ENGINEERING PORTFOLIO

William Canavan

DISCIPLINE
Mechanical (Aerospace)

LOCATION
Brisbane

YEARS EXP.
Penultimate Student

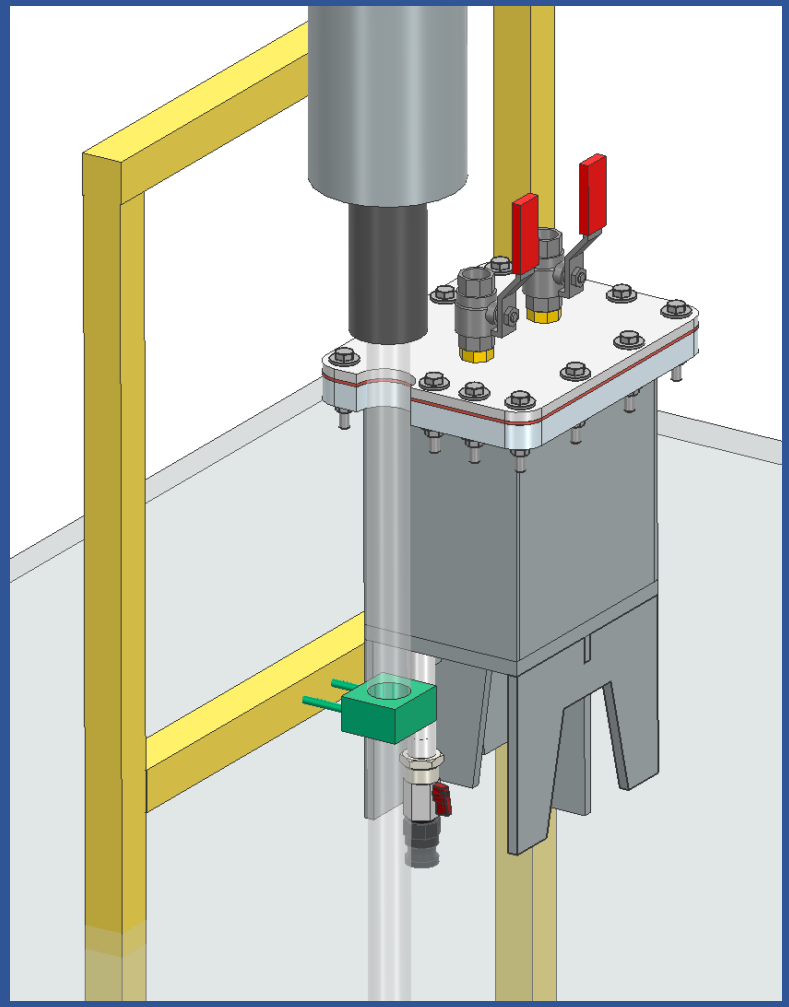
JAMESON CELL BUBBLE LOAD DEVICE

Summer Research Student · Sustainable Minerals Institute UQ · 2026

- Completed 6 week research program in floatation and mineral processing technology. In the short time frame, I became familiar with key concepts in a foreign field and used this knowledge and previous experience to design a replacement experimental apparatus for a PhD Student at the research facility.

- The apparatus was designed for measuring the weight of minerals attached to bubbles in a Jameson floatation cell. It was a replacement for a previous design that was unable to be used in the tight space constraints of the test cell. I ensured the fundamental design requirement of spatial integration was met by creating a digital clone of the existing Jameson Cell and using the 3D CAD model to ensure adequate clearance for the finish design.

- Additionally further improvements were made over the original design including larger and easier to access top mounted ball valves, additional drain valve, and quick disconnect. These improvements would allow for significantly faster operation and reset times allowing for the device to be used many times in a single experimental run of the cell.



Right: CAD Model of bubble load device and Jameson Cell. Note clearance in bubble load device for Jameson Cell Downcomer tube.

JAMESON CELL BUBBLE LOAD DEVICE

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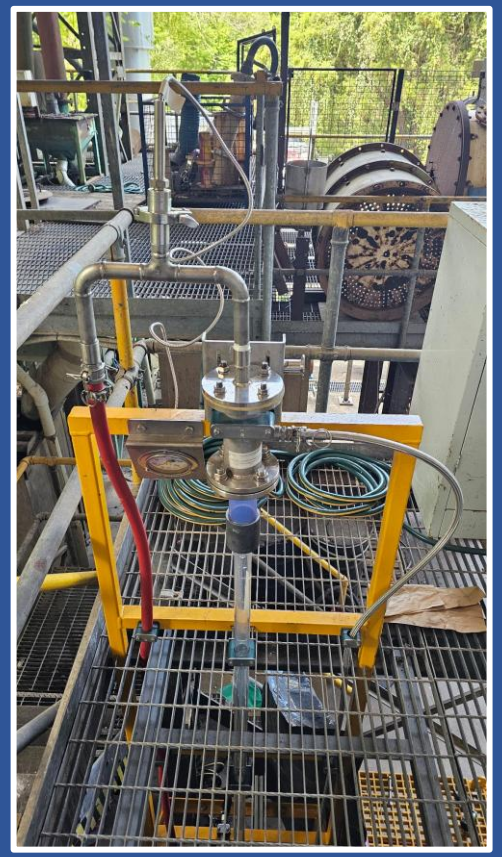
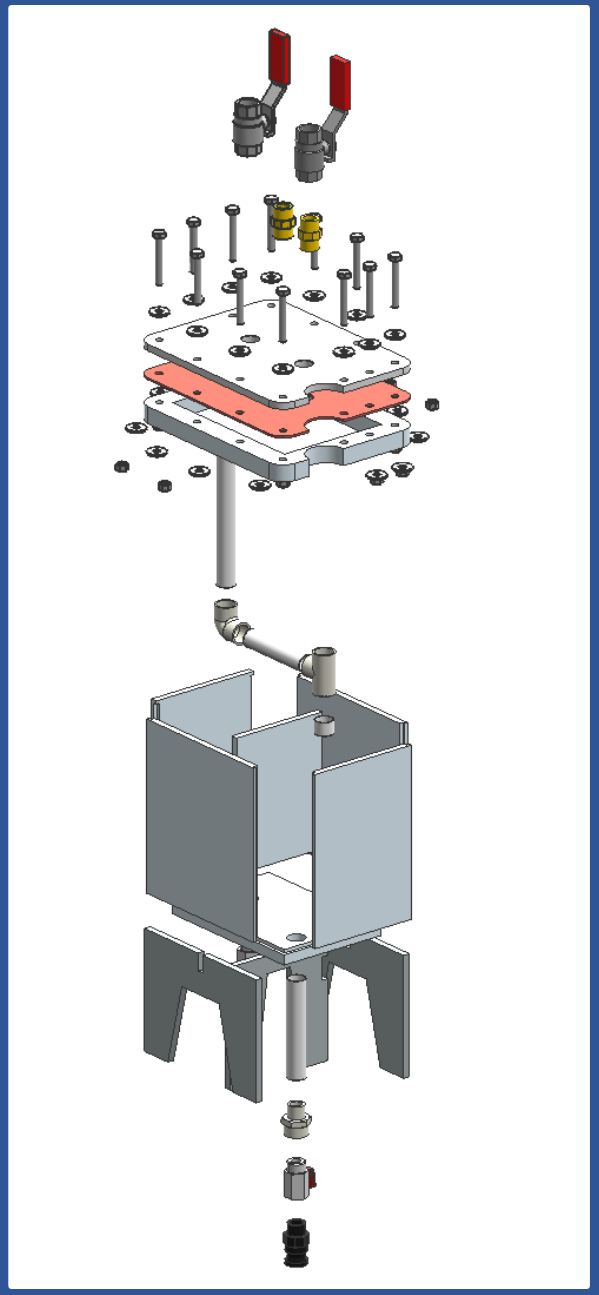


