SAE Baja:Mid-Point Progress Report

Team 19 Suspension and Steering

Benjamin Bastidos, Victor Cabilan, Jeramie Goodwin, William Mitchell, Eli Wexler

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Introduction

- 2014 SAE Baja Competition El Paso, TX
- Stakeholder: NAU SAE
- Project Advisor: John Tester
- Customer: SAE International
- Recent milestones
  - Polaris parts delivered
  - Donation of $4000 from ASNAU

Need Statement

- NAU has not won an event at the SAE Baja Competition in many years
- Goal of the suspension team is to design a suspension system that will traverse rugged terrain
- Goal to design a steering system of optimal turning radius

Design Modifications: Front Suspension

- Modifications to A-Arms
  - 20 degree attachment to hub
  - McMaster Carr ⅝” heim joints threaded into A-Arms
  - Mounting tabs aligned vertically
  - To add simplicity, a bolt through bushing design is used to mount A-Arms to frame

Design Modifications: Front Suspension

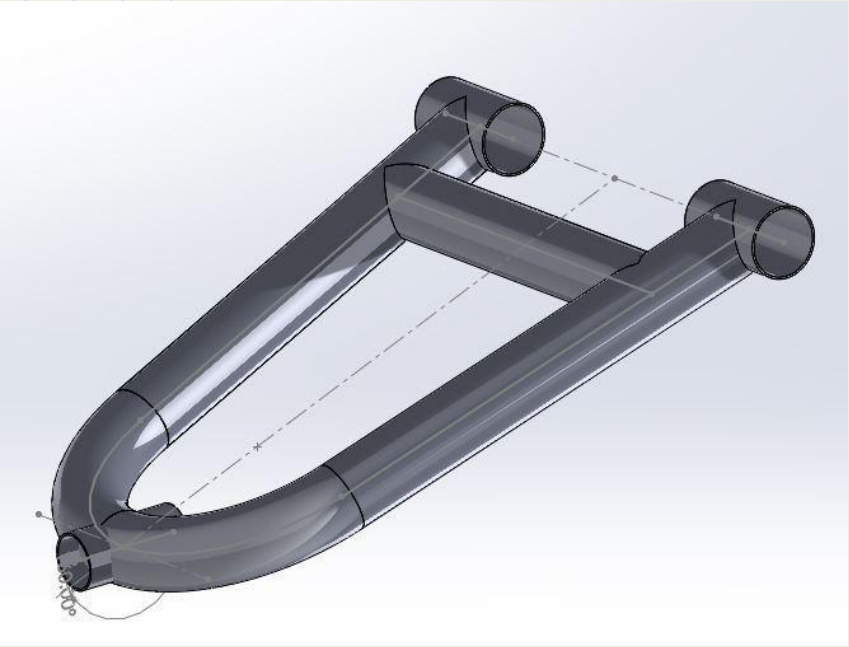


Figure 1 - Top A-Arm

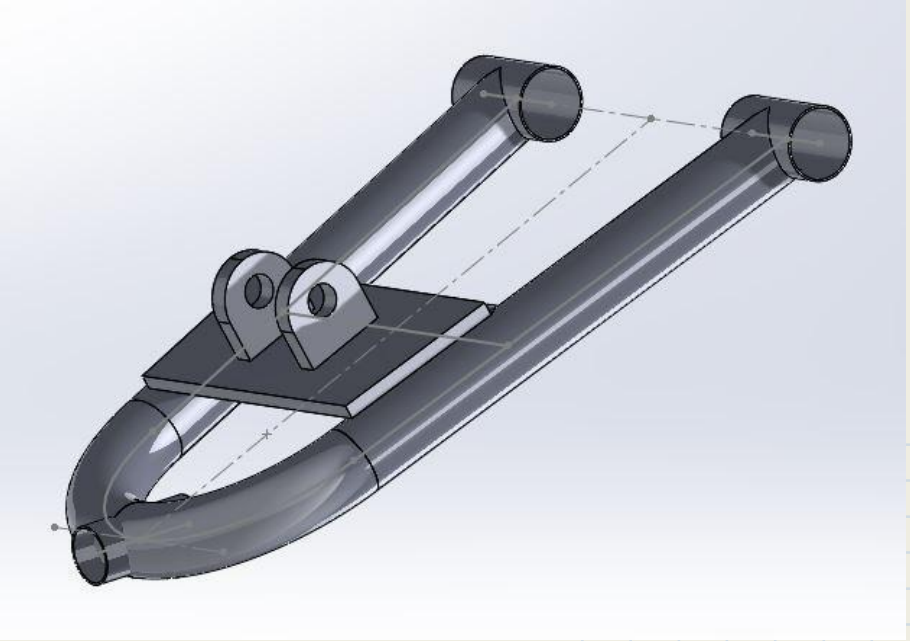


Figure 2 - Bottom A-Arm

Current Progress: Front Suspension

- Finalized A-arm length
  - Top A-arms: 11”
  - Bottom A-arms: 12”
- Knuckle mounted to all parts by McMaster Carr ⅝” heim joints
- Expect to begin fabrication with assistance from 316 MotorWorks

