



MINI BAJA

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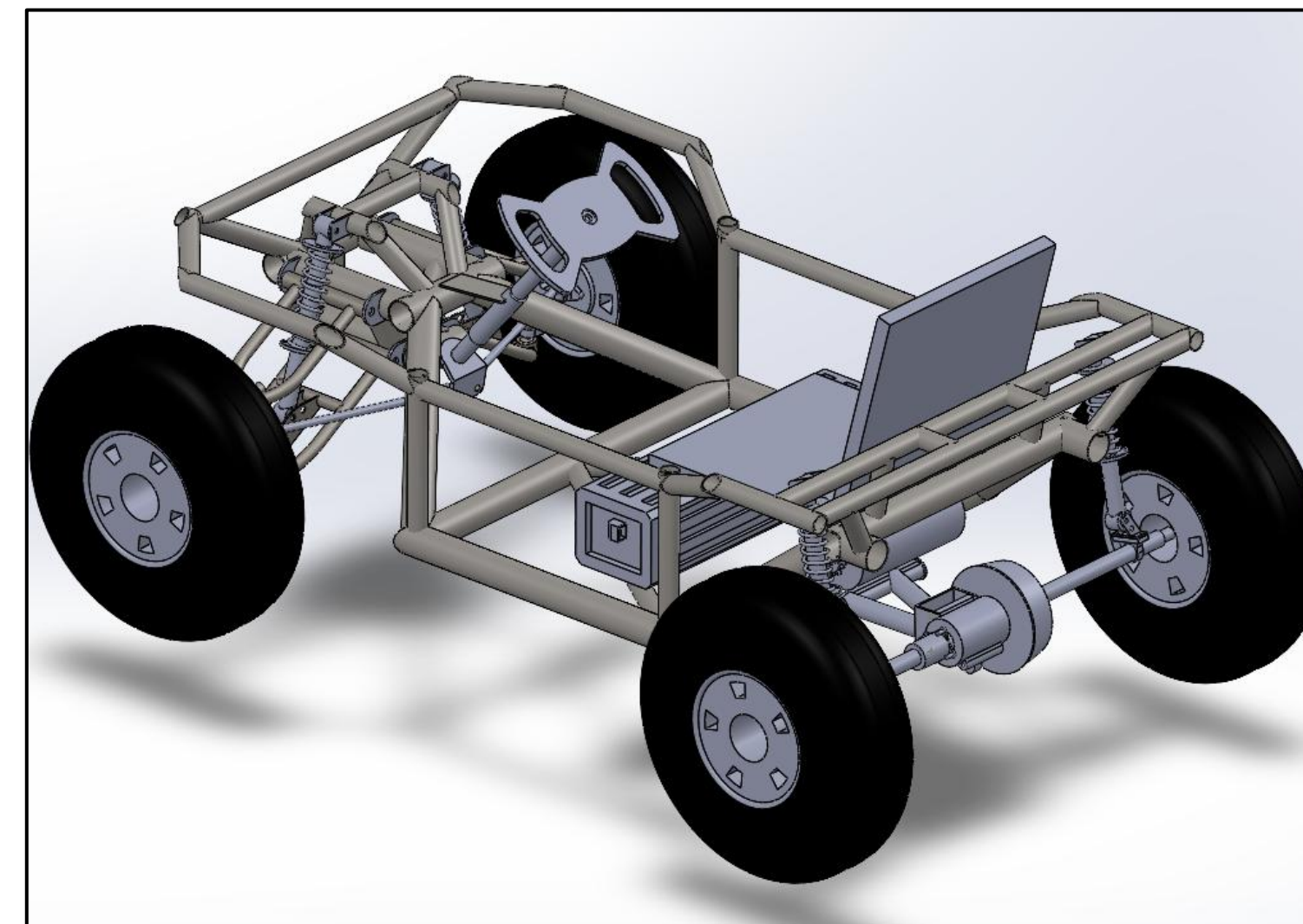
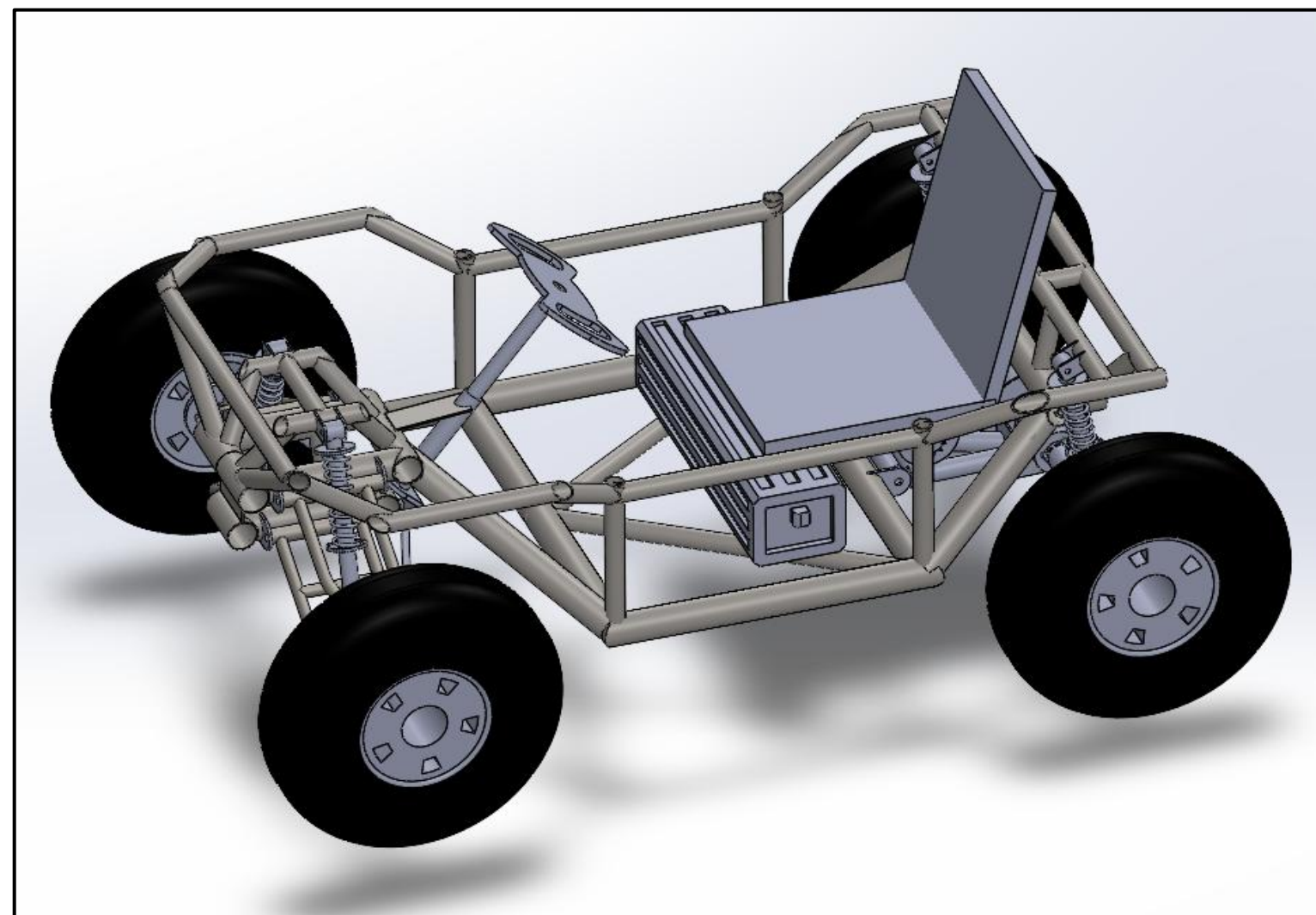
Project Overview

