

## 3S Trailer Suspension

### Meeting # 12

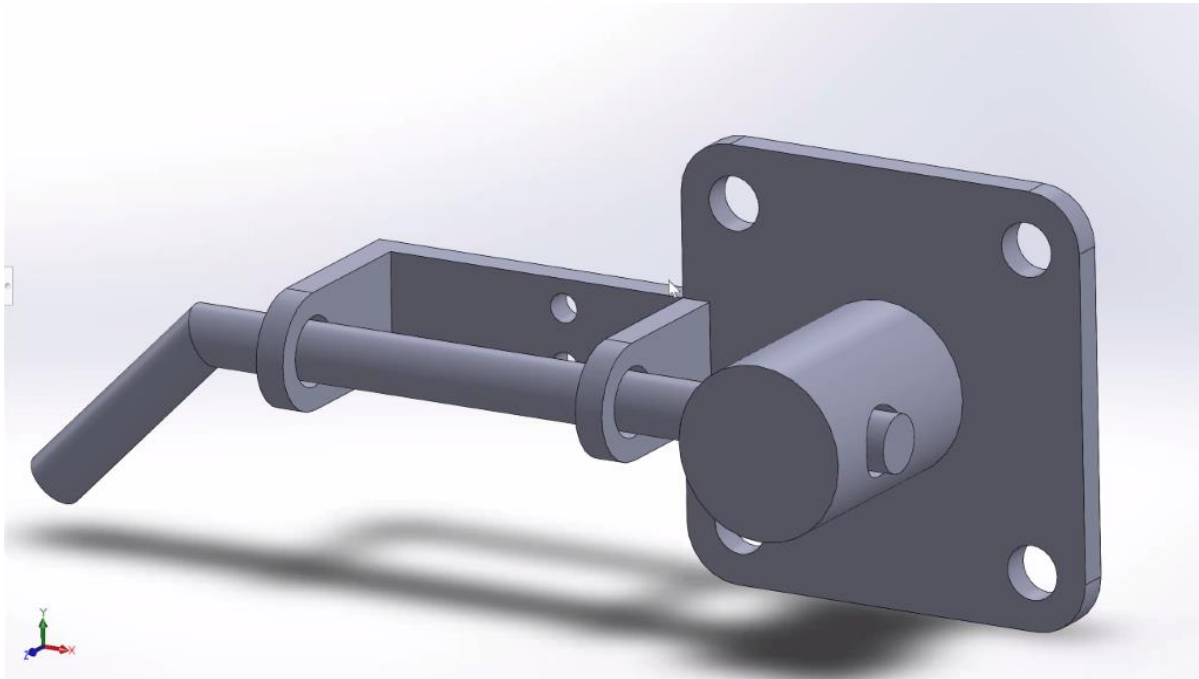
**Start Date & Time:** Tuesday, 7/7/2020, 9:30am

**Members Present:** Caitlin, Robert, Kirk, Anson

**End Time:** 1:00pm

### **Last Meeting:**

- New pin design
- Finalized budget
- MATLAB code for lever ratios
- Found new wheels
- Found black filament



### **Today's Objectives:**

- Pick 3 lever ratios
- Choose springs
- Choose bearings
- Send purchase order to Swenson
- Discuss finite element research

### Notes:

Lever ratio options, based off the 4 different spring Stiffnesses used in Excel Calculation file:

Stiffness (lb/in)	90% stiffness	Lever Ratio	Min Desired Stiffness
K = 112	100.8	$19.75/6.25 = 3.16$	100.14
K = 114.3	114.3	$23.75/8 = 2.96875$	113.46
K = 138	124.3	$22.75/8 = 2.84375$	123.65
K = 105	94.5	$20.25/6.25 = 3.24$	95.26

