



University of Idaho

College of Engineering

Design Review

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Problem Statement

- Develop a carriage damping system to reduce/eliminate carriage bounce and vibration.



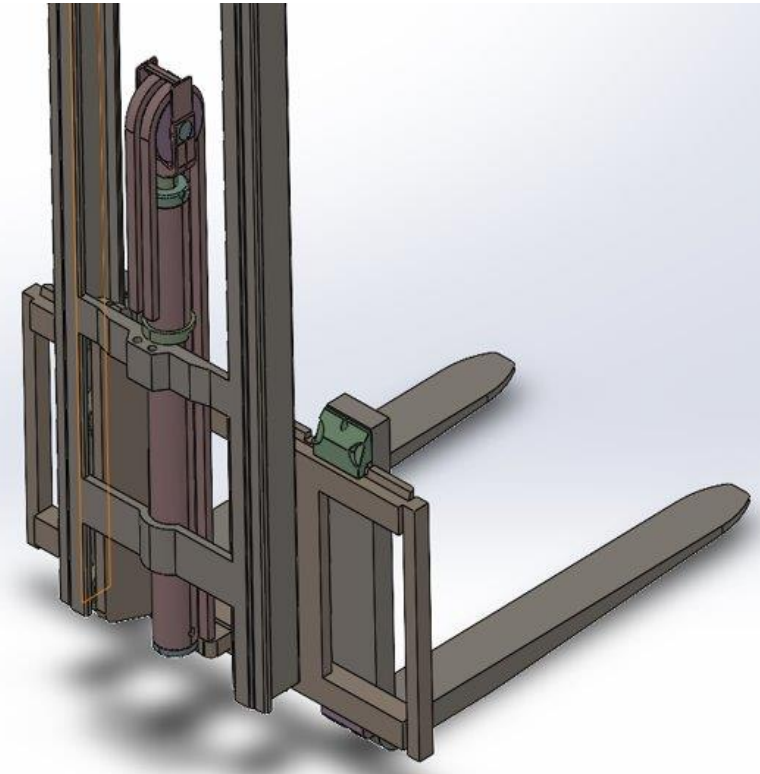
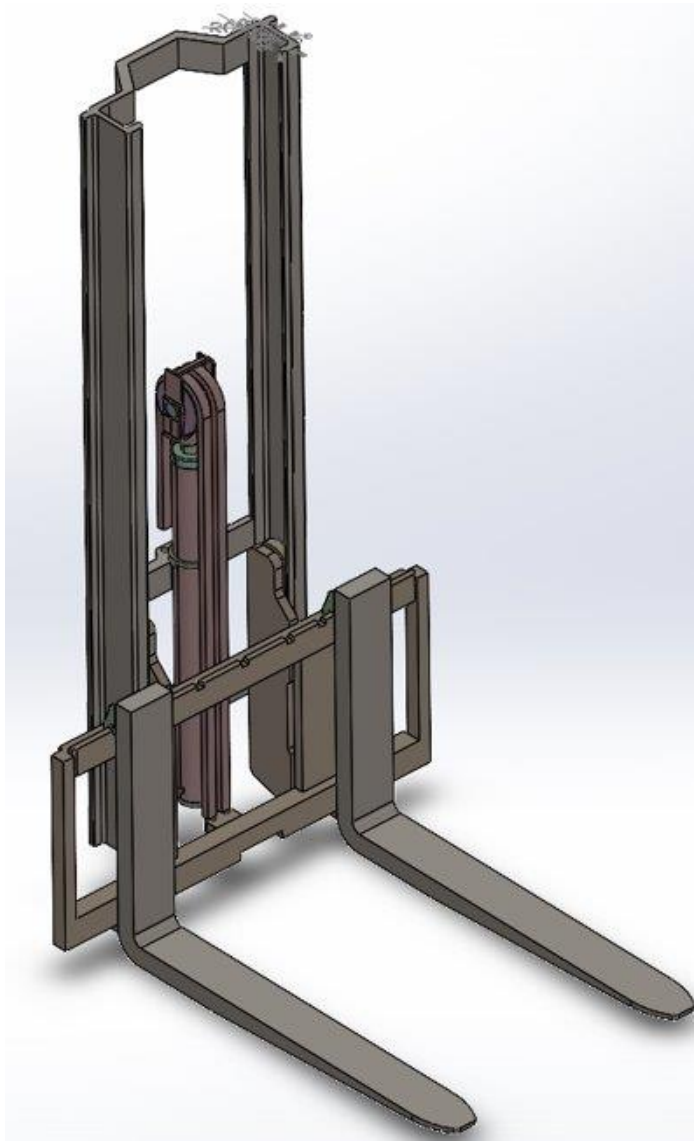
Value Proposition



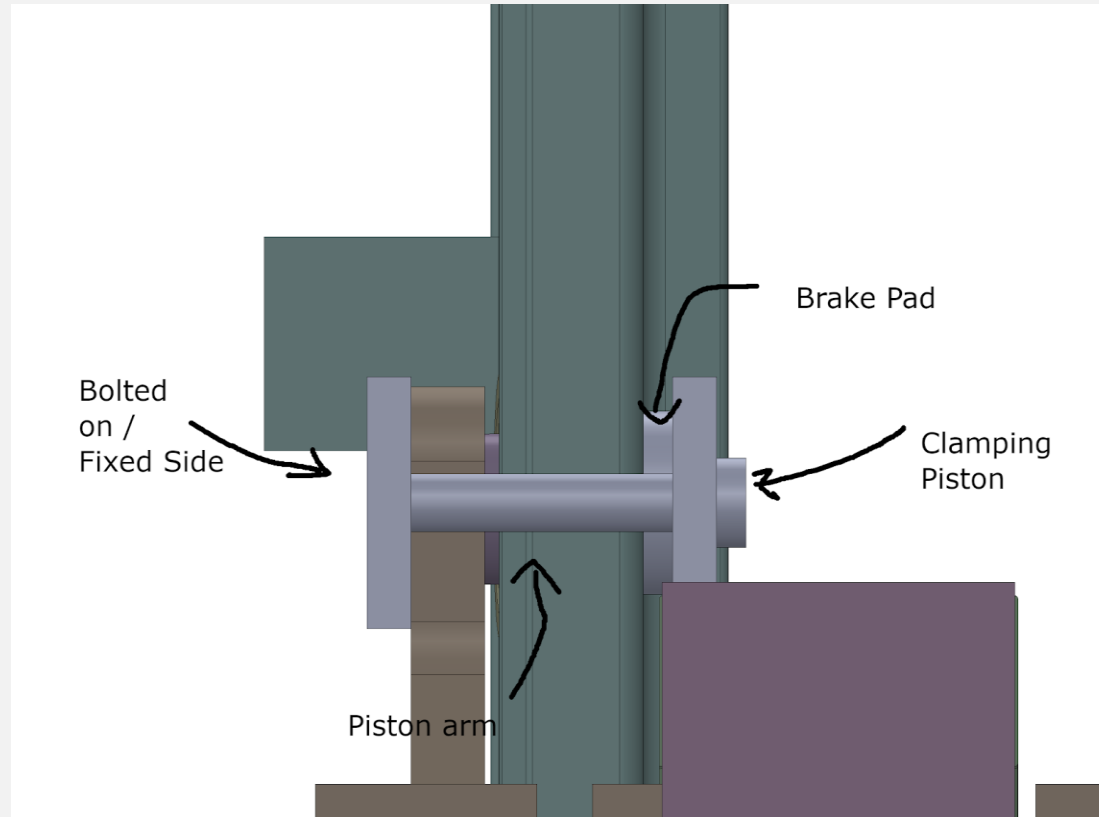
Design requirements

- Effective on a variety of surfaces
- Within hydraulic pressures forklift is capable
- Work within ~\$2300 budget
- Scalable
- Manufacturable