Problem Statement

- “Power Wheels” are designed for children and cannot support adult riders

Project Goal

- Develop an adult-scale electric ‘Mini Baja’ vehicle
- Custom weld a steel tube frame for strength and durability
- Design for off-road performance and adult load capacity
- Electric drivetrain to deliver high torque with limited maintenance

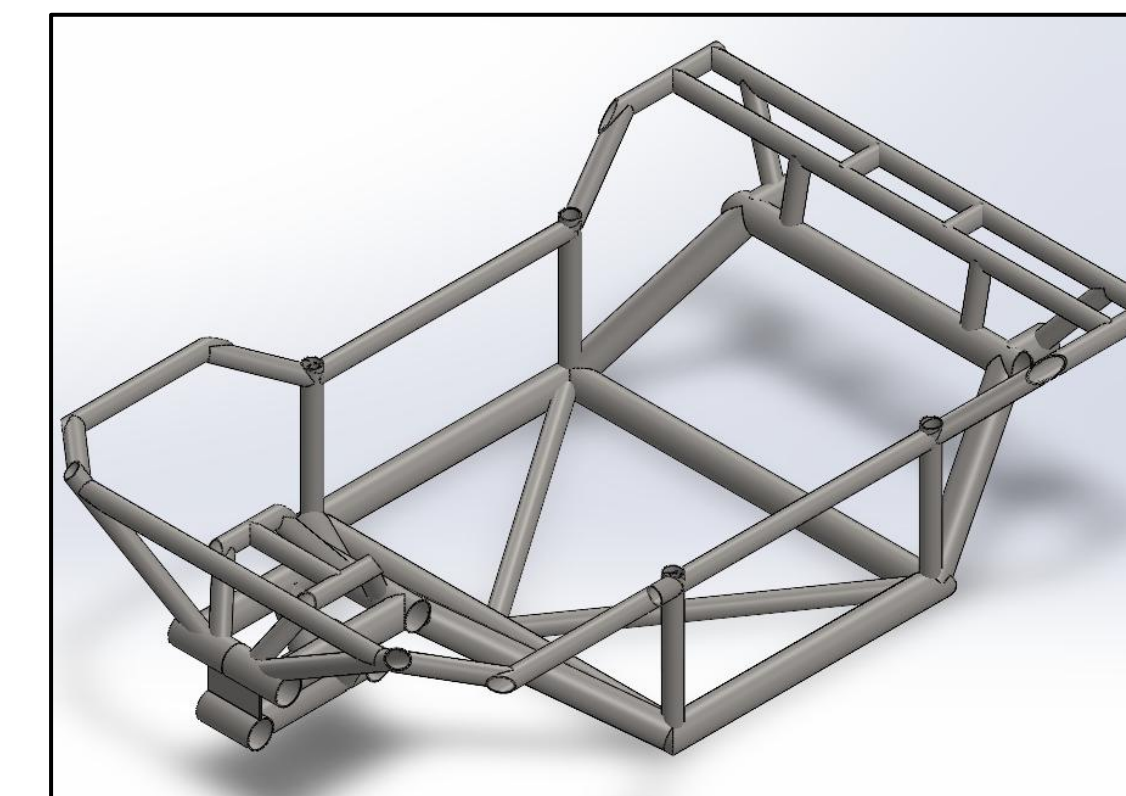


SolidWorks Model Of Entire Vehicle

Frame Design

Design

- Geometry modeled using SolidWorks Weldments to ensure load simulations were accurate
- Tubular chassis designed to distribute complex loading
- Designed to withstand ~4g loading impact



