# Kyle Tam

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## SUMMARY OF QUALIFICATIONS

**Design:** SolidWorks, Solid Edge, Fusion 360, AutoCAD, Ansys Mechanical, GD&T, Mathcad
**Manufacturing:** DFM/DFA, Machining, 3D Printing (plastics & metals), Composites, CNC
**Electrical:** Data Acquisition, Controls, Arduino, Git; C, C++, LabVIEW, MATLAB Programming

- Considerable interdisciplinary engineering experience in mechanical design, manufacturing, and controls gained through experience working in industry and extracurriculars
- Excellent collaboration and communication skills developed through student team leadership

## EXPERIENCE

### Additive Manufacturing Research Assistant
*May – August 2021*

Multi-Scale Additive Manufacturing Lab (MSAM) – University of Waterloo

- Developed a machine vision-based data acquisition and controls system using LabVIEW for 5-axis laser metal deposition (LMD) 3D printing that tracks layer height during production and minimizes wasted material
- Created a laser scanner quality control system to detect 5+ µm defects in metal 3D-printed parts
- Contributed to 5-axis CNC process planning algorithms to prevent collisions between the robot and print

### Mechanical Engineering Intern
*September – December 2020*

Flash Forest | *Automated drone reforestation company*

- Established a semi-automated manufacturing line to produce seed pods for rapid reforestation
- Designed custom tooling and jigs in SolidWorks to prototype different pod geometries
- Developed a drone-mounted pneumatic distribution system that increased germination by over 30%
- Prototyped 3D-printed and vacuum-formed components to validate seed pod and pneumatic designs

### Mechanical Design Engineering Intern
*January – April 2020*

Hatch - Engineered Equipment Group | *Engineering consulting firm*

- Collaborated on the designs of a hydraulic unloader and large experimental high-speed bearing system
- Created 3D models and drawings in Solid Edge to communicate designs in client deliverables
- Produced stress analysis calculations to minimize the unloader weight and select optimal bearing types
- Conducted time studies to reduce monthly operation costs of unloader by $20,000
- Communicated with vendors and contractors to produce capital cost estimates for client proposals

### Engineering Technician Intern
*May – August 2019*

eleven-x | *IoT sensors, network, and analytics solution provider*

- Collaborated with clients to install IoT sensors on-site and document operation procedures
- Designed test jigs using SolidWorks to simulate product performance in harsh environmental conditions
- Developed back-end decoders using PHP to decipher sensor data in reliable bi-weekly Jira sprints

### Payload Subteam Lead
*October 2018 – Present*

Waterloo Rocketry | *High-powered rocketry student design team*

- Directed 15 students in the research and design of a radiation-shielding materials experiment payload that was awarded the title of Top 10 Payload in the SDL Payload Challenge at Spaceport America Cup 2021
- Designed a 3U CubeSat validated using Ansys structural and vibrational FEA to simulate behaviour during the launch of the team's 17 ft hybrid rocket flight up to an altitude of 30,000 ft
- Designed and drafted couplers, electronics enclosures and satellite parts using SolidWorks and GD&T
- Fabricated flight hardware on the mill and lathe to tolerances of 0.1 mm or less
- Manufactured carbon fiber and fiberglass composites through wet layup and infusion processes

