From Proposal to Reliability: ESA's Approach to RHA in Space Projects

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ESA ESTEC

24/07/2025

Summaries

23/07: **Radiation Challenges and Reliable Testing Methods**

- Radiation testing - Generalities
- Standards test methods
- Alternatives test methods
  - Pulsed scanned methods (SEE Laser)
- Conclusion

24/07: **ESA's Approach to RHA in Space Projects**

- The European Space Agency
- RHA process
- ESA's R&D programs
- ESA Education office
  - Trainings
  - Programs
  - Early career opportunity

The European Space Agency

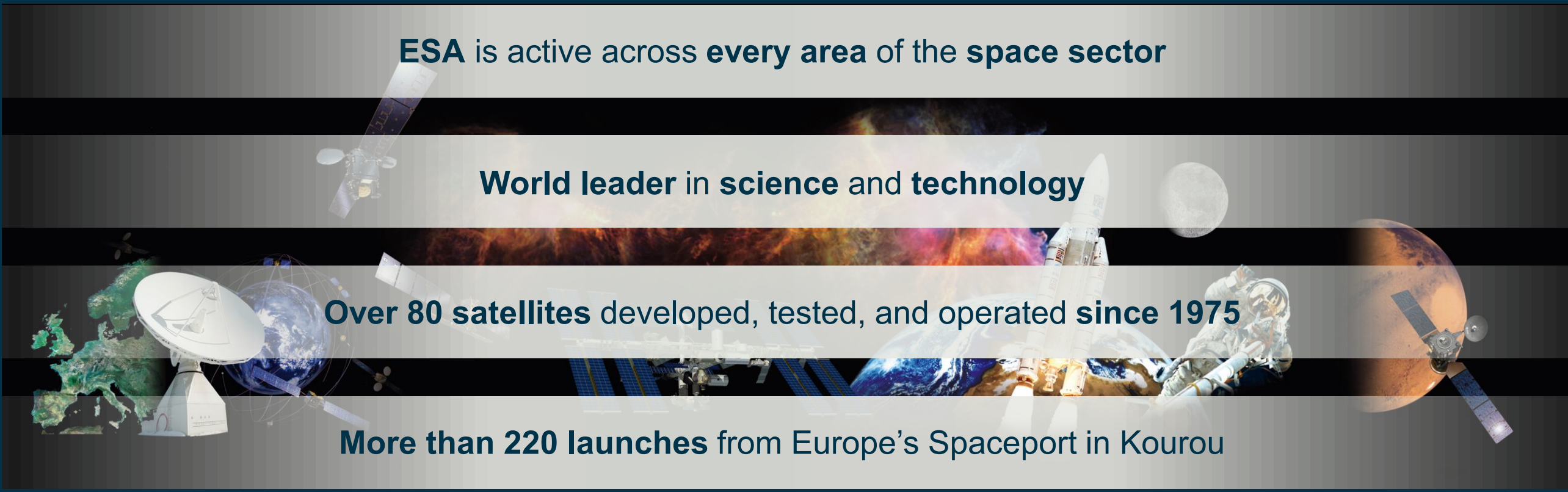
We Are ESA

EUROPE'S GATEWAY TO SPACE

WHAT	22 Member States, 5000 employees
WHY	Exploration and use of space for exclusively peaceful purposes
WHERE	HQ in Paris, 7 sites across Europe and a spaceport in French Guiana
HOW MUCH	€6.49 billion = €12 per European per year

What Does ESA Do?

ALL OF THIS IS POSSIBLE THANKS TO THE COLLABORATION OF MEMBER STATES



ESA is active across **every area** of the **space sector**

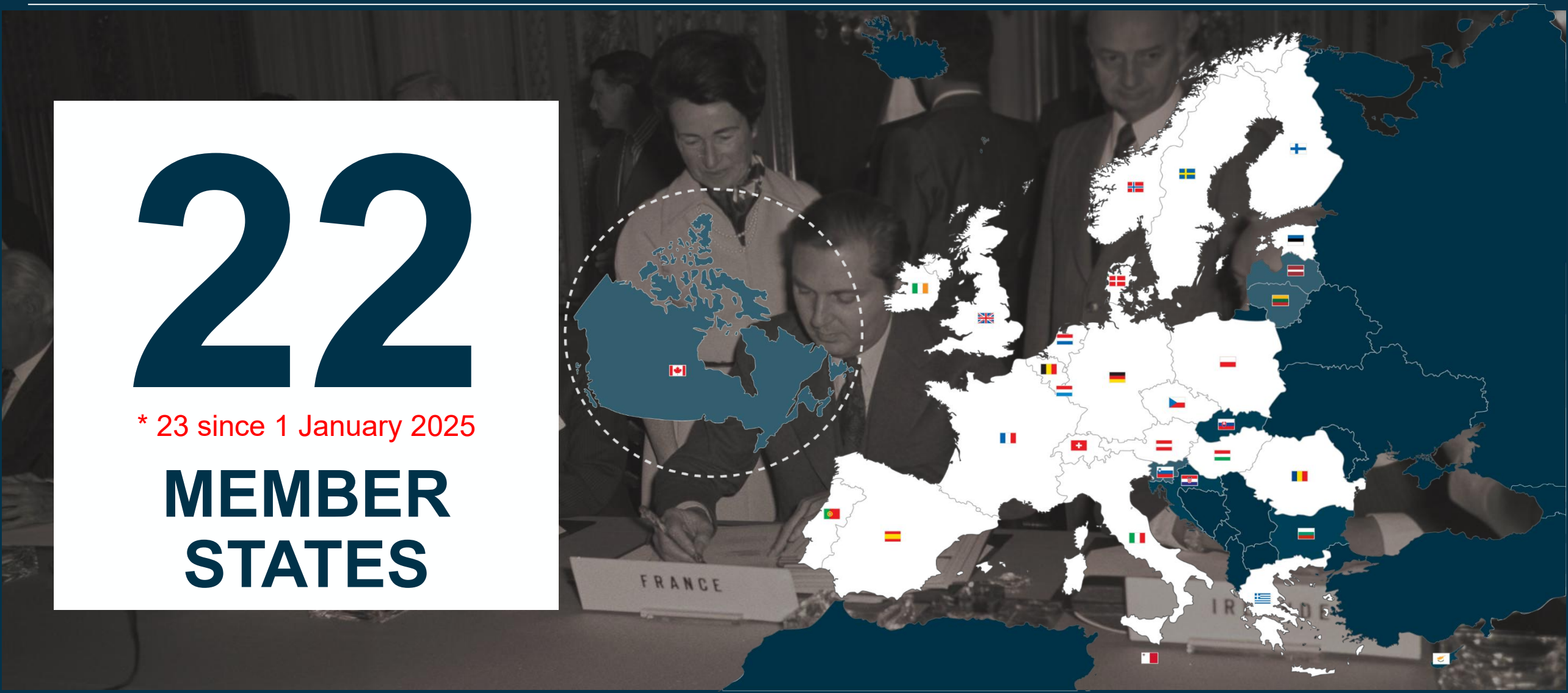
World leader in **science** and **technology**

Over 80 satellites developed, tested, and operated **since 1975**

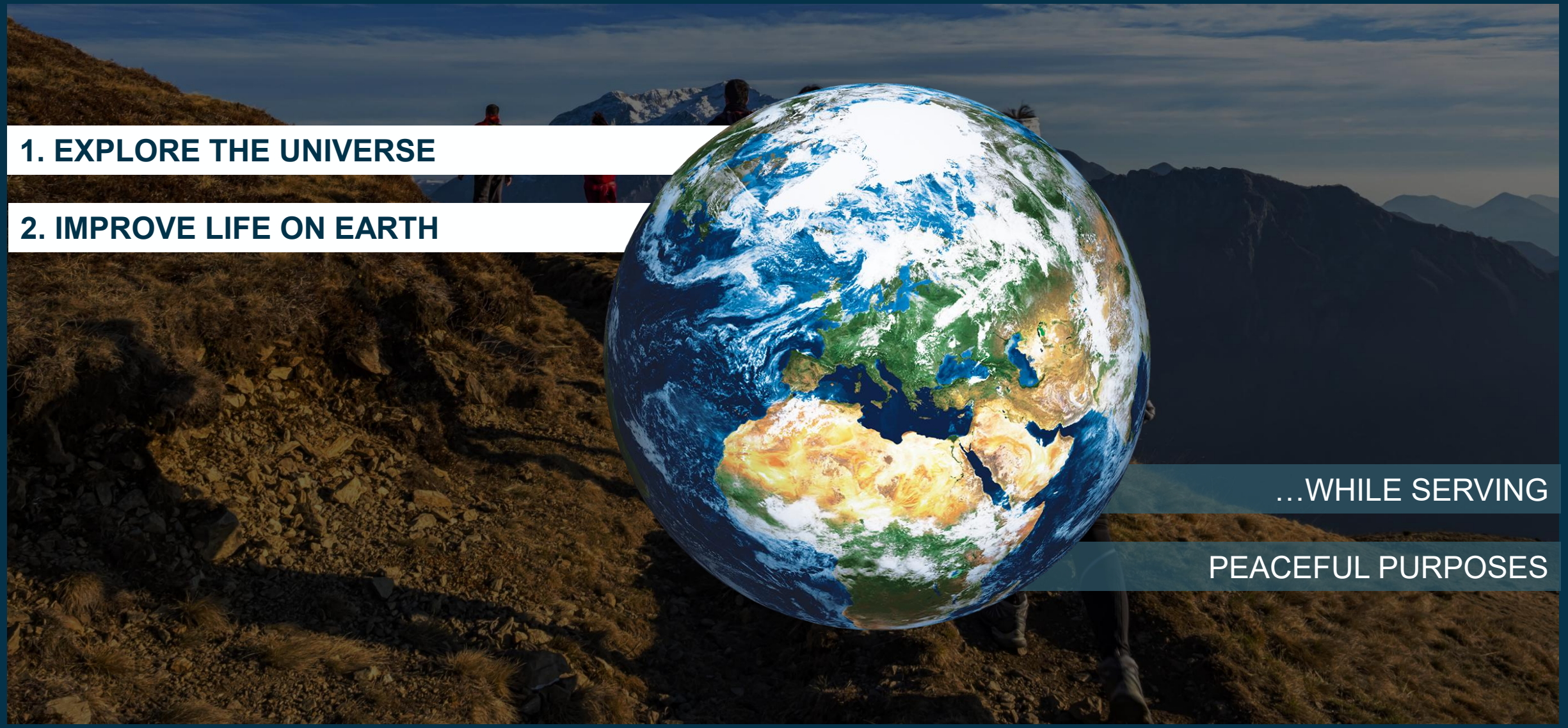
More than 220 launches from Europe's Spaceport in Kourou

