Carlo Gavazzi Space SpA
COMPANY PRESENTATION

Marco Molina, PhD
Technical Directorate

Carlo Gavazzi Space SpA

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Company General Overview

► CORE BUSINESS LINES

Space segment

- Small satellites
- Scientific Payloads
- ISS laboratories

Ground segment

- EO and TLC applications
- Ground Stations development
- Fluidic and general means for Launchers

In space Business since 1981. ISO-9001 certified.

► KEY COMPANY DATA
Fiscal Year 2007/08

Revenues	46 M€
Employees	203
Backlog	113 M€

Main locations

Milano	– Headquarters
Roma	– I4SB consortium, Satellite Engineering, Research Projects
Benevento and S. Giorgio del Sannio	– Satellite products & Research Laboratory
Rivalta Scrivia (AL)	– Satellite Integration
Bologna	– Earth Observation & Research Laboratory

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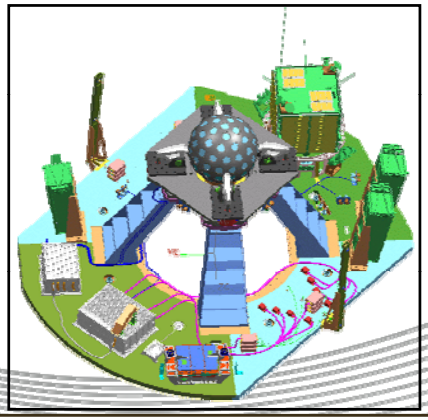
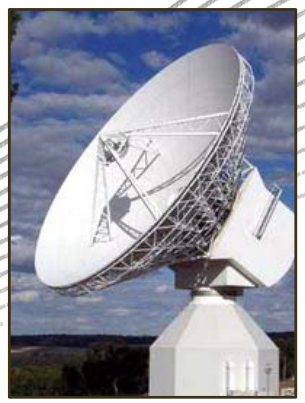
Business Mission

PROVIDE THE USER COMMUNITY WITH SOLUTIONS TO LOWER THE COST OF FIRST CLASS SCIENCE AND APPLICATION PROJECTS BY:

Exploiting the full potential of Small and Medium Size **Satellite** Missions.

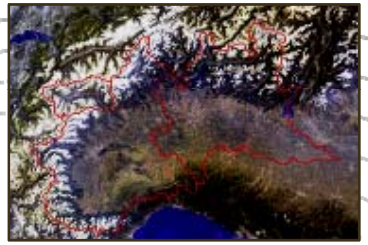


Turning technologies into products for **Scientific** and application projects.



Realizing reliable systems for **Ground Segment** applications.

Developing technologies for **Orbital** and **Transportation** Systems.



Developing products for **Earth Observation**services.

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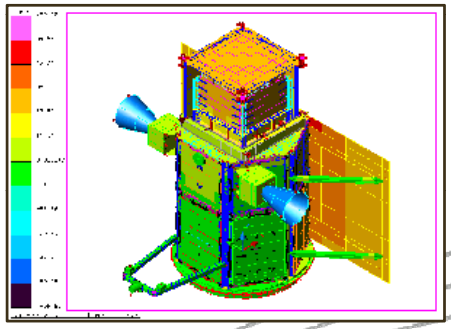
Technical Assets

Space Segment:

- System and Subsystem Engineering.
- AOCS.
- On Board Data Handling & Signal Processing.
- Structural & Thermal Design and MAIV.
- Power Conditioning & Distribution.
- On-Board Operating System & Real Time SW.
- AIV/AIT

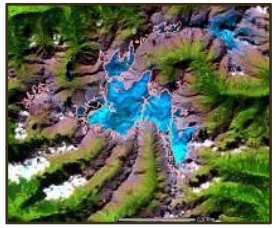


Ground Segment:

- Turn-key ground station solutions for single satellites and constellations.
- Specifically designed HW and SW products.
- Integration of COTS components.
- Infrastructures for Launch Vehicles Ground Segment

User Segment:

- SW products for Satellite Earth Observation Data Exploitation.
- High Resolution Optical and SAR Data Processing.
- End-to-End Information Services for Environmental Monitoring.



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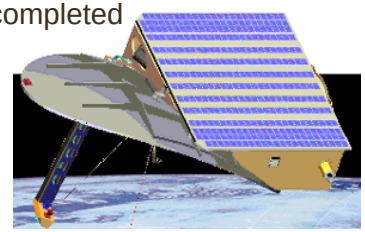
Satellite Roadmap

Small Satellites (500-1500 Kg)

SAR Lupe (750 Kg)
12/06 – 07-11/07 – 03/08 – 07/08

EGPM (620 Kg)
Phase A completed

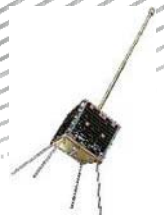


SAR Lupe

Micro-satellites (10-120 Kg)

MIOSAT (120 Kg)
Under development

IMSAT (70 Kg)
Under final integration



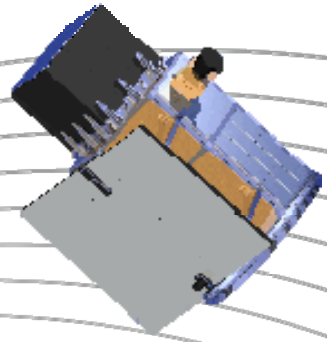
SAFIR 1-2 (65 Kg)
Launched 1994/1998

RUBIN Class (30 Kg)
Rubin 1 and 2 already launched

Mini-satellites (130-500 Kg)

PRISMA (500 Kg)
Under development

AGILE (350 Kg)
Launched 4/23/2007



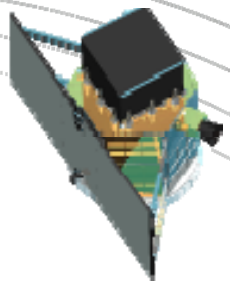
Agile

LARES
Under development

ARGO (300 Kg)
Under development

MITA (170 Kg)
Launched 7/15/00

MOS (130 Kg)
Under development



-- Remote Sensing SAR
-- Remote Sensing Multispectral
-- Scientific
-- Telecommunications
-- Technology Demonstration

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AGILE

AGILE installed on PSLV

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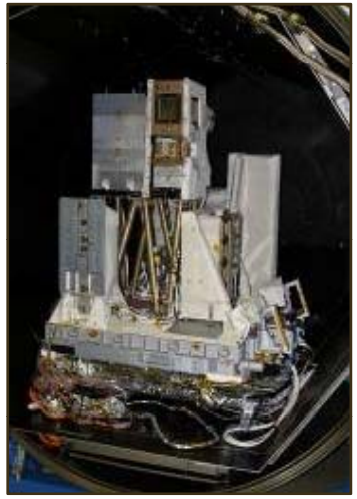
Orbital Infrastructures

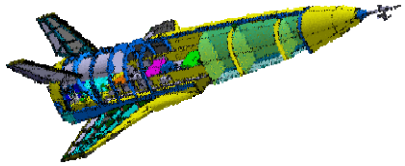


External ISS experiments

AMS02 Alpha Magnetic Spectrometer, **EUTEF** European Technology Exposure Facility, **EUROPA** External Use of Robotics for Payloads, **HEXAPOD** Pointing System, **CPD** Coarse Pointing Device, **LOBSTER** Observatory.

International Space Station (ISS):

significant expertise on facilities and payloads for internal and external experiments.



Unmanned Space Vehicles

structures and mechanisms of the Prora USV of CIRA.

Internal ISS experiments

RPDA Remote Power Distribution Assembly, **BIOLAB** Laboratory for biology, **FSL** Fluid Science Lab, **EPM** European Physiology Module, **HCU** Heater Control Unit.

