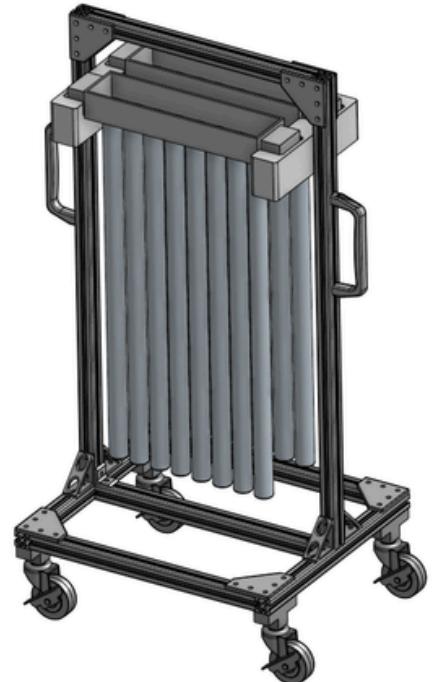
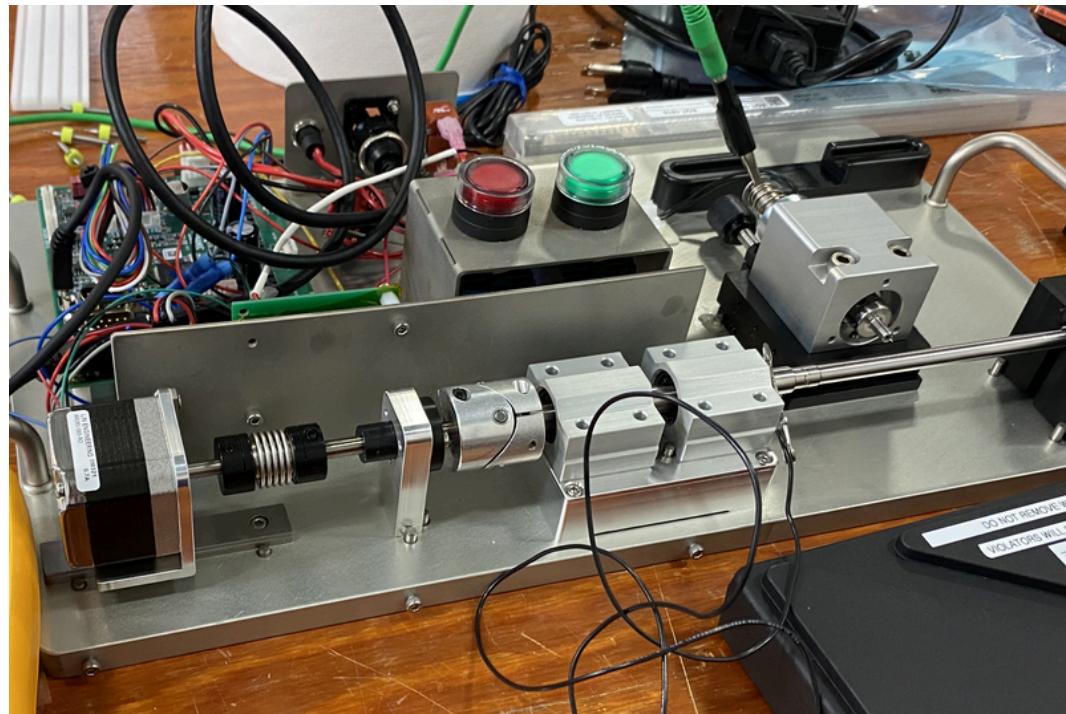


Benjamin Lee

Project Portfolio

MECHANICAL ENGINEERING AT THE UNIVERSITY OF BRITISH COLUMBIA

Kardium Inc. Design Project/Facility Expansion



What?

