ESA & ESA Education Programme

Presented by
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ESA Education Office

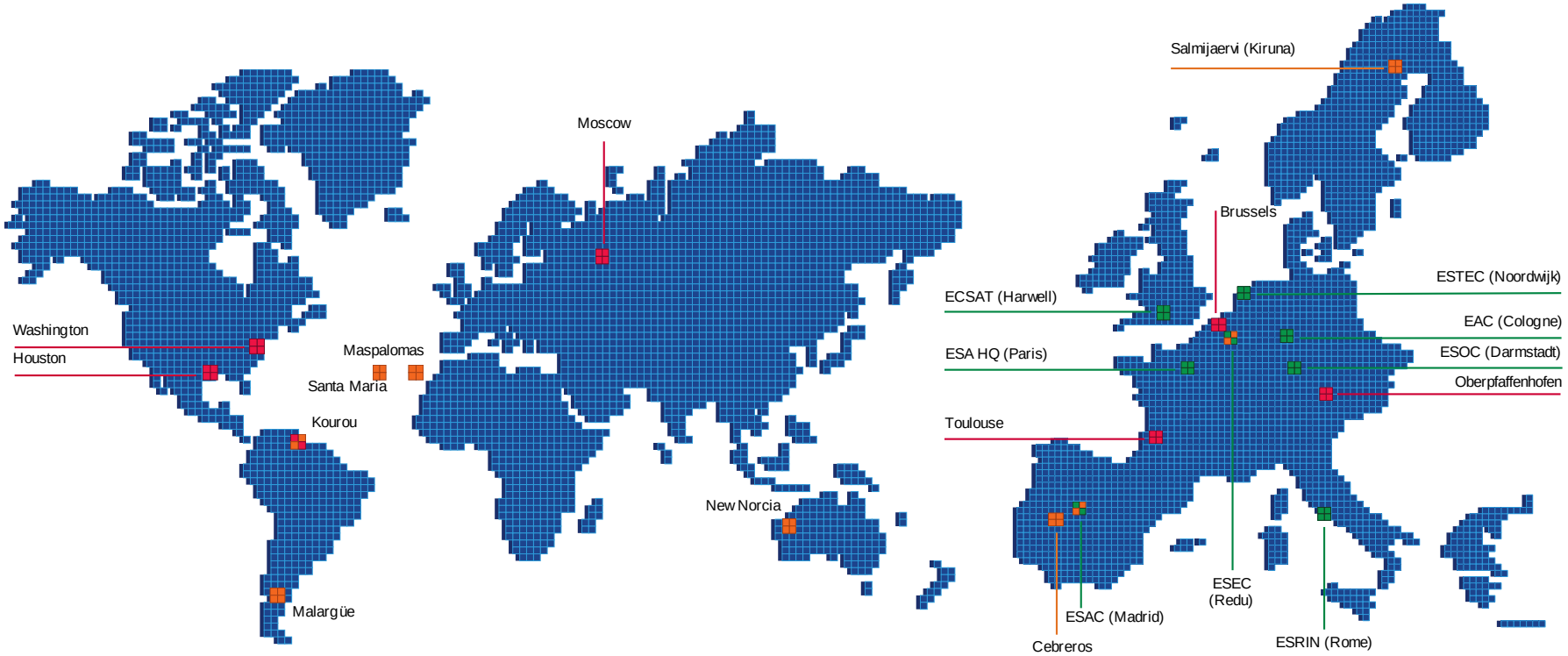
Content

- **ESA & Early career opportunities at ESA**
- ESA Education Programme
- ESA Academy Programme – for university students

