PORTFOLIO

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Turbojet Toroidal Inlet Fan

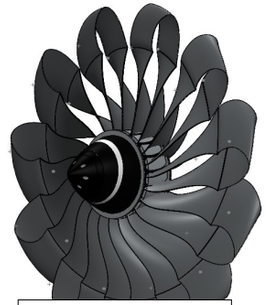
MIT Lincoln Laboratory's Inspired Prototype Design

The toroidal inlet fan design, inspired by MIT Lincoln Laboratory's drone propeller innovation, involves looping two blades together to minimize drag effects and reduce the acoustic signature of the fan.

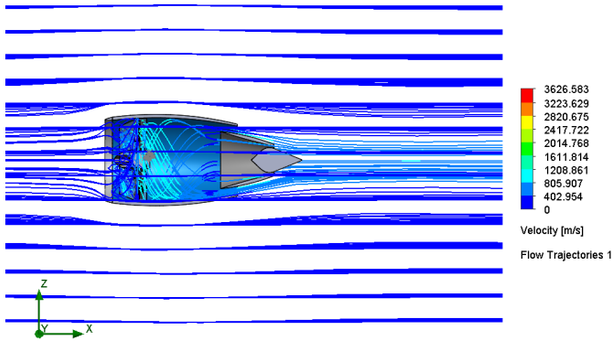
Project Summary:

1. **Incorporation of Toroidal Design**
2. **Iterative Design Process**
3. **CFD Simulations for Geometry Optimization**
4. **Increased Intake Mass Flow**
5. **SolidWorks for Surface Modeling and Design Refinement**
6. **Blade Shape, Curvature, and Spacing Modifications**
7. **Enhanced Fan Performance by 7%**
8. **Thrust Enhancement**

Trent-1000 Inlet Fan



Toroidal Inlet Fan



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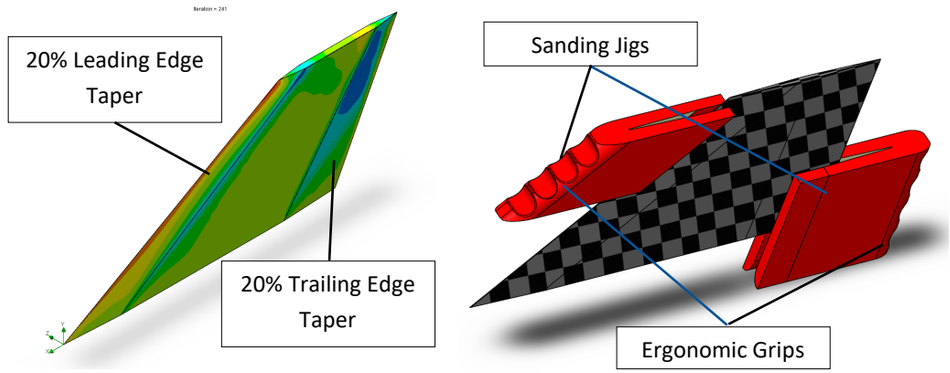
Supersonic Rocket Fin Optimization

University of Waterloo Rocketry Team

Analyzed and proposed a new double diamond cross-section tapered shape for fins aimed to reduce momentum loss in the supersonic speed regime.



- **Achieved a 60% reduction in fin drag.**
- **Increased apogee by 1300 ft.**
- **Ensured a 1.8 safety factor against fin flutter.**
- **Designed jigs for carbon fiber fin manufacturing.**

