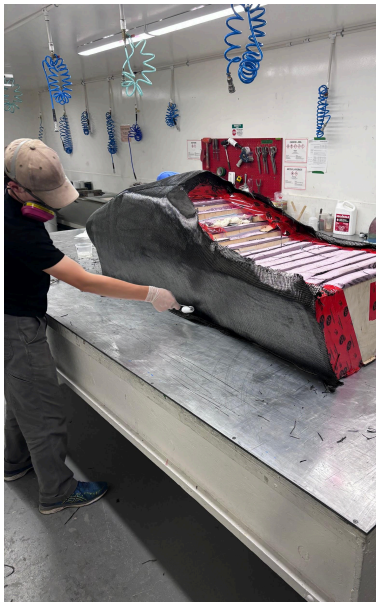
Chase Berno

4th Year Mechanical Engineering Student

250-893-5991

chase.berno99@gmail.com

Carbon Fibre Manufacturing: Formula SAE



What?

- Worked with a small team to Fabricate the mould and Carbon Fiber body for the 2025 UVIC Formula SAE car. The body was manufactured as a single piece for the first time in the clubs history

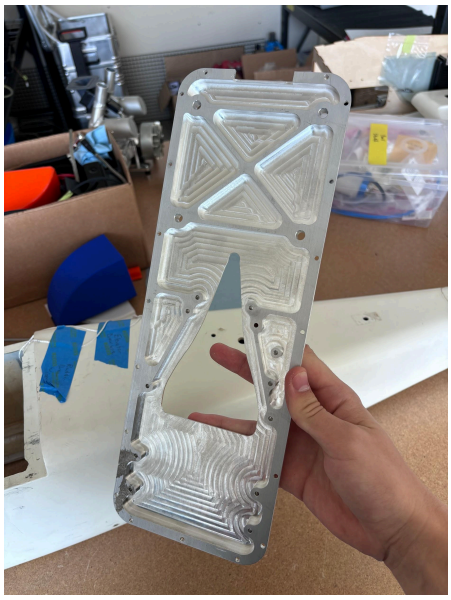
How?

- The withstand the compressive forces during manufacturing and to achieve the correct dimensions, the mould was made with lasercut plywood, high strength foam, and some 3D printed inserts. The mould was covered in Bondo to achieve a smooth surface
- The body was made with 2 layers of carbon fiber and compressed pulled under a light vacuum

Results

- The mould withstood the compressive forces of vacuum bagging, and the carbon fiber body was successfully manufactured.The body was tested during the 2025 FSAE competition in michigan and performed perfectly

Hybrid-Electric Experimental drone: UVIC Center for Aerospace Research



What?

- Completed a technical project at UVIC's Center for Aerospace Research involving the integration of a hybrid electric power system into a fixed with drone. Parts to fit a gasoline engine into the drone, including fairings, intakes, exhausts, a reinforced floorboard, a liquid cooling system, numerous cutting jigs, and several other components had to be designed, fabricated, and integrated

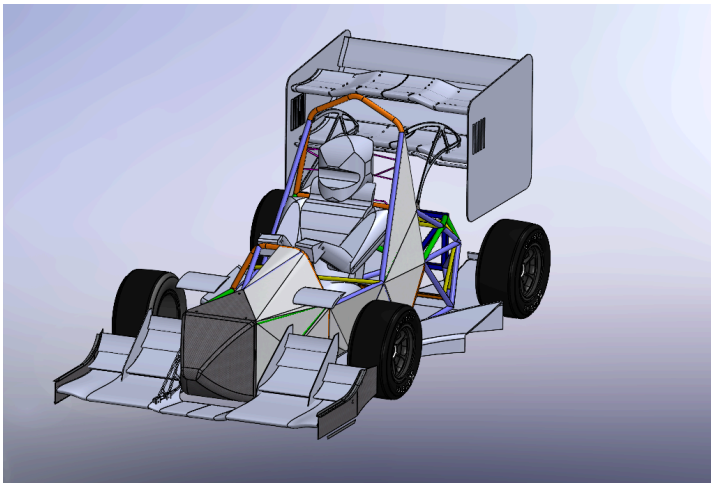
How?

