EASN 16th International Conference

October 27-30, 2026

Toulouse, France

KEYNOTE PRESENTATION

Architecting the Future: ESRE's Vision for Technological Sovereignty in the Next European Space Era

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Chairman

ESRE – European Space Research Establishments Association



ESRE

ASSOCIATION OF EUROPEAN SPACE RESEARCH ESTABLISHMENTS



THURSDAY

October 29, 2026

easnconference.eu

RTOs with a governmental mandate for space research to collaborate on R&D, boost the European space sector, and tackle major societal challenges.

CBK (Poland)
CIRA (Italy)
DLR (Germany)
INCAS (Romania)
INTA (Spain)
NLR (the Netherlands)
ONERA (France)
VZLU (the Czech Republic)

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ASSOCIATION OF EUROPEAN
SPACE RESEARCH ESTABLISHMENTS

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ESRE's Critical Mass in European Space R&I

ESRE
ASSOCIATION OF EUROPEAN SPACE RESEARCH ESTABLISHMENTS

17562
TOTAL NUMBER OF EMPLOYEES

643 M
INTERNAL SPACE RESEARCH

8866
NUMBER OF PUBLICATIONS

107,1 M
REVENUES FROM EU PROJECTS

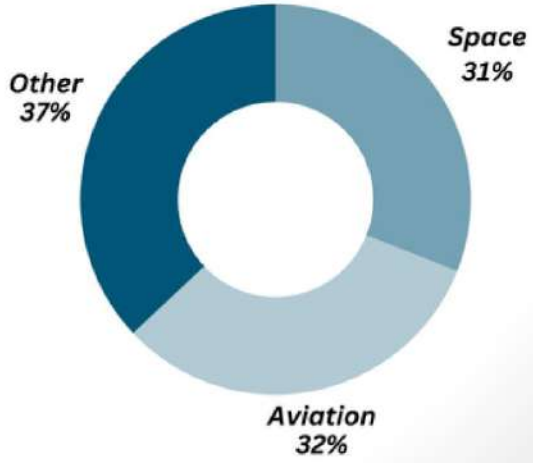
316
NUMBER OF NEW PATENTS

86,3 M
REVENUES FROM ESA



Breakdown of ESRE total revenues by clients

National Funding	49,1 %
Own Resources	3,3 %
Other External	11,8 %
Non Aerospace Industry	1,4 %
Non EU Aerospace Industry	0,5 %
EU Aerospace Industry	9,2 %
Eurocontrol	0,2 %
EU / European Commission	4,4 %
ESA	3,6 %
National Space Agencies	0,3 %
Governmental Projects	16,2 %



Breakdown of ESRE expenditures for RTD

Total: 2087 M€

The Next European Space Era

Where we are today :

European Union owns and operates **Space assets** to offer to European citizens and to national and European institutions space-based data and services in many domains of application.

- **Galileo and EGNOS**, the Europe's satellite navigation system, provide high-quality positioning, navigation and timing services.
- **Copernicus**, for Earth Observation, monitor our planet's environments from space and on the ground.
- **IRIS² and GOVSATCOM** will ensure secure and resilient satellite communications.

All those components are linked to :

- Europe's **Access to Space: l**aunch sites (Guiana Launch site) and launchers (Ariane and Vega family of launchers);

- Europe's **Space Safety** : Member States national ground assets for the **Space Situational Awareness**.

ESRE Space Research Priorities :

Sustainable safe and secure usage of Space

- ensure the continuity in ***operating the space systems and their ground infrastructures*** currently in use;
- continue improving the performance of ***critical components***;
- introduction of new technologies - ***the integration of innovations arising from applied research***;
- new approaches for facing space-related (new) ***challenges.***

ESRE on-going developments :

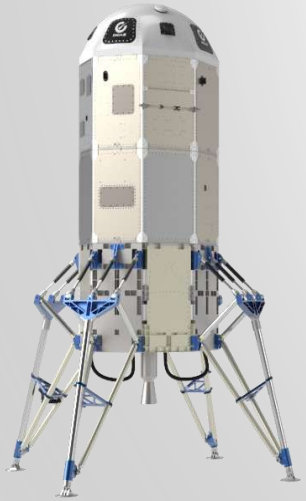
- reusability of launchers, in order to improve the flexibility, the responsiveness and the efficiency of European capabilities (***reduction of the cost per kilogram to orbit***);
- vehicle recovery, rapid refurbishment, and digital engineering approaches aimed at ***improving reliability***;
- In-Space Operations and Services through technologies for ***rendez-vous and proximity operations***;
- sustainable and cost-effective use of satellites throughout their operational lifetime ***managing life-extension missions***;
- investing the Very Low Orbit (VLEO) : aerodynamic satellite design, low-drag materials, advanced propulsion systems, and energy management solutions required for ***long-duration operations in VLEO***;
- extended the research activities to ***the stratosphere*** with High Altitude Permanent Systems (HAPS)

Reusable launchers (work with ESA)



THEMIS

Reusable first stage demonstrator on its launch site at the Esrange Space Center, Kiruna, Sweden.
(featuring ONERA SHM system)



ADAMP

Autonomous Reusable VTVL demonstrator
(scheduled for free flight in 2026 at INCAS - 6.5 kN liquid rocket engine propulsion)



REVOLUTE

Future EU family of reusable launch systems that include human space transport capability, based on ESA's vision for 2030+.
(CIRA participation)



