriers.

We carry out a wide range of **innovative R&D projects** around energy transition, research and space, encouraging initiative and agility.



## EXPERTISE

**With a recognized expertise of more than 12 years**, Absolut System develops **customized cryogenic systems** at the cutting edge of technology. We provide the best solutions adapted to your requirements.

Our highly skilled engineers can break through the technological barriers with a high level of exigence, to design the innovations of tomorrow.



## SYNERGY

We believe in combining the skills of each of our employees to successfully carry out our projects. By valuing **expert experience** and recruiting tomorrow's talent, we create a positive dynamic for training and knowledge sharing. We work together in a **productive and caring environment** to complete complex projects from A to Z.



## INTEGRITY

For Absolut System, integrity and honesty are essential to ensure the highest quality in the design of your systems. Thanks to our openness to the markets and to **current technological developments**, we can develop customized systems or offer you off-the-shelf products. From the engineering office to manufacturing, our partnerships are based on trust, and we are committed to offering you the best quality-price ratio.

# OUR SKILLS & KNOW-HOW

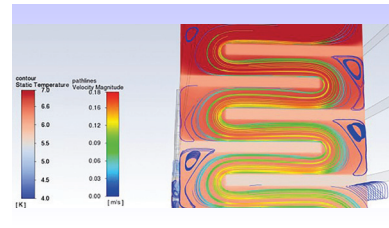
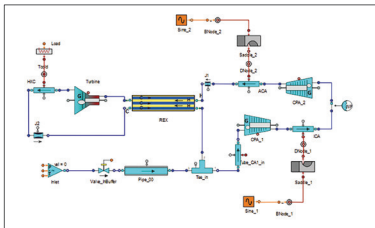
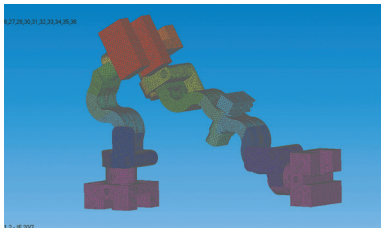
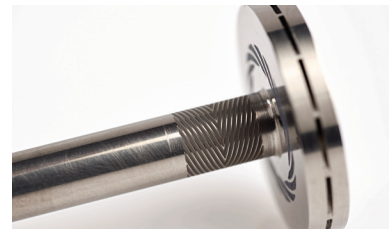
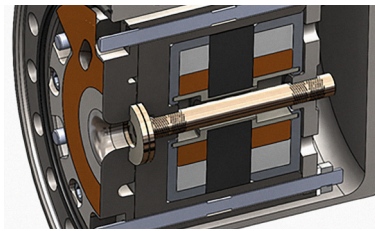
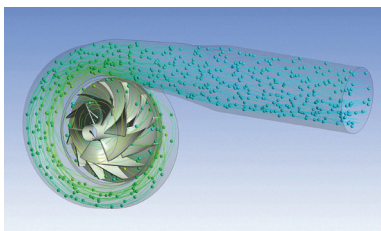
Absolut System puts all its skills and know-how in the development of cryogenic systems to support you at each stage of your project.

## MODELISATION AND ANALYSIS

We have **multiple skills** within our **engineering office and our technical workshops**. We have developed a strong expertise in validation with FEM and CFD analysis. These skills allow us to **predict, optimize and validate** the performance of our systems.

TEMPERATURES (K)	1 K → 2 K	3 K → 5 K	5 K → 20 K	20 K → 40 K	40 K → 65 K	65 K → 120 K
CRYOGENIC POWER (W)	0.05 W → 0.8 W	1 W → 25 W	0.5 W → 1000 W	1 W → 2 500 W	1 W → 5 000 W	1 W → 10 000 W

Absolut System has a heritage of over 30 years in the design of hydrodynamic bearings. This innovative technology uses the rotation of the shaft to create a local overpressure of the fluid. This system has many economic advantages, as well as increased autonomy and longevity (>10 years).



