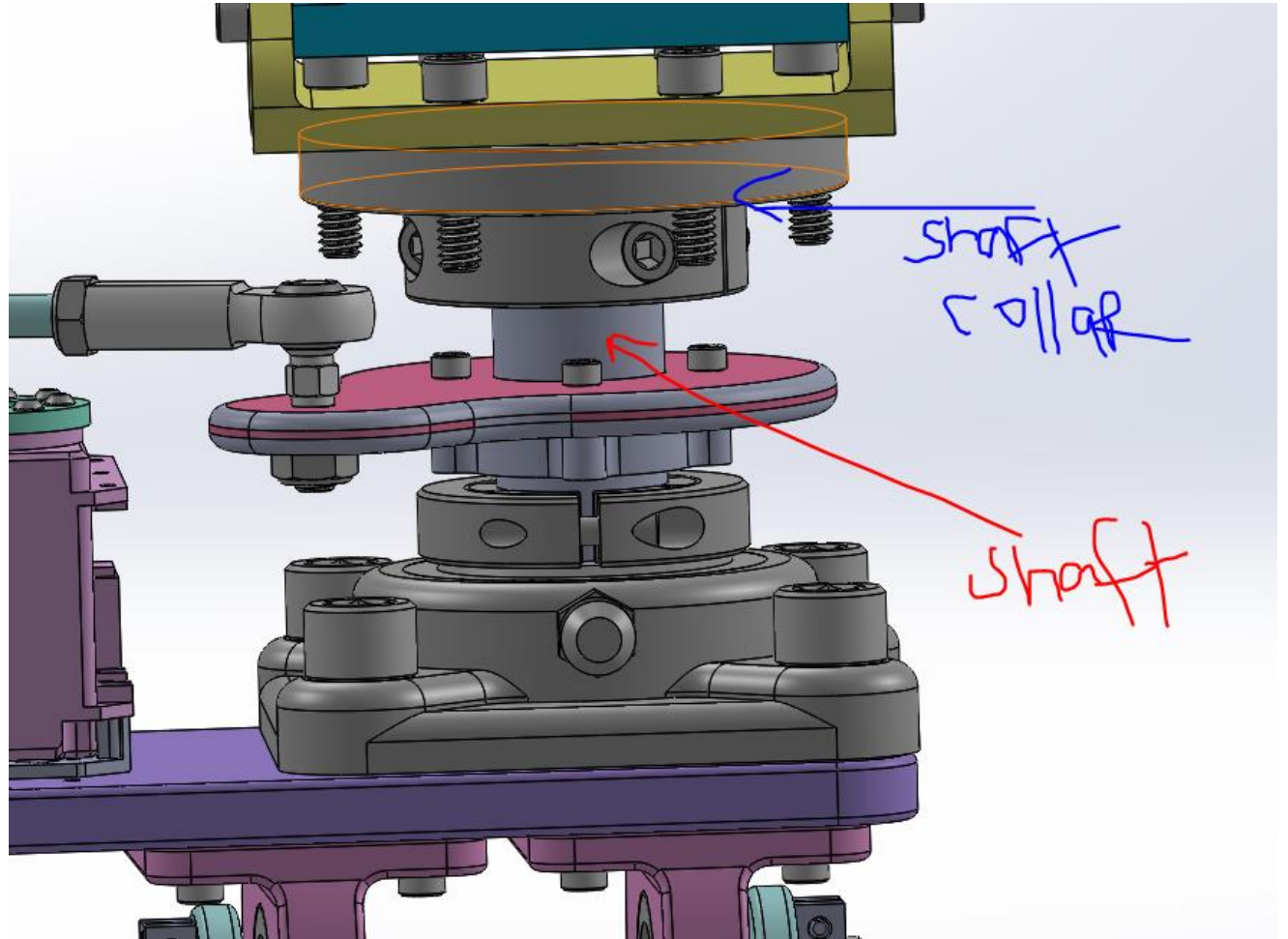


Tom Design Changes

Fall 2018

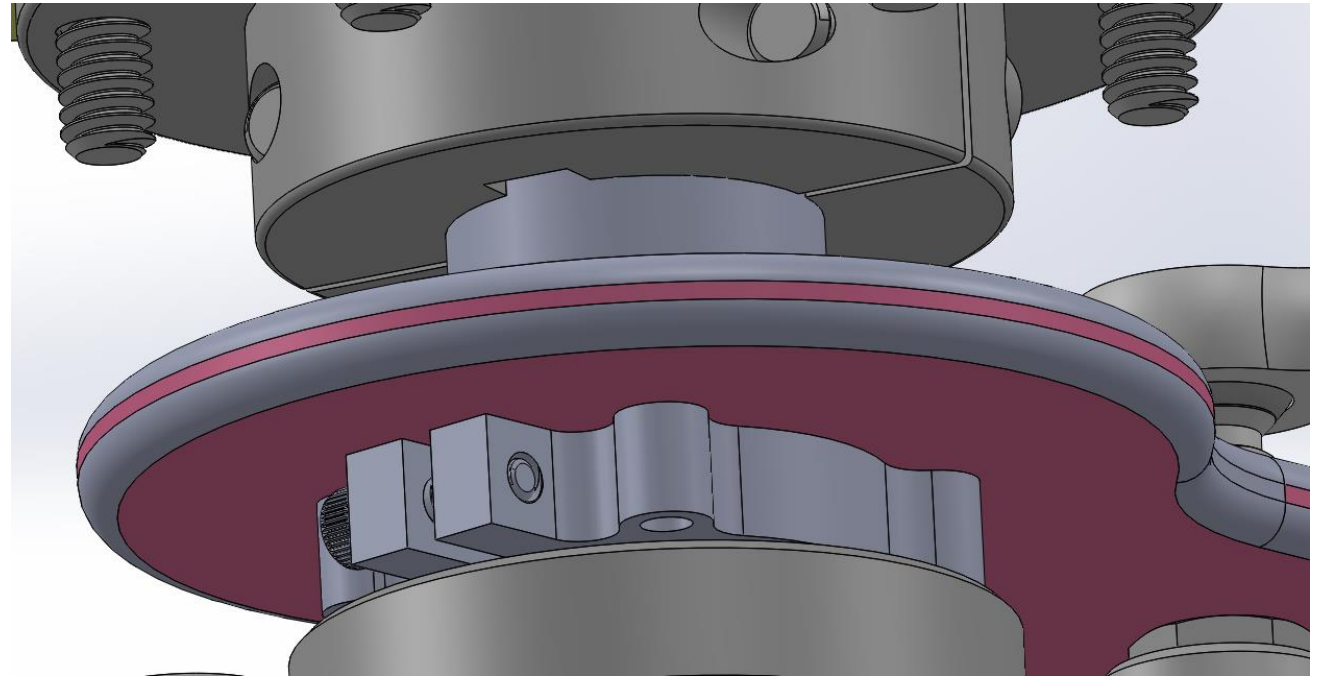
Problem 1

- Shaft is rotating within the flanged shaft collar due to turntable piece (pink) hitting the foam body, resistance of the foam

