

# Polish Student Activities in Space Research and Education

**Warsaw University of Technology:**



• *Student Astronautical Group*



• *Student Space Engineering Scientific Group*



• *Radiolocation and Digital Signal Processing*

*Students' Research Group*



*Vienna, 12 – 15 February 2007*



## Our supreme goals:

- To extend our knowledge in Astronautics and related fields of science.
- To popularize Astronautics among the youth.

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# Space Related Education

## At Warsaw University of Technology

- Faculty of Power and Aeronautical Engineering – Aerospace Specialization
- Faculty of Electronics and Information Technology – Satellite Communications
- Faculty of Geodesy and Cartography – Teledetection, Orbital Mechanics, Navigation
- Also at Universities in Wroclaw and Olsztyn

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# Student Parabolic Flight Campaign

- Competition of student ideas from all over the world (but only 30 places to take).
- WUT students participation since 1994
- Extremely fascinating opportunity to experience the lack of gravity.
- 30 seconds to feel like real astronauts.



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# Student Parabolic Flight Campaign

Our experiments:

- Burning liquids and fibres
- Diffusion flame in micro- and hypergravity
- Selfignition in microgravity
- Visualization of magnetic field in 0g
- Contiguous force in microgravity.



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# Student Parabolic Flight Campaign



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# YES2: Young Engineers' Satellite 2

- Foton attached module („FLOYD”)
- Reentry capsule „Fotino”
- „Spacemail” experiment



Safe and inexpensive method of bringing samples back to the Earth.

- Launch dated on September, 11th 2007
- Fotino recapture in Kazakhstan around 23rd

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# YES2: Young Engineers' Satellite 2

Polish students' tasks:

- Stepper driver
- Mechanical structure
- UHF link between tether ends
- Mobile Ground Station



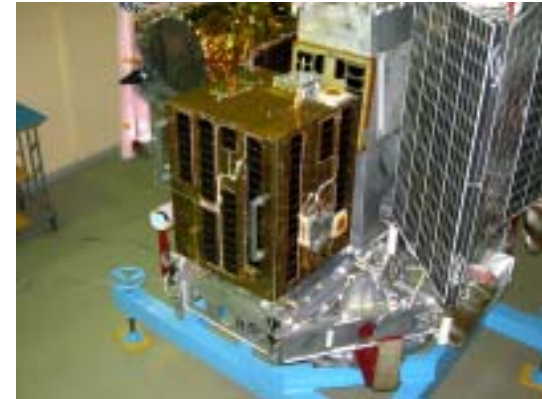
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# SSETI - Express

- SSETI Express is the first ESA student satellite
- Launched into a Low Earth Orbit in October 2005 (27.10.2005)

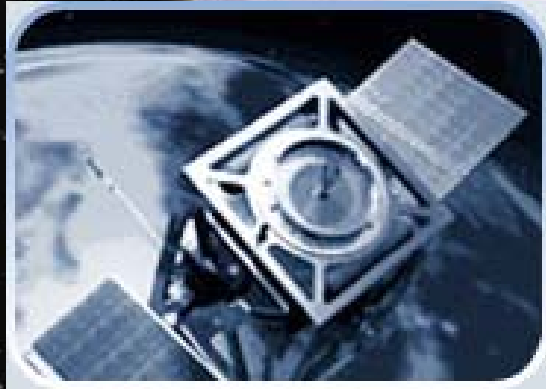


- The satellite served as a technological demonstration and as a test bed for some of the hardware that will be used for ESEO
- Polish teams: Communication Team (Wroclaw University of Technology), Operations Team (Warsaw University of Technology)

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# SSETI – ESEO (project realization)



## *European Student Earth Orbiter*

### The microsatellite objectives:

- taking pictures of Earth and Moon
- measuring radiation levels
- testing technologies for future missions.