DTV

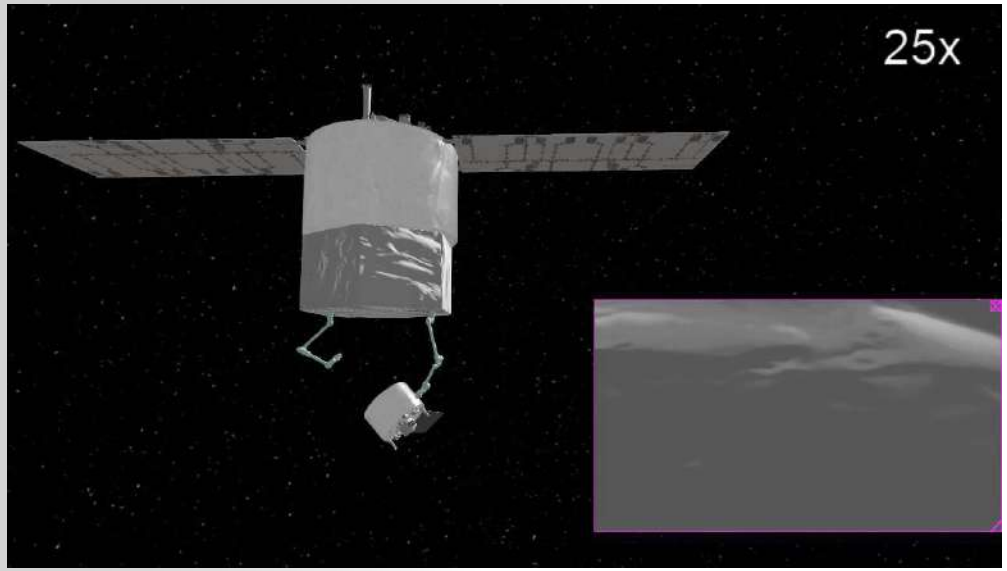
Autonomous Reusable VTVL demonstrator
(NCAS validated in Free Flight 2020)



European 60T LEO

Reusable Launch System Pathfinder
(@materials and Aerotermodynamics)

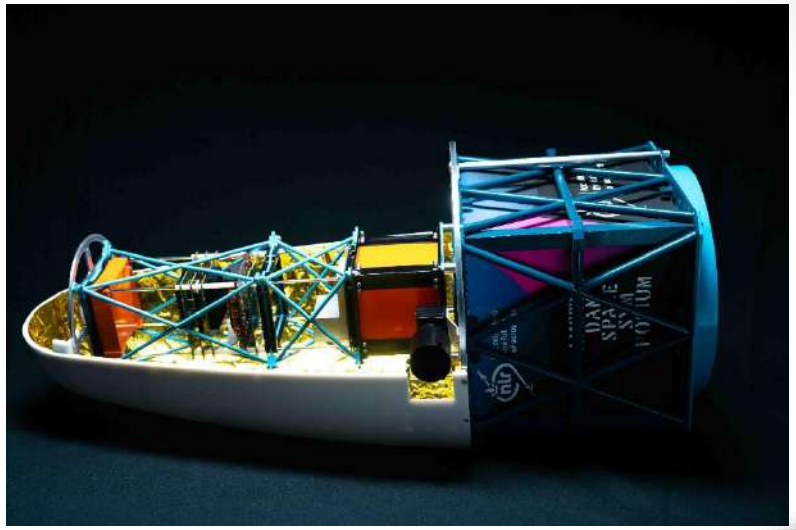
In-Space Operation and Service, VLEO and Stratosphere



Control performances: Comparison with a separated manipulators/base control strategy

SCHEMIN network

Flight simulation platform specifically designed for the development, testing and validation of navigation, guidance and control (NGC) algorithms. (ONERA)



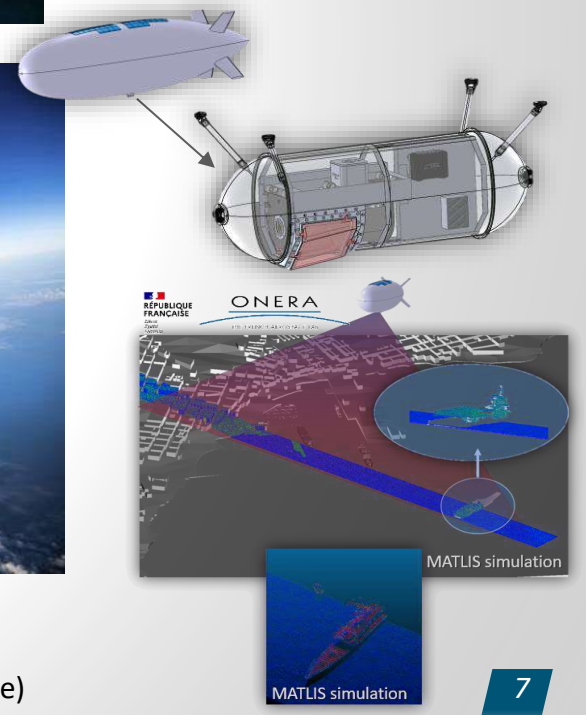
VLEO platform concept

Modular architecture tailored for operation 100–450 km (NLR)



STRATOBUS

HAPS (High Altitude Pseudo-Satellite)
Credit TAS - ONERA



ESRE Space Research Priorities(cont) :

Protect our environment (both on Earth and in Space)

- ensure the ***safety of our Space resources***;
- Space Traffic Management (STM) - ***safer orbital operations***;
- ***AI-based decision-support systems*** capable of predicting traffic, collision-risk assessment, and autonomous coordination tools to support the safe and efficient management of the rapidly growing population of satellites and space objects;
- ***debris*** mitigation and debris removal.

ESRE on-going developments :

- ***eco-design of spacecraft***, end-of-life disposal techniques, re-entry analysis, debris monitoring, active removal concepts, and life-cycle assessment approaches to reduce environmental impacts;
- Space systems ***protection against cyber threats*** throughout their lifecycle;
- resilient communication architectures, ***autonomous threat detection***, and protection of ground / space infrastructures,
- Safe operations in an ***increasingly contested, congested, and interconnected environment***;
- reducing the ***environmental footprint*** of space systems both on Earth and in orbit.

