STRATH CUBE

University of Strathclyde Glasgow

STRATH AIS

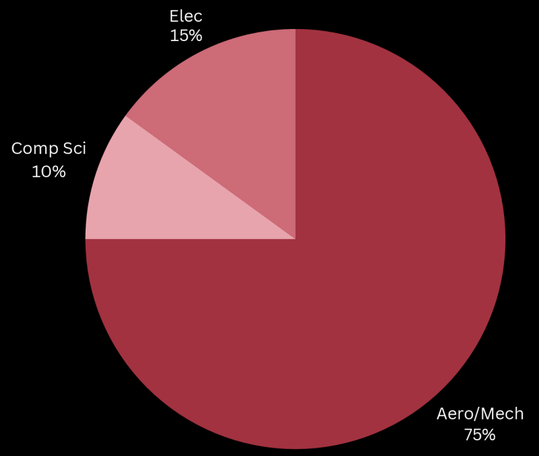
MEET THE TEAM

9 MEng

3 Bachelors

30 Society Students

3 PhD Students



Male - Female Split

Yeargroup Split

HELLO!

Dan

Secondary Payload

MAE

Thomas

Mission Analysis

MAE

Cameron

Systems Architecture

MAE

Freya

Project Management/EPS

MAE

Daniel

Communications

EEE

Preben

Primary Payload

Comp Sci

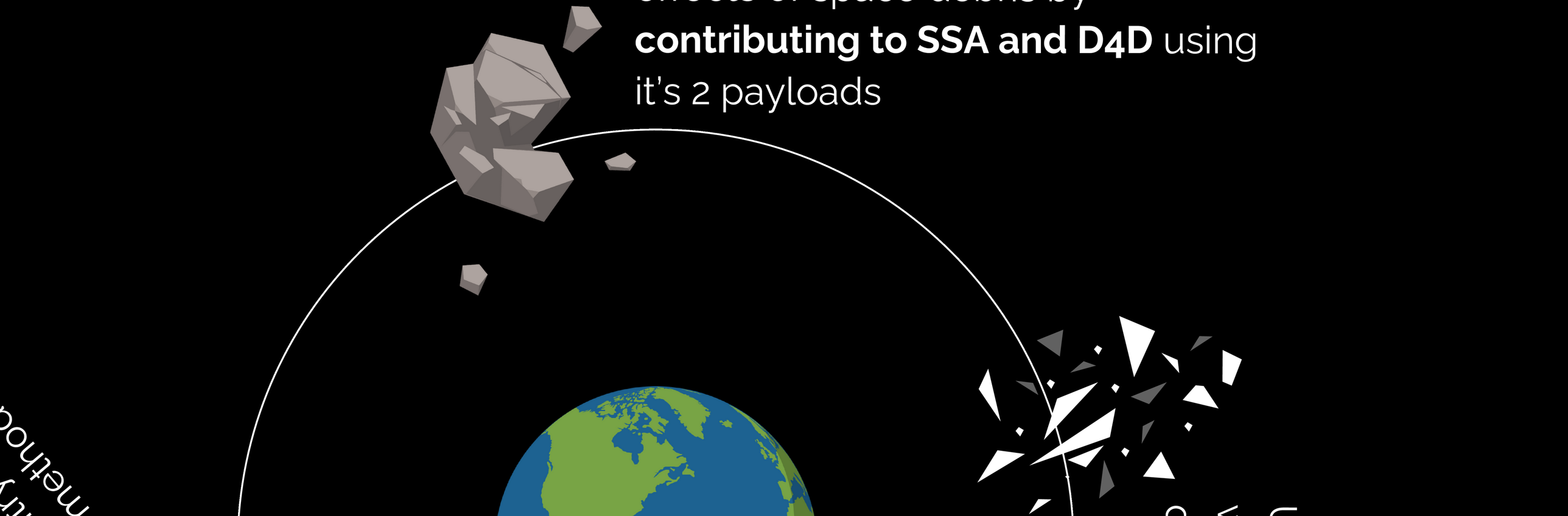
Nepheli

Systems Engineer

RA

WHY STRATHCUBE

STRATHcube aims to combat the effects of space debris by **contributing to SSA and D4D** using it's 2 payloads



