

Separation Connector Improvement

Final Concepts and Analysis

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Presentation Overview

- Problem Statement
- Final Two Concepts
- Detailed CAD Assemblies and Parts Lists
- Material Analysis
- Stress Analysis
- Updated Gantt Chart
- References

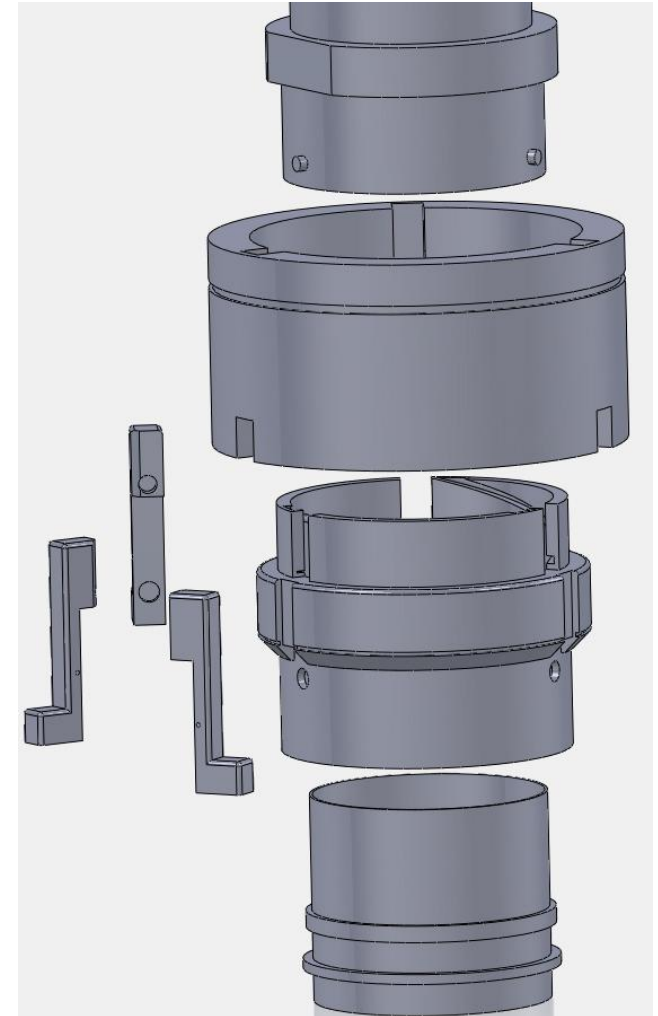
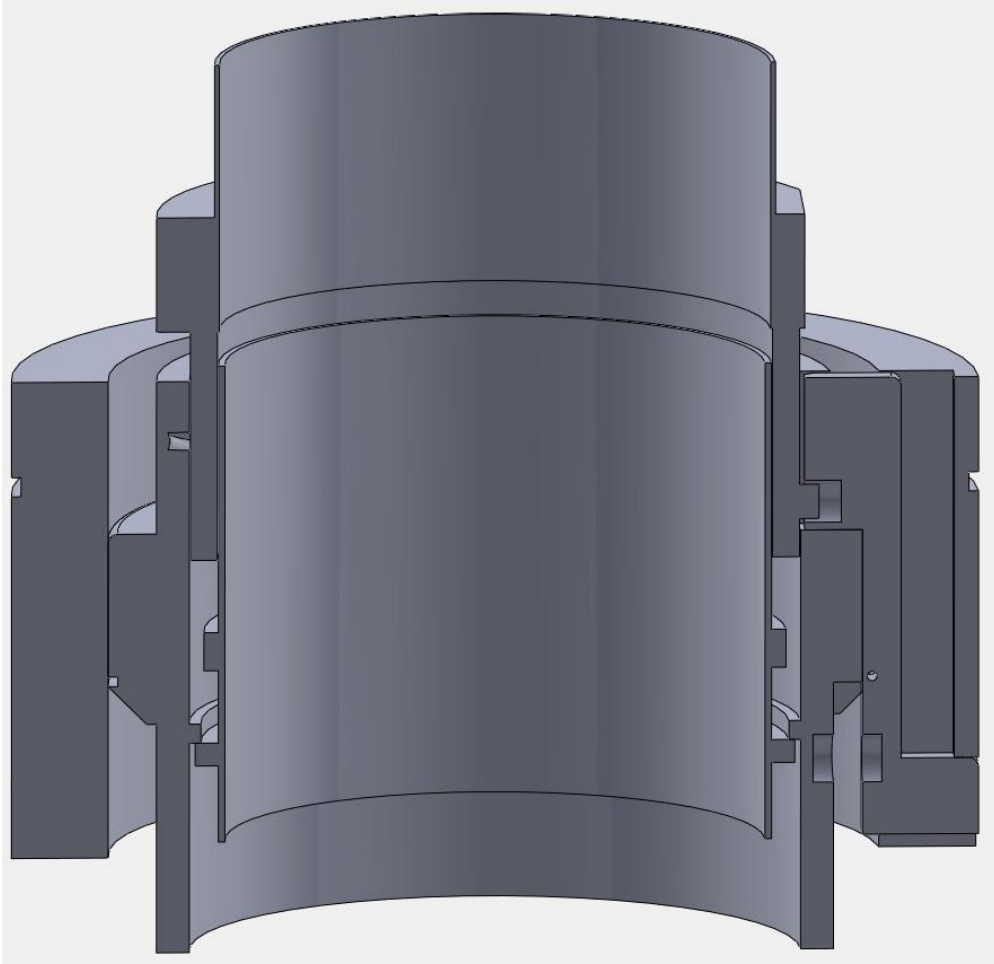
Problem Statement