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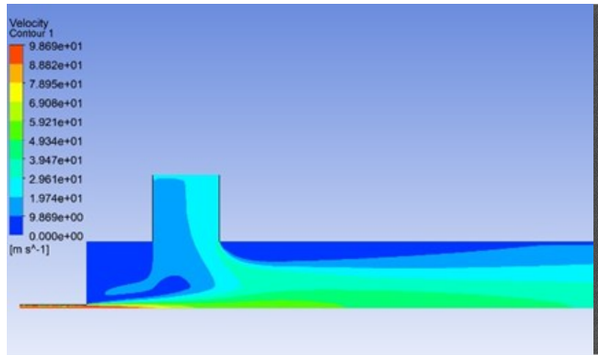
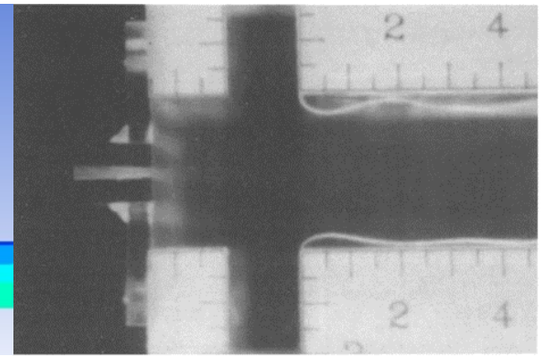
Computational Fluid Dynamics Projects

Side-Dump Simulated Combustor

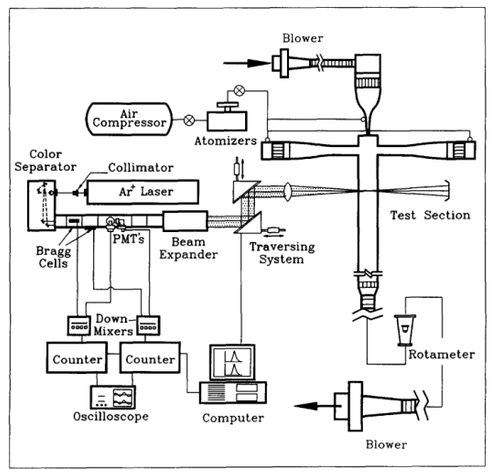
University of Waterloo—Department of Mechanical Engineering

Investigated the influence of side inlet angles on mixing in a complex hydrocarbon gas and air blending combustor.





- **Employed advanced CFD simulations to reveal counterrotating vortices and characterize separating bubbles.**
- **Provided insights into turbulence distribution, validating combustion models for improved combustor design.**
- **Conducted independent analysis, contributing valuable information for combustor design optimization and computational model enhancement.**



Schematic Drawing of Overall Experimental System

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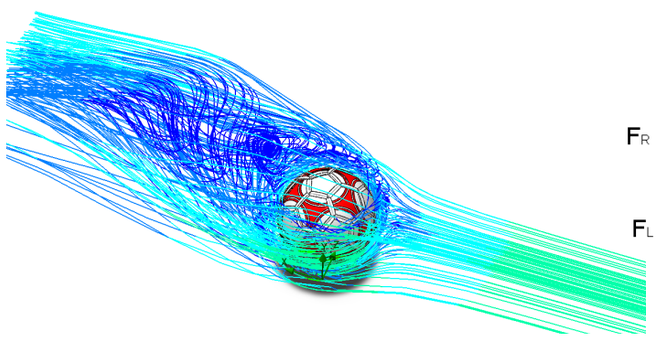
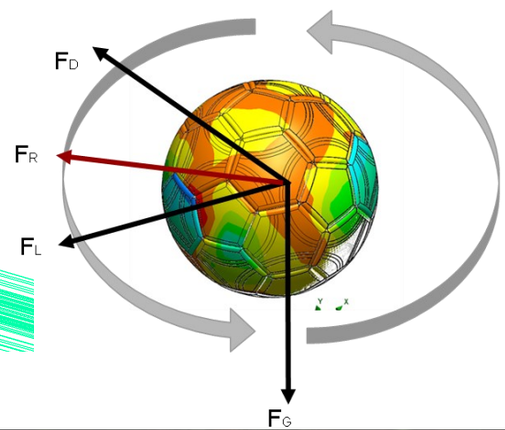
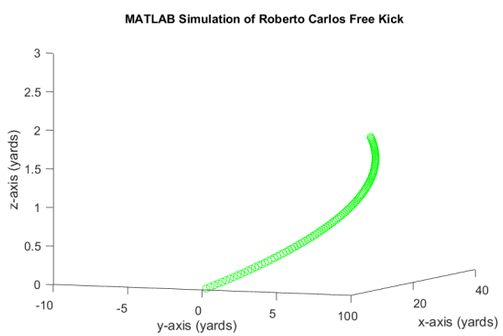
Fluid Mechanics of Roberto Carlos' Freekick

