UNH BAJA Racing

Background & Objectives

Introduction and Background Information

- As a prerequisite of senior projects, the UNH BAJA team was tasked with designing and fabricating an off road vehicle that will compete in the Society of Automotive Engineers *(SAE)* Baja Competition.
- The BAJA SAE is a contest that is held annually . It is comprised of Universities in the United States and overseas.
- Vehicle will be tested on acceleration/braking, hill climb/traction, maneuverability & endurance.

Methods

- Based on the previous designs, adjustments were made in the framework suspension to make it more ergonomic and to improve safety of the driver.
- There were new set of rules for this year's competition. Members were assigned to review the new handbook for rules.
- The team members were divided up and assigned to specialize in the frame suspensions, engine and drive train and the testing of the vehicle.

Team Members:

Tyler Burke, Alexander Montehermoso, Noah Rapazzo, Kenneth Openshaw, Esther Soloman, Thomas Colson

Controls

Brakes

- Drop Mounted Pedal Design
- Pedals withstand 2000N force
- Lights attached on front and back
- Runs through front console

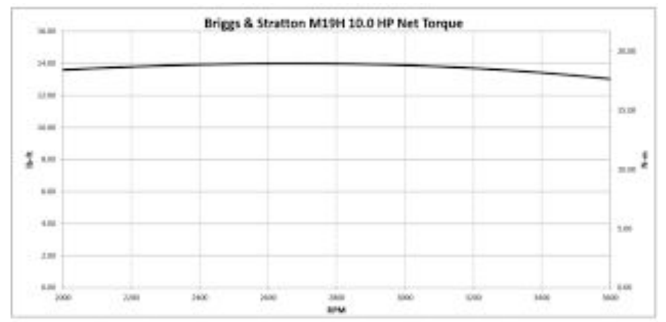
Steering

- Packaged comfortably for driver
- Wheel connects to front wheels via U-joint
- Stiletto Fast Rack and Pinion
- Steering ratio of 3:2:1

Drive Train

Engine

- 10 HP Inek Briggs and Stratton
  - Cannot be Modified
- 14.5 ft-lb of torque
- Multi-Positional Engine Mount



CVT

- Infinite gearing ratios
- Fully rebuilt this year
- Tuning
  - Compressional Spring (45 lbf)
  - Torsional Spring (19 lbf)
  - Flyweight (+/- 120g)
  - Helix Cam Angle (27°)
  - Belt Type

CVT System Ratios

Pulley	Ratio	
Primary	Starting	3.90:1
	Ending	0.90:1 (Nominal)
Secondary	Starting	3.50:1
	Ending	0.90:1 (Nominal)

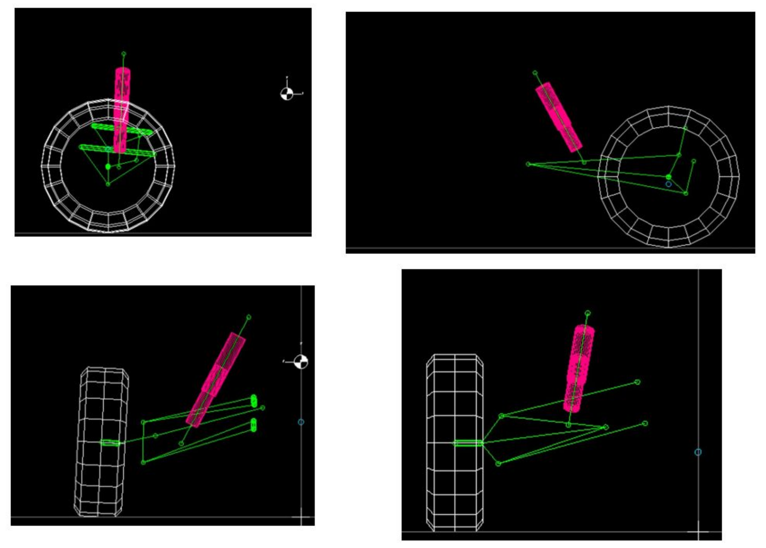
Arrangement

- Engine output shaft drives CVT
- CVT attached to chain reduction
- Chain reduction mounted to drive shaft
- Drive shaft connects to rear 2016 Polaris Ranger differential
- combination front and rear differential drives half shafts turning the wheels

Suspension

Design Goals

- Maintain useful geometry over rough terrain and jumps
- Utilize full shock travel range
- Minimize bump steer
- Decrease understeer and dead steering.