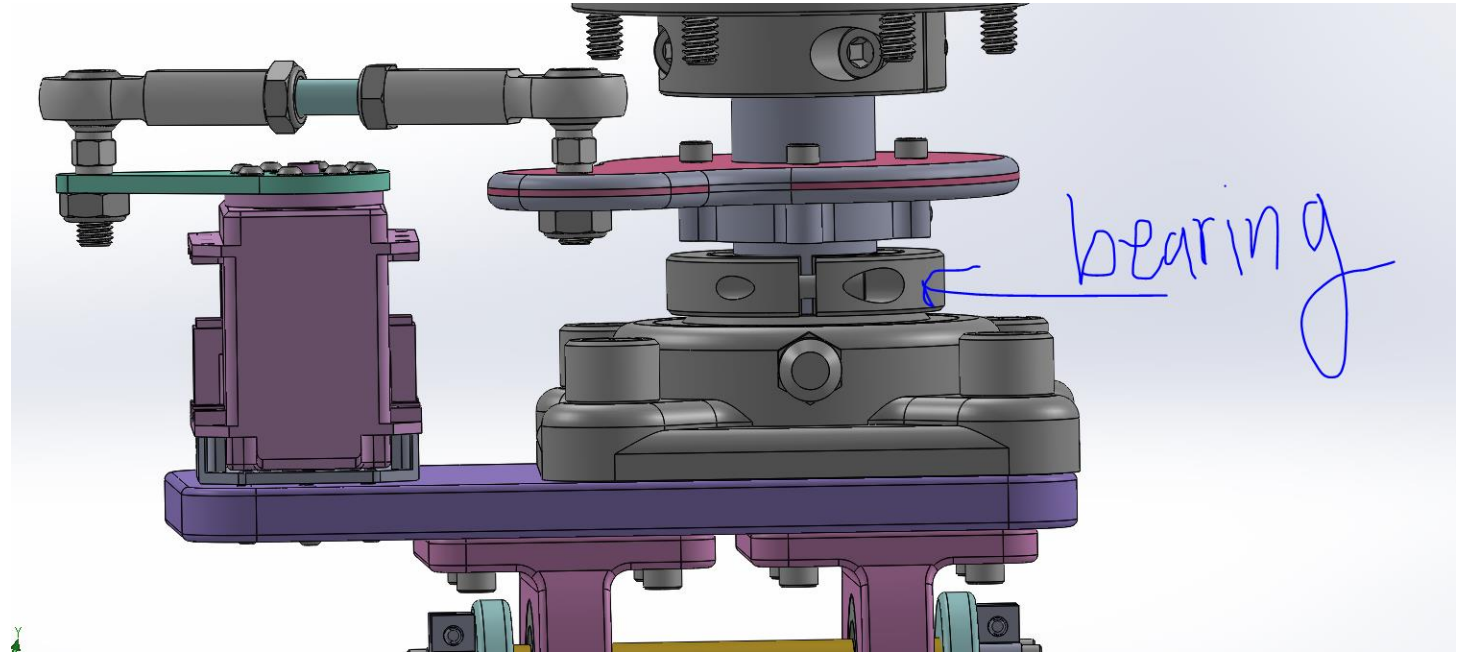
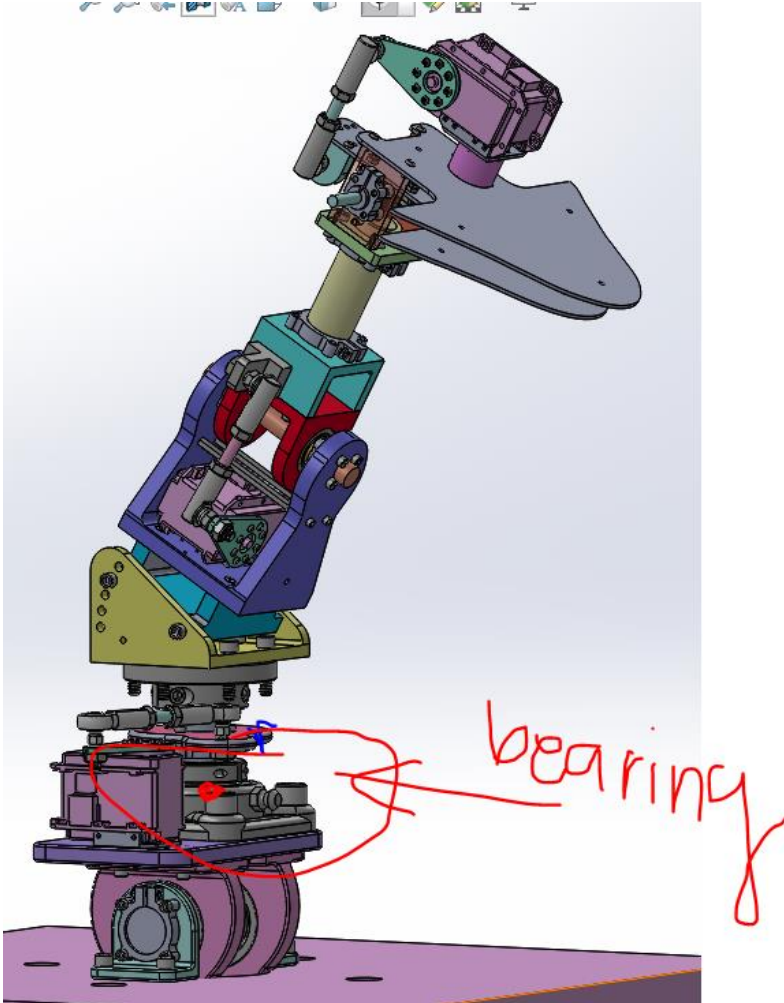


