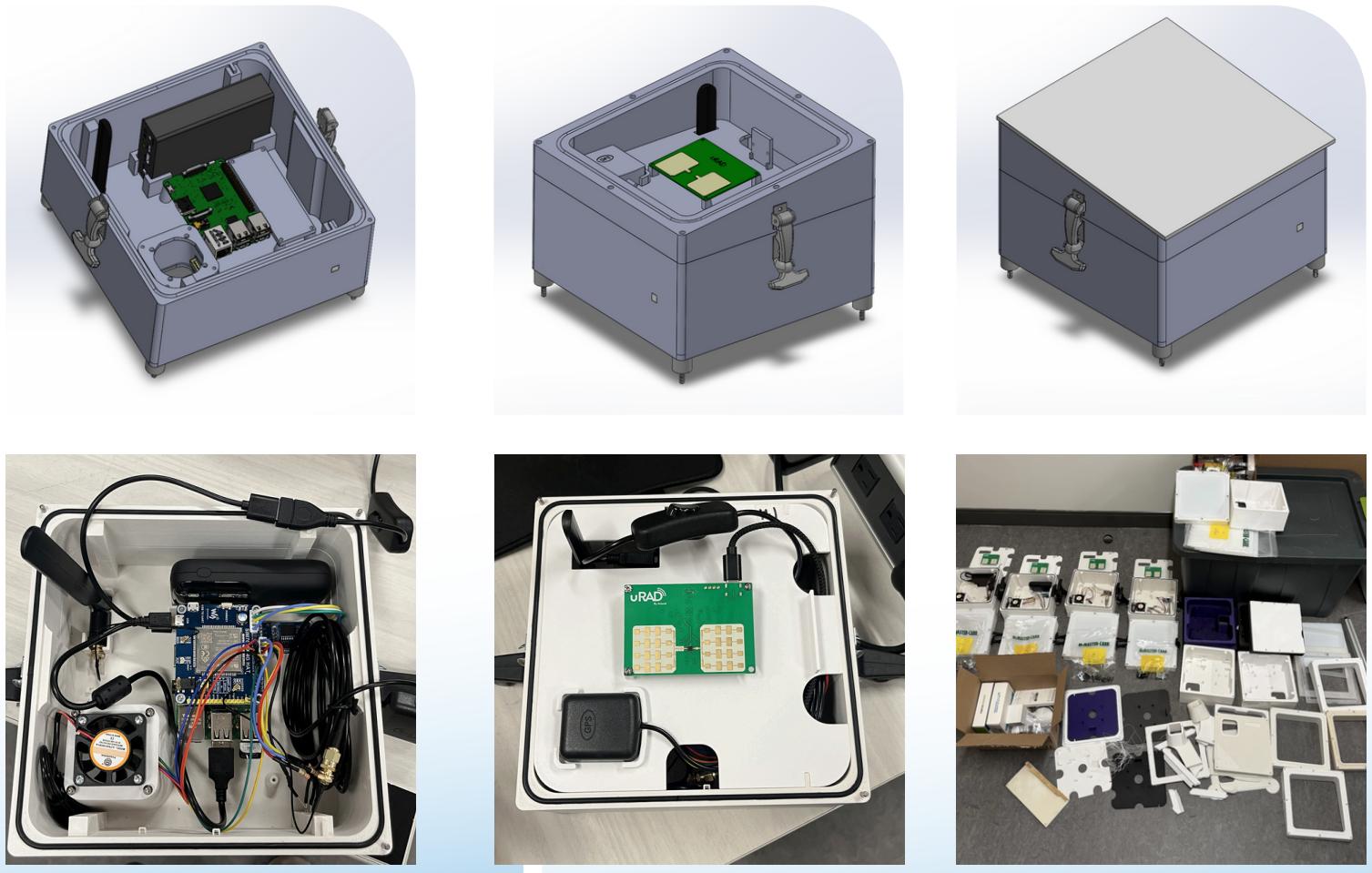


NORTHERN HAIL PROJECT ENCLOSURE

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

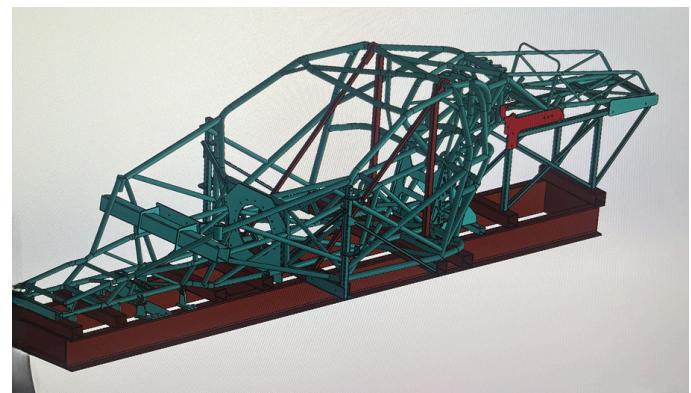
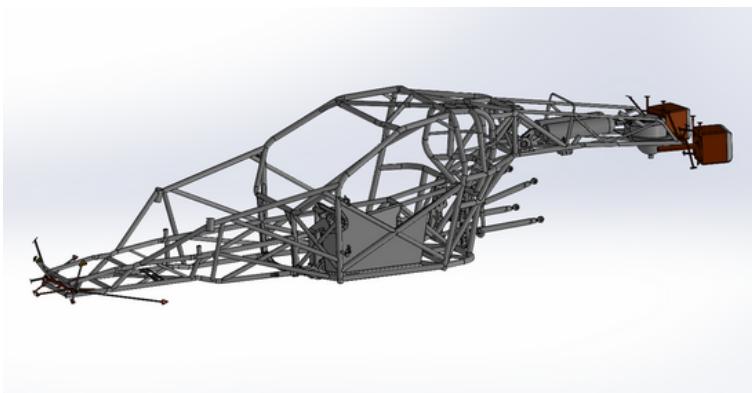
SolidWorks 2025 • GD&T • Additive Manufacturing (PETG/ASA) • UHMW-PE Machining • Design for Assembly (DFA) • O-Ring Seal Design • Prototyping & Test Validation

Highlights

- Designed sealed enclosure achieving IP65 rating through precision O-ring groove geometry, holding $\pm 0.1\text{mm}$ tolerances on sealing interfaces for consistent gasket compression and waterproof performance
- Applied GD&T to sealing and dowel-pin interfaces, holding $\pm 0.1\text{ mm}$ tolerance on critical fits for consistent gasket compression.
- Validated design through spray testing and impact testing; four enclosures deployed to US field sites, with one unit surviving direct tornado exposure
- Integrated Raspberry Pi, GPS/4G modem, environmental sensors, and power management with cable routing and component mounting optimized for field serviceability