- The goal for this project is to design and prototype a perfectly reliable, inexpensive, and easily manufacturable separation connector

Final Two Concepts

- Spring Lever Design
- Ball Bearing Design

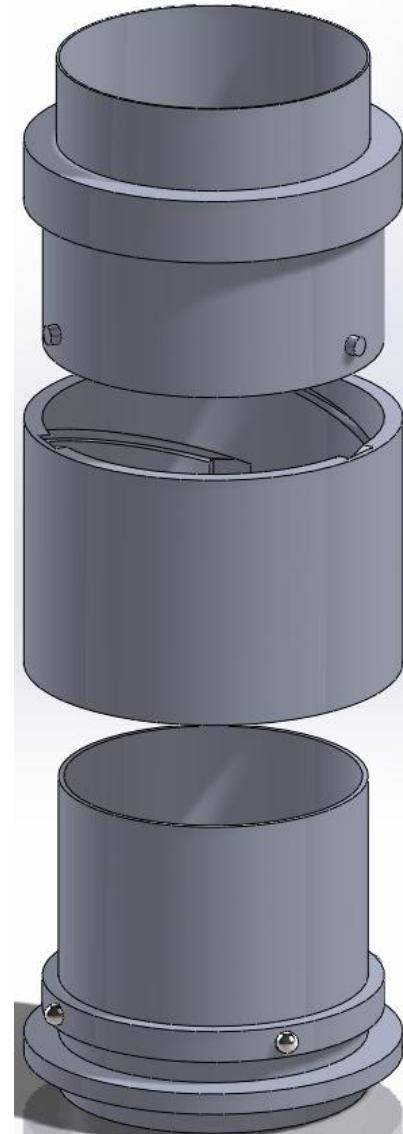
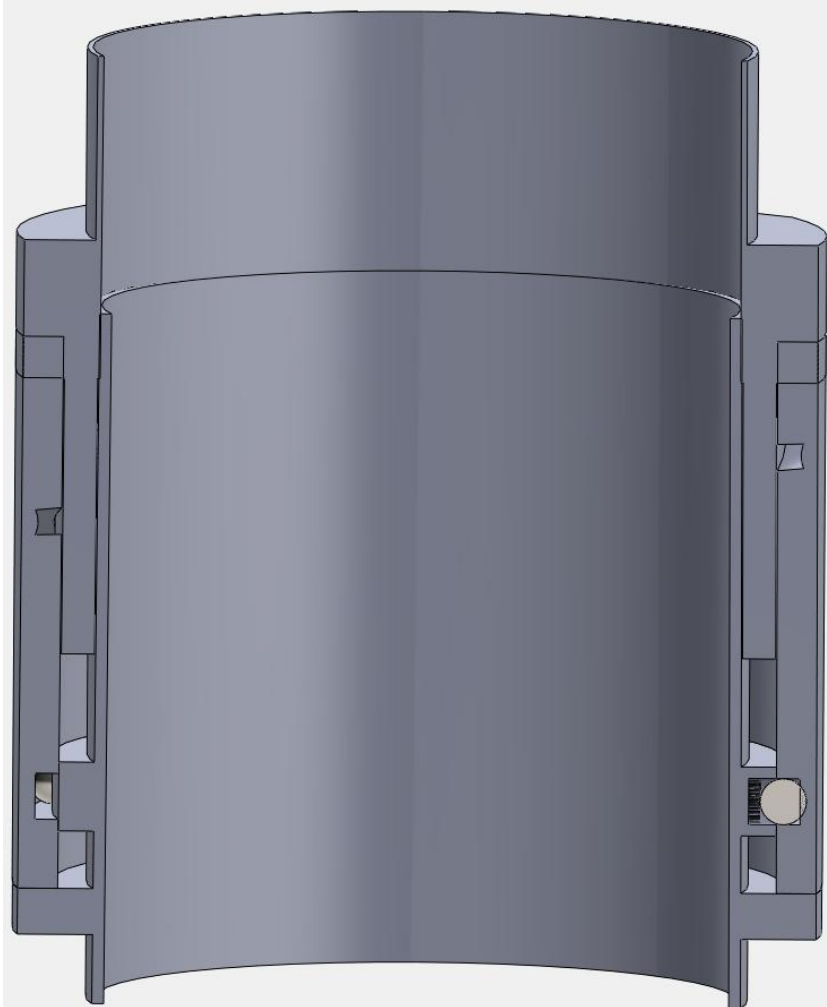
Spring Lever Design