1975 Signing of ESA Convention

Today - 2021



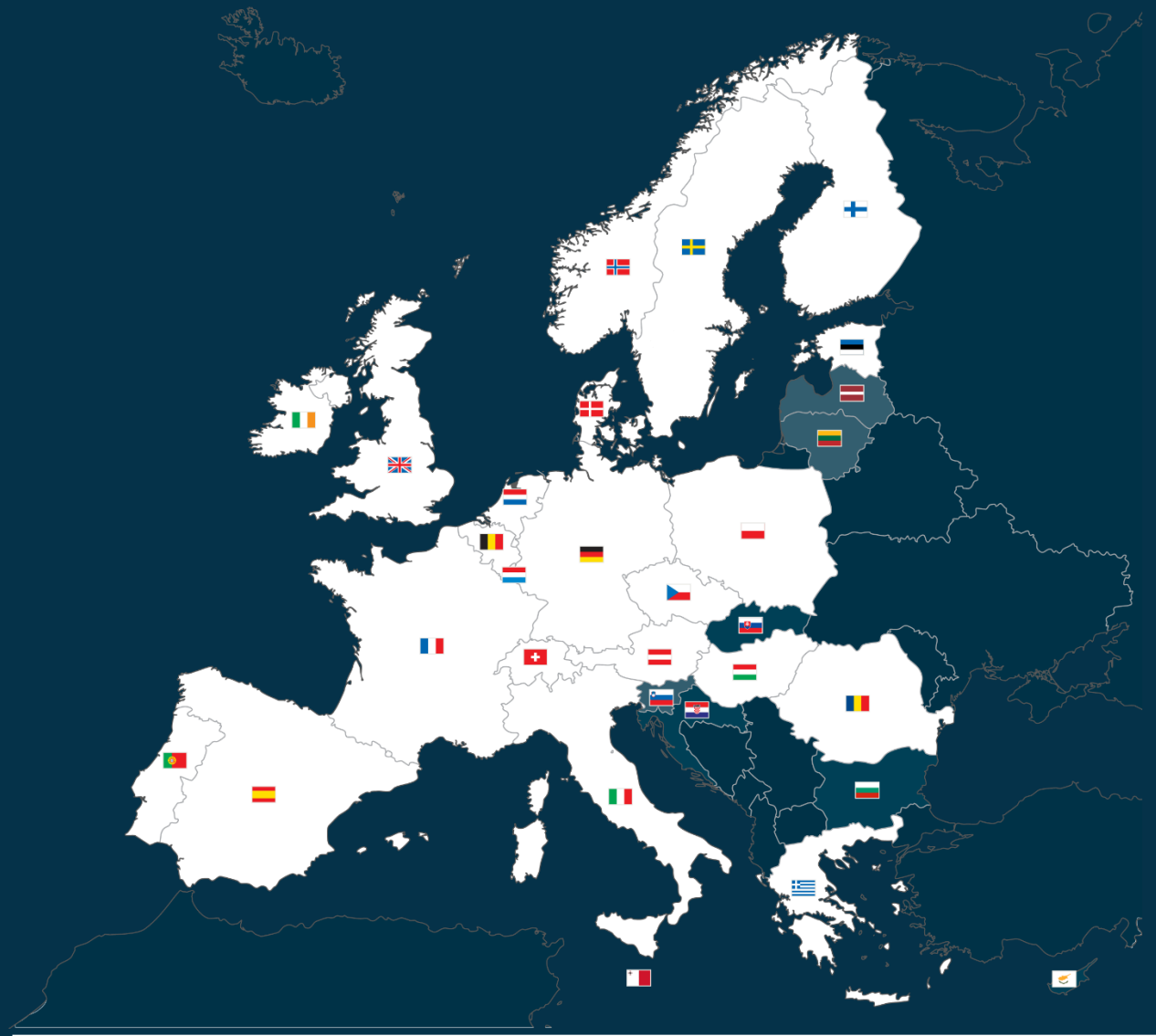
The Explorers and Their Challenge



CORPORATE ACTIVITIES

ESA Establishments

ESA Establishments *(1)*



Headquarters
Located in Paris, home to the main programme directorates that steer and formulate ESA policy.

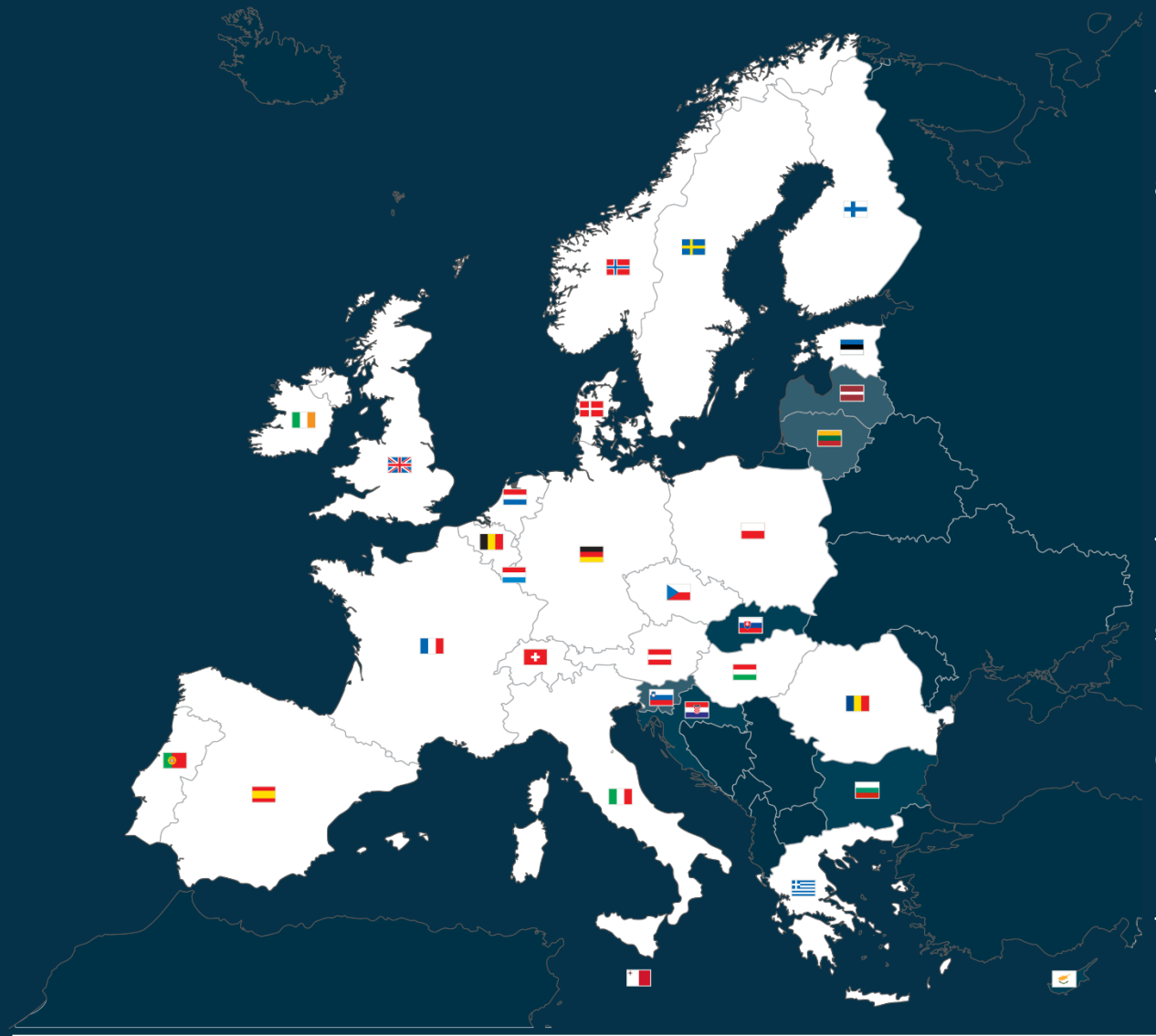
ESRIN
ESA's centre for Earth observation activities, near Rome, Italy, also develops information systems and hosts the Vega launcher project.

ESTEC
The European Space Research and Technology Centre, Noordwijk, the Netherlands, is the largest site and the technical heart of ESA.

ESOC
The European Space Operations Centre, Darmstadt, Germany, tracks and controls European spacecraft.

EAC
The European Astronaut Centre, Cologne, Germany, trains astronauts for missions to the International Space Station and beyond.

ESA Establishments *(2)*



ESAC
The European Space Astronomy Centre, near Madrid, Spain, hosts the science operation centres and archives for ESA's astronomy and planetary missions.

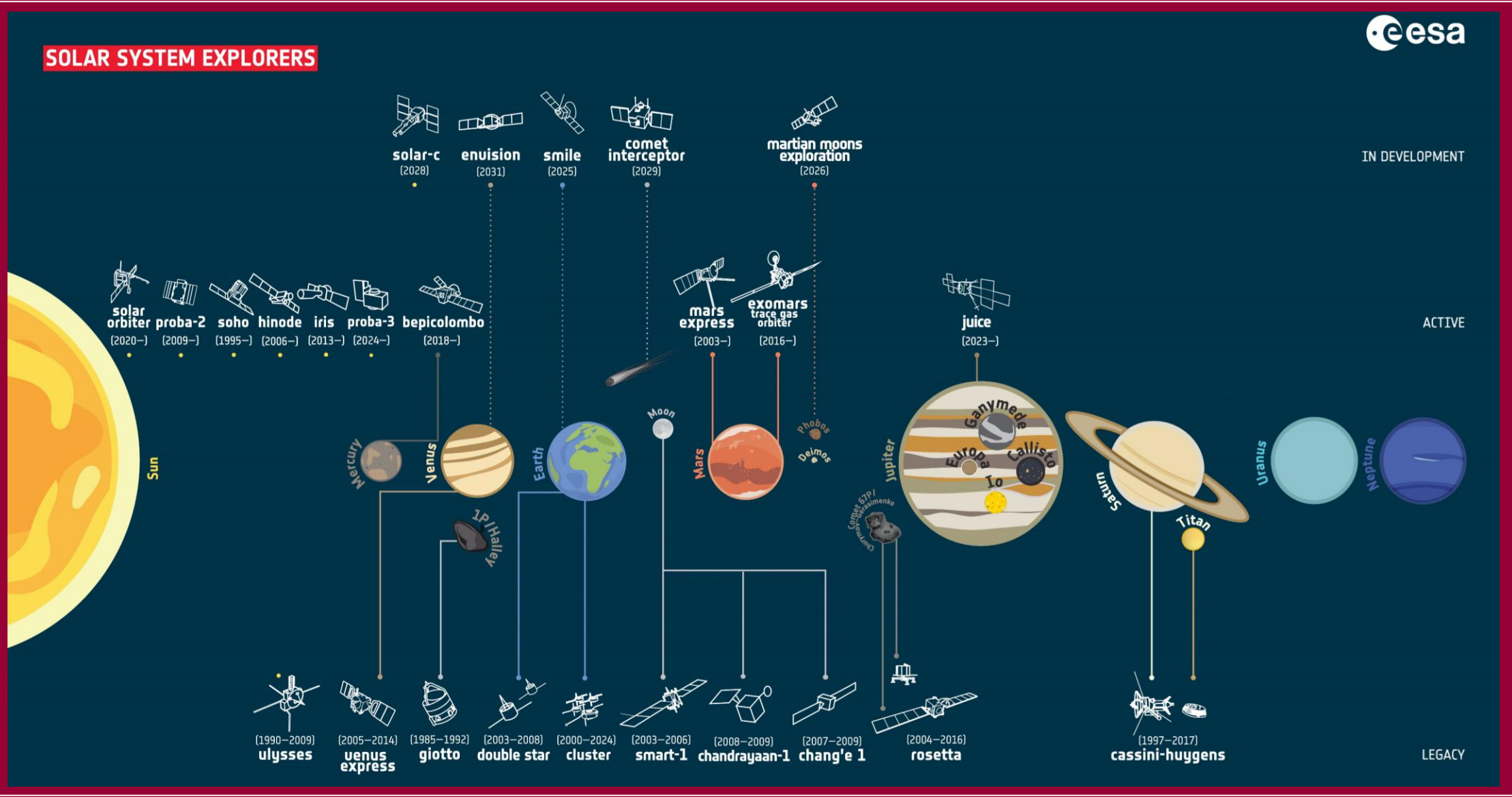
Harwell (ECSAT)
Harwell Centre, in Oxfordshire, UK, is focusing on commercialisation and partnerships in space activities.

Redu (ESEC)
The European Space Security and Education Centre in Belgium is part of ESA's ground station network and has specialised on operating small satellites and security relevant, sensitive operations.

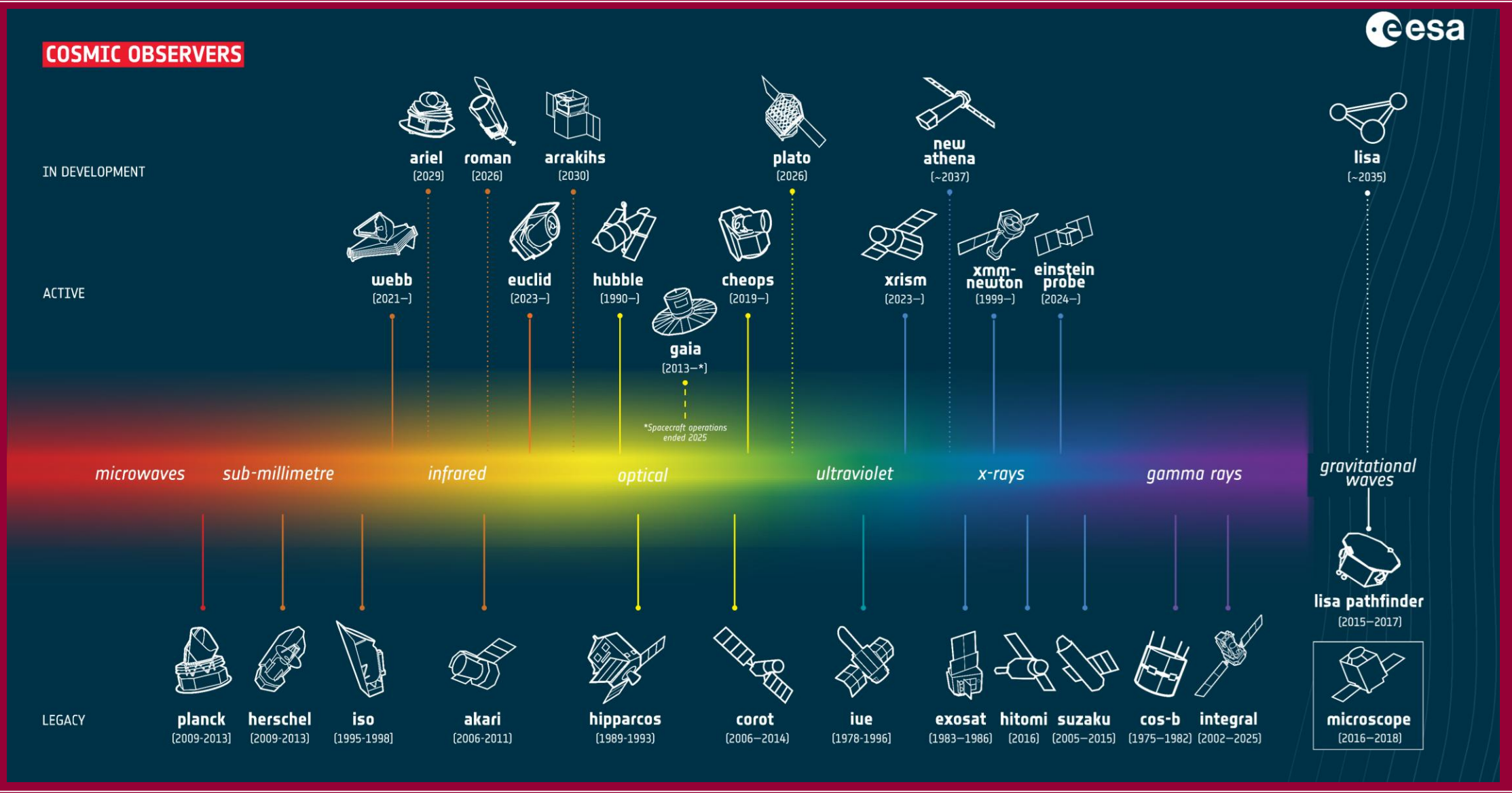
Guiana Space Centre
ESA's launchers lift off from Europe's Spaceport in Kourou, French Guiana. It is jointly operated by the French space agency (CNES) and Arianespace with the support of European industry.