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

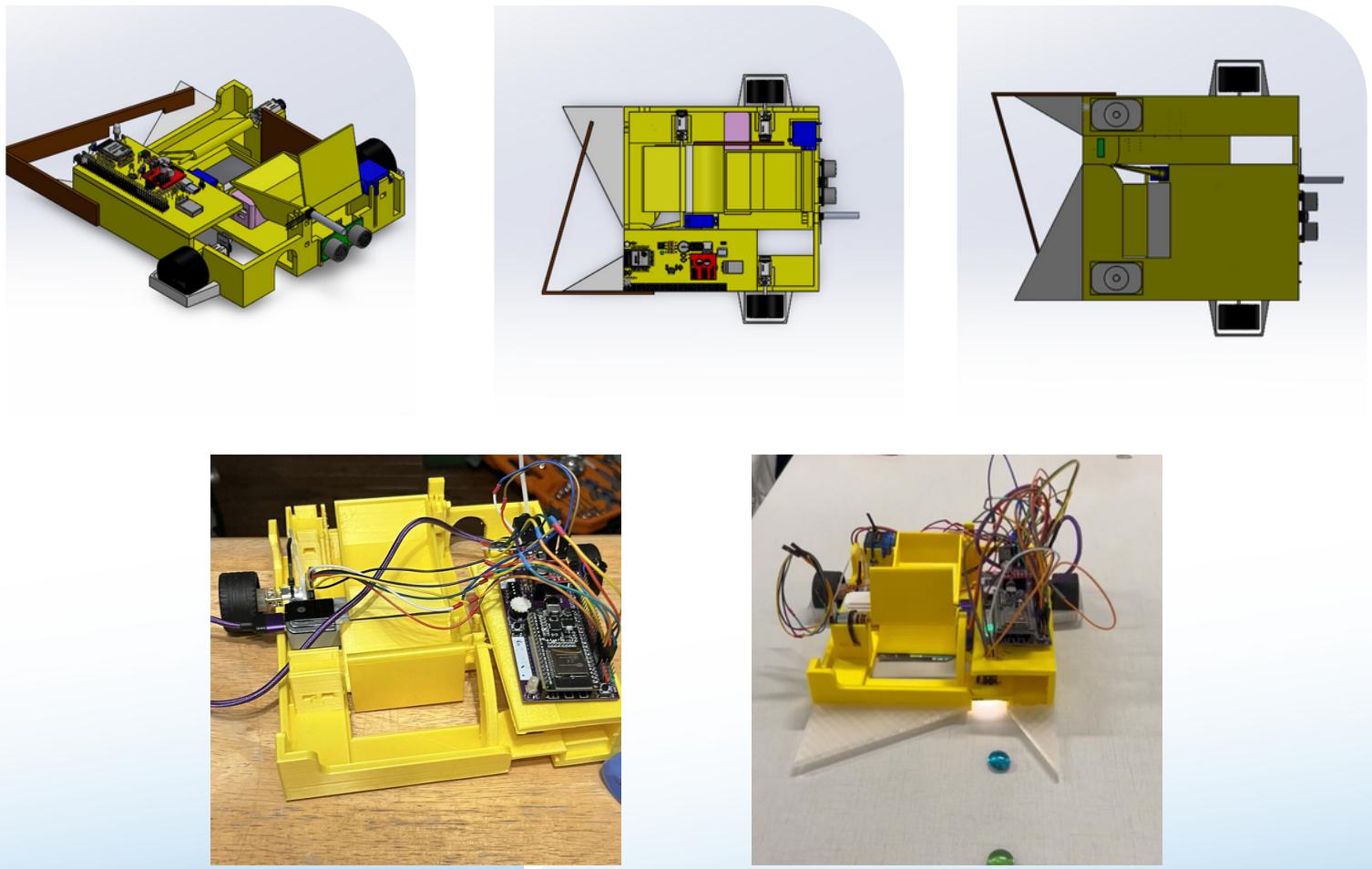
SolidWorks 2025 • Weldment Design • Structural Analysis • GD&T • Design for Manufacturability (DFM) • Assembly Modeling • CNC Fabrication Prep

Highlights

- Reverse-engineered competitor chassis through 3D laser scanning, then collaborated with Australian drag racing specialist to design optimized version with 20 fewer tubes while meeting NHRA structural requirements validated through third-party FEA
- Modeled 200+ member tubular structure in SolidWorks weldments environment with automated cut lists and part numbering, reducing material through strategic use of smaller diameter tubing in lower-stress areas
- Coordinated chassis design with composite body team to integrate custom carbon fiber components including bucket seat and parachute handle mount