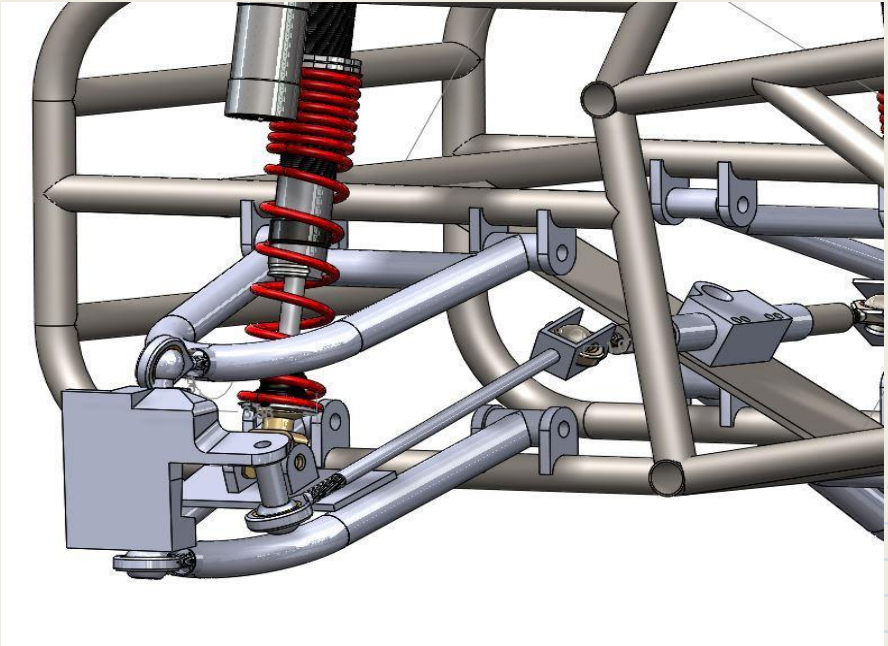


Figure 7- Suspension at Ride Height

Current Progress: Front Suspension

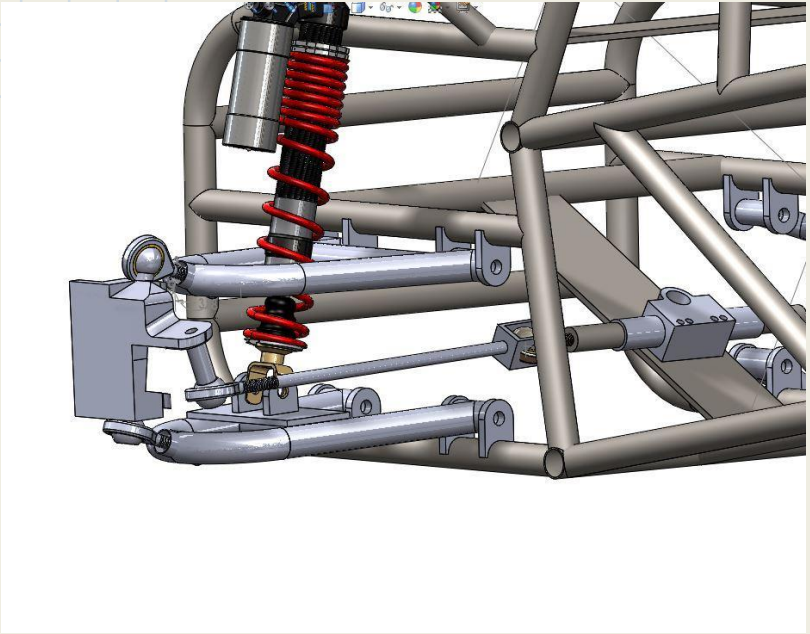


Figure 8 - Fully Compressed Suspension

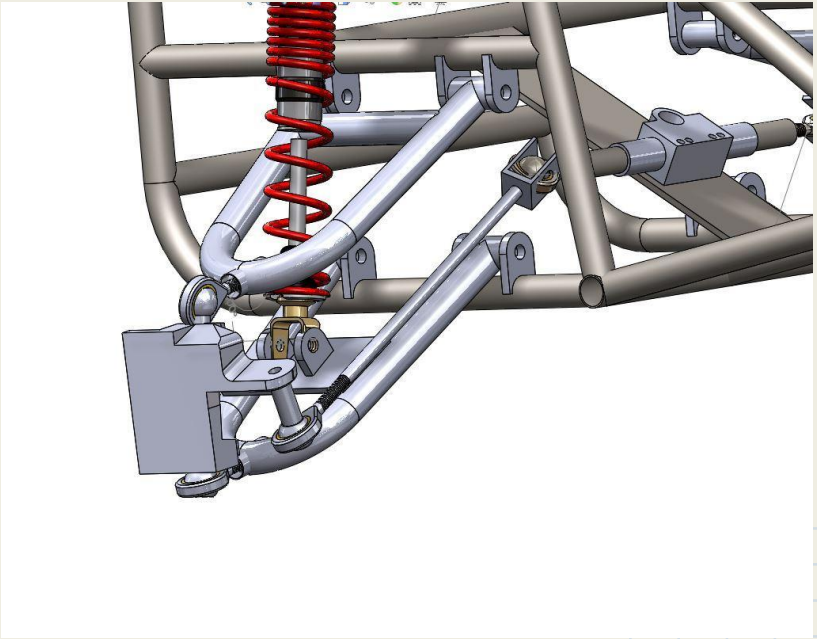


Figure 9 - Full Drooped Suspension

Design Modifications: Steering

- Modifications to Rack mount
  - Two-barred straight plate
  - Angle iron between A-arm mounts
  - One additional bar and straight plate
