

# Gorilla Racing

A division of SAE Baja



# Purpose

- All-terrain vehicle for the outdoor enthusiast
  - Design
  - Manufacture
  - Test
  - Promote
- Competing for shares in a large market against:
  - Polaris
  - Honda
  - Kawasaki

# SAE BAJA Requirements

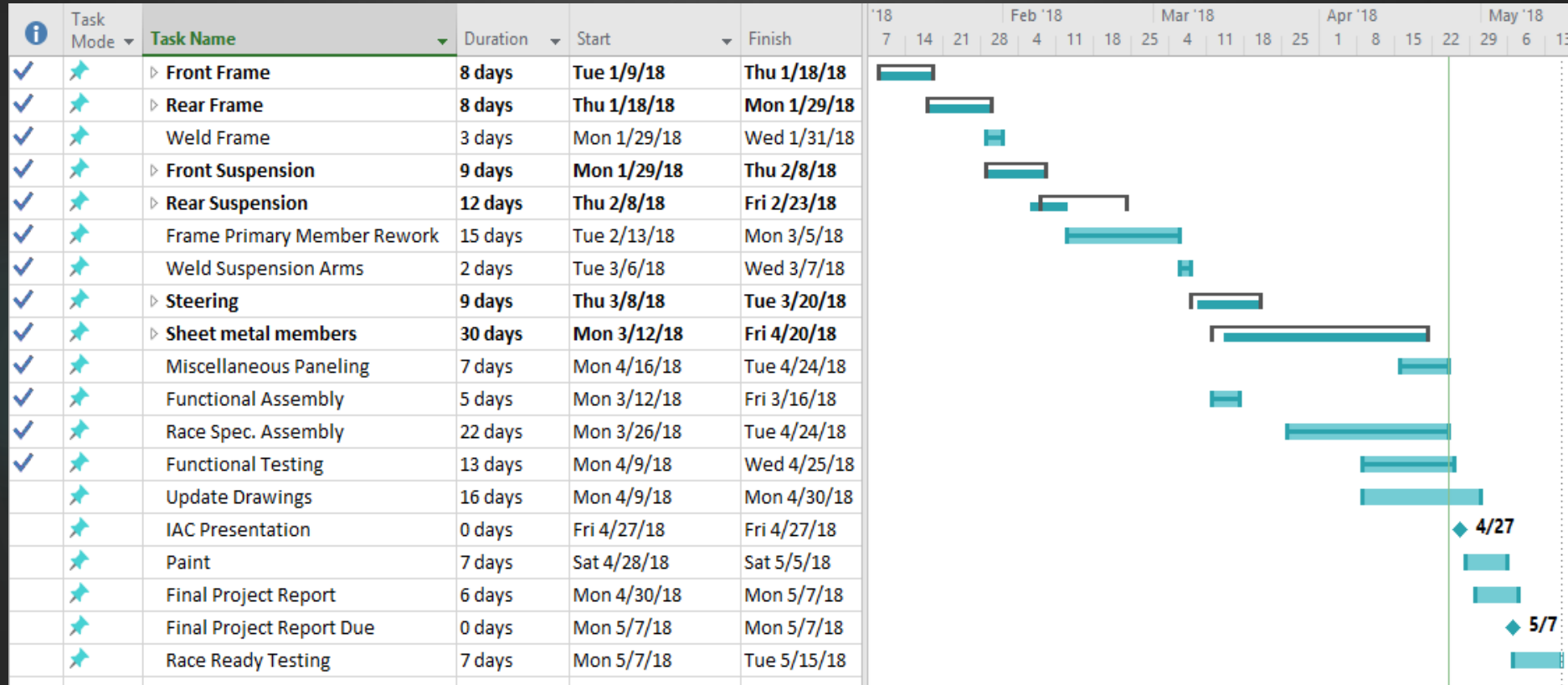


- Material strength  $\geq$  1018 Mild Steel
- Briggs and Stratton 10-hp engine
- Max width 64"
- 5 point safety harness
- 6 inch head clearance
- 3 inch shoulder clearance
- Full firewall
- Fuel drip pan

# Budget

- Beginning Baja Account Balance: \$24,000
- Total spending to date: \$6,125.10
- Travel expenses: \$7,961.10
- Fundraising goal per member: \$1000
- Total amount fundraised to date: \$7,680
- ✓ Total car cost: \$14,086.20