**NOTE:**  $20/6 = 3.33$ , w/ required stiffness of 90 lb/in

Current design:  $23/6.25 = 3.68$ , w/ required stiffness of 73.4 lb/in

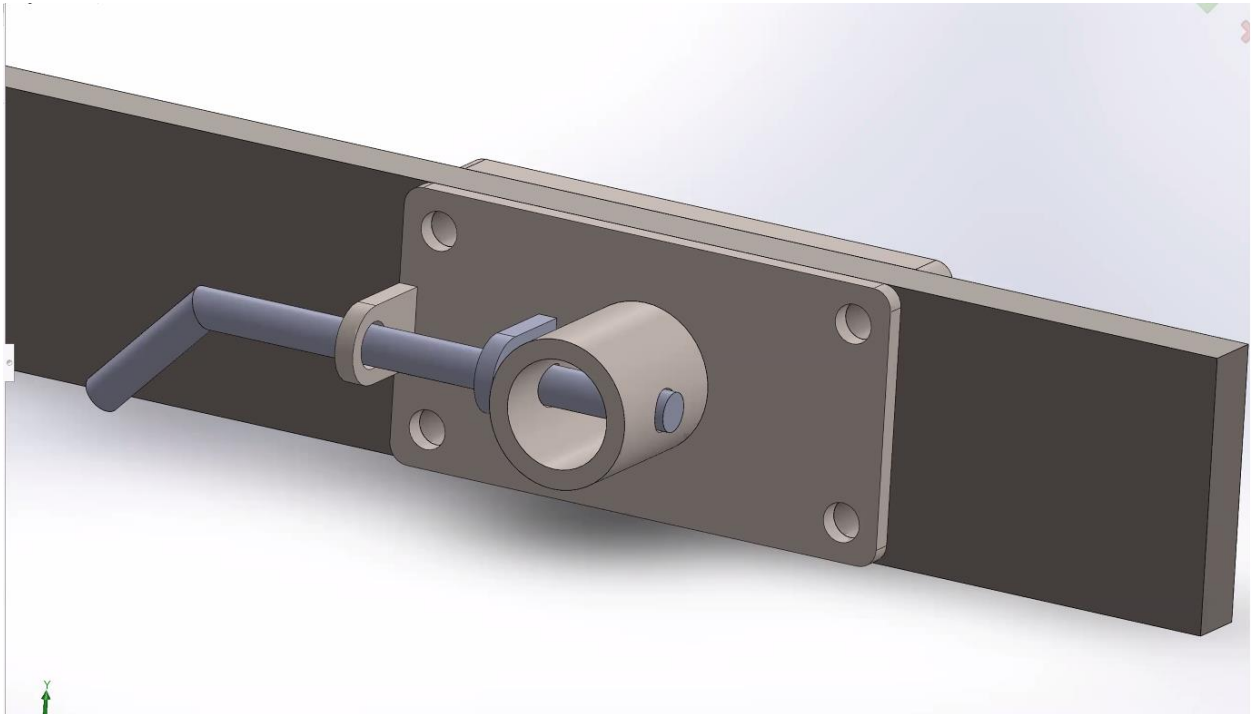
### 9:30 am meeting

- Review of what Robert and I did yesterday
- Pack it with grease for the capped end
- Don't have wheels tires or bolts files
- Full length of the steel pipe to go over the axle
- 2 instead of 4 bearings!
- Wiki-page - Robert is doing that tomorrow
- Parametric study - need to revise
- Tomorrow - 3500lb and 6000lbs springs and lever ratios
- Explore the 2000lb lever ratio
- Finite element analysis - need to do!!