- Implemented a new chemical-based cleaning process
- Assembled and integrated custom mechanical/electrical jigs for facility expansion
- Conducted installation qualification testing for test equipment and jigs

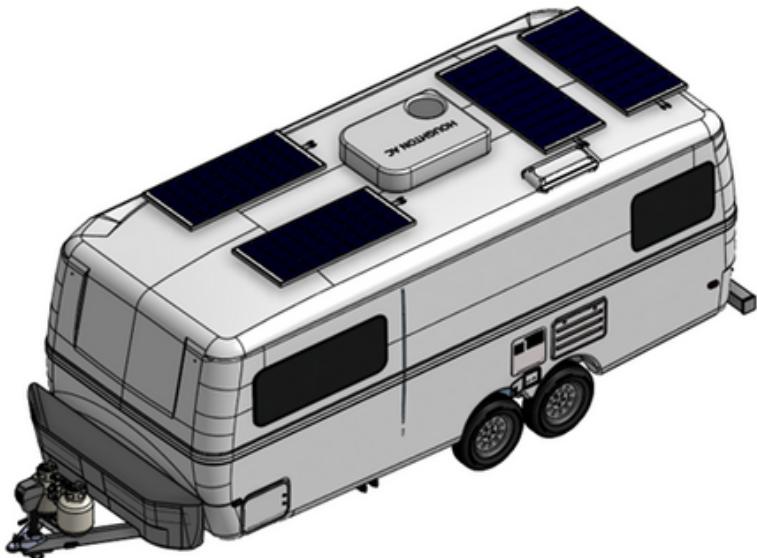
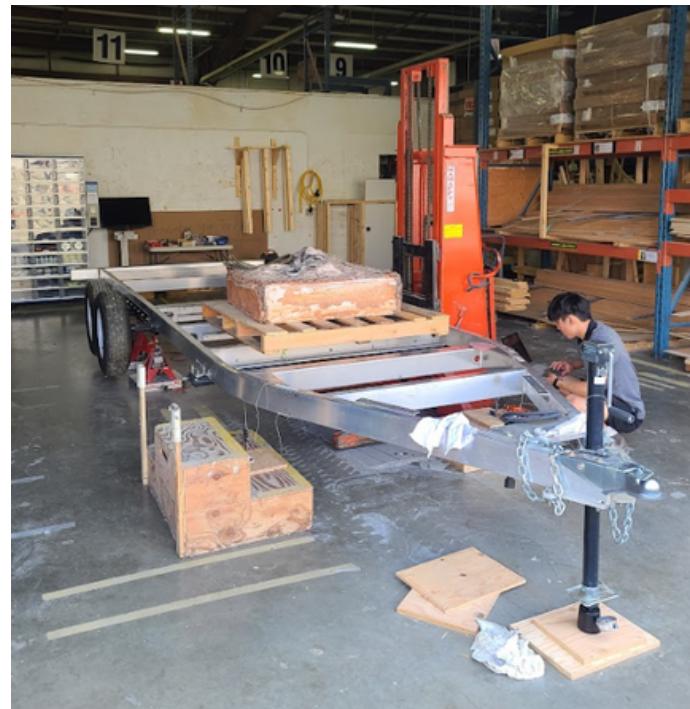
How?

- Designed and implemented new tooling, jigs, and fixtures in **SolidWorks**
- Interpreting engineering drawings per **ASME Y14.5** standards utilizing various machine shop tools (mill, laser welder) to reproduce parts
- Did troubleshooting and performance verification, to complete formal reports for review

Results

- New cleaning process resulted in a **75% reduction in process time** and improved production efficiency in a clean-room environment.
- **Doubled facility production capacity** from equipment duplication
- **21 new production jigs**, tested and qualified

Escape 23 Trailer



What?