WHY STRATHCUBE

STRATHcube aims to combat the
objects of space debris by
contributing to SSA and D4D using
2 payloads

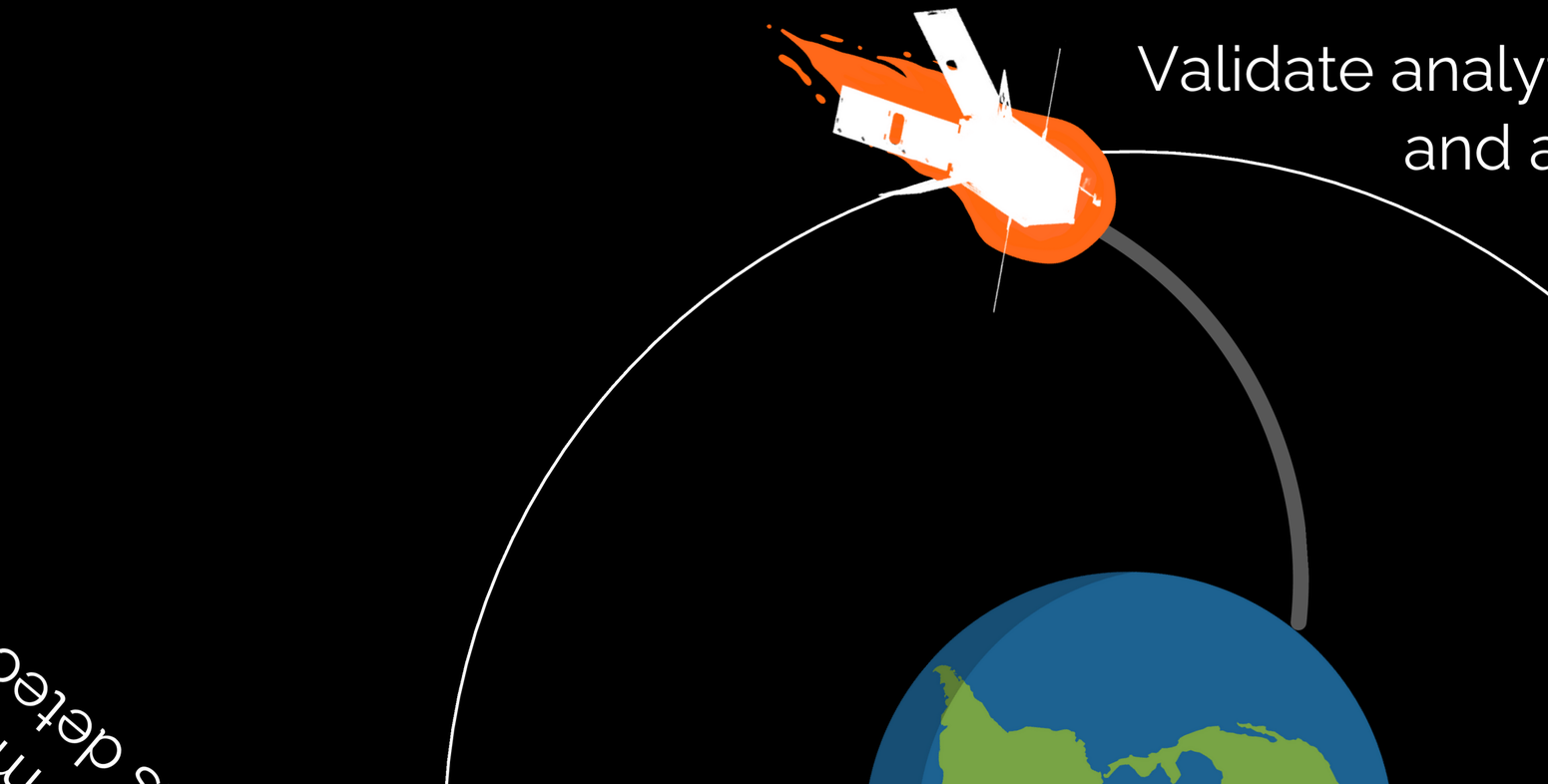
Using **Passive Bistatic Radar (PBR)**
with the Iridium Constellation to
detect space debris while in orbit.

