SAE Mini Baja

Team 19 Suspension and Steering

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Overview:

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  - Old design to new design
- Rear Suspension:
  - Old design to new design
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  - Old design to new design
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Project Introduction:

- 2014 SAE Baja Competition
- Customer is SAE International
- Stakeholder is NAU SAE
- Project advisor is Dr. John Tester

Need Statement

- NAU has not won an event at the SAE Baja Competition in many years
- Goal of the suspension team is to design the most durable and versatile front and rear suspension systems
- Goal of the steering team is to design an efficient steering mechanism that will meet the needs of off-road racing with a competitive turning radius for competition

Front Suspension: Original

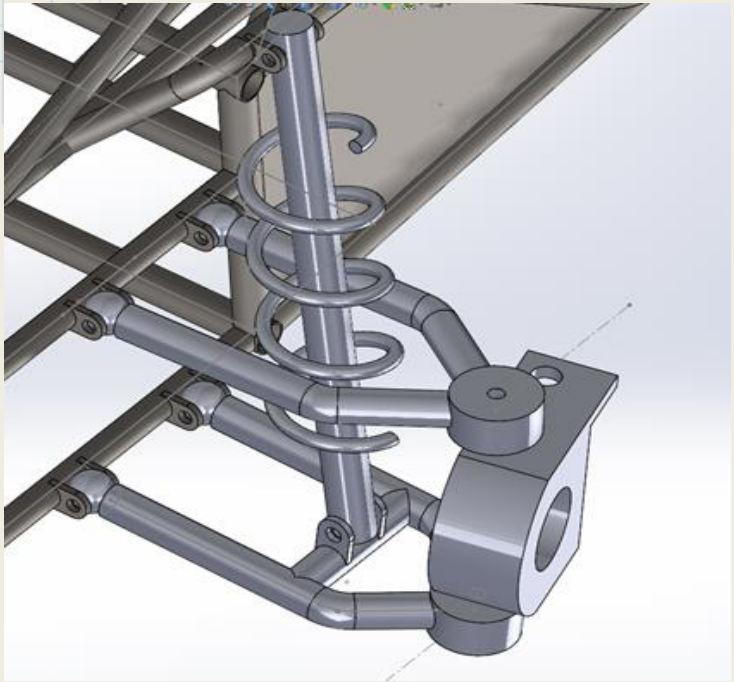


Figure 1: Original A-Arm Design

The old design used Heim joints to mount the A-arms to the frame and uniballs to mount to the hub.

Front Suspension: V2.0

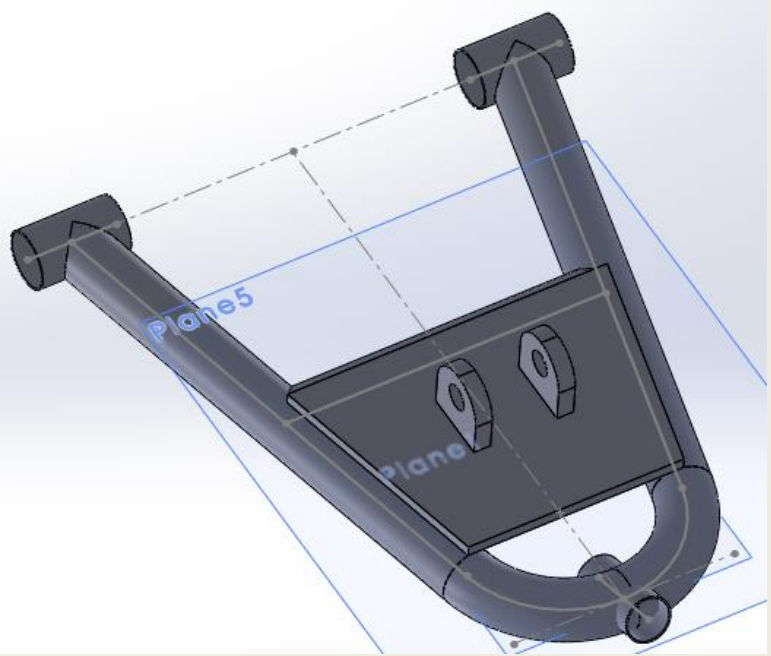


Figure 2: A-Arm Design V2.0

The new design uses bushings and through bolts to mount to the frame and Heim joints to mount to the hub. It also uses a cross plate instead of a tube to mount the shock.

