Engineering Analysis: Quick Change Electrical Connection

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Overview

- Problem Statement
- Concept Selection
- Analysis
- Gantt Chart
- Conclusion

Intro

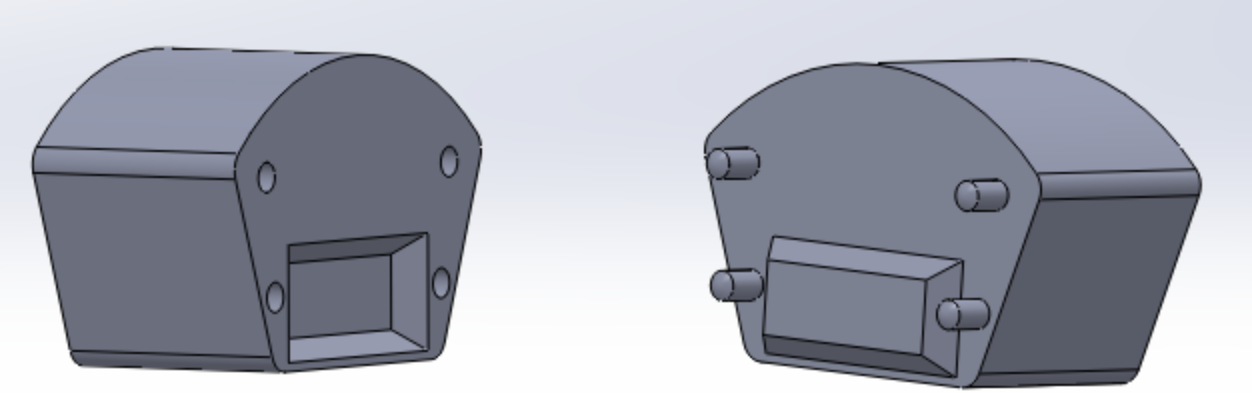
- Client: Raytheon Missile Systems
  - Started 90 years ago
  - Defense, aerospace, and government applications
- Quick Change Electrical Connection

Problem Statement

- The current nose assembly is unable to provide the ability to quickly install the nose without compromising the electrical connection.
- Goal
  - Design an improved electrical connection alignment.