Solution

- Buy a keyed shaft, key stock
 - <https://www.mcmaster.com/7398k45>
 - <https://www.mcmaster.com/98491a102>
- Keyed shaft and key stock will ensure that shaft does not rotate within flanged shaft collar
- Cost: ~\$16
- Redesign time: 0 hours
 - *Optional:* could add a keyway to pink turntable piece to ensure that pink piece does not rotate about shaft (hasn't been a problem but could fix, to replace part would cost ~\$120, or could see if CMU machinist could add the keyway for us, using the mill)
- Redesign time: 2 hours



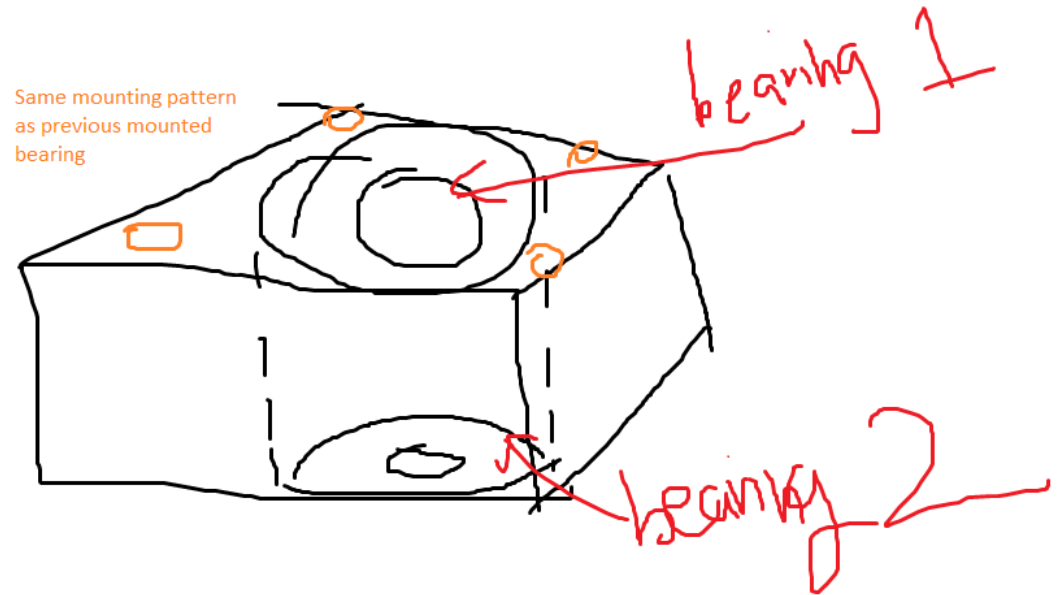
Problem 2



- Bearing popped out mount/housing
 - Due to (what I believe) is weight of figure and a high moment applied on bearing when static, but also when torso forebend is actuated