Space Traffic management (STM)

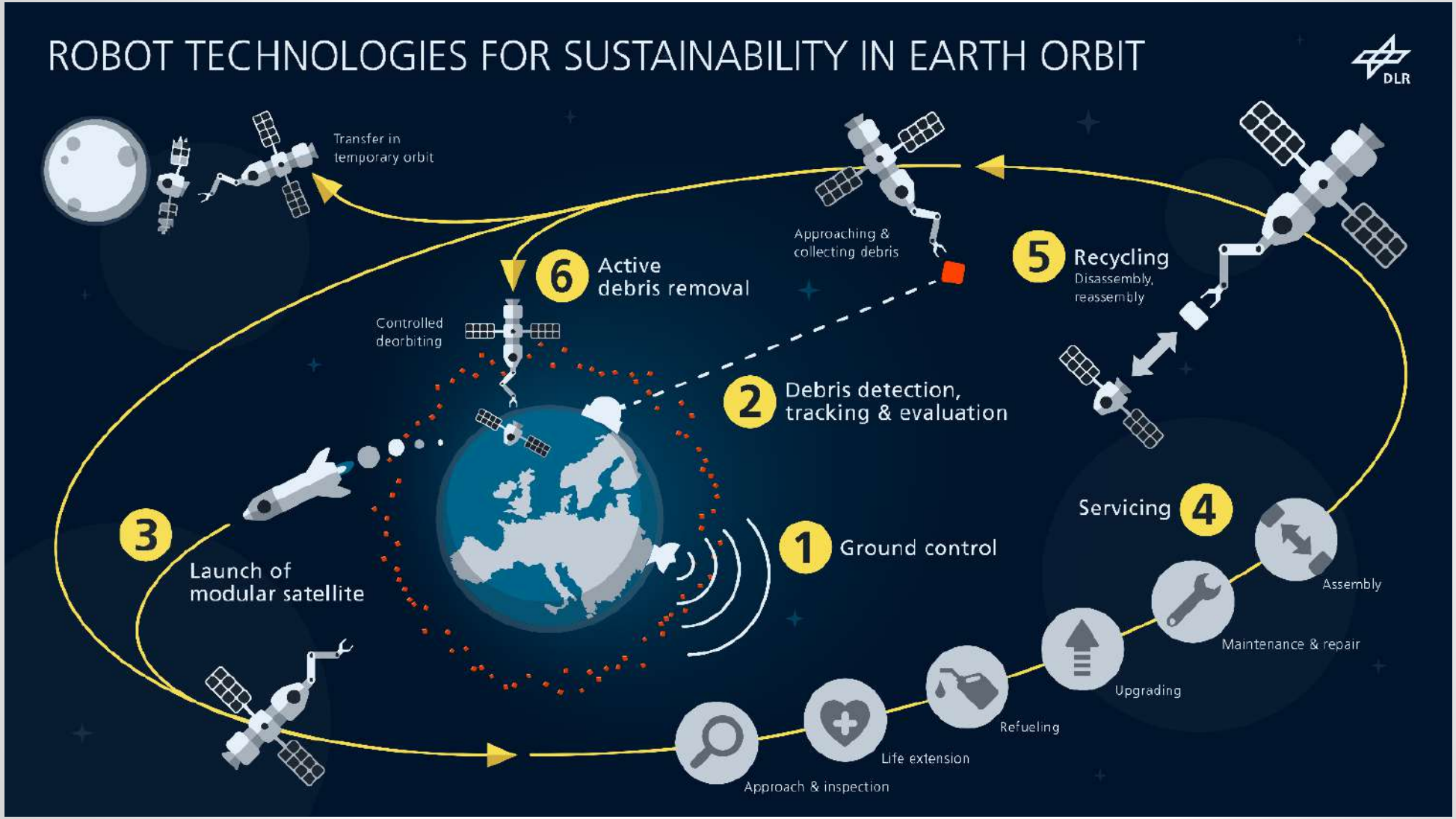


NARSIM
Credit NLR



From ATM to STM
Credit ONERA

Sustainability in Earth orbit



ION

New operational processes development for sustainability of earth orbit (DLR)

GROUND STATIONS



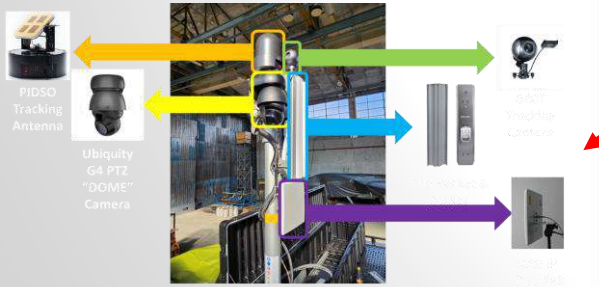
FEELINGS

Ground station based on adaptive optics - 'GEO Feeders' links. The first high-speed bidirectional optical communication was achieved using Feelings in June 2025 (ONERA)

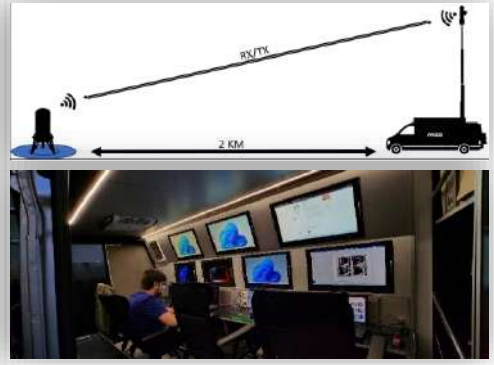


PROVIDENCE

Space surveillance and optical research. Will achieve first light by the end of 2028 and become fully operational in early 2029. (ONERA)







Mobile Ground Station (MGS)

VTVL Vehicles Operation (INCAS)

ESRE Space Research Priorities(cont) :

Contribute to Technological Sovereignty

- A global race technologies, not only because of economic competitiveness but since most ***space technologies are dual use***;
- The Space technological sovereignty will be ***built on what has already been achieved***.;
- The need for a ***supply chain*** and products at ***affordable costs*** for the intended uses;
- the ***emerging technologies*** in critical areas.

ESRE on-going developments :

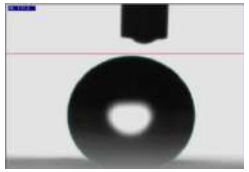
- a wide range of ***emerging technologies*** that could transform future space systems, including advanced materials, additive manufacturing, dust mitigation technologies, self-healing materials, autonomous systems, bio-inspired engineering and novel computing architectures;
- AI as a ***key enabler for future space missions***: onboard data processing, autonomous operations, predictive maintenance, anomaly detection, mission planning and decision support;
- ***quantum technologies*** for secure communications, sensing and computing;
- ***innovative satellite platform technologies*** addressing future mission requirements in terms of autonomy, modularity, miniaturization and sustainability.

