Cole Book - Mechatronics Engineering - 2269381472 - colebook9@gmail.com - LinkedIn
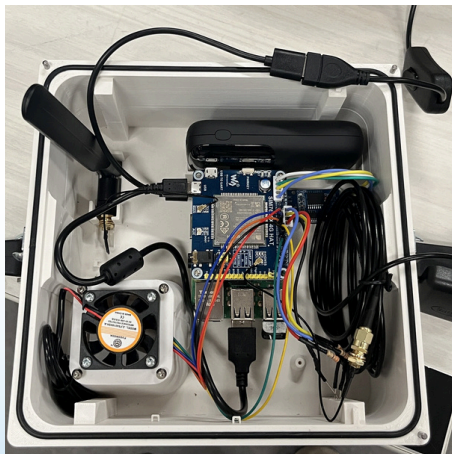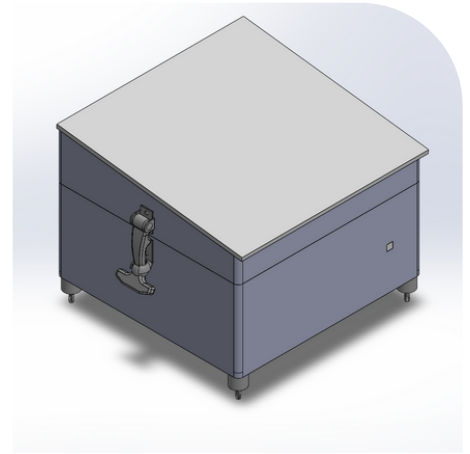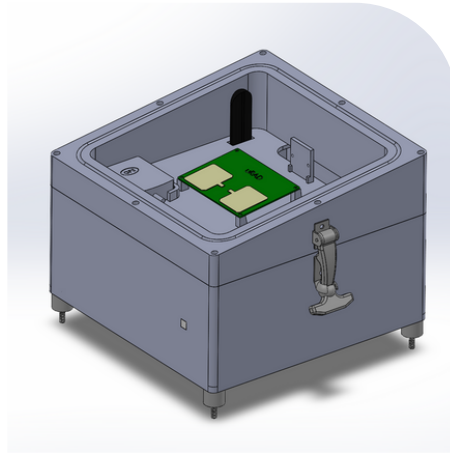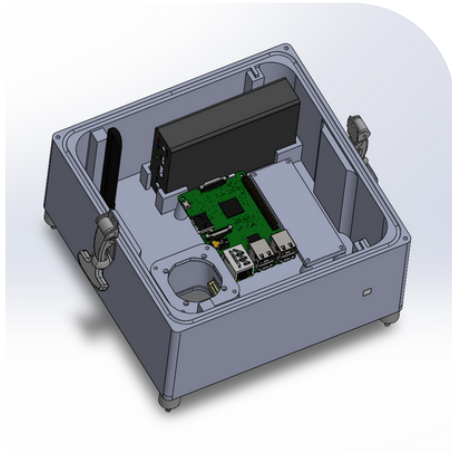
NORTHERN HAIL PROJECT ENCLOSURE

FIELD-DEPLOYABLE ENCLOSURE FOR RADAR-BASED HAIL SENSING AND ENVIRONMENTAL DATA ACQUISITION

Project Overview

Developed a sealed radar instrumentation enclosure designed for harsh outdoor environments. Led the full design cycle, from 3D modeling and component packaging to waterproofing validation and field testing to ensure mechanical durability and manufacturability.

Tools & Skills

SolidWorks 2025 • GD&T • Additive Manufacturing (PETG/ASA) • UHMW-PE Machining • Design for Assembly (DFA) • O-Ring Seal Design • Prototyping & Test Validation

Highlights

- Designed a two-part printed enclosure with precision O-ring groove and latch geometry, achieving waterproof performance (IP54 equivalent).
- Applied GD&T to sealing and dowel-pin interfaces, holding ±0.1 mm tolerance on critical fits for consistent gasket compression.
- Optimized UHMW-PE lid design for radar transparency, machining efficiency, and water runoff.
- Integrated mounts for Raspberry Pi, modem, and sensors, applying DFM principles for clean cable routing and assembly access.
- Validated mechanical performance through impact and leak testing, correlating epoxy reinforcement with increased wall stiffness and sealing reliability.