## EDUCATION

### University of Waterloo
*September 2018 – April 2023*

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

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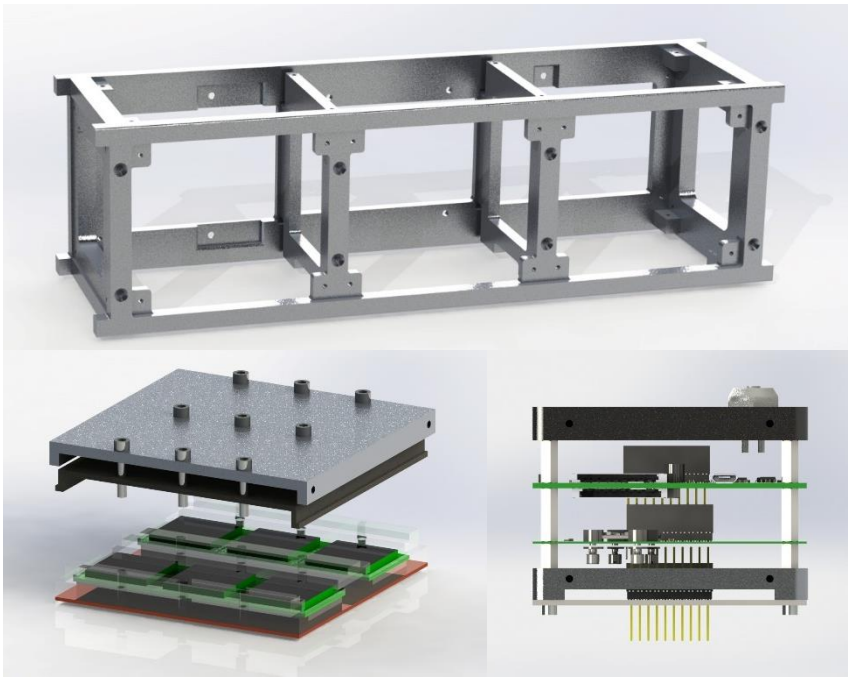
## Waterloo Rocketry: Payload 2020-2021

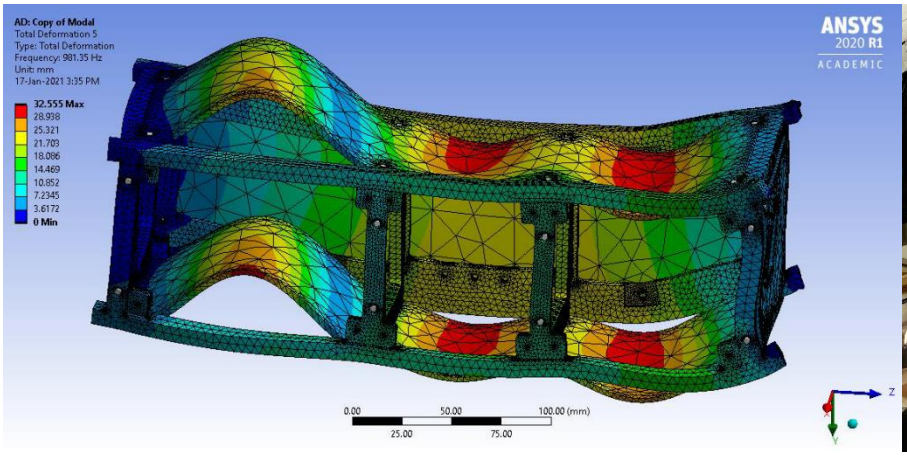
CubeSat Structure & Experiment (Sept 2019 – Present)

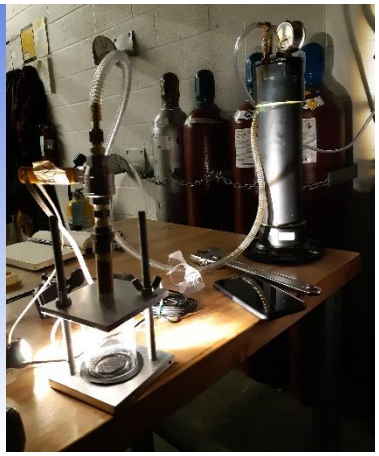
Payloads developed by the team are scientific experiments that take advantage of the high altitudes, extreme launch forces and micro-gravity experienced in our flight up to 30,000 ft. As Payload Lead, I led the design of a 3U CubeSat and radiation sensor suite to test material samples and detect secondary cosmic radiation passing through our rocket. Our payload was eventually selected as one of the Top 10 Payloads in the SDL Payload Challenge at the Spaceport America Cup 2021 competition.