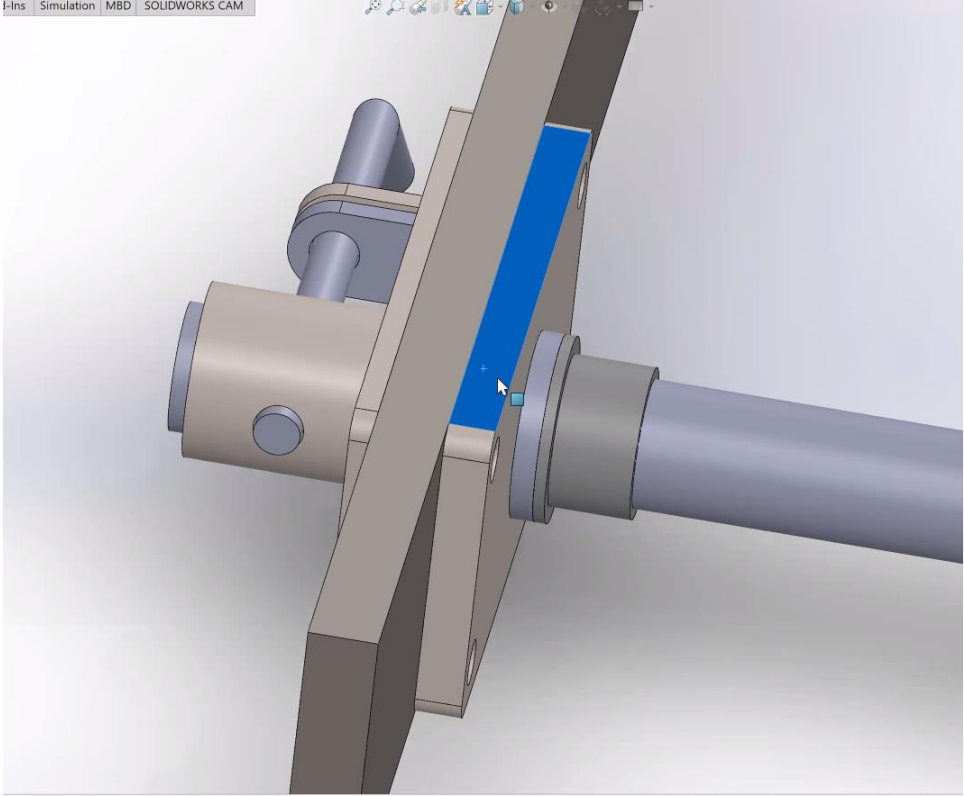
### For Swenson

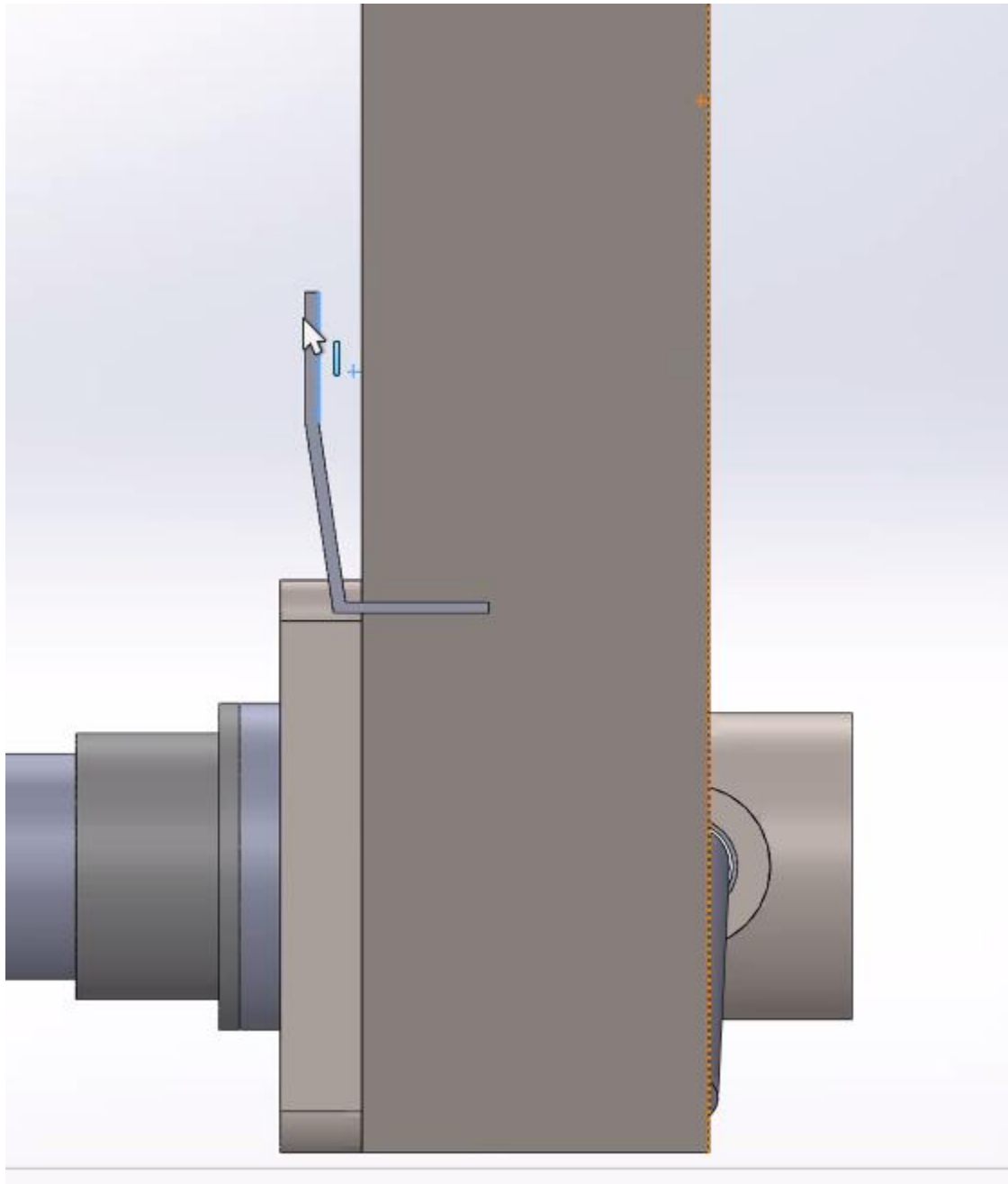
- need to tell him about the missing files
- As of right now the lever ratio is 3.68 with spring of 112lb/in