Materials

DUST MITIGATION SYSTEMS

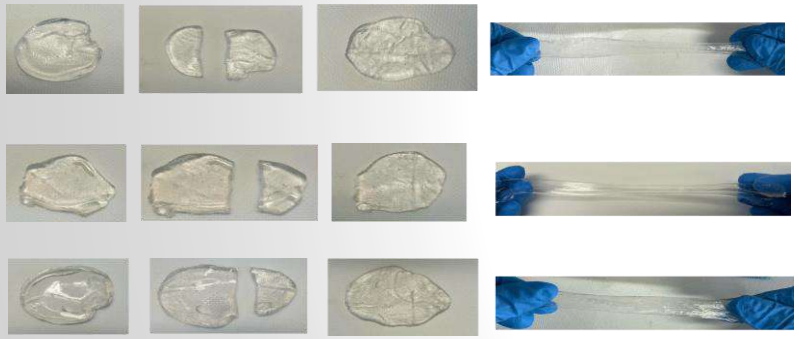
High-performance polymers, simultaneously exhibiting outstanding thermo-mechanical properties and superior non-sticking capacity (CIRA)

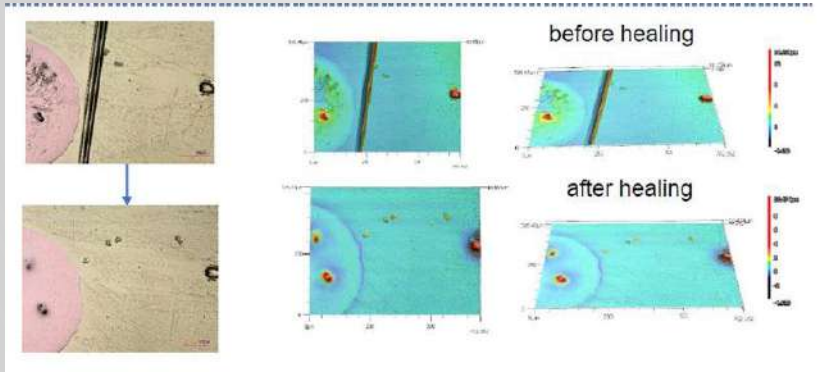




θ_w = 169°

SELF HEALING



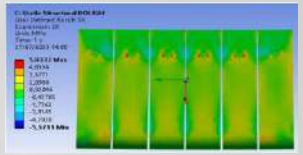


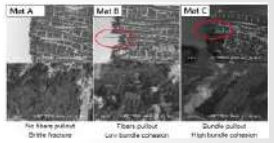
THERMAL PROTECTION SYSTEMS & HEAT SHIELDS

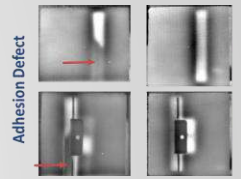
(CIRA)

- Thermal Protection Systems & Heat Shields;
- Methods and techniques for characterization and space qualification of such materials;
- Analysis and modeling required to understand the behavior of materials;
- Support the materials selection for specific applications in the field of space transportation, hypersonic and propulsion systems.











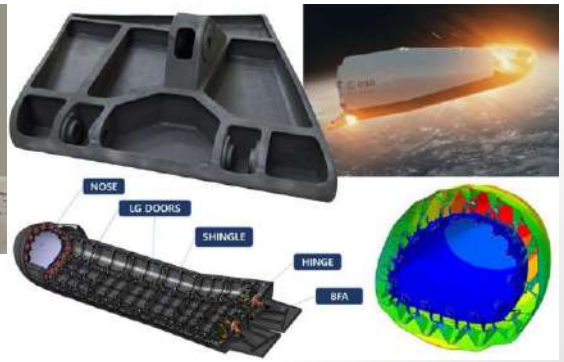






Space Rider TPS

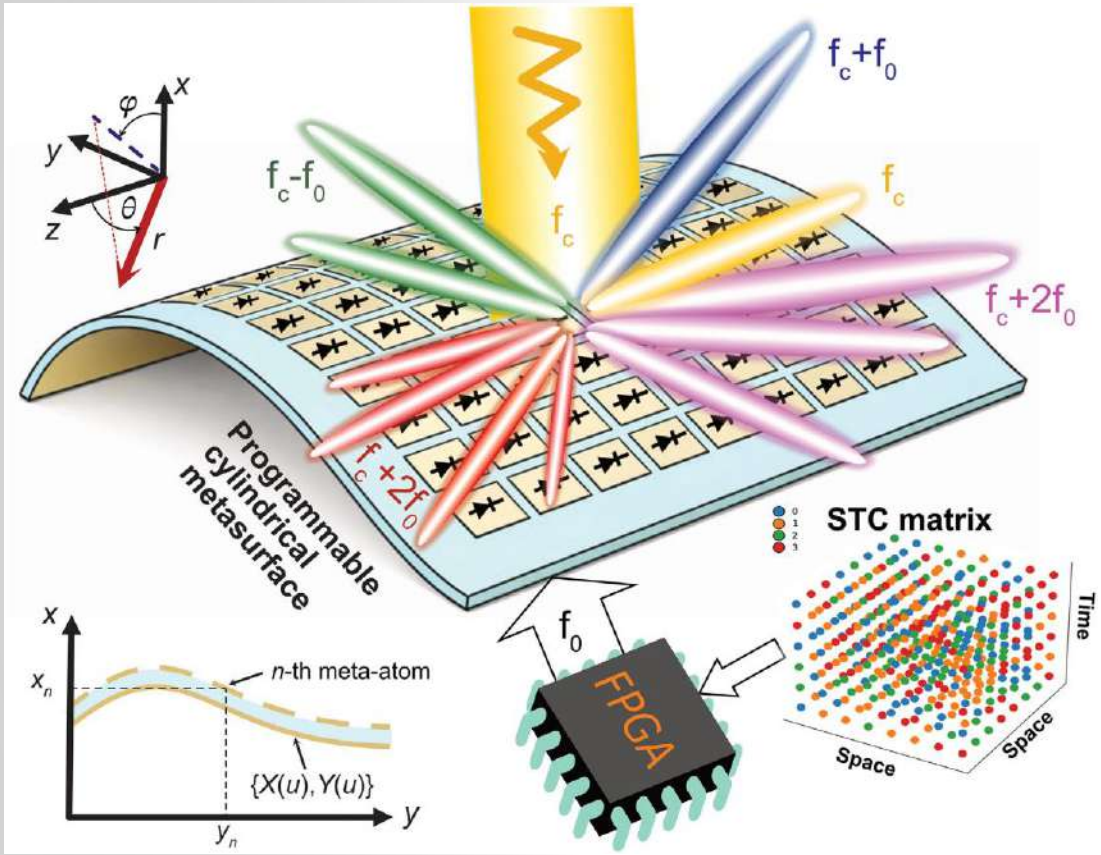
(CIRA, INCAS)