Act as a technology demonstrator for
the use of PBR as a means of in-orbit
space debris detection.

WHY STRATHCUBE

Record the **heat and motion history** of the satellite and determine the **conditions of Solar Panel Fragmentation** (SPF) during atmospheric re-entry.

Validate analytical re-entry simulation and analysis methods.



PRIMARY PAYLOAD

Patch antenna receives RF signal energy from Iridium

Signal Data passed through LNA and BPF

Filtered signal passed through SDR

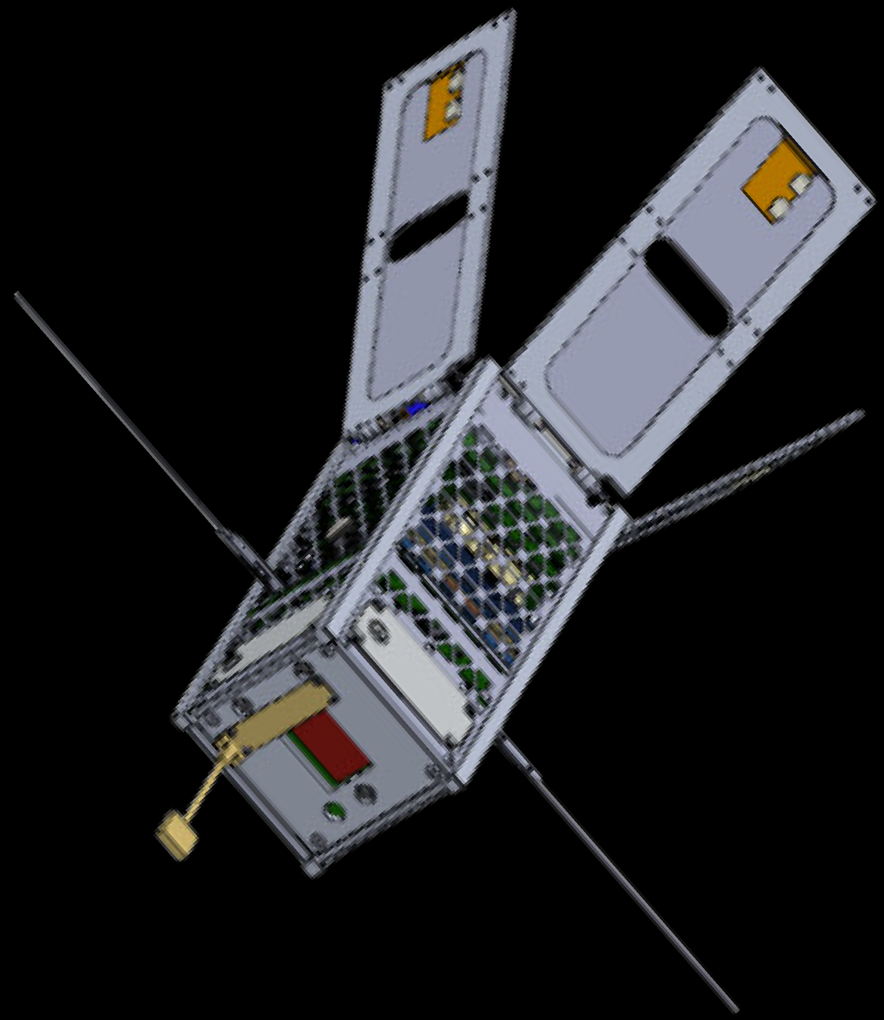
Data is downlinked to JWGS

Data is processed using the debris detection algorithm

Process is validated by comparing to the known positions of ISS

SECONDARY PAYLOAD

Passive aerodynamic stability for re-entry



Shuttlecock Configuration

Sensor package

- Thermocouples – Temperature determination
- Pressure sensor – Free stream velocity determination
- Inertial measurement unit – Acceleration and attitude determination
- Heat flux sensor
- Stain gauges