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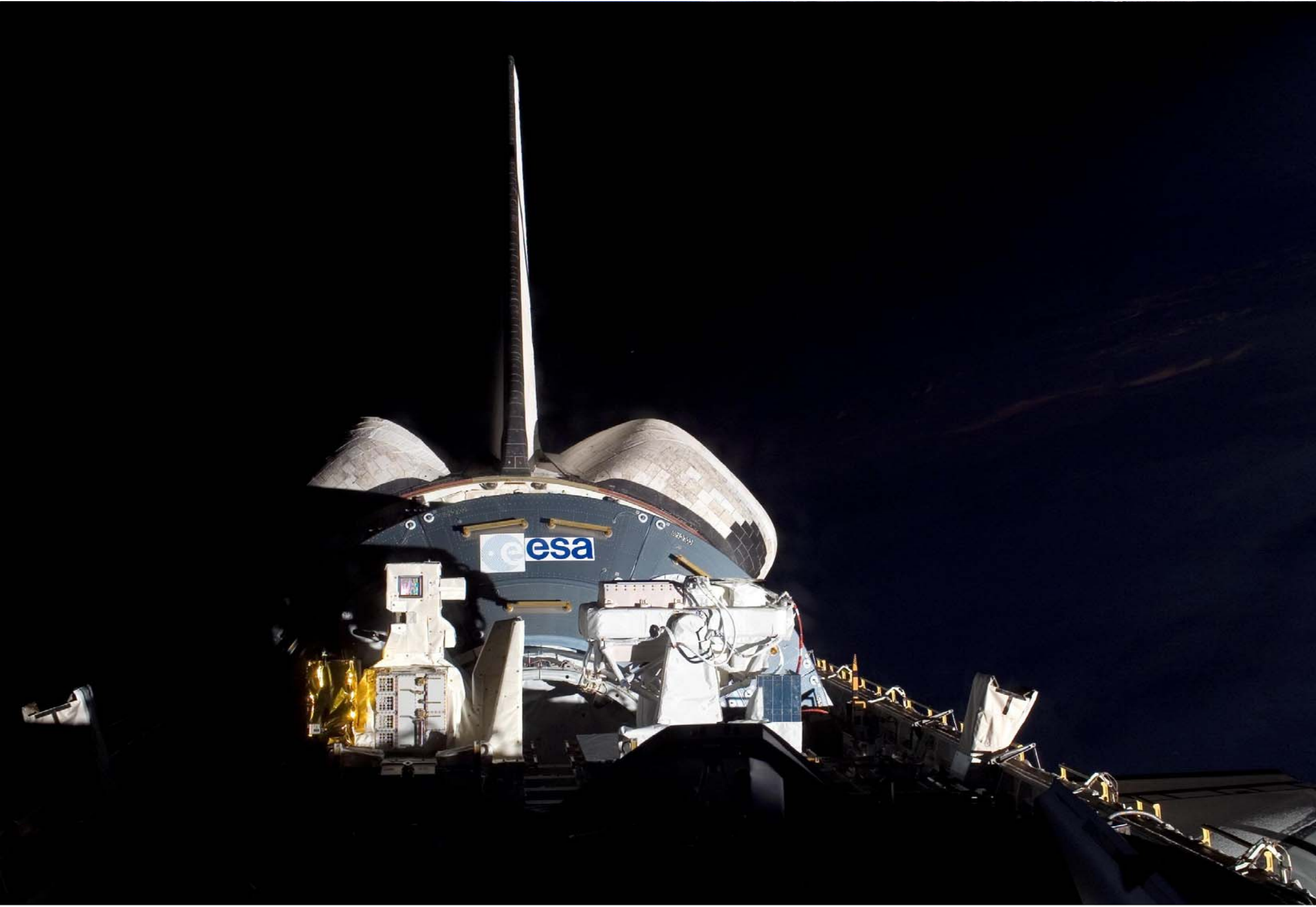

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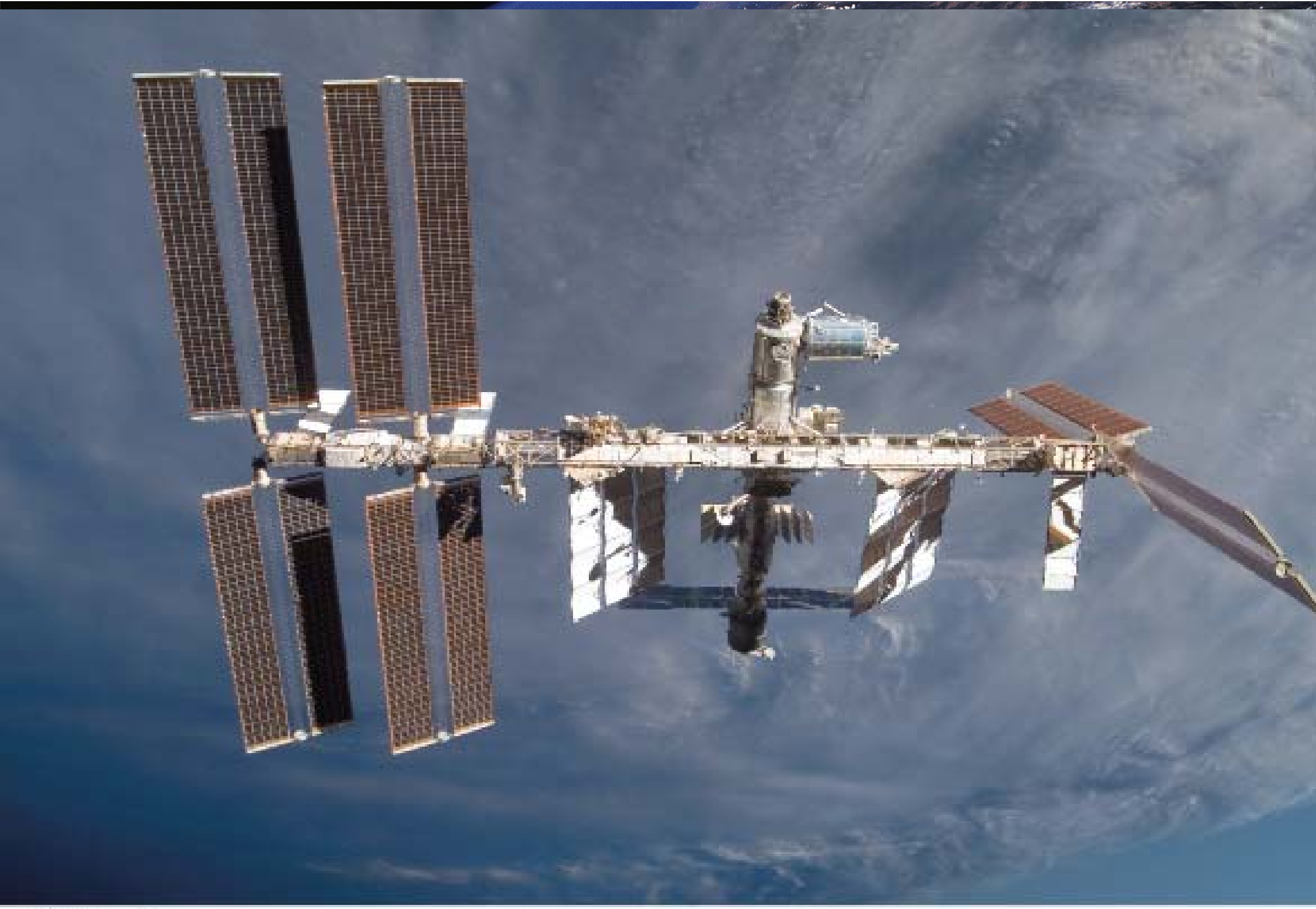