Concept Selection

- Solid Guided Connection

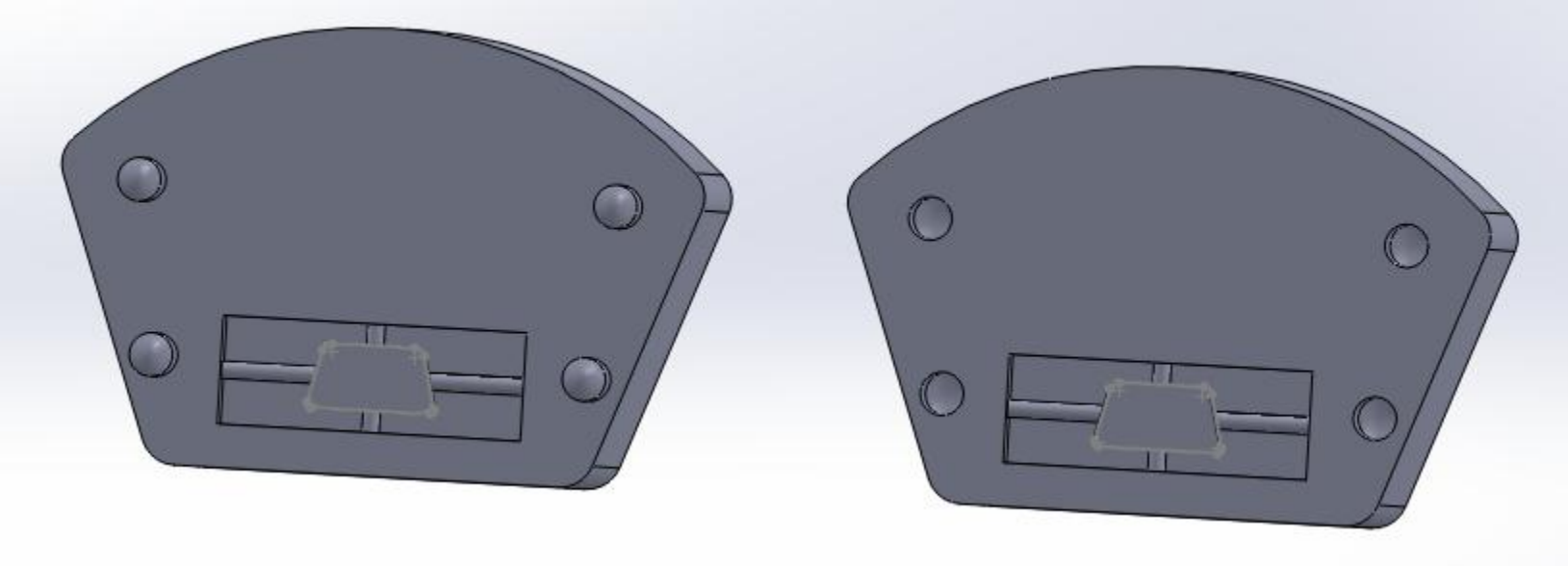


Concept Selection

Category	Weight	Score
Power Loads	.407	1.628
Cost	.051	.204
Maintenance	.097	.582
Operating Conditions	.445	2.67
Totals	**1.00**	**5.084**

Concept Generation

- Stabilizing Rods

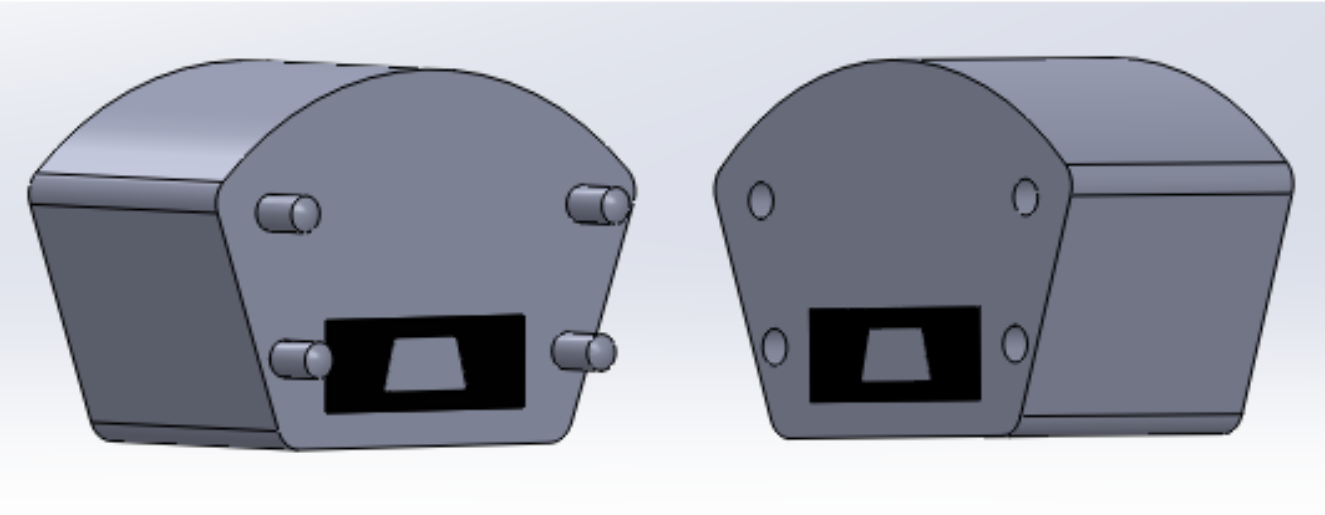


Concept Selection

Category	Weight	Score
Power Loads	.407	2.035
Cost	.051	.102
Maintenance	.097	.194
Operating Conditions	.445	1.78
Totals	**1.00**	**4.111**

Concept Generation

- Flexible Material



Concept Selection

Category	Weight	Score
Power Loads	.407	1.221
Cost	.051	.153
Maintenance	.097	.388
Operating Conditions	.445	2.225
Totals	**1.00**	**3.987**

Analysis

- Focus on evaluating materials under the specified operating conditions
  - Power Loads
    - Transportation Loads
    - Bomb Rack Ejection
  - Temperature
  - Sand/Dust
  - Vibration
  - Water/Ice
  - Salt
  - Jet Fuel