University of Waterloo Rocketry Team

- **Developed a Computational Fluid Dynamics (CFD) model employing numerical methods to simulate the trajectory of a soccer ball during flight.**
- **Utilized MATLAB to analyze the trajectory of the 1997 Roberto Carlos free kick, taking into account factors such as air resistance and spin.**
- **Determined a flight mechanics model that incorporates the drag coefficient and magnus lift force, providing crucial information about spin-induced trajectory deviation.**







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Flight Dynamics Analysis System Design

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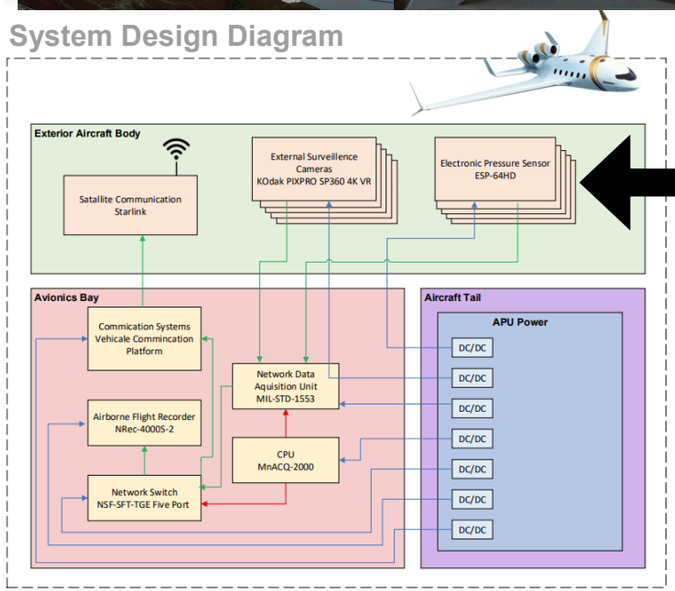
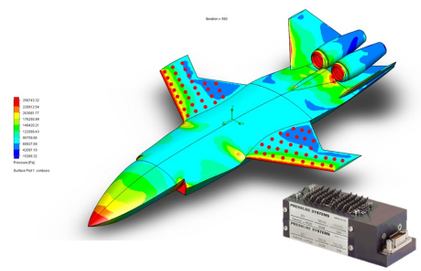
System Design Diagram





- **Designed a flight dynamic monitoring system tailored for testing experimental control surfaces and aerodynamics.**
- **Implemented a comprehensive surface pressure profile using more than 192 electronic pressure sensors, ensuring detailed data collection during flight tests.**
- **Successfully validated wind tunnel testing on a full-scale aircraft, enhancing the reliability of the experimental data.**
- **Established a real-time video relay system to the ground control station, facilitating live monitoring of control surfaces during flight tests.**