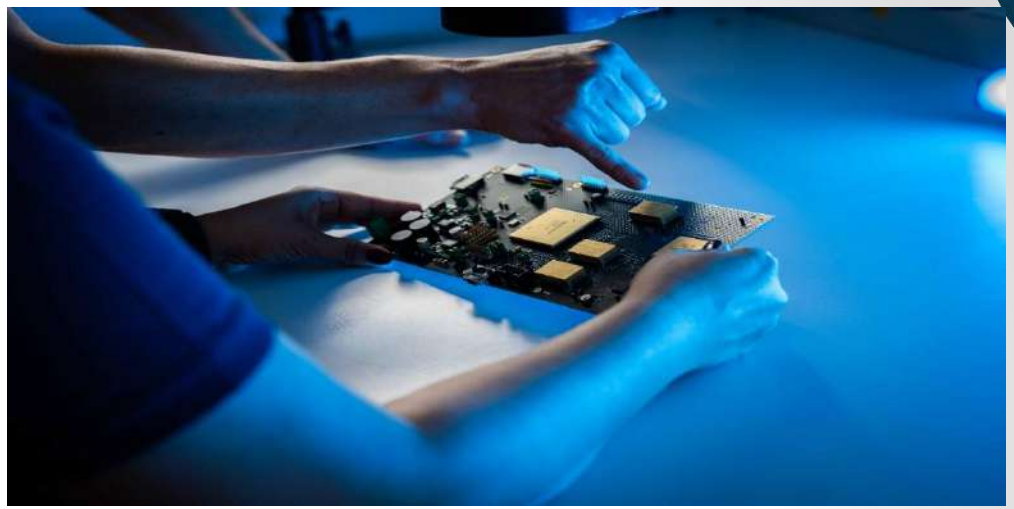
COMPONENTS

Physical-layer Security for Space Communications

Credit CIRA

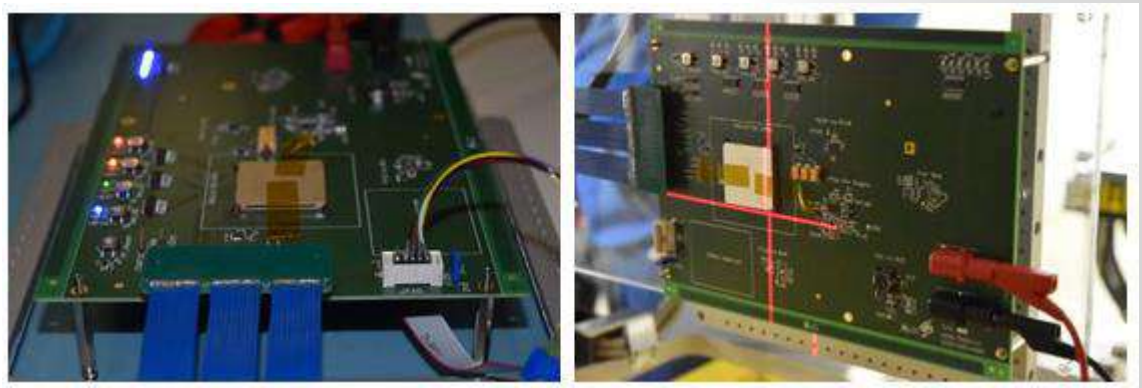


Space-Time Coding (STC) conformal metasurfaces implemented on a cylindrical geometry. The metasurface behavior is encoded through a three-dimensional STC matrix specifying the discrete reflection states in space and time.



On-board processing using FPGA

Credit NLR



Radiation-hardened RISC-V processors for space applications

Credit NLR

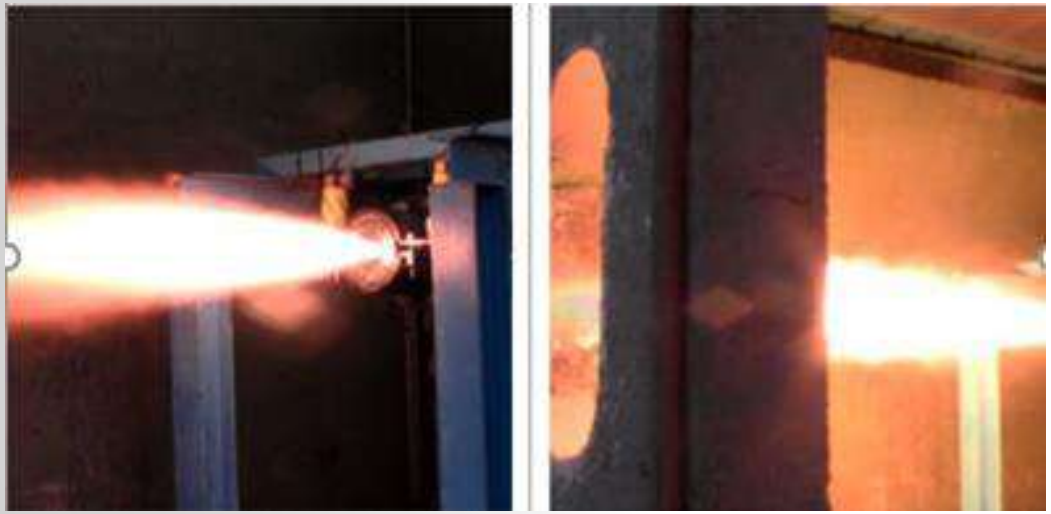
SYSTEMS

PROPULSION



Low Power Electric Propulsion

Medium (~ 1 kW) and low (< 0.5 kW) power electric propulsion by maturation of Hall Effect Thrusters (HET) and related subsystems. Credit CIRA