SolidWorks Model

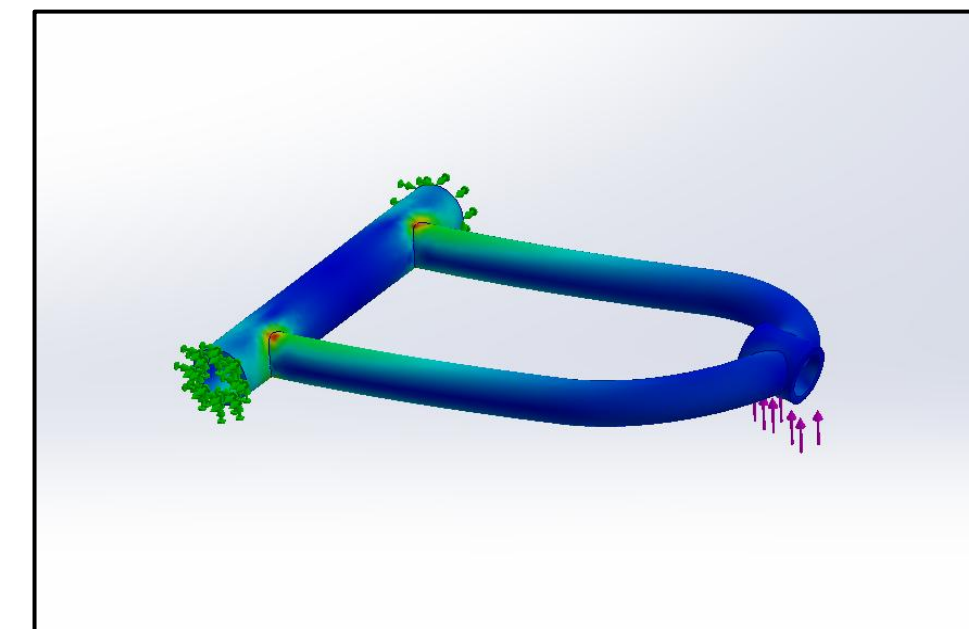
Materials

- All structural components made of ANSI 1020 low carbon steel
- Primary structural frame composed from 2-inch OD round tube with a WT of 0.065 inch.
- Upper subframe composed of 1 – ¼ inch OD with a WT of 0.065 inch

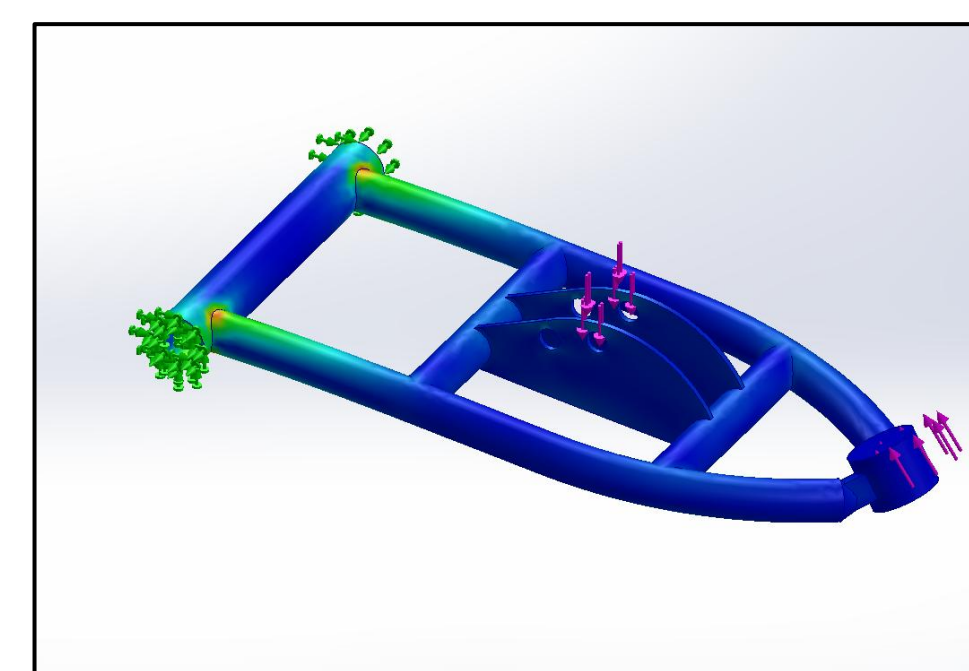
Suspension

Front Suspension

- Independent double wishbone
- Improves steering control over uneven terrain
- Allows for wheel adjustments
- Static FEA analysis place FOS > 2 for both control arms
- Front spring rate target: 17.4 lb/in