Left: Lab Scale Jameson Cell being used by PhD student I was supporting. I created a 3D CAD model of the top structure and jet to ensure adequate clearance was designed into bubble load device.

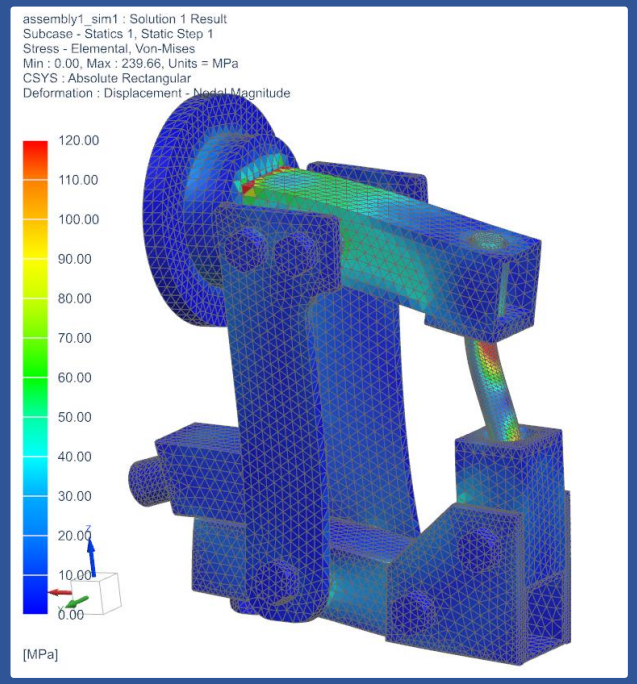
Right: Exploded view of bubble load device that I designed.



MECH3100 Design Challenge

Traction Sub-Team· 2025

- Member of the Traction Sub-team for the MECH3100 Design Challenge Course. Required to design a vehicle that clamped to a railway track and pulled a braked load. To obtain the required frictional force on the wheel surface to pull the load the vehicle must be pulled into the track by clamps. I designed the clamps to use roller bearings angled to match the rail surface due to the smooth motion and tight tolerances they would provide. I additionally designed the mounting system so all clamping loads would be transferred directly into the drive shaft and not through the thin walls of the structure. Our vehicle was able to pull 1000N, or ~100kg.



Left: FEA simulation completed by team member of traction mounting system I designed. **Above:** Constructed traction mounting arm during testing on rail interface. **Right:** Fully Assembled vehicle before safety inspection.

10,000ft HIGH POWER ROCKET

PROJECT HERA

Lead Aerostructures Engineer · UQSpace / University of Queensland· 2024

- Coordinated Aerostructures sub-team in the design, manufacture, and delivery, of a High Power Rocket with a maximum altitude of 10,000ft that went on to place 12th out of 152 teams in the Spaceport America Cup competition taking place in the United States.

- I assisted with the initial scoping and development of the project from conceptual planning to final review of the system requirements. Additionally, I coordinated the design, review, manufacture, and delivery stages for the Aerostructures team. I had oversight over each section of the Aerostructures team design and was responsible for ensuring my team were capable and enabled in completing their respective work.

- In creating the 3D CAD model of the rocket, I ensured that all internal sizing was consistent with the system requirements and adequate for the needs of the internal rocketry systems through inter sub-team communication. I collaborated with my team to develop new composites workflows which delivered high-quality composite components under time and budget constraints.

- I was responsible for the ultimate performance of the Aerostructures systems and as such flew to the United States to take part in the Rocketry Competition. I developed rigorous checklists, completed outstanding manufacturing items, and diagnosed and solved issues collaboratively with the rest of the team to ensure a safe and successful flight. In part due to the efforts of myself and my sub-team the rocket performed flawlessly, achieving 12th out of 152 teams.

Left: Render of Hera with vinyl and internal cut-away.
Right: *Hera* Rocket during take-off and initial motor burn.