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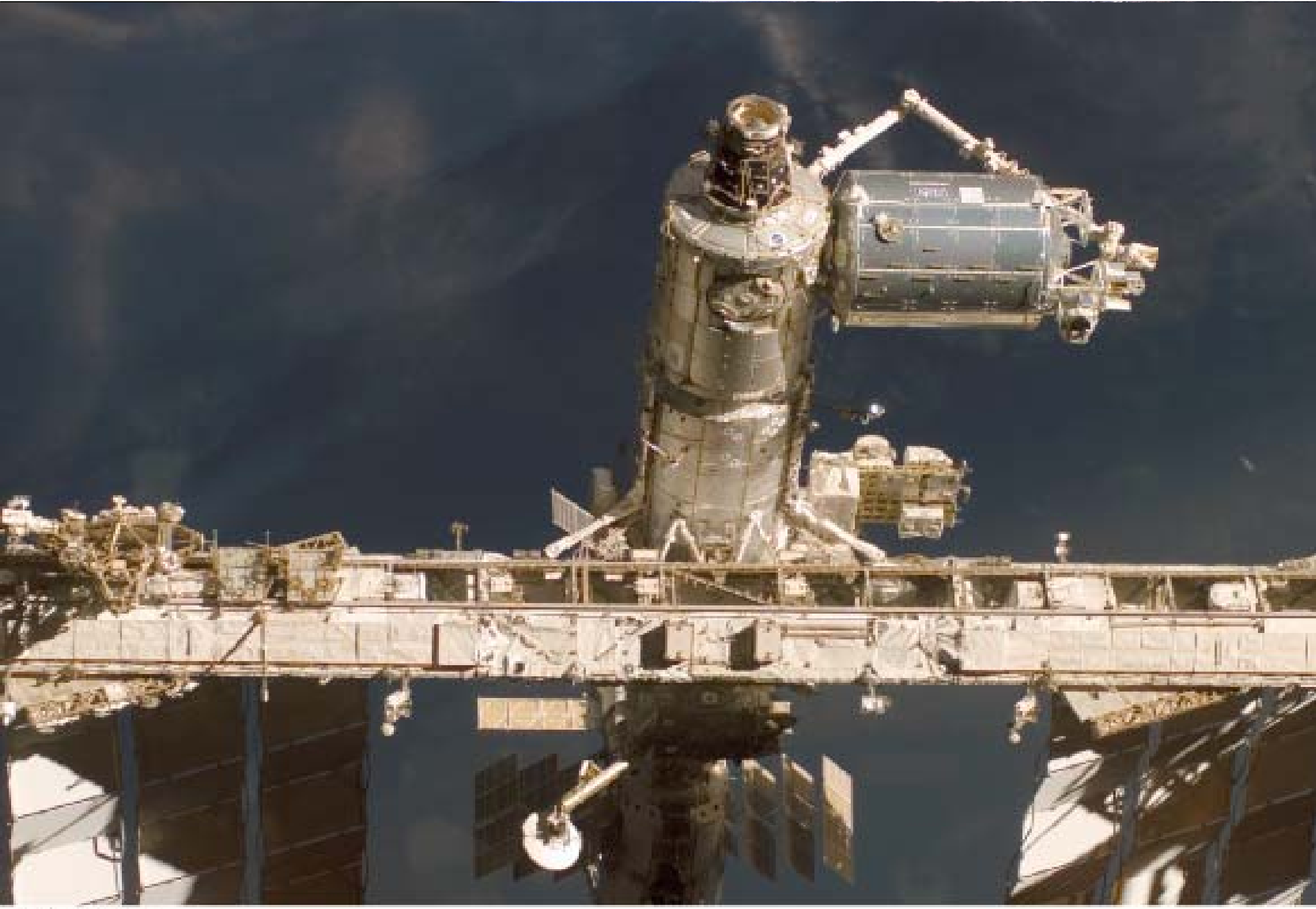

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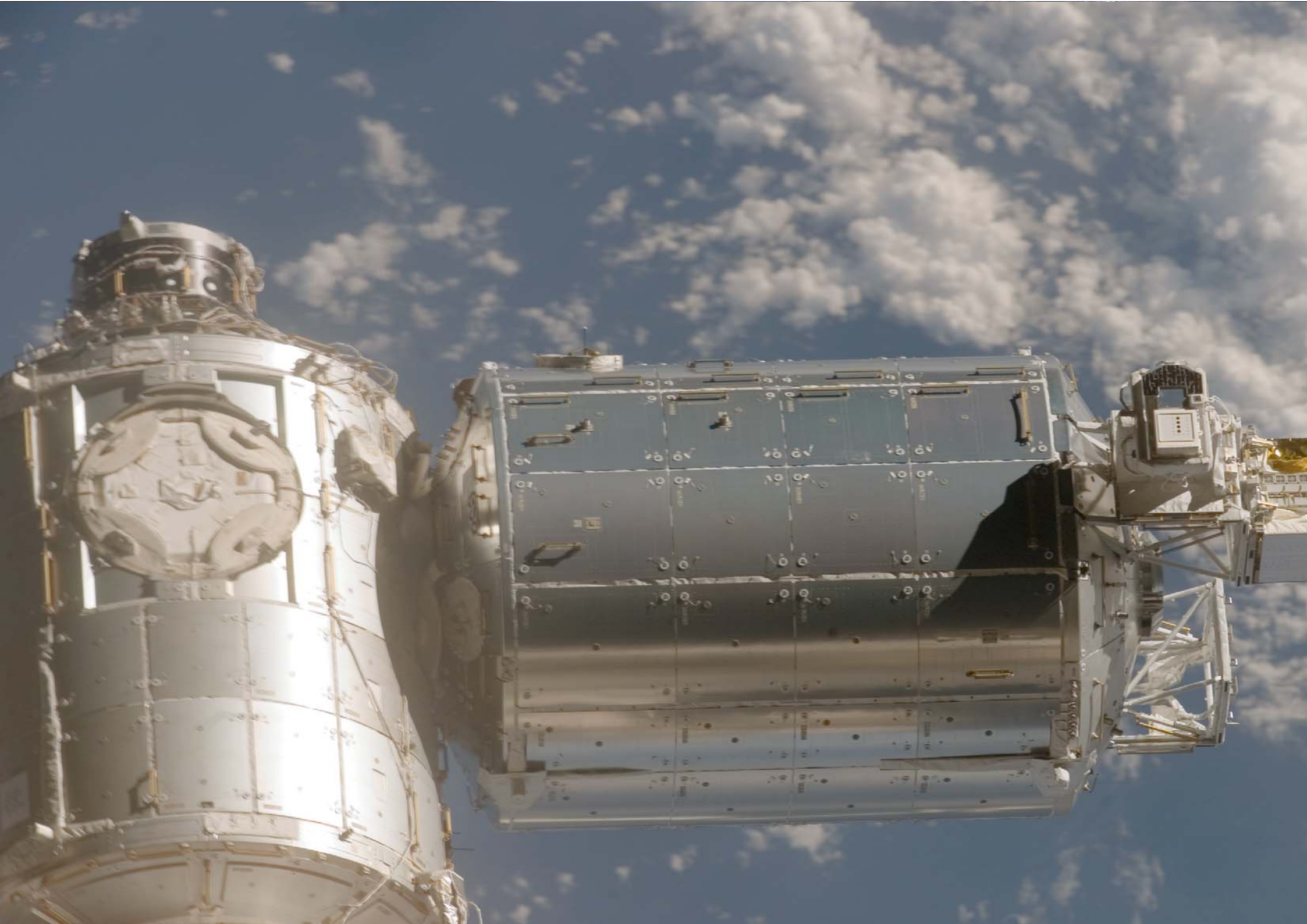
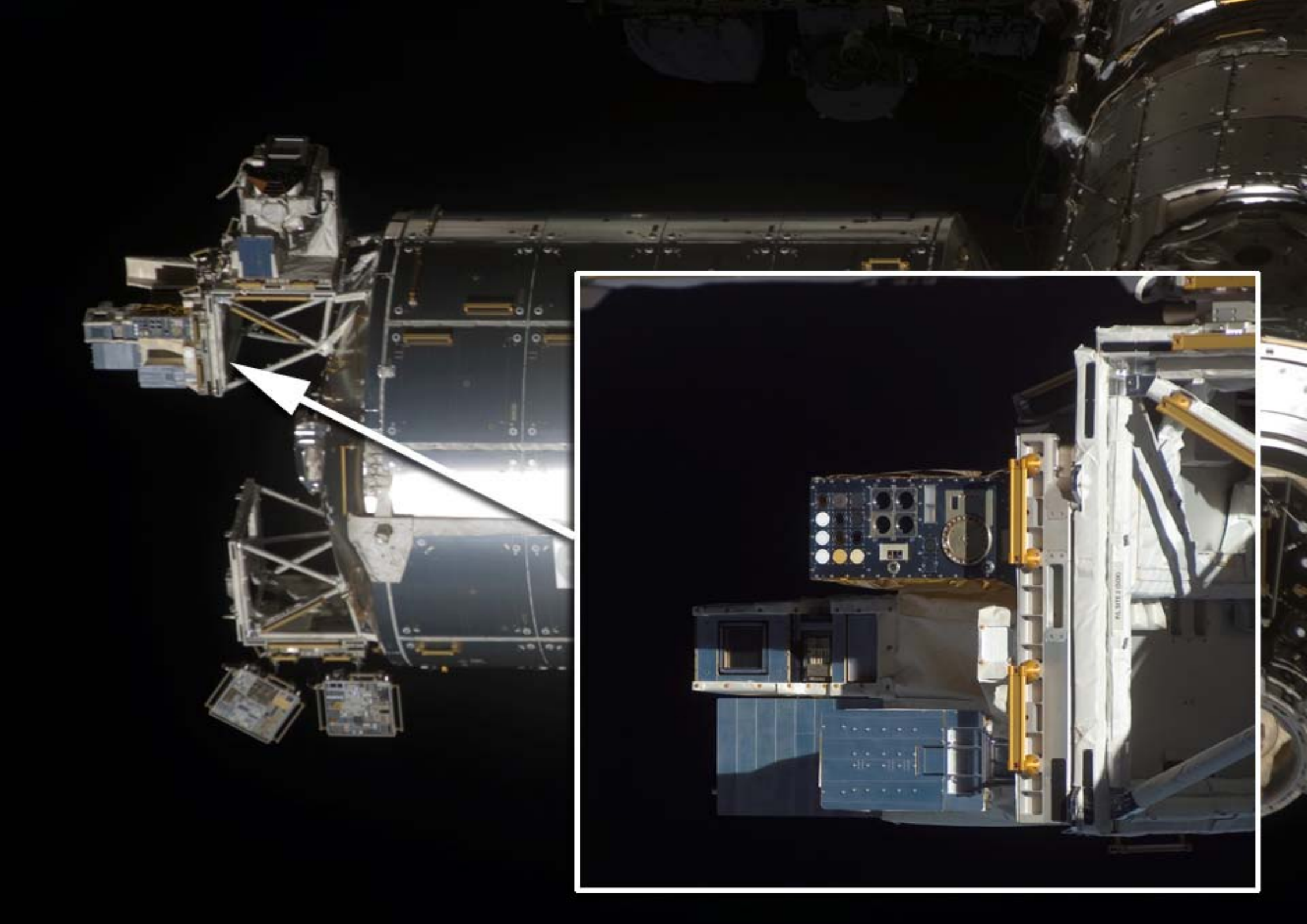