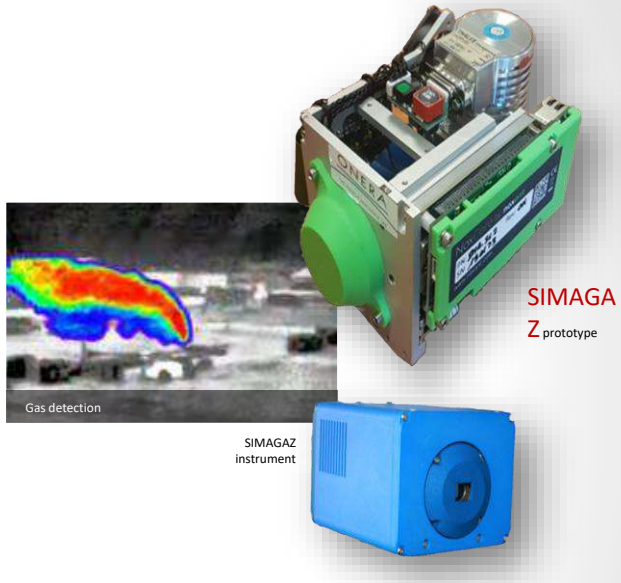


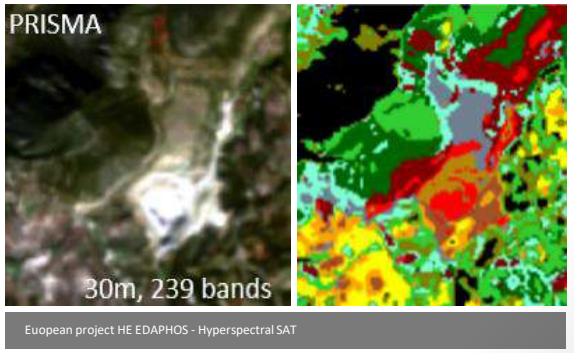
Hybrid Rocket Engine Propulsion

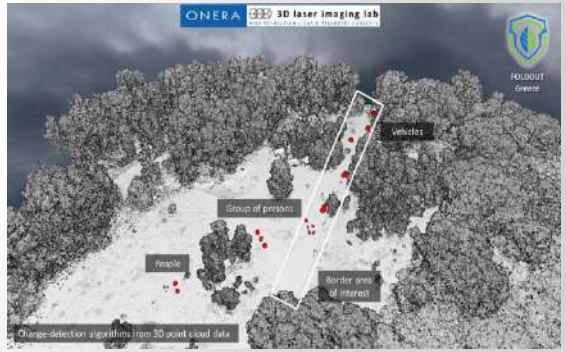
Hybrid and green propulsion technologies for future space and suborbital applications. Credit CIRA

SENSING

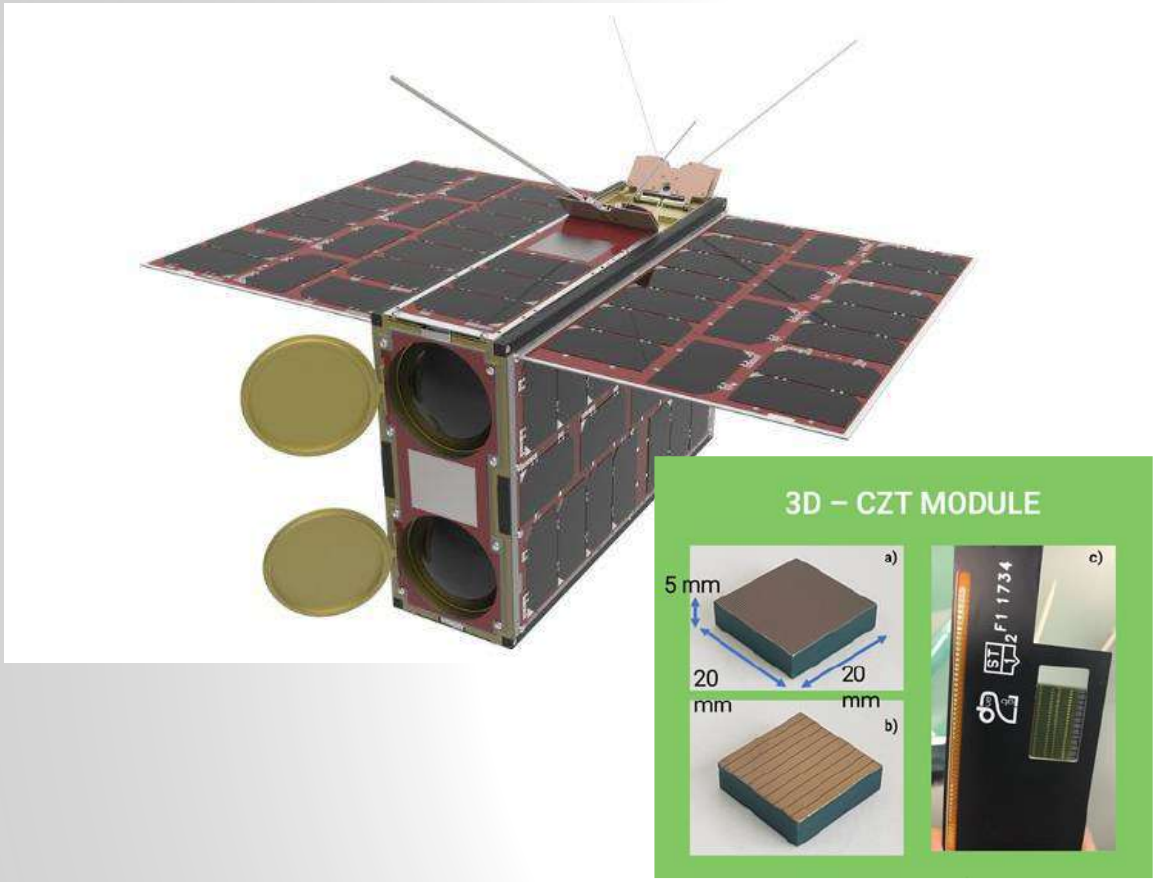
Credit ONERA







CUBESATS



RAMSESS

(RAdiation Measurement Sensor with Enhanced Sensibility for Space)

to be launched into Earth's Polar Orbit for the Study of the characterization by measurement of the local Radiative Environment to be correlated at those of the near and deep Space Exploration. Credit CIRA