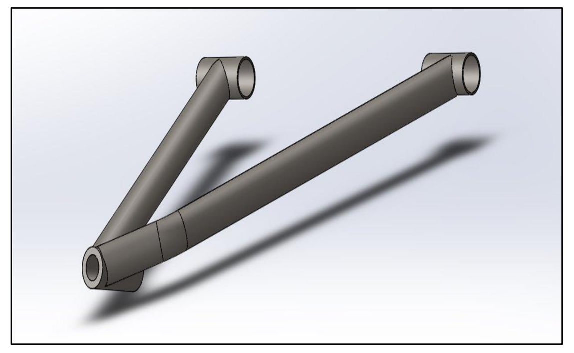


Lotus Shark Geometry Analysis

- 13" of travel front and rear
- Front camber decreases 0.62° per inch of travel
- Rear camber decreases 0.43° per inch of travel

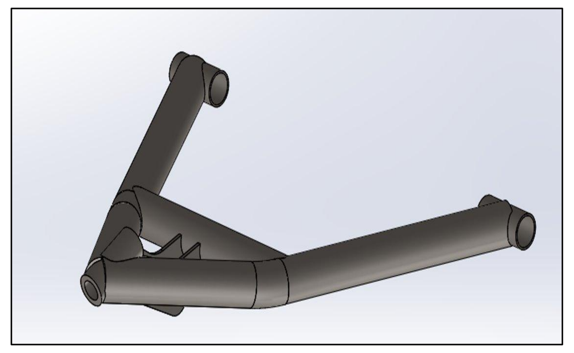
Front Suspension – Unequal Length A-Arms

- "Progressive" geometry maintains desirable camber and toe
- Shock mounted on lower A-Arm
- New Heim joints will allow for smooth suspension travel at high angles
- New ball joint linkages and Delrin bushings allow smooth operation
- 1" x 0.95" wall 4140 tubing for all components



Rear Suspension – 3-Link Trailing Arms

- Trailing arm design adds strength and stability under acceleration
- "Linear" geometry allows for use of full travel range
- Adapted from previous design to meet time constraints



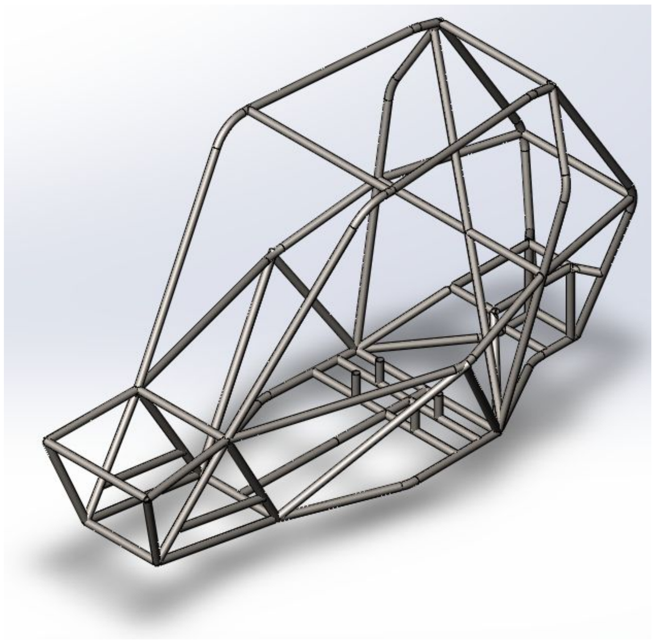
Fox Float 3 EVOL Air Shocks

- 18" x 5.6" stroke
- Infinitely adjustable spring rate
- EVOL chamber adjust curve of spring rate

Frame

Research and Design:

- Updated 2021 design with ergonomics, strength, and center of gravity
- Modeled and analyzed in SolidWorks
- Triangulated members distribute stress efficiently
- Calculated stiffness and strength of material
- Designed for manufacturability at UNH



Ergonomics:

- Comfortably fits 5th percentile female to a 95th percentile male
- Widened frame and increased leg room
- Reinforced front and side impact members
- Lower center of gravity than previous years model
- Increased driver space

Materials Selected:

- Material: Carbon Steel
- Profile: 1" outer diameter, ⅛" thickness
- Bending stiffness of frame members 25.4%
- Yields weight of 120 lbs.
- Bending Stiffness of 1,733 Nm² & Strength of 243 Nm