Parts List for Analysis

- Spring Lever Design
 - Levers
 - Male End
 - Internal Female Mate
 - Outer Shell
 - Inner Collar
 - Springs

Ball Bearing Design



Parts List for Analysis

- Ball Bearing Design
 - Springs
 - Male end
 - Inner Female Mate
 - Outer Shell
 - Ball Bearings

Material Analysis

Materials

- Steel alloys
 - Stainless steel
- Aluminum alloys
 - 6000 Series
 - 7000 Series
- Abs plastic

Material Analysis Cont.

	Stainless Steel	Aluminum 6061	Aluminum 7075	Abs plastic
Tensile Yield Strength (kpsi)	31.2	40	73	6.1
Fatigue Strength (kpsi)	35	14	23	11
Brinell Hardness	123	95	150	X
Modulus of Elasticity (kpsi)	28000	10000	10400	310

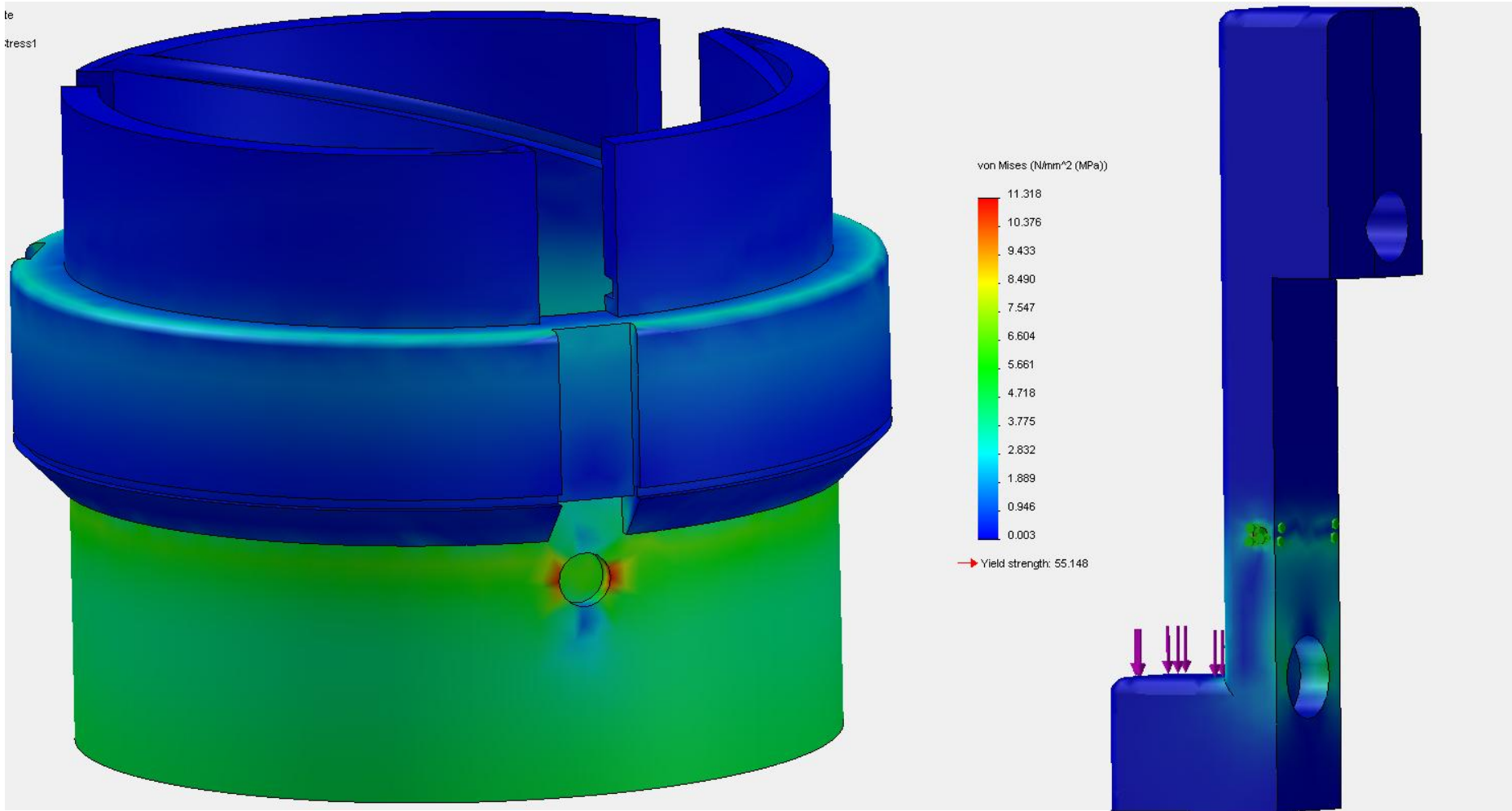
Material Analysis Cont.

Materials								
length (inch)	1	Aluminum alloys				Stainless steel		
force		6061-T6		7075-T6		AISI Type 304		
P = (lbf)	300	σ (stress)	ϵ (strain)	σ (stress)	ϵ (strain)	σ (stress)	ϵ (strain)	ϵ (strain)
Area	(inch ²)	psi	Inch/inch	psi	Inch/inch	psi	Inch/inch	Inch/inch
	0.1	3.00E+03	2.88E-04	3.00E+03	3.00E-04	3.00E+03	1.07E-04	1.03E-04
	0.2	1.50E+03	1.44E-04	1.50E+03	1.50E-04	1.50E+03	5.36E-05	5.17E-05
	0.3	1.00E+03	9.62E-05	1.00E+03	1.00E-04	1.00E+03	3.57E-05	3.45E-05