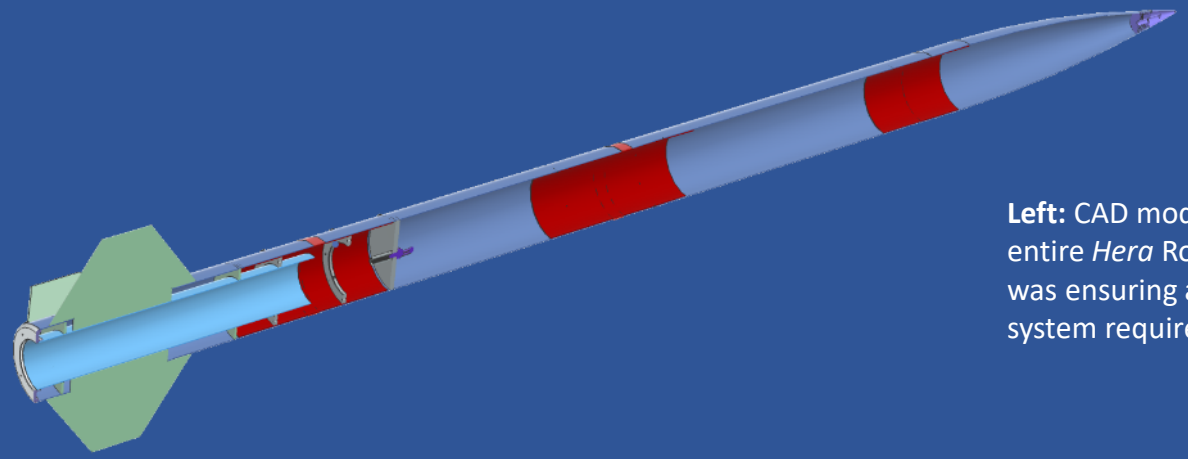
PROJECT HERA

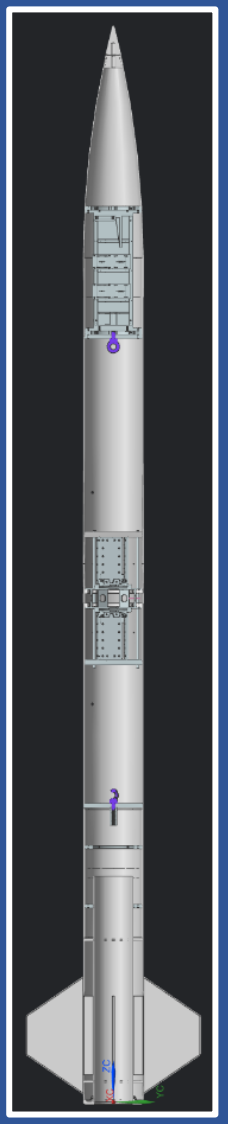
Part Number	Part Name	Quantity	Drawing	Stock Procurement	Manufacturing	Assembled	Operations Left
	External Nosecone Tip	1	Complete	Complete	Complete	Complete	
	Interal Nosecone Tip	1	Complete	Complete	In-Progress	Incomplete	Drill and Tap
	Nosecone Tip Threaded Rod	1	In-Progress	Complete	In-Progress	Incomplete	Check Length
	Nosecone	1	Complete	Complete	In-Progress	Incomplete	
	Nosecone Mould	1	N/A	Complete	In-Progress	Incomplete	Grind channel
	Nosecone Coupler	1	Complete	Complete	In-Progress	Incomplete	Sand and Mill Holes
	Forward Airframe	1	Complete	Complete	In-Progress	Incomplete	Sand
	Avionics Coupler	1	Complete	Complete	In-Progress	Incomplete	sand, mill holes
	Avionics Switchband	1	Complete	Complete	Incomplete	Incomplete	Mill Holes, Square Switchband
	Forward Aft Airframe	1	Complete	Complete	Complete	Incomplete	Sand
	Ballast Coupler	1	Complete	Complete	In-Progress	Incomplete	Sand
	Ballast Coupler Band	1	Complete	Complete	Complete	Complete	-
	Aft Aft Airframe	1	Complete	Complete	In-Progress	Incomplete	Cut to Length, Mill
	Fins	4	Complete	Complete	In-Progress	Incomplete	Cut Fins
	Centering Rings	2	Complete	Complete	In-Progress	Incomplete	Turn to size
	Motor Tube	1	Complete	Complete	Incomplete	Incomplete	Cut to Length
	Ballast Bulkheads	2	Complete	Complete	Incomplete	Incomplete	Acquire Stock
	Thrust Ring	1	Complete	Complete	In-Progress	Incomplete	Anodise
	Rail Guides	2	Complete	Complete	Complete	Complete	Mount
	Aft Airframe Recovery Bulkhead	1	Complete	In-Progress	Incomplete	Incomplete	Acquire Stock
	That one at front thats made of polycarb bulkhead	1	Complete	Complete	Complete	Complete	Acquire Stock
	Ballast Discs	?	Incomplete	In-Progress	Incomplete	Incomplete	Design
	Forward Centering Ring Jig	1	Complete	Complete	Complete	Incomplete	Design
	Aft Centering Ring Jig	1	Complete	Complete	Complete	Incomplete	Design

Aerostructures Requirements Overview

Req. ID	Requirement Description	Verification Status
STRU-1	*The launch vehicle shall be aerodynamically stable during ascent without any active flight control.*	Verified - On the basis of the below, and no active flight control is used
STRU-1.1	*The stability margin of the vehicle shall be greater than 1.5 during all stages of ascent (from launch to first recovery deployment event).*	Verified - Current min stability (launch rod clearance) as per Hera OpenRocket v1.5.0 is 1.57. Ballast can be adjusted to improve this number.
STRU-1.2	*The stability margin of the vehicle shall be less than 6 and should be less than 4 during ascent.*	Verified - Current max stability as per Hera OpenRocket v1.5.0 is 3.86
STRU-1.3	*The rail departure velocity should be least 30 m/s and shall be more than 15 m/s.*	Verified - Current rail departure velocity as per Hera OpenRocket v1.5.0 is 28.2 m/s, further stability verified by above

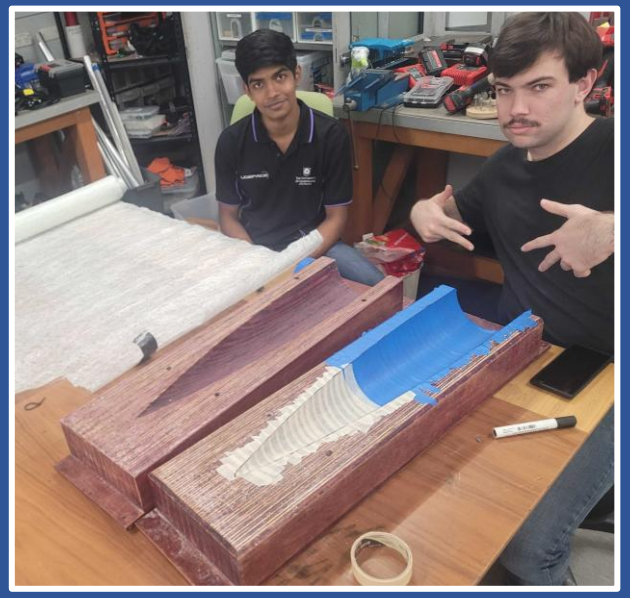
Left: Example spreadsheet that I created and maintained tracking the state of all parts the Aerostructures team was responsible for. **Above:** Example System Requirements that I helped create and validate.

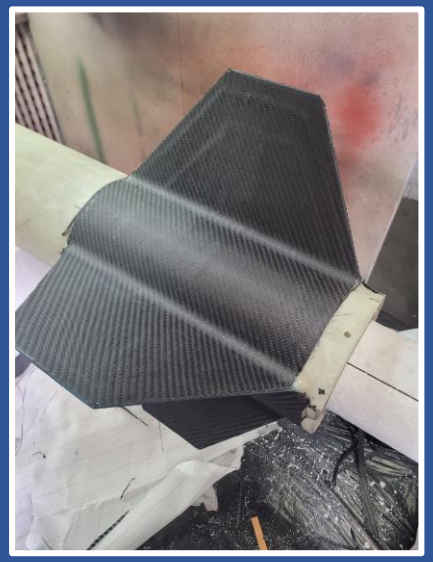




Left: CAD model of the *Hera* Rocket that I designed. **Right:** Cross-section view of entire *Hera* Rocket with other sub-systems included. Key responsibility of my role was ensuring all sub-systems could integrate into the airframe as specified by the system requirements.