Earth Observation

Earth Observation: Exploitation of remote sensing data for environmental monitoring, natural hazards and security, air quality.

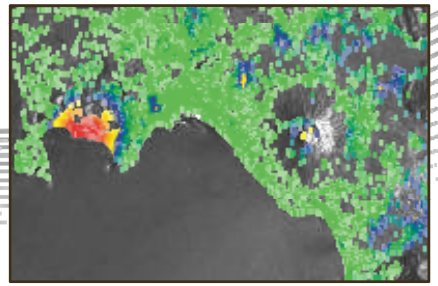
Service Provider Role:

- User requirements analysis
- End-to-End information chain design and development
- Technology transfer: from research to operational systems
- Product generation and validation
- Product promotion and delivery to users
- Education and Training.

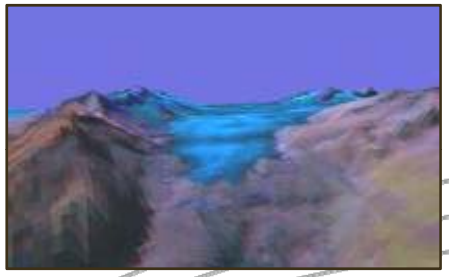
Monitoring of Environmental Risks in Volcanic Areas.

GLOBVOLCANO
(ESA GMES)

MINERVA
(ESA DUP Project)

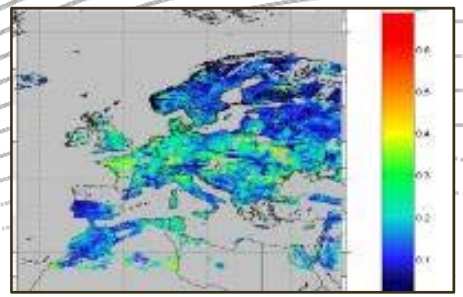


Monitoring of Glaciers and Snow Cover mapping in the Alpine regions.



GLASNOWMAP
(ESA DUP Project)

Air Quality monitoring



PROMOTE
(ESA Project)

Other Areas of Expertise

Tropospheric Emissions Monitoring (TEMIS), Hydropower Plant Management (EO-HYDRO), Air Quality Control (Quitsat, Promote), Landslide and forest fires monitoring (Morfeo, Sigri).

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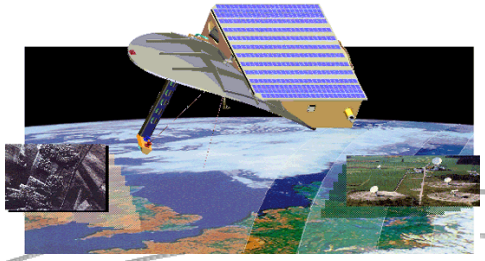
Ground Segment

SAR-Lupe Constellation
Satellite Ground Segment

Prime contractor for the realization of the SAR-Lupe Satellite Control Center consisting of the hardware (antenna, RF equipment and Base-Band) and satellite control software
Customer: OHB / BWB



Ariane Ground Segment

- Refurbishing and upgrading of the TSAR (Télécommande Sauvegarde Ariane) system
- Upgrade of six equatorial ground stations (SYSTA)
- Ariane 5 portable Telemetry Acquisition System. Customer: CNES
- Ariane 5 and Soyouz tracking stations at S. Maria at Azores and Perth.
  Customer: ESA

Launchers Ground Segment

- Responsible for VEGA launch pad mechanical infrastructure, fluidic, low current and communication systems design and realization at the CSG in Kourou.
  Customer : Vitrociset/ESA
  Responsible for Soyouz low current and communication systems.
  Customer: Vitrociset/CNES

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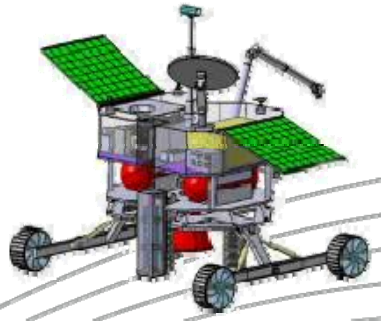
Planetary Exploration

Planetary Exploration:

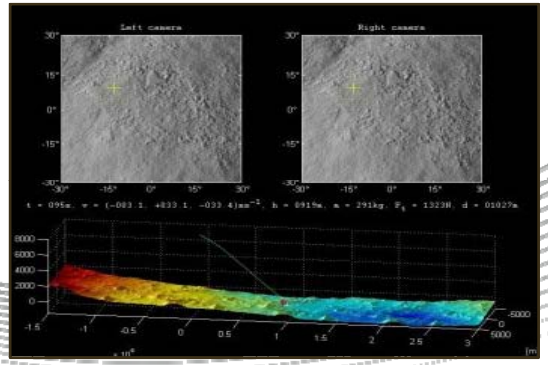
System studies, research projects and technologies for future exploration missions.