In-Orbit Technology Demonstrations

FlyLab nanosatellites have been placed into orbit, on March 2026, on a Sun-Synchronous Orbit (SSO) at around 550 km.
They will carry out technology demonstrations for two years, before being deorbited in 2028. Credit ONERA

ESRE Space Research Priorities(cont) :

Ground Research/Technological Infrastructures (TI)

- Future space systems require increasingly ***sophisticated ground research infrastructures***;
- Maintaining technological sovereignty requires ***access to world-class testing and validation infrastructures***;
- The need for an ***in-orbit research infrastructure*** – "***Moonshot for the Moon"***

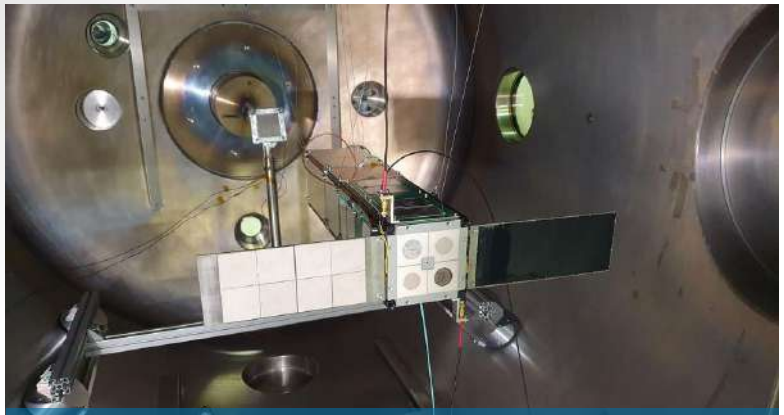
ESRE on-going developments :

- high performance **research infrastructures** to understand Physics, and to improve the robustness of the future Space systems in relevant environment;
- ***Research and technological infrastructures*** to address mission operations, digital mission control centers, space traffic management, cybersecurity, integration of artificial intelligence into operational workflows to improve efficiency and responsiveness.
- ***specialized facilities*** for environmental testing, propulsion qualification, electromagnetic compatibility, optics, materials characterization and hardware-in-the-loop simulation, enabling the maturation of critical technologies before deployment;
- a wide range of ***testing facilities for emerging technologies*** that could transform future space systems.

TESTS AND QUALIFICATION FACILITIES (1/2)



Hot Engine Testing & Identification Stand
Credit INCAS



CROCUS integrated payloads tested in the ONERA plasma chamber. Credit ONERA



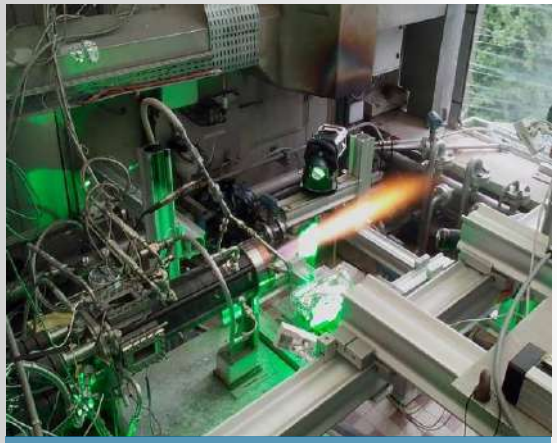
Cryogenic Cryostat
From cold (-55°C/218 K) to deep cryogenic (-253°C / 20 K).
Credit NLR



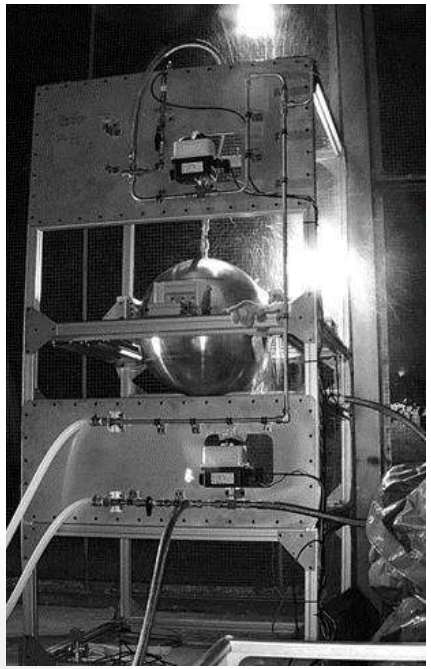




MIRAGE, SEMIRAMIS, GEODUR, Irradiation test benches. Credit ONERA



MASCOTTE cryo combustion testing facility. Credit ONERA



Automated Tank Testing Stand
Credit INCAS



DROP test bench to simulate lunar environment. Credit ONERA

Current capacity ~1.5 kW thrusters



ERIS vacuum testing facility for electric thrusters. Credit ONERA

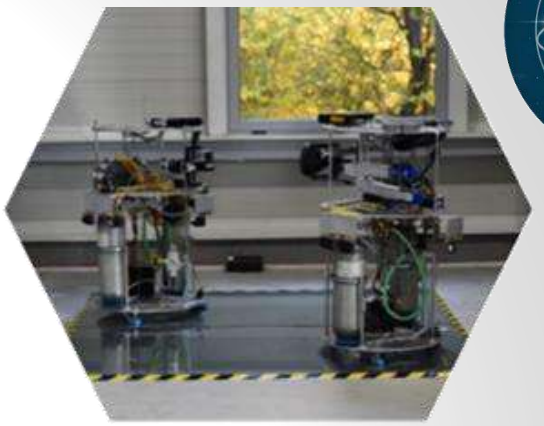
TESTS AND QUALIFICATION FACILITIES (2/2)



Vibration and Shock Test facility (VST)
Shaker system (125 kN) and shaker-sliptable combinaisons. Credit NLR



Medium Scale Vacuum Chamber
Ultra-high-vacuum chamber as a space simulator dedicated to electric propulsion. Credit CIRA



Spacecraft Planar Operations and Docking Simulator (SaPODS)
2D Free-Floating Spacecraft Dynamics and Docking Testbed. Credit INCAS