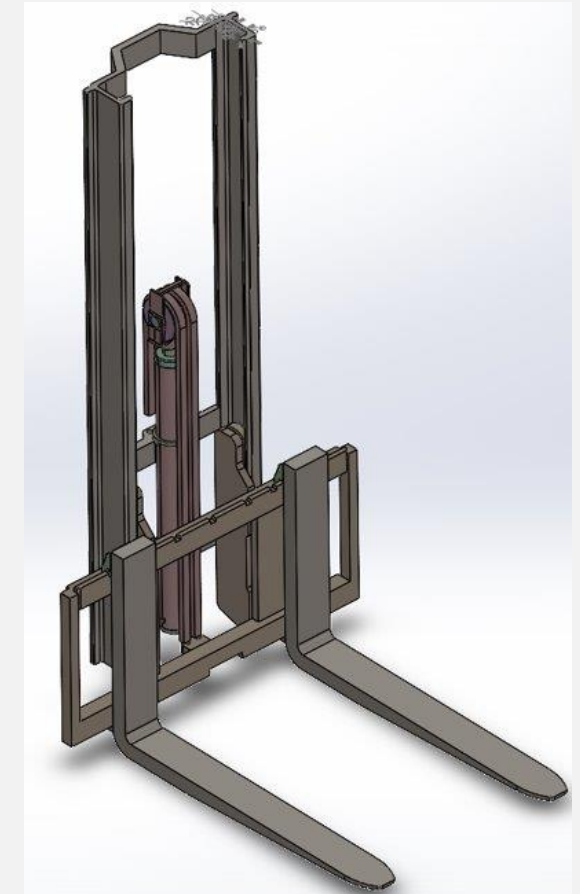
Previous Design Concepts



Hydraulic Brake

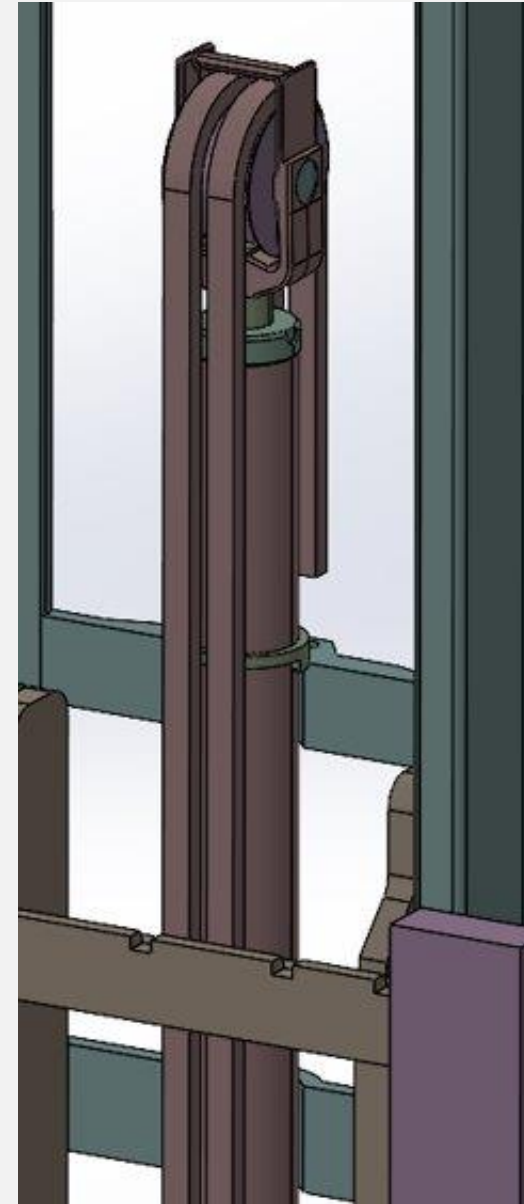
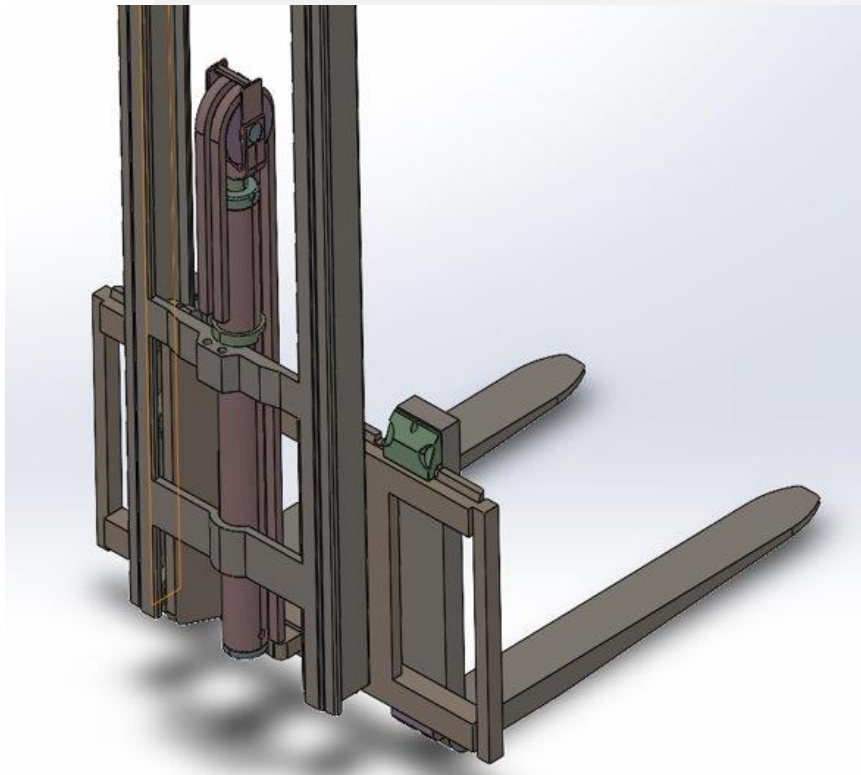