Analysis

- Ideal Material Properties
  - Low Thermal Conductivity
  - Corrosion/Rust Resistant
  - Ductile
  - High Hardness
  - High Tensile Strength
- Trying to find the best balance

Analysis

- Solid Guided Connection

- Most Important Criteria: Modulus of Elasticity
  - Need Ductile Material
  - Stainless Steel
    - E = 27.6 Mpsi
  - Carbon Steel
    - E = 30.0 Mpsi
  - Aluminum
    - E = 10.4 Mpsi

Analysis

- Stabilizing Rods

- Most Important Criteria: Power Loads
  - Must resist forces acting on the rods
- Axial and Normal Bending w/ Temperature Effects:

$$\sigma = \frac{Mc}{I}$$

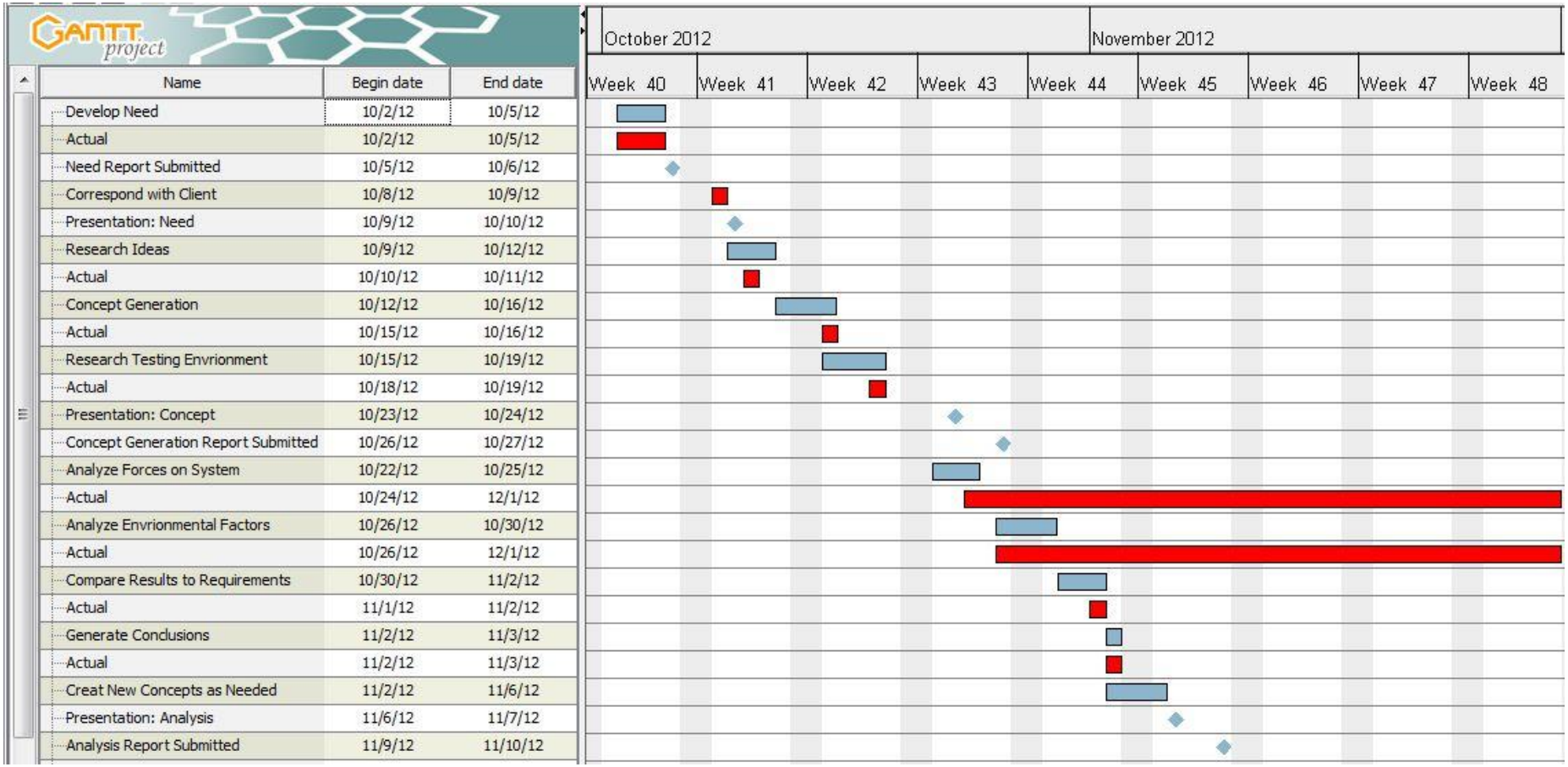
$$\sigma = -\epsilon E = -\alpha(\Delta T)E$$

