Midpoint Review Presentation: Quick Change Electrical Connection

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Overview

- Problem Statement Recapitulation
- Criteria
- Final Proposal
- Design Changes
- Current Design
- Next Steps
- Testing
- Gantt Chart
- Conclusion
- Questions

Intro

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

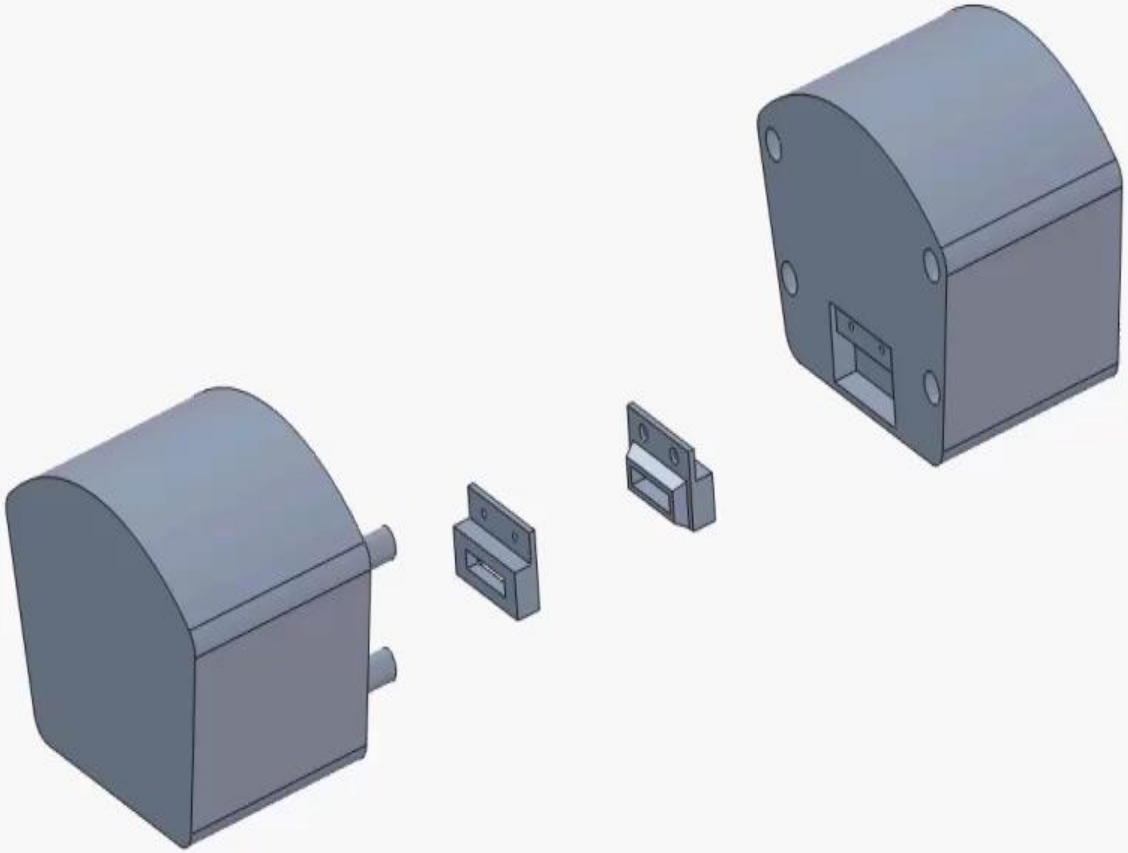
Problem Statement

- 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.