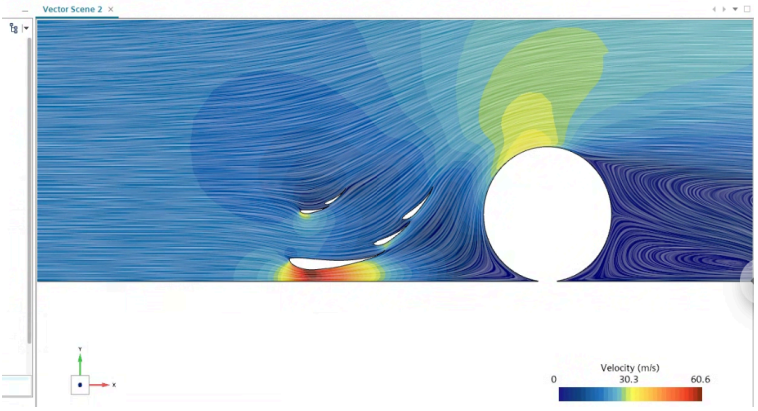
- Fairings were manufactured by thermoforming plastic sheets over a 3D printed mould. Numerous cutting jigs were sized around the required holes needed to accommodate the engine, inlets, and exhausts. The submerged NACA duct was designed and optimized to provide air to the radiator, and a radiator exhaust was positioned in the tail. The floorboard was designed to support the engine, NACA duct , radiator, and most other internal components. G-code was generated in both MasterCAM and Fusion, and the plate was CNC milled.

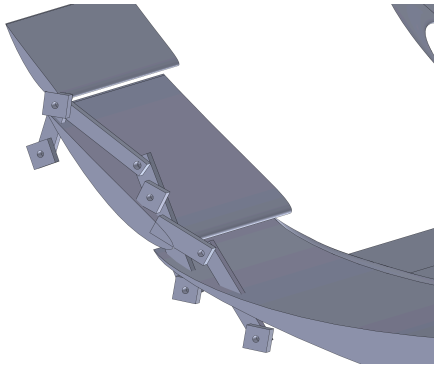
Results

- Components were manufactured and integrated successfully. All components were integrated successfully with one another. Results were positive and CFAR was satisfied with the results

Formula SAE Front Wing + Aero Package Design







What?

- Currently working on a complete redesign on the aero package for the formula car, with my main responsibility being all aspects of the front wing design. The wing is designed to optimize interactions with a new undertray and the rest of the car
- Currently experimenting with a fowler-flap style drag reduction (DRS) mechanism
- Optimizing results using STAR-CCM+
- Experimenting with forged carbon for endplate fabrication

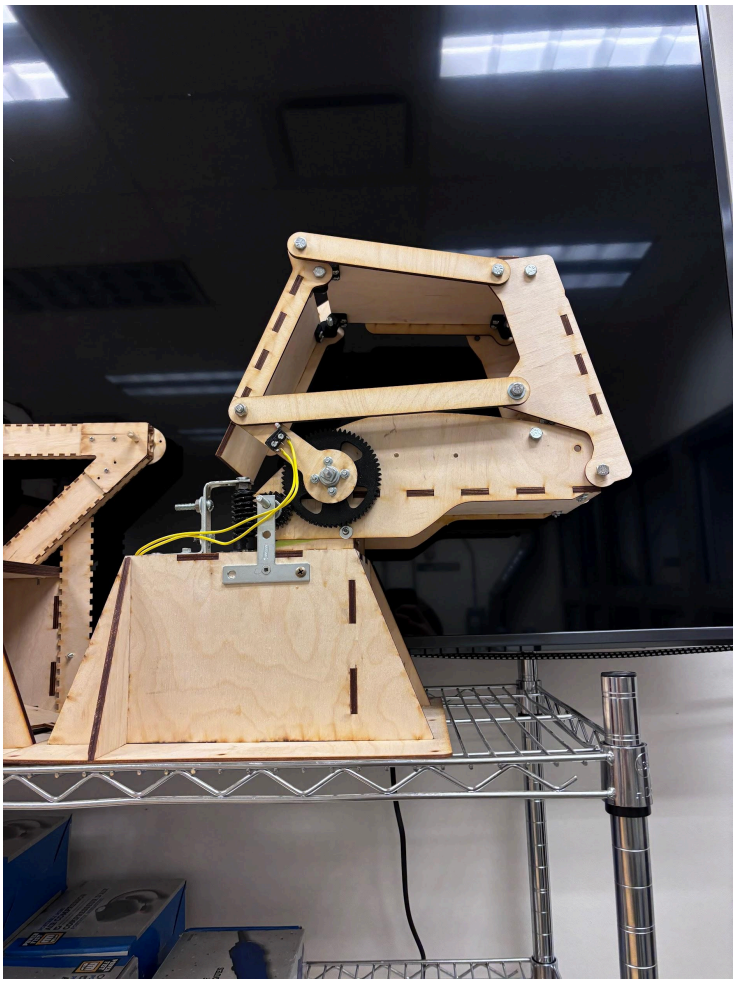
How?