- Simple
- Easy to service
- Low complexity



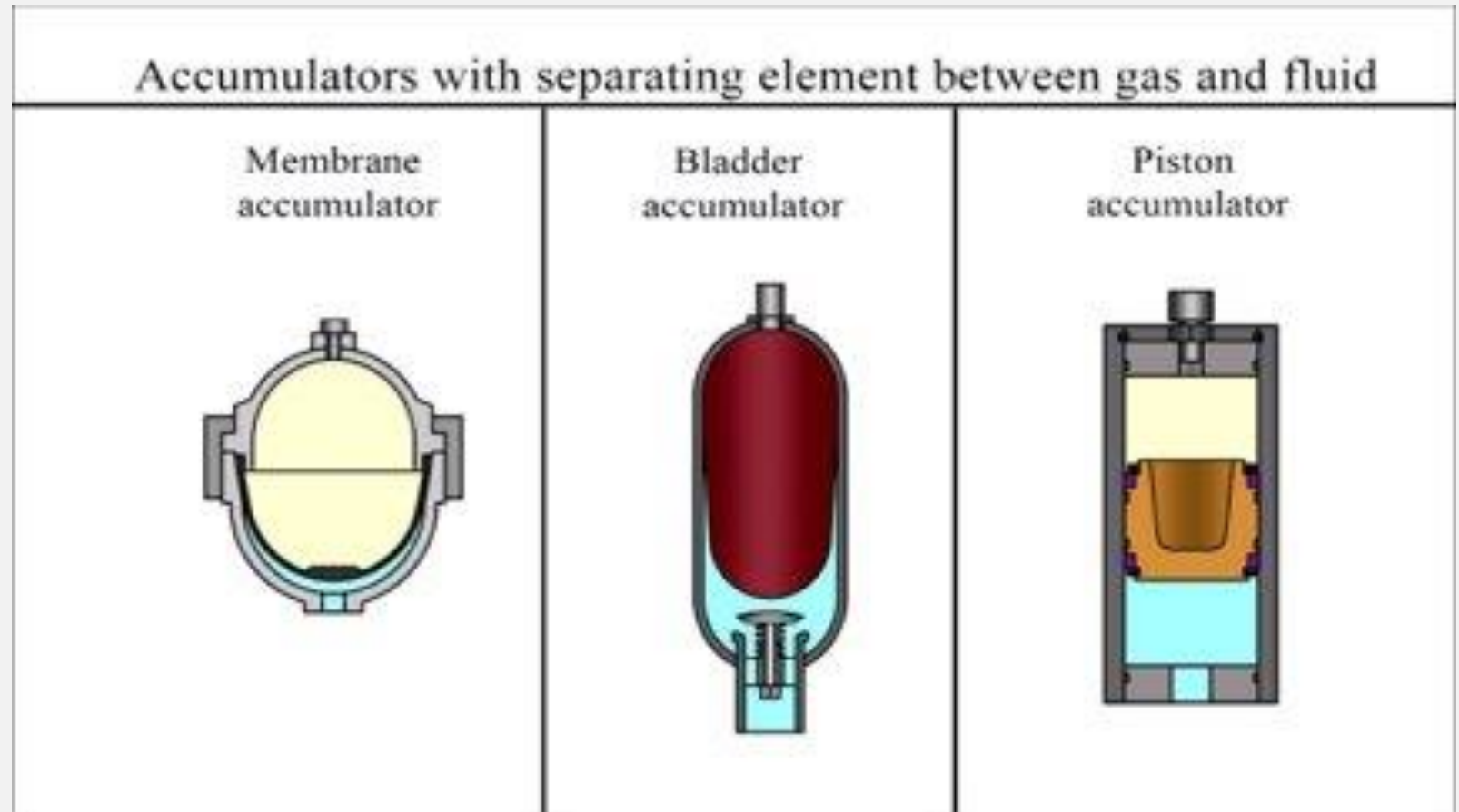
Spring Mass Damper

- Simple implementation
- Cheap and effective
- Functions at all heights



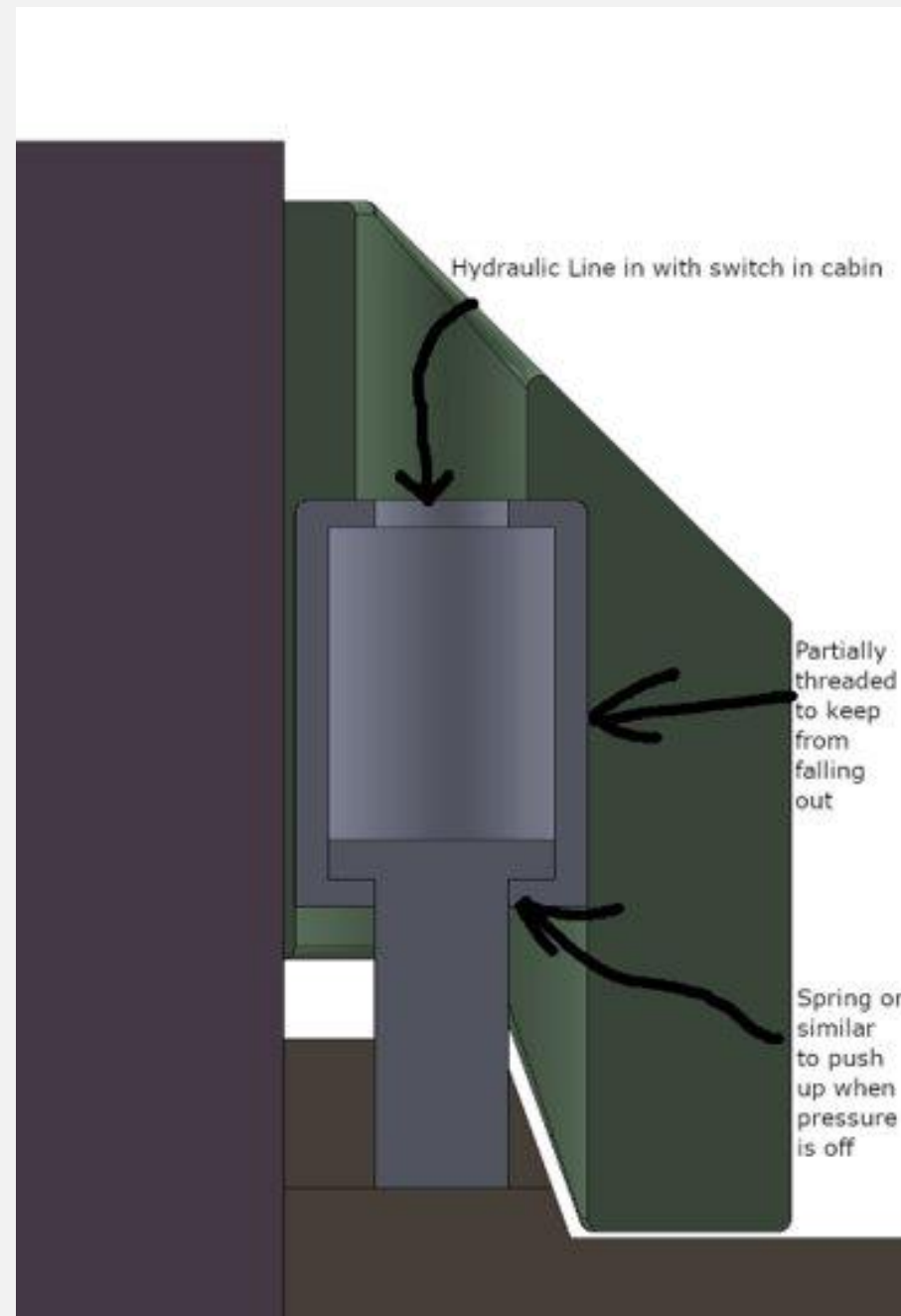
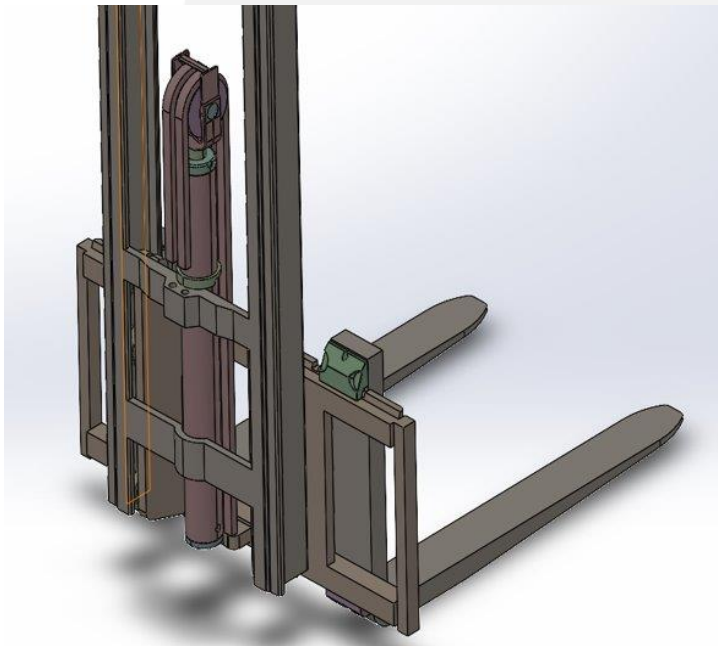
Hydraulic Accumulator