### Abilities/software mastered by the engineering office:

- **CAO:** Solidworks, Autocad
- **FEM:** FEMAP NX (Nastran) with TMG of Maya HTT
- **CFD:** ANSYS/Fluent, OpenFoam
- **Thermohydraulics & Processes:** SINDA/FLUINT (intensively used by NASA), ECOSIM PRO, MOLFLOW
- **Internal code:** Thermodynamic cycles, compressors/turbines (piston, centrifugal...) and thermal/hydraulic calculations
- **Rotordynamique:** Axstream

### Currently available know-how with high skills:

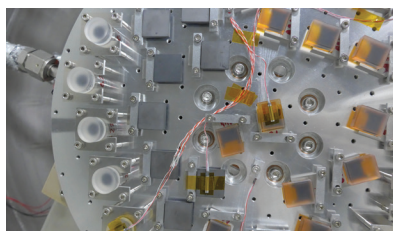
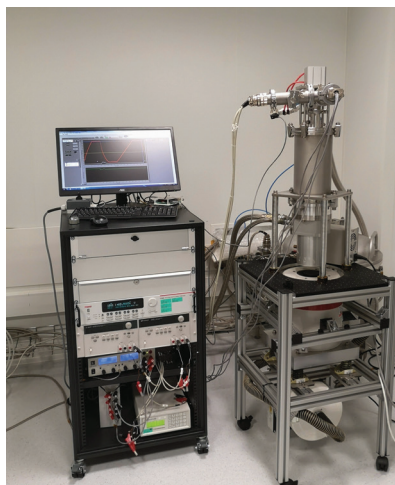
- **Thermal modelling:** Conductive coupling, conductive, convective, radiative...
- **Structural modeling:** Static and dynamic loads (sine, random, shocks...)
- **Turbomachines:** Rotordynamics, hydrodynamics, electromagnetics
- **Crypumping:** Thermal and molecular behavior using Monte-Carlo
- **CFD:** Phase change, low gravity, cryogenic fluid behavior, complex multiphysics modeling...

## TESTS AND INTEGRATIONS

Absolut System has a **high level of testing capability** based on **optimization** and **characterization** under representative operating conditions. We are able to design complex systems and test them for validation.

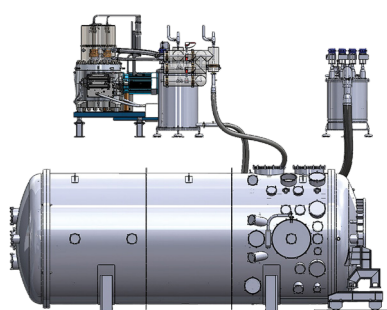
### We validate products using our multiple test structures:

- Thermal vacuum test benches equipped with cryocoolers (from 20 K to 373 K) or cryogenic cooling loop;
- Thermal cycling for sample/process qualification (from 30 K to 373 K);
- Mechanical test benches: rigidity, articulation, dynamics, sine and random vibration;
- ISO 8 cleanroom and ISO 5 fume hoods for the integration of critical components.



## YOUR PROJECTS FROM A TO Z

We accompany you from the preliminary study to the on-site installation.



### We ensure the realization of complex projects from A to Z:

- Design and definition
- Modeling and optimization
- Arbitration at the system level and technologies
- Proof of concept and prototyping
- Production
- Optimization, testing and qualification of the final product
- Integration, commissioning, and maintenance on site

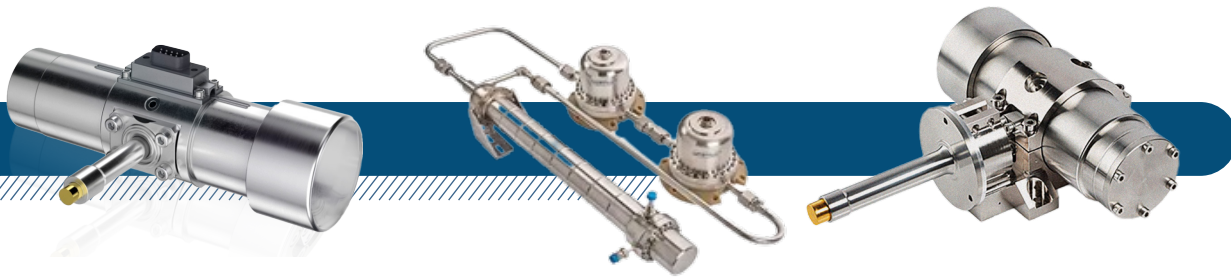
# OUR CRYOGENIC SOLUTIONS FOR SPACE

With more than 10 years of experience in the space industry, Absolut System is able to design customized cryogenic and thermal equipment, both on the ground and in orbit.

