Kyle Tam

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SKILLS

CAD & Design: SolidWorks, Solid Edge, AutoCAD, ANSYS, GD&T
Manufacturing: DFM/DFA, Composites, Machining, 3D Printing, Laser Cutting, Injection Molding
Electronics: Arduino, Data Acquisition, Soldering, Test Equipment, KiCad, C/C++ Programming, Git
Other Skills: Project Management, MATLAB, Mathcad, Microsoft Office

EXPERIENCE

Flash Forest
September 2020 – December 2020

Mechatronics Engineering Intern

- Established a semi-automated manufacturing line to produce seed pods for rapid reforestation
- Developed a drone-mounted pneumatic distribution system that increased germination by over 50%
- Prototyped 3D-printed and vacuum-formed components to validate seed pod and embedder designs

Hatch
January 2020 – April 2020

Mechanical Engineering Intern – Engineered Equipment Group

- Collaborated in the design of a hydraulic unloader and large experimental high-speed bearing system while balancing other projects in a fast-paced consulting environment
- Conducted stress analysis and time studies to reduce monthly operation costs of unloader by $20,000
- Created 3D models and drawings in Solid Edge to communicate designs in client deliverables
- Communicated with vendors and contractors to produce capital cost estimates for client proposals

Eleven-X
May 2019 – August 2019

Hardware Validation Intern

- Created test fixtures to analyze IoT device hardware and determine viability for commercial applications
- Developed back-end decoders to securely decrypt sensor data transmitted via LoRaWAN

Waterloo Rocketry
September 2018 – Present

Engineering Manager/Designer – Payload Subteam
August 2019 - Present

- Leading 15 students in the research and design of a radiation-resistant materials experiment that will be flown on the team's 17 ft hybrid rocket to an altitude of 30,000 ft at the 2021 Spaceport America Cup
- Designed a 3U CubeSat structure and internal modules to house and interface the experiment
- Managed finances and communications with external researchers while meeting tight project deadlines

Core Member (Payload, Airframe, Data Acquisition, Recovery)
September 2018 – July 2019

- Designed and drafted bulkheads, electronics enclosures and satellite parts using SolidWorks and GD&T
- Developed and operated the data acquisition system used during hot fire tests of the rocket engine
- Fabricated and assembled flight hardware on the mill and lathe to tolerances of 0.1 mm or less

PROJECTS

Canadian Reduced Gravity Experiment Design Challenge
September 2018 – July 2019

- Collaborated with SEDS Canada and the National Research Council on an experiment that analyzed the behaviour of ferromagnetic fluids under the influence of a magnetic field in microgravity
- Developed an experimental solenoid pump controlled by an Arduino that assessed the feasibility of non-mechanical fluid actuation for industry applications

EDUCATION

University of Waterloo
September 2018 – April 2023

Candidate for BASc in Mechatronics Engineering with Physical Sciences Option in Physics

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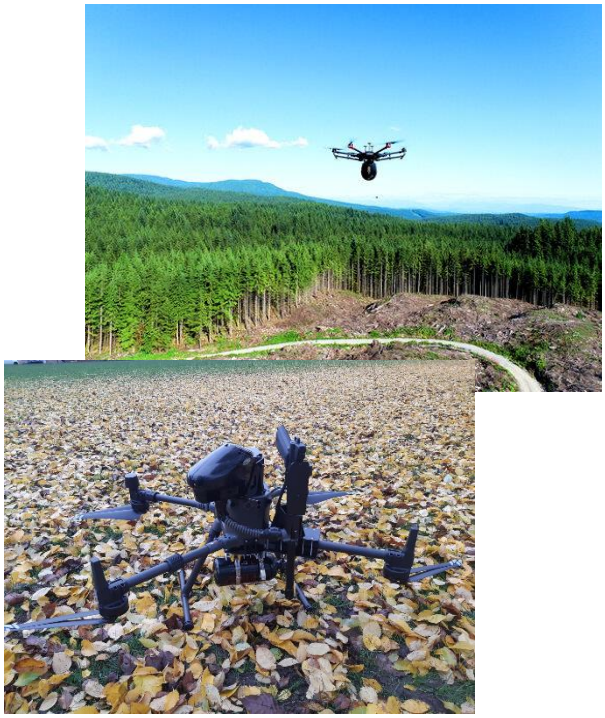
Flash Forest

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 procuring with various machinery and prototyping parts to integrate into an assembly line.

