Kyle Tam

Project Portfolio

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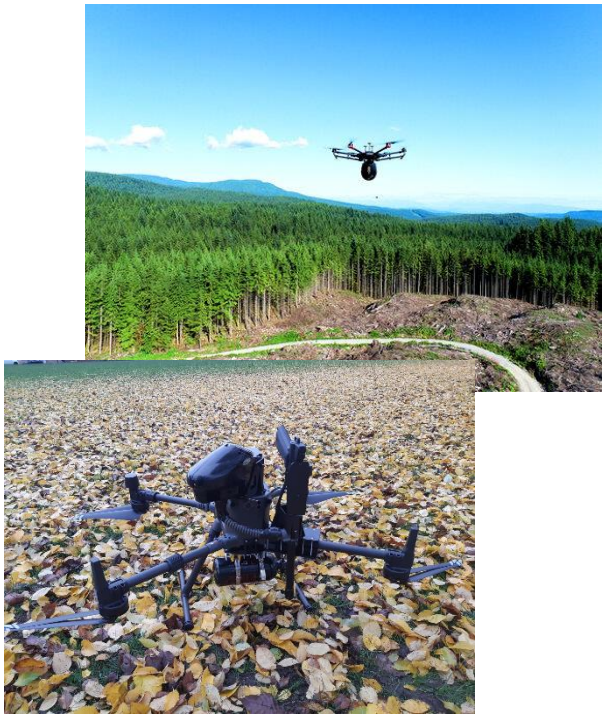
Flash Forest

Seed Pod Manufacturing, Embedder System (2020)



During my time at Flash Forest, I had the opportunity to assist in the development of the company's core seed pod technology.

My primary responsibility was assisting in the establishment of a semi-automated manufacturing process for the company's proprietary seed pods that were previously produced by hand. This involved experimenting with different machinery and prototyping parts to integrate with commercial technologies.

I also worked with full-time staff and other co-ops on the development of the company's seed pod distribution system. Mounted on drones, this system is used to precisely embed seed pods into the ground to maximize germination in various soil types around the world!

Hatch

Hydraulic Unloader, Experimental Bearings (2019)

Working at a global engineering consulting company, my time at Hatch exposed me to many exciting engineering challenges in the mining and energy industries. These included:

- Assisted in the design of a hydraulic unloader used to facilitate fuel extraction in the oil & gas industry
- Collaborated on the design of a large, high-speed bearing and damper system for an experimental nuclear fusion reactor
- Producing a large capital cost estimate for a client's industrial steel furnace upgrade
- Working with other engineering co-ops to create a hand-held spring-loaded impactor device to conduct non-destructive testing of furnace refractory

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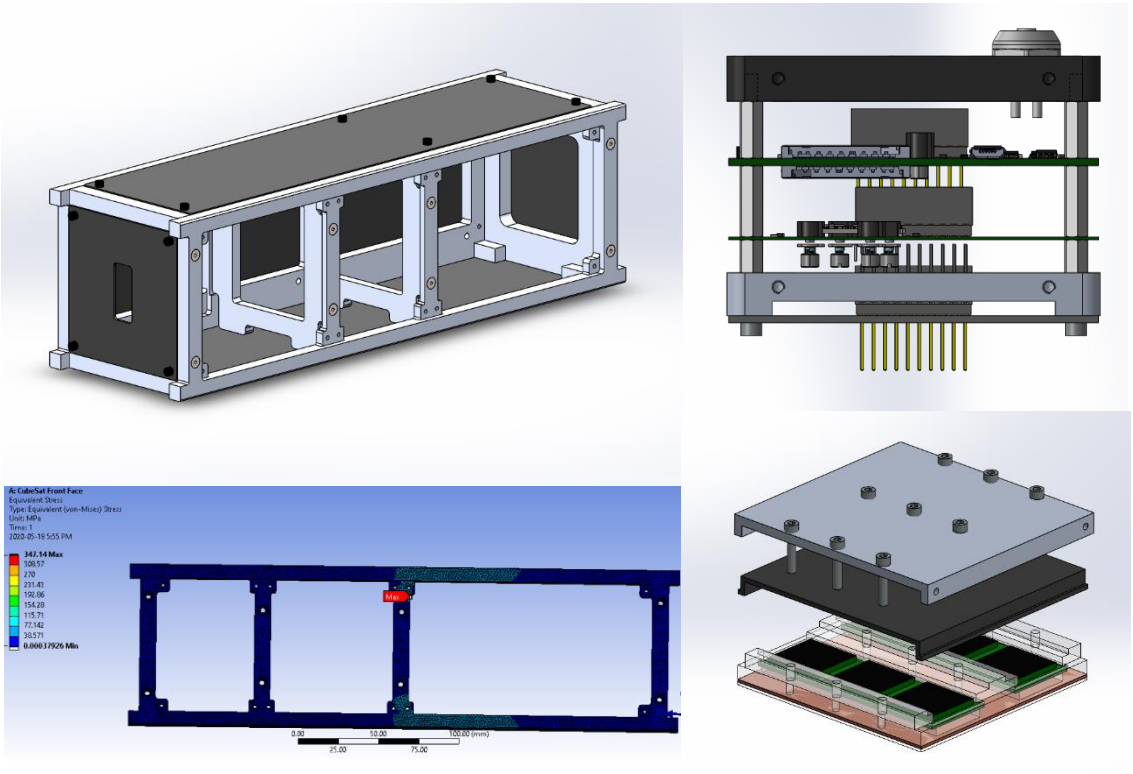
Waterloo Rocketry: Payload