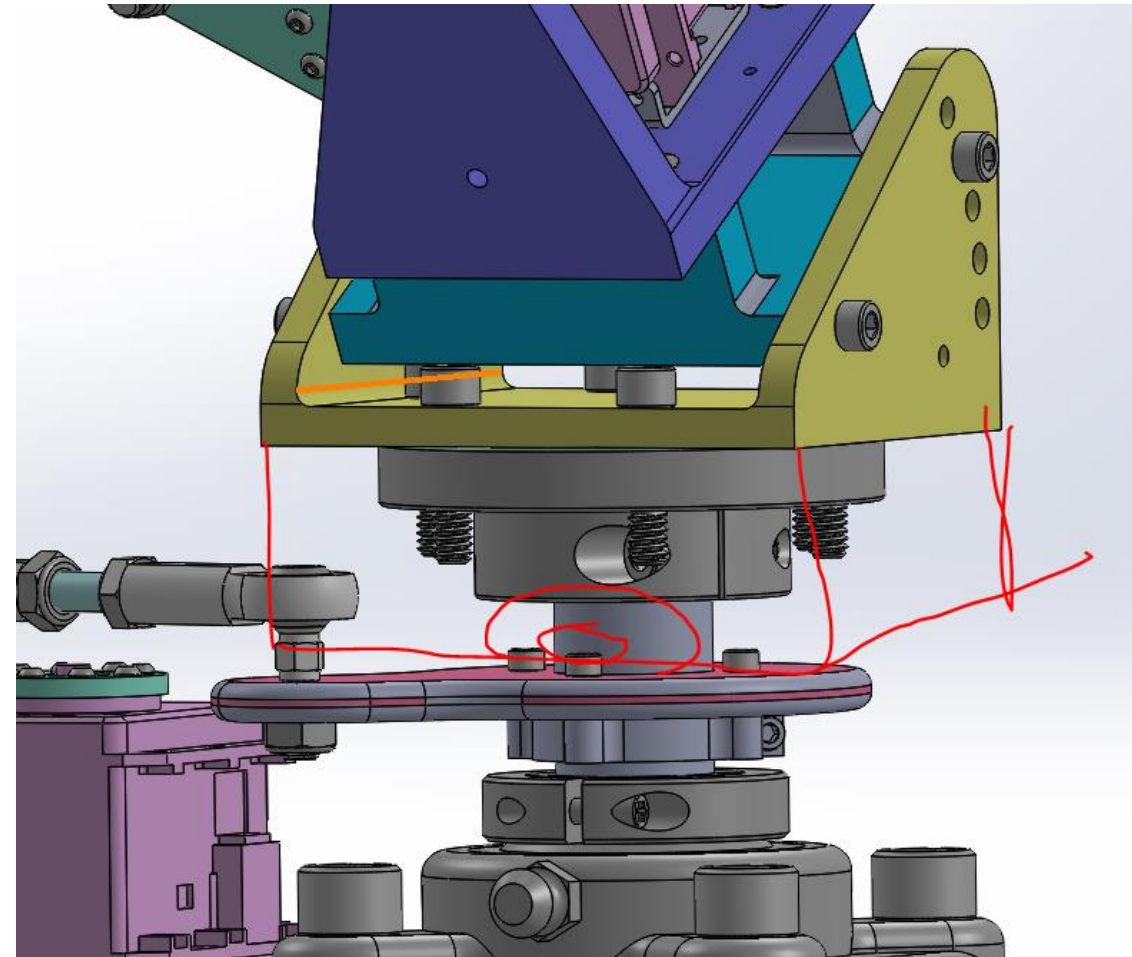
Solution 1

- Replace flanged bearing with a custom housing with two bearings press fit into the housing
 - **need to determine which bearings (tapered roller or ball)
 - Disperses load btwn two bearings and changes moment location
 - Cost: ~\$150-\$200 for new part via Protolabs, bearings ~\$150-\$200 for both
 - Redesign time: 10 hours