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 a nuclear fusion reactor demonstration
- Producing a large capital cost estimate for a client's industrial smelting 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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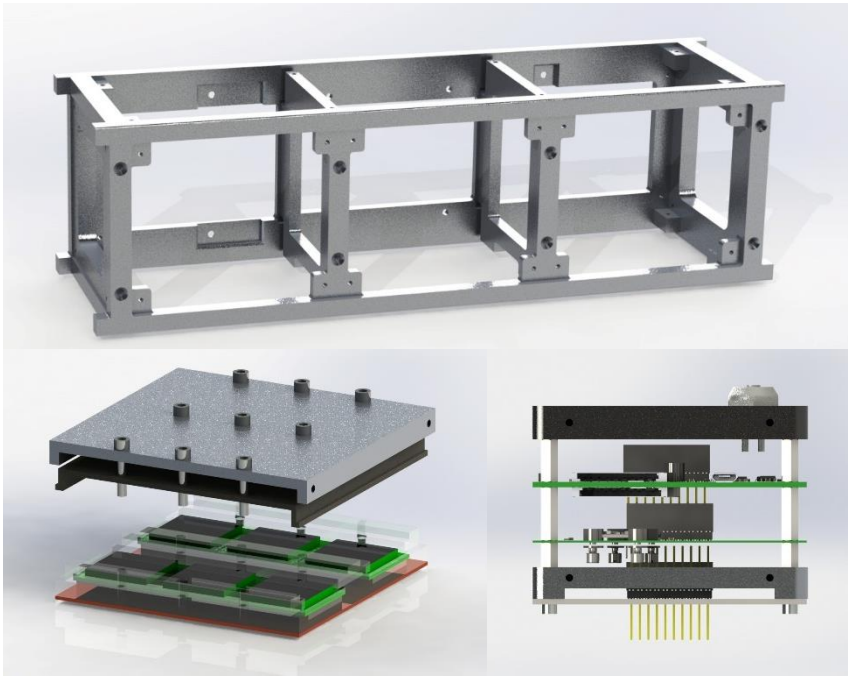
Waterloo Rocketry: Payload 2020-2021

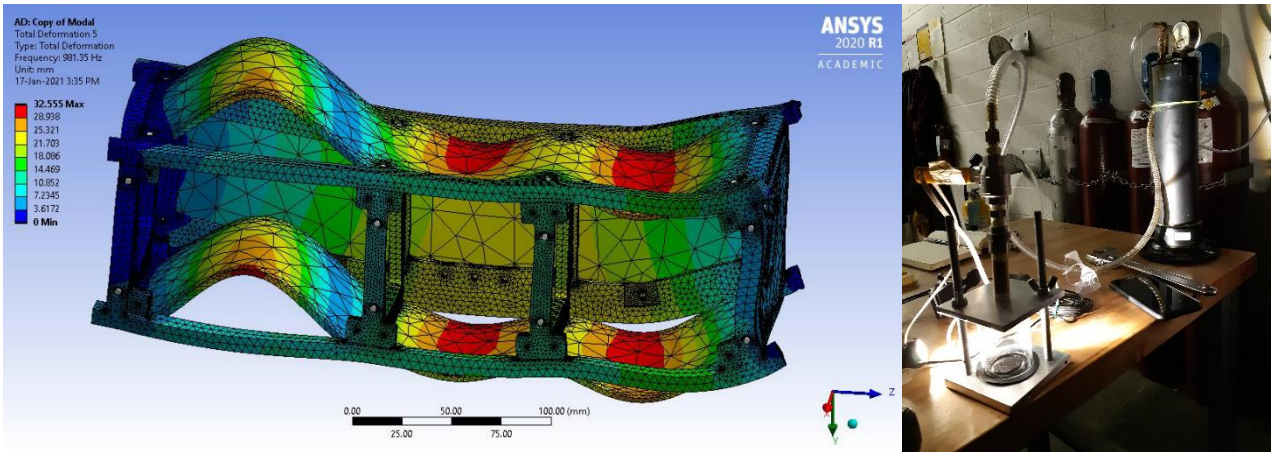
CubeSat Structure & Experiment (Sept 2019 – Present)

Payloads developed by the team are scientific experiments that take advantage of the high altitudes, extreme launch forces and micro-gravity experienced in our flight up to 30,000 ft. As Payload Lead, I have been leading the design of a 3U CubeSat and radiation sensor suite to test material samples and detect secondary cosmic radiation passing through our rocket.