PROJECT HERA

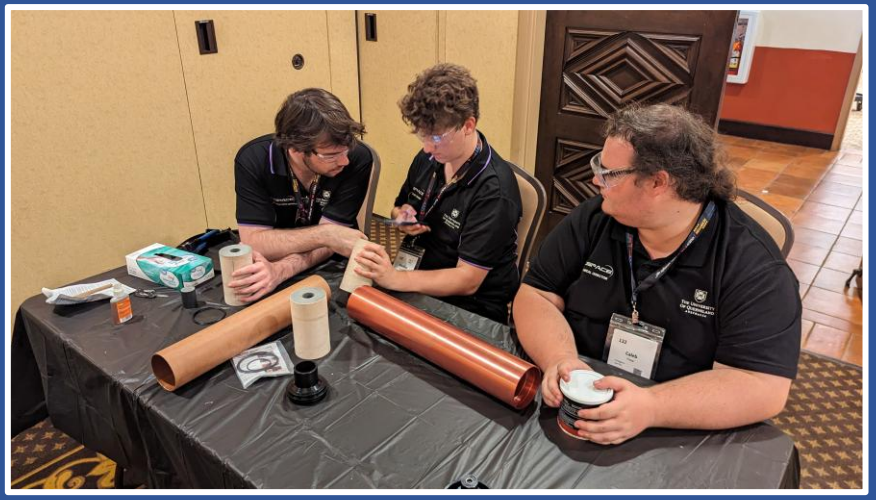




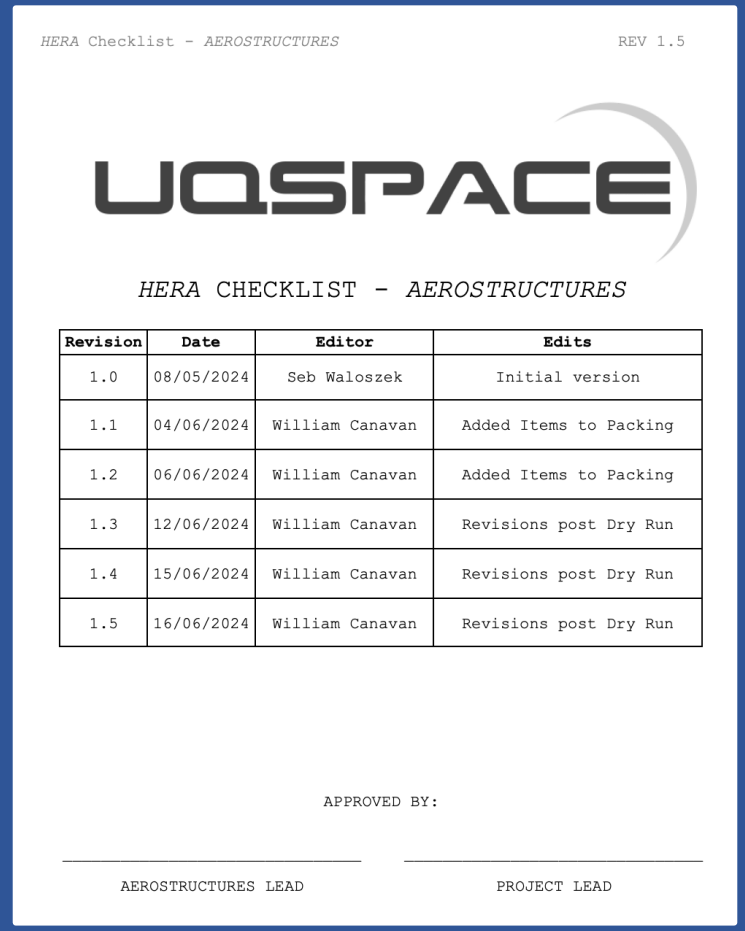
Above: Myself and Aerostructures team member preparing Nose Cone mould before composite layup. **Right Above:** Fin Can of rocket during and after completion of carbon fibre layup**. Right Below:** Airframe Tube mounted in milling machine during operation to create fin slots and mounting holes. **Right:** *Hera* Rocket full stack after manufacturing and assembly without cosmetic vinyl.

10,000ft HIGH POWER ROCKET

PROJECT HERA



Left: *Hera* Rocket after successful safety inspection and gaining approval to launch. **Above:** Myself and two other UQ Space Members during assembly of the rocket motor. **Right:** Cover of final Aerostructures Checklist that I helped develop. I completed this checklist multiple times before the flight for testing and on the day of the flight to ensure maximum reliability under high stress.



HERA Checklist - *AEROSTRUCTURES* REV 1.5

UQSPACE

HERA CHECKLIST - *AEROSTRUCTURES*

Revision	Date	Editor	Edits
1.0	08/05/2024	Seb Waloszek	Initial version
1.1	04/06/2024	William Canavan	Added Items to Packing
1.2	06/06/2024	William Canavan	Added Items to Packing
1.3	12/06/2024	William Canavan	Revisions post Dry Run
1.4	15/06/2024	William Canavan	Revisions post Dry Run
1.5	16/06/2024	William Canavan	Revisions post Dry Run

APPROVED BY:

AEROSTRUCTURES LEAD

PROJECT LEAD

10,000ft HIGH POWER ROCKET

PROJECT HERA

Top Left: *Hera* Rocket launch. The structure designed and constructed by myself and my team survived the intense aerodynamic loading environment created during motor thrust phase. The structure endured a maximum velocity of 280m/s or 1000km/h. **Bottom Left:** *Hera* Rocket suspended under parachutes after successful apogee and rocket separation. Calculation of size and amount of shearing bolts was a critical responsibility of the Aerostructures team that I oversaw. **Right:** *Hera* Rocket aft section and parachutes after touchdown. All structural components were found undamaged and in re-flyable condition, a key requirement for success. The Hera structure did re-fly the following year under the name *Epimetheus.* Epimetheus also had a flawless flight placing 2nd overall in the Australian University Rocketry Competition (AURC).

PROJECT THESEUS

Lead Aerostructures Engineer · UQSpace / University of Queensland· 2024

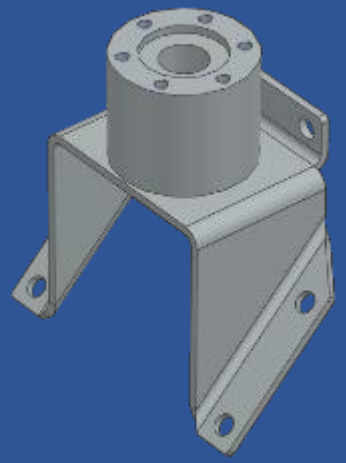
- Coordinated and took part in planning, design, manufacturing, and delivery of the Aerostructures components and sub-team for the *Theseus III* Lunar Rover. This consisted of leading the Aerostructures team through design phase and review, planning timelines, manufacturing components, integrated testing, and final competition.

