NMT Baja SAE Racing Team

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Background

Baja SAE® is a series of international collegiate design competitions. Teams gain real-world engineering experience in automotive processes by designing and building a single seat off-road vehicle.

2012-2013 NMT Baja Car

Objectives

The purpose of our project is to apply sound engineering practices to design and fabricate an off-road vehicle. We will create a design that will be competitive in the dynamic competitions. The team will develop and manufacture a cost-effective design that will be presented at the design and sales competition while managing a 2,500 person hour project.

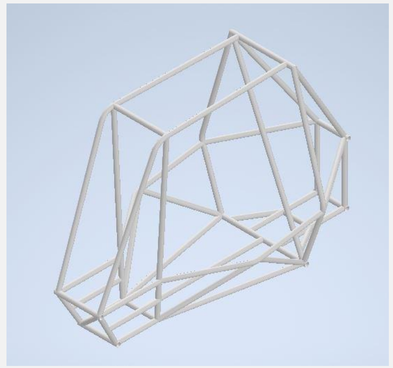
Design Criteria

- Meet or exceed requirements of SAE rulebook
- Incorporate the SAE® provided 10 HP Briggs & Stratton Engine in design
- Accelerate over 100’ from stationary in 5.5 seconds
- Top speed of approximately 40 MPH
- Bump steer reduced to 0.05” of bump per 1” of travel
- Ground clearance between 12” and 14”
- Total vehicle weight less than 310 lbs
- Weight distribution should be 40% front, 60% rear
- Vehicle to accommodate individuals from 75” tall and 250 lbs to 60” tall and 110 lbs

Completed Work

Frame

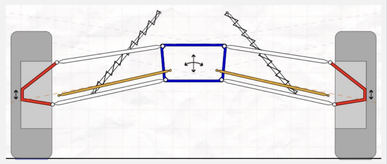
- Selected 1.25” OD 4130N Chromoly Steel based on its strength to weight ratio
- Maximized durability and driver safety in the frame design
- Designed the frame to also maximize manufacturability while reducing weight to ~65 lbs



Model of Frame

Suspension

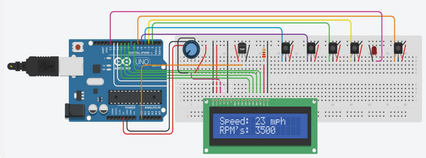
- Developed mathematical model for A-arm geometry to optimize suspension properties
- Consideration given to spring rate, ride frequency, roll center, jacking, ride comfort, and jump trajectory
- Focused on high ground clearance and long control arms
- Completed front and rear suspension geometry



2D Front A-arm Model

Driver Controls

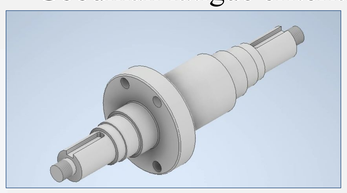
- Verified compliance of all designs with SAE technical specifications
- Researched and validated designs
- Planned a Vehicle Monitoring System to provide driver with instantaneous feedback on engine performance, speed, fuel level, and vehicle structural health



Vehicle Monitoring System Concept

Drivetrain

- Developed and ran MATLAB simulation for testing gear ratios to identify optimal torque to speed ratio as a function of acceleration
- Optimized transmission components for various loading scenarios and material selection using Goodman fatigue criteria



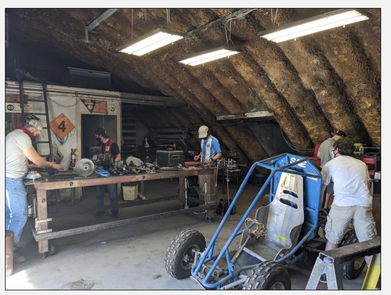
Output-Shaft

Spring Goals

- Finish frame prototype by 01/09/2021
- Finish suspension prototype by 02/13/2021
- Have a rolling chassis completed by 02/14/2021
- Prepare business presentations & reports by 02/15/2021
- Complete vehicle assembly by 03/14/2021
- Test vehicle from 3/21/21 through 4/25/21

2018-2019 NMT Baja Car

More About Us



2020-2021 Team in Action

Scan this QR Code to visit the NMT Baja SAE Facebook Page

Acknowledgements and Sponsors

Project Advisor: Hollis Dinwiddie

Sponsors: NMT Mechanical Engineering Department