ESA Quick Facts & Figures

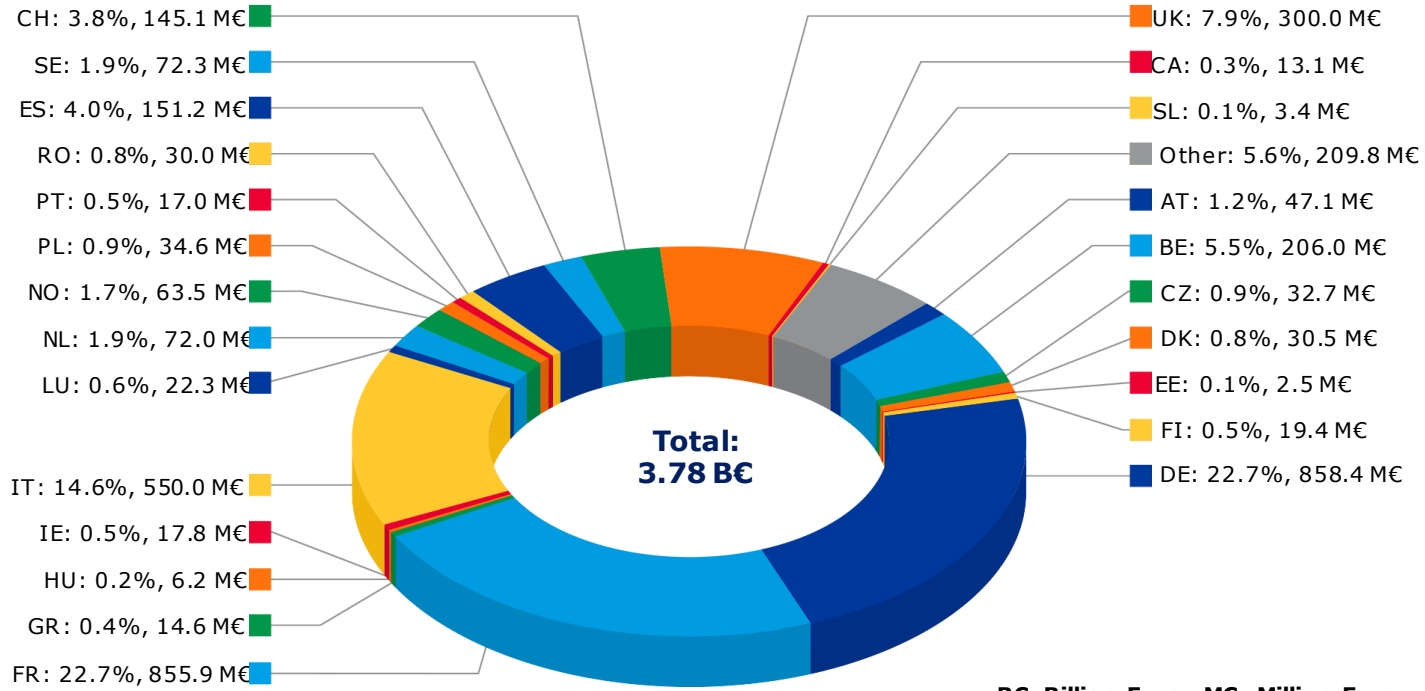
- Over 50 years of experience
- 22 Member States
- Eight sites/facilities in Europe, 2448 staff
- 5.75 billion Euro budget (2017)
- Over 80 satellites designed, tested and operated in flight

ESA's locations



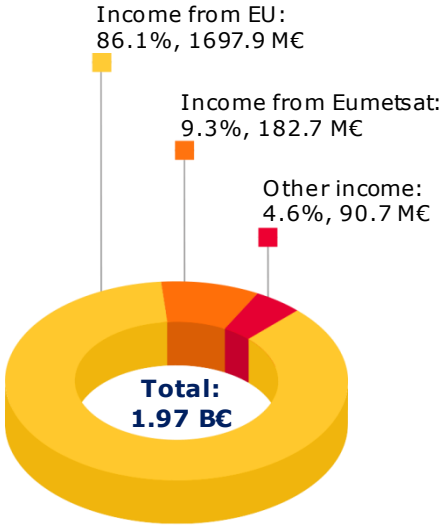
ESA budget for 2017: 5.75 B€

ESA Activities and Programmes



B€: Billion Euro M€: Million Euro

Programmes implemented for other institutional partners



ESA Council

The Council is the governing body of ESA.

It provides the basic policy guidelines for ESA's activities. Each Member State is represented on the Council and has one vote.

Every two to three years, Council meets at ministerial level ('Ministerial Council') to take key decisions on new and continuing programmes and financial commitment.

