To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Team 27: SAE Mini Baja

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Mr. Jack Rettig

PROJECT OVERVIEW

Baja SAE Engineering Design Competition
Location: Tennessee Tech University
Cookeville, Tennessee
Date: April 14th-17th

OBJECTIVES

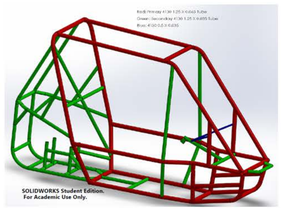
- Design a single-seat, all terrain vehicle that adheres to all SAE rules
- Top 20 finish at 2016 Baja SAE Competition
- Score at least 150 points in static events
- Overall weight under 400 pounds

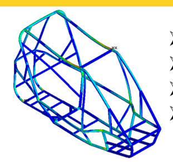
COMPETITION LAYOUT

STATIC EVENTS [300 Points]	DYNAMIC EVENTS [300 Points]	ENDURANCE RACE [400 points]
➢ Cost Report [100] ➢ Design Report [150] ➢ Sales Presentation [50]	➢ Acceleration [75] ➢ Maneuverability [75] ➢ Sled Pull [75] ➢ Suspension [75]	

FRAME

- Primary (red): 1.25” OD, 0.065” thick
- Secondary (green): 1.00” OD, 0.035” thick





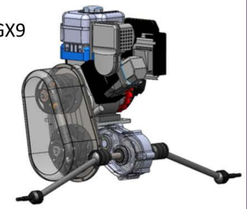
- Dynamic impact
- ANSYS Mechanical
- Load = 2.6 x weight
- Von Mises stress

	Max Stress	Max Deformation	FOS
Top	23.2 ksi	0.15 in	4.2
Front	29.1 ksi	0.07 in	3.4
Side	54.1 ksi	0.82 in	1.8

Number of Members	48
Length of Tubing	95.4 ft
Weight	65 lbs
Length	82 in
Height	47 in
Width	31 in

DRIVETRAIN

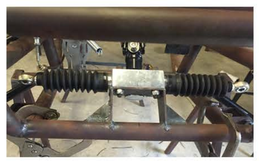
- Engine - Briggs and Stratton OHV Intek Model 20S232 0036-F1
- Continuously Variable Transmission (CVT) - Gaged Engineering GX9
- Custom Gearbox - single speed, dual reduction spur gear train



Gear Ratio	7.56:1
Final Drive Ratio (High/Low)	6.80:1 / 29.48:1
Top Speed	35 mph
Acceleration Time (100 ft.)	4.01 s
Max Rear Axle Torque	427 ft-lbs
Gear Material	AISI 4330-V Steel
Casing Material	6061-T6 Aluminum

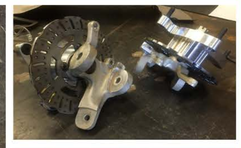
BRAKES / STEERING

- Front calipers - stock Polaris Outlaw 525
- Rear caliper - Wilwood Dynapro Single
- 6.25:1 brake pedal ratio
- 14” rack and pinion
- 4130 steel tie rods - 15” long, 0.625” OD and 0.125” thickness



SUSPENSION

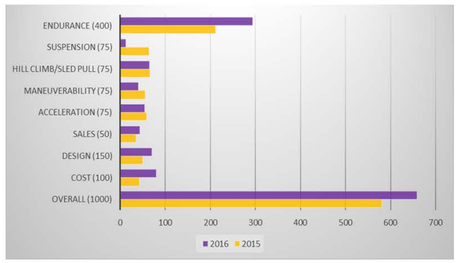
- Front Suspension
  Unequal length double A-arms
  4130 steel tubing
- Rear Suspension
  Custom aluminum trailing arm
  CNC machined billet aluminum bearing carrier
  4130 steel radial arms (2)
- Fox Float 3 EVOL R shocks

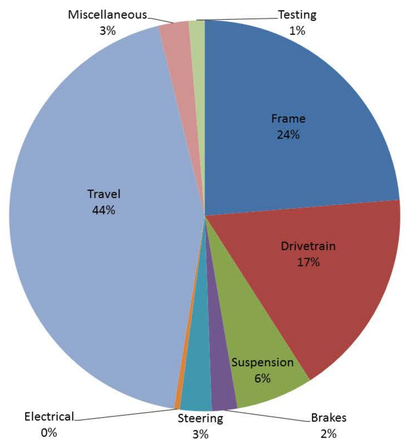


	Front	Rear
Wheelbase	70 in	
Track Width	52.5 in	49 in
Ground Clearance	12.5 in	
Wheel Travel	8 in	5 in
Spring Rate	80 lbs/in	55 lbs/in
Tires	22x7-10 Maxxis Razr 2	23x8-10 ITP Mudlite
Camber	-3 degrees	0 degrees
Caster	13 degrees	0 degrees

RESULTS

- 20th place / 96 teams
  658.72 points overall
- 11 place improvement from 2015
  78.08 more points scored
- 193.12 points in static events
- Overall weight: 394 pounds
- 23 laps completed in endurance
  No major failure during race





Frame = $2840
Drivetrain = $2100
Suspension = $800
Brakes = $255
Steering = $313
Electrical = $60
Travel = $5225
Miscellaneous = $300
Testing = $160

Total = $10163

Sponsors: Mr. Jack Rettig, IPS, CB Gear, LSU Student Government, H&W Machine, Fluor, Dow, SST, MH Barrie, The Bandit

Advisors: Dr. Warren Waggenspack, James Burgard, Colby