SCIENCE & EXPLORATION

Some of Today and Tomorrow's Science Missions *(1)*



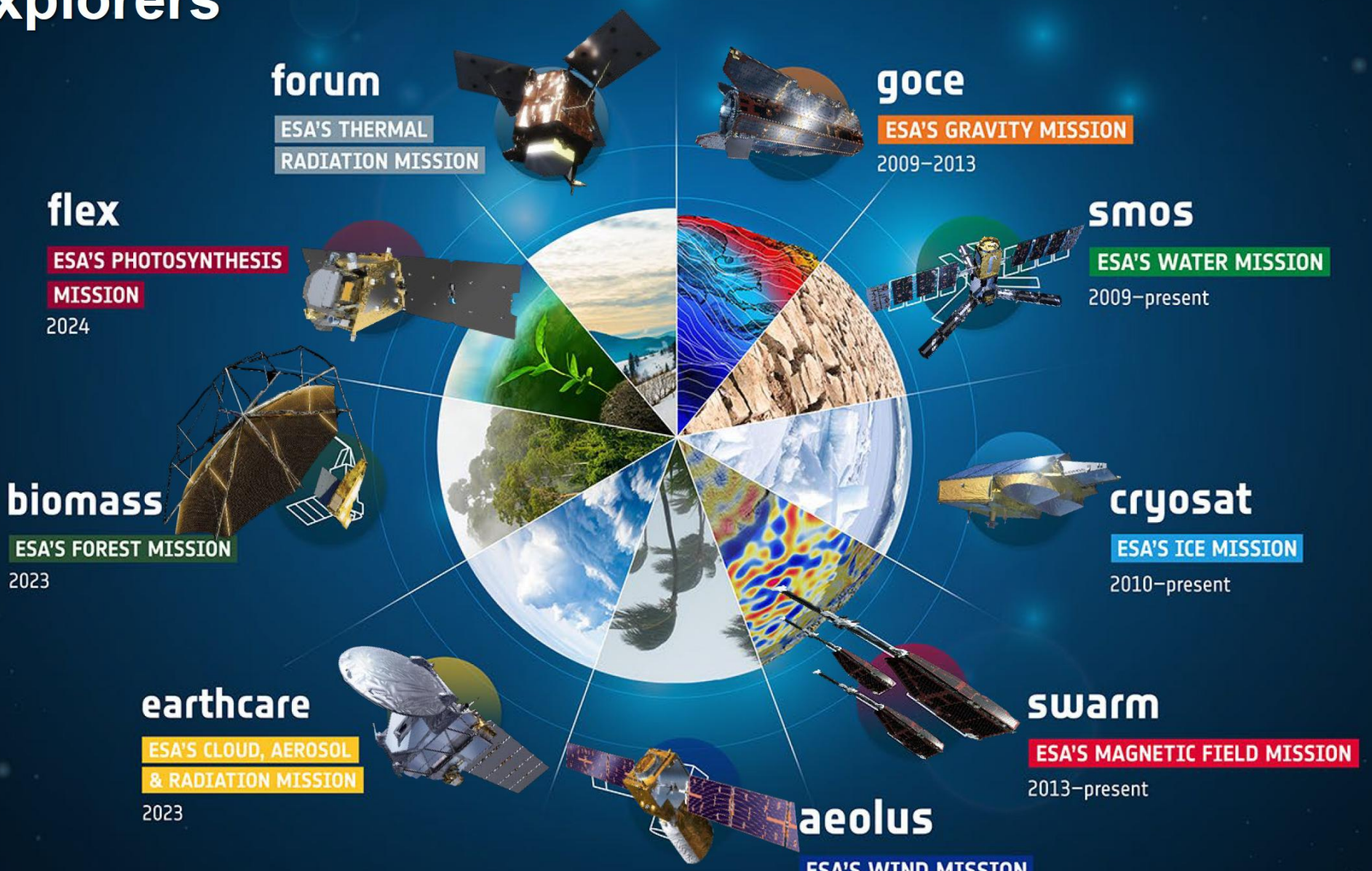
Some of Today and Tomorrow's Science Missions *(2)*



EARTH OBSERVATION


esa
2010
2015
2020
2025
2030
ERS-1
ERS-2
Envisat
MetOp-A
Proba-1
SMOS
GOCE
CryoSat
Swarm
Proba-V
Meteosat 10 (MSG)
MetOp-B
Sentinel-1A
Sentinel-2A
Sentinel-3A
Sentinel-5P
Meteosat 11 (MSG)
Sentinel-1B
Sentinel-2B
Sentinel-3B
MetOp-C
Sentinel-6 Michael Freilich
Sentinel-1C
Sentinel-2C
Sentinel-3C
Aeolus
EarthCARE
Biomass
Phisat-2
HydroGNSS
ALTIUS
FLEX
Sentinel-1D
Sentinel-2D
Sentinel-6B
Sentinel-3D
FORUM
Harmony
TRUTHS
MAGIC
Earth Explorer-11
Earth Explorer-12
MTG-I1
Sentinel-4A MTG-S1
Arctic Weather Satellite
CO2M-A
CO2M-B
CO2M-C
CRISTAL-A
CIMR-A
ROSE-L-A
LSTM-A
CHIME-A
CRISTAL-B
ROSE-L-B
LSTM-B
CHIME-B
CIMR-B
Sentinel-5A MetOp-SG-A1
MTG-I2
MetOp-SG-B1
MTG-I3
Aeolus-2A
Sentinel-4B MTG-S2
Sentinel-5B MetOp-SG-A2
MetOp-SG-B2
Sentinel-1
Sentinel-2
Sentinel-3
Sentinel-6
Sentinel Next Generation Missions
Science
esa
Copernicus
European Union
Meteorology
EUMETSAT
→ THE EUROPEAN SPACE AGENCY

Earth Explorers



PROGRAMME OF THE EUROPEAN UNION

Sentinel-Next Gen. under definition

Expansion missions : 1st launch (CO2M) in 2026

co-funded with esa

CHIME

Copernicus Hyperspectral Imaging Mission for the Environment

soil properties
crop health
raw materials
biodiversity
water quality

ROSE-L

L-band Radar Observing System

geohazards
polar ice
forest management
food security
maritime surveillance

LSTM

Land Surface Temperature Monitoring

sustainable agriculture
water resources management
drought
urban heat islands

CIMR

Copernicus Imaging Microwave Radiometer

sea-ice concentration
sea-surface temperature
polar maritime security
global ocean and cryosphere
soil moisture and vegetation

CO2M

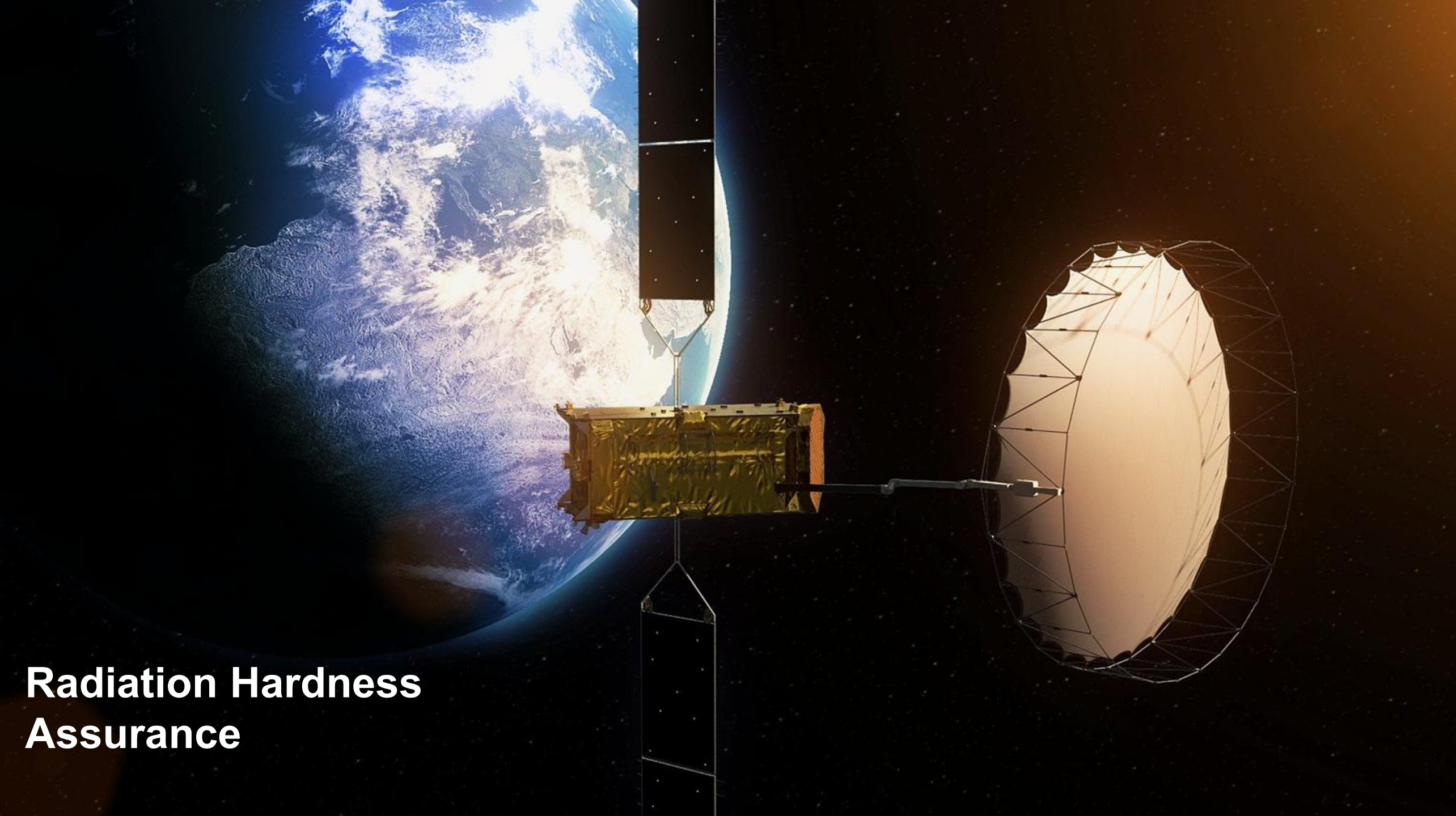
Copernicus Anthropogenic Carbon Dioxide Monitoring

carbon dioxide and methane from human activity

CRISTAL

Copernicus Polar Ice and Snow Topography Altimeter

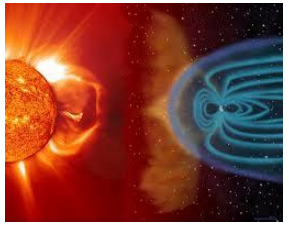
sea-ice thickness
ice sheets and glaciers
snow
polar oceanography
coastal and inland waters

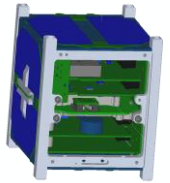


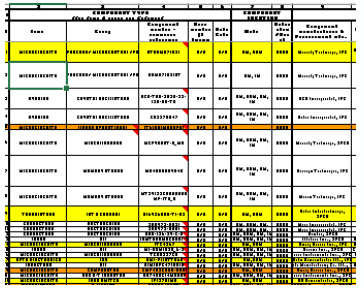
Radiation Hardness Assurance

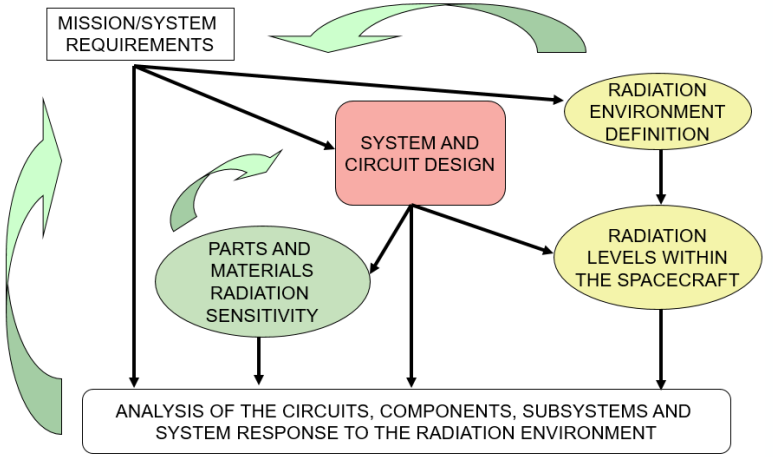
What is RHA?