Activities

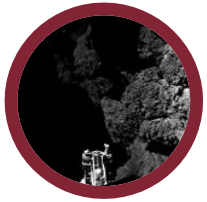
Nearly all areas of space activity

Scientific Programme and Basic Activities are

Mandatory Programmes

All Member States contribute according to GNP

All other programmes are **Optional**


space science


human spaceflight


exploration


earth observation


launchers


navigation

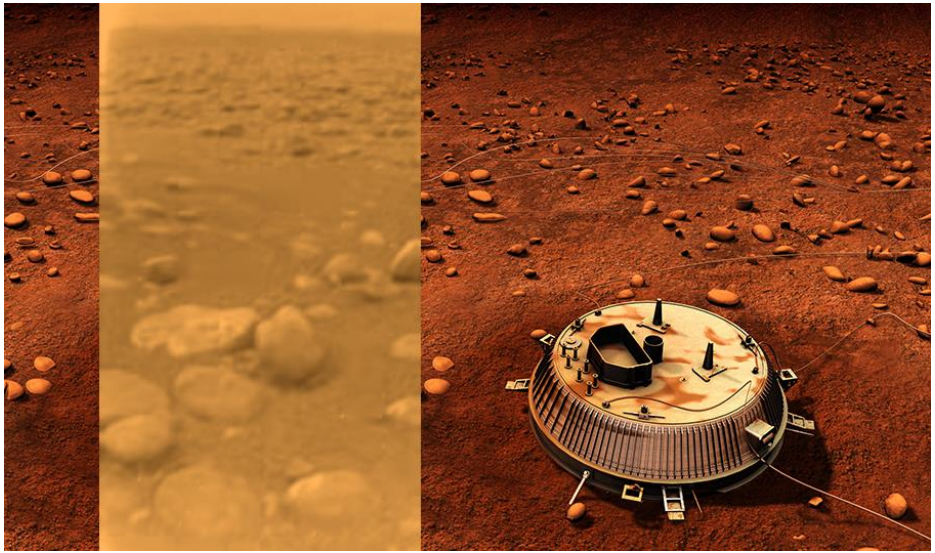

operations

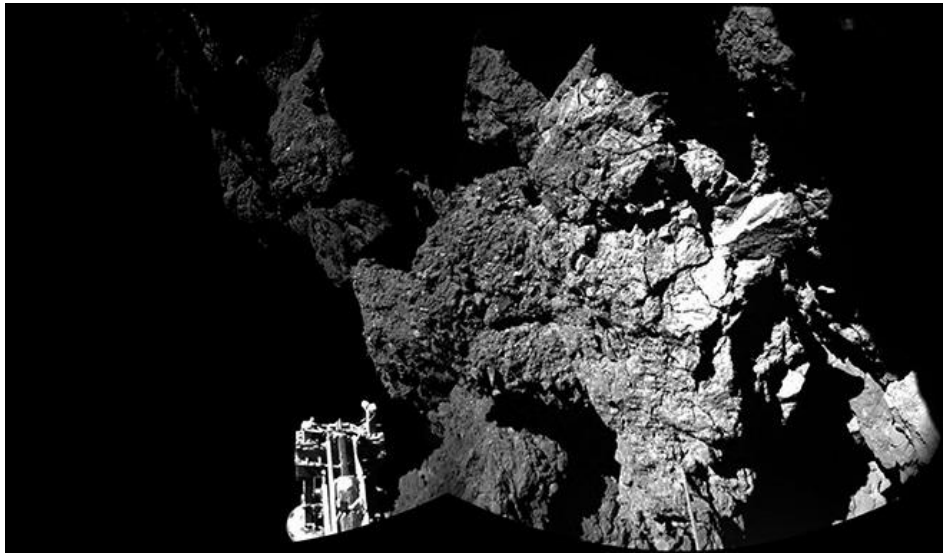

technology


telecommunications

Space Science

- **Huygens** (2005) landed on Titan
- **Rosetta** (2014) landed on Churyumov–Gerasimenko

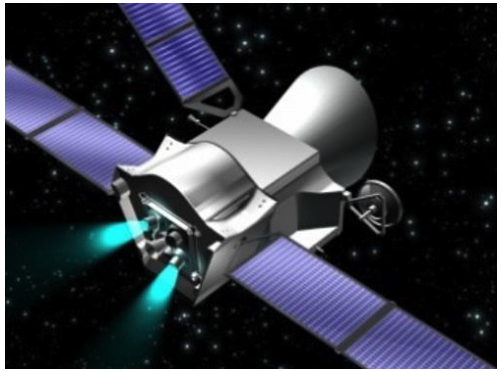
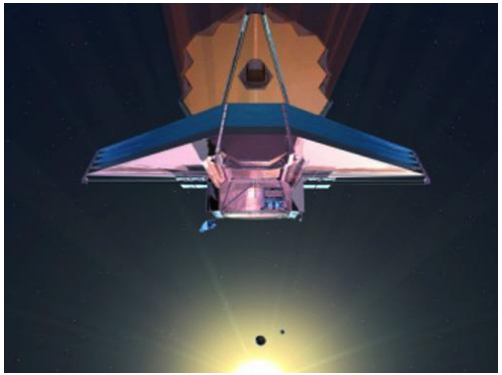
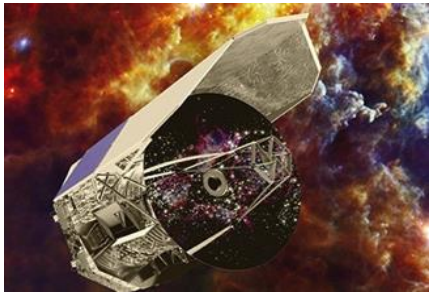
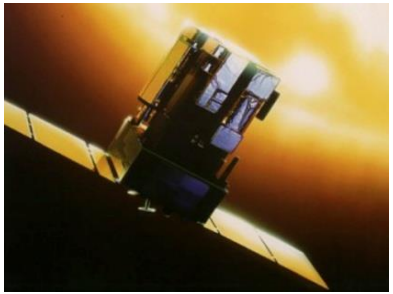