Technological Laboratories for Advanced Materials and Processes
Credit CIRA

Space Qualification Laboratory
Testing of nano and micro satellites (up to 70 Kg), electronic and mechanical components. Credit CIRA







Rendezvous, Proximity Operations and Docking Robotic Simulation Facility (RoPOD)
Dual Robotic Arm and Rail-Based Simulation Testbed. Credit INCAS

ESRE View on Space research in the next MFF

What ESRE is advocating for next MFF/FP10 :

- **Autonomy of FP10 (governance and budget) with regard to the European Competitiveness Fund (ECF);**
- A substantial and ***dedicated budget for Space civil and dual research***, clearly identified and separated from the one for security & defence industry:
  - Industry proposal for the space civil and dual applications amounts up to B€ 40 – 60, .i.e. x2 to x3 compared to the current Space programme;
  - First estimation for Space research and development ~ B€ 7;

- ***Space research and development*** may be made of ***3 pillars***:
  - Excellent science (TRL 1-2, pillar I);
  - Traditional collaborative research (TRL 3-6, pillar II);
  - A ***Space Partnership*** for competitiveness and environmental sustainability (TRL 3-8).
- ***Space components/applications*** (components of the former Space programme) and deployment initiatives (TRL 7 -9)

Tentative objectivation of the Space Research



Policy Objectives

- Strategic Autonomy
- Industrial Competitiveness
- Scientific Excellence
- Home Affairs *Environment*
- Home Affairs *Single Market*

Not addressed by HE 2021-2027

Horizon Europe 2021-2027

- **EU Space Programme** (*Copernicus, Galileo/EGNOS, GOVSATCOM/IRIS2, SSA*)
- **GCSS** *EO / SatCom / Smart Tech 4 launchers*
- **ISOS 4 Infrastructures**
- **Critical Technologies** *including quantum gravimetry*
- **Space Sciences & Data**
- **Space Weather**
- **SST, Debris**
- **Atmospheric pollution** *from space vehicles*
- **Space Technology Infrastructures**
- **EDF – Space Research segment**

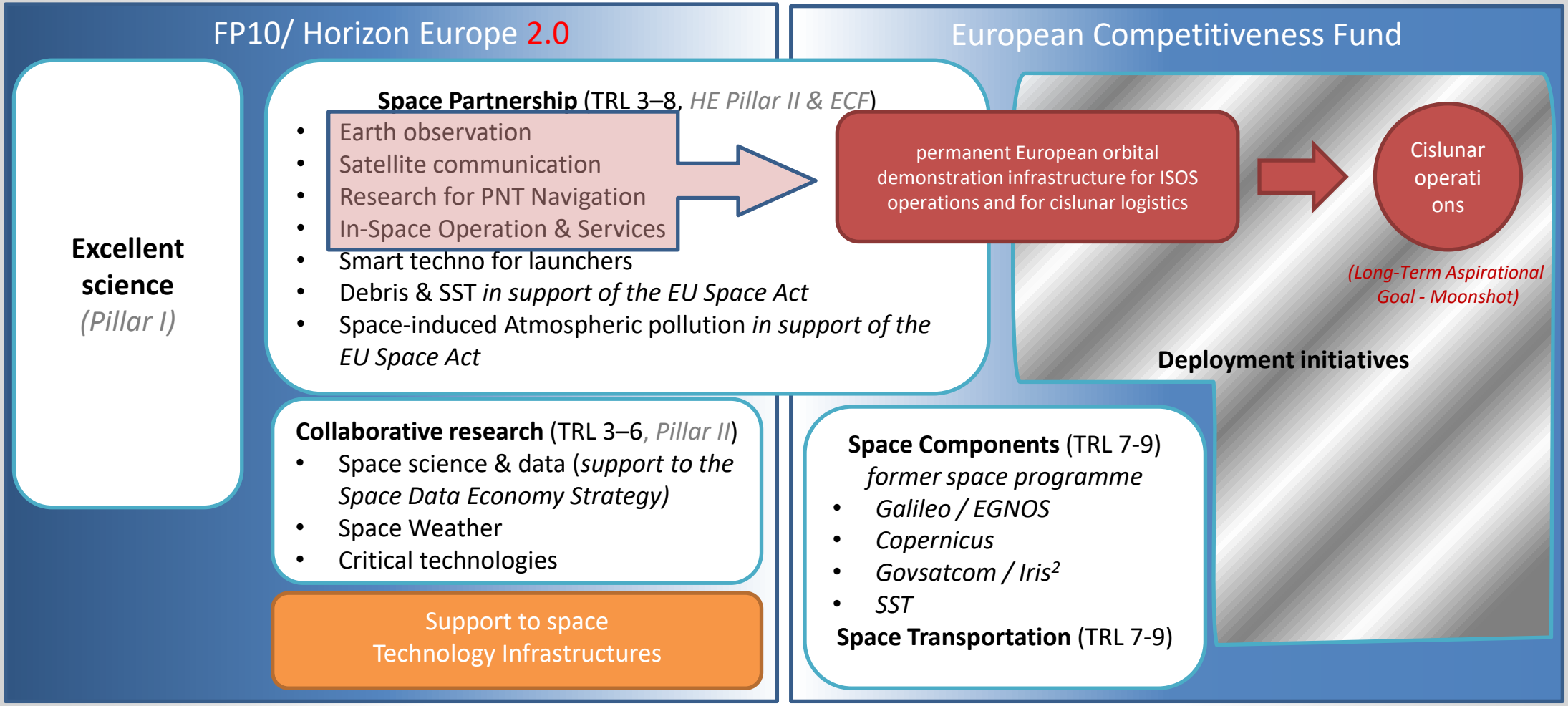
Horizon Europe 2.0 2028-2034

- **FEC Non GCSS**
- **GCSS *Competitiveness***
- **HE collaborative Research Non GCSS**
- **GCSS *Environmental sustainability***
- ***ERIC ?***

Supporting policies, strategies or acts

- **European Space Act**
  - Safety
  - Resilience
  - Environmental Sustainability
- **EU Defence Shield**
- **Space Moonshot**
- **EU Space Strategy for Security and Defence**
- **Space Data Economy Strategy**

Space Partnership as a gate between ECF & HE




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