- Contributed to the successful launch of a new product line (Escape 23)
- Brought project from concept sketches all the way to full-scale production for consumers
- Redesigned existing trailer parts for improved manufacturability

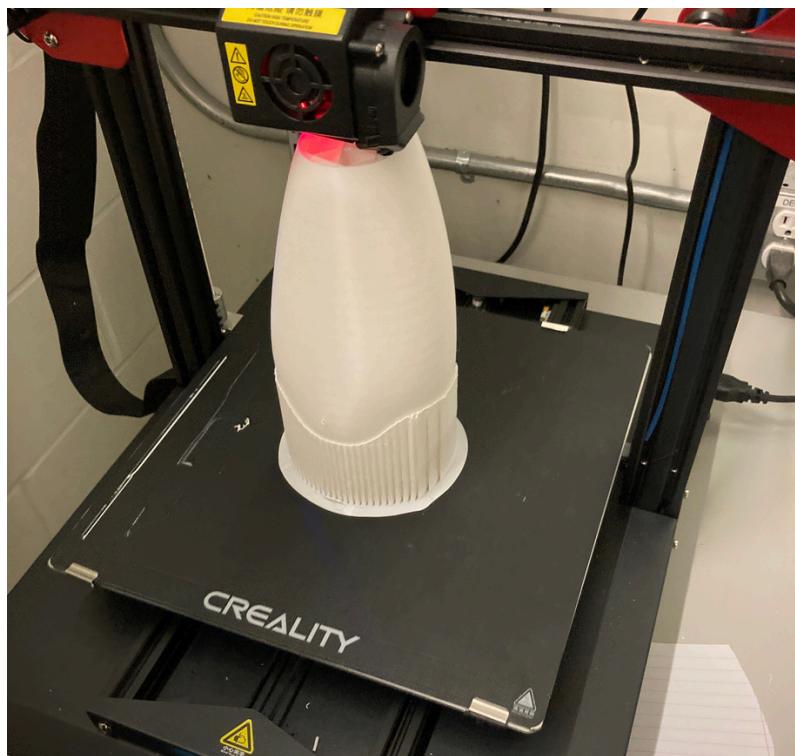
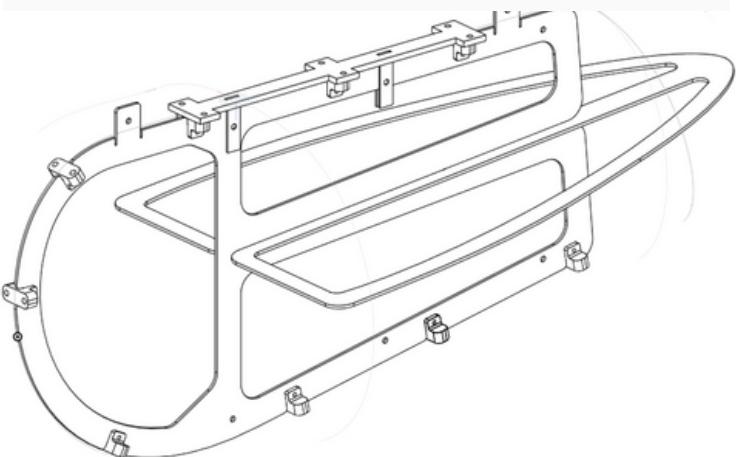
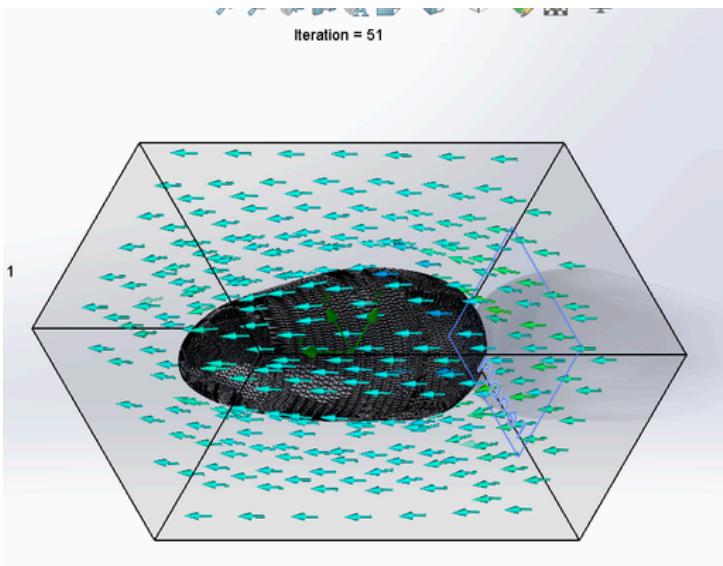
How?