### Four Polish teams:

- Operations
- Mechanical/thermal configurations and structure
- On-Board Data Handling Module
- Communications (Wrocław University of Technology Team)



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# SSETI – ESMO (Feasibility Study)



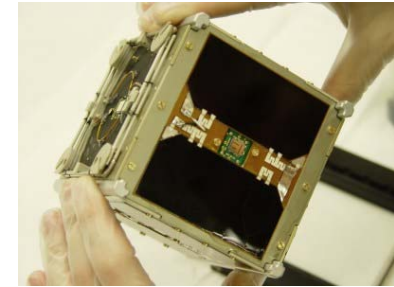
*European Student Moon Orbiter is to:*

- acquire images of the Moon and transmit them back to Earth for public relations and education outreach purposes
- perform new scientific measurements relevant to lunar science & the future human exploration of the Moon, in complement with past, present and future lunar missions
- provide flight demonstration of innovative space technologies developed under university research activities

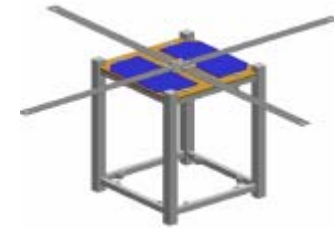
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# PW-Sat



- A CubeSat being built at Warsaw University of Technology
- First Polish picosatellite
- Is supposed to test new alternative method of disposal inactive satellites from LEO
- Will have radio amateur transceiver on-board
- Destined to take a part in DGSS experiment

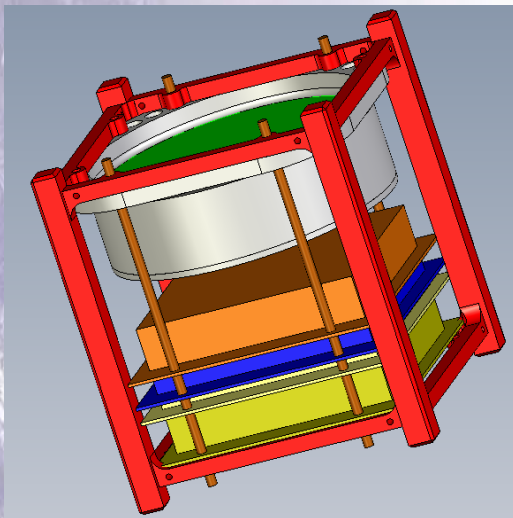


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## PW-Sat

- Unusual payload (kapton balloon)



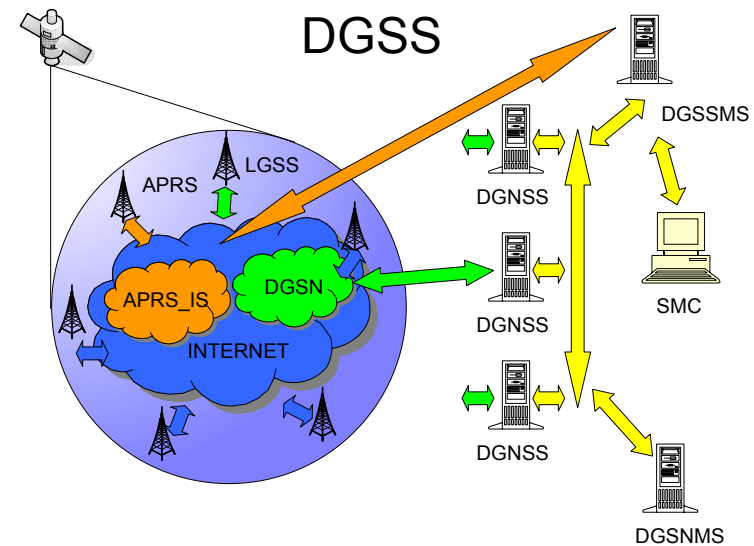
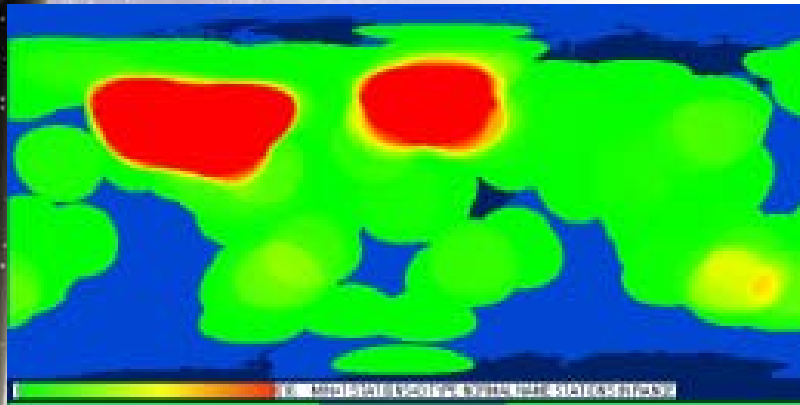
- Easy way to keep LEO clean
- Scientific results on perturbations forces effects