Analysis

- Flexible Material

- Further Research needed due to lack of background knowledge
- Possible Material Ideas:
  - Silicon
  - Rubber

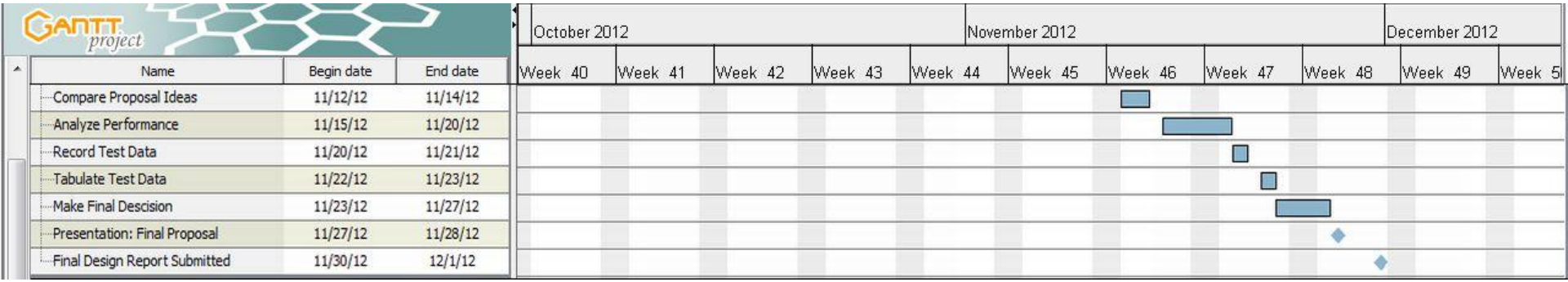
Gantt Chart



Name	Begin date	End date
Develop Need	10/2/12	10/5/12
Actual	10/2/12	10/5/12
Need Report Submitted	10/5/12	10/6/12
Correspond with Client	10/8/12	10/9/12
Presentation: Need	10/9/12	10/10/12
Research Ideas	10/9/12	10/12/12
Actual	10/10/12	10/11/12
Concept Generation	10/12/12	10/16/12
Actual	10/15/12	10/16/12
Research Testing Envrionment	10/15/12	10/19/12
Actual	10/18/12	10/19/12
Presentation: Concept	10/23/12	10/24/12
Concept Generation Report Submitted	10/26/12	10/27/12
Analyze Forces on System	10/22/12	10/25/12
Actual	10/24/12	12/1/12
Analyze Envrionmental Factors	10/26/12	10/30/12
Actual	10/26/12	12/1/12
Compare Results to Requirements	10/30/12	11/2/12
Actual	11/1/12	11/2/12
Generate Conclusions	11/2/12	11/3/12
Actual	11/2/12	11/3/12
Creat New Concepts as Needed	11/2/12	11/6/12
Presentation: Analysis	11/6/12	11/7/12
Analysis Report Submitted	11/9/12	11/10/12

Gantt Chart

- Upcoming Timeline



Name	Begin date	End date
Compare Proposal Ideas	11/12/12	11/14/12
Analyze Performance	11/15/12	11/20/12
Record Test Data	11/20/12	11/21/12
Tabulate Test Data	11/22/12	11/23/12
Make Final Descision	11/23/12	11/27/12
Presentation: Final Proposal	11/27/12	11/28/12
Final Design Report Submitted	11/30/12	12/1/12

Conclusion

- Problem Statement
- Concept Selection
- Analysis
- Gantt Chart

Questions?