The CubeSat structure was designed to be a modular assembly that minimizes the number of unique parts. Each module slides into the satellite for easy access and operation in the field.

Shown here are renderings of the CubeSat Structure, Detector Module, and Systems Module.



Testing and analysis is important to validate the performance of the payload. Shown here is a screenshot of an ANSYS Modal analysis of the CubeSat assembly and a photo of an early detector test.

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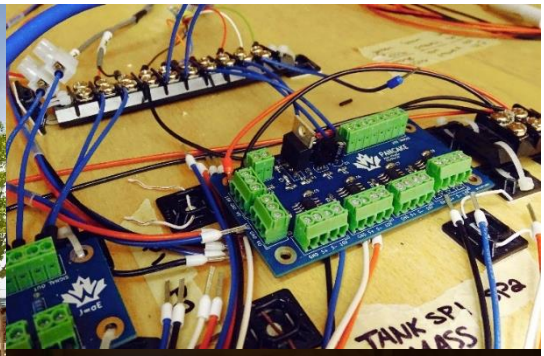
Waterloo Rocketry: Data Acquisition & Test Crew

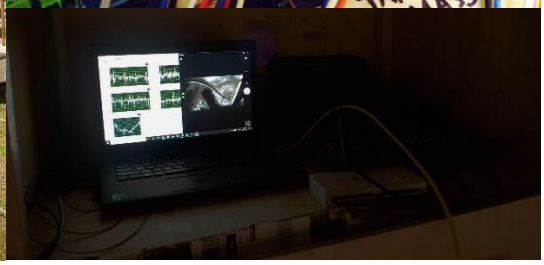
DAQ System, Cold Flow & Hot Fire Engine Tests (Nov 2018 – Mar 2020)

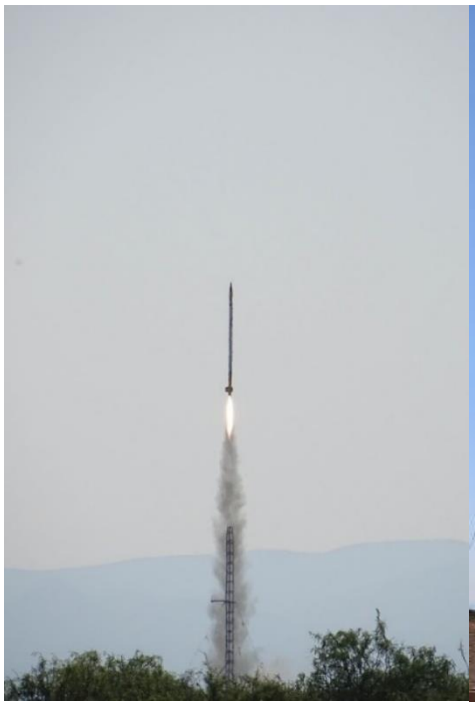
The data acquisition (DAQ) system is responsible for monitoring the performance of our rocket during engine tests and at launch. This is accomplished by a suite of sensors that output signals to an amplification PCB before being sent to a National Instruments DAQ device. This allows us to interpret our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

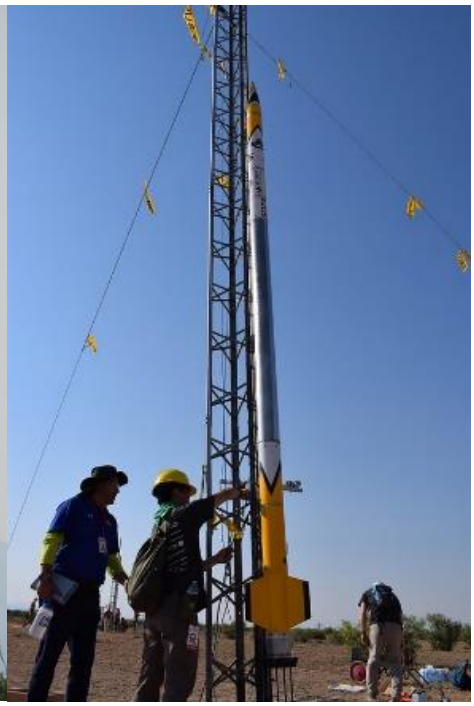
During cold flow and engine static fires, my job was to set up test infrastructure and operate the DAQ system. Behind the scenes, I worked on noise analyses, sensor calibrations and other improvements to the DAQ system.