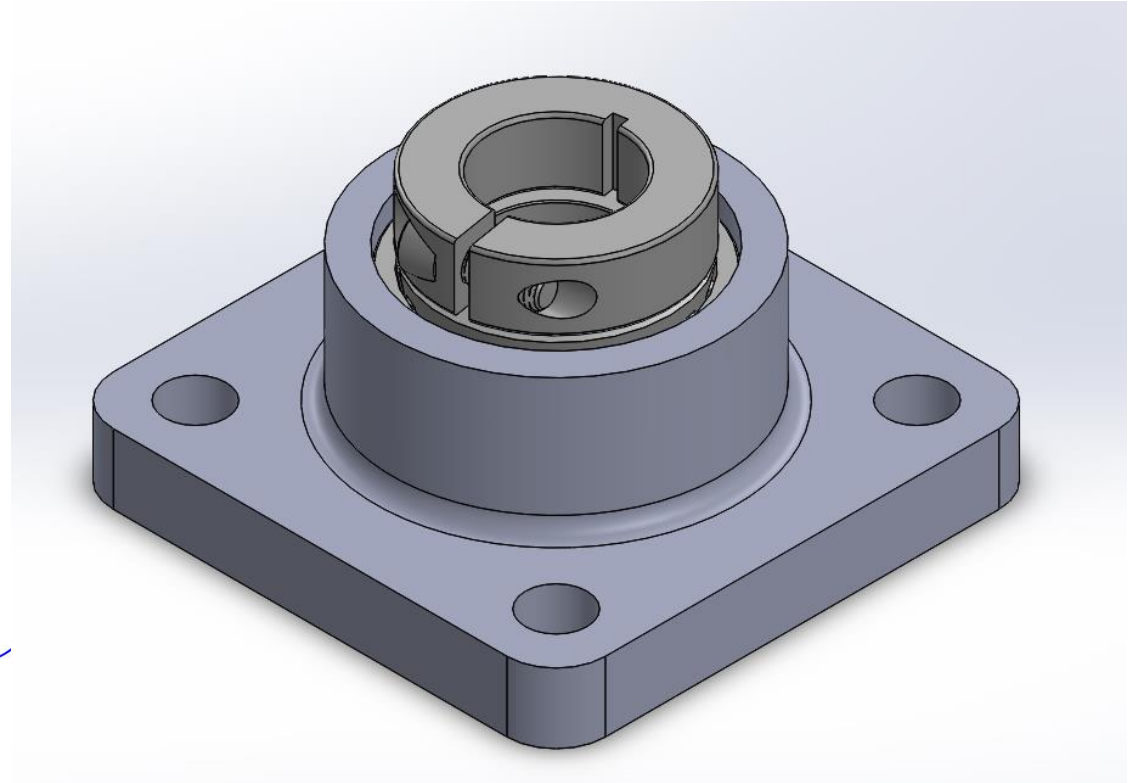
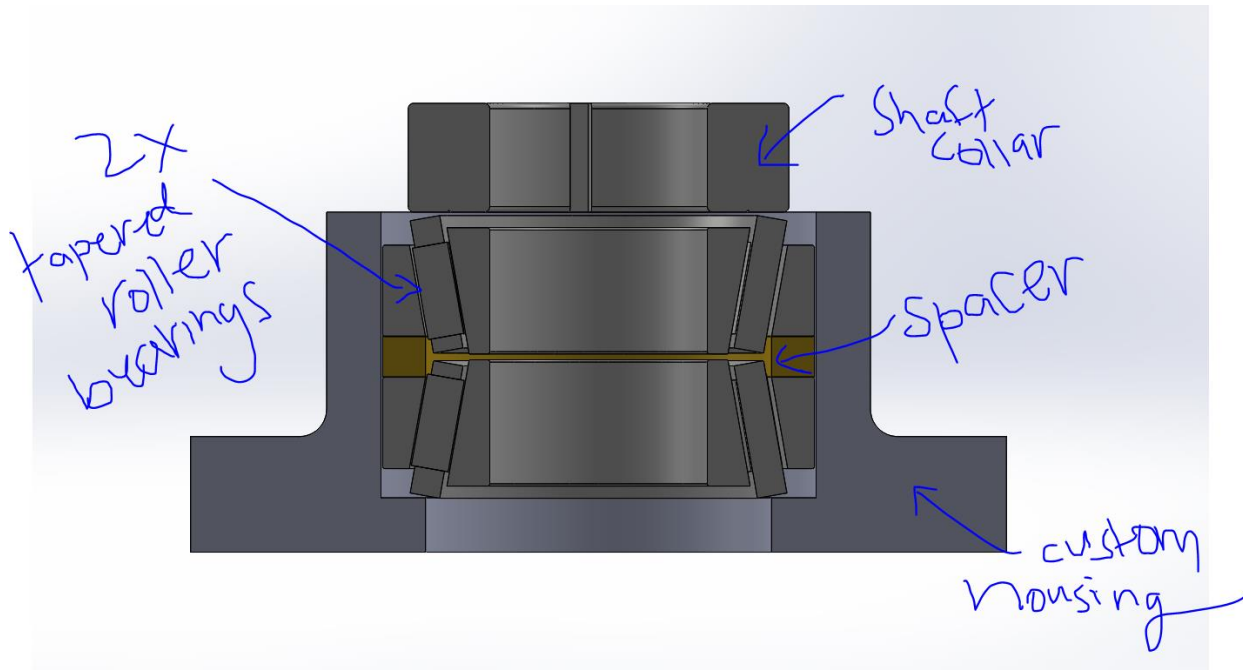