CUBESAT DESIGN

SECONDARY PAYLOAD

PRIMARY PAYLOAD

CUBESAT JUSTIFICATION

Technology Demonstrator

- Smaller components are required
- CubeSat can provide sufficient power

Risk Mitigation

- Reduces the cost of the mission
- Use of COTS components provides more assurance for the success of the mission

Educational Output

- Allows hands-on experience for students
- Promotes collaboration between students from different departments

CURRENT DEVELOPMENT STATUS

Phase B (Gantt)

Detailed System Definitions

Subsystem / element	**Manufacturer** (in-house/ COTS)	**Model**	**At Uni lab?** (Y/N)	**Status**
Primary Payload	*In house*	*Development Model*	Y	- *Antenna selected,* - *Manufacture of PCB and FE required*
Secondary Payload	*COTS/In house hybrid*	*Development model*	N	- *New Antenna selection required* - *Connection to Iridium core needs to be designed*
Structure	*In house*	*Development model*	Y	- *CAD in development* - *Materials procured from within university* - *FEA to be performed this year*
ADCS	*COTS*	*Development model*	N	- *Module ready to be ordered*
OBDH	*COTS*	*Development model*	N	- *Motherboard selected* - *Unprogrammed OBC*
TCS	*COTS*	*Development model*	N	- *Mission analysis profile created* - *Operations profile needed*
EPS	*COTS*	*Development model*	Y	- *Components selected and ready for assembly*
COMS	*COTS for Ground, In-house/COTS hybrid for iridium*	*Development model*	N	- *For ground, Antenna and components selected* - *For iridium, FE design still required*
Ground Segment	*COTS*	*Development model*	N	- *To be integrated upon components procurement*

RISK MANAGEMENT

Handovers

Procurement Issues
with Components

Same Level of
Education Each Year

RISK MANAGEMENT

Handovers

- Detailed handover documents
- Onboarding for future Masters teams
- Multi-year PhD students at the head of the project