Shown here are photos of the DAQ hardware, software, as well as the launch tower and rocket.









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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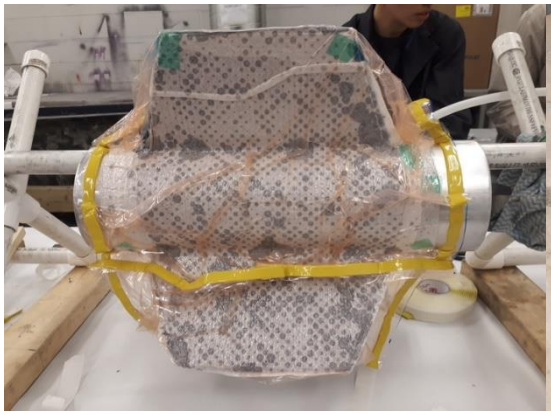
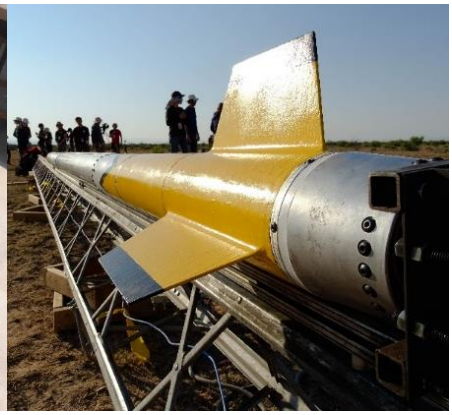
Waterloo Rocketry: Airframe

Composite Layups (May 2019 - Present)

The airframe is the main structure of the rocket. As this is a large contributor to the overall weight of the rocket, great efforts are made to reduce the weight of the airframe. This includes designing and manufacturing composite airframe components made from carbon fibre and fibreglass.

One of the first projects I did with the team was the design of the nosecone. Using a Von Kármán geometry and a 4:1 fineness ratio, the nosecone was optimized for both subsonic and supersonic velocities. This was manufactured using two MDF molds, fibreglass and Aeropoxy.





Another major composite part that was manufactured includes the carbon fibre-epoxy fin can. To produce this part, a vacuum bag layup was required to produce the body tube. Subsequently, three tip-to-tip layups were performed to adhere the carbon fibre fins onto the cylinder.

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Waterloo Rocketry: Recovery

Avionics Section/Recovery Testing (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.

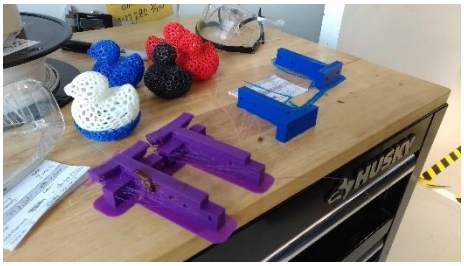
The task was to design the recovery avionics section. This included the electronics sled and bulkhead.

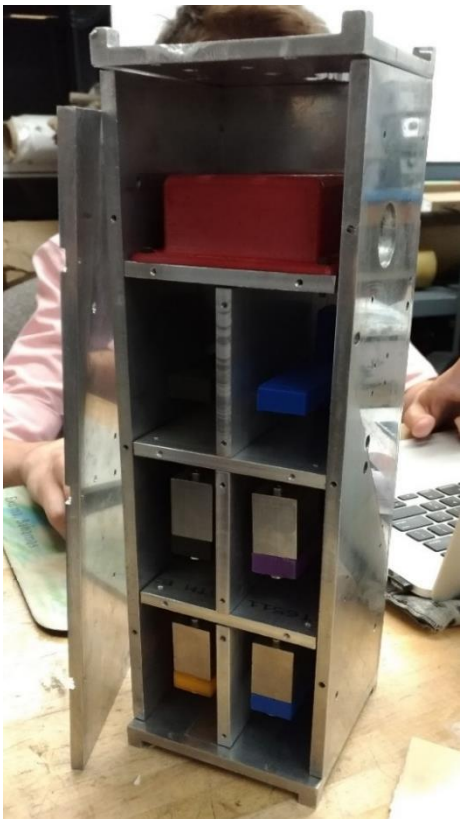
Subsequent recovery tests were conducted to validate system functionality and parachute deployment.