Space Science

- **Planck** (2009–13) detecting first light of Universe and looking back to the dawn of time
- **Herschel** (2009–13) unlocking the secrets of starbirth and galaxy formation and evolution
- **Hubble** (1990–) orbiting observatory for ultraviolet, visible and infrared astronomy (with NASA)
- **SOHO** (1995–) studying our Sun and its environment (with NASA)
- **BepiColombo** (2018) a satellite duo exploring Mercury (with JAXA)
- **James Webb Space Telescope** (2018) studying the very distant Universe (with NASA/CSA)



Earth Observation

- **Envisat** (2002–12) the largest satellite ever built to monitor the environment
- **SMOS** (2009–) studying Earth's water cycle
- **CryoSat-2** (2010–) studying Earth's ice cover
- **Meteosat 2nd Generation** (2002, 2005, 2012, 2015) – 4 satellites providing images of Earth from GEO
- **MetOp** (2006, 2012, 2018) – 3 satellites providing meteorological observations from polar orbit.

- **Sentinel-1** – land and ocean services.

Sentinel-1A launched in 2014/Sentinel-1B in 2016.

- **Sentinel-2** – land monitoring.

Sentinel-2A launched in 2015/Sentinel-2B (2017).

- **Sentinel-3** – ocean forecasting, environmental and climate monitoring.

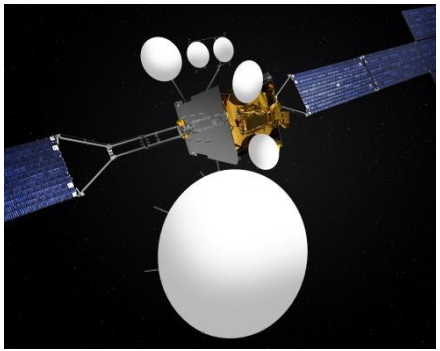
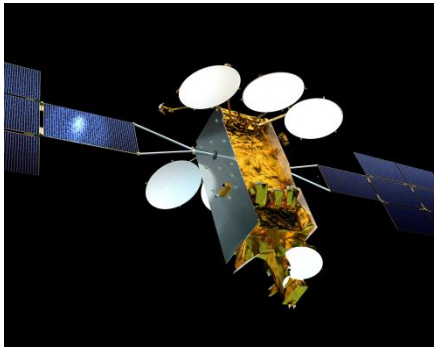
Sentinel-3A launched in 2016. Sentinel-3B (2017).

- **Sentinel-4** – atmospheric monitoring payload (2019)
- **Sentinel-5** – atmospheric monitoring payload (2021)
- **Sentinel-5 Precursor** – atmospheric monitoring (2017)
- **Sentinel-6** – oceanography and climate studies (2020)

Telecommunication

ESA's **Advanced Research in Telecommunications Systems** (ARTES) programme stimulates innovation and promotes the development of products, services and applications in partnership with industry.

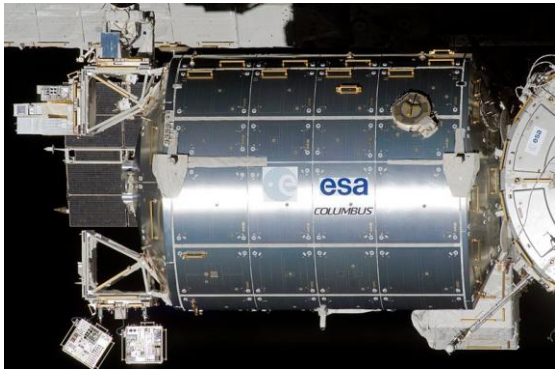
- **SmallGEO** – for the 3-tonne market, with OHB (first launch on Hispasat's H36W-1, 2017)
- **Spacebus Neo** and **Eurostar Neo** – for the 3- to 6-tonne market, with Thales Alenia Space/Airbus D&S (first launches in 2019)
- **Electra** – first fully electric propulsion OHB satellite, with SES (2021)


Human Space Flight

Columbus (2008) is the most multi-functional laboratory on the ISS

Cupola (2010) is the nicest view-port ever in space



The **European Service Module (ESM)** is ESA's contribution to NASA's **Orion** spacecraft that will send astronauts to the Moon and beyond.