Solution 2

- Keep mounted flanged bearing where it is (well, buy a new one that isn't damaged)
- Re-model yellow piece to have a custom mount with bearing pressed inside
 - Versus solution 1: might be better for alleviating moment, by moving the moment's location closer to the shaft collar
 - More expensive— to replace parts and model new ones (4 parts total), would cost ~\$600
 - Design time: 20 hours



Solution 1: SolidWorks Mockup



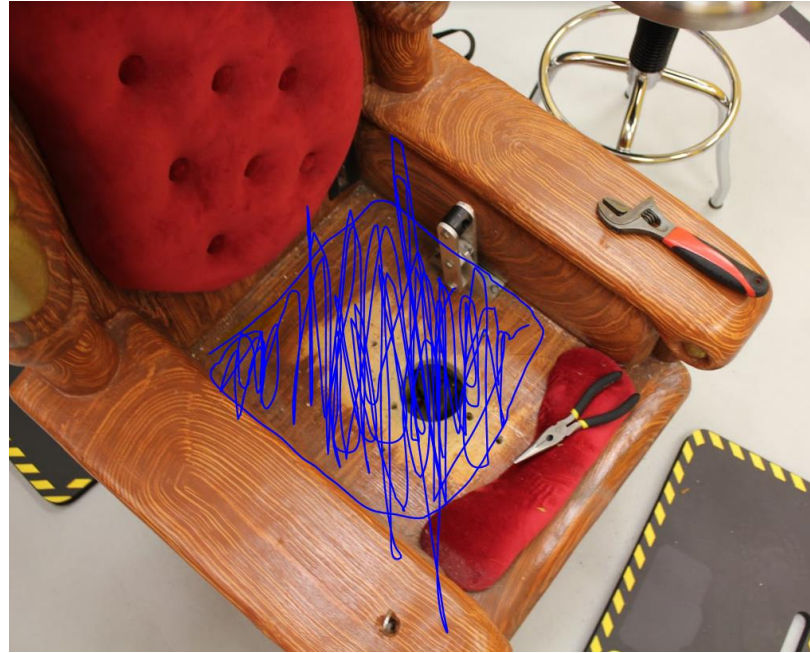
- Same mounting hole pattern to fit onto plate with motor
- Tapered roller bearing: <https://www.mcmaster.com/6678k12>

Problem 3

- Tom's wood chair is not going to hold up over time
- Already have experienced lots of wood chipping and cracking noises

Solution

- Cut wood out of base (where Tom sits, and at bottom, where chair meets the floor)
- Replace with aluminum 80/20 base frame