CubeSat Structure & Experiment (2018 – Present, Project Lead Since 2019)

The payload is the cargo of a rocket. Waterloo Rocketry payloads are usually scientific or engineering experiments that take advantage of the high altitudes, extreme launch forces and micro-gravity environment experienced during the flight up to 30,000 ft to conduct research. Within the team's hybrid rocket, these payloads are housed in a 3U CubeSat, a nanosatellite structure commonly used by numerous companies in the aerospace industry.

As Payload Lead, I have been managing 15 students in the research and design of a 3U CubeSat and radiation sensor suite that will be flown at the 2021 Spaceport America Cup. Some of my daily tasks include:

- the design of the CubeSat structure and internal modules
- managing finances and communications with external research
- learning the basics of ANSYS to conduct a stress and vibration FEA analysis to simulate the conditions that the payload will encounter during flight



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Waterloo Rocketry: Data Acquisition & Test Crew

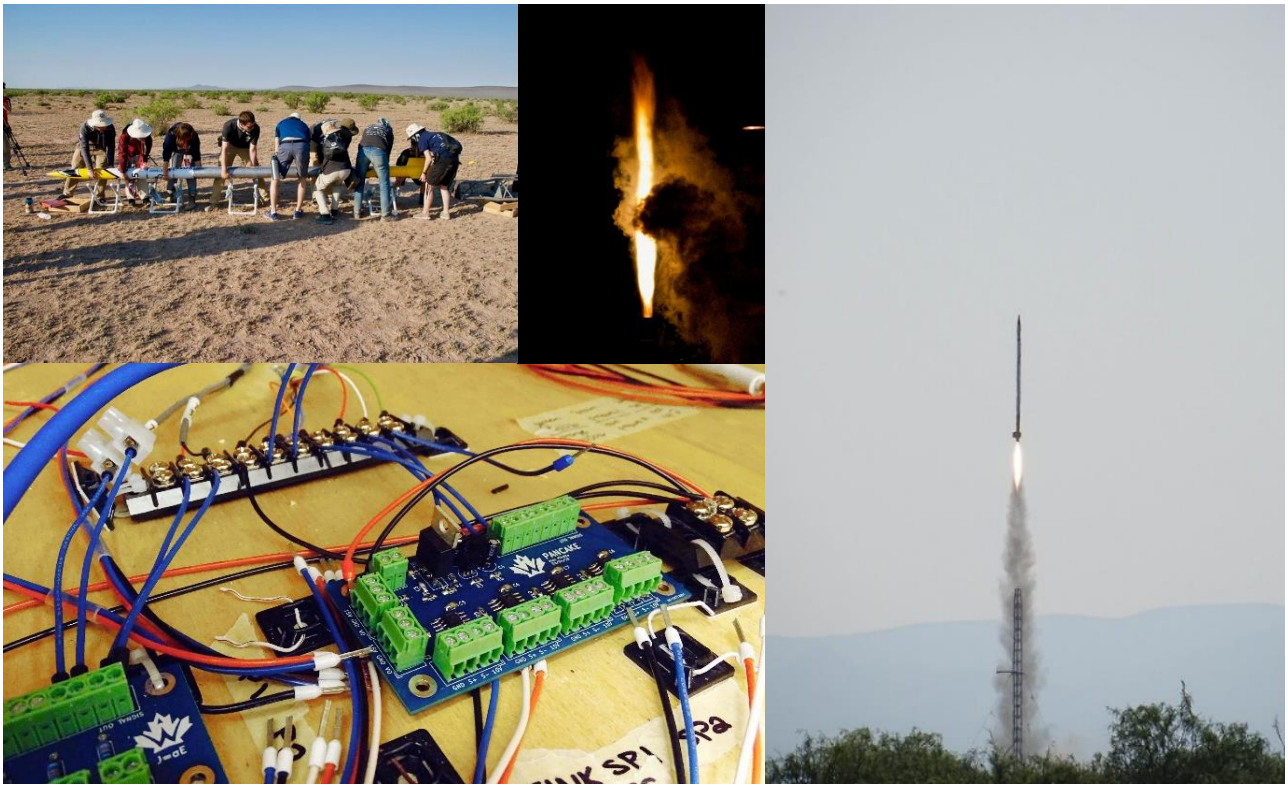
DAQ System, Cold Flow & Hot Fire Engine Tests (2018 - Present)