Human Space Flight

European Astronaut Corps (1999)

Six new astronauts selected in 2009

7th new astronaut selected in 2017

Navigation

Putting Europe at the forefront of this strategically and economically important sector, **Galileo** will provide a highly accurate, guaranteed global positioning service under civilian control.

Full Operational Capability – 18 satellites now in orbit. Deployment of remaining ground/space infrastructure ongoing (full system – 24 satellites, plus orbital spares to prevent interruption in service).

ESA is the system architect for Galileo, managing its design, development, procurement, deployment and validation on behalf of the EU. ESA will maintain this role, providing technical support to the European GNSS Agency, designated by the EC to run the system and provide Galileo services.

Dec 2016 – start of Galileo **Initial Services**, the first step towards full operational capability.

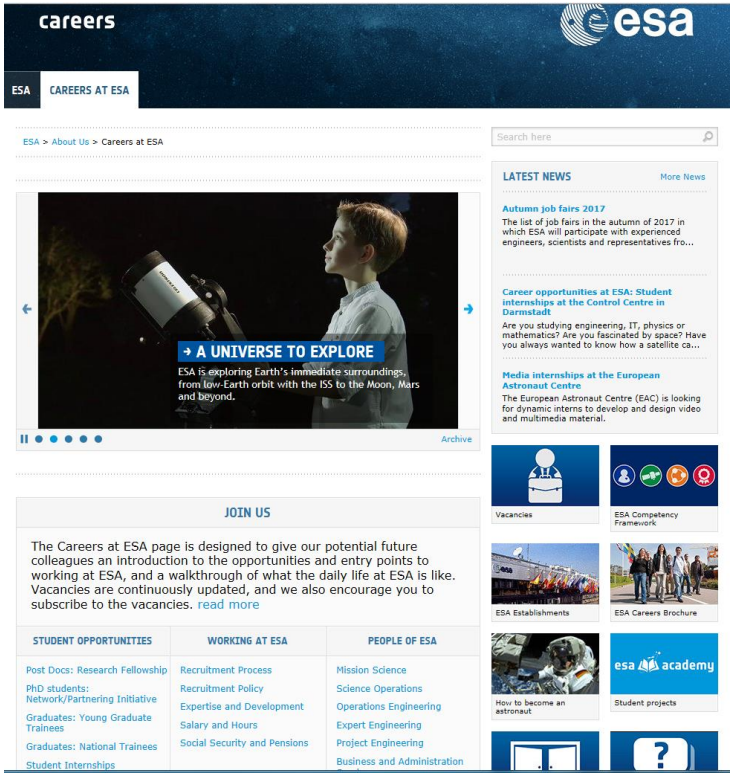
Launchers

The **Ariane** and **Vega** launchers developed by ESA guarantee European autonomous access to space. Their development and successful exploitation is an example of how space challenges European industry and provides precious expertise.

Ariane is one of the most successful launcher series in the world. Complemented since 2011 by **Vega** and **Soyuz**, they are all launched from Europe's Spaceport in French Guiana.

Early career at ESA

- Young Graduate Trainees
- Research Fellowship Programme
- Students Placements
- National Trainees Programmes
- …



More information: http://www.esa.int/About_Us/Careers_at_ESA

Young Graduate Trainees (YGT) (1/2)

- Recent **Masters Degree** graduates, with limited professional experience
- Preparation for a job in Europe's space industry and research institute
- Rich personal and professional experience of living and working in another country in a **diverse and international environment**
- **1 year**, with possibility for 1 additional year

Young Graduate Trainees (YGT) (2/2)

- **Trainee Opportunities**
  - Advertised mid-November on the ESA web site
  - Interviews February/March
  - Start date between May/Sept

- **113** traineeships in 2017(!) – all establishments
- 2016: **3000** applications, **27%** female