- Designed interior layout with **CAD** software (**OnShape/SolidWorks**)
- Designed a strain gauge system for testing chassis structure and validating FEA models
- Implemented **Lean Six Sigma** Principles to reduce material waste and introduced **CNC manufacturing** into the production line for E23 and existing products

Results

- Reduced initial production cycle time down 60%
- Increased CNC machinery machine uptime rate by 50%
- Reduced defect rates by 40% and reduced material waste by 66%
- Generated **\$1.2M** in product presales

UBC UAS Design Team: UAV Airbus



What?

- National AEAC Competition passenger transport UAV piloted autonomously
- Worked on aircraft cabin that seats 4 Barbie Dolls and 2kg of cargo

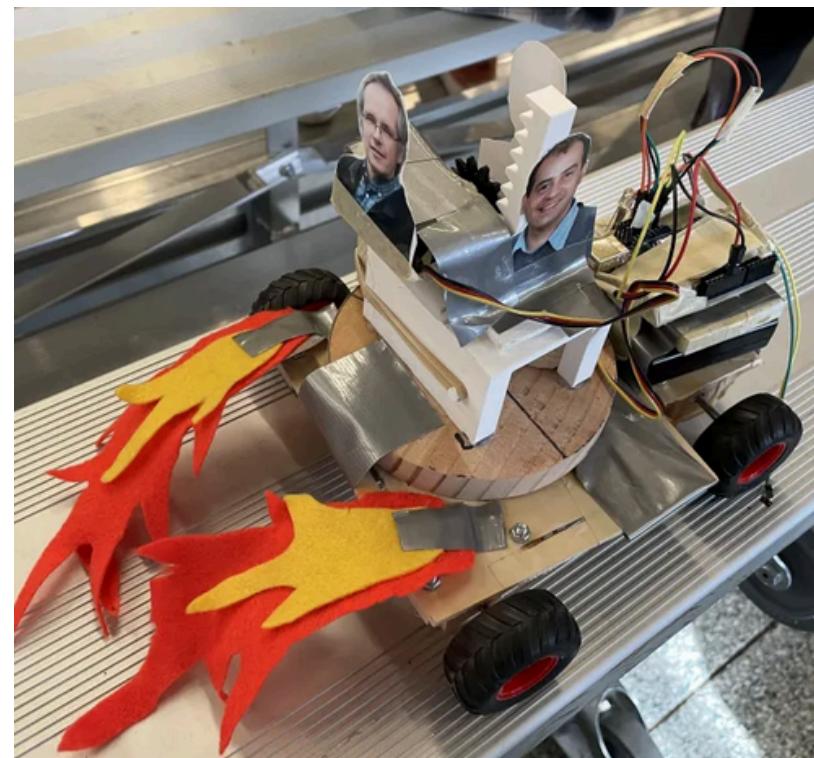
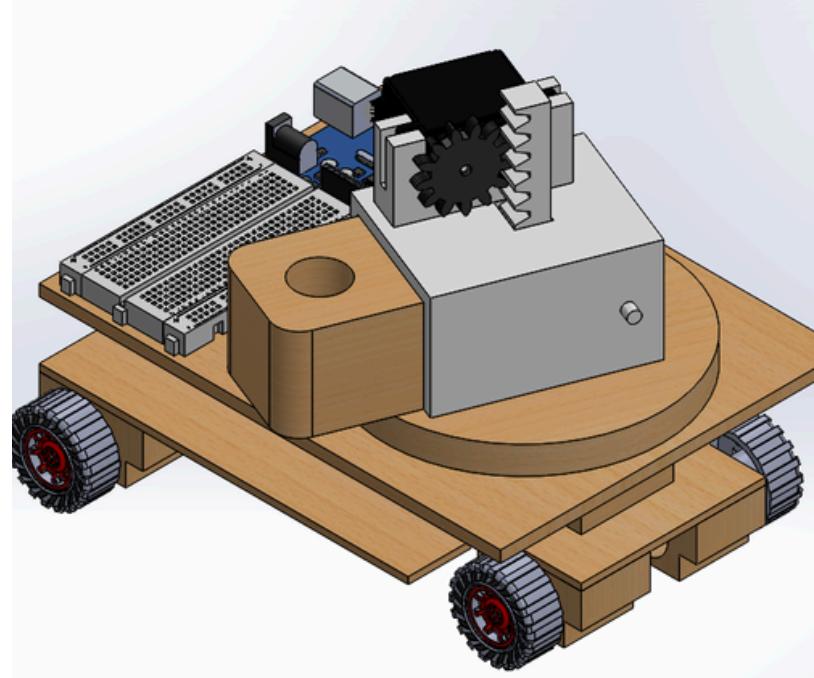
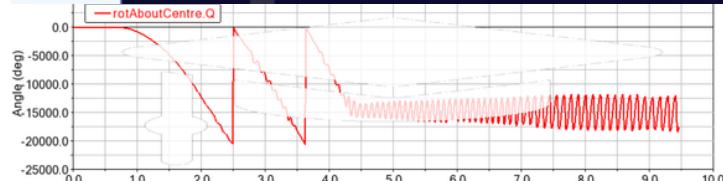
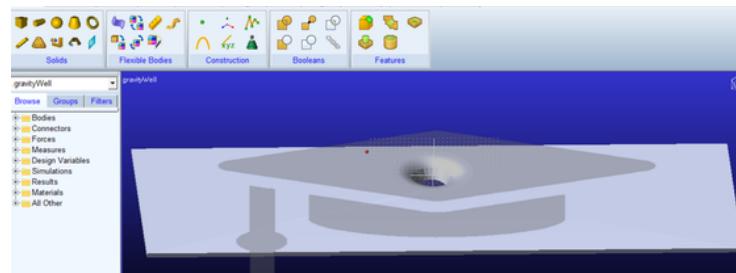
How?