## MINIATURISED CRYOCOOLERS

**Absolut System develops miniaturised cryocoolers adapted to space applications, for use on board satellites.**

These Reverse Turbo-Brayton or Pulse-Tube LPT6510 cryocoolers are excellent examples of our vision of the future, thanks to their high reliability and vibration-free operation, which is a real step forward for future Earth observation programmes.

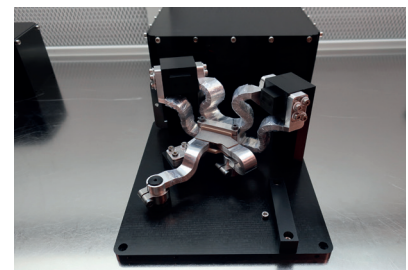
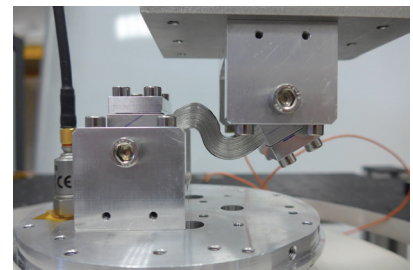


## THERMAL LINKS

**Absolut System is an expert in the development of on-board thermal links in observation satellites.**

These links physically connect the cryocooler to the application (focal plane/radiator). Thanks to this know-how, Absolut System has taken part in prestigious space missions, producing thermal links for the Copernicus mission, EUCLID and the MTG family of satellites

Our thermal links offer high conductive coupling and, thanks to their flexibility, allow misalignment and significant relative dynamic displacement, as well as filtering out micro-vibrations. All these characteristics mean we can offer new solutions for Earth Observation satellites. We offer thermal links in pure aluminium and copper as well as pyrolytic graphite (POG).



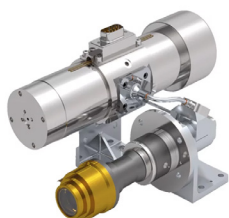
## OUR CRYASSY PRODUCTS RANGE

**CRYASSY are compact cryogenic assemblies incorporating a detector, a cryostat and a Pulse-Tube cryogenic machine, also known as IDCA: Integrated Dewar Cooler Assembly.**

Our range of high-performance, miniaturised integrated detection systems enables the direct integration of detectors for SmallSat constellations or exploration missions.

### FOCUS

Space and ground observation



#### SWIR → MWIR

- » IDCA fully welded and vacuum-sealed.
- » Miniaturized Pulse-Tube for reliability and low vibration.
- » Multispectral and hyperspectral observation.

### ACCESS

High-performance space imaging



#### SWIR → LWIR

- » Adjustable flange focal distance and aperture
- » Multispectral and hyperspectral observation.

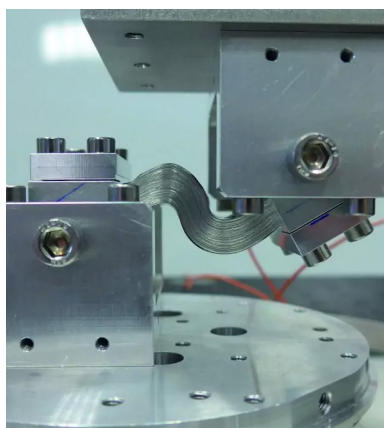
### EDGE

High standards and low costs



#### SWIR → LWIR

- » Multispectral and hyperspectral observation
- » High cryogenic performance
- » Very low vibrations



## GROUND TEST FACILITIES

**Absolut System develops specific test benches to characterise and optimise its various space products.**

To validate, test and qualify space products, Absolut System manufactures its own test and validation benches. For example, mechanical test benches (vibrations, dynamics deflections...) and thermal testing (Pulse-Tube, thermal links and exchangers) are developed.

## »»» OUR CRYOGENIC EXPERTISE

### CRYOGENIC SYSTEMS

*Absolut System develops customized cryogenic systems to meet your requirements in terms of reliability, performance and durability, for your ground and on-board applications.*

Our teams will work with you from A to Z to design your cryostat according to your temperature and cooling power requirements.