  34% women recruited – Gender policy for women in technical and scientific roles

YGT secondment to Industry

- Follows the ESA traineeship
  1 year secondment in European Space Sector
  Better investment of our best young talents
- **Who**: YGTs who **excel** in performance
- An assignment that is agreed between ESA and the **hosting company**
- We are looking to **expand the scheme** – develop more co-operations with space companies

Research Fellowship Programme

- Recently attained **doctorate (PhD)** in a relevant field
- Carry out advanced research related to space science, space applications and space technology
- **2 year** contract – can exceptionally be extended for a third year
- Approximately **50** Research Fellows every year

Students Placements (Stagiaire)

- Students in their **last or penultimate** year of a Master's degree
- Space Sector experience as part of the studies

  Fulfilling **internship requirements** for graduation

  Final Thesis contribution
- **3 - 6** month placement, can be split into two parts
- Around **100** students each year → **75 at ESTEC**
- **Application procedure:**
  http://www.esa.int/About_Us/Careers_at_ESA/Student_internships

After an ESA Traineeship…

- 15% of ESA staff have been either a YGT or Internal Research Fellow
- 10% of YGT's and Research Fellows become on site contractors
- Research Fellows in the fields of astronomy, planetary sciences, helio-physics and instrumentation pursued their career in Research Institutes and Universities
- Most YGT's find a job in the European Space or non-space Industry
- Many YGT's pursue a Ph.D.

Content

- ESA & Early career opportunities at ESA
- **ESA Education Programme**
- ESA Academy Programme – for university students

ESA education objectives

1. Motivate and enable young people to enhance their **literacy & competence** in sciences and technology (STEM disciplines).

2. Inspire and enable young people to consider pursuing a **career** in the STEM field, in the space domain in particular.

3. Contribute to increase youngsters' **awareness** of the importance of space research, exploration and applications in modern society and economy.

{CHANGE THE EQUATION}™

Targets & challenges

Wide target: 6 – 32 years old

6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Primary																										
				Lower secondary																						
								Upper secondary																		
												Tertiary														

Challenges:

- More than 80 million school-age pupils, 7 million teachers
- 22 Member States
- 17 languages
- Different lower education systems and curricula
- Lack of interest in STEM, girls in particular
- Shortage of specialized workforce in the space sector

A diversified approach

School pupils & teachers

Space is the context

- **Formal education**, right into the schools, with teacher training and resources to support the curriculum in an innovative way

- **Hands-on:** learning to think, learning to do, as classroom project or extracurricular activity

- **Informal education**, learning while having fun

University students

Space is the subject

- **Hands-on**:

- Satellite projects
- Scientific experiments
- Technology demonstration

+

- **Academic support**:

- Courses, schools and workshops
- Participation to conferences
- Lectures/seminars of ESA experts

= ESA ACADEMY!!

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ESA Academy

- **ESA Academy** allows to evolve and better complete the portfolio of opportunities offered by ESA's Education Office to university students
- The objective is to have a transfer of space expertise, know-how and standard professional practice from ESA to European university students
- The idea is to work in close **coordination** with **European academic institutions** and, whenever possible, in partnership with **European space industry** and other organisations involved in space activities
- ESA Academy is the combination of two components:
  - **Hands-on Programmes**
  - **Training and Learning programme**
- **Training and Learning Centre** was developed 1,5 years ago in the frame of the ESA Academy programme

ESA Academy – Concept

esa academy

Hands-on Programmes

- Spin Your Thesis!
- Drop Your Thesis!
- Fly Your Thesis!
- REXUS/BEXUS
- ESEO
- Fly Your Satellite!
- Fly a Rocket!
- Spin Your Thesis! Human Edition
- …

Training and Learning Programme

Portfolio of courses:

- Gravity-Related Experiments Training Week
- ESA Satellite Programmes Training Workshops
- Concurrent Design of a Space System
- Space Mission Operations and Communications
- Space Human Physiology
- Standardisation
- Product Assurance & Safety
- Space Law
- Science Planning
- …

University Students Community

CubeSat Laboratory

Training and Learning Centre

CDF

Fly Your Thesis!

fly your thesis!

Parabolic Flight opportunity for Masters & PhD student experiment projects

What: Topics include physics, medicine, biology, technology demonstrations etc.
When: once a year (periodical calls for proposals)
Who: up to 6 student teams, (minimum 4 students per team)
Facility: A310 Zero-G aircraft operated by Novespace (France)

- 3 parabolic flights
- 31 parabolas per flight
- ~20s of weightlessness per parabola (10^{-3} g) → in total about 30min

Campaign duration: 2 weeks

Status:

- 2 teams selected for FYT! 2018
- Campaign: 22 Oct - 2 Nov 2018

Drop Your Thesis!