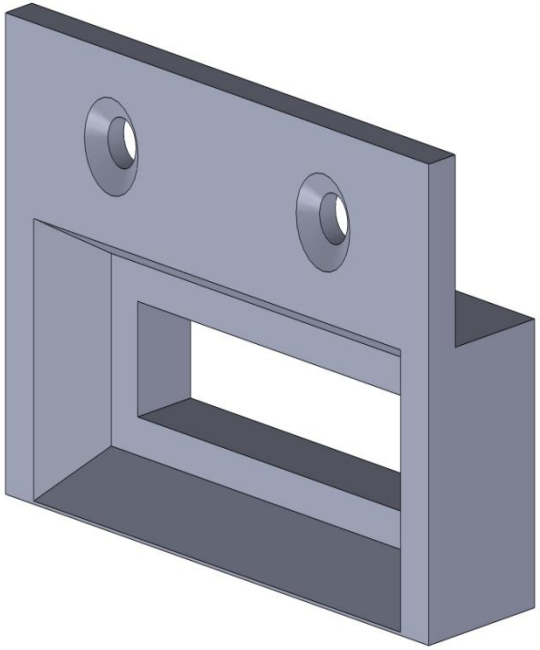
Constraints

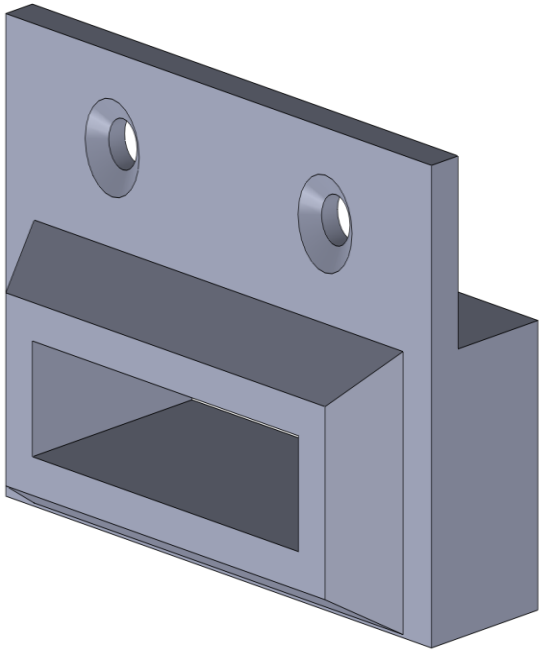
- Focus on evaluating materials under the specified operating conditions
  - Power Loads
    - Transportation Loads
    - Bomb Rack Ejection
  - Temperature
  - Sand/Dust
  - Vibration
  - Water/Ice
  - Salt
  - Jet Fuel