	0.4	7.50E+02	7.21E-05	7.50E+02	7.50E-05	7.50E+02	2.68E-05	2.59E-05
	0.5	6.00E+02	5.77E-05	6.00E+02	6.00E-05	6.00E+02	2.14E-05	2.07E-05
	0.6	5.00E+02	4.81E-05	5.00E+02	5.00E-05	5.00E+02	1.79E-05	1.72E-05
	0.7	4.29E+02	4.12E-05	4.29E+02	4.29E-05	4.29E+02	1.53E-05	1.48E-05
	0.8	3.75E+02	3.61E-05	3.75E+02	3.75E-05	3.75E+02	1.34E-05	1.29E-05
	0.9	3.33E+02	3.21E-05	3.33E+02	3.33E-05	3.33E+02	1.19E-05	1.15E-05
	1	3.00E+02	2.88E-05	3.00E+02	3.00E-05	3.00E+02	1.07E-05	1.03E-05
	1.1	2.73E+02	2.62E-05	2.73E+02	2.73E-05	2.73E+02	9.74E-06	9.40E-06
	1.2	2.50E+02	2.40E-05	2.50E+02	2.50E-05	2.50E+02	8.93E-06	8.62E-06
	1.3	2.31E+02	2.22E-05	2.31E+02	2.31E-05	2.31E+02	8.24E-06	7.96E-06
	1.4	2.14E+02	2.06E-05	2.14E+02	2.14E-05	2.14E+02	7.65E-06	7.39E-06
	1.5	2.00E+02	1.92E-05	2.00E+02	2.00E-05	2.00E+02	7.14E-06	6.90E-06
	1.6	1.88E+02	1.80E-05	1.88E+02	1.88E-05	1.88E+02	6.70E-06	6.47E-06
	1.7	1.76E+02	1.70E-05	1.76E+02	1.76E-05	1.76E+02	6.30E-06	6.09E-06
	1.8	1.67E+02	1.60E-05	1.67E+02	1.67E-05	1.67E+02	5.95E-06	5.75E-06
	1.9	1.58E+02	1.52E-05	1.58E+02	1.58E-05	1.58E+02	5.64E-06	5.44E-06
	2	1.50E+02	1.44E-05	1.50E+02	1.50E-05	1.50E+02	5.36E-06	5.17E-06