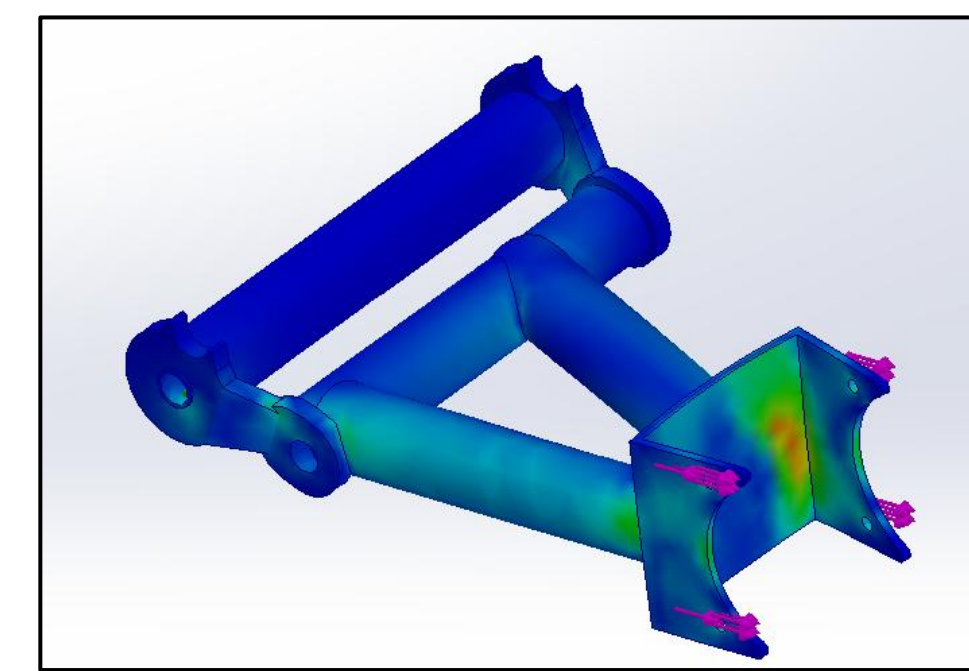
Upper Control Arm Stress Analysis



Lower Control Arm Stress Analysis

Rear Suspension

- Rear swing arm
- Connects rear axle to frame
- Motor mounted directly on swing arm
- Created from 1020 ANSI steel tubing
- Static FEA analysis place FOS > 2 with lateral forces accounted for
- Rear spring rate target: 43.5 lb/in