CYNERGY DRAG CAR CHASSIS

LIGHTWEIGHT WELDED-TUBE CHASSIS ENGINEERED FOR MANUFACTURABILITY, STIFFNESS, AND INTEGRATION WITH COMPOSITE BODYWORK.
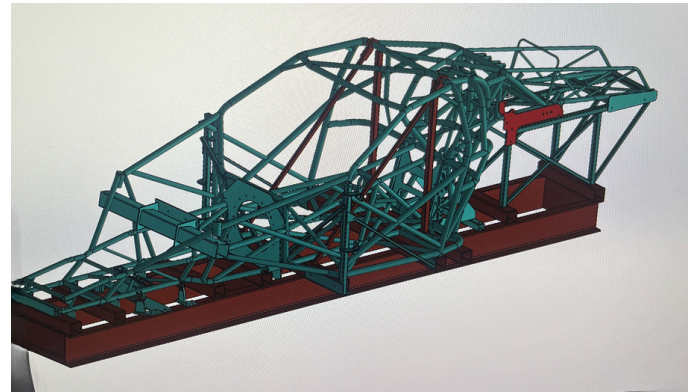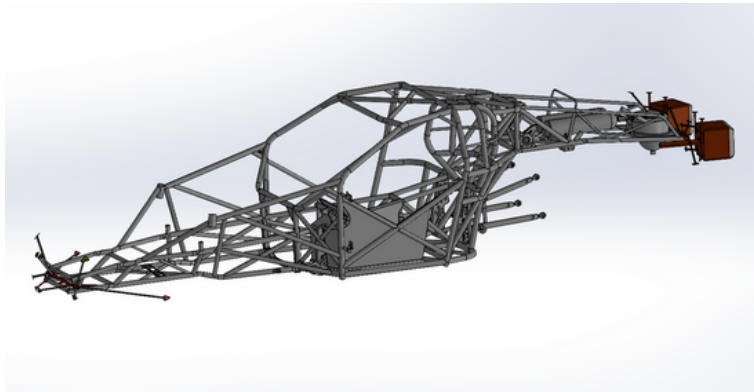
Project Overview

Designed a modular drag car chassis optimized for strength, manufacturability, and weight reduction. The structure was modeled using SolidWorks weldments and configured for CNC-cut tube notching, fixture assembly, and composite body integration.

Tools & Skills

SolidWorks 2025 • Weldment Design • Structural Analysis • GD&T • Design for Manufacturability (DFM) • Assembly Modeling • CNC Fabrication Prep

Highlights

- Created a full vehicle chassis model consisting of 200+ tubes using the SolidWorks weldment environment with automated cut lists and part numbering.
- Applied GD&T and tolerance management for key mounting points and suspension geometry to ensure alignment accuracy during welding and jig setup.
- Designed CNC tube templates and fixture points to support consistent production and simplify assembly alignment.
- Collaborated with composite body and rear-end teams to integrate mounting interfaces and define packaging constraints.