Proposed Design



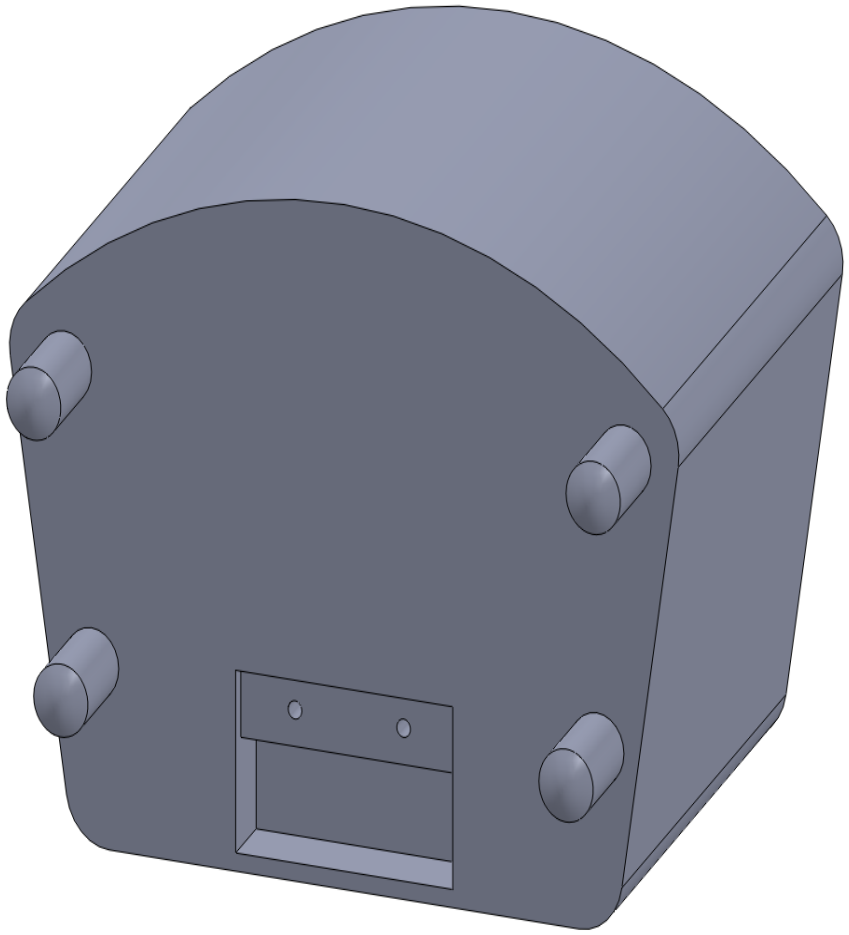
Proposed Design





Electrical Connector
Similar to:

Proposed Design



Material Selection

- Outside shell of missile will take most of the forces produced from bomb rack ejection
  - Corrosion is more important
- Material Choice: AISI 303 Stainless Steel
  - Annealed
    - Makes it Stronger and Less Brittle
  - E = 27.6 Mpsi
  - Yield Strength = 35 kpsi
  - Ultimate Strength = 87.3 kpsi
  - Resistant to Corrosion
  - Melting Point: 1400 ° C

Cost Analysis: For Us

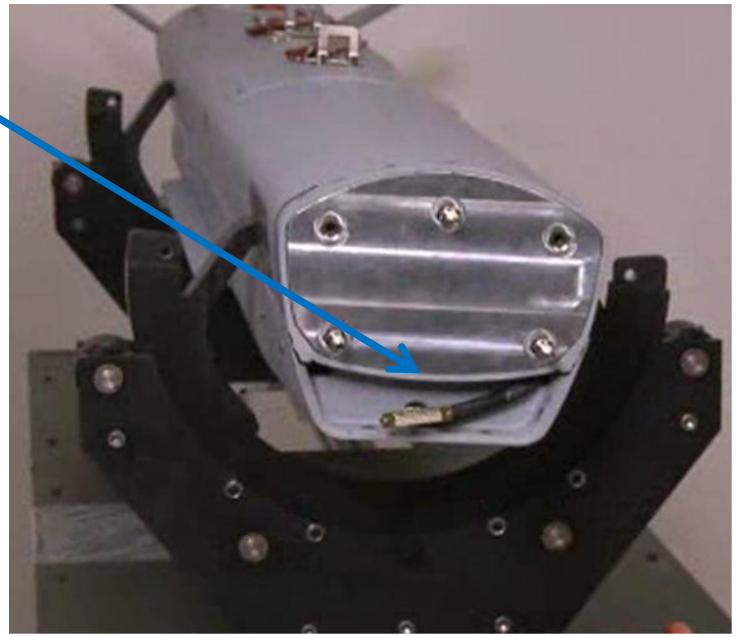
Category	Units	Cost
Material	$3-6 per kg	$7.20
Manufacturing	Free (Machine Shop)	
Electrical Connector	$20	$20
Totals		**$27.20**

Cost Analysis: For Raytheon

Category	Units	Cost
Material	$3-6 kg	$7.20
Manufacturing	Man Hours	4 hours ~ $80
Production Cost	Man Hours	2 hours ~ $40
Electrical Connector	Glenair Unit Price	$40
Totals		$167.20