*CubeSats are a type of standardized nanosatellites. The CubeSat structure on the left 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 are important to validate the performance of the payload. Shown above is a screenshot of an ANSYS Modal analysis of the CubeSat and a photo of an early detector prototype test.*

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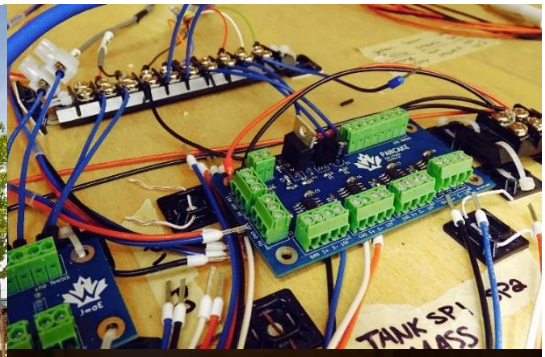
## Waterloo Rocketry: Data Acquisition & Test Crew

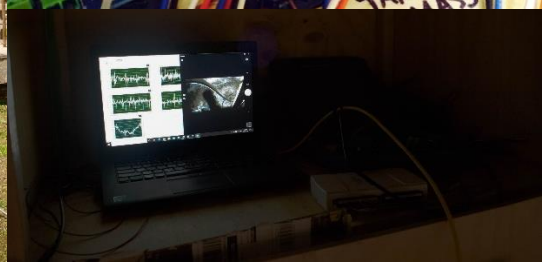
DAQ System, Cold Flow & Hot Fire Engine Tests (Nov 2018 – Mar 2020)

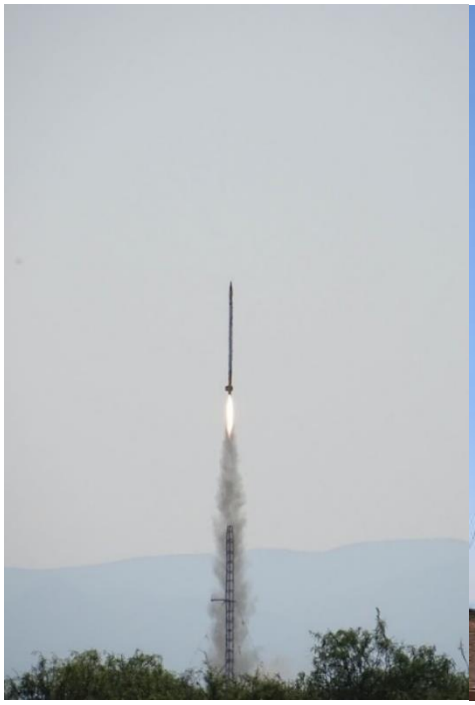
The data acquisition (DAQ) system is responsible for monitoring the performance of our rocket during engine tests and at launch. This is accomplished by a suite of sensors that output signals to an amplification PCB before being sent to a National Instruments DAQ device. This allows us to interpret our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

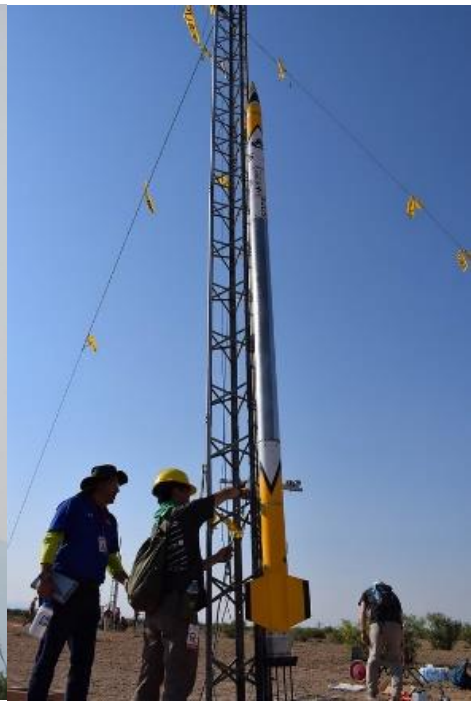
*During cold flow and engine static fires, my job was to set up test infrastructure and operate the DAQ system. Behind the scenes, I worked on noise analyses, sensor calibrations and other improvements to the DAQ system.*