- Initial specifications and design principles were identified, such as determining vortex locations, adding flow conditioning devices, and directing air to into the undertray and radiators. Different configurations were initially optimized using 2D STAR-CCM+ simulations before running 3D simulations. Simulations were run constantly for 3 months, iterating between different airfoil designs, angles, endplates, and other parameters, until downforce was optimized. Structural members were designed and optimized with

Results

- Current CFD results are indicating a significant increase in downforce compared to any previous design, with 195N of downforce at 50kph, while also directing airflow to the undertray. Construction of the wing is beginning in February.

Retractable Bridge



What?

- Designed and built a model retractable bridge for a third year design project. The extended length is 32 inches and retracts to a length of 10 inches within 13 seconds.
- The bridge retracts and extends with an electric motor and includes a dual throw switch for direction control and a limit switch to prevent the bridge from over extending or over retracting.

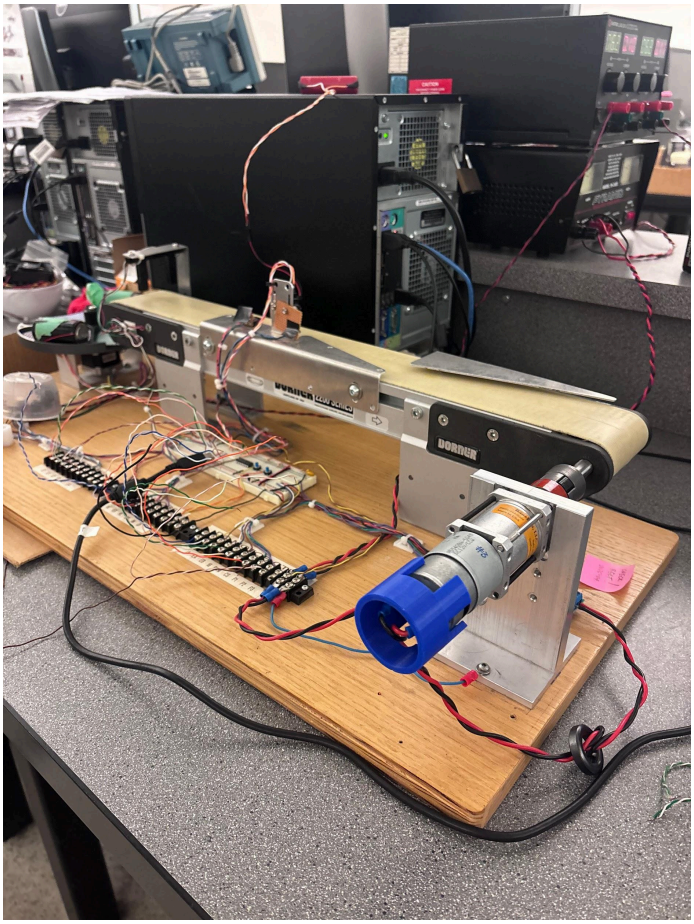
How?

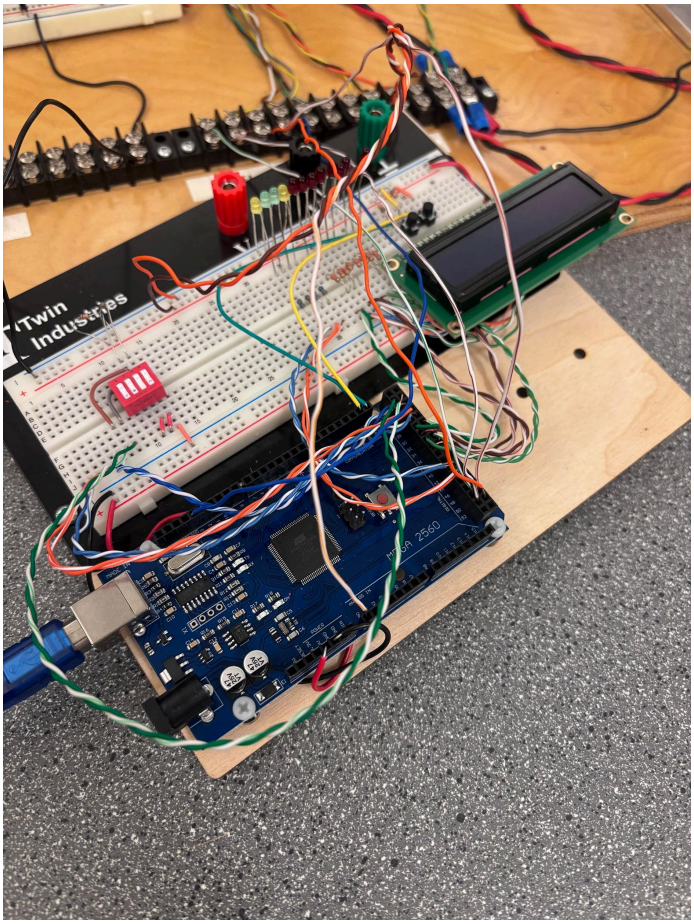
- Initial specifications and design principles were identified and the mechanism was synthesized in SolidWorks. An initial prototype bridge was constructed to predict strength and identify unforeseen issues. Afterwards, the lessons learned from the prototype were applied to the final bridge.
- Worm gears, helical gears and hinges were all 3D printed, while most other components were made of laser cut plywood