TOOLING, COMPOSITE MOLDS & FUEL SYSTEM DESIGN

PRECISION TOOLING AND COMPOSITE MOLD DEVELOPMENT FOR VEHICLE BODY AND FUEL SYSTEM COMPONENTS
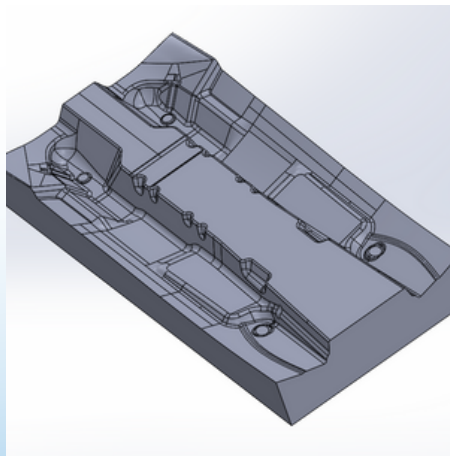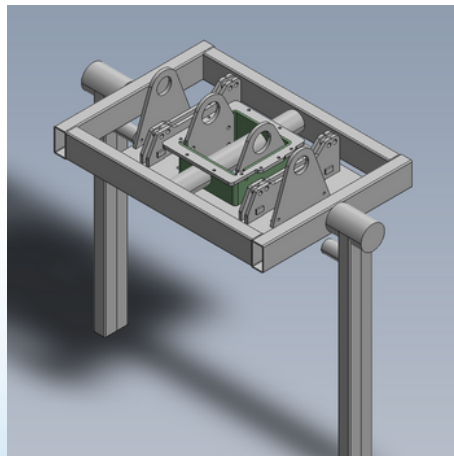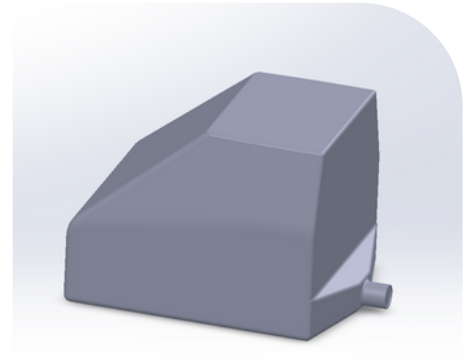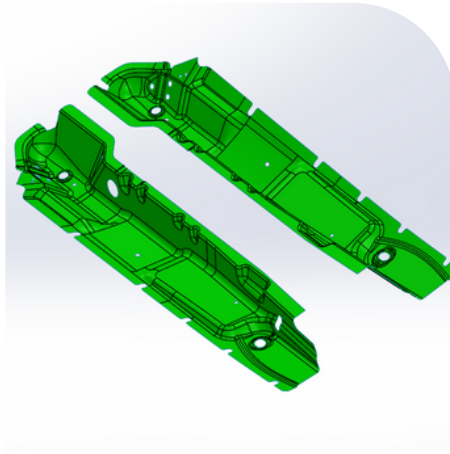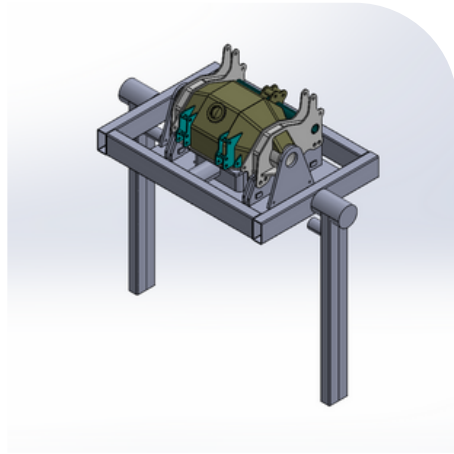
Project Overview

Contributed to the design and fabrication of welding jigs, composite molds, and a custom aluminum fuel tank for a high-performance drag car program. Focused on tooling accuracy, manufacturability, and surface modeling for composite part production.

Tools & Skills

SolidWorks 2025 • Advanced Surface Modeling • GD&T • CNC Machining • Sheet Metal Design • Tooling & Fixture Design • Design for Manufacture (DFM)

Highlights

- Welding Fixture: Designed and fabricated a rear-end welding jig to align tubes and brackets during tack and final weld stages, ensuring repeatable geometry and minimizing distortion.
- Composite Molds: Modeled GT-style carbon fiber door molds using advanced surfacing techniques with precise parting-line control, draft management, and layup clearance optimization.
- Fuel Tank Design: Developed a custom aluminum fuel tank featuring internal baffles, a welded filler neck, and mounting tabs
- Applied GD&T to fixture and mold interfaces for consistent tolerance stack-ups across machined and printed tooling.

Cole Book - Mechatronics Engineering - 2269381472 - colebook9@gmail.com - LinkedIn