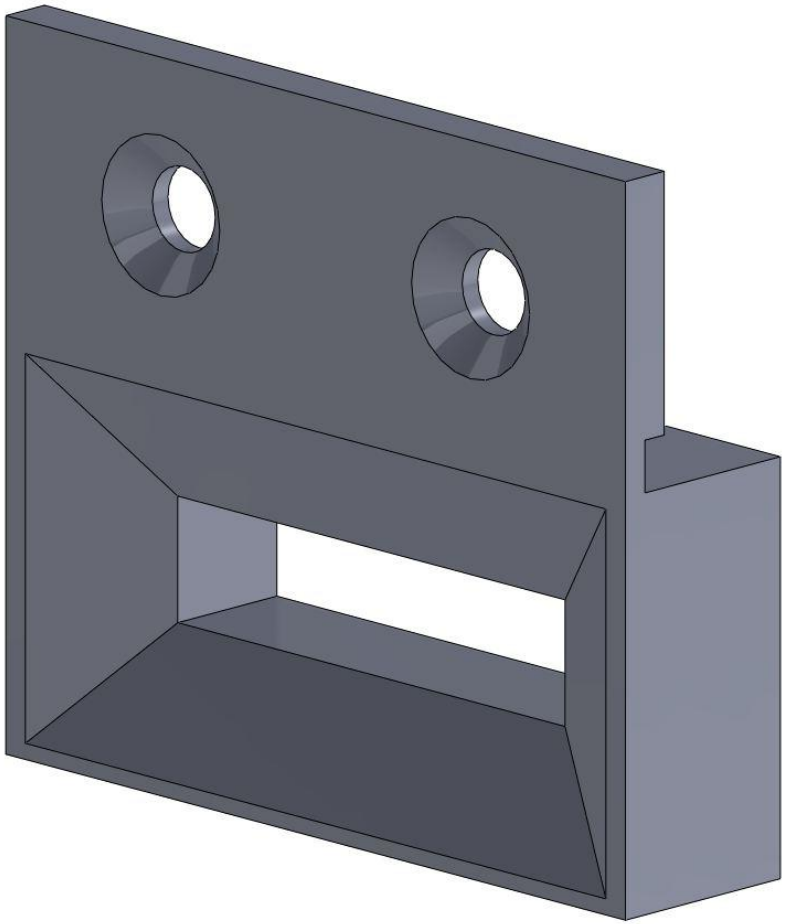
Revisions

- Can work with tin plate above:
  - Can not go past 2 inch depth
  - Can not cut thin layer
  - Field Replaceable
    - 2 Electrical Connector System
  - Preload
    - Must be able to mate with 40lbs
    - One person must put it together