Waterloo Rocketry: Payload 2019

3D-Printed Materials Analysis (2018-2019)

The goal of the 2019 payload was to evaluate the suitability of different 3D printed materials for use in sounding rockets. “T” shaped test samples with notches were placed under steel weights and high launch forces during flight.





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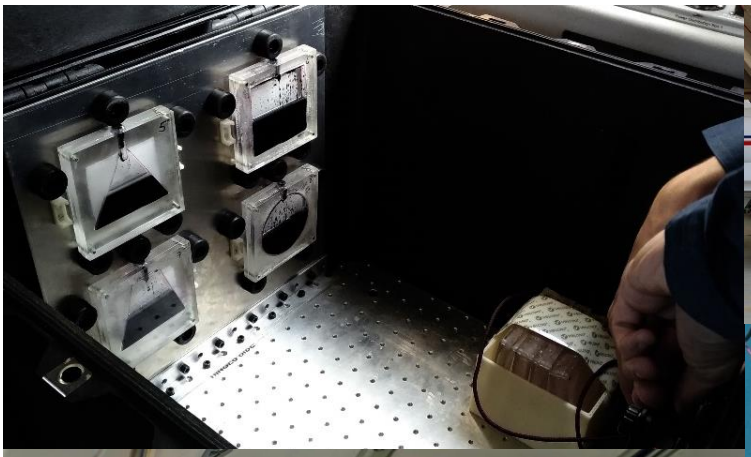
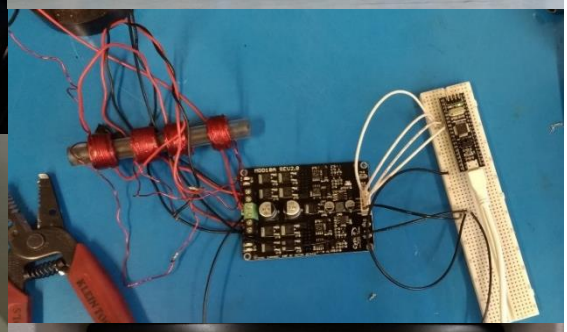
Canadian Reduced Gravity Experiment Design Challenge

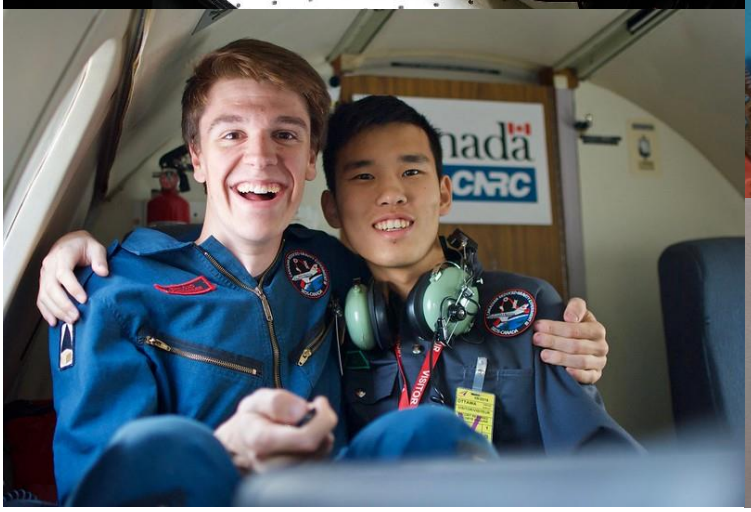
Ferromagnetic Fluids Experiment (2018 - 2019)

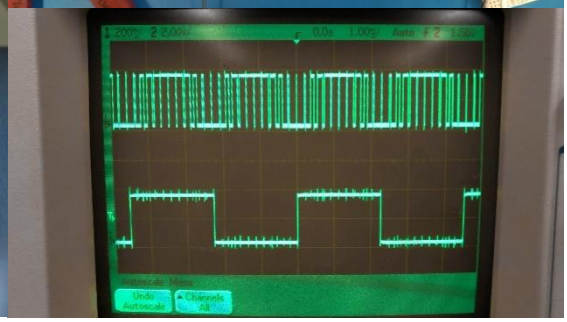
The Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX) is a competition for Canadian post-secondary students to design and test a small scientific experiment on board the National Research Council's Falcon 20 in collaboration with the Canadian Space Agency.

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