



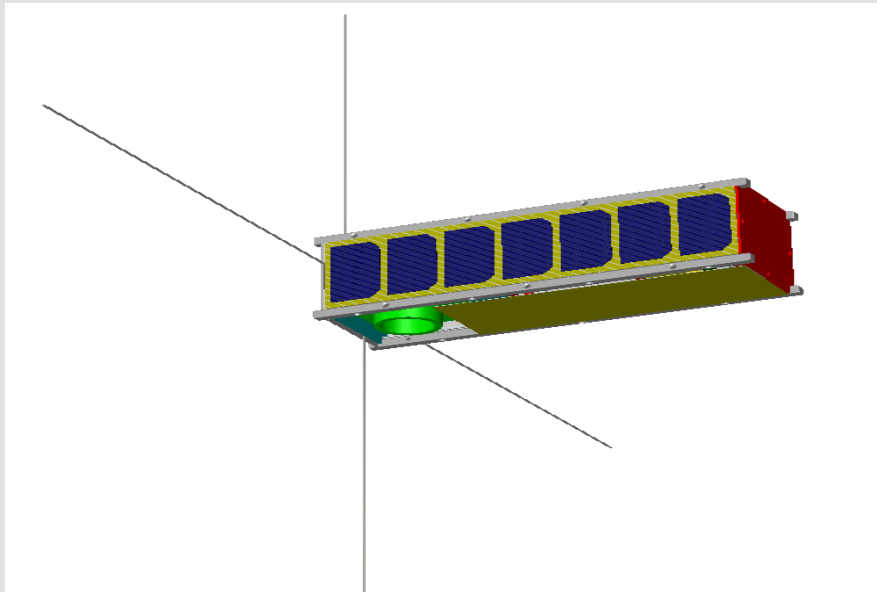
Space Universities Network

Supporting the Space Higher Education Community

Title:

Sheffield Cube Satellite – forming tomorrow’s Space Engineers, today

Summary



Along with the Sheffield Space Initiative (SSI) and the growing space interest at the University of Sheffield, students are developing the university’s very first satellite. Using NASA open source code and low-cost devices, the aim is to create a small device enabling easy access to space and inspiring the next generation of Space Engineers and Scientists.

Aims/Objectives

To demonstrate technical capability with leading edge developments in space satellite design by creating a prototype 3U CubeSat with all the core supporting subsystems for a future payload (such as EO camera).

What was the context / background?

Following the success of the SunbYte mission (2017), the Sheffield Space Initiative (SSI) was founded to further engage University of Sheffield students in the science and engineering challenges involved in the exploration of Space and now consists of several exciting projects. One such project was satellite design. Satellites are key to many critical systems on Earth, from navigation to telecommunications; this project gives students the chance to apply their taught knowledge to a physical space project.

How was it organised and who was involved?

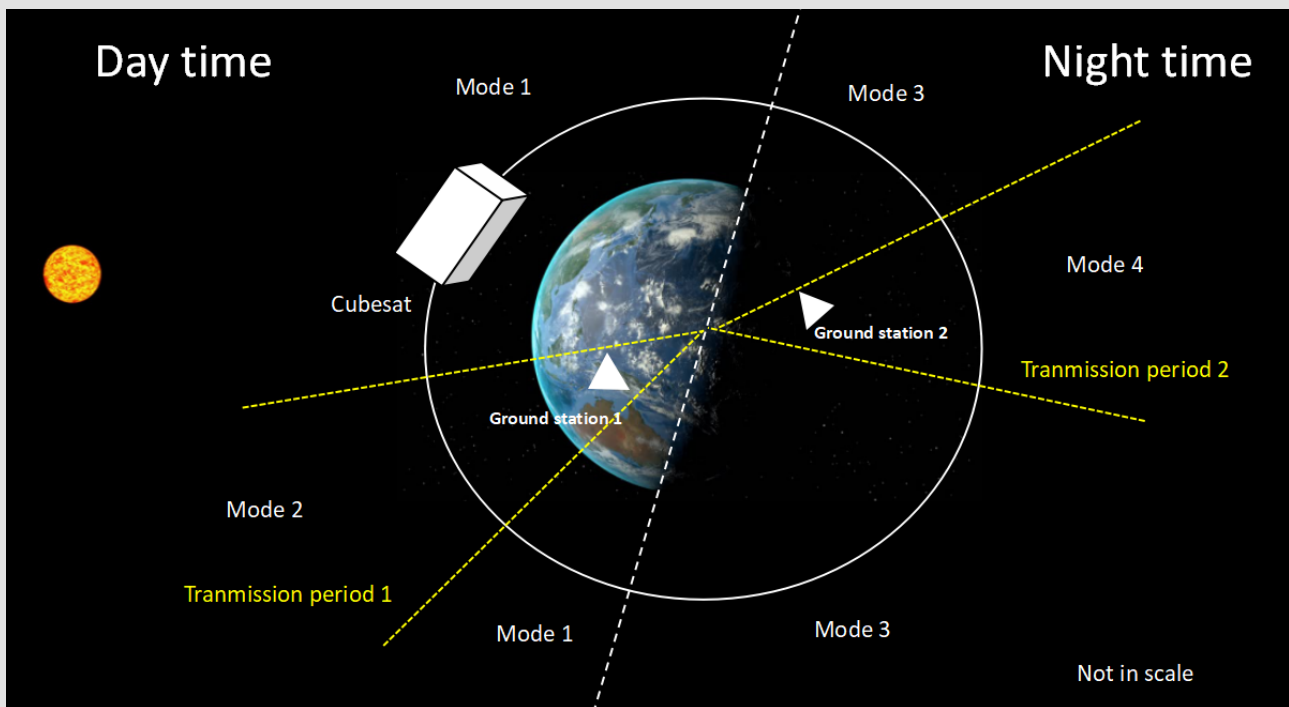
The team is organised based on subsystems such as Electronics and Power, Command and Data handling, Mechanics and Attitude Determination and Controls. This is intended to resemble the team structure in a typical space project. A range of students across the engineering and science disciplines are a part of the team.