Procurement Issues with Components

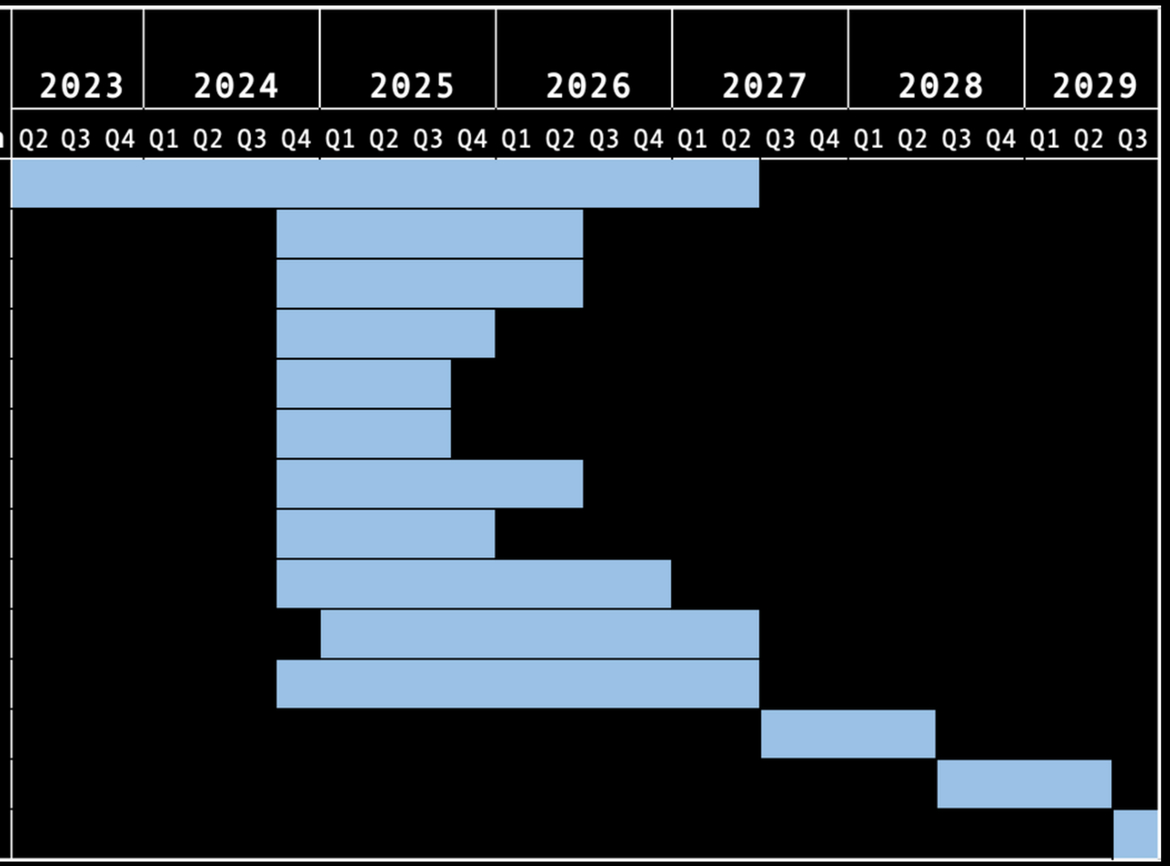
- Multiple potential components selected
- Suppliers contacted sooner
- Same supplier for multiple components

Same Level of Education Each Year

- PhD Students with experience in the sector
- Interactions with industry
- If working with ESA - gaining knowledge from experts

TIMELINE

Task Name	Start Date	End Date	Duration
Phase C - Detailed Design	04/11/2023	04/07/2027	149 wks
Detailed Design of ADCS	12/06/2024	05/27/2026	55 wks
Detailed Design of EPS	12/06/2024	05/27/2026	55 wks
Detailed Design of TT&C	12/06/2024	01/30/2026	43 wks
Detailed Design of Structures	12/06/2024	10/06/2025	31 wks
Detailed Design of Mechanisms	12/06/2024	10/06/2025	31 wks
Detailed Design of OBDH	12/06/2024	05/28/2026	55 wks
Detailed Design of Thermal Control	12/06/2024	12/23/2025	39 wks
Detailed Design of Primary Payload	12/06/2024	09/11/2026	66 wks
Detailed Design of System	02/04/2025	03/08/2027	78 wks
Detailed Design of GSS	12/06/2024	04/06/2027	87 wks
Phase D - Qualification & Production	04/08/2027	05/25/2028	43 wks
Phase E - Utilization	05/26/2028	07/25/2029	43 wks
Phase F - Closeout	07/26/2029	10/22/2029	9 wks