- Modifications to Steering column
  - Quickener
  - U-joints
  - Quick Release

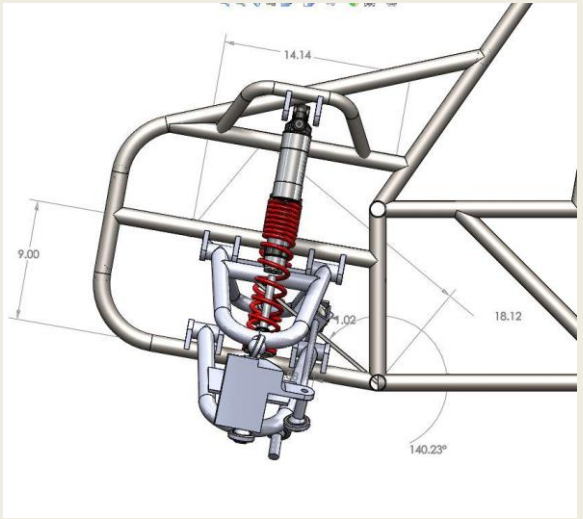


Figure 3- Rack Mount

Design Modifications: Steering

- Previously Stated use of Quickener
  - lowers amount of steering wheel turns
  - In our situation by 50%
- Will help in maneuverability,
  - will take time to get used to
- Added quickener because of freed up budget
- Order has been made
  - Expected late next week => Desertkarts.com