Results

- The bridge is capable of operating smoothly and reliably with minimal deflection or issues. The bridge Successfully completed all trials
- The project also included a 75 final design report. The bridges design, construction, and final report scored favorably, resulting in an A letter grade.

Automatic Sorting Machine





What?

- Wired and programed an ATMEGA 2560 microcontroller as part of a 4th year mechatronics class
- The system must automatically identify and separate different objects based on material, including steel, aluminum, and plastic
- The microcontroller controlled numerous devices, including a DC motor, a stepper motor, a reflectivity sensor, multiple optical sensors, buttons, and an LCD display.

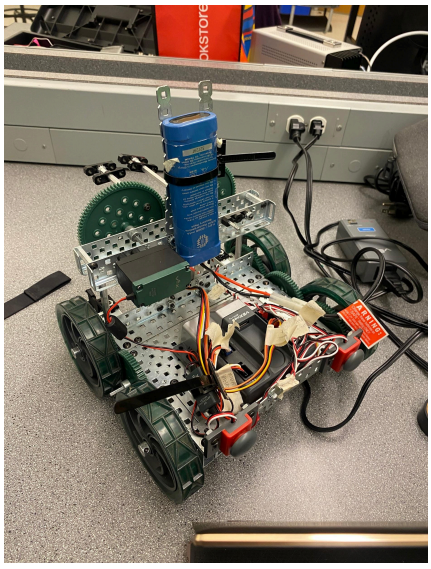
How?

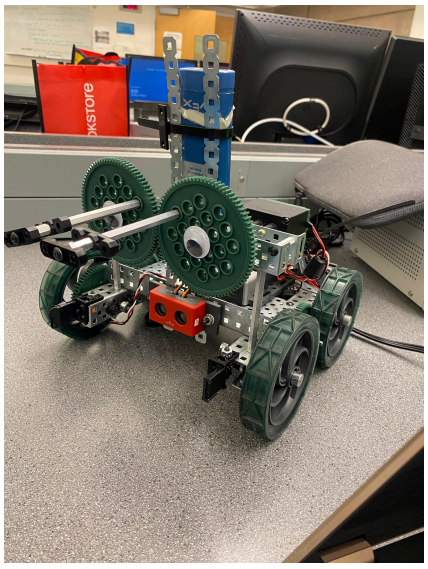
- All devices and sensors were wired and tested separately, with functions programmed for each sensor.
- After each system worked correctly, systems were integrated together. Algorithms were written to turn on the conveyor belt, identify the position of different cylindrical pieces using optical sensors, measure the reflective property of each piece to identify its material, and sort the piece accordingly.
- After all systems worked correctly to scan a single piece, more algorithms were written to operate with multiple pieces at once, and also tooptimize the speed of the system

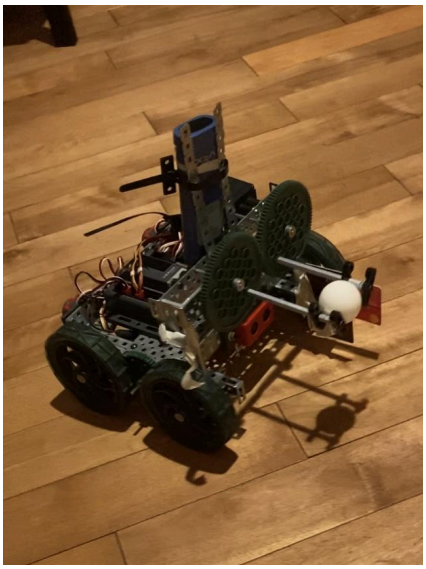
Results

- The robot was able to successfully sort 48 different pieces within 30 seconds, scoring within the top 25th percentile of the class.

Fully Autonomous VEX Robot







What?

- Designed, built, and coded a fully autonomous VEX robot that automatically located an infrared target, drops a ball on the target, and then automatically moves to the nearest wall in the room

How?

- The robot was built using VEX components and infrared sensors
- The robot was programmed in C, including numerous functions that make decisions based on sensor inputs

Results

- The robot was able to locate the target, drop the ball, and move to the nearest wall in under 30 seconds, achieving a 100% success rate