Expertise:

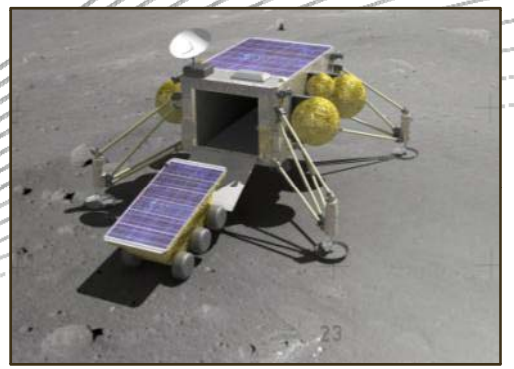
- GN&C (Guidance Navigation and Control)
- Technologies precision landing systems
- Surface mobility vehicles in-situ science



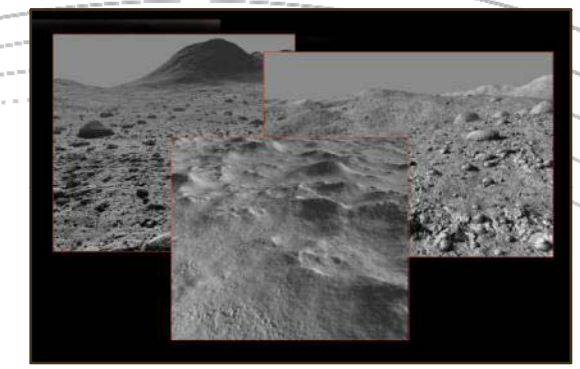
HMLSV
HIGH MOBILITY LUNAR SURFACE VEHICLE
Customer: ASI



GN&C
GUIDANCE NAVIGATION & ACONTROL
Customer: ESA



LUNA HOP
INTERNAL RESEARCH PROJECT



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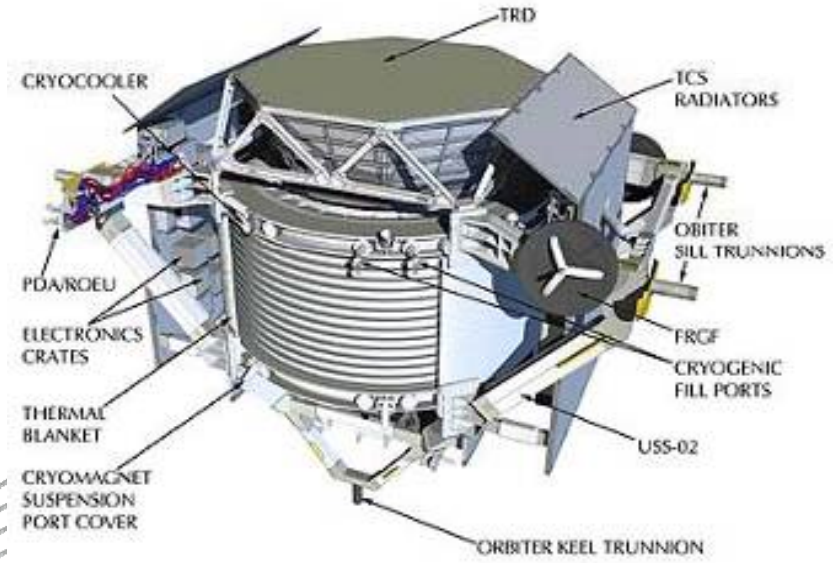
Scientific Payloads

Scientific Payloads: experiments in microgravity conditions, deep space and planetary exploration.

PAMELA
ANTI-MATTER PAYLOAD
Customer: INFN
Launched 15/6/2006 on Resours DK

LISA
Laser Interferometer Space Antenna
Customer: ESA



AMS-02 Particle Detector
ALPHA MAGNETIC SPECTROMETER
Customer: NASA

LOBSTER X Ray Detector, **SMART2** Technology Packages, **RICH & TOF** Cherenkov Ring Imager and Time of Flight Counter, **UVCI** Ultra Violet Coronal Imager.

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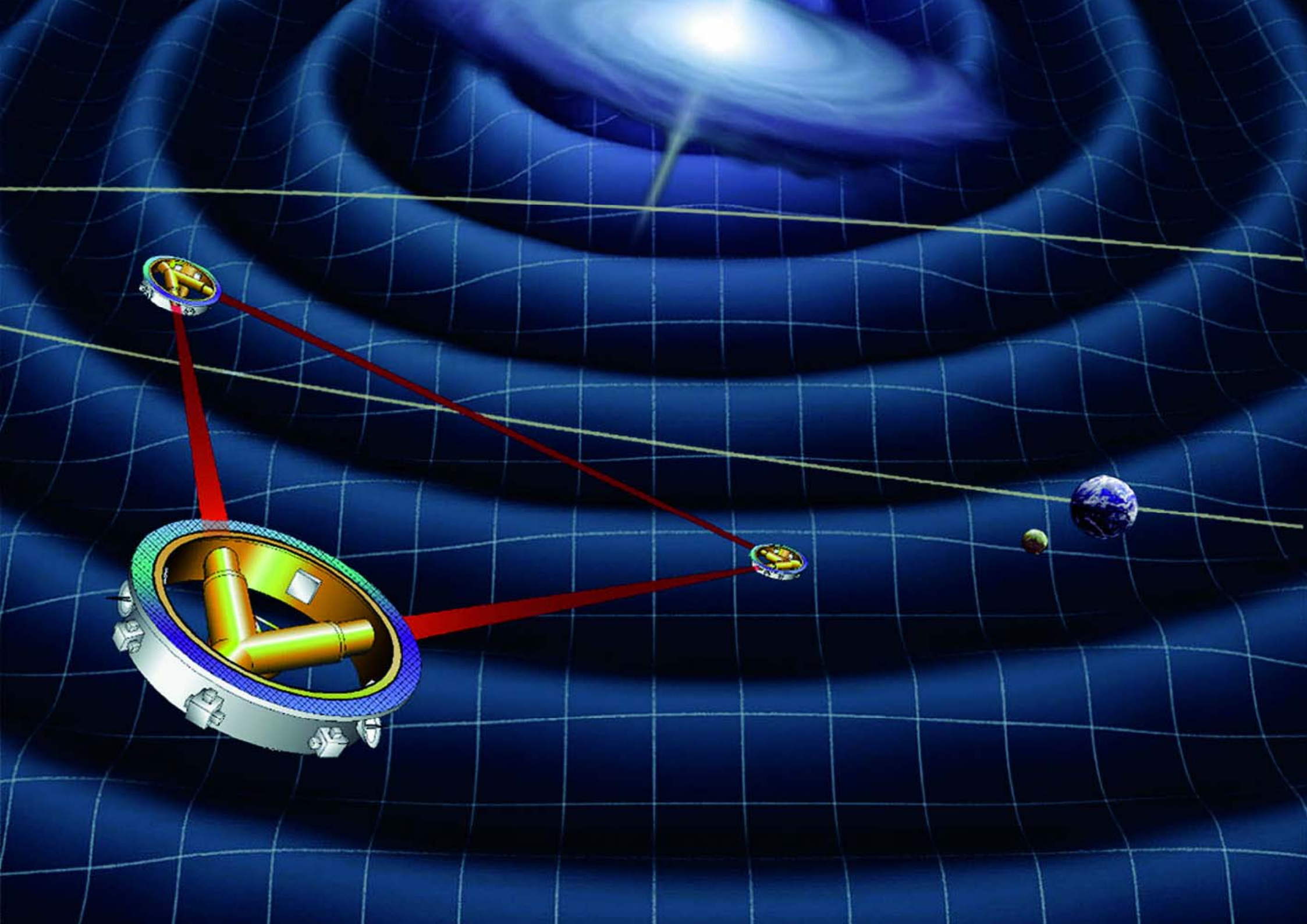
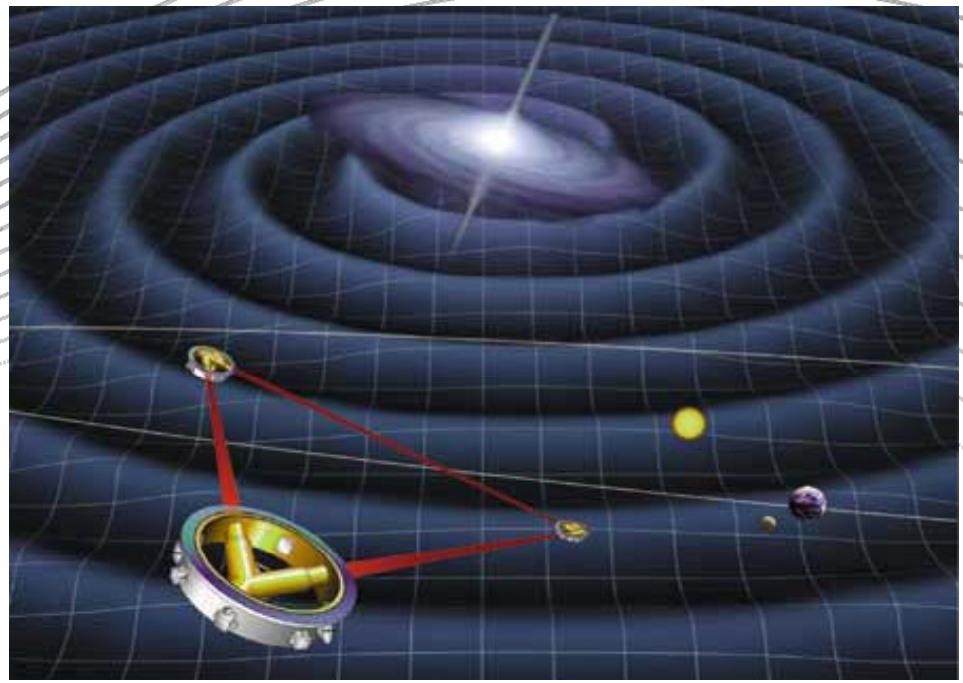