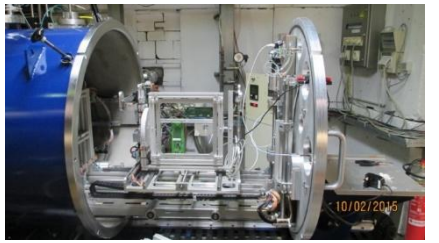
- **What is RHA**:
  - It is a PA discipline: **all activities** to "assure" radiation hardness!
  - An RHA Plan is defined and can be **adapted** to each project
- **When:**
  - From the **start of the design**, up to "CDR" (bulk of work)…until in-orbit anomaly investigations!
  - Radiation test, as part of RHA, is done before CDR…but also after CDR for RADLAT.
- **How**:
  - RHA engineer + **Interaction** with PA manager & other engineers from several disciplines
  - **Iterative** process but which should start early during the project lifecycle.
  - Summarised in the **Radiation Analysis Report**











Radiation Requirements Flow-Down

Environment requirement
-Particle fluxes, incident and shielded
-Dose versus depth curve
-Damage versus depth curve
-LET spectra
Requirements
-Radiation top level requirements and design margins
-Tolerable system failure rate, Availability requirements

Orbit & mission duration
Spacecraft layout
Spacecraft mass
Cost, Risk

Mass distribution
Location of sensitive parts
Radiation tolerance of parts

-mass budget
-subsystem SEE requirements
-subsystem performance requirements
-Top level requirements or S/C shielding
- design margins

System Level

Sub-System Level

EEEComponent Level

Part selection
Test method
Lot variation

-test requirements
-part SEE tolerance level
-part TID and TNID tolerance level

Radiation Hardness Assurance During the Program Life

Phase B1 – SRR (System Requirement Review)

- Draft environment definition
- Draft hardness assurance requirements (top level)
- Preliminary studies

Phase B2 – PDR (Preliminary Design Review)

- Final environment definition
- Electronic design approach
- Preliminary spacecraft layout for shielding analysis
- Preliminary shielding analysis & hardness assurance requirements update

As designed ERCB

Phase C –CDR (Critical Design Review)

- Radiation test results
- Final shielding analysis & final hardness assurance requirement
- Circuit design analysis results

As built ERCB

Phase D

- Radiation Lot Acceptance Tests (RLAT)

Phase E

- Failure analysis

Radiation Environment Analysis ECSS:

- ECSS-E-ST-10-04C – Space Environment
- ECSS-E-ST-10-12C – Methods for calculating radiation received, it's effects & design margins
- ECSS-E-HB-10-12A – Handbook for the above
- ECSS-E-ST-20-06C – Spacecraft Charging

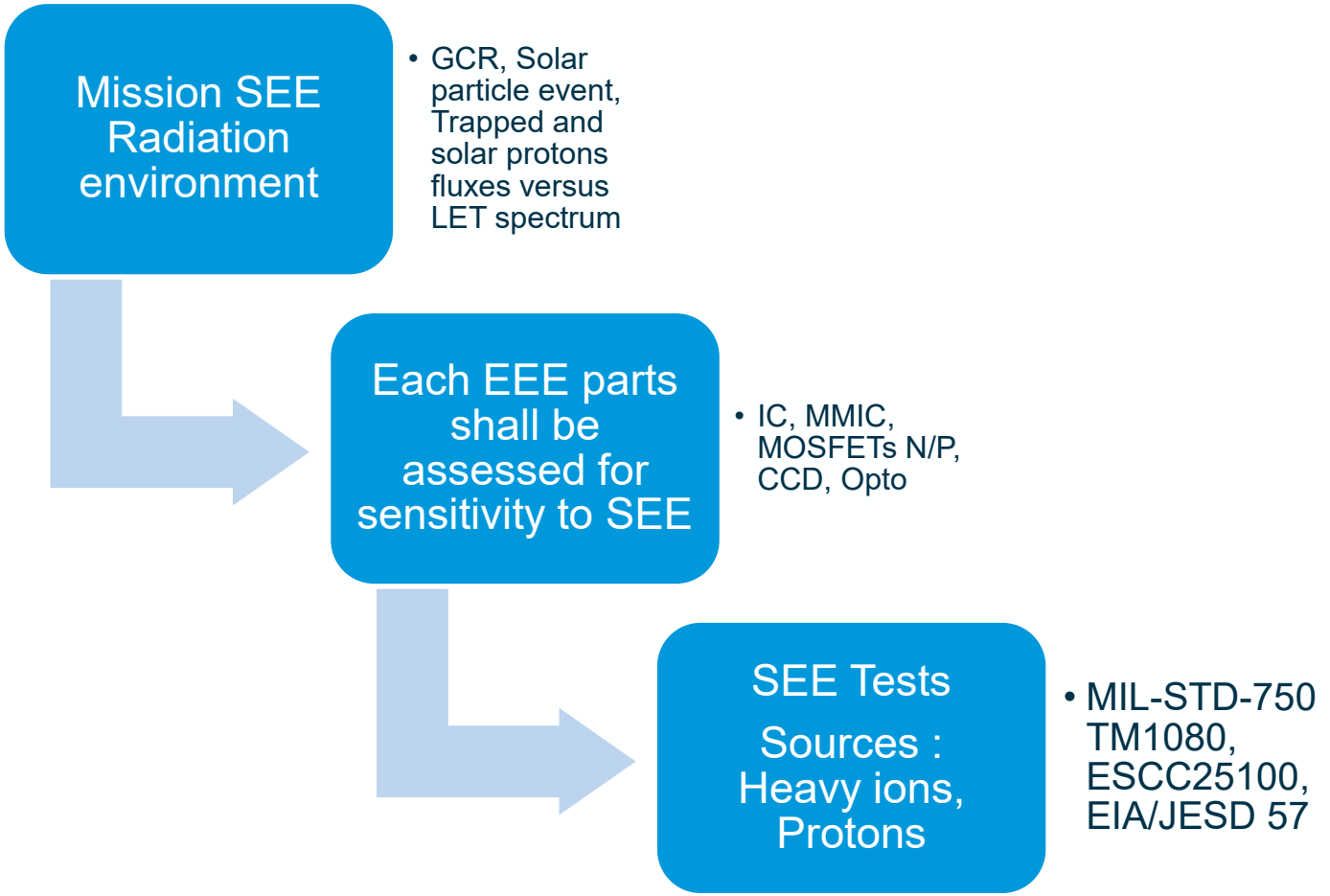
Radiation Hardness Assurance EEE Components ECSS:

- ECSS-Q-ST-60-15C – RHA for EEE components
- ECSS-Q-HB-60-02A – Techniques for radiation effects mitigation in ASICS and FPGAs handbook

Component Radiation Testing Specifications ESCC:

- ESCC 22900 – Total Dose Irradiation Test Method
- ESCC 25100 – Single Event Effects Test Method and Guidelines
- ESCC 22500– Guidelines for Displacement Damage Irradiation Testing

Traditional SEE RHA Process



No SEE shall cause damage to a system or a subsystem or induce performance anomalies or outages not compliant with mission specifications

Alternative Sources: Cf-252, Focused Pulsed Laser, Neutron, Alpha sources

Alternative sources shall not be used for SEE qualification. Only for preliminary assessment
Ref ECSS-Q-ST-60-15C

ESA new Approach to Mission Classes
Evolution of RHA and SEE test requirements -in definition

5 Classes, 4 different sets of requirements tailored from ECSS-Q-ST-60-15

Class V

- < 3 M
- No TID test
- NO SEE test **except for MOSFET VDS > 200V**
- **Proton Test recommended (component or board level)**

δ

Class IV

- 3M-2y
- No TID test if TIDL<5Krad
- **SEE** HI test **recommended**
- **Proton** test **required**

γ

Class III

- 2y -5 y
- No TID if TIDL<5Krad
- HI at part and board level
- Proton at part and board level

β

Class I & II

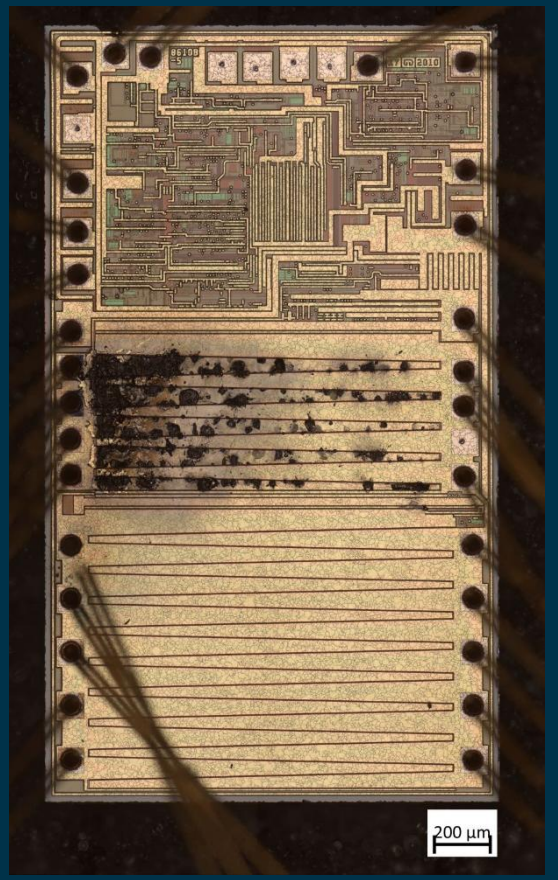
- > 5 y
- ECSS-Q-ST-60-15 + ESSB-Q-008
- TID
- SEE

α

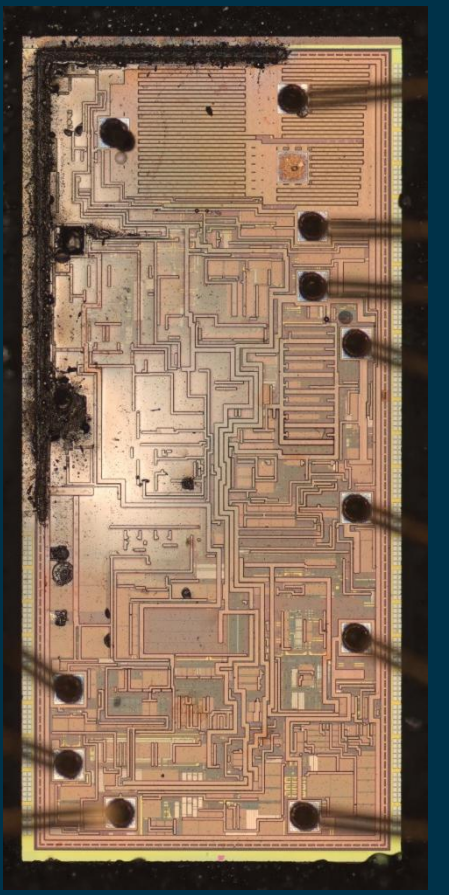
SEE - Analysis Requirement ECSS-Q-ST-60-15C