The data acquisition (DAQ) system is responsible for monitoring the performance of our rocket during engine tests and at launch. This is accomplished by a suite of sensors that output signals to an amplification and signal conditioning PCB before being sent a National Instruments DAQ device. This allows us to interpret all of our data through a program written in LabVIEW.

Some roles I took on DAQ include operating the system during hot fire engine tests of our rocket, conducted a noise evaluation of the system to improve data resolution, and assisted in the set up of infrastructure and plumbing during engine tests.

Here are some statistics from our most recent hybrid rocket Shark of the Sky (SotS):

- Dry Mass: 45 kg
- Wet Mass: 72 kg
- Height: 5.3 m / 17.4 ft
- Total Impulse: 38,000 N·s
- Maximum Altitude: 4.7 km / 15,568 ft



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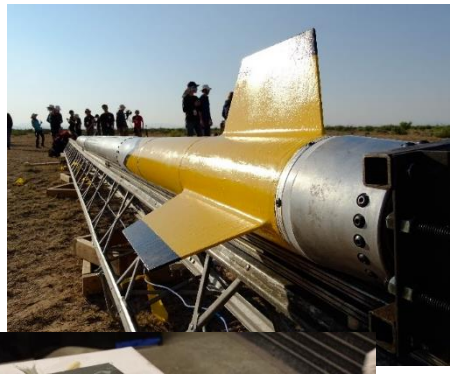
Waterloo Rocketry: Airframe

Composite Layups (2019 - Present)



The airframe provides the main structure of the rocket. As this a large contributor to the overall weight of the rocket, great efforts are made to reduce the weight of the airframe, including designing and manufacturing composite components.

Some of the major projects I worked on included:

- Conducted a vacuum bag layup to produce a carbon fibre-epoxy fin can and performed three additional tip-to-tip layups to adhere carbon fibre plated fins onto the cylinder
- Collaborated with a team of 5 students to research and design a fibreglass-epoxy nosecone with a Von Kármán shape and a 4:1 fineness ratio optimized for transonic flight

Waterloo Rocketry: Recovery

Drogue Parachute Nosecone & Electronics Sled (2019)

The recovery system is integral to safely retrieving the rocket after launch. While the team had a history of past recovery failures, the 2019 system I worked on successfully deployed the drogue parachute, leading to a safe recovery.