- LISA (Laser Interferometer Space Antenna)

- Constellation of 3 S/C, Heliocentric orbit, average distance $5*10^6$ km

- Scientific purpose: Gravitational Wave Detector
  - 3 couples of free-floating test masses to detect differential displacements (of the order of 10^{-12} m, 1/10 the atomic size!)
  - Laser beams bouncing between test masses, to build up a 2-3 arms interferometer



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Precursor mission: LTP (Lisa Technology Package) on SMART-2

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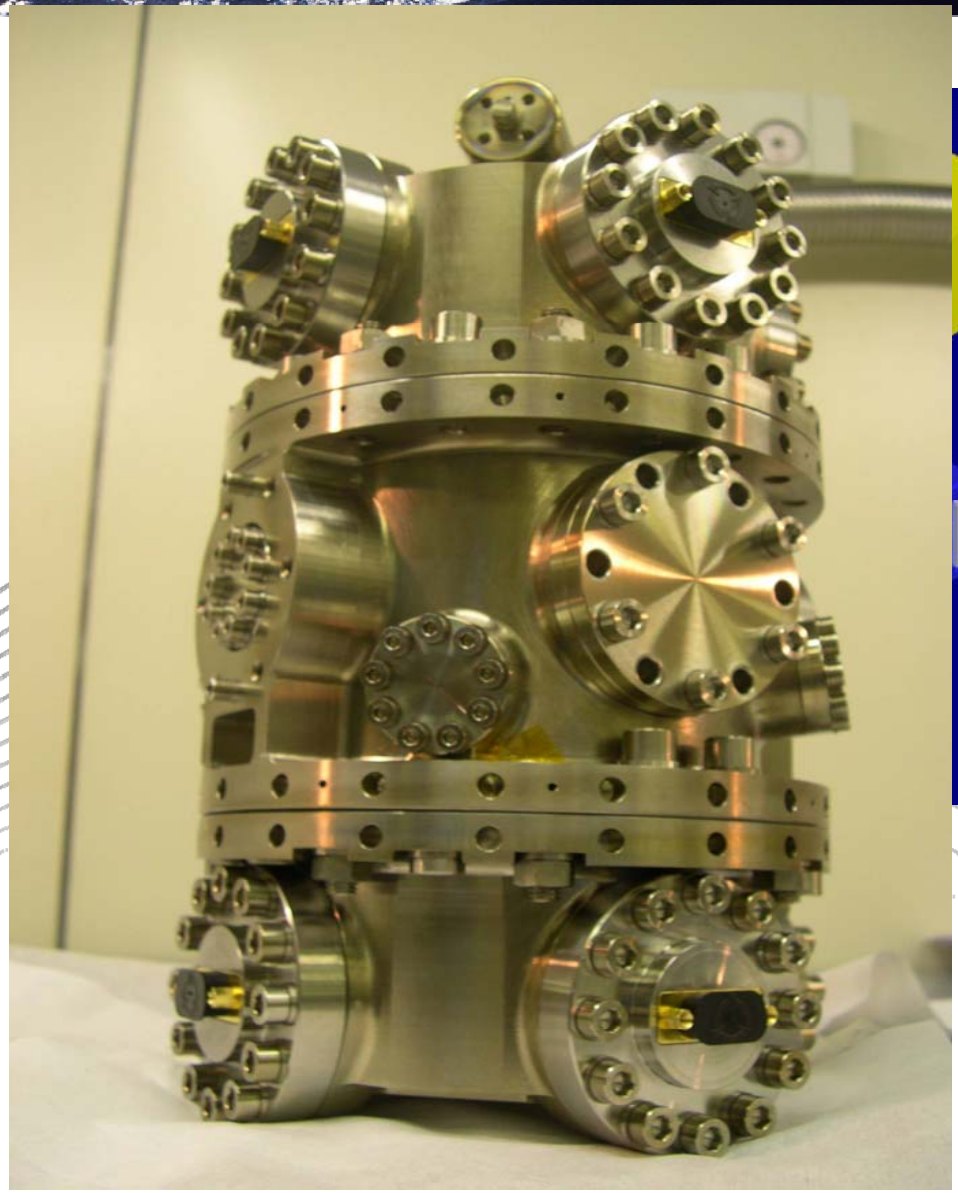
LISA Detector Description

- The scientific core of the satellite is contained in a Thermal Shield (TS), to lower the thermal noise
- Inside the TS an Optical Bench (OB) is located, hosting Laser beam optics
- A couple of Inertial Sensors (IS) lies on the OB. Each IS is an ultra-vacuum enclosure for the Test Mass, the Caging Mechanism (CM) and the Electrode Housing (EH), located around the TM.