- Long Life
- Low complexity
- Off the shelf



Fork Clamps

- Easy to implement
- Simple
- Easy to Service
- Low complexity

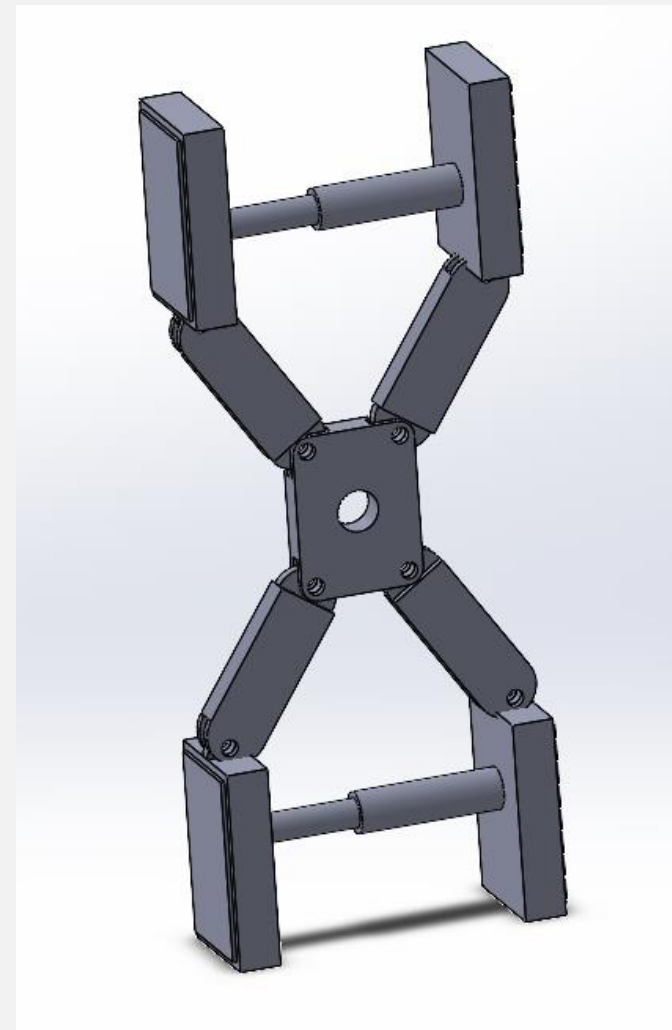
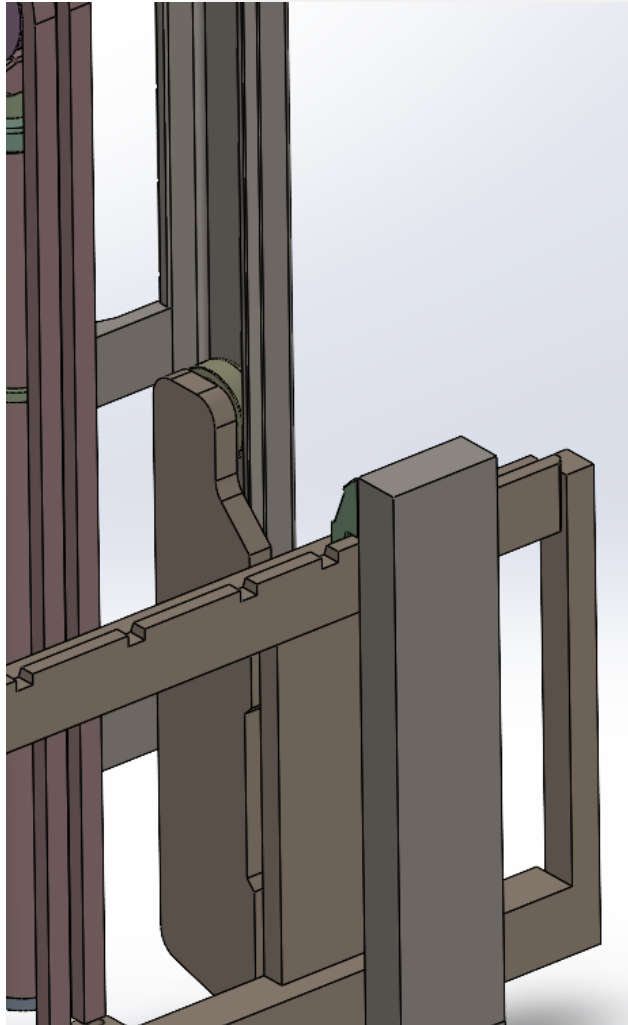