Front Suspension: Uniball

Figure 3: Uniball Cup
Source: Camburg racing

The old design used Uniball cups. They are heavier and more robust but do not allow for camber adjustments. They are also much more difficult to install.

Front Suspension: Heim Joint

Figure 4: Heim Joint
Source: Houser racing

The Heim joints are strong enough for our application and allow for camber adjustment.

Rear Suspension: Original

- 3-Link Trailing Arm
- Pros:
  - Strong
  - Aesthetically pleasing
- Cons:
  - Heavy
  - Frame meshing
  - Hard to build

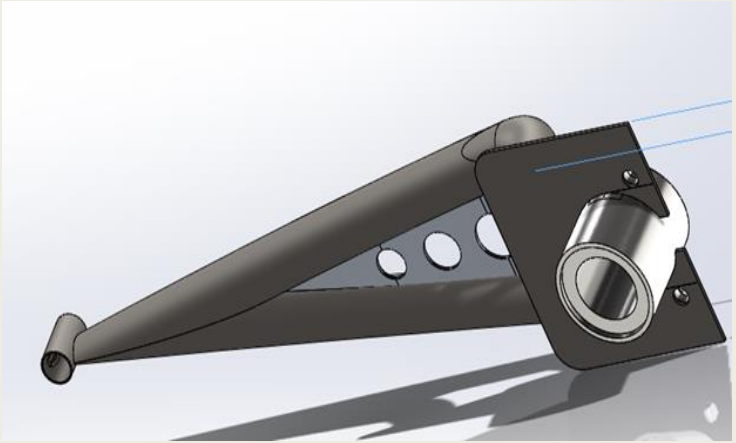


Figure 5: Original 3-link

Rear Suspension: V2.0

- 3-Link Trailing Arm:
- Pros:
  - Lighter
  - More practical
  - Easier to build
  - Long travel
- Cons:
  - CV angle may be an issue
  - Shock mounting

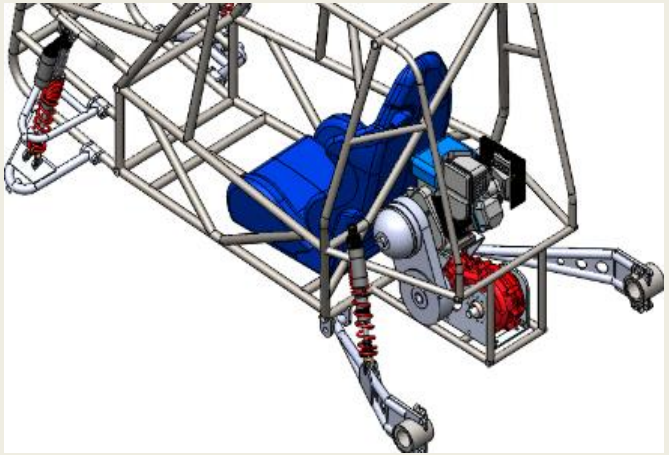


Figure 6: New 3-link

Steering System: Original

- Rack and Pinion
- Length: 9in
- Radius: 12ft
  - not ideal
- 4in rack travel

Figure 7: Rack and Pinion
Source:Car Bible

Steering System: V2.0

- Rack and Pinion
- Length: 14in
- Radius: Theoretically 6.56 ft
- 12:1 ratio (several turns)
  - easy to turn
  - quickeners
- 1.5 turns = 4.25in rack travel
  - lock to lock
- cost: $98
  - deserkarts.com

Figure 8: Rack/Pinion
Source: Desertkarts.com

Steering System: New

- Reduces Gear ration
  - Quicker turning
  - Low space for driver
  - Expensive
    - Approx. $200
- Suggestion
  - Sponsors (Possibility)
  - Advantage is outweighed by cost