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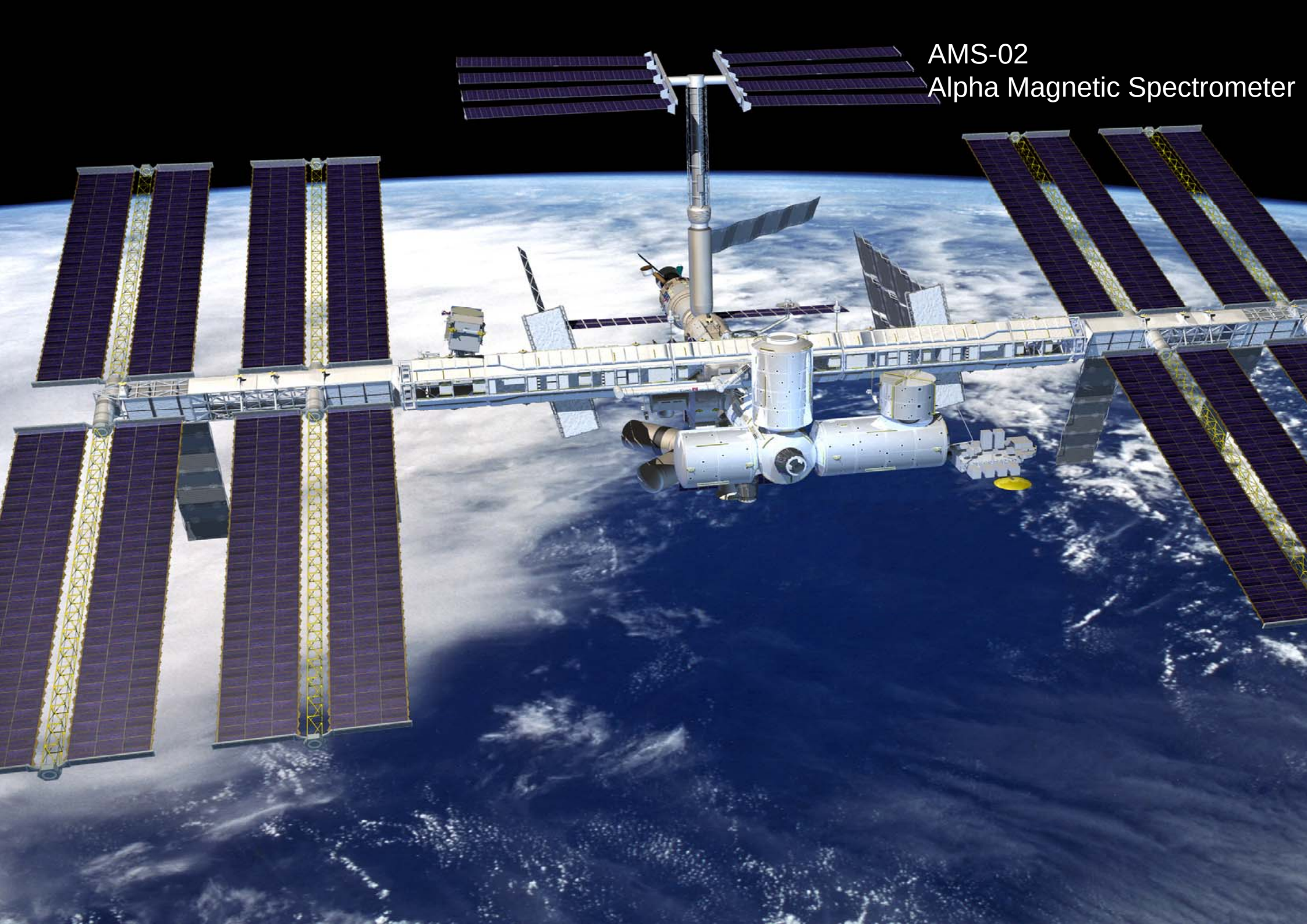
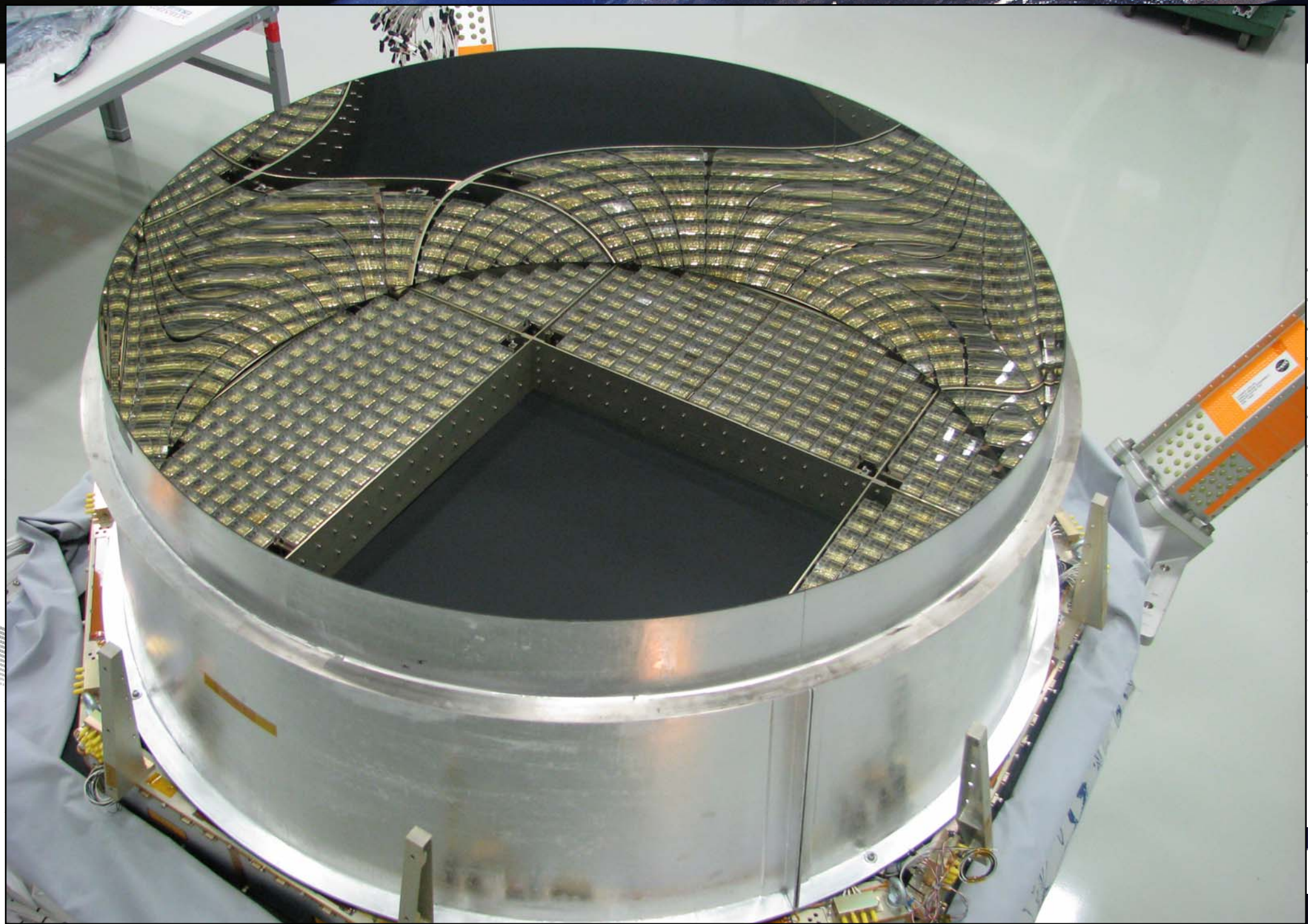

AMS-02
Alpha Magnetic Spectrometer


The AMS-02 payload
During its integration at CERN

RICH INTEGRATED IN AMS (December 2008)



CRYOCOOLER RADIATOR INTEGRATED WITH THE LOOP HEAT PIPES

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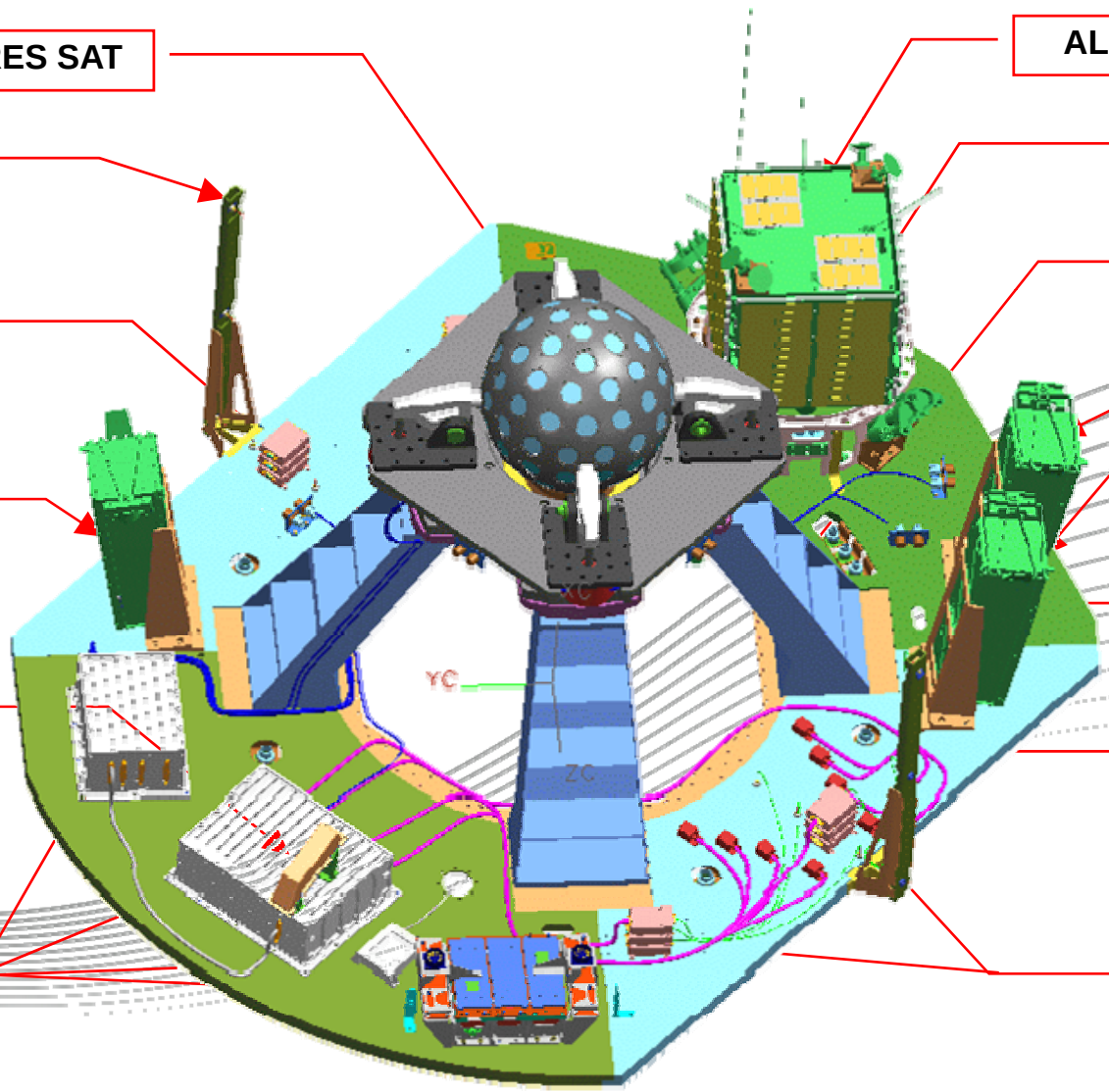
LARES SYSTEM: OVERVIEW