Decision Matrix

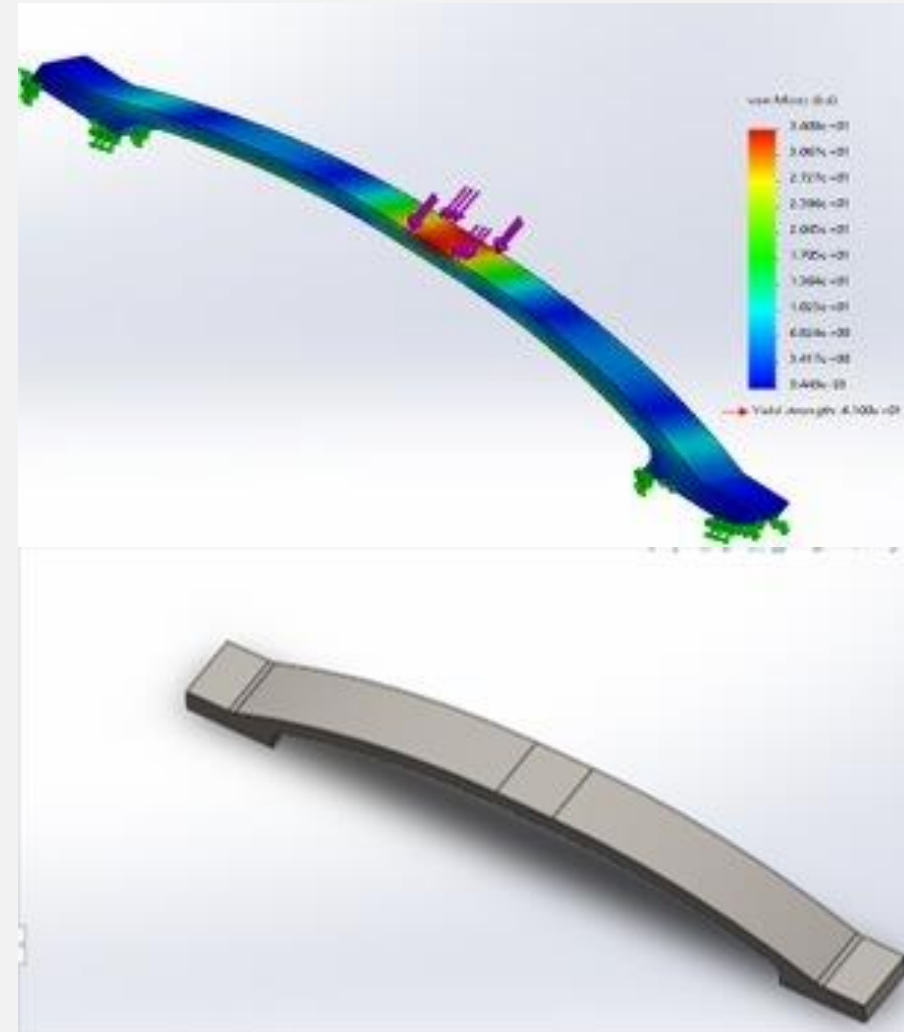
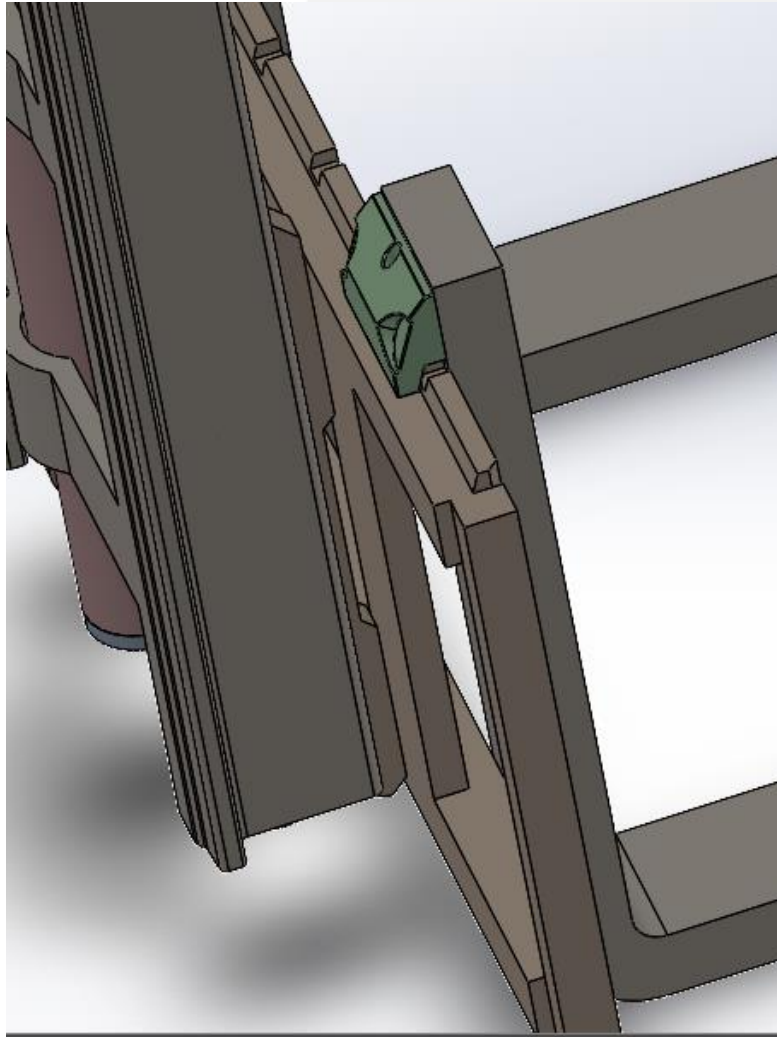
		Hydraulic Accumulator	Brakes	Clamped Forks	Spring Mass Damper
Ease of Maintenance	20%	1	4	4	2
Life	10%	4	3	3	3
Ease of implementation	20%	2	3	4	2
Cost	10%	2	3	4	3
Complexity	15%	1	4	4	2
Effectiveness	25%	3	4	1	3
Score	100%	2.166666667	3.5	3.333333333	2.5

