Systems Design Review

Cockpit-to-Motion Table

Andy Birkel, Christina Cignarale, Matt Glynn, Daniyar Tokkozha

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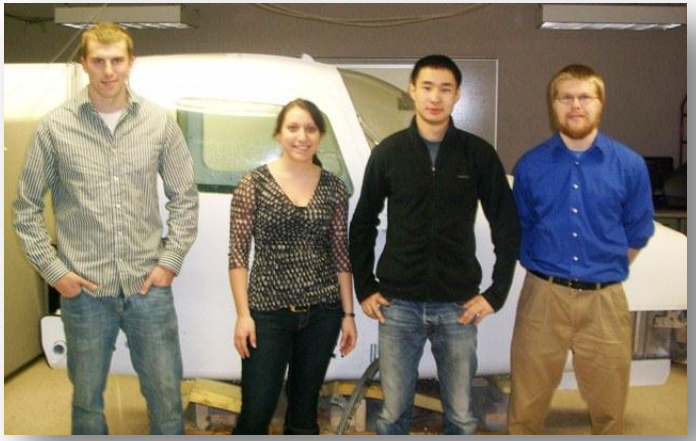
Personal Introductions

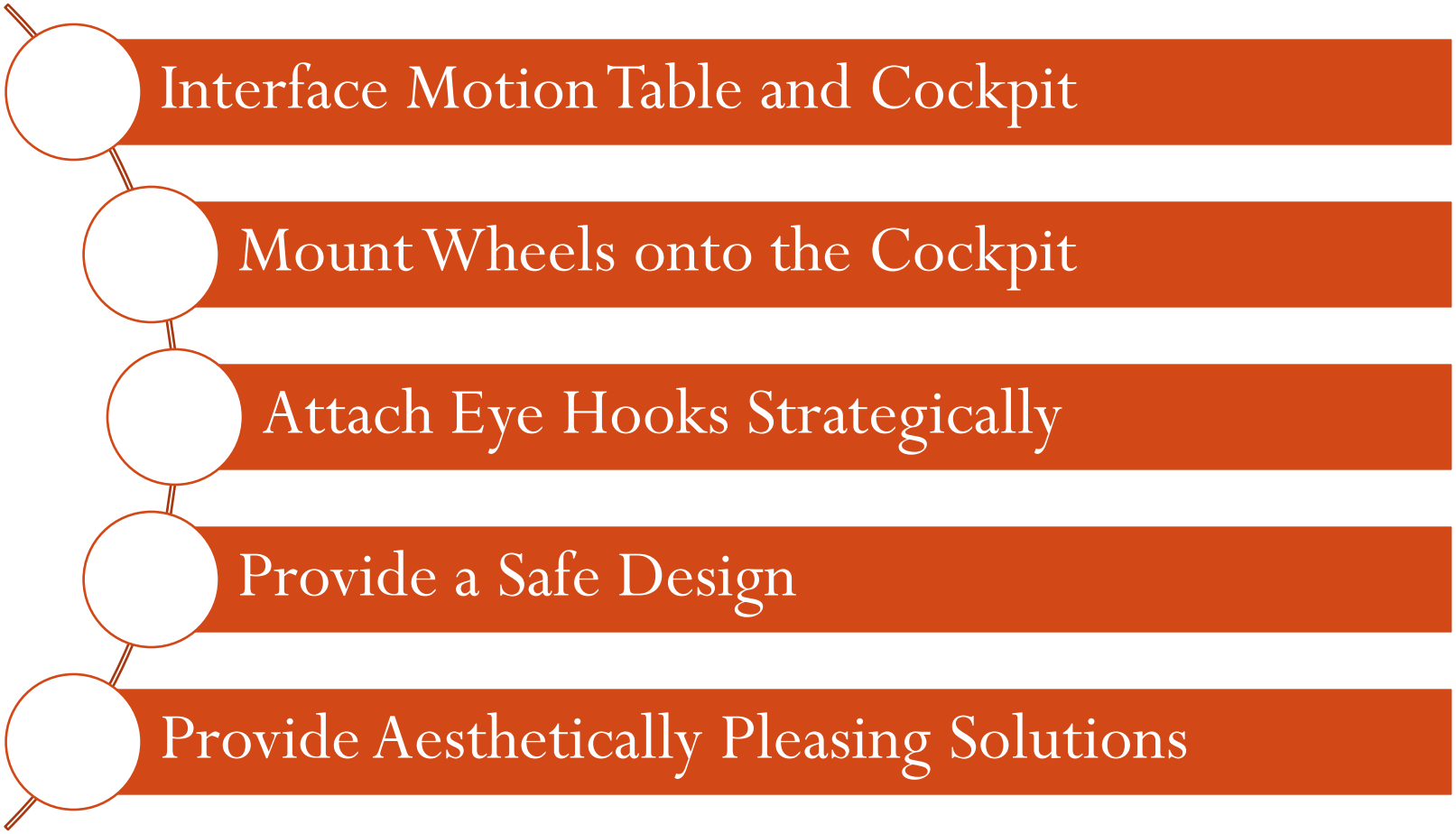


Team Member	Role	Discipline
Andrew Birkel	Lead Engineer	ME
Christina Cignarale	Project Manager	IE
Matthew Glynn	Engineer	ME
Daniyar Tokkozha	Engineer	ME

Presentation Outline

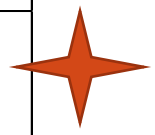
- Introduce Project Scope
- Review Customer Specifications & Needs
- Review Functional Decomposition
- Present Concept 1
- Present Concept 2
- Present Concept 3
- Present Selection Matrix
- Estimated Costs
- Discuss Risk Assessment
- Discuss Project Plan
- Open Discussion