*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):*

- *Height: 5.3 m / 17.4 ft*
- *Diameter: 6 in*
- *Dry Mass: 45 kg*
- *Wet Mass: 72 kg*
- *Total Impulse: 38,000 N·s*
- *Maximum Altitude: 4.7 km / 15,568 ft*

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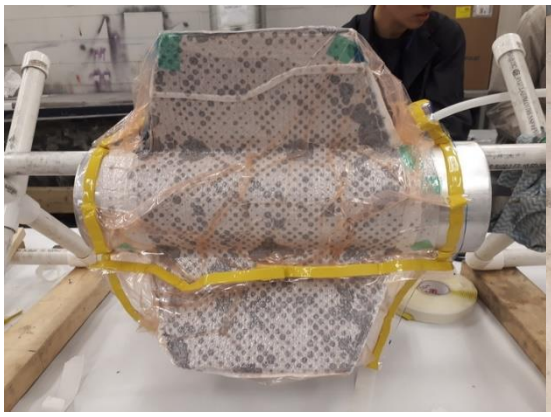
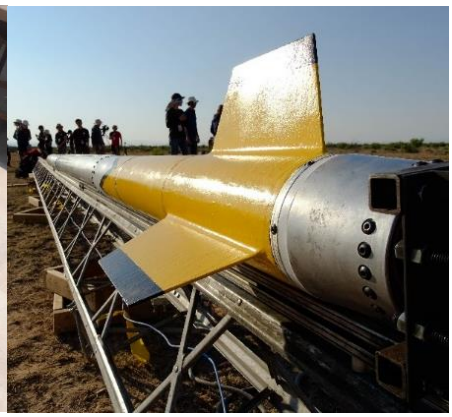
## Waterloo Rocketry: Airframe

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.

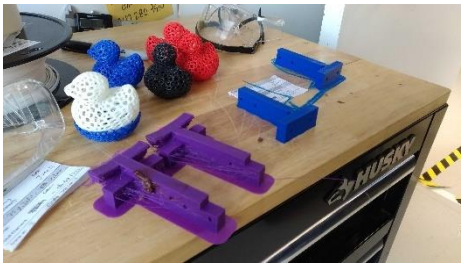
*The task was to design the recovery avionics section. This included the electronics sled and bulkhead.*

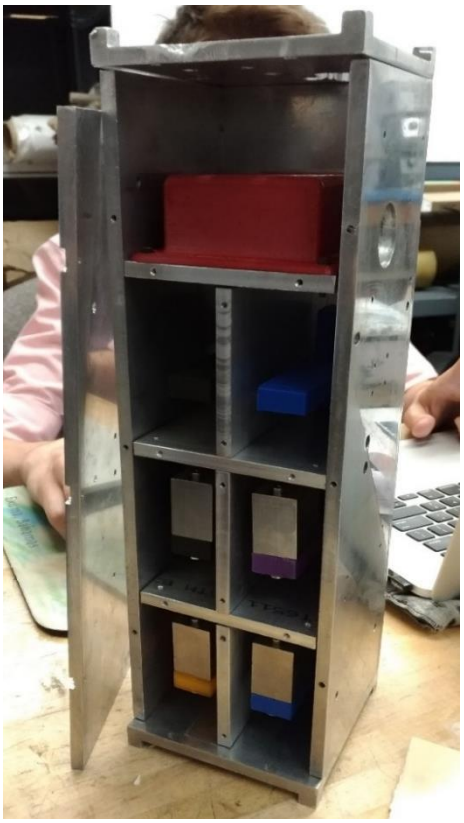
*Subsequent recovery tests were conducted to validate system functionality and parachute deployment.*