AUTONOMOUS ROBOT PROJECT

AUTONOMOUS MOBILE ROBOT INTEGRATING SENSING, SORTING, AND NAVIGATION THROUGH EMBEDDED CONTROL.
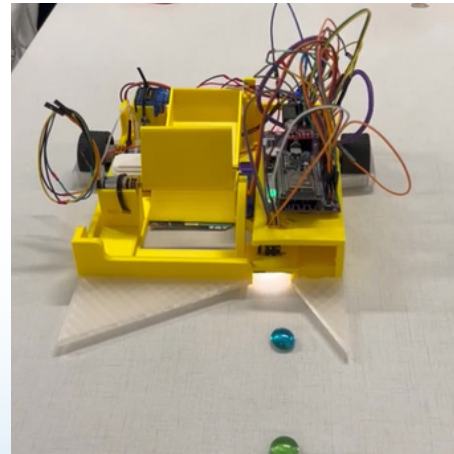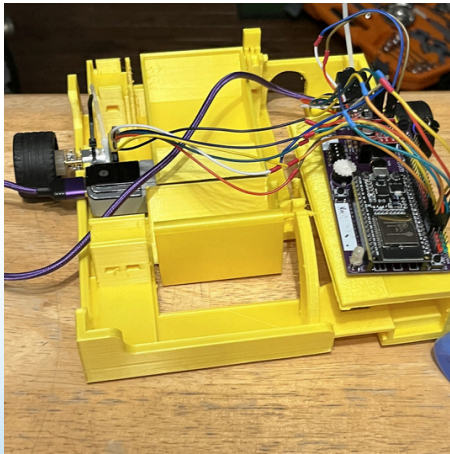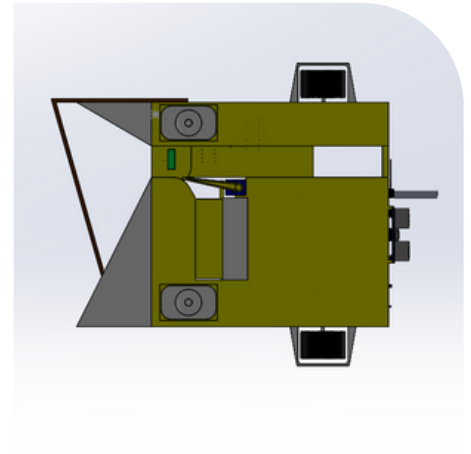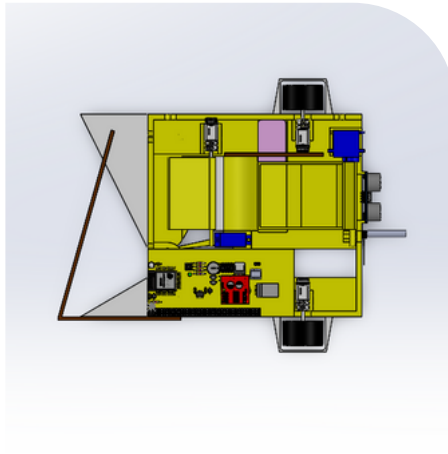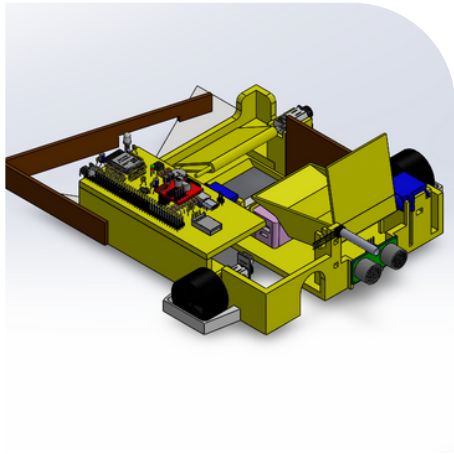
Project Overview

Built a two-wheel robot powered by DC motors with front rollers for stability. The system performs color-based marble sorting and obstacle-aware navigation using an ESP32 microcontroller with ultrasonic, infrared, and color sensors.

Tools & Skills

SolidWorks • Arduino IDE (C++) • ESP32 Microcontroller • DC Motor Control (PWM) • Servo Actuation • Ultrasonic & IR Sensing • Color Sensor Integration • Non-Blocking Timing (millis())

Highlights

- Designed the mechanical chassis and component mounts for sensors, motors, and servo mechanism in SolidWorks.
- Implemented colour-based sorting using a colour sensor to command a servo gate for marble acceptance or rejection.
- Programmed dual DC motor control for differential steering and speed modulation via PWM.
- Integrated ultrasonic and infrared sensors for autonomous navigation and line tracking.
- Developed real-time control logic with non-blocking timing (millis()), enabling concurrent sensor updates and motor actuation.