# Manufacturing Schedule

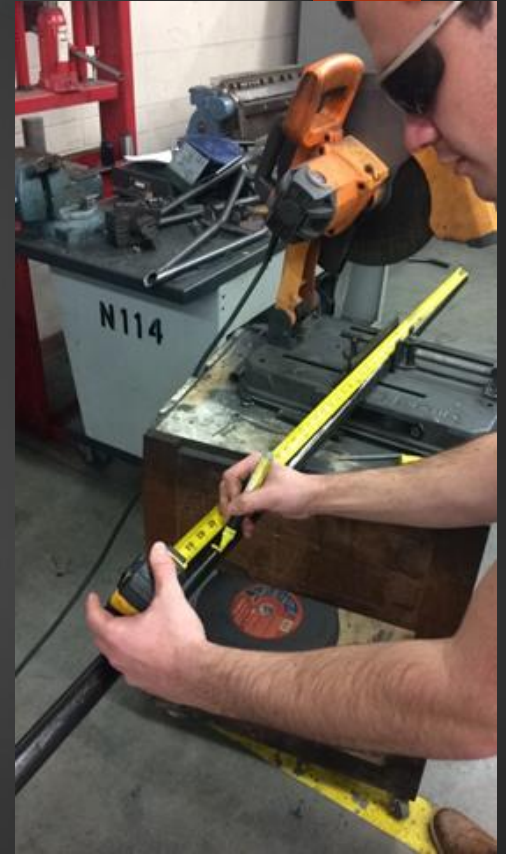


# Material Selection

Material	Cost (\$/ft)	Weight of Frame (lbs)	Bending Stiffness (lbs/in)	Bending Strength (lbs/in <sup>2</sup> )
A513 (1" OD x 0.120")	1.33	357	11,606,098.6	421,281.86
4130 Chromoly (1.25" OD x 0.065")	2.77	320	11,845,399.6	643,625.05

# Individual Members

- Cut all pieces to length using a chop saw
- Bend all pieces with a pipe bender and a 3" die
- Coped all ends with a 1" end mill



# Frame Manufacturing

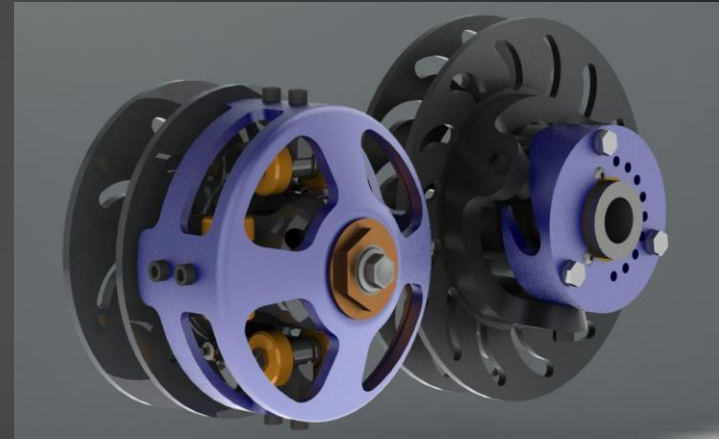
- Jig to locate critical members
- Tack welded once fit





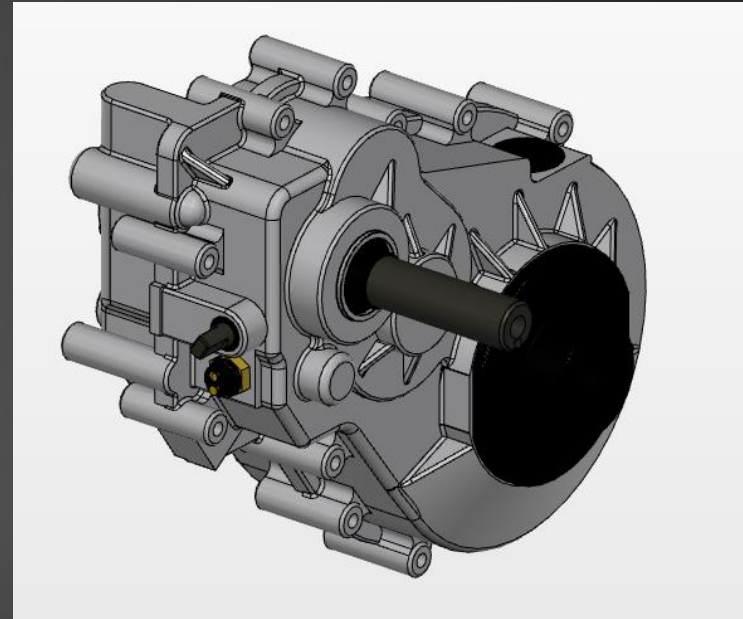
# Drivetrain

- CVT (Gaged Engineering)
  - Composite Belt Drive
  - Primary (Min: 2.05 in diameter, Max: 6.0 in diameter)
  - Secondary (Min: 5.4 in diameter, Max: 8.0 in diameter)
- Starting Gear Ratio → 3.90:1
- Ending Gear Ratio → 0.90:1