The components I worked on include:

- Designed the recovery avionics section to be placed within the nosecone of the rocket which decreased the volume of the recovery section by 16% compared to the year before
- Collaborated with the electrical team to integrate electronics within the avionics section while balancing rigorous component height restrictions due the nosecone geometry

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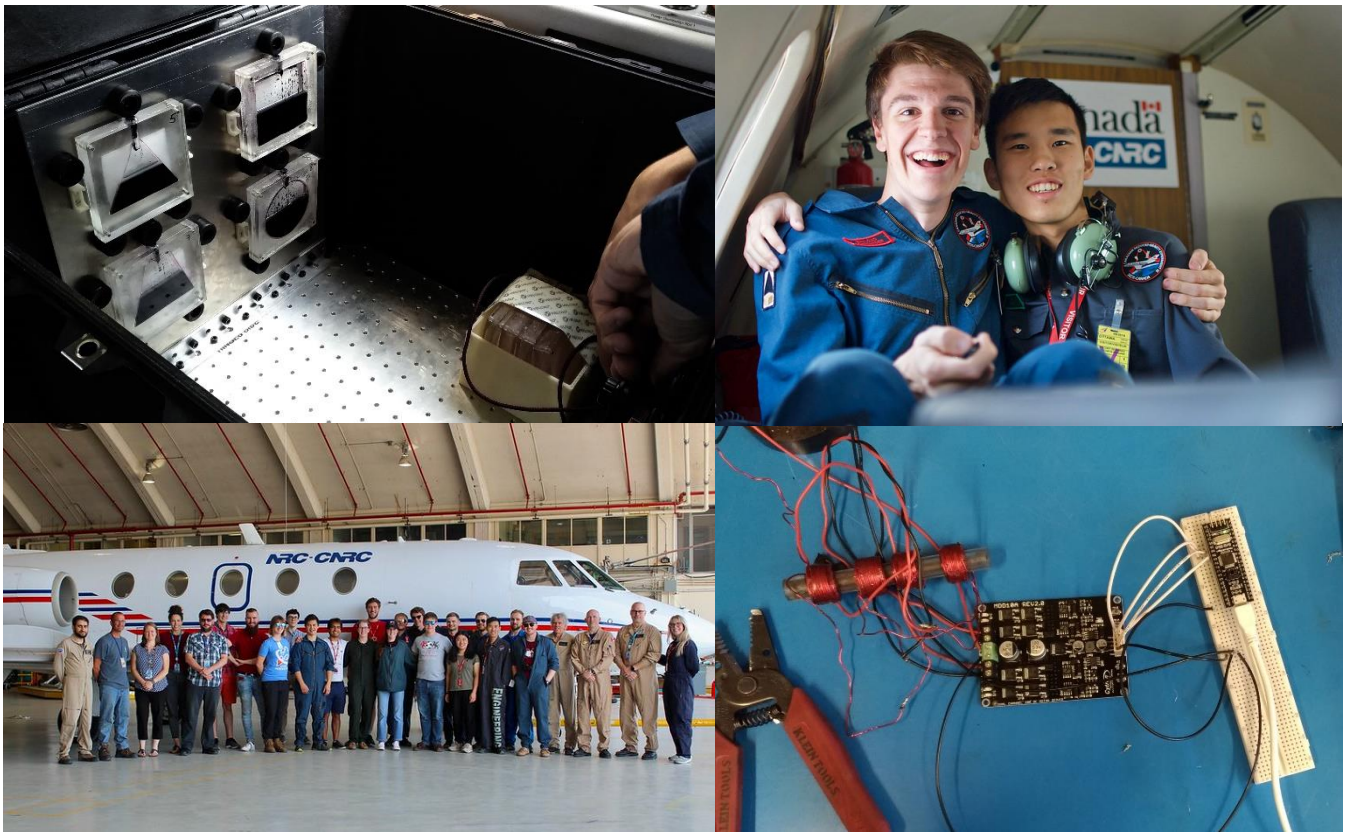
Canadian Reduced Gravity Experiment Design Challenge

Ferromagnetic Fluids Experiment (2018 - 2019)

The Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX) is a competition for Canadian post-secondary students to design and test a small scientific experiment on board the National Research Council's (NRC's) Falcon 20, which has been modified for reduced gravity flight in association with the Canadian Space Agency (CSA).

Working with a few other students, we developed an experiment that explored the characteristics of ferromagnetic fluids under the influence of a magnetic field in microgravity. We also designed an experimental solenoid pump controlled by an Arduino to determine whether non-mechanical fluid actuation might be possible in microgravity environments such as in satellite cooling systems or to control dangerously reactive rocket oxidizers.



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Miscellaneous Projects/Hobbies