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ROAAS System Design

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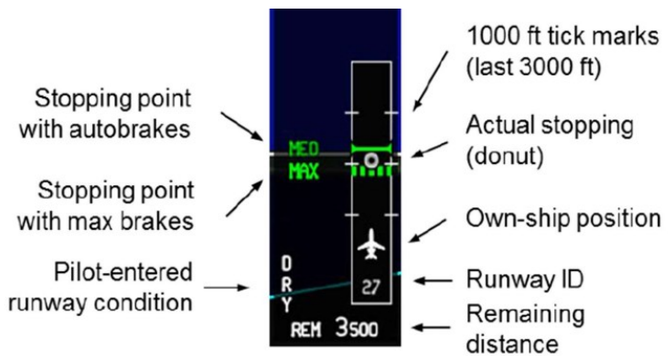
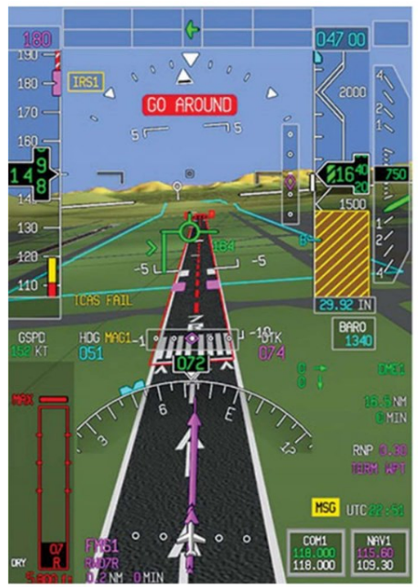
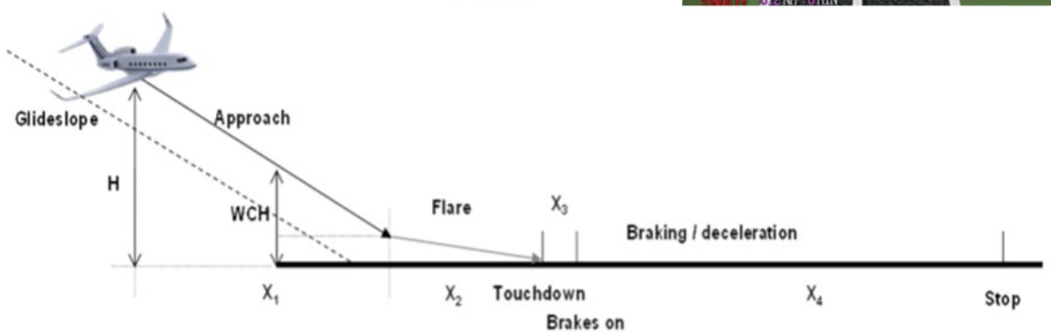
Runway Overrun Awareness and Alerting System (ROAAS)

- **Integrated a system to enhance runway safety and prevent landing overruns**
- **System design and algorithms to use air data systems, flight management systems and GPS**
- **Calculates landing distance for six distinct landing weather conditions**







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Professional Projects

Print Pause Recovery

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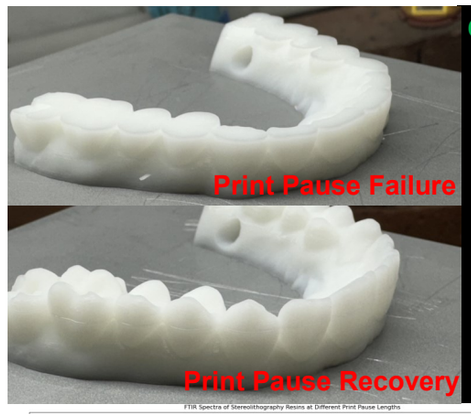