Item # 29NZ78 Mfr. Model # 1515-48 Catalog Page # N/A UNSPS



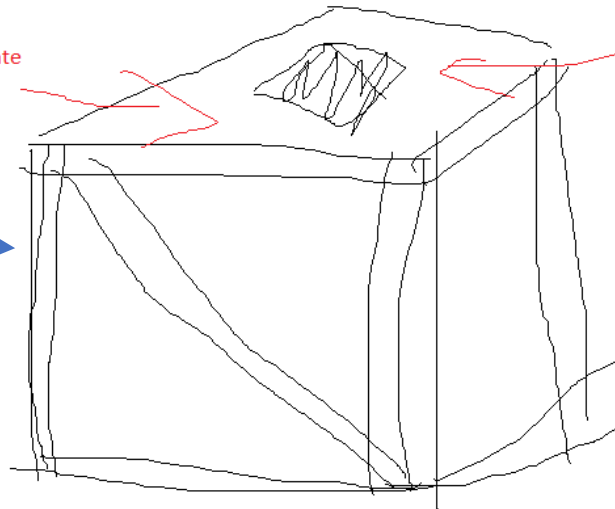
Cat



Oth

1/4" aluminum plate

Tom sits here

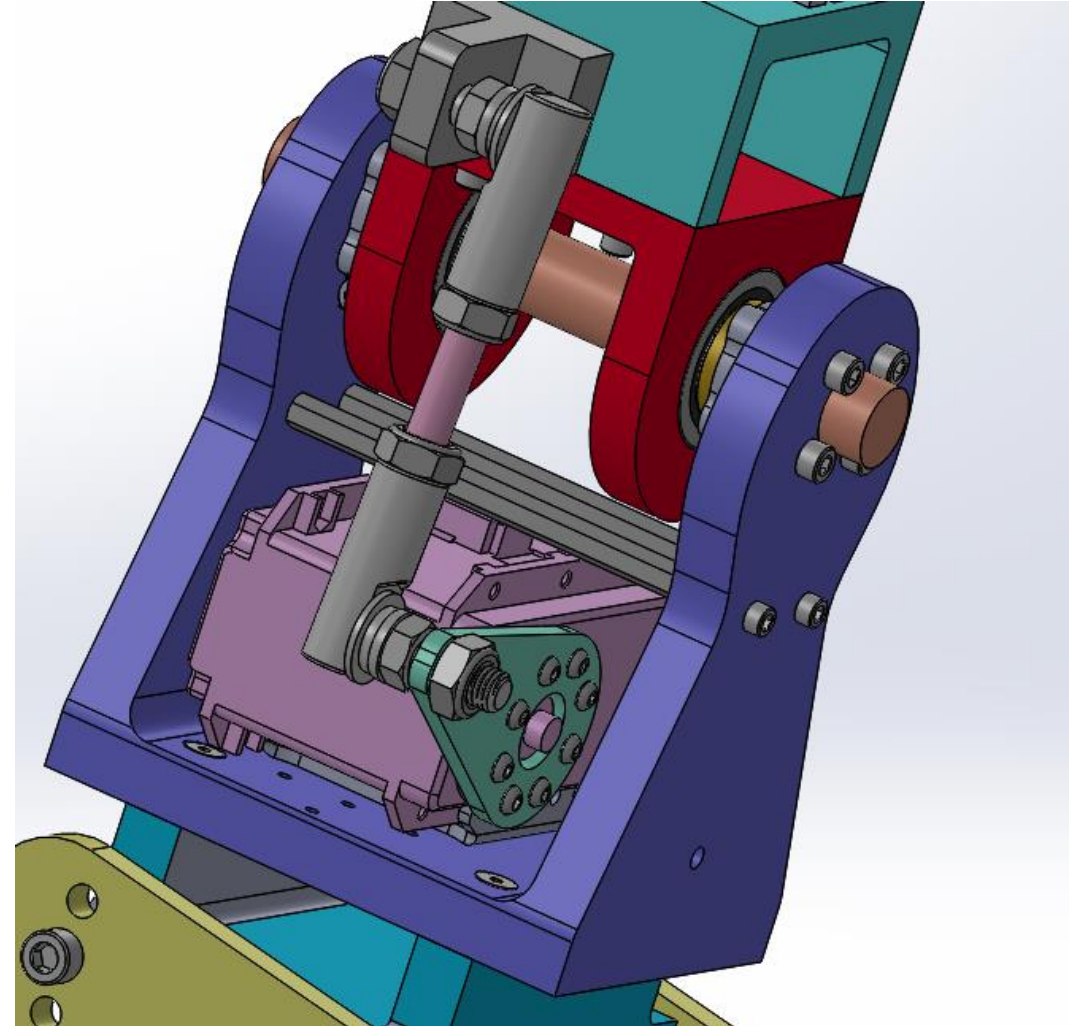


Solution cont.

- Design time: 20 hours, Assembly/manufacturing time: 10 hours
 - Taking measurements of chair and base where Tom sits
 - Ordering 80/20 and cutting/assembling base
 - Cutting out wood in both top and bottom of base where Tom sits
 - Either going through protolabs or working with CMU machinist to machine ¼" aluminum plate with accurately dimensioned holes for Tom's plastic ring at his base as well as Torso Forebend mounting holes and Tom's "elbow"
 - **should model this plate in SolidWorks

Optional: Problem 4

- Purple head tilt piece makes assembly of function SUPER difficult
- May lead to issues like maintenance not fixing the function or bolts being stripped



Solution

- Split single piece into 3 separate pieces
- Cost: ~\$450 via Protolabs, might be cheaper through CMU ME dept.
- Design time: 5-7 hours