SEE LET Threshold	Analysis Requirement
$LET_{threshold} > 60$ MeVcm^2/mg	SEE risk negligible, no further analysis needed
15 MeVcm^2/mg$<LET_{threshold}<$60 MeVcm^2/mg	SEE risk, heavy ion induced SEE rates to be analyzed
$LET_{threshold} < 15$ MeVcm^2/mg	SEE risk high, heavy ion and proton induced SEE rates to be analyzed
$LET_{threshold} < 1$ MeVcm^2/mg ?	Very high SEE risk, heavy ion and proton (indirect and direct ionization) and electrons

Bonus: Destructive Single Event



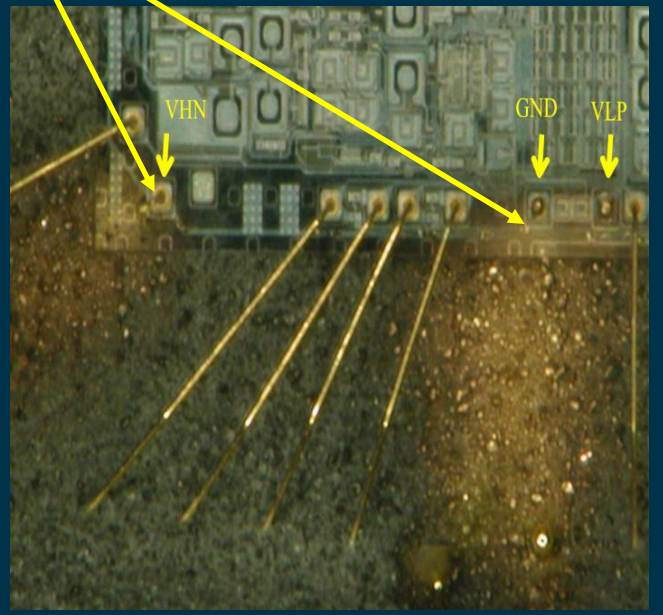
DC/DC:
LT8603

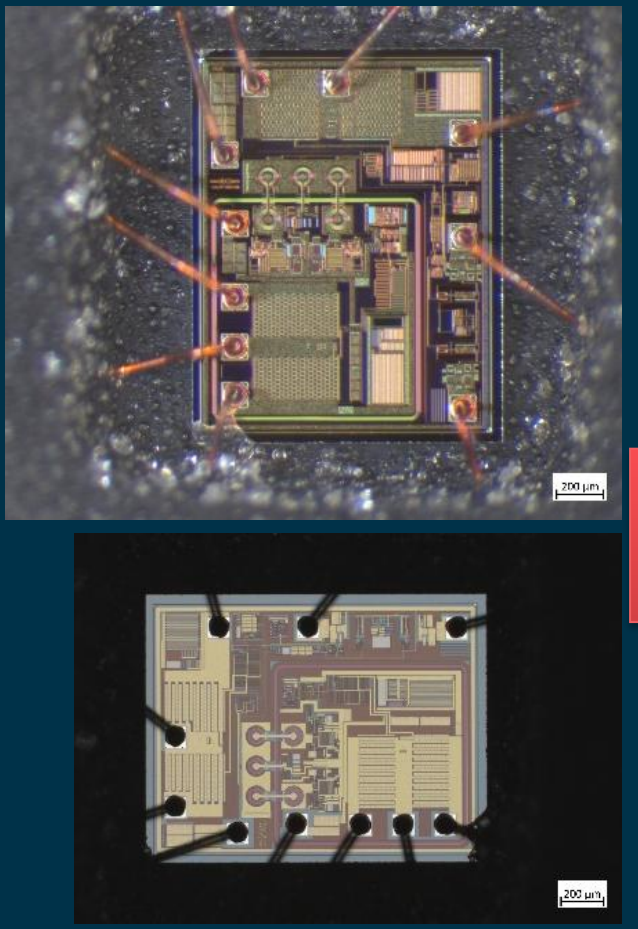


DC/DC:
MAX17551

Bonus: Destructive Single Event

Vaporized wirebonds in an Agere LSP2916 MEMS Driver from an SEL





ESA programs and initiatives

ESA programs and initiatives

Non-Exhaustive list of programmes and initiatives within ESA:

Procurement actions reserved for SME and "Non-Primes" (C1-C4 clauses)

Technology Development Element Programme (TDE)

General Support Technology Programme (GSTP)

Discovery & Preparation

Science Core Technology Programme (CTP)

ARTES 4.0 Programme

ARTES Core Competitiveness (part of ARTES 4.0)

BASS – Business Applications and Space Solutions (part of ARTES 4.0)

Boost! - Commercial Space Transportation Services and Support Programme

FLPP - Future Space Transportation ecosystem programme

Future EO – Earth observation science for society

:

:

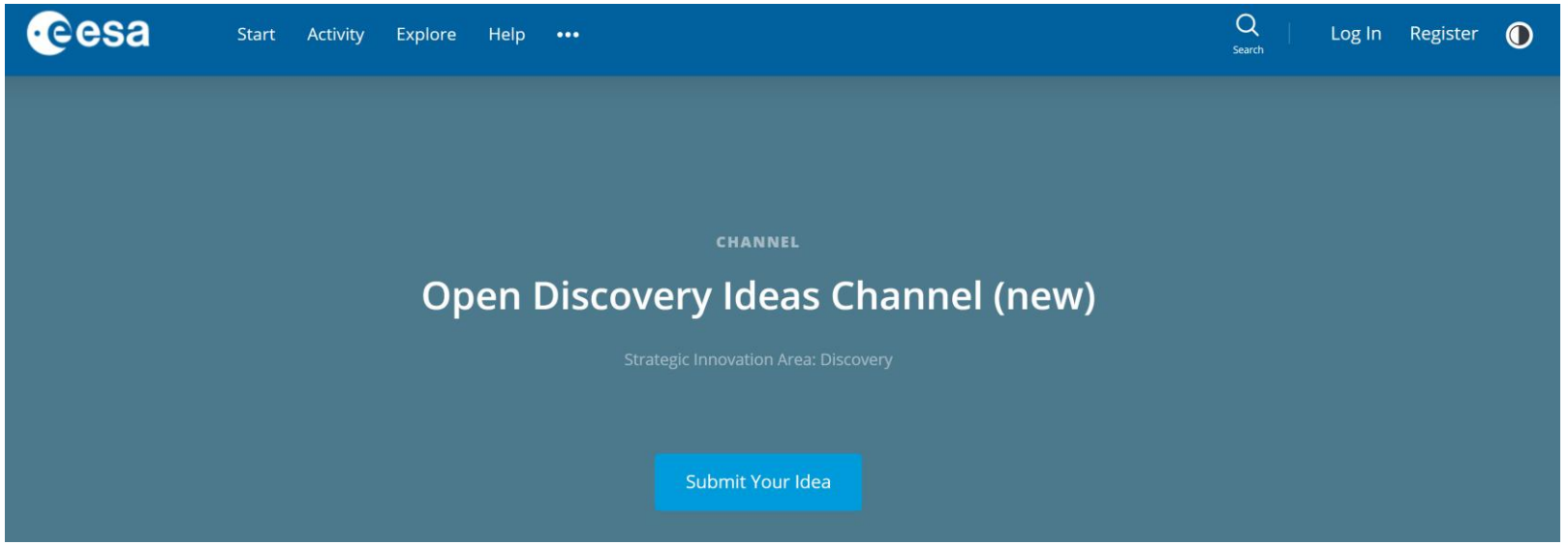
Lots of programs
Every program had its own objective

From:
https://www.esa.int/About_Us/Business_with_ESA/Small_and_Medium_Sized_Enterprises/ESA_programmes_and_activities_of_interest_to_SMEs#GSTP

ESA programs and initiatives

The Open Space Innovation Platform (OSIP)

OSIP Program



ESA Director General
Sponsor

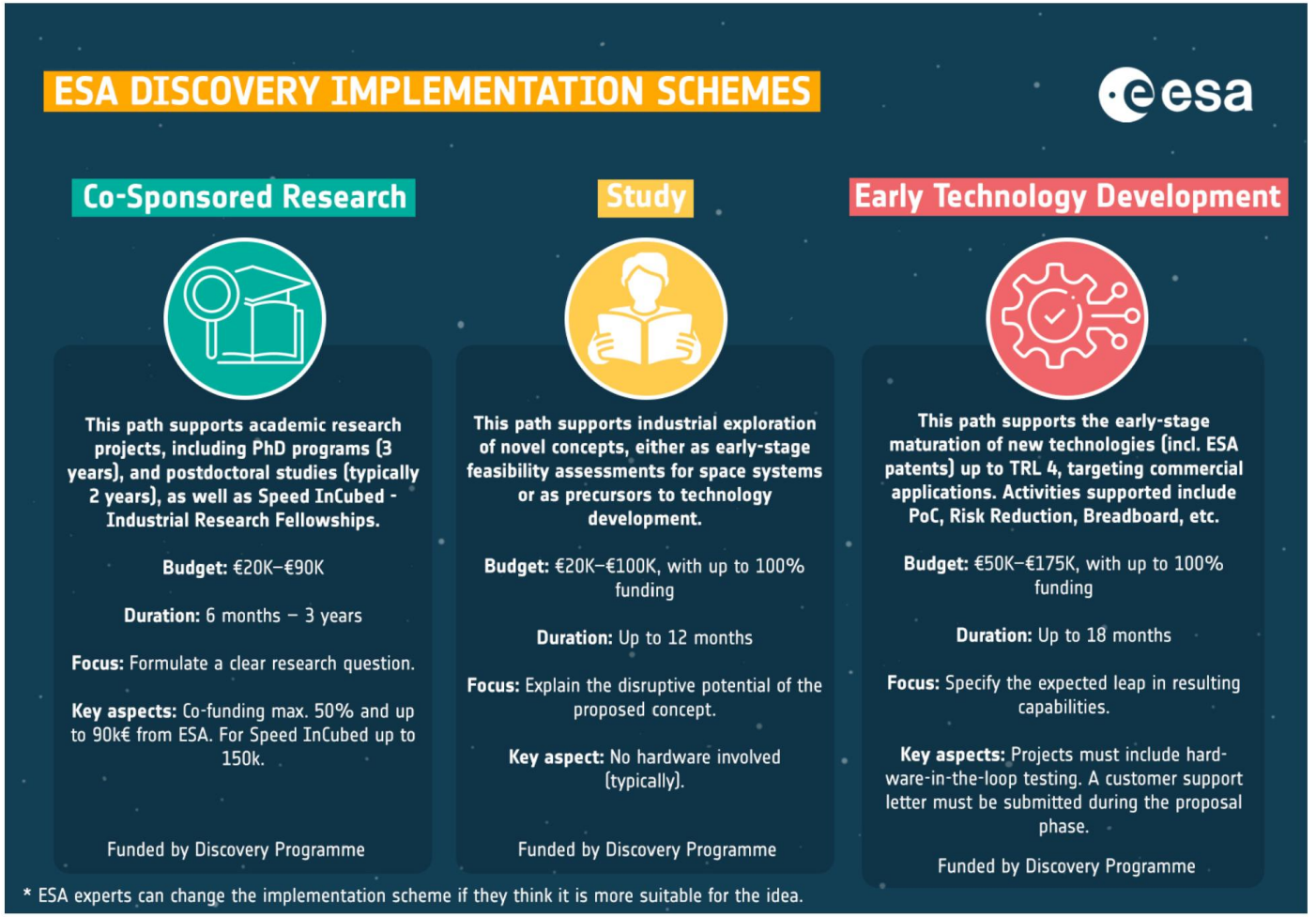
35 Followers

Got an idea that could revolutionise space research and technology? We're looking for visionary concepts and technologies to explore and inject into the European space landscape. This channel offers a streamlined entry point to ESA's R&D pipeline.