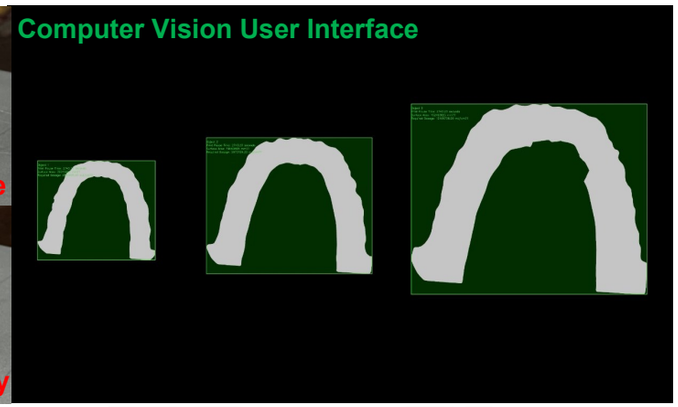

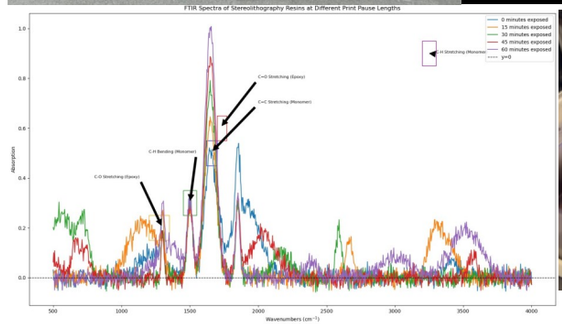

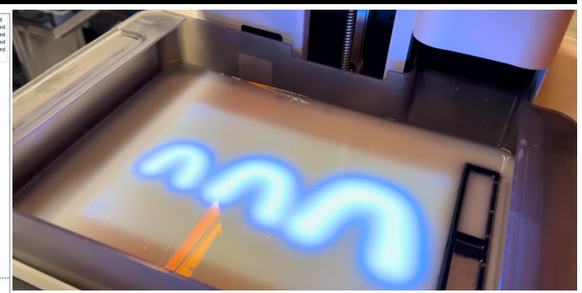

- **Recognizing the need to enhance SLA printer reliability and efficiency by mitigating pause failures, developed a feature specifically designed to prevent such interruptions.**
- **Utilized Fourier-transform infrared spectroscopy to create a detailed library of UV light curing rates and depths, enhancing precision in 3D printing.**
- **Implemented a computer vision feature for streamlined identification and application of the 3D printer's pause recovery mode, enhancing user experience and minimizing downtime.**

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LCD Hardware Airflow Optimization

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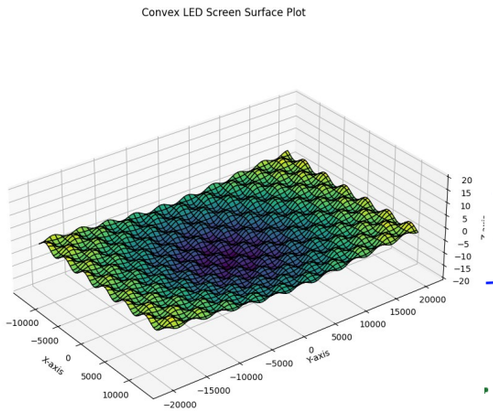