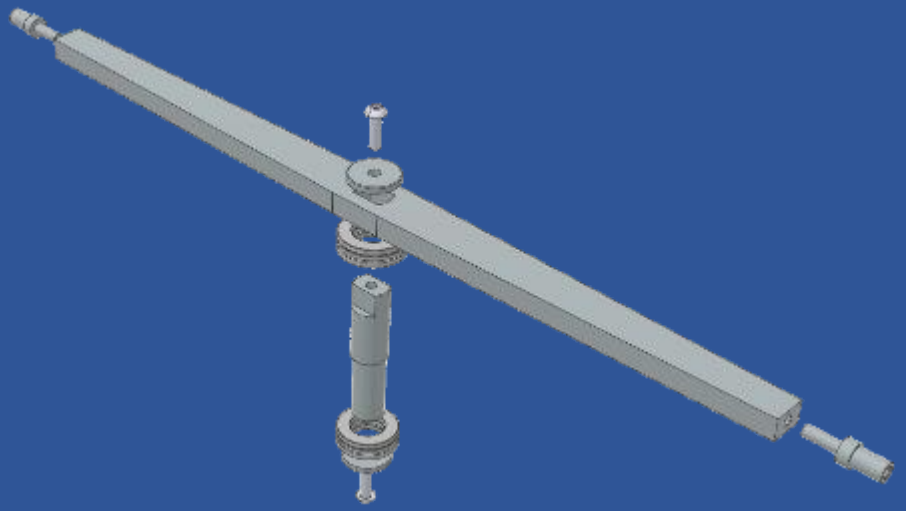
- On the *Theseus III* Rover I designed and constructed a new differential pivot mechanism to mitigate the failures of the previous design. It was imperative that the new design was strong, smooth, and easy to assemble and disassemble. The previous design exhibited excessive bending of the differential bar under load, was extremely difficult to disassemble, and lacked rigidity causing looser rover movement.
To address these issues, I designed a thickened differential bar, a bearing assembly for the pivot, and a mount that was attached to multiple panels, bracing the skin of the rover. The new design was successful and was last used in the 2026 ARCh competition where UQSpace placed 1st.

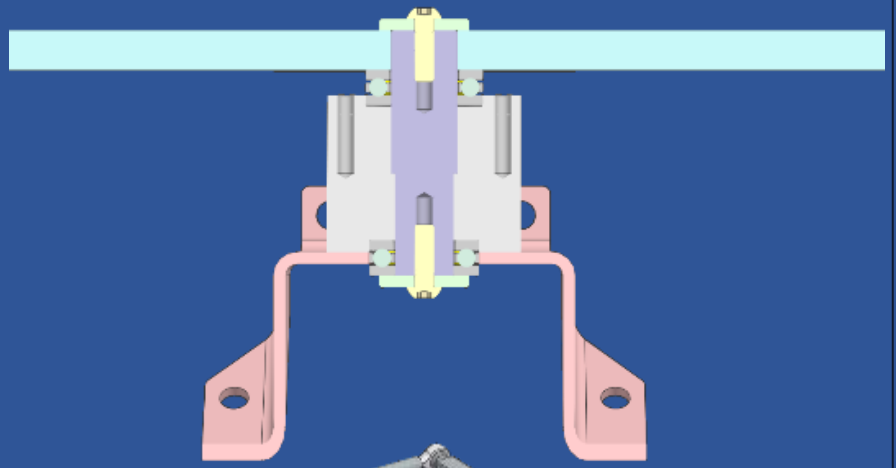
- As the person responsible for the Aerostructures team I travelled to Adelaide to compete where I designed and completed pre-use checklists, diagnosed and solved issues under pressure, and gained experience with team collaboration. The UQSpace Team and *Theseus III* Rover placed 3rd.

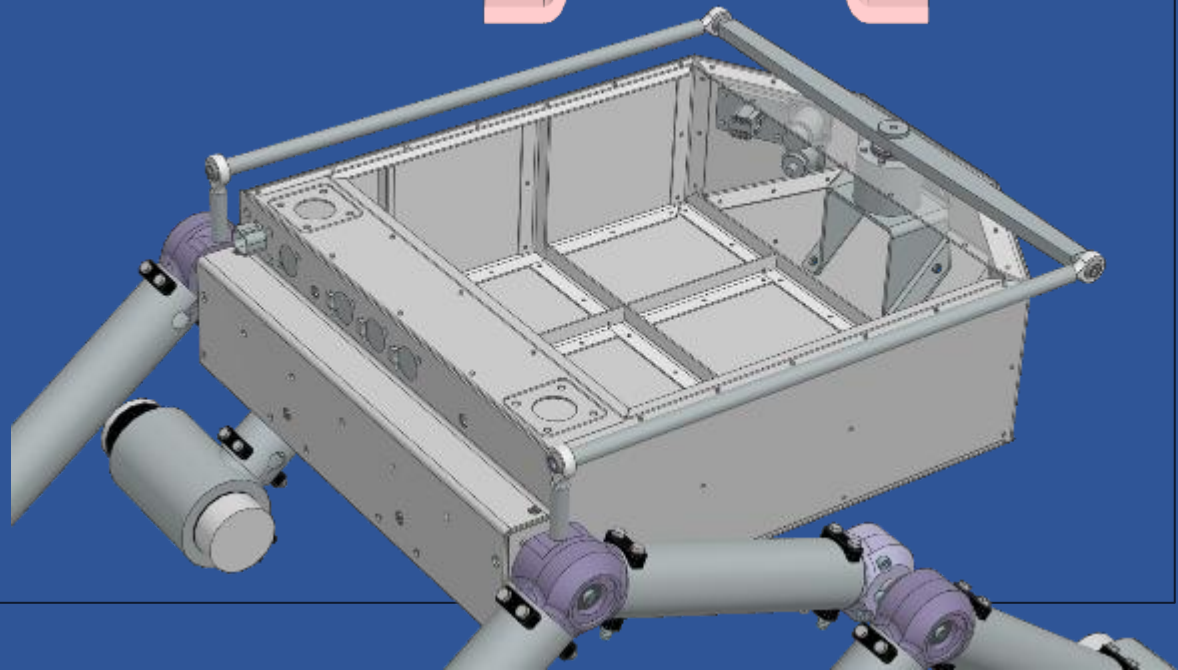
Right: *Theseus III* Lunar Rover during field testing after competition activities had concluded for the day.