Rear Swing Arm Stress Analysis

Powertrain

Electric Motor & Suite

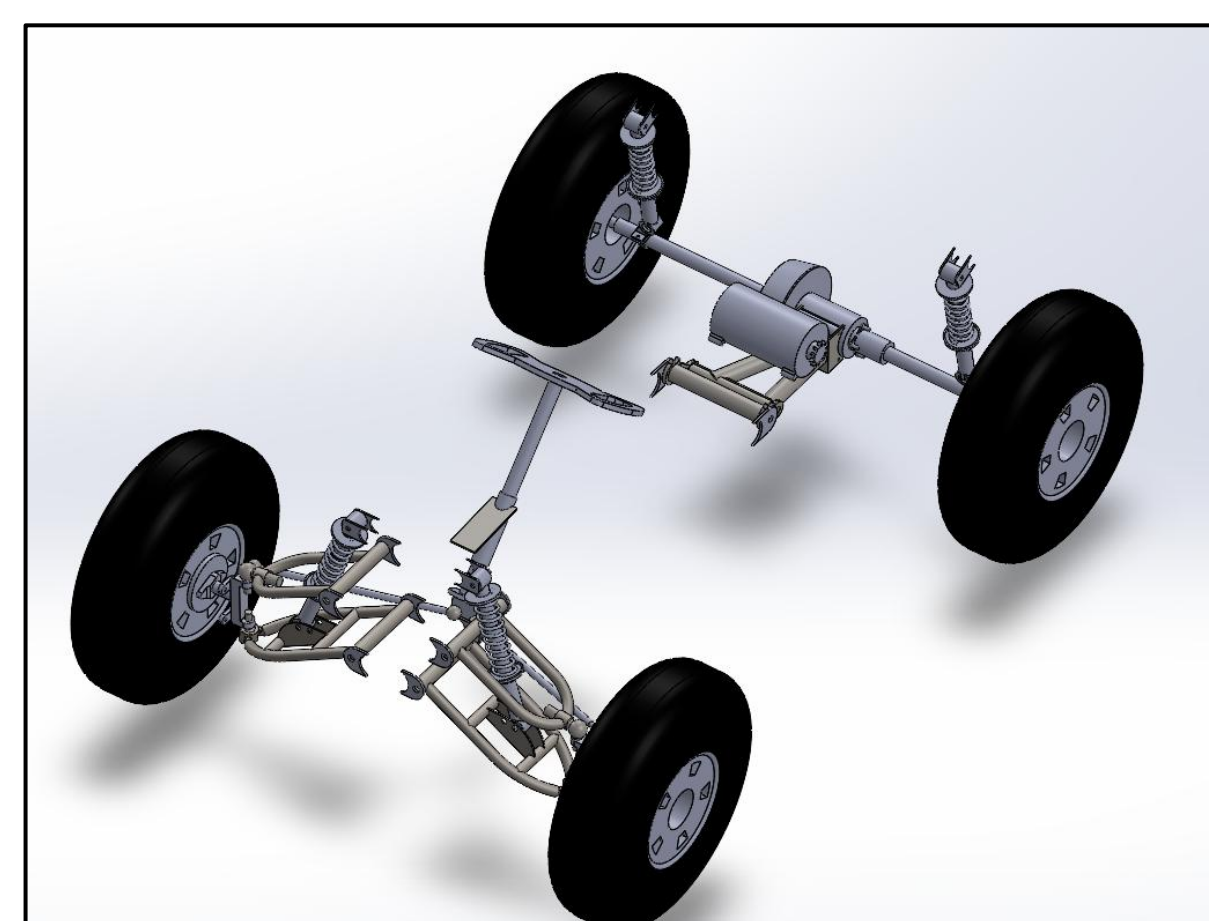
- Talaria XXX electric drivetrain (motor + controller)
- 60 V lithium battery (40 Ah, ~2.4 kWh)
- High-efficiency IPM motor (~95% efficiency)
- Provides high torque and smooth acceleration
- Integrated controller system for reliable operation
- Regenerative braking capability

Drive Axle Design

- 1 inch steel shaft to handle torque
- Chain driven rear axle
- Supported by bearing housings for load distribution
- Designed to handle off-road loads and impacts



Motor & Suite



Drivetrain SolidWorks Model

Features & Fabrication

Features

- Top speed of 35 mph
- Acceleration 0-25 mph in 2.5 seconds
- Vehicle mass around 260 lbs. (without driver)
- Ground clearance of 9 ½ inches
- Electric drivetrain with 170 ft-lb of torque
- Rear-wheel drive
- Low center of gravity for stability

Fabrication

- Assembled using TIG & MIG welding
- Custom mounts (motor, battery, axle)
- Custom front and rear suspension
- Modular assembly for maintenance



Chassis During Suspension Assembly

Controls

Steering

- Mechanical steering with direct linkage to front knuckles
- Responsive control and tight turning radius
- Lightweight for improved off-road control

Braking

- Front and rear drum brakes sourced from donor quad
- Reliable and simple braking system
- Designed to stop vehicle from 25 mph in 18 ft

Acknowledgements

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