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# Distributed Ground Station System

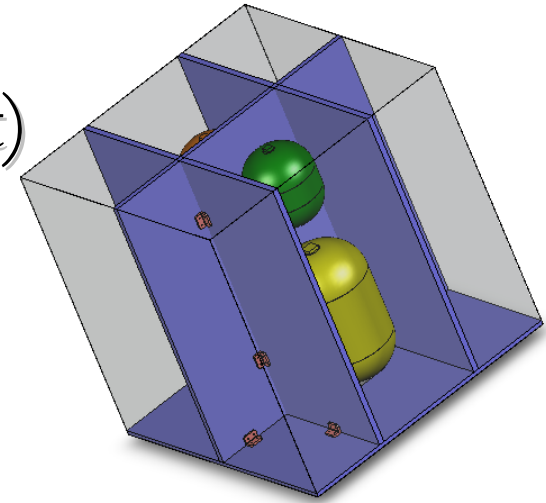
Improves access window time significantly and minimizes error rates for communication with satellites on Low Earth Orbit



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# PAS-Sat (Concept)



## *Polish Academic Student Satellite:*

- Panchromatic scanner (4m per pixel)
- Three communication channels (X band up to 80Mb/s)
- 120GB Memory (Solid State Recorder)
- RadHard, Fault Tolerant, Redundant CPU
- Cubic-look Structure
- Accurate Stabilization (Pointing accuracy: 0,2 deg )
- Bipropellant chemical propulsion.

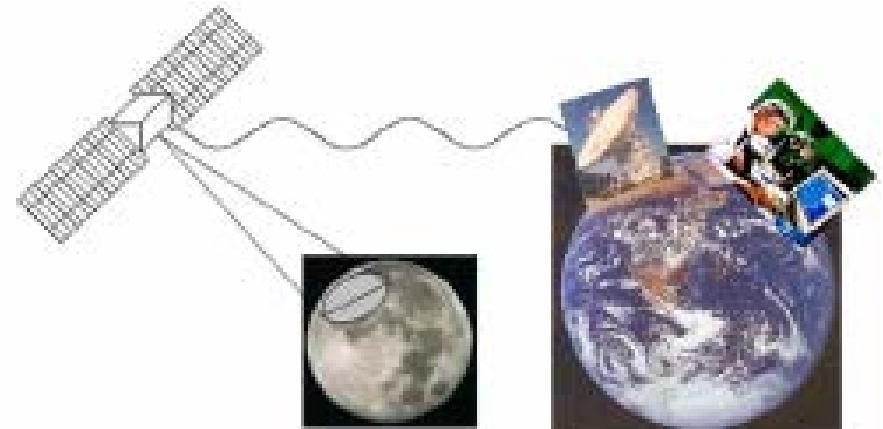
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# Satellite Simulation Team

## Research:

- SAR / ISAR / IfSAR Processing
- DSP Applications in Space
- Feasibility Study of the Space SAR radar
- Development of the satellites' simulation software
- 3D Radar Simulations
- Microwave Amplifiers
- Mobile Communications



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# Design of Satellite Launcher – student project



- **Rocket engines and stages calculation and design**
- **Thrust vector control**
- **Optimization of rocket's trajectory**

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## What's more...

- Space Technology Education Conference
- International Astronautical Congress
- Seminars in Space Research Center Warsaw
- Signal Processing Symposium
- International Air shows
- A lot of publications
- Space weekends, Science Fairs
- Meetings with Astronauts

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# Animation of satellite launch and deployment and other student's activities related to Space Research

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Thank you for your attention.

*Students of Warsaw University of Technology*

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