We supply closed-circuit cooling loops using cryocoolers and our circulators.



### CRYOGENIC STORAGE

*Absolut System manufactures customized cryogenic storage systems, including evaporation solutions.*

We market cryogenic storage systems based on liquid helium or liquid nitrogen.

### THERMAL MANAGEMENT

*Our specialist cryogenic engineering teams can help you with thermal management for space and ground applications.*

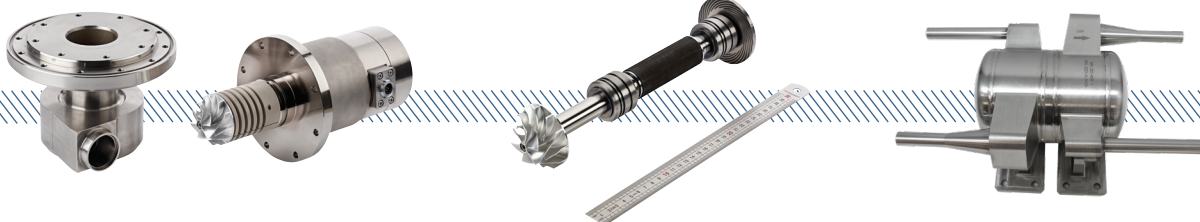
Absolut System offers single-phase and two-phase heat exchangers to transfer thermal energy under the best possible conditions while reducing losses.

We have a heritage of over 30 years in the design of hydrodynamic bearings\*.

All the technologies we have mastered make our compressors, circulators and turbines highly reliable and efficient systems, even in a very demanding environment.

- Turbomachinery
- Thermal components
- Heat exchangers

*\* This innovative technology ensures frictionless shaft rotation, ideal for space applications.*





# OUR OPERATED MARKETS

Absolut System produces innovative solutions in 4 markets, linked to energy transition and space:

## SPACE



## ENERGY



## SUPERCONDUCTIVITY & ELECTRONICS



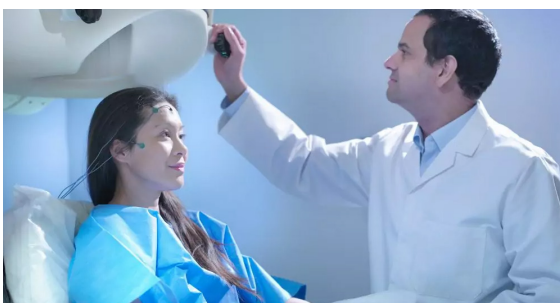
## SCIENTIFIC & INDUSTRIAL RESEARCH



## AERONAUTICS



## MEDICAL



# PROJECTS

Absolut System, a recognised expert in cryogenics innovation, is involved in a number of innovative cryogenics projects for various sectors, including space.

## TRANSFER AND STORAGE OF CRYOGENIC PROPELLANT

**Absolut System is coordinator of the CRYALIS project, which aims to develop a long-term cryogenic propellant transfer and storage system in microgravity, to carry out a small-scale in-orbit demonstration for 6 months.**

Selected by the European Union's Horizon Europe programme, CRYALIS is an exceptional collaboration between Absolut System, The Exploration Company, the Centre Spatial de Liège and the Universitat Politècnica de Catalunya, funded by the European Commission (HADEA).

Absolut System's cryogenic technologies and expertise are being used to develop the demonstration system, which will be used to validate propellant storage and transfer tests in space. This opens up new opportunities for in-orbit transport, long-duration missions and space exploration.

By enabling a spacecraft and its propellant to be launched separately, the technologies developed will increase the size and duration of missions to Mars and the Moon.



## DESIGN OF INFRARED HYPERSPECTRAL CAMERAS

In order to meet needs in the field of hyperspectral imaging, Absolut System is working on innovative infrared remote sensing projects.

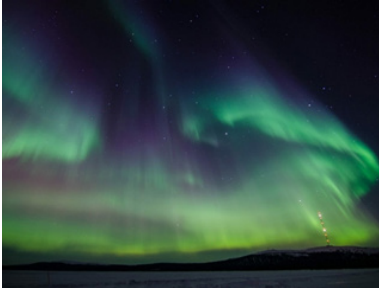
We are designing CRYASSY-type cryocoolers for infrared detection, providing access to spectral bands previously inaccessible to nanosatellites.