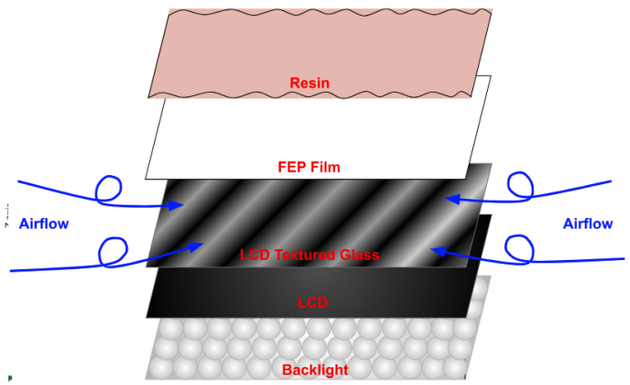

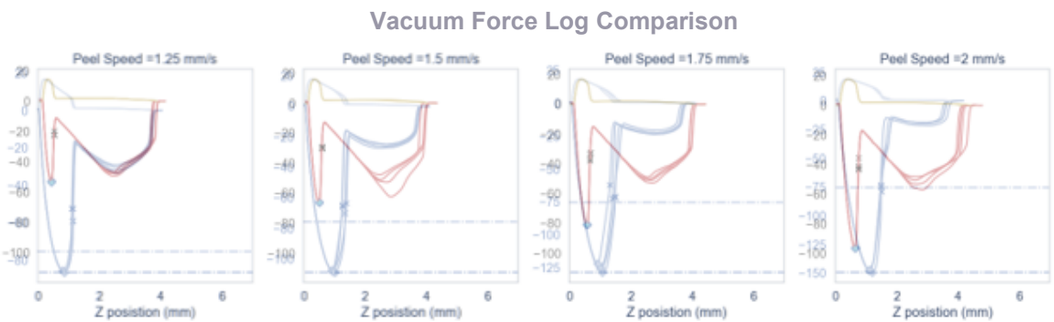

- **Identified the opportunity to enhance SLA printer performance through the redesign of the LCD hardware.**
- **Investigated and harnessed the vacuum break force to optimize performance, particularly focusing on reducing airflow resistance between the LCD Textured Glass and the FEP Film.**
- **Successfully achieved a 15% reduction in print time, demonstrating the effectiveness of the hardware redesign in improving SLA printer efficiency.**

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Professional Projects

Wiper Mixer Design Analysis

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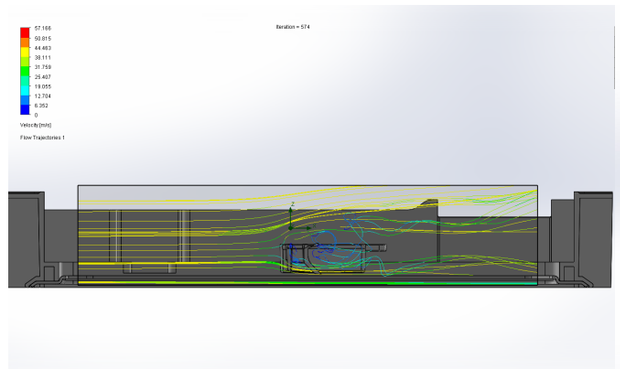
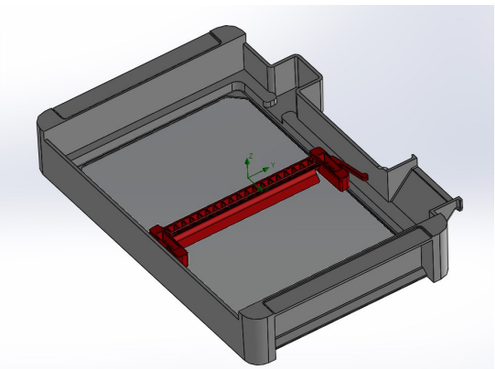
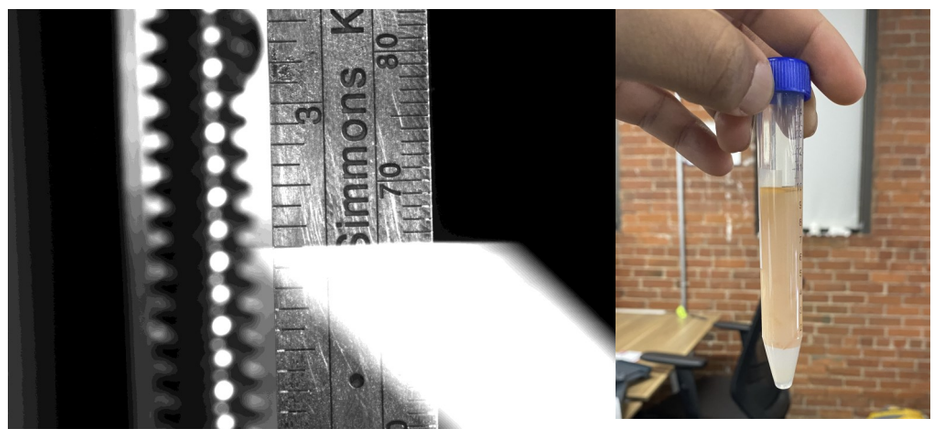
- **Conducted analytical CFD testing and high-speed camera analysis to evaluate and improve the efficiency of the SLA printer resin mixer.**
- **Addressed the aerodynamic lift of the mixer to enhance remixing performance and overall efficiency.**
- **Employed centrifuges and spectroscopy techniques to assess the quality of the mixed resin, ensuring optimal printing outcomes.**