PROJECT THESEUS



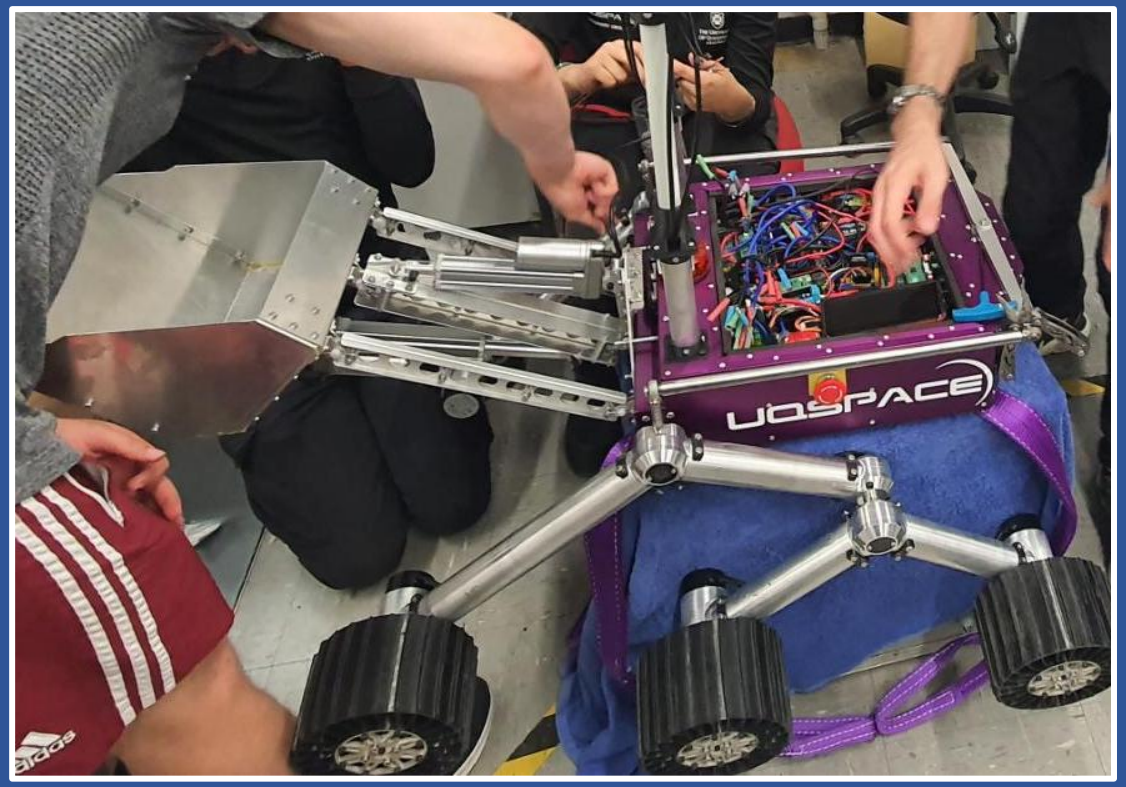


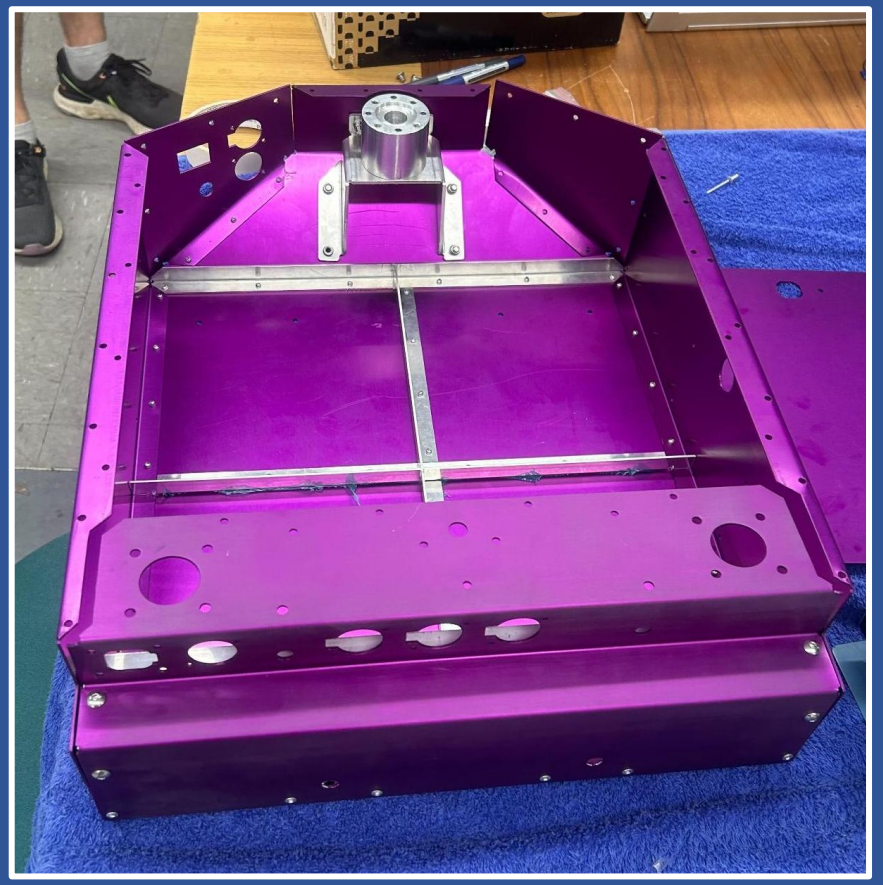




Top Left: Views of differential mechanism and mount that I designed and manufactured with an emphasis on increasing stiffness and rigidity. **Top Right:** Cross Section view of differential mechanism and mount. **Bottom Right:** CAD model of rover structural components with the differential mechanism visible at rear.