As an extra-curricular project, students volunteer their time. Together, they have thoughtful design discussions and experience the trade-off challenges which often occurs in real life. In the future, some students may use this for their final year projects.

What resources did you need?

Funding of several thousand pounds was needed mainly for component purchases, manufacture, assembly and testing. Support from faculty such as allocation of space and access to workshops was key to enable the work packages to be carried out.

Describe the activity



Throughout last year and this year, the team worked together to develop preliminary design concept for Earth Observation mission surveying deforestation. They conducted trajectory analysis based on the assumption of an ISS orbit and calculated the overpass times with accessible ground stations. A system budget regulating mass and power was formed and modes of operations were assessed. Based on the requirements, an electronics power subsystem was designed and a mechanical CAD model built to assess spatial constraints. The team was excited to try open source software from NASA for Command and Data Handling. This enabled them to understand the key differences between flight software and normal Earth operating systems. Although an extra-curricular project, it was important that the

team remained organised, disciplined and focused in order to deliver valuable achievements.

Has it been evaluated? What feedback have you had?

The project is in talks with other institutions to seek testing and launch opportunities. At the same time, the team hopes to work with other Sheffield projects such as the supersonic rocket to provide telemetry services and test the satellite's robustness. No doubt further collaborations will be formed, if you are interested, please email us!

Key Learning Points

Space is not an easy environment to operate in, it demands respect and care. Students develop a wider understanding of commercial space operations and appreciate that space components are not only expensive due to space heritage but also because they are good, reliable parts.

Thematic Categories (tick any that apply to your case study)

Method		Topic	
Online Text and Notes	<input type="checkbox"/>	Orbits and Trajectories	<input checked="" type="checkbox"/>
Assessment Materials	<input type="checkbox"/>	Rocket Propulsion	<input type="checkbox"/>
Video and Audio Lectures	<input type="checkbox"/>	AOCS/ADCS	<input checked="" type="checkbox"/>
Lecture Slides	<input type="checkbox"/>	Payloads	<input checked="" type="checkbox"/>
Curricula	<input type="checkbox"/>	Power	<input type="checkbox"/>
Video and Audio Clips	<input type="checkbox"/>	Communications	<input checked="" type="checkbox"/>
Recommended textbooks	<input type="checkbox"/>	On Board Data Handling	<input checked="" type="checkbox"/>
Useful software	<input checked="" type="checkbox"/>	Systems	<input checked="" type="checkbox"/>
Worksheets and Projects	<input checked="" type="checkbox"/>	Mechanical	<input checked="" type="checkbox"/>
Simulations	<input checked="" type="checkbox"/>	Thermal	<input checked="" type="checkbox"/>
Tutors' Guides	<input type="checkbox"/>	Astronomy	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	Earth Observation	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	History of Spaceflight	<input type="checkbox"/>
	<input type="checkbox"/>	Other	<input type="checkbox"/>

Contact Details

Name of Organisation	University of Sheffield CubeSat group
Contact Name	Yun-Hang Cho
Email Address	yun-hang.cho@sheffield.ac.uk
Links	<i>Please add links to any relevant pages/documents on your own website</i>

Email case study to: sun-group@bristol.ac.uk