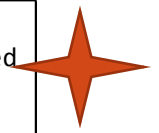
Scope


Interface Motion Table and Cockpit
Mount Wheels onto the Cockpit
Attach Eye Hooks Strategically
Provide a Safe Design
Provide Aesthetically Pleasing Solutions

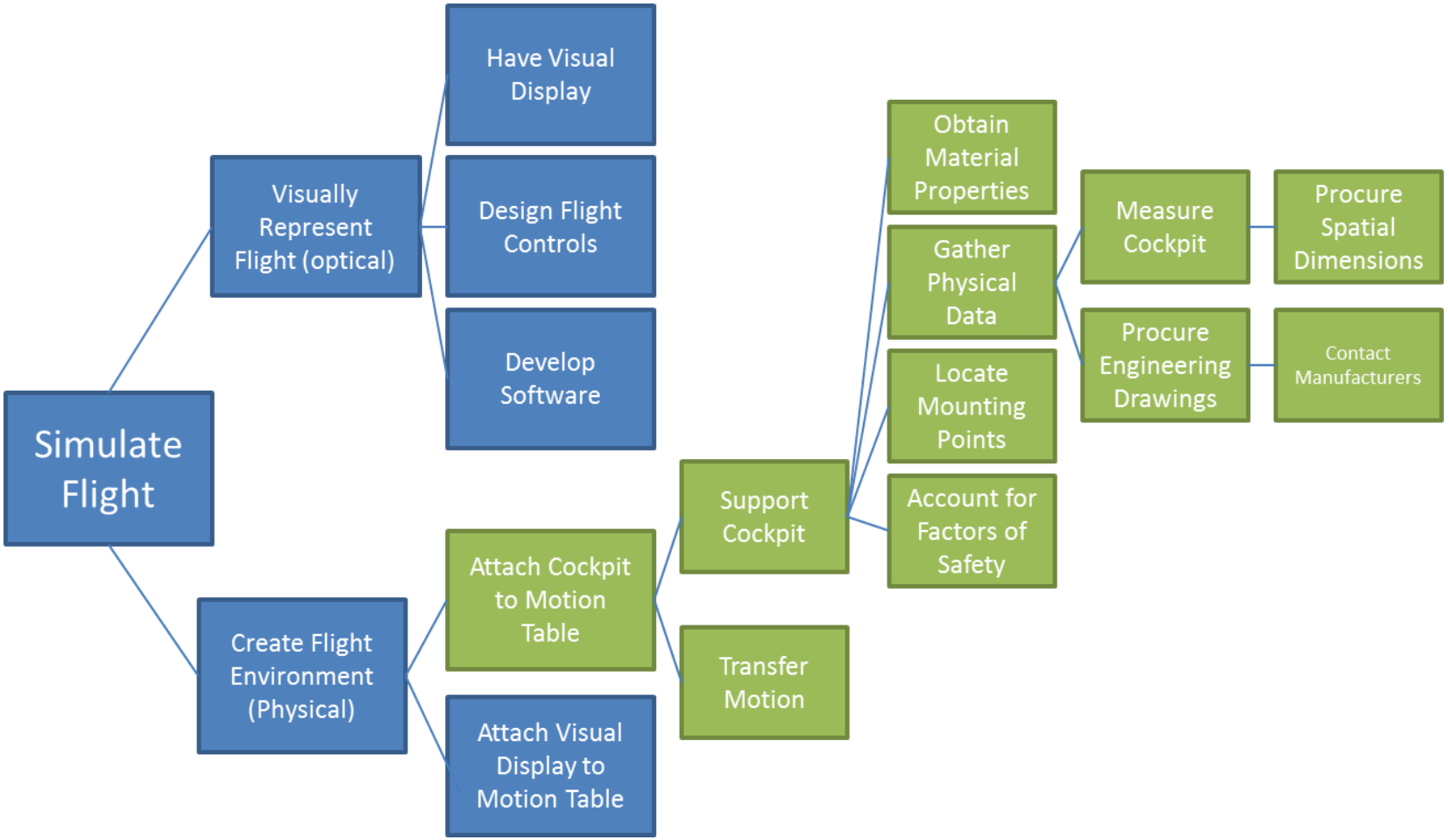
Customer Needs

Customer Needs	*Specifications*
The cockpit needs to be robustly mounted via an adaptor plate to the 6-DOF motion platform.	Adaptor must be rigid
The adaptor plate must be able to accommodate the mass of the cockpit, the visual displays, and two adult male pilots.	The adaptor plate needs to support **TBD** mass of the cockpit, display and pilots.
Given the dynamics environment of the cockpit and motion platform interface the adaptor plate will have to be analyzed and designed from a non-static perspective.	the adaptor must be able to withstand the **forces** produced from the flight simulation program
Transportation: the adaptor must be able to be disassembled	
Aesthetics: the solution must be professional and crafted in a manner that symbolizes the quality inherent in MOOG products	Design needs to be aesthetically pleasing as well as durable
The cockpit needs to be mounted to simulation table using pre-existing mounting hole pattern	The **mounting pattern** on the 6-DOF motion table is FIXED and will be provided by MOOG.
Project must be under budget specified by MOOG	Total cost of labor and materials must be under $5000
Engineering Drawings of the adaptor plate solution	Engineering Drawing Packet, Part, Solid Model, & Assembly Files





Functional Decomposition



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