

Building Ireland's First Satellite



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Introduction

- The Educational Irish Research Satellite, **EIRSAT-1** is:
 - A student-led project to design, build, test and launch **Ireland's very first satellite!**
 - A **2U CubeSat** (1U = $10 \times 10 \times 10 \text{ cm}^3$)
 - 1-of-6 university teams selected in 2017 to participate in the 2nd round of the European's Space Agency's '**Fly Your Satellite!**' (FYS!) programme
- The FYS! programme provides access to state-of-the-art test facilities, guidance from satellite experts and, if certain milestones are achieved, a **launch opportunity**



fly your
satellite!



Aims

The EIRSAT-1 mission is driven by **scientific** and **educational** aims:

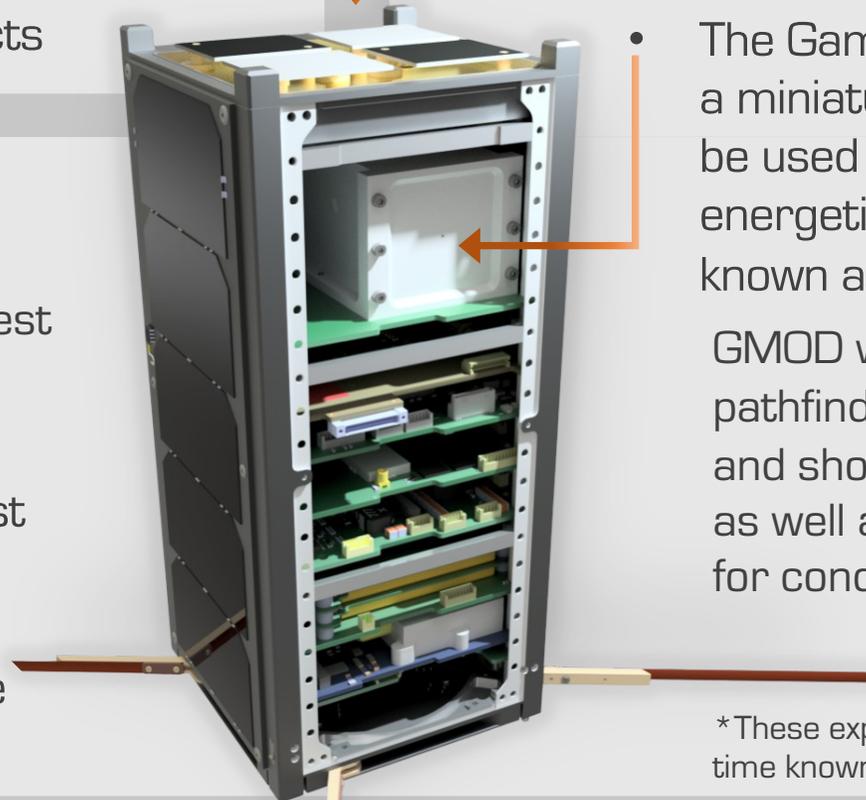
- Enhance the capabilities of the Irish higher education sector in space science and engineering
- Inspire the next generation of students towards the study of STEM subjects

Science Payloads

EIRSAT-1 will perform the first in-flight test of **3 experiments**

- Wave Based Control (**WBC**): a software-based experiment to test a novel attitude (i.e. spacecraft orientation) control algorithm and demonstrate its capabilities for use on larger spacecraft.

- The ENBIO Module (**EMOD**): 4 coated panels placed on the exterior of the spacecraft to test the performance of ENBIO's 'SolarWhite' and 'SolarBlack' (also on ESA's Solar Orbiter mission) thermal management coatings for the first time in Low Earth Orbit.

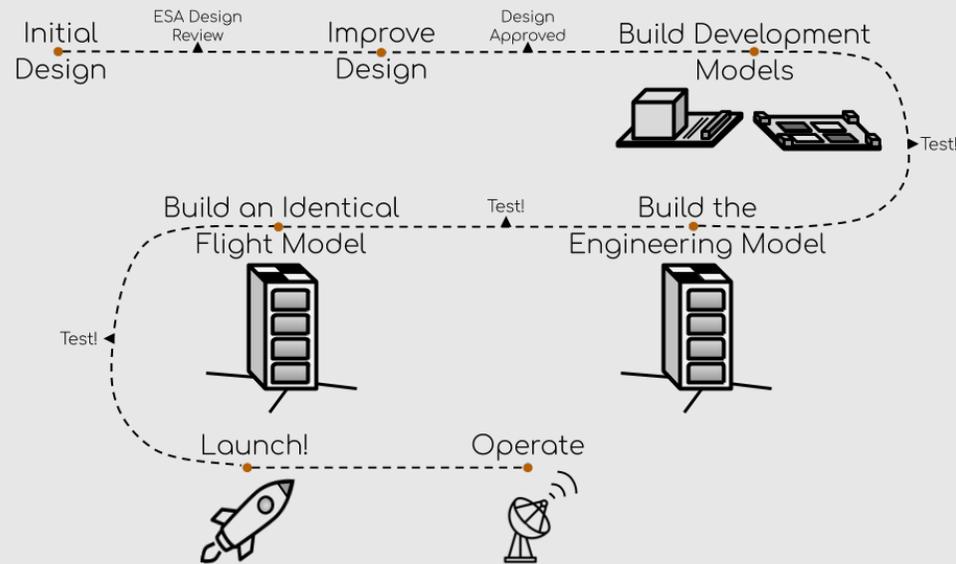


- The Gamma-ray Module (**GMOD**): a miniaturized γ -ray detector that will be used to detect light from the most energetic explosions* in the Universe, known as Gamma-ray Bursts (GRBs).
GMOD will act as a technology pathfinder for future scientific missions and show the capabilities of CubeSats, as well as constellations of CubeSats, for conducting GRB research.

*These explosions are so energetic that ripples in space-time known as Gravitational Waves are also produced!

Building a Spacecraft

- Teams participating in FYS! are involved in all aspects of their mission, from design to in-orbit operations



- Space-relevant **skills** and **expertise** are developed across all mission stages
- EIRSAT-1 is sowing the seed for the growth of the Irish space sector, by building capacity in systems engineering, flight software, environmental testing and spacecraft operations, **paving the way for future innovative missions**

My Role - Spacecraft Software & Operations

- To develop and test:
 - Software to control the CubeSat's behavior when in-orbit
 - Operational procedures detailing how to interact with the satellite's software
- A key aspect of my PhD research is to **improve the reliability** of the EIRSAT-1 mission through rigorous software testing
- As EIRSAT-1 is Ireland's first satellite, my role relies on building knowledge and learning from mission teams with in-orbit experience



The EIRSAT-1 Team

- The project draws on the skills of students and staff from a **range of science disciplines** at UCD
 - Physics, engineering, computer science and maths
- Students contribute through their masters/PhD research, for taught module credit, or as a volunteer
- Driven by a shared passion for space and science, the EIRSAT-1 team are strong outreach advocates of **equality** and **inclusion** in STEM

"It takes every sort of person to build a satellite" -

David Murphy, EIRSAT-1 Systems Engineer

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Images from EIRSAT-1 outreach activities