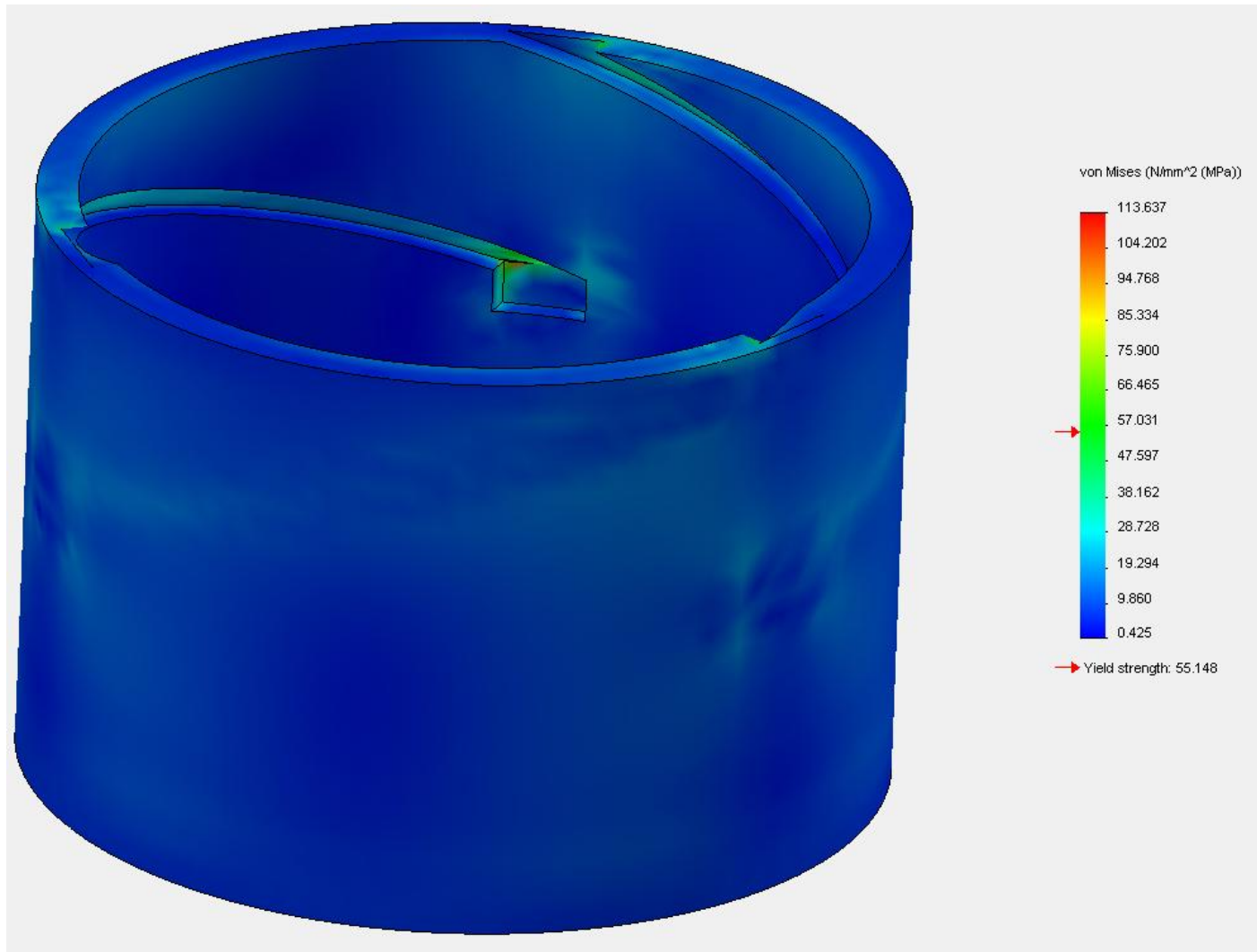
Stress Analysis

- Assumptions
 - Non finalized cross sectional area
 - Material
 - Assume horizontal de-mate (no pull angle yet)
 - Perfect reliability
 - Frictionless de-mate