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

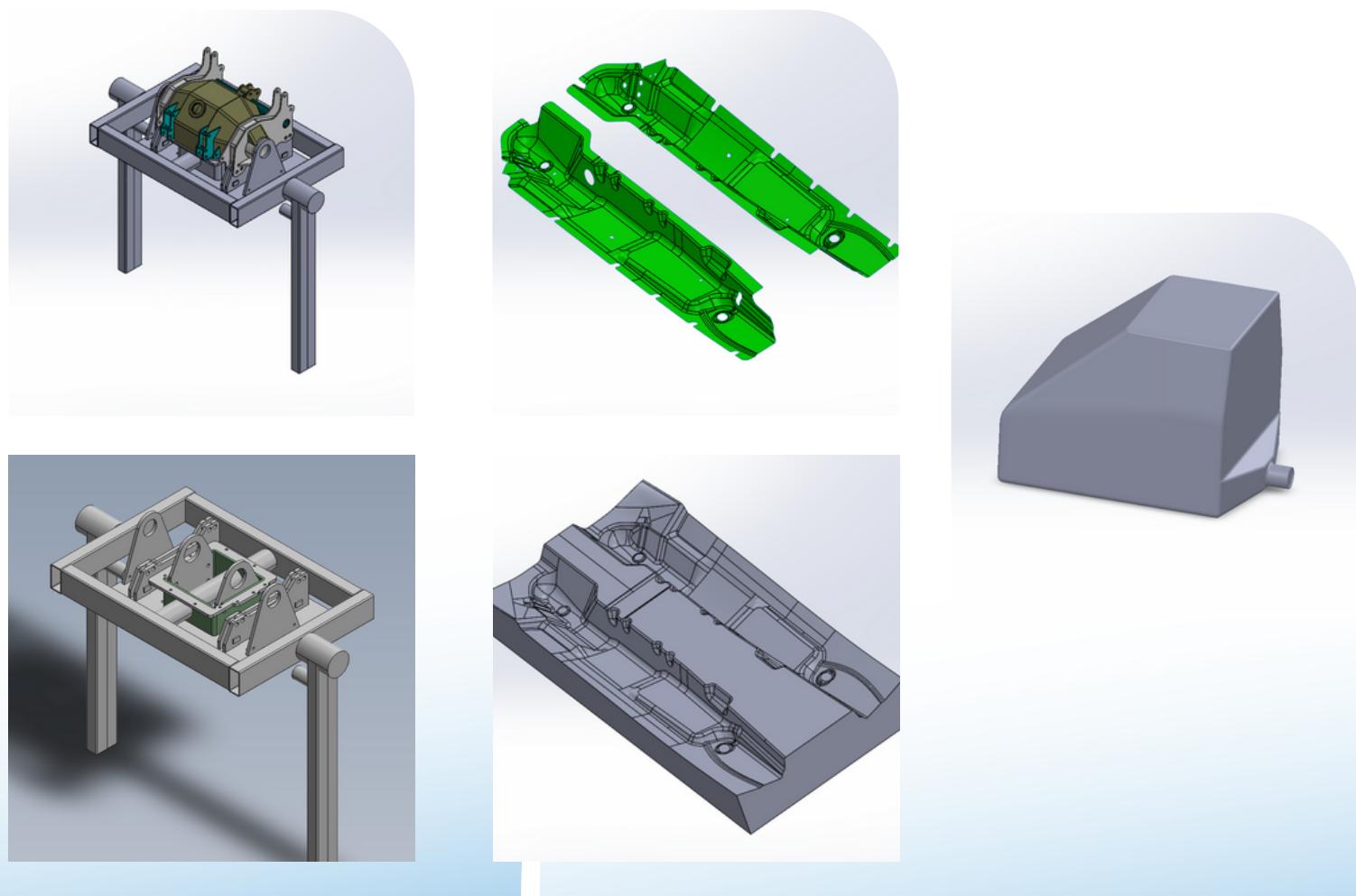
SolidWorks • Arduino IDE (C++) • ESP32 Microcontroller • DC Motor Control (PWM) • Servo Actuation • Ultrasonic & IR Sensing • Color Sensor Integration • Non-Blocking Timing (millis())

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.

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.