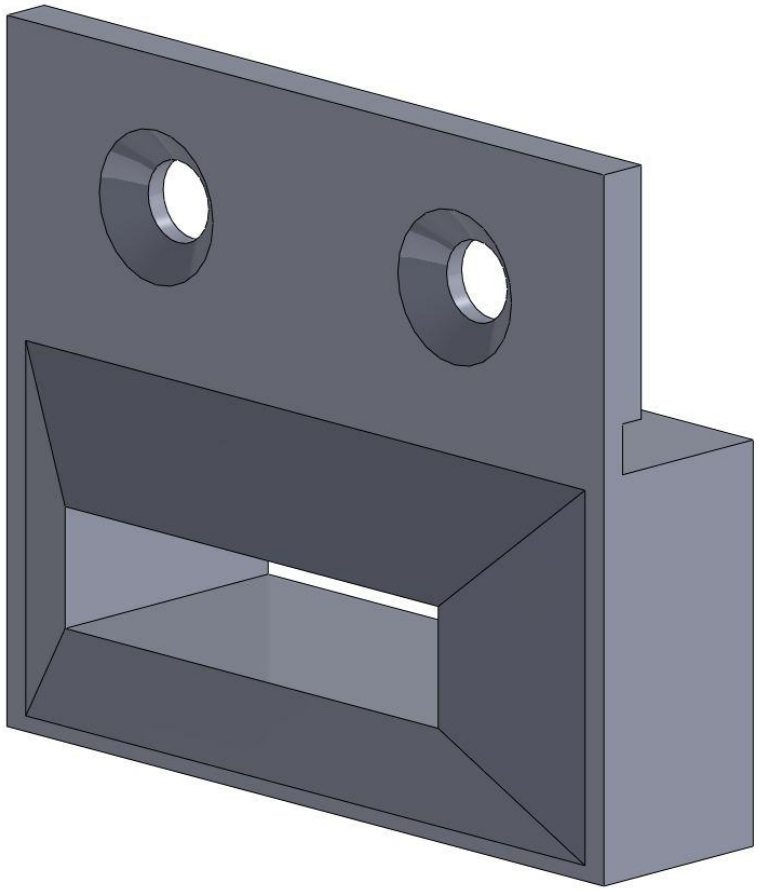


New Design

Body Side



Nose Side



Next Steps

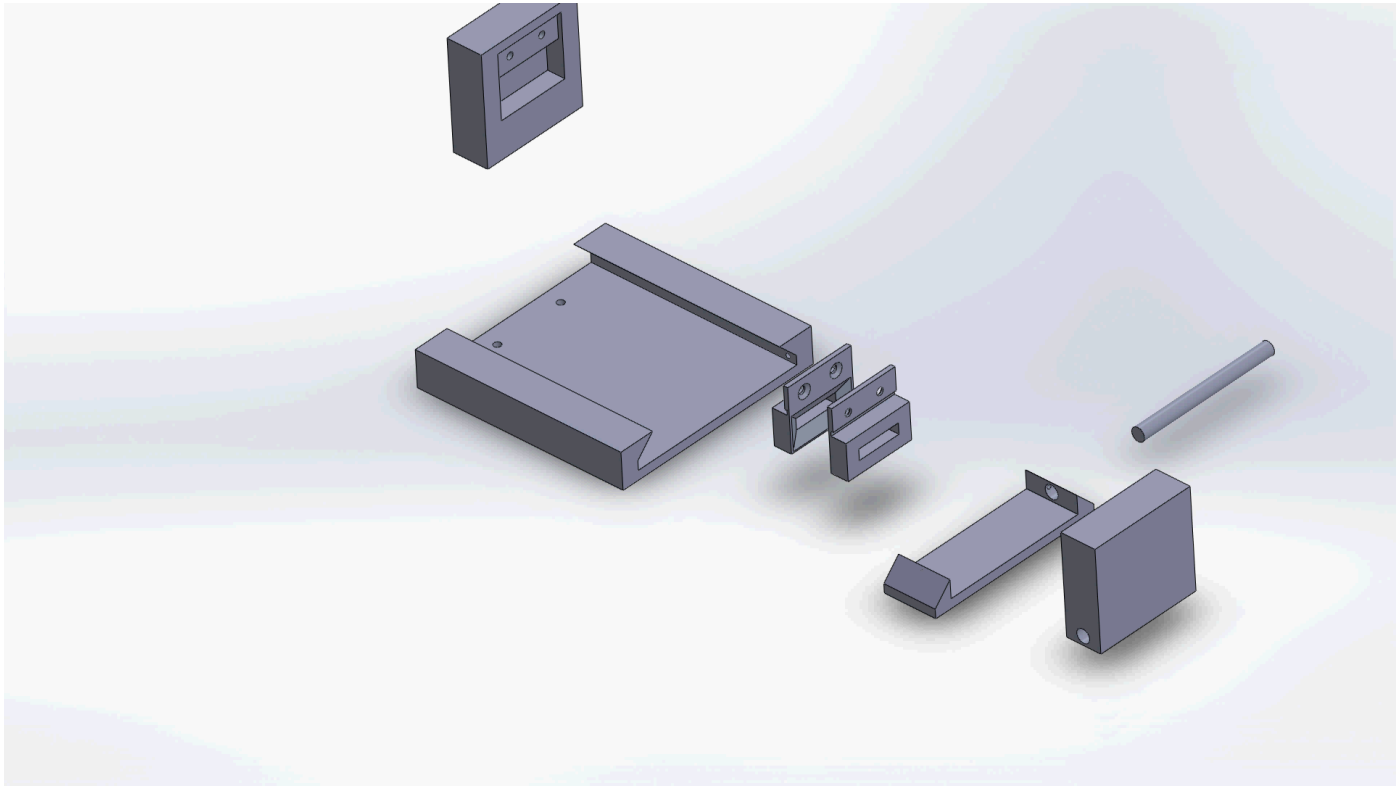
- Prototype
  - Acquiring Electrical Connector
- Test
- Perform Calculations
  - Vibrations
  - Mechanics of Materials
  - Statics
  - Dynamics
    - Mating Forces