- Pursuing both ideas

Previous Brake Designs

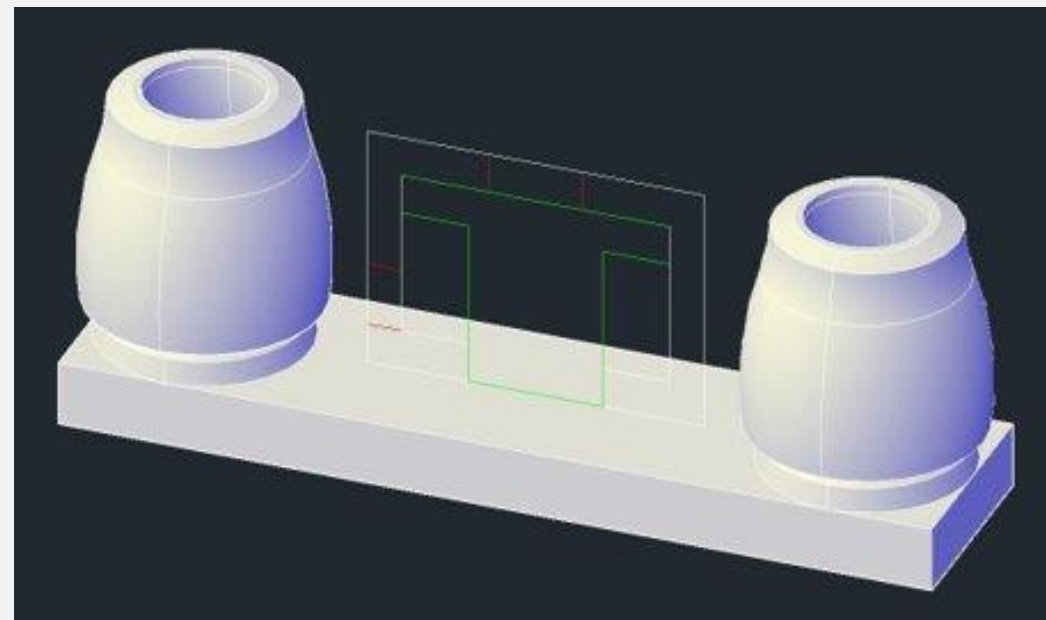
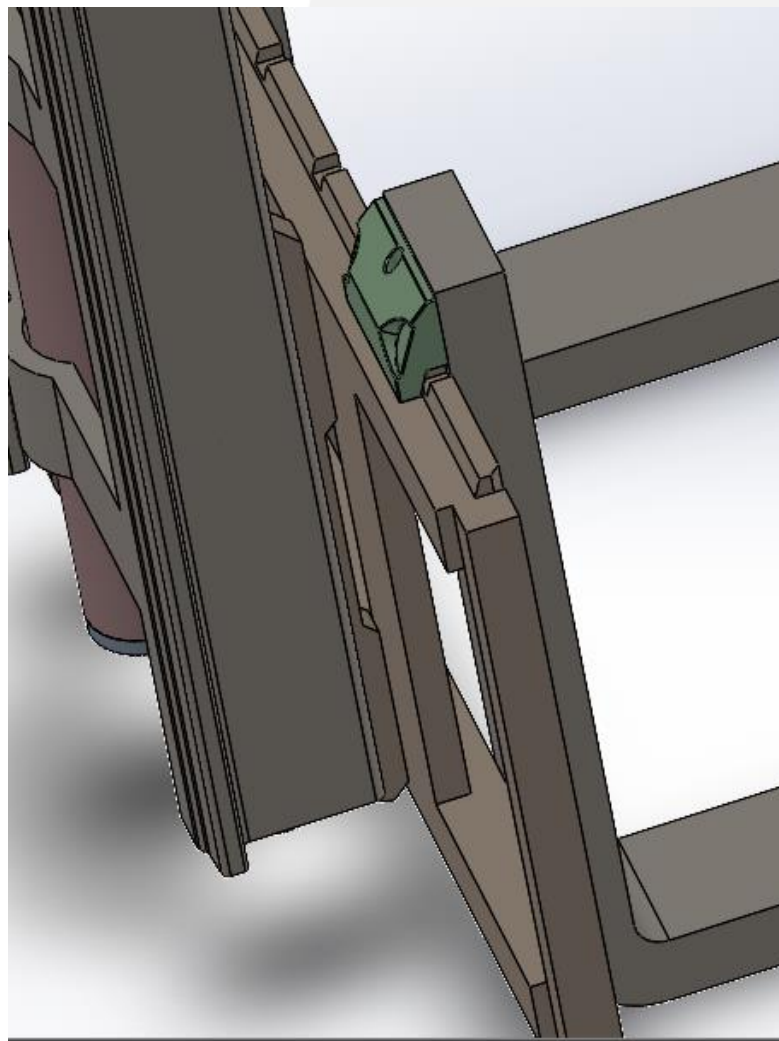


Previous Brake Designs

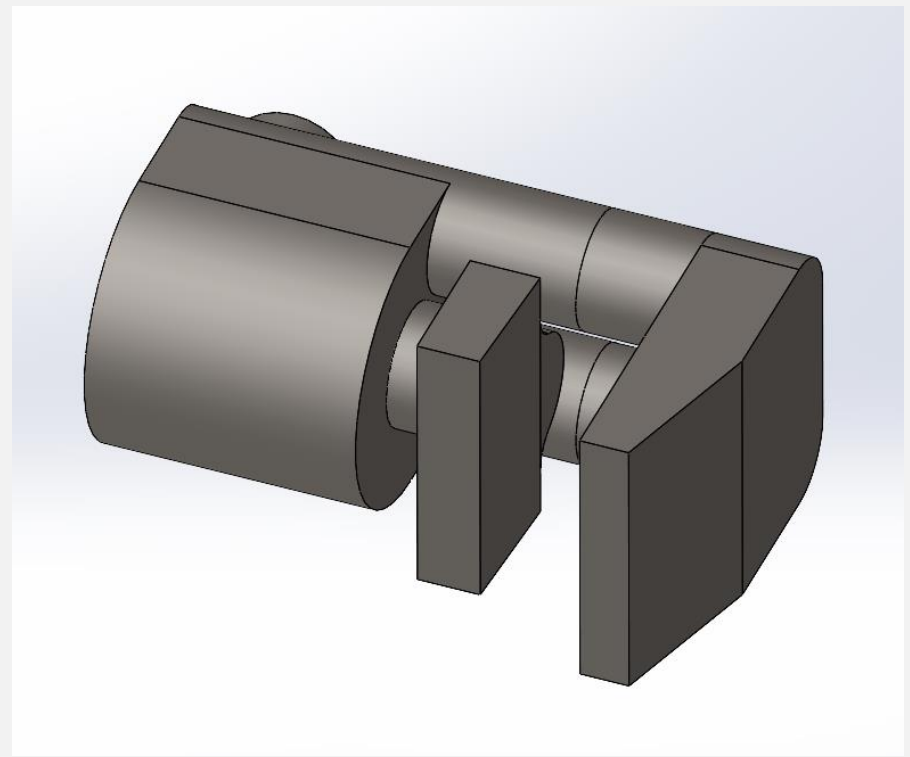
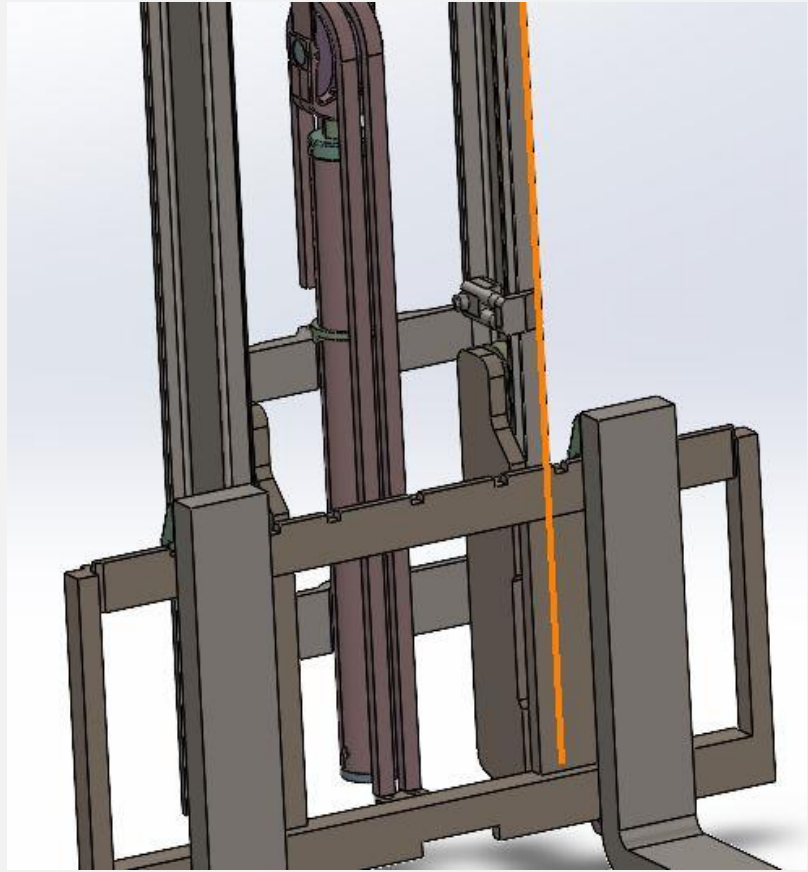