Figure 4 - Steering Quickener

Current Progress: Steering

Figure 11 - Steering Knuckle

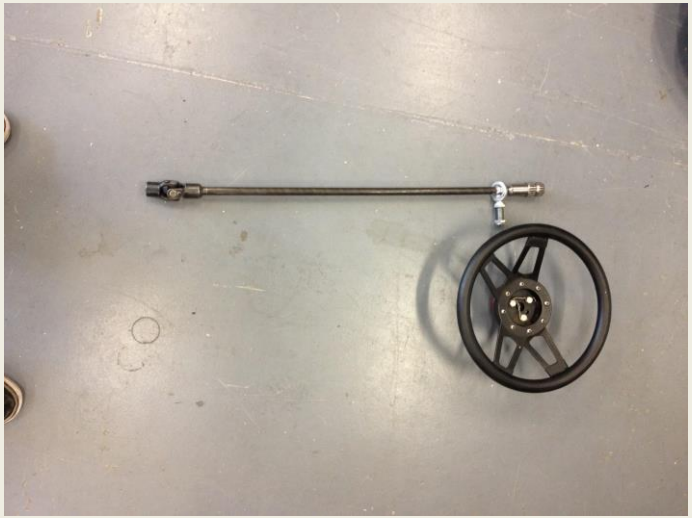


Figure 12 - Steering Wheel and Steering Column

Current Progress: Steering

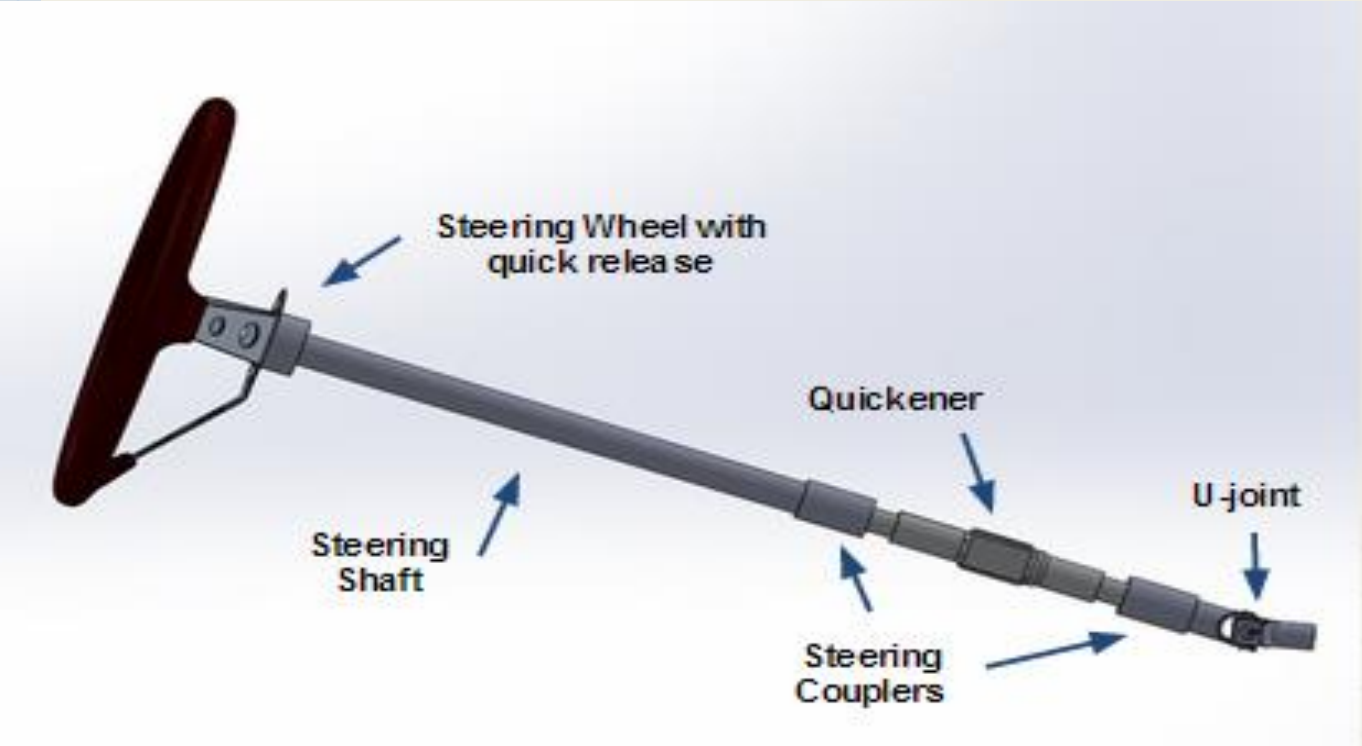


Figure 13 - Steering Column

Current Progress: Steering

- Turning Radius
  - Approx ~ 9ft
  - More Practical
- Ordered majority of parts
  - Desertkarts.com
- WIll be using previous steering wheel & steering column
- Calculate tie rod length

Figure 10 - Steering Column on Frame

Design Modifications: Rear Suspension

- Round tubing
  - Simple to build
  - Does not require gussets
  - 1.25” OD, 0.0625” w.t.
- Trailing Arm V4
  - Laterally fixed
  - 4.5” bending radius

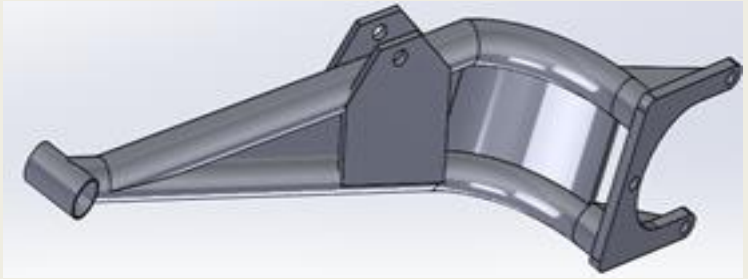


Figure 5 - Rear Trailing Arm V4
(Model provided by Chris Bennett)

Design Modifications: Rear Suspension

- Trailing Arm V5
  - Similar to V4
  - 1.25” OD, 0.0625” w.t.
  - Gradually arching top tube for extra strength
  - 4.5”+ bending radius
  - Heim joint frame mount