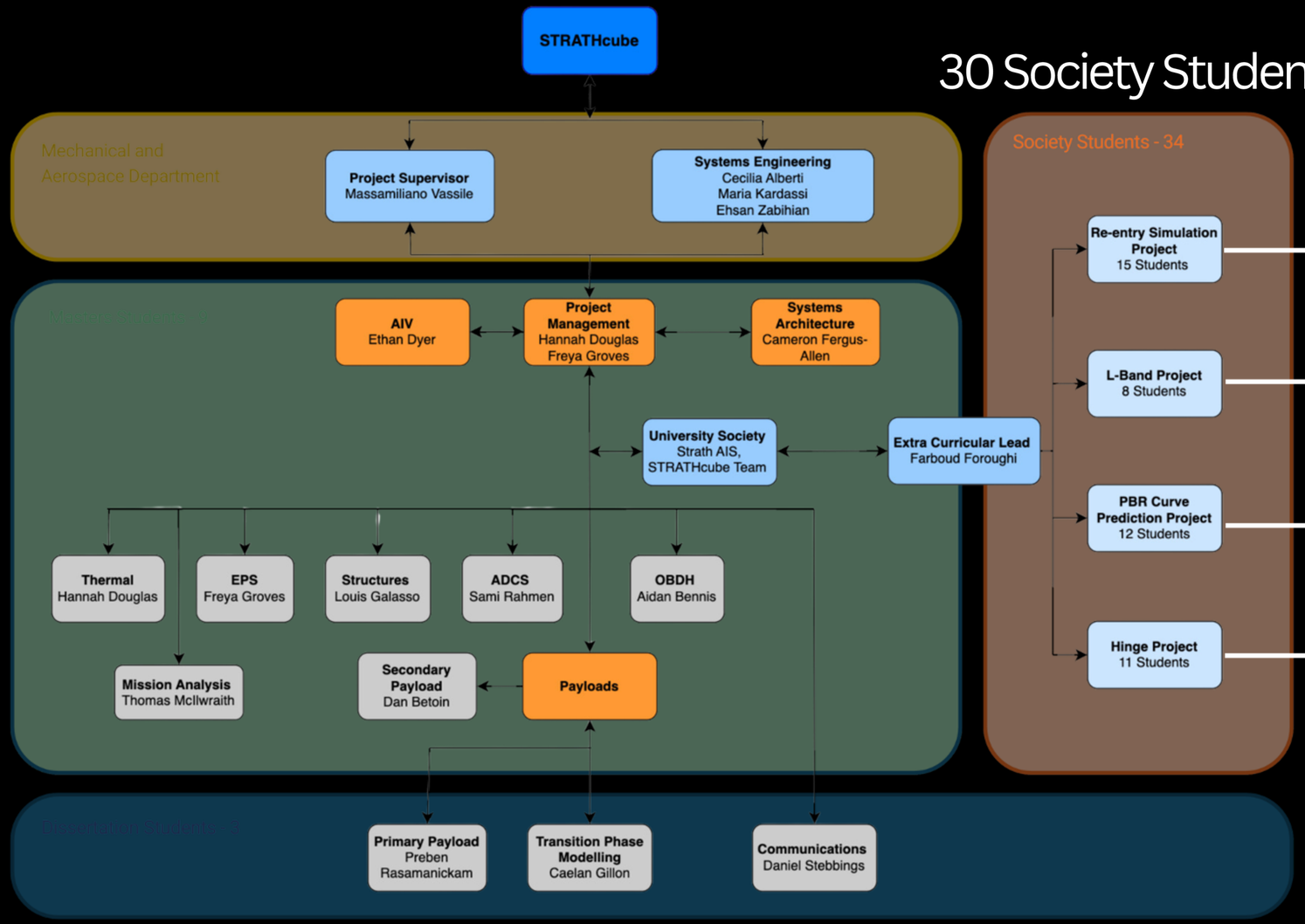


PROJECT MANAGEMENT

4 Academic Staff

9 MEng Students

3 BEng Students



30 Society Students

4 Student Projects:

- Re-Entry Simulation
- L-band
- PBR Curve Prediction
- Structure Re-design

EDUCATIONAL RETURN

4 Student Projects:

⟶ Re-Entry Simulation

⟶ L-band

⟶ PBR Curve Prediction

⟶ Structure Re-design

- First student led Scottish satellite
- UG Research featured in IAC 7 times
- Site visits to Airbus, Clyde Space, Alba Orbital
- Growing exponentially - students
- Students included in each part of the design

DOWNSTREAM APPLICATIONS

Primary Payload

- ★ Development of a **modular, easy-to-install PBR unit** that can be implemented into commercial platforms
- ★ Distribution of processed data to **improve the ESA MASTER database**

Secondary Payload

- ★ Validation of **fragmentation conditions** in atmospheric re-entry modelling
- ★ Demonstration of CubeSat aerodynamic stability during re-entry

THANK YOU

University of Strathclyde Glasgow

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