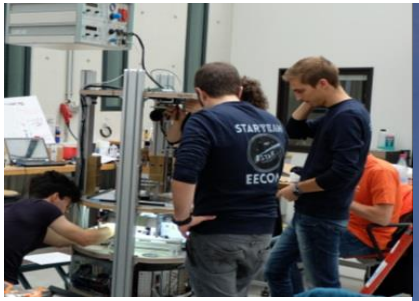
drop your thesis!

Microgravity opportunity for university student projects

What: Topics include physics, biology, technology demonstrations, chemistry etc.
When: once a year (periodical calls for proposals)
Who: up to 2 student teams, (up to 4 students per team)
Facility: ZARM Drop Tower, Bremen (Germany)

- Two launch modes:
  - Drop mode : 4.7 s of microgravity (10^{-6}g)
  - Catapult mode : 9.3 s of microgravity (10^{-6}g)

Campaign duration: 2 weeks, 5 launches



Status:

- Team selected for DYT! 2018
- Campaign: 2 weeks in Oct-Nov 2018

Spin Your Thesis!

spin your thesis!

Hypergravity opportunity for university student projects

What: Topics include physics, biology, technology demonstrations, chemistry, etc.
When: once a year (periodical calls for proposals)
Who: up to 4 student teams, (4 students per team), per year
Facility: Large Diameter Centrifuge (LDC), ESA/ESTEC (Netherlands)

- Accelerations between 1 and 20 times the Earth's gravity for minutes/hours/days durations
- Durations and acceleration levels selectable by users, even interactively if desired

Campaign duration: 1 week, nominally 2.5 days access to the LDC per team

Status:

- 2 teams selected for SYT! 2018
- Campaign: 1 week September 2018

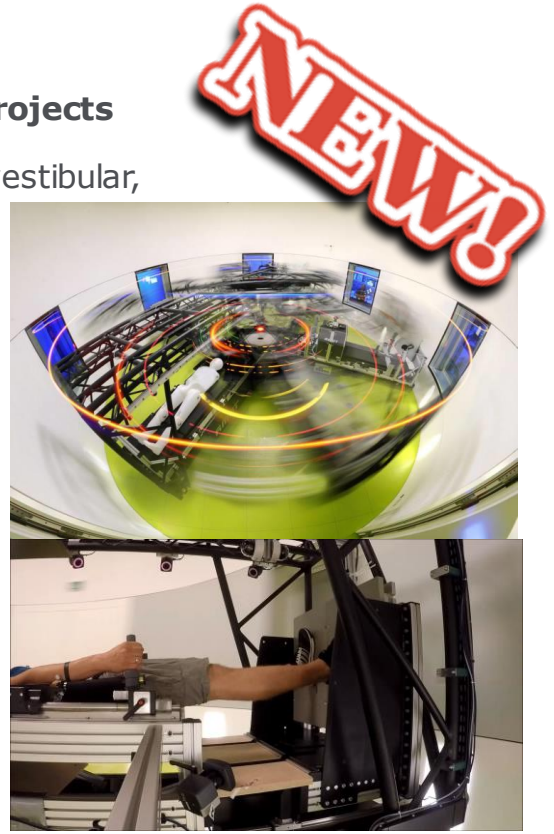
Spin Your Thesis! Human Edition

Hypergravity opportunity for university student human physiology projects

What: Non invasive human physiology (cardiovascular, muscular, nervous, vestibular, psychological, human performance)
When: once a year (periodical calls for proposals)
Who: up to 4 student teams of 4-6 students per team
Facility: :envihab facilities at DLR Köln
5 female, 5 male subjects – one protocol based on selected teams
2 day workshop at DLR/EAC after selection

Campaign duration: 7 days

Status:
- Website with more info: http://www.esa.int/Education/Spin_Your_Thesis!_Human_Edition
- Call Closed.
- Workshop March
- Campaign end June 2018 (7 days)



REXUS/BEXUS

Rocket and Balloon EXperiments for University Students

Realised under a bilateral Agency Agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB).
Available to students from other ESA Member and Associated States through a collaboration with the ESA.

What: Experiment topics include physics, biology, technology demonstrations, atmospheric sciences
When: once a year launch of 2 sounding rockets and 2 stratospheric balloons (periodical calls for proposals)
Who: up to 10-11 SNSB/ESA student teams
Facility: Launch site: Esrange Space Center, Kiruna (Sweden)

Status:

- 11 teams for 10th cycle selected in December 2016
- BEXUS 24/25 launch campaign: 13-23 October 2017
- REXUS 23/24 launch campaign: 5-17 March 2018

RYMDSTYRELSEN Swedish National Space Board

DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center

Fly a Rocket!