## 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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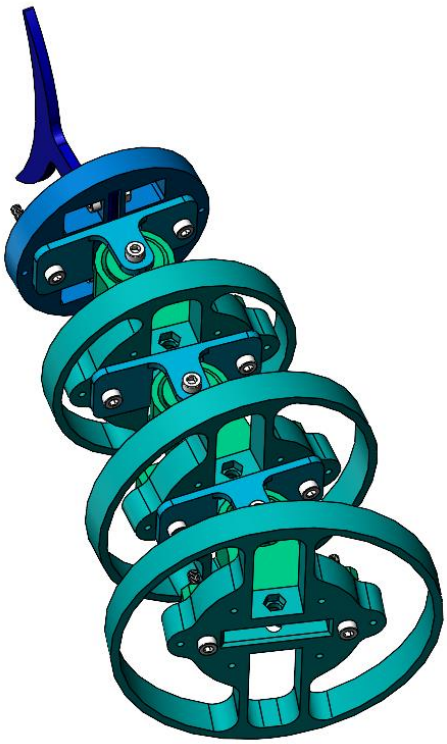
## Lamber Labs: Robotic Fish

Mechanical Design (May 2021 - Present)

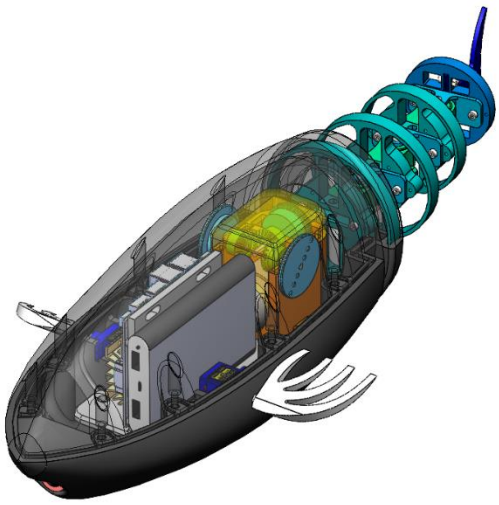
Lamper Labs is a project focused on developing a robotic fish capable of gathering data in shallow ocean environments and blending into its environment for marine biology research. The robotic fish will be wirelessly controlled and will feature a range of sensors and instrumentation to facilitate research purposes.

A major component of the fish is the mechanical design of the propulsion system and enclosure. Mimicking the natural movements of a fish is challenging to replicate and has required multiple design iterations to fine-tune the caudal fin propulsion system.

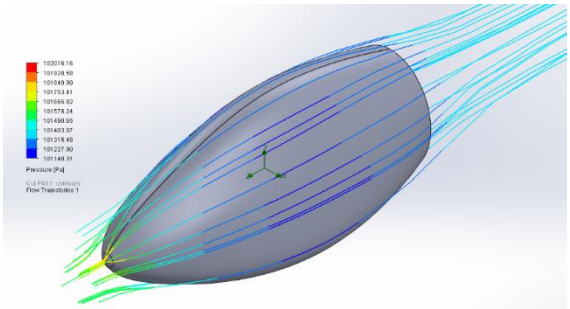


*The current propulsion system is a continuous-rotating system where two oppositely rotating turntables (shown in blue below) pull on a set of wires routed through the ribs of the tail seen on the left.*

*As the turntables rotate opposite of each other, each wire will alternate being in tension while the other remains slack, oscillating the tail – similar to the movements of a tuna for example.*



*Preliminary work is also being conducted to determine a geometry of the enclosure that will minimize drag and increase stability during swims.*