Previous Brake Designs



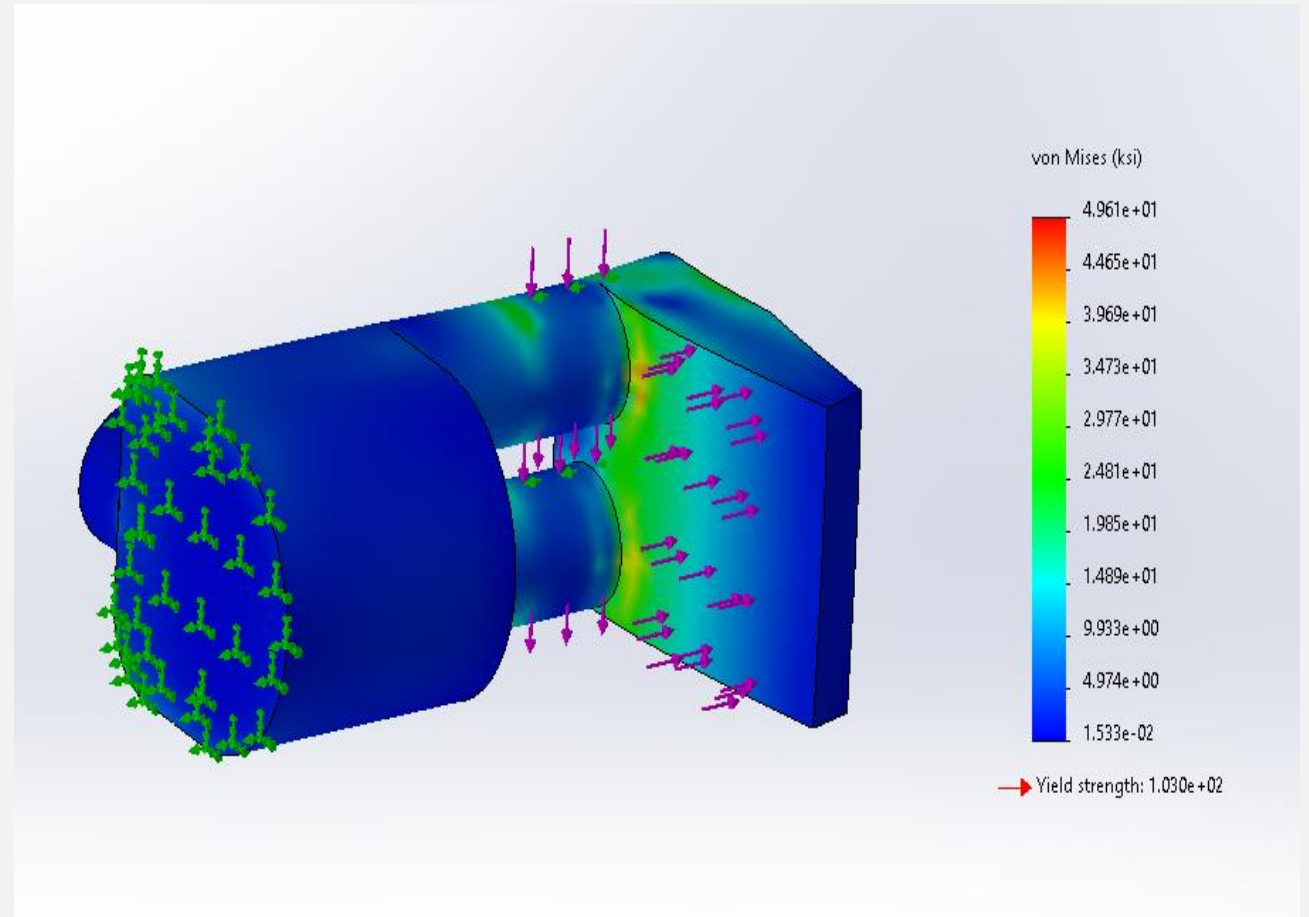
Current Design





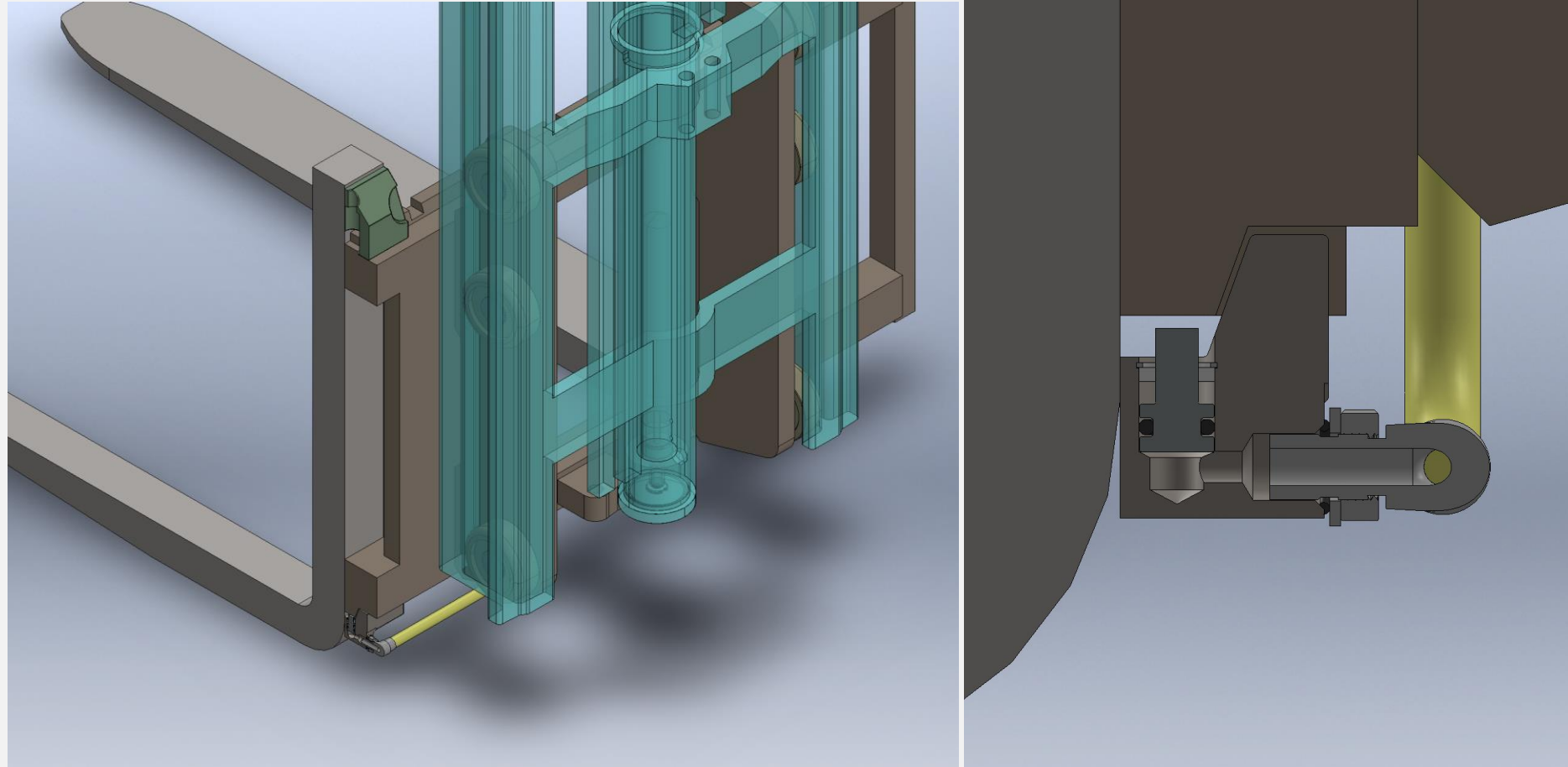
Current Design

- FEA validates design





Current Design



Data Collection

- What?
 - Inertial load
- Why?
 - Design Validation
- How?
 - Accelerometers
 - Strain Gauge