From:
https://ideas.esa.int/servlet/hype/IMT?documentTableId=4508721805316882 5&userAction=Browse&templateName=&documentId=084c11fe4a9679bf192774977870faba

OSIP Program

The ESA Discovery Implementation Schemes



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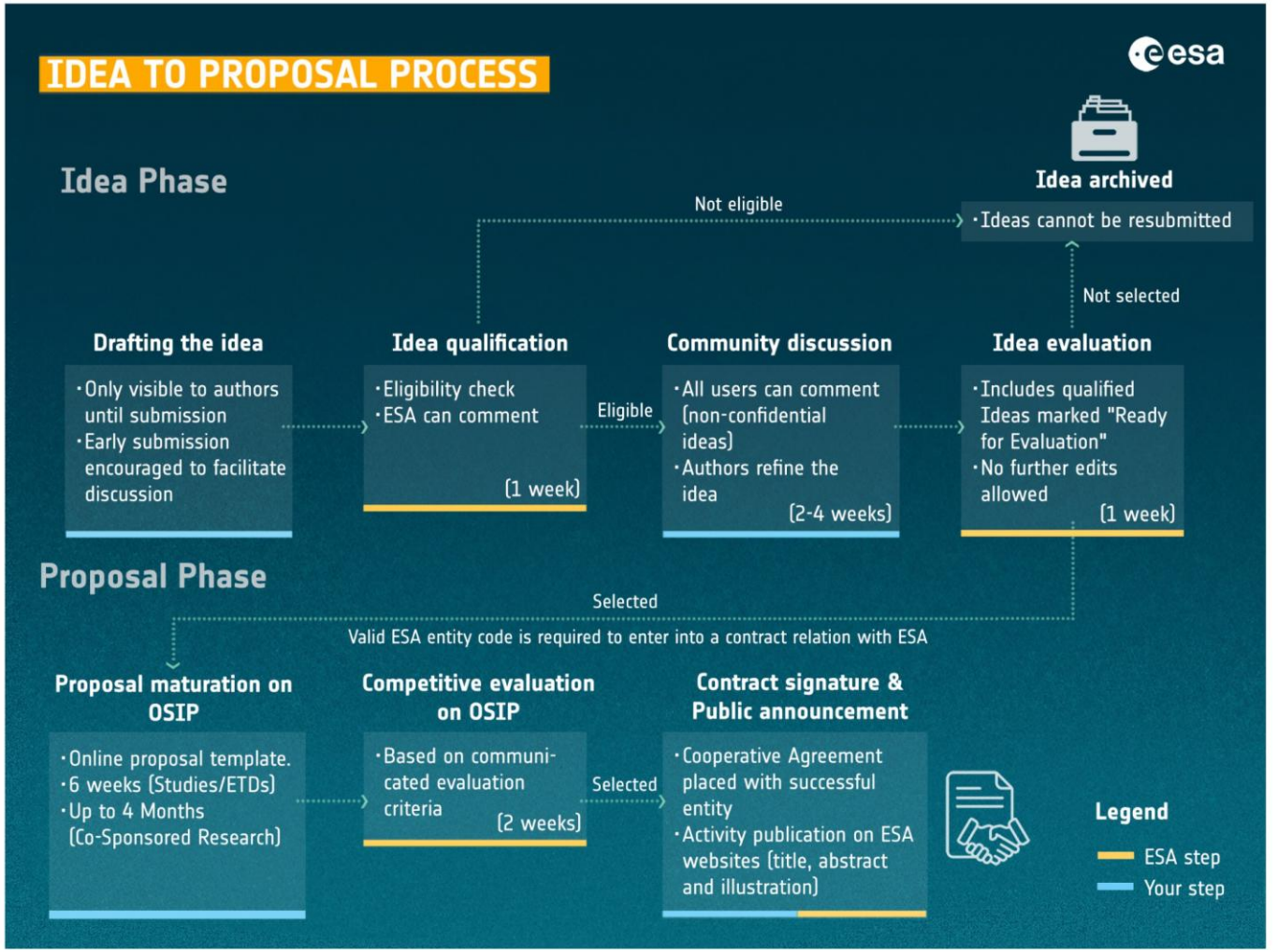
OSIP Program



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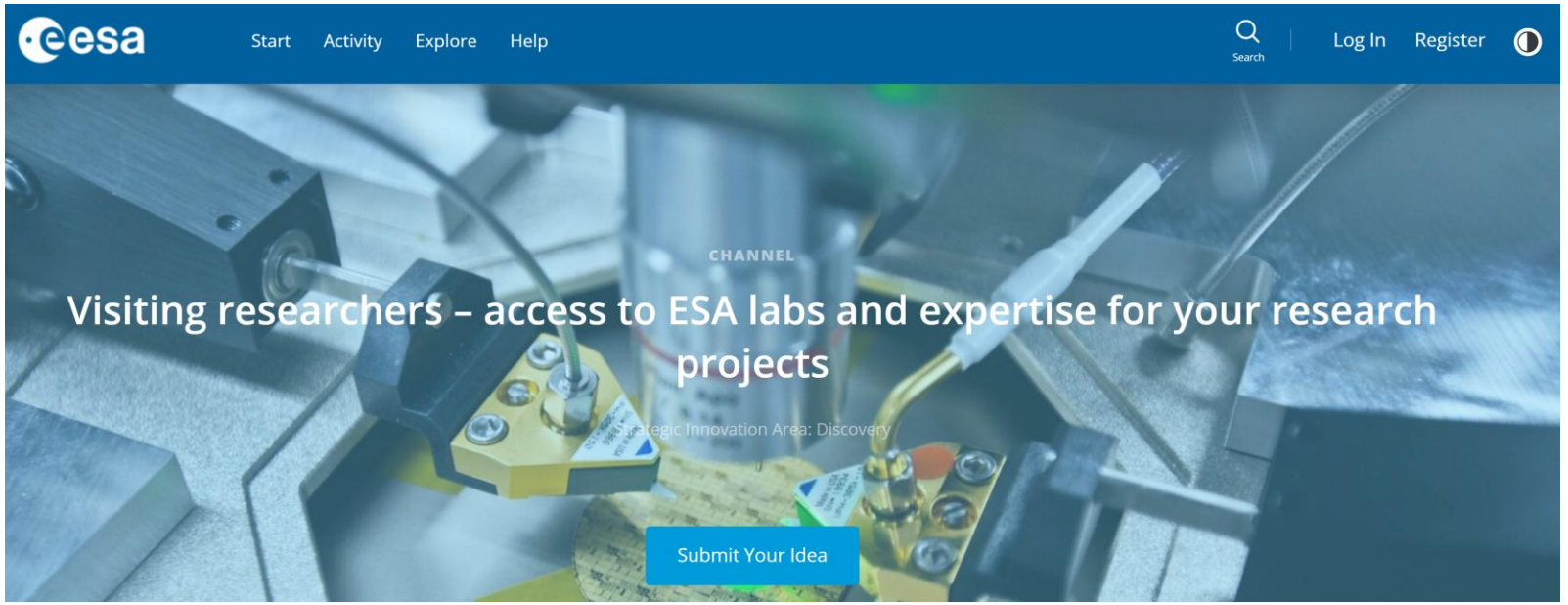
OSIP Program – Visiting researcher



Director of Technology, Enginee...
Sponsor

Do you have a funded research project and think that you might benefit from ESA labs and/or expertise by joining as a visiting researcher? Submit your project here!

From:
https://ideas.esa.int/servlet/hype/IMT?documentTableId=45087661359713405&userAction=Browse&searchTerm=dmlzaXRpbmc&templateName=&documentId=ea0e1fd289bd5f4f9a47138cc6791b2e&searchContextId=c3965aabf3c7c1c4a72b2a97b583ed42

OSIP Program – Visiting researcher

Who is this for?

The visiting researcher channel is for active European researchers at the PhD, post-doc or higher level. Visiting researchers are expected to be able to perform research autonomously, as well as to understand and have experience with the typical requirements and rules of laboratory work. Visiting researchers need to have an ongoing researcher contract with an ongoing funded project and be employed by an organisation in one of ESA's Member and Cooperating States. The Channel is not open for Master's students and is not intended as a training exercise. If you are a European business interested in using ESA labs, please have a look at our simplified lab access.

How long or short are the stays of visiting researchers?

There is no fixed length of stay and some projects might require multiple shorter stays. Thus these stays by visiting researchers at ESA could last from a few weeks up to a year, if justified by the project and agreed with the ESA team/lab.

From:
https://ideas.esa.int/servlet/hype/IMT?documentTableId=45087661359713405&userAction=Browse&searchTerm=dmlzaXRpbmc&templateName=&documentId=ea0e1fd289bd5f4f9a47138cc6791b2e&searchContextId=c3965aabf3c7c1c4a72b2a97b583ed42

ESA Academy

Enhancing skills, boosting ambitions

Opportunities for tertiary education students and early-career professionals

Alex Kinnaird

Directorate of Technology, Engineering and Quality

ESA/ESTEC

28 Feb 2025

STEM LEARNING & INSPIRATION

ESA ACADEMY

esa academy

esa

For tertiary-level students and early-career professionals from ESA Member and Associate States

Transfer of space know-how and **interaction with space professionals**

Enriching academic education to increase **employability** within space sector

Stimulate **innovation & entrepreneurship** in response to community needs

ESA Education Programme - Objectives and Relevance

❖ Objectives

- *inspiring and engaging the next generation*
- *enhancing youngsters' literacy & competences in STEM*
- *motivating students to pursue studies & careers in the space sector*

  - ➢ *by using space as learning & teaching contexts*
  - ➢ *by offering unique hands-on opportunities & access to SoA facilities*
  - ➢ *by sharing ESA's expertise*

❖ Contributing to building the human capital needed by the European space sector to implement its programmes

- equip the future workforce with the skills and competences which Europe needs in order to remain competitive
- stimulate creativity, innovation and entrepreneurship
- eventually enhance employability

ESA Academy in a nutshell

18+ y/o

ESA ACADEMY

TRAINING

TRAINING SESSIONS
- Online training sessions
- Onsite training sessions
- Hybrid training sessions

ONLINE LEARNING LIBRARY

PROJECTS

EXPERIMENTS
- Large Diameter Centrifuge
- Parabolic Flights
- Drop Towers
- Orbital Robotics Laboratory
- Space Rider
- International Space Station

SATELLITES
- Fly Your Satellite
- Fly Your Satellite - Design Booster
- Fly Your Satellite - Test Opportunities

ROCKETS
- Fly a Rocket
- REXUS/BEXUS

ENGAGEMENT

SCHOLARSHIPS
- Summer schools
- Academic programmes

INTERNSHIPS

CONFERENCES
- Student sponsorships
- European Space Education Conference

ADDITIONAL LEARNING OPPORTUNITIES
- Downstream hackathons
- Student Aerospace Challenge
- European Rocketry Challenge
- External partners' training courses

CAREERS FOR YOU

BOOK A SPACE PRO

EDUCATION WEB TV

TRAINING

Training Programme

Facility

Training and Learning Facility ESA/ESEC-Galaxia (BE)

What

1–4 week intensive training sessions

When

Continuous, 1-2 sessions per month

Who

Individual

Bachelor/Master/PhD

Opportunity

Regular calls for applications

Training Programme

Target audience

Engineering & Science university students, from **BSc to PhD**

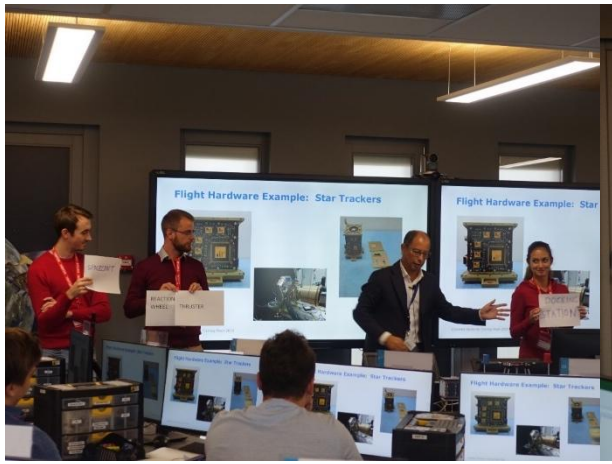
- Participating to ESA hands-on projects
- Preparing for a space related career
- Never involved in the space domain

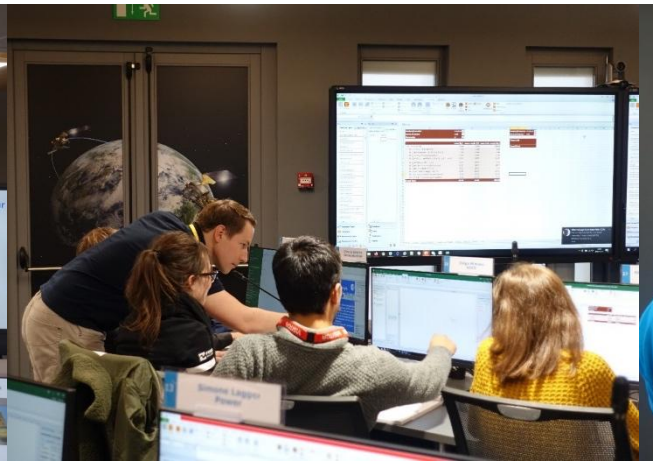
→ Each training session has a specific target audience

Typical training

Minimum **32 training hours**

- 30 - 60 University students
- 1-6 Trainers/day:
- ESA, space industry and academia experts
- Group projects & exercises
- Student presentations & evaluations
- Certification and Training transcript for ECTS credit(s)






Portfolio

Training Courses:

- Clean Space
- Cybersecurity
- Earth Observation
- Satellite System Design
- Human Space Physiology
- Introduction to Space Law
- Spacecraft Communications
- Spacecraft Operations
- Navigation
- Product Assurance Awareness
- Satellite Communication Systems
- Space Debris
- Space Standards
- Space Systems Engineering
- Space Weather
- CubeSat Hands-On Design
- Concurrent Engineering Challenge