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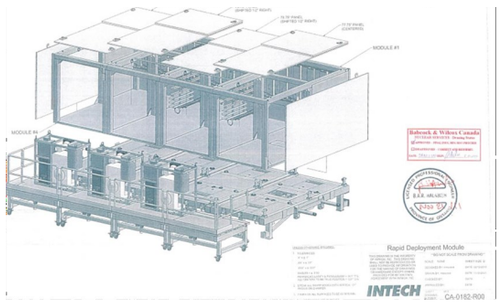
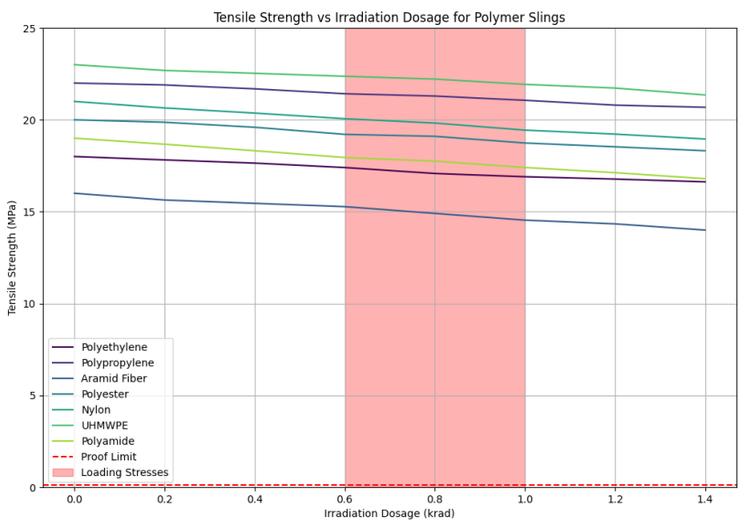
Effects of Irradiation on Polymers Hoisting

BWXT

- Evaluated radiation impact on Polyester Polymer hoisting for Bruce Power's Rapid Deployment Module (RDM) to ensure compliance with Canadian Nuclear Safety Commission standards.
- Conducted a comprehensive assessment of Polyester slings, focusing on their safety and mechanical integrity during prolonged exposure in the nuclear power plant environment.





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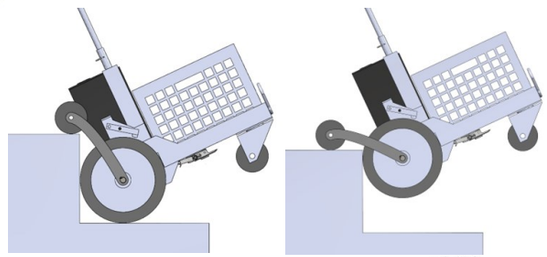
Ascend Tech (Capstone Project)

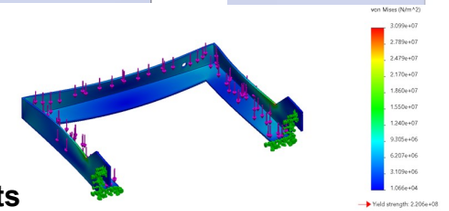
Forth-Year Design Project

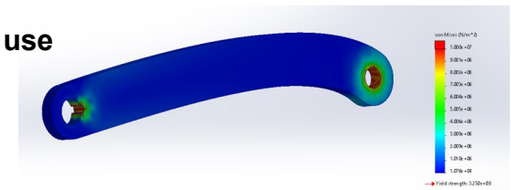
This initiative was focused on developing a lightweight, electrically assisted device tailored for individuals with mobility challenges. This innovative solution streamlines the transport of daily essentials up and down stairs, combining ergonomic design with cutting-edge materials to enhance user independence and efficiency.



Project Objectives:

1. Electrically climb up/down stairs
2. Support loads of 30 Kg
3. Design gear train system
4. Design Control System
5. Select appropriate power supply
6. Simulate FEA on designed components
7. Designed for safe and ergonomic use
8. Foldable and easy to store
9. Cost effective Design





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