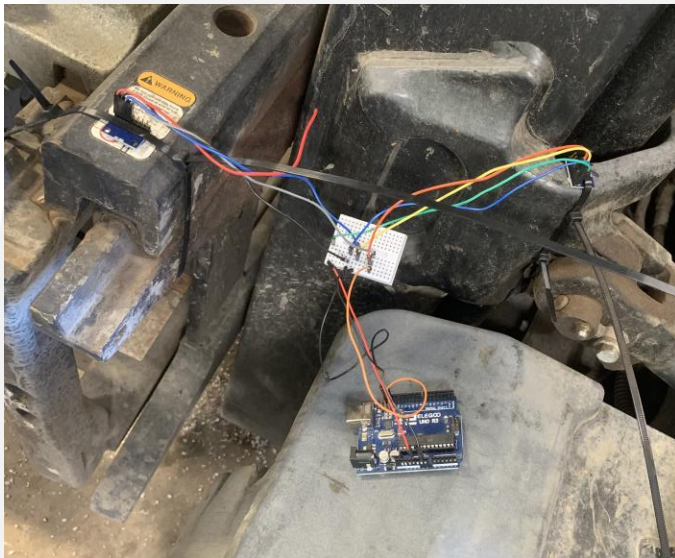
Data Collection

Limitations:

- I2C protocol noise
- Collisions

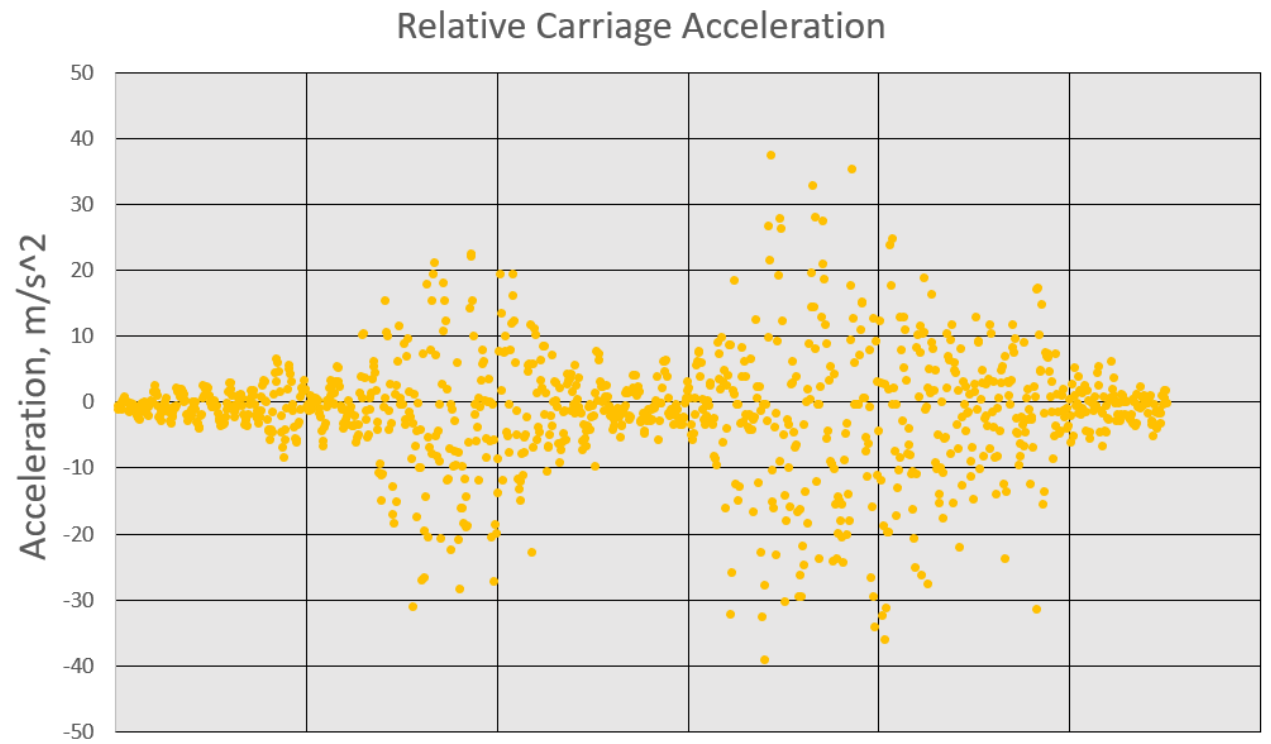
Advantages:

- Fast, easy data
- All components on-hand



Data Collection

Preliminary Results



Data Collection: Current progress



Determining proper gauges and materials



Pursuing strain gauge data



LOTS of research

Validation

- Build a Full-scale prototype
- Full functionality
- Limited options for free forklifts





Project Schedule

Capstone Project Schedule

			Project: Hyster Yale Carriage Bounce Control System																																										
		Last Updated:	10/4/20																																										
		Year	2020															2021																											
		Month	Sept			Oct					Nov					Dec			Jan			Feb			Mar			Apr			May														
Task Description	Duration	Assigned	9/4	9/13	9/20	9/27	10/4	10/11	10/18	10/25	11/1	11/8	11/15	11/22	11/29	12/6	12/13	12/20	12/27	1/3	1/10	1/17	1/24	1/31	2/7	2/14	2/21	2/28	3/7	3/14	3/21	3/28	4/4	4/11	4/18	4/25	5/2	5/9	5/16	5/23	5/30				
Team Contract		X																																											
Budget		Conner																																											
Product Requirements																																													
Approval of Requirements						X																																							
Project Schedule					X																																								
Finalization of Idea																																													
Design Validation Plan									X																																				
Focused Research																																													
Value Proposition											X																																		
Basic Mockups																																													
Wikipage											X																																		
Concept Design Review												X																																	
Team Member Citizenship													X																																
Rapid Prototyping																																													
EPO order of Long Lead Parts																X																													
Detailed Design Review																X																													
Initial Prototype																																													
Design Expo Registration																							X																						
Engineering Release of Drawings																												X																	
Team Member Citizenship																											X																		
Portfolio																														X															
Wikipage																														X															
Final Prototype																																													
Validation and testing																																													
Complete Prototype Build																																												X	
UI Design EXPO																																											X		
Booth Display																																										X			
Technical Presentation																																									X				
Final Reports and Drawings to client																																											X		



Questions?