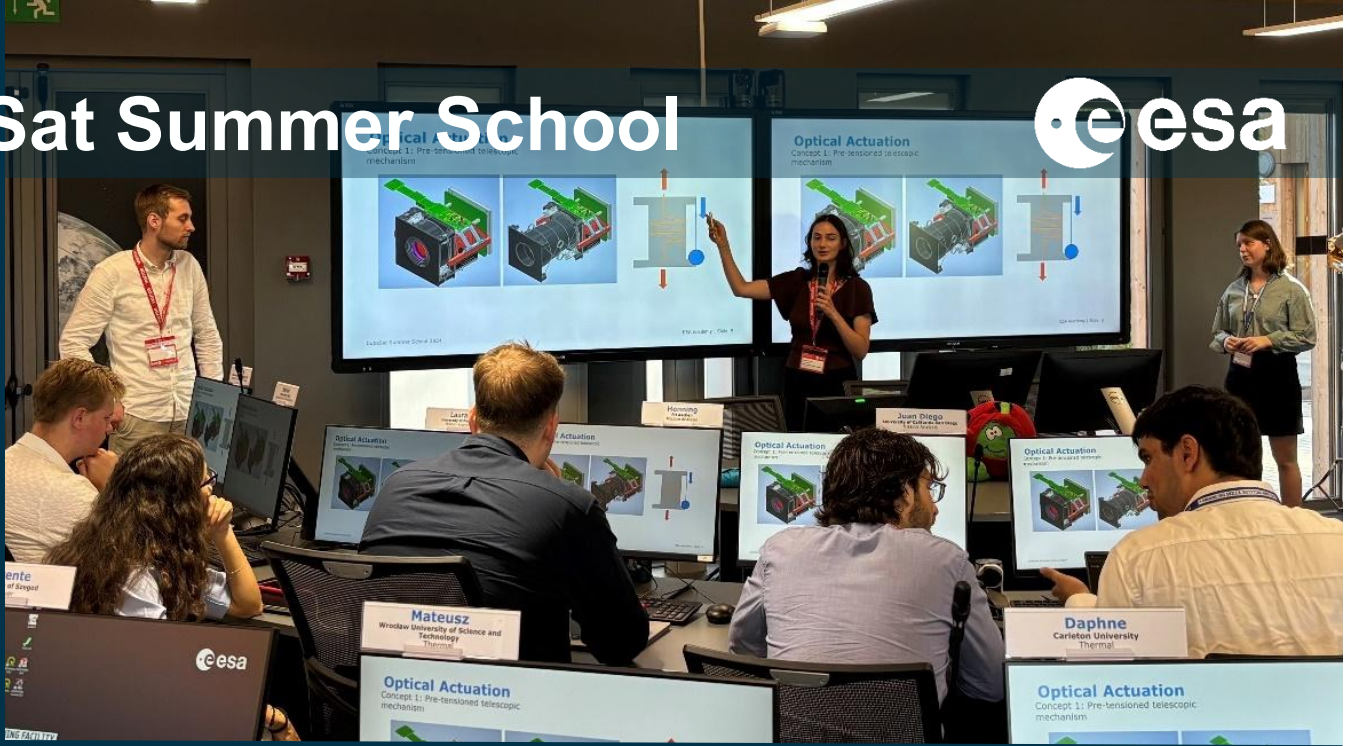
Workshops:

- Concurrent Engineering Workshop
- CubeSat Concurrent Engineering
- Earth Observation Remote Sensing
- ESA Academy Experiments
- Robotics
- Spacecraft Testing
- Technology Transfer, Application & Innovation

- CubeSat Summer School
- ESA/ELGRA Gravity Related Research Summer School
- Post-Alpach Summer School

Learning Management System for e-learning under development

Example: CubeSat Summer School



ENGAGEMENT

Direct collaboration schemes with academia, industry and institutions

ENGAGEMENT

Objectives

- ✓ Reinforce collaboration with ESA Directorates, academia, industry and institutions to the benefit of students and early professionals so to increase the number and quality of opportunities available to them, to stimulate visibility and awareness of the job market, and to bring talents in contact with potential employers;
- ✓ Exchange on the needs in terms of knowledge, skills and competences
- ✓ Work together on topics of common interest and enable closer involvement of the space sector in education
- ✓ Organise educational activities together (ex: Hackathon)
- ✓ Offer additional opportunities to future talents
- ✓ Facilitate internships in space industry
- ✓ Offer easy access to ESA expertise to the community for educational and inspirational purposes
- ✓ Raise awareness on ESA and the European space programme, and promote the ESA Education Programme

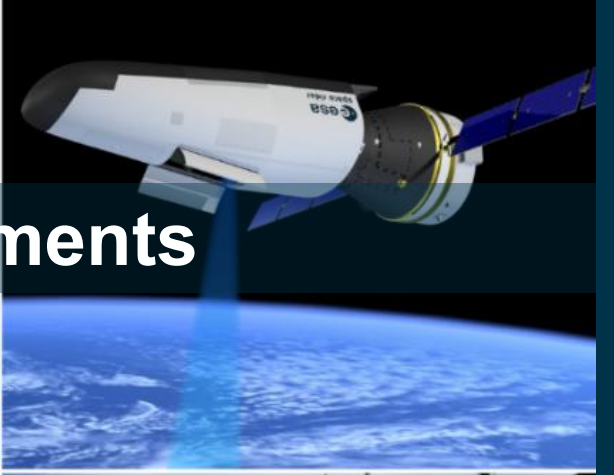
PROJECTS

EXPERIMENTS

SATELLITES

ROCKETS

ESA Academy Experiments



ESA Academy Experiments

Facilities

- Large Diameter Centrifuge
- Orbital Robotics Laboratory
- ZARM Drop Towers
- Parabolic Flights
- Space Rider
- ICE Cubes Facility (ISS)

What

Development of an experiment and operations

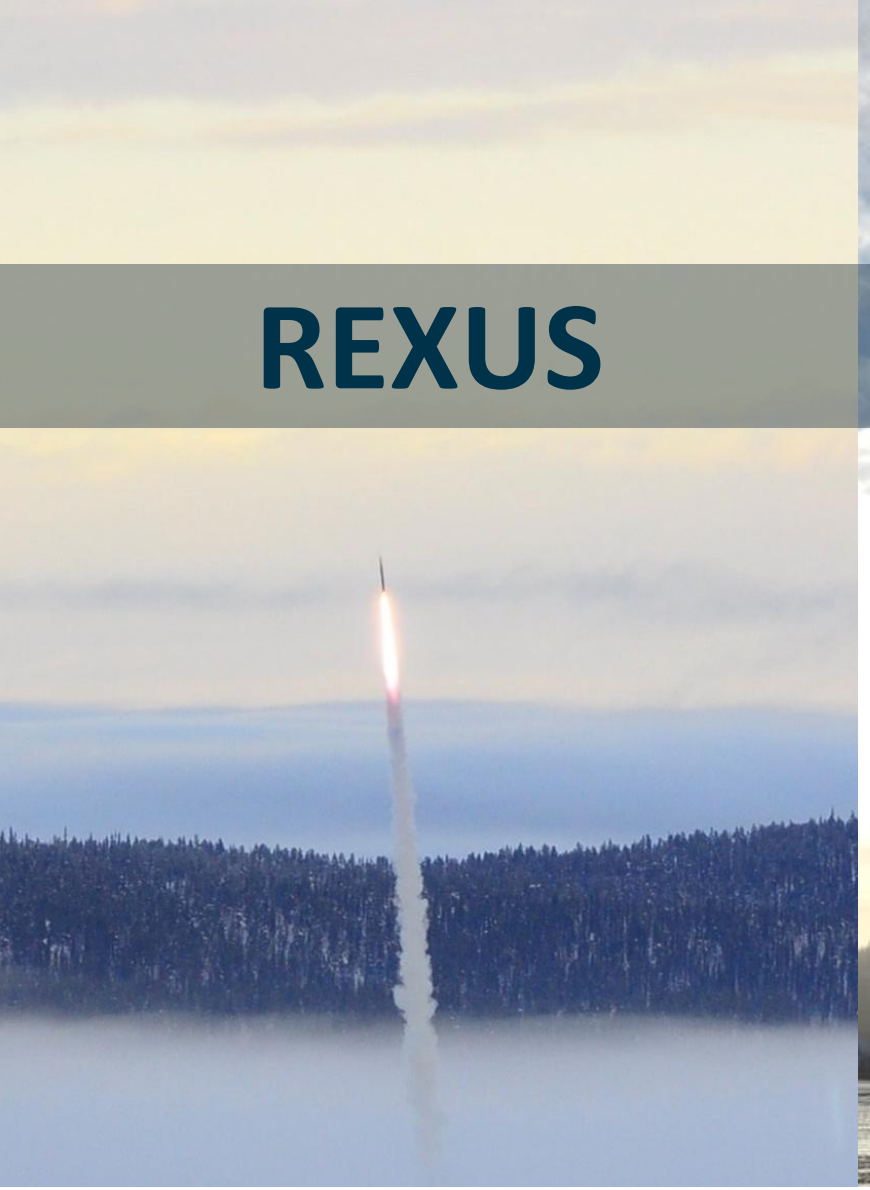
When

Once a year

Who

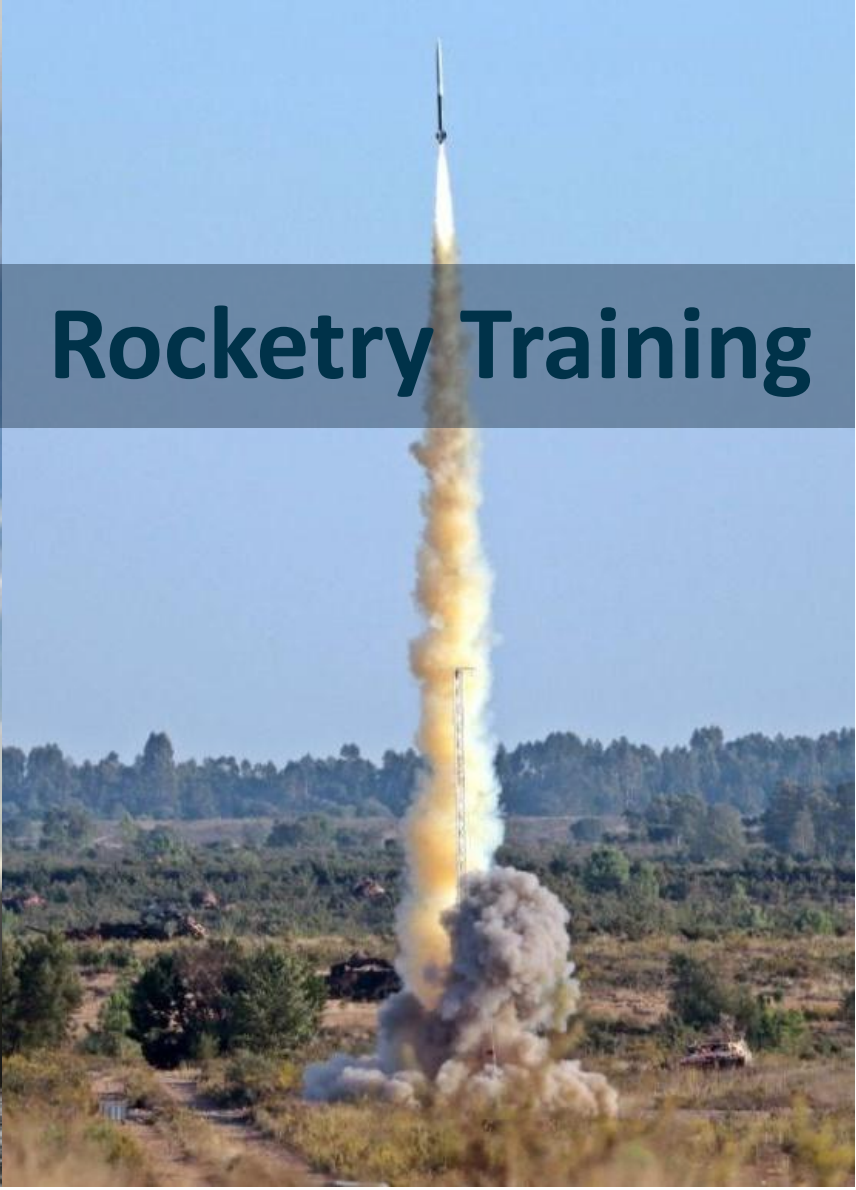
Team: bachelor, master, PhD students

REXUS



BEXUS

Rocketry Training



Rymdstyrelsen
Swedish National Space Agency

DLR German Space Agency at DLR

SSC

ZARM

EuroLaunch

EuRoC
EUROPEAN ROCKETRY CHALLENGE

PORTUGAL SPACE

European Rocketry Challenge (EuRoC)