- Used **SolidWorks/OnShape** to CAD cabin components, test mounts, and carbon fibre layup molds
- Conducted **FEA** and **CFD** in SolidWorks to optimize cabin structure and aerodynamics
- Rapid prototyping using 3D printing, waterjet cutting, and laser cutting

Results

- Reduced aircraft fuselage internal structure weight by 20% and increased rigidity by 15%
- Reduced previous layup mold material by 67% and exterior weight by 30%
- 2nd in Design Presentation and 3rd Place in Flight Demonstration at AEAC 2024

Titan Endurance Launcher & Orbiter



What?

- Potential energy launcher that propels an electronic catapult on wheels that launches a sphere
- Goal:** Launch a sphere of unknown mass into a funnel and achieve maximum spirals before reaching the bottom

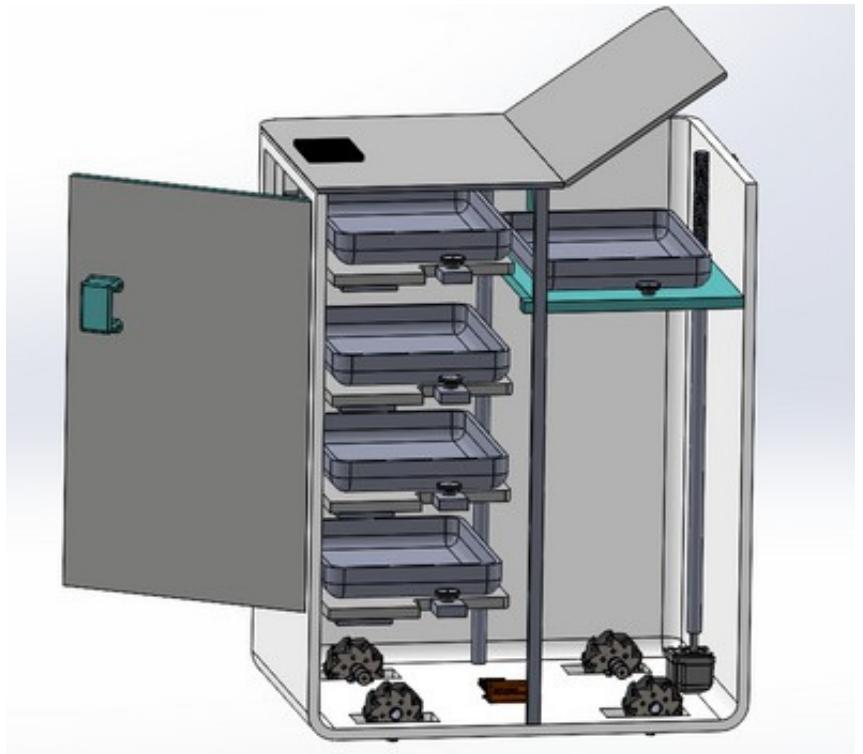
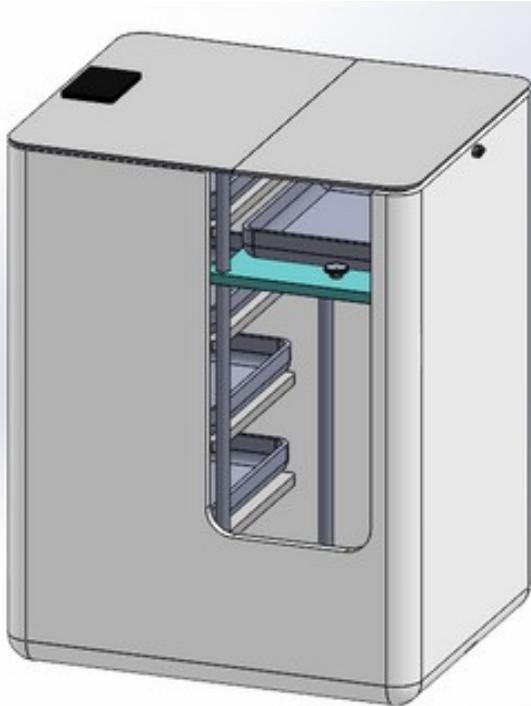
How?

- Optimized ball launch velocities by using **MSC Adams** to simulate and predict launch trajectories
- Used **SolidWorks** to CAD prototype launcher builds
- Led a team of 6 members to design, manufacture, and present engineered solutions to stakeholders
- Manufactured parts using 3D printing, waterjet cutting, and laser cutting

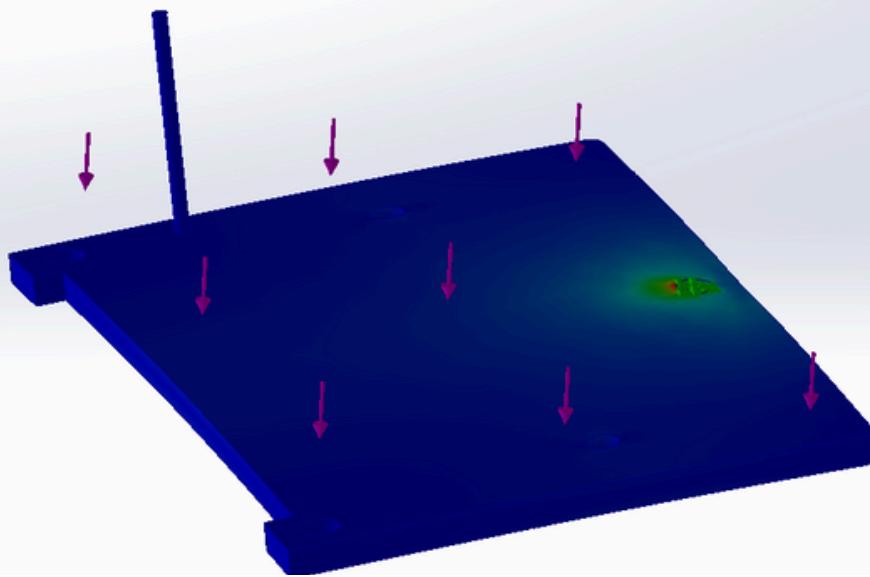
Results

- Predicted launch parameters with 85% accuracy using the simulation model
- Gained project management and technical documentation experience
- Successfully hit the target and achieved a spiral time of 56 seconds

Kitchen Robot Server



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What?