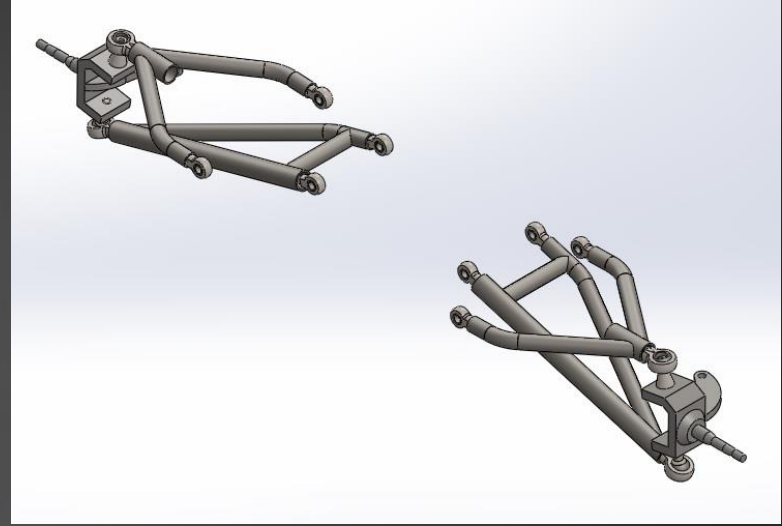
# Drivetrain

- Gearbox (Spicer H-12 FNR)
  - Forward gear ratio → 10.15:1
  - Neutral Equipped
  - Reverse gear ratio → 11.15:1
- Overall Velocity Ratio
  - Starting:  $3.90 \times 10.15 = 39.585$
  - Ending:  $0.90 \times 10.15 = 9.135$ 
    - => Top Speed of 28.475 w/ 23 inch tall tires



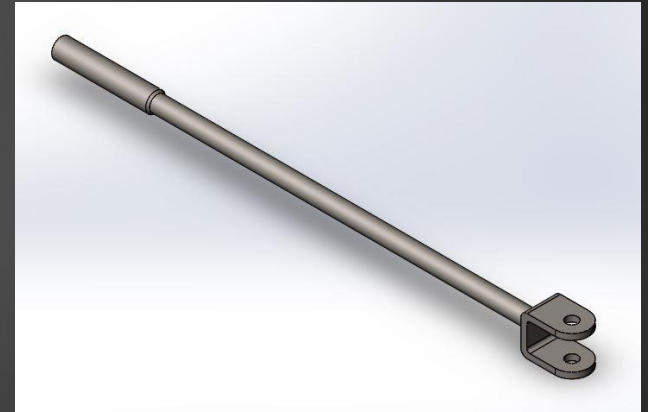
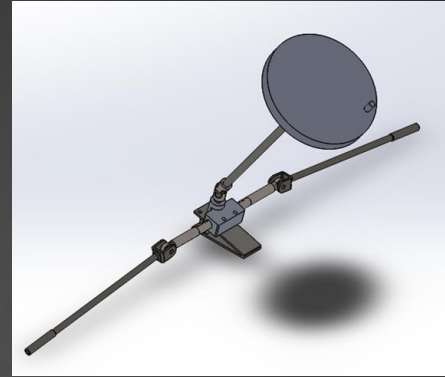
# Suspension

- Plate and tube jigs
  - Quick jig modifications
- Heim joints and inserts
  - Ready to weld in and go



# Steering

- Purchased components:
  - Rack and pinion
  - Heim Joints
  - Steering Wheel
- Manufactured Components:
  - Tire rods
  - Steering shaft
  - Steering shaft mount
  - Rack mount



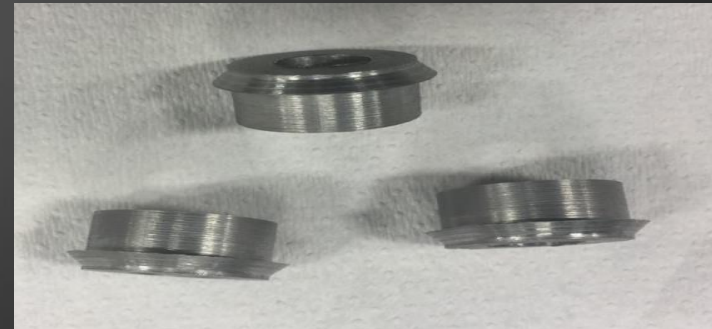
# Tie Rods & Steering Shaft

- 1/2 in. 1020 cold rolled rod stock
  - Tie rods
    - Cut to length
    - 5/8 in. sleeve
    - C-shaped bracket
  - Steering Shaft
    - Cut to length
    - Splined end
    - Quick disconnect end



# Miscellaneous

- Lathe working
  - Heim caps
  - Heim misalignments
  - Tie rod thread sleeves
- Plasma cutting
  - Paneling
- Water Jet
  - Mounting tabs and gussets
  - Cut by KMT



# Performance Testing Plan



- Acceleration/velocity
- Torque
- Suspension
- Maneuverability
- Possible through a strain gage

# Lessons Learned



- Don't take previous Baja projects words as valid reasoning
- Consider all systems of a design during the process
- Always document adjustments made when building the car





# Questions?

Can't think so

Thank You!