Our teams are also developing complete multispectral and hyperspectral infrared camera systems. These systems incorporate a cooler from our CRYASSY range, a detector and the optical and electronic components - hardware and software. They meet all your gas detection needs, from greenhouse gases to gases of defence interest.

**SCARBOn**  
SPACE CARBON OBSERVATORY next step

The SCARBOn (Space CARBOn Observatory Next step) project is a continuation of the Horizon 2020 SCARBO project. This project, led by AIRBUS Defense and Space, is being developed by a European consortium bringing together the space industry, SMEs and scientific institutes.

The SCARBOn system is based on a constellation of small Earth observation satellites measuring greenhouse gases (CO<sub>2</sub>/CH<sub>4</sub>). Absolut System is participating in the dimensioning of the cryogenic system integrated into the instrumental part of the Payload and in the design of the NanoCarb-P prototype that will be taken on board for an airborne test campaign.



## MONITORING THE AURORAL OVAL

***Absolut System is a partner in the AURORA Demonstrator mission (AURORA-D), part of ESA's space security programme, which aims to put a network of 4 satellites into orbit to monitor the auroral oval for the purposes of space weather.***

Absolut System is the system architect for the AOSI (Aurora Oval Spectro-Imager) spectral imager, and leads the international consortium developing this instrument. Our teams provide the payload, optical system expertise, thermomechanical design and in-flight data acquisition and pre-processing software. The AOSI instrument developed by Absolut System is a miniaturised hyperspectral camera using visible sensors. This camera is capable of mapping the polar and southern auroras.

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## LSTM

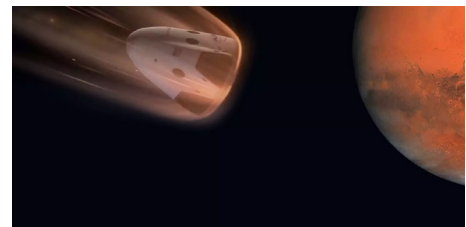
***Absolut System back in the Copernicus programme to monitor the Earth's temperature.***

The LSTM (Land Surface Temperature Monitoring) project aims to develop a satellite to monitor the Earth's temperature in order to redefine climate models, monitor environmental change and evaluate the impact of human activities, in collaboration with Airbus Defense and Space.

Absolut System is highlighting its expertise in cryogenics by supplying thermal links for cold circulation in cryogenic machines and reducing the associated vibrations.

## MEESSST

***Absolut System is a partner in the MEESSST (MHD Enhanced Entry System for Space Transportation) project, which is developing a solution based on magnetohydrodynamics to facilitate the entry of spacecraft into the atmosphere.***



The MEESSST project is an international collaboration between universities, companies and research institutes. Its aim is to significantly improve numerical prediction capabilities, reduce the thermal load on the surface of the spacecraft and resolve the radio-frequency communication failure encountered on entry into the atmosphere. This project is funded by the European Commission via the Horizon 2020 Future and Emerging Technologies (FET) programme.

Absolut System manufactures and supplies the cooling system, based on a cryogenic circulation loop. This system cools the superconducting magnet, which is maintained at 30 K, generating a magnetic field capable of repelling the plasma.

# °BLUEFORS



## EXCLUSIVE RESELLER

Bluefors (ex Cryomech) is a recognized leader in the manufacturing of high quality cryogenic products. Absolut System is the exclusive distributor of Bluefors products in France (incl. DOM-TOM), Switzerland, Belgium, Italy, Morocco and Tunisia.

## DISCOVER OUR RANGE OF PRODUCTS

- Thermal management (components, turbomachines)
- Cryocoolers
- Cryogenic systems custom-made
- Composite manufacturing
- Integrated space equipment
- Cryogenic storage
- Superconducting systems

## CLIENTS & PARTNERS

### SPACE & AERONAUTICS

Thales Alenia Space, Thales Cryogenics, SAFRAN, Airbus UpNext, Sodern, CNES, EADS...

### INDUSTRIES & LABORATORIES

SNCF, Nexans, APCO, Lynred, WiN MS, Tokamak Energy, Commonwealth Fusion System, CEA, DGA, CNRS...



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