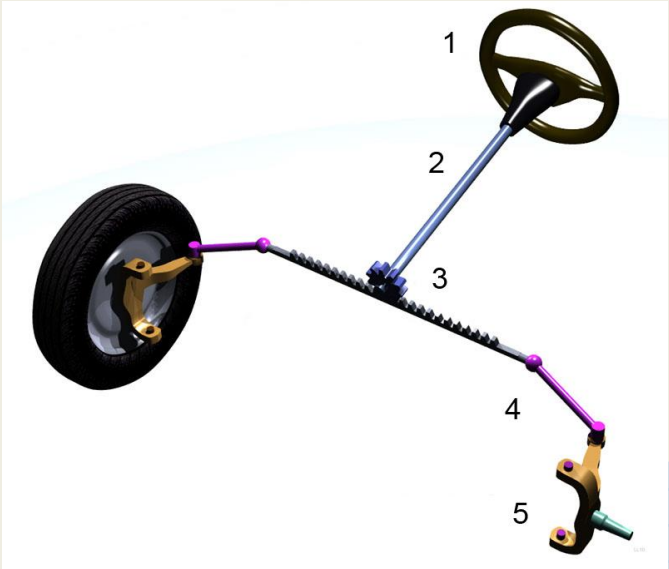
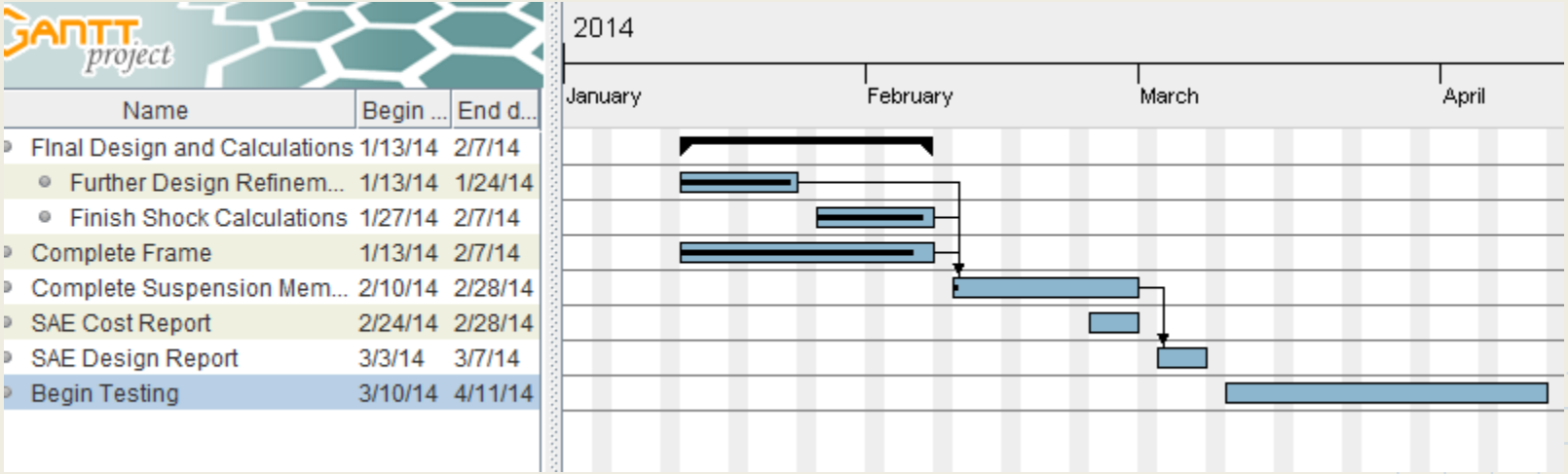


Figure 9: Rack & Pinion
Source: wikipedia

Gantt Chart: Spring 2014



Conclusion:

- The front suspension is largely unchanged
  - Changes made were to cut down costs, fabrication time and increased adjustability
- Rear supension design changes, new designs, and revamped geometry
- The steering system was changed for a tighter turning radius, and steering quickeners could potentially be used to further increase maneuverability.

References:

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- Wikipedia, "Steer System," http://en.wikipedia.org/wiki/File:Steer_system.jpg