Machining

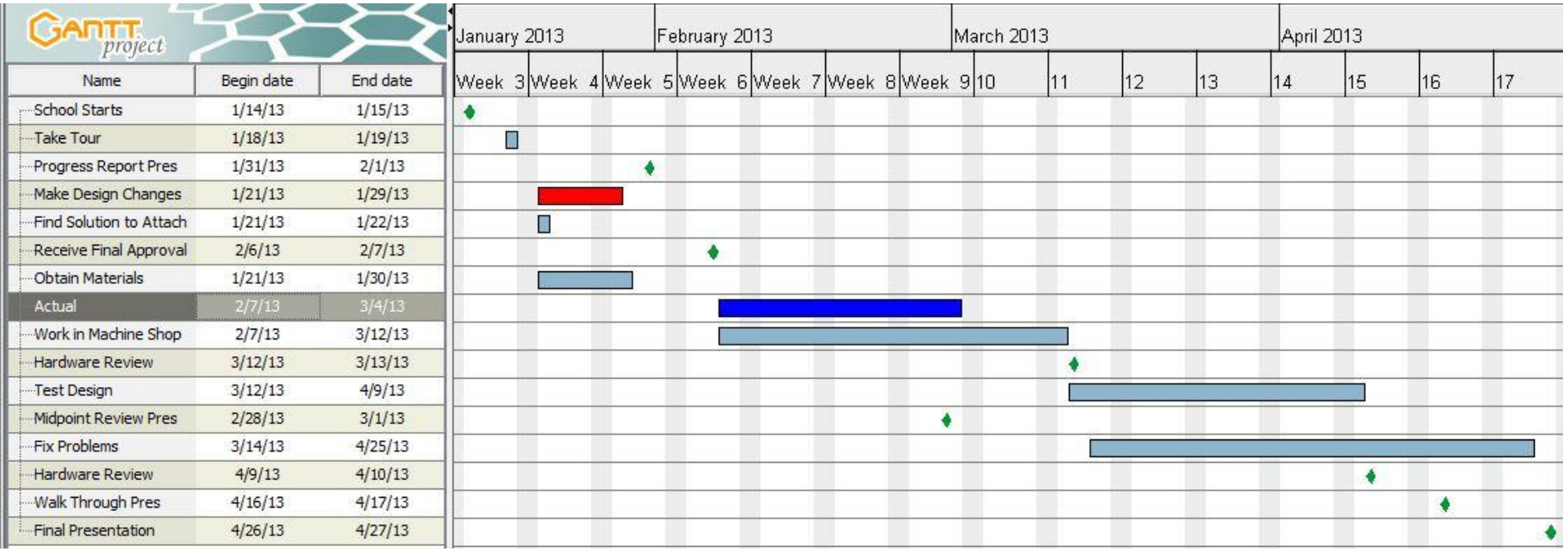
- Transferring Design to CAM Works
- Expensive to obtain AISI 303 Stainless Steel
  - Must buy in bulk
  - Do we need to use stainless steel for prototype?
    - Is aluminum an option?
- Not sure if machine shop can machine our part
  - Talk with Perry Wood Tuesday 2/26
- Receive Quotes

Testing

- 2 Axis Mating System



Gantt Chart



Name	Begin date	End date
School Starts	1/14/13	1/15/13
Take Tour	1/18/13	1/19/13
Progress Report Pres	1/31/13	2/1/13
Make Design Changes	1/21/13	1/29/13
Find Solution to Attach	1/21/13	1/22/13
Receive Final Approval	2/6/13	2/7/13
Obtain Materials	1/21/13	1/30/13
Actual	2/7/13	3/4/13
Work in Machine Shop	2/7/13	3/12/13
Hardware Review	3/12/13	3/13/13
Test Design	3/12/13	4/9/13
Midpoint Review Pres	2/28/13	3/1/13
Fix Problems	3/14/13	4/25/13
Hardware Review	4/9/13	4/10/13
Walk Through Pres	4/16/13	4/17/13
Final Presentation	4/26/13	4/27/13

Conclusion

- Problem Statement
- Final Proposal
- Revisions
- Current Design
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Questions?