Figure 6 - Rear Trailing Arm V5

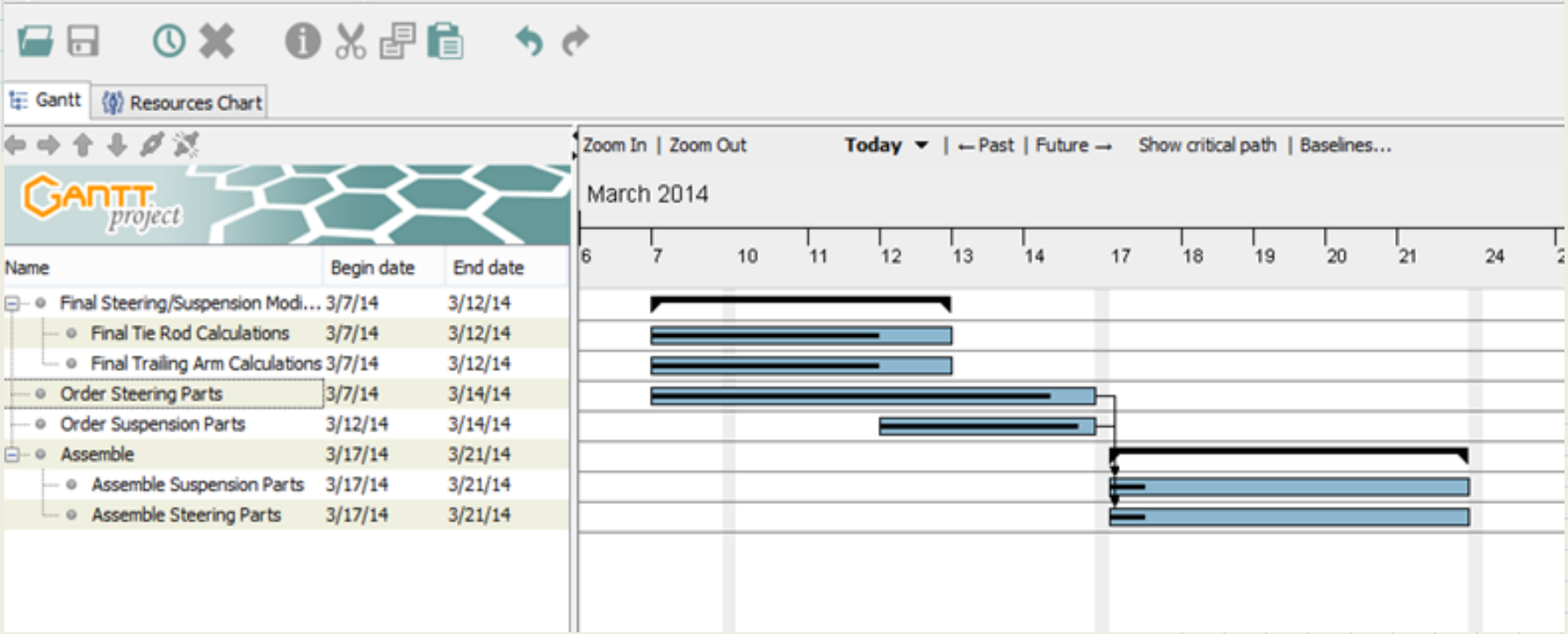
Current Progress: Rear Suspension

Figure 14 - Left Rear Bearing Carrier

Figure 15 - Fox Podium Rear Shock

Figure 16 - Upper Radius Rod

Gantt Chart:


Gantt
Resources Chart
Zoom In | Zoom Out
Today
| ← Past | Future →
Show critical path | Baselines...
March 2014
6 7 10 11 12 13 14 17 18 19 20 21 24
Name
Begin date
End date
Final Steering/Suspension Modi... 3/7/14 3/12/14
Final Tie Rod Calculations 3/7/14 3/12/14
Final Trailing Arm Calculations 3/7/14 3/12/14
Order Steering Parts 3/7/14 3/14/14
Order Suspension Parts 3/12/14 3/14/14
Assemble 3/17/14 3/21/14
Assemble Suspension Parts 3/17/14 3/21/14
Assemble Steering Parts 3/17/14 3/21/14

Conclusion

Steering:

- Using a quickener = Less wheel turning
- longer rack = potential more usable rack travel

Suspension:

- Went from square tubing to circular tubing trailing arms for rear
- Finalized geometry for front A-arm suspension
    - Getting help from local company on manufacturing front/rear suspension (316 MotorWorks)

Questions?