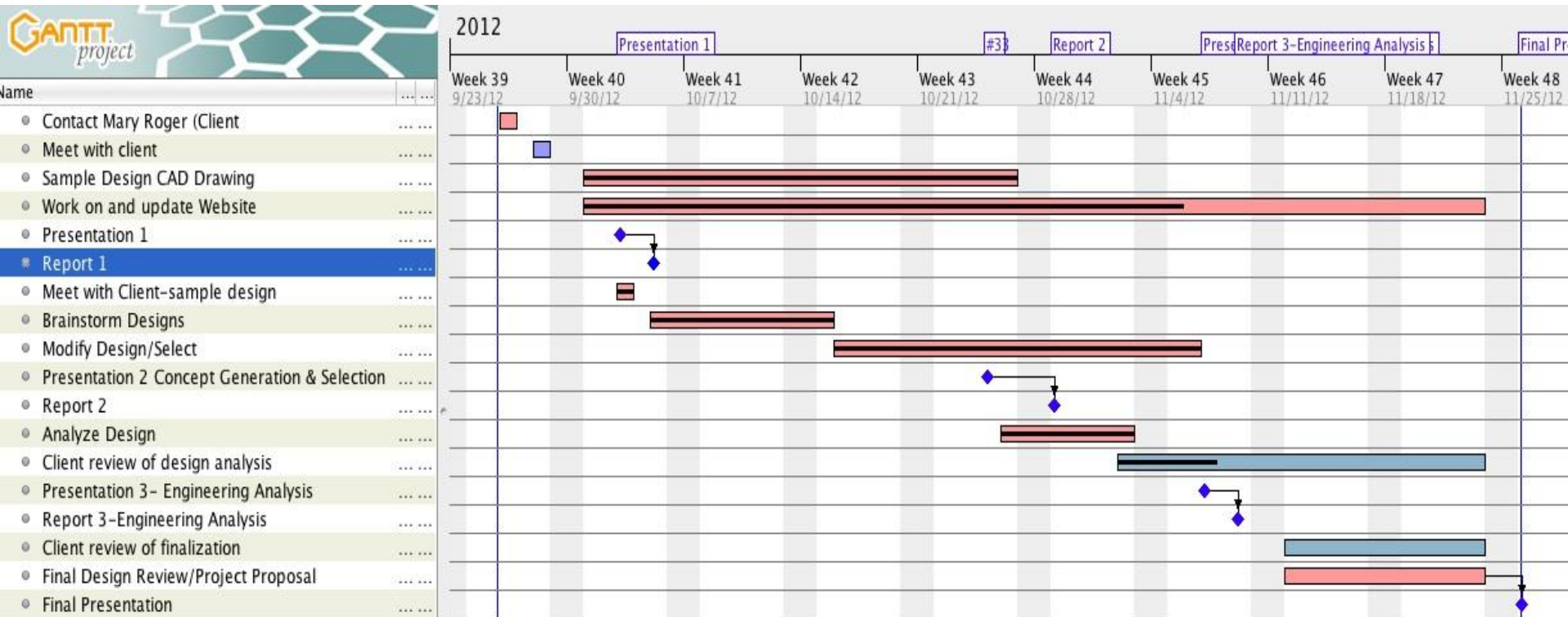
Analysis of the Spring Lever Parts



Analysis of the Ball Bearing Parts



Updated Gantt Chart



References

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Questions?