Online training and sounding rocket launch campaign for undergraduate students

Realised in cooperation with the Norwegian Centre for Space Related Education (NAROM) and the Norwegian Space Centre.

What: online course and rocket launch campaign
Who: 20 1st and 2nd year university students (beg. Bachelor level)
Facility: Andøya Space Center (Norway)
Campaign duration: 5 days

Status:

- Online course closed
- Launch campaign: performed 27-31 March 2017
- New call TBD (as a target periodical calls)

NAROM

Norsk Romsenter
NORWEGIAN SPACE CENTRE

Fly Your Satellite!

CubeSat opportunities for university student teams

What:

- Support in the development of a CubeSat
- Current edition consist of five programme phases (Design, Build, Test, Launch and Operate Your Satellite!)

Who:

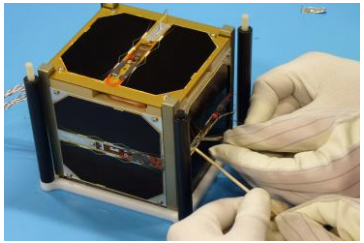
- University student teams with a finalized detailed design of their CubeSat

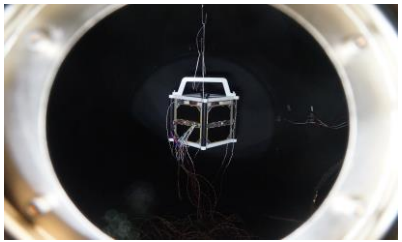
Facility:

- Dedicated CubeSat Education Centre, ESA/Redu (Belgium)

Status:

- 6 teams selected in May 2017 for the 2nd edition of the programme
- New call to be released in 2018





ESEO

European Student Earth Orbiter

What:

Micro-satellite (60kg, 33x33x66cm)

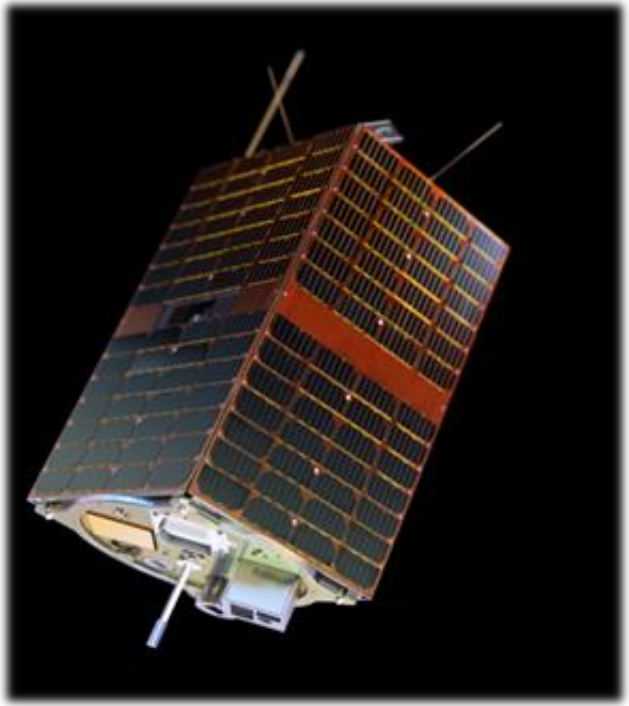
- About 600km altitude/sun synchronous
- P/L: micro cameras/radiation sensors/comms and GPS technology
- 6 months+ mission
- Drag sail for re-entry

Who:

Many Universities (currently 10) involved

Status:

- Phase C (detailed design) – CDR completed in 2015
- Phase D (AIT) – Qualification and Acceptance tests at S/S level on-going



ESA Academy's Training and Learning Centre

- **Target audience**
  - students participating to ESA hands-on programmes
  - students preparing for a space related career
  - students never involved in the space domain
- **Trainers**
  - mainly ESA staffs (active or retired)
  - university professors
  - experts from space industry
- **Examples of training courses**
  - ESA experiment hands-on programmes training week
  - ESA satellite programmes training week
  - Concurrent Design
  - Ladybird Guide to Spacecraft Operations and Communications
  - Human Space Physiology
  - Standardisation
  - Product Assurance & Safety
  - Introduction to Space Law
  - Space Debris
  - …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