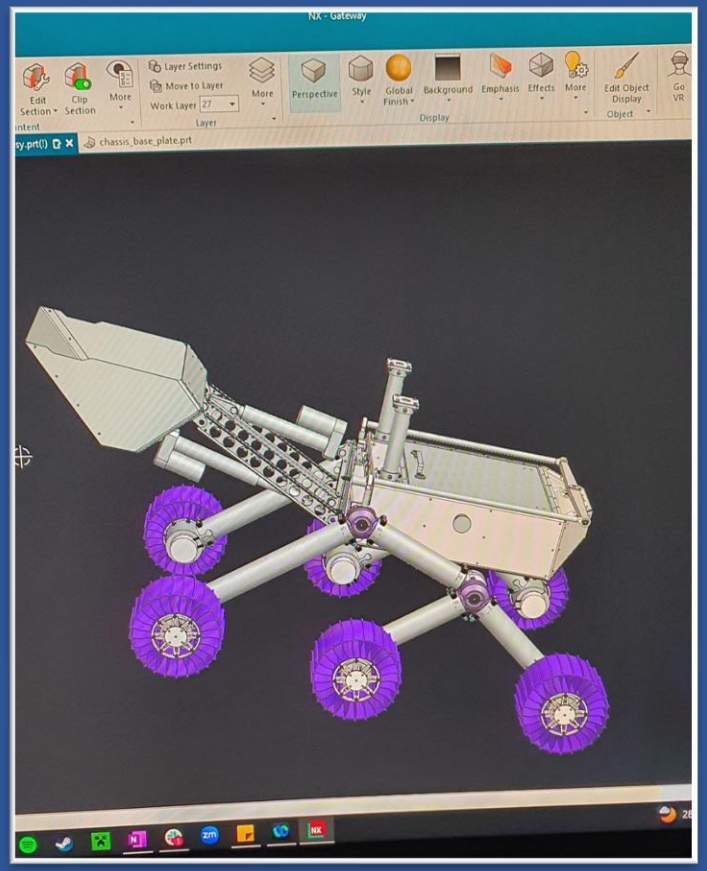
PROJECT THESEUS

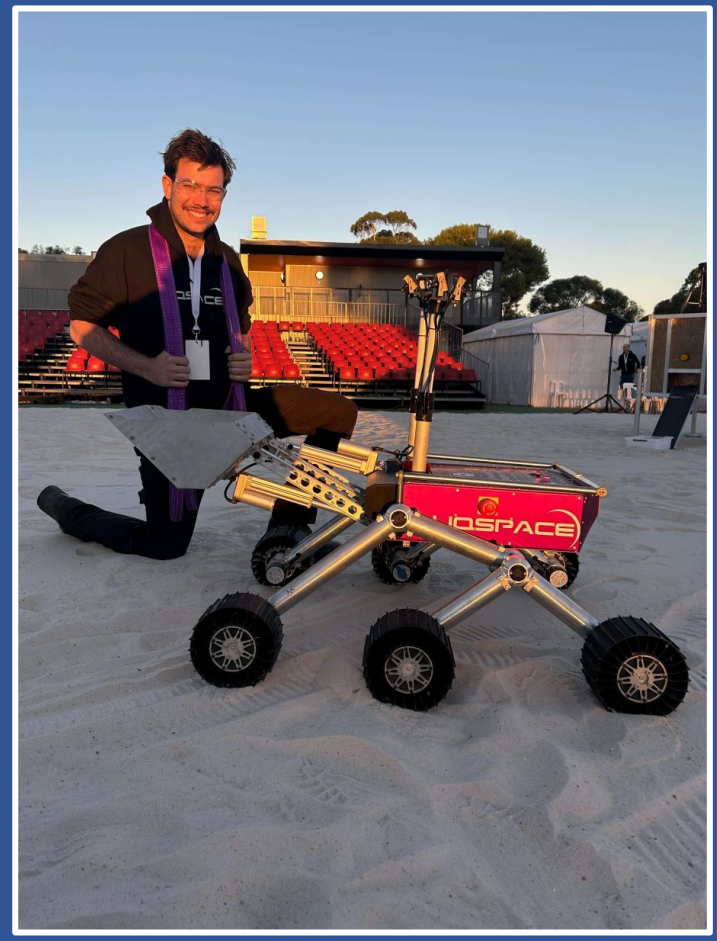




Top Left: Integration testing of the *Theseus III* Lunar Rover, note assembled differential system bracing the suspension pivots. **Top Right:** *Theseus III* chassis components after anodization and partial assembly.

PROJECT THESEUS





Left: CAD model of *Theseus III* rover and excavator attachment before Design Review. **Middle:** *Theseus III* lunar rover after assembly. **Right:** Myself and *Theseus III* during *ARCh* competition held in Adelaide.

10,000ft HIGH POWER ROCKET

PROJECT EOS

Aerostructures Engineer · UQSpace / University of Queensland· 2024

- First Semester at University and in UQSpace, learnt engineering planning concepts, such as system requirements, design reviews, and verification & validation testing. Gained hands on experience with composite layup process assisting with the creation of body tubes and nose cone for the *Eos Rocket.*

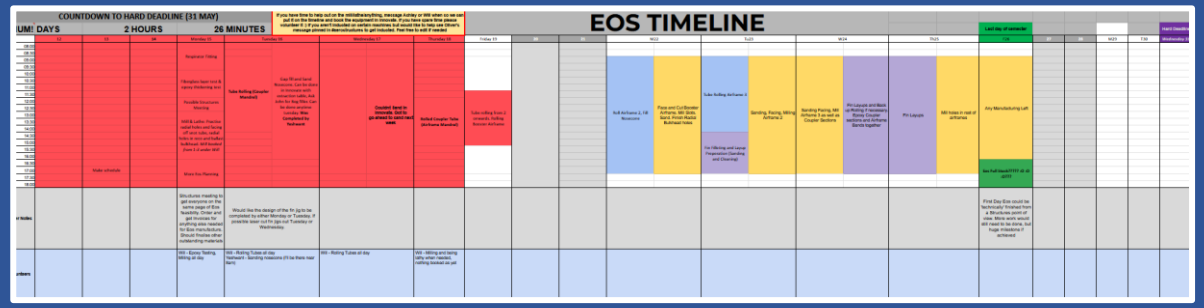
- Took on responsibility for manufacturing planning during period where senior Aerostructures members were unavailable. Created timelines, work breakdowns, and manufacturing steps to ensure efficient usage of time before competition.

- The *Eos* Rocket went on to place 2nd in Category and 6th overall at the Spaceport America Cup 2024.

Left: *Eos* Rocket composite airframe tube during curing. **Right:** *Eos* rocket during competition conference, pictured with Project Eos Lead.