- Rocket launch competition for European university teams
- Created by the Portuguese Space Agency in 2020
- ESA supports since 2022

EUROC

EUROPEAN ROCKETRY CHALLENGE

REXUS

BEXUS

Development of an experiment and execution of the launch campaign at Esrange Space Center, Sweden

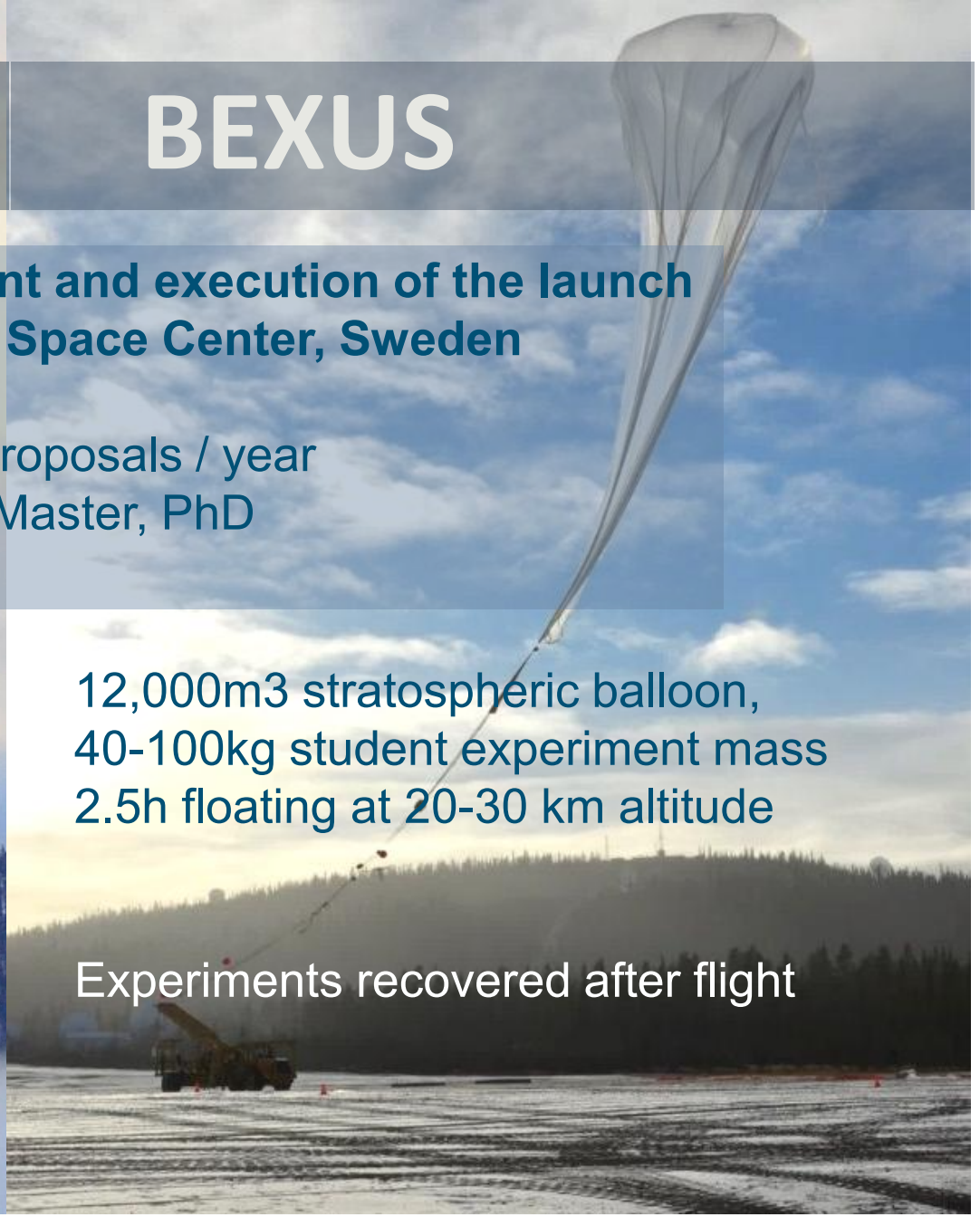
One call for proposals / year
Bachelor, Master, PhD

5.6m spin-stabilised sounding rocket
40kg student experiment mass
Altitude ca 90km

~ 3min of microgravity, up to 10^{-4} g
Despin and experiment ejection possible
Experiments recovered after flight

12,000m3 stratospheric balloon,
40-100kg student experiment mass
2.5h floating at 20-30 km altitude

Experiments recovered after flight



Rymdstyrelsen
Swedish National Space Agency

German Space Agency at DLR

ZARM

EuroLaunch

Rocketry Training Programme


esa
Fly Your Satellite!

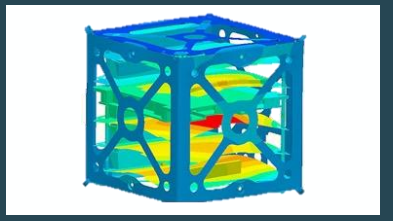
Fly Your Satellite – CubeSat opportunities

Fly Your Satellite!

For teams with subsystems built & tested, ready to integrate soon

Fly Your Satellite!

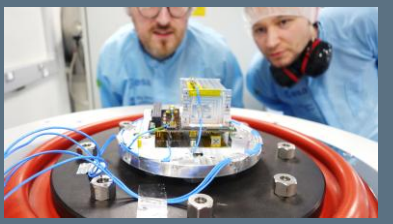
Design Booster



For teams with a preliminary design

Fly Your Satellite!

Test Opportunities



For teams who would like to learn from an environmental test campaign

Fly Your Satellite! & Training

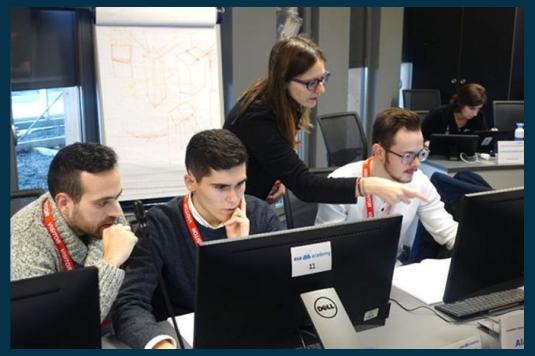
Training sessions

Training weeks for students/teams before or in early phases of CubeSat projects

Various opportunities throughout the year

CubeSats Concurrent Engineering Workshop

5-day training course at TLF | BSc, MSc, PhD students

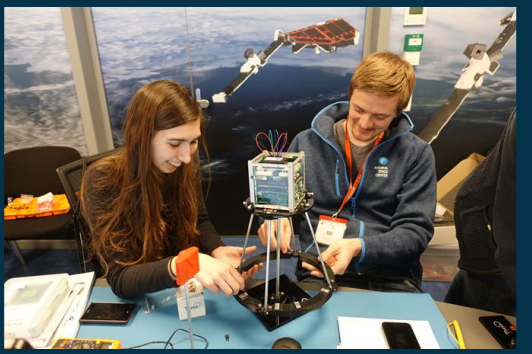


CubeSat Summer School

4-week training course at Galaxia | BSc, MSc, PhD

CubeSat Hands-On Training Week

5-day training course at TLF | BSc, MSc, PhD students



Spacecraft Testing Workshop

5-day training course at TLF & CSF | BSc, MSc, PhD students

ENGAGEMENT


Space for our Future
INTERNATIONAL STUDENT ZONE
INTERNATIONAL STUDENT ZONE
START-UP SPACE
START-UP SPACE
AIRBUS
NL SPACE

esa academy

Engagement

- Structured collaboration models involving ESA, academia, companies & institutions

- Prepare future talents in tertiary education via joint opportunities

esa academy

Engagement

Funding opportunities

- Conference Student Sponsorship programme
- Short Courses Scholarship programme
- Academic Scholarship programme

Events

- European Space Education Conference

Collaboration

- Book a Space pro & Alma Matter
- Careers for you
- Tailored collaboration

Future: SME's Internship Support – Coming soon

Conference Student Sponsorship Programme

Make European **space-related conferences more accessible** to tertiary education students

→ To be eligible, the student is expected to contribute to the conference (oral presentation, poster, …)

- ✓ Registration fee
- ✓ Economy travel & accommodation costs up to a ceiling amount

Short Course Scholarship Programme

Make European **space-related short courses more accessible** to tertiary education students by financially supporting their participation.

- ✓ Registration fee
- ✓ Economy travel & accommodation costs up to a ceiling amount

Academic Scholarship Programme

Make European **space-related higher education programmes more accessible** to future talents by covering the tuition fees.

Institutions to apply before 14th March 2025

✓ tuition fee

ESA Early career opportunities

→ THE EUROPEAN SPACE AGENCY

ENTRY-LEVEL AND RESEARCH PROGRAMMES

STUDENT INTERNSHIPS PROGRAMME

YOUNG GRADUATE TRAINEE PROGRAMME

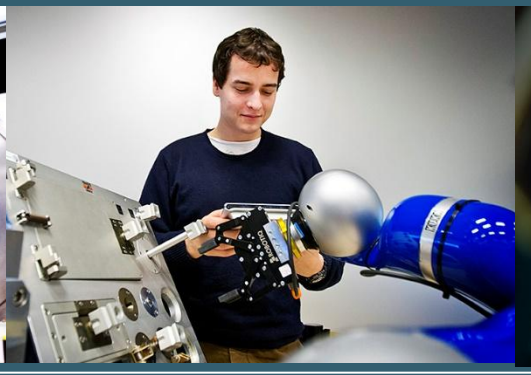
NATIONAL TRAINEE PROGRAMMES

RESEARCH FELLOWSHIP PROGRAMME (post-docs)

ESA CO-FUNDED RESEARCH (for PhDs and post-docs)

JUNIOR PROFESSIONAL PROGRAMME




STUDENT INTERNSHIP PROGRAMME

DURATION

- **3 – 6 months placement**

WHO CAN APPLY?

- Students in their **last** years of a Master's degree
- You must be a citizen of one of the ESA Member States, Associate Members, European Cooperating States or Canada as a Cooperating State.

WHEN DO THEY OPEN?

- November

HOW TO APPLY?

- jobs.esa.int

ESA GRADUATE TRAINEE PROGRAMME

DURATION

- **One-year contract (subject to conditions, a second-year extension may be granted)**

WHO CAN APPLY?

- You must be a student in the final year of a Master's or have just graduated
- You must be a citizen of one of the ESA Member States, Associate Members, European Cooperating States or Canada as a Cooperating State

WHEN DO THEY OPEN?

- February

HOW TO APPLY?

- jobs.esa.int

NATIONAL TRAINEE PROGRAMME

DURATION

- Initial duration of one year, with possible extension to another year.

WHO CAN APPLY?

National Trainee Programmes are set up through bilateral agreements between ESA and national agencies.

- You are a citizen of one of the participating countries

  (see the website for the latest list)

WHEN DO THEY OPEN?

- This varies between participating countries but the selection is usually on an annual basis

HOW TO APPLY?

- Application through national agency
- Learn more here bit.ly/ESANationalTrainee

RESEARCH FELLOWSHIP PROGRAMME

DURATION

- **2 year contract, with the possibility of a third year**

WHO CAN APPLY?

- Recently attained doctorate (PhD) in a relevant field
- You must be a citizen of one of the ESA Member States, Associate Members, European Cooperating States or Canada as a Cooperating State

WHEN DO THEY OPEN?

- Research Fellowship opportunities are published throughout the year, except Space Science (usually published in August)

HOW TO APPLY?

- jobs.esa.int

JUNIOR PROFESSIONAL PROGRAMME

DURATION

- **A three-year ESA contract with the perspective of a permanent ESA position at the end of the programme**

WHO CAN APPLY?

- You must be graduate of a Master's-level degree programme.
- You must have two to three years of relevant professional experience after Master's
- You must be a citizen of one of the ESA Member States, Associate Members, or Canada as a Cooperating State

WHEN DO THEY OPEN?

- The next publication of JPP vacancies is currently foreseen for early 2025

HOW TO APPLY?

- jobs.esa.int

ESA CO-FUNDED RESEARCH

WHAT IS OFFERED?

- **ESA co-funding up to 50% and up to €90K research at PhD or post-doc level**
- **access to ESA laboratories**
- **technical support by ESA experts**
- **networking through ESA links to identify industrial partners for further cooperation or to build ”innovative networks”**

WHO CAN APPLY?

- PhD or post-docs

WHEN DO THEY OPEN?

- Open all year long

HOW TO APPLY?

- ideas.esa.int