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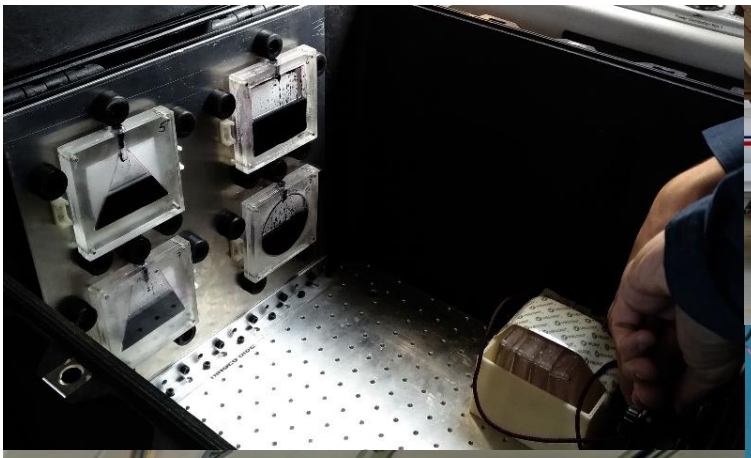
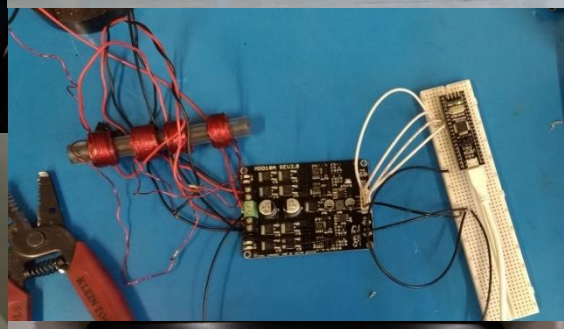
## Canadian Reduced Gravity Experiment Design Challenge

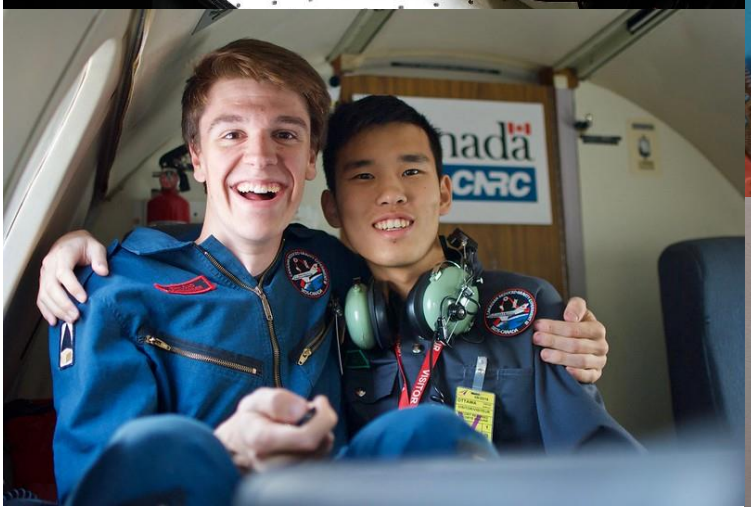
Ferromagnetic Fluids Experiment (2018 - 2019)

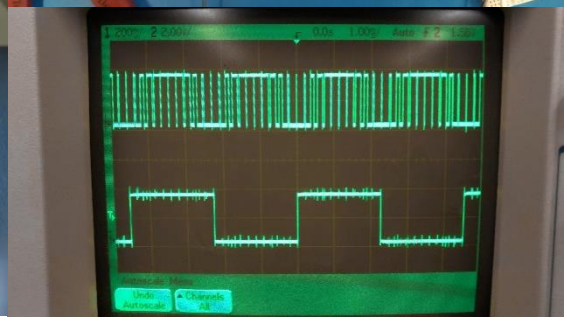
The Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX) is a competition for Canadian post-secondary students to design and test a small scientific experiment on board the National Research Council's Falcon 20 in collaboration with the Canadian Space Agency.

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