- Tomorrow we will be selecting spring and lever ratios for 3500lb and 6000lb



- Metal on metal on metal - we didn't think that gaskets are needed
- Bearing is needed in the middle
- How does the lever arm keep from sliding off? Set screw bearing?





- Shelf is static
- Unloaded rested position - what degree is the lever arm at?
- Square steel is the easiest to weld
- The spring won't fit on the lever arm - need to redo that

#### 12:00 meeting with Swenson

- Angle of the lever arm - has that been factored in?
- Spring - user would never lose the pin - make it easier for user to lock it back into place by themselves

- Spacer is same pattern and bolt size
- Rubber stopper
- Didn't want flanged bearing rubbing up against the spacer
- Keep the steel pipe as a whole - cost trade off because of more bearing would out cost the 2 bearings - protective sleeve for the axle - easier to install
- Welded cap on the outside - set screw radial bearings?
- Would it be best to mount the axle flush?
- Don't need the rubber on the spacer!
- Don't mind expanding the spacer to the bolt pattern!
- Make sure the hardware doesn't interfere with the rest of the trailer
- Lock pin - what is going to keep it from shutting back in?
- Arm is angled - in resting position - Swenson doesn't think it matters - doesn't care what the arm angle is
- On the bar - use finite element method - for stress concentrations
- He needs a design for the small-scale prototype - the most mature
- We need a clear plan - doesn't see the plan
- Nothing in here to show the mount of springs
- And wheels and tires mounting
- Axle needs to be right below the frame
- Willing to purchase the springs, tires, and PLA for us
- Pick a date for our design review between now and the 20th
- We want 1-inch gap between frame and steel axle

### For Next Time:

- Kirk – Spring mount, FEA
- Robert – Exploded View of the trailer, Wiki-page
- Caitlin/Anson - Lever ratios, Springs, and bearings
- Start Value Proposition
- Start Design review
- Set a design review date Between now and the 20<sup>th</sup>
- Start Design Validation plan
- Portfolio for Snapshot 1

### Comments/Concerns/Reflections from Today:

- Need to redo spring because the lever will not fit based on the outer diameter of the spring

Next Meeting Time & Date: Wednesday, 7/8/2020 @ 8:00pm