Educational CubeSat Programmes at ESA

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1. The ESA Education Office

2. CubeSat programmes: past & present

3. Future: ESA Academy and the European CubeSat Education Centre
1. The **Education and Knowledge Management Office** is engaged in:
   
   a. Communication and Outreach
   
   b. Primary/Secondary Education projects

   c. **Tertiary Education activities**
   
   d. Knowledge Management

2. **Tertiary Education current project initiatives** include:
   
   
   b. REXUS / BEXUS

   c. **CubeSats activities**
   
   d. ESEO – European Student Earth Orbiter

For more info: [http://www.esa.int/Education](http://www.esa.int/Education)
1. Contribute to form a **suitable and talented workforce** for ESA and the European space industry

2. Enhance the **motivation** of university students to work in the fields of space engineering, technology and science, by:
   - Providing them with **practical experience** in real space projects
   - Enabling transfer of know-how and **direct interaction with space professionals**
Presentation Outline

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3. Future: ESA Academy and the European CubeSat Education Centre
CubeSats on the Vega Maiden Flight

- Act as the **technical and programmatic interface** between the selected CubeSat teams and the launch organisation.

- Provide technical and financial support to run the **integration and testing activities** in preparation of launch.

- Support and verify that CubeSats met the technical requirements required to perform their **acceptance** for integration with the deployer, the LARES System, and VEGA launch vehicle.

- **12 university CubeSat teams** supported

- **7 CubeSats launched** on 13 Feb 2012
CubeSats on the Vega Maiden Flight & other initiatives

**Orbit:** 300 x 1450 km; \( i = 69.5^\circ \)

Natural orbital lifetime around 2.5 years

- **PW-Sat** (Warsaw University Of Technology)
- **Goliat** (University of Bucharest)
- **Robusta** (Université Montpellier 2)
- **UniCubeSat** (La Sapienza, Roma)
- **MaSat-1** (Budapest University of Technology)
- **E-St@r** (Politecnico di Torino)
- **XaTcobeo** (University of Vigo)

**Other CubeSat activities:**

- **Goliat** (University of Bucharest, RO) supported for thermal vacuum test
- **HumSat-D** (University of Vigo, ES) supported for environmental tests (vibrations and thermal vacuum)
Fly Your Satellite!
«Fly Your Satellite!»:
Programme Breakdown

Phase 1 – Build your Satellite!
Phase 1A: Satellite integration
Phase 1B: Functional tests – Ambient

Phase 2 – Test Your Satellite!
Phase 2A: Environmental Tests Preparation
Phase 2B: Environmental Tests Execution

Phase 3 – Ticket to Orbit!
Phase 3A: Acceptance tests campaign
Phase 3B: Launch Preparation campaign

Phase 4 – CubeSats in Space!
Phase 4A: Launch and Early Operations Phase
Phase 4B: CubeSats Operations Results Feedback
Programme **kicked-off** in June 2013 with 6 university CubeSats

- **Objectives**
  - Focus on satellite **integration & verification**
  - **Methodology** similar to bigger ESA missions
  - From satellite integration **to mission operations**
  - Technology but **also laws and regulations**

- **CubeSat teams** participating in the programme:
  - Receive direct support from **ESA technical specialists**
  - Are taught the **importance of verification** and **good documentation**, as key methodologies to improve chances of mission success
  - Have **access to state-of-the-art environmental test facilities**
  - The teams that demonstrate the flight readiness of their CubeSat can benefit from the ESA support for the procurement of the **launch opportunity**
Three CubeSat teams selected for participation in Phase 2:

**AAUSAT4**
Aalborg University
Test AIS receiver
AOCS tech demonstrator

**OUFTI-1**
Université de Liège
Test D-STAR amateur radio protocol in space

**E-St@r-II**
Politecnico di Torino
Test an active 3-axis Attitude Control
Preparing the future: Pilot Project: Fly Your Satellite from the ISS!
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Practical – Hands-on Component

Fully deployed at ESA/ESTEC

- Spin Your Thesis!
- Drop Your Thesis!
- Fly Your Thesis!
- Fly Your Satellite!
- REXUS
- BEXUS
- ESEO

Training Component

Being developed at ESA/REDU

- Space Robotics Training School
- ESA Academy Training and Learning Centre
- European CubeSat Education Centre

European CubeSat Education Centre
ESA Academy
European CubeSat Education Centre

- ESA ACADEMY at ESA/REDU
ESA Academy
European CubeSat Education Centre

- **Facilities:**
  - Host **end-to-end** educational CubeSat activities:
    - **Training facilities** (Training and Learning Centre)
    - **Concurrent Design Facility** (CDF)
    - **AIV facilities** (Soldering, Thermal-Vacuum, Vibration, Ground Station, etc)

- **Objectives**
  - Next FYS programme: Focus on satellite **design, integration, verification, testing and operations**
  - Offer **equal opportunities** to a maximum of university students' teams
  - Complete academic education with initial **training** in Project Management; Mission design, analysis and operations; QA/PA; Space systems engineering; Standards, ...
  - **Apply Methodology** similar to bigger ESA missions
  - Technology but **also laws and regulations**

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Fly Your Satellite-II

P0 - Call, Training, Selection
  → Pre-Sel. → Selection

P1 - Design
  → Kick-Off → PDR → CDR

P2 - Build
  → Training → PDR → CDR → TRR → PTR

P3 - Test
  → Training and Learning Centre operational
  → CDF operational

P4 - Ticket to Orbit
  → Assembly Integration → System Level Testing → TRR → PTR

P5 - CubeSats in Space
  → AIV operational

Operations
  → Training
  → CDF operational
  → AIV operational

European Space Agency
THANK YOU!

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