PROJECT EOS

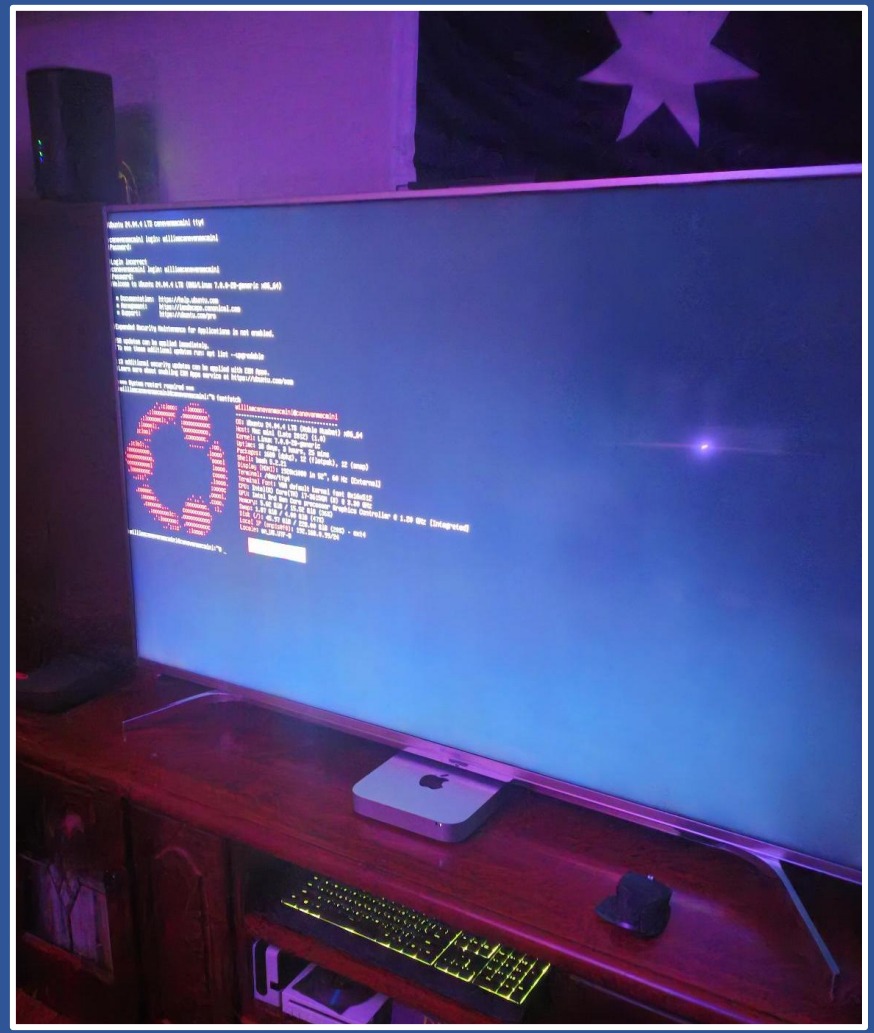
Left: Nosecone and mould after de-moulding.
Above: Myself and two members of Aerostructures team after composite layup session. I gained experience with a wide variety of composite procedures during my first semester with the UQSpace Team.



Left: An example timeline spreadsheet I created to organise and coordinate the procedures left for Eos manufacturing during the leadup to the competition.
Above: *Eos* Rocket mounted on rail before launch.

PERSONAL PROJECT – MAC MINI HOME SERVER

- Personal Server project running on a 2014 Mac Mini computer. Runs website, game streaming, game servers, and media player. Throughout this project I have learnt networking concepts, website front and backend design, Linux operation, and other computer skills. Current plans for the future are to set up a NAS (Network Attached Storage) to replace OneDrive use and possible locally hosted LLM (Large Language Model) depending on performance requirements.

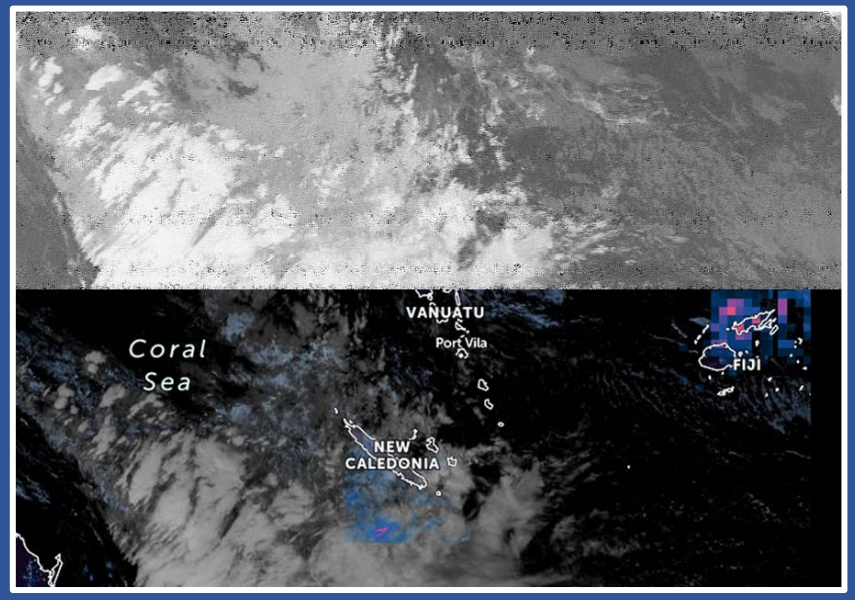


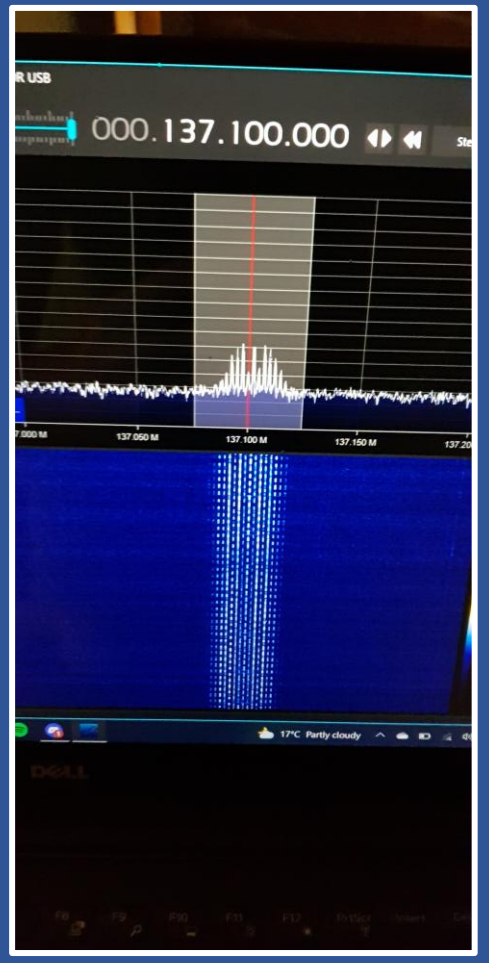
Left: A screenshot of my personal webpage that I created and host on my home lab server. **Right:** Picture of Mac Mini computer connected to TV with command line interface and computer details visible.

PERSONAL PROJECT – NOAA WEATHER SATELITE ANTENNA

- Created Double Cross Dipole Antenna to receive transmissions from NOAA Weather Satellites; used SDR (Software Defined Radio) to record transmission information on laptop and then process into images. Gained experience in antenna design and construction, amateur radio, and signal processing.

Left: Image obtained from satellite and antenna above reference image from live earth imagery website. **Middle:** Satellite transmission signal received by antenna and radio. **Right:** Antenna, radio, and computer setup before Satellite overpass.





CONTACT INFORMATION

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