LARES SAT

ALMASat-1

Heat flux sensor support

SSEP

SSUP

Heat flux sensors conditioners

PPOD/Cubesats

PPOD/Cubesats

Heat flux sensor support

Video-camera

Accelerometer conditioners

A&H

Heat flux sensors conditioners

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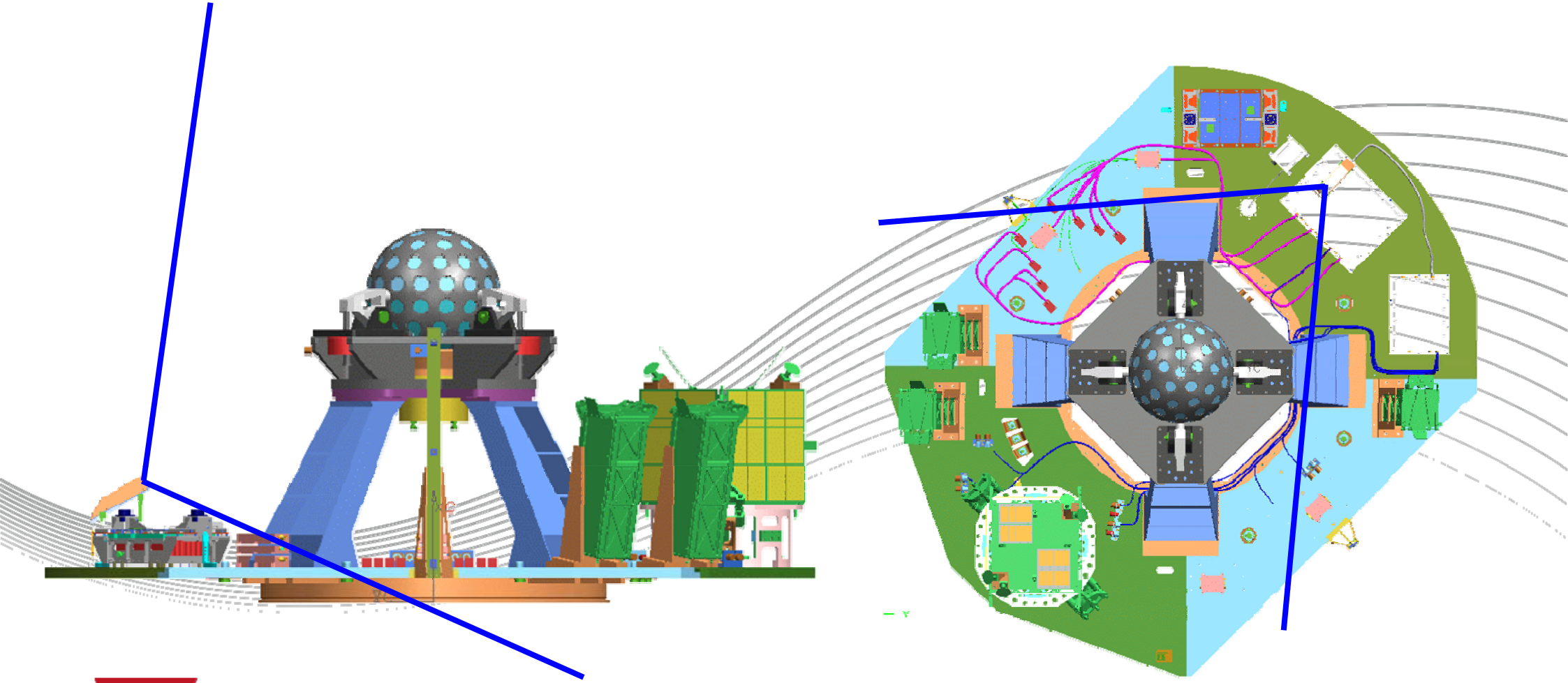
Internal video-camera field of view



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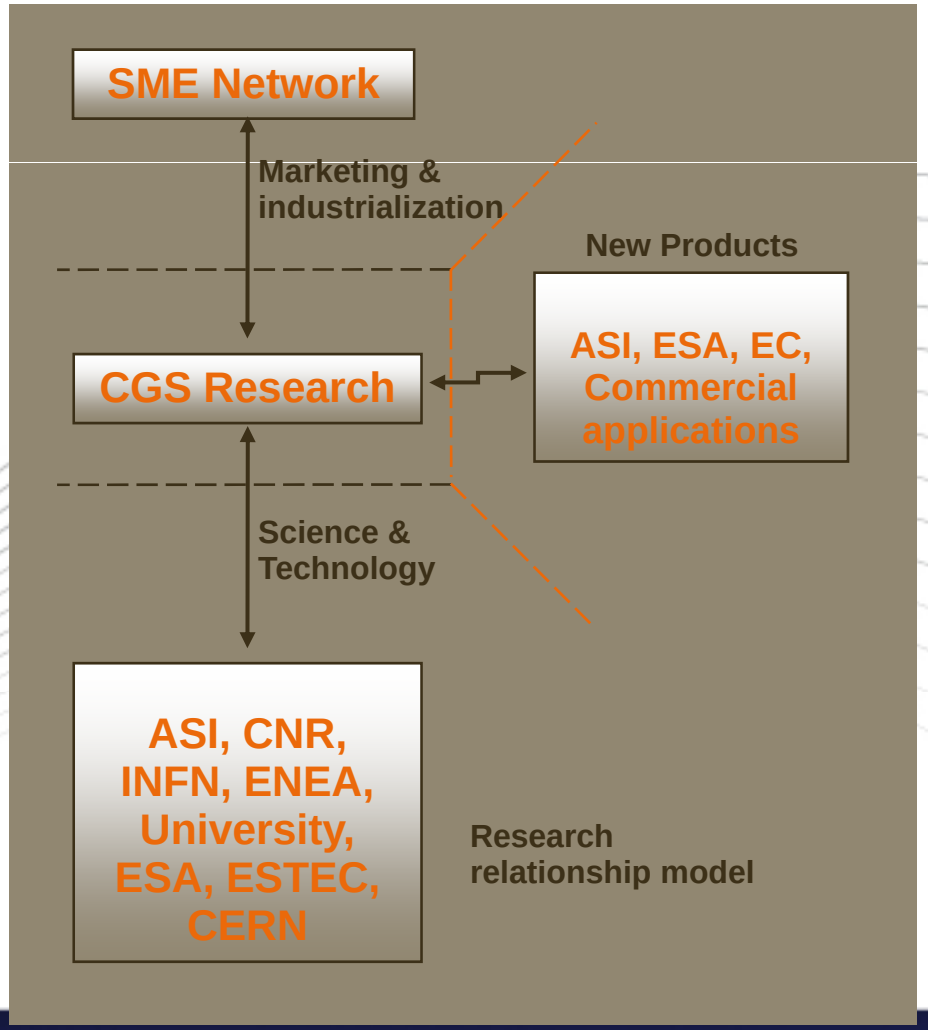
Rivalta Scrivia (AL) - Roma - S. Giorgio del Sannio (BN)

Research (1)

15 % of activities devoted to research projects



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Main Customers and Membership

Industries 4 Space Bases Consortium

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Research (2)

Collaboration with the main Research Institutes and Universities:

Mit
Massatchussets institute of technology

C.A.S.C.
Chinese Space Agency (Research institute)

C.N.R.
National Council of Research

Ente Nazionale per le Nuove Tecnologie l'Energia e l'Ambiente

Main Research Areas

- Micro and nano-technologies (e.g. MEMS/MEOMS)
- Fuel Cells Energetic systems
- Re-entry vehicles technology
- Telecommunications SDR technology
- Innovative structures & thermal technologies