- Designed a restaurant robot that automatically delivers food to customers
- Relies on sensors and motors to transport food from the kitchen to the customers

How?

- Use **SolidWorks** to CAD and perform **FEA** to validate structural rigidity
- Worked with stakeholders to develop component BOM sheets for cost estimation of mass production

Results

- Formally presented concept to a group of judges and received design feedback
- Strengthened skills in electromechanical design, FEA, and part modelling

POSTURE-INO Posture Corrector



```
Postureino_Code
7 Serial.begin(9600);           // sets the serial port to 960
8 }
9
10 void loop()
11 {
12     x = analogRead(0);        // read analog input pin 0
13     y = analogRead(1);        // read analog input pin 1
14     z = analogRead(2);        // read analog input pin 1
15     /*Serial.print("accelerations are x, y, z: ");
16     Serial.print(x, DEC);    // print the acceleration in t
17     Serial.print(" ");        // prints a space between the
18     Serial.print(y, DEC);    // print the acceleration in t
19     Serial.print(" ");
20     Serial.println(z, DEC);  // print the acceleration in t
21     delay(100);              // wait 100ms for next reading
22     int ydeg = (y, DEC);
23     Serial.print("Your sitting angle is ");
24     Serial.print(abs(360 - y));
25     Serial.println();
26     Serial.println();
27     //detect slouching
28     if (y < 375){
29         tone(buzzer, 1000);
30         Serial.println("SIT UP STRAIGHT! YOU'RE SLOUCHING");
31     }
32     else {
33         //nothing
34 }
```



What?

- Electronic posture corrector that alerts of poor sitting posture and tracks sitting data
- Made with minimum waste and recycled materials

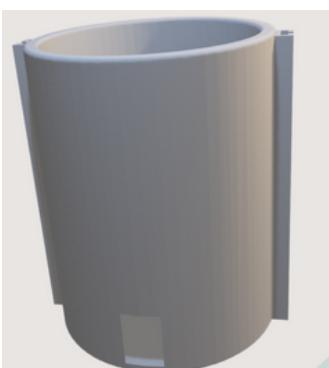
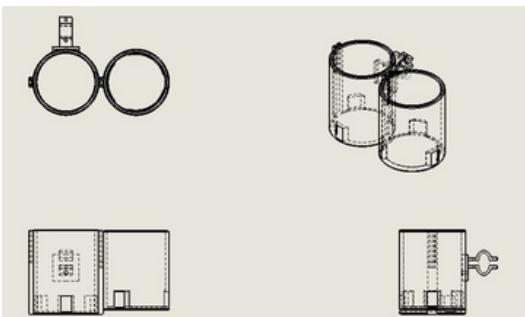
How?

- Used prototyping boards and **Arduino** hardware to create circuitry
- Programmed data collection and feedback delivery features in **C++**

Results

- Posture-ino recorded data and alerted 14 students of their poor sitting posture
- Experience writing engineering reports and presenting to stakeholders

Baby Stroller Cupholder



What?

- Custom-designed dual beverage cup holder that mounts onto a baby stroller
- Affordable and practical solutions resolve the lack of beverage holders for this specific problem

How?

- Connected with stakeholders to understand requirements and determine design constraints
- Produced 3D **CAD** models and detailed 2D engineering drawings for assembly using **SolidWorks**

Results

- Gained experience in **SolidWorks**, **3D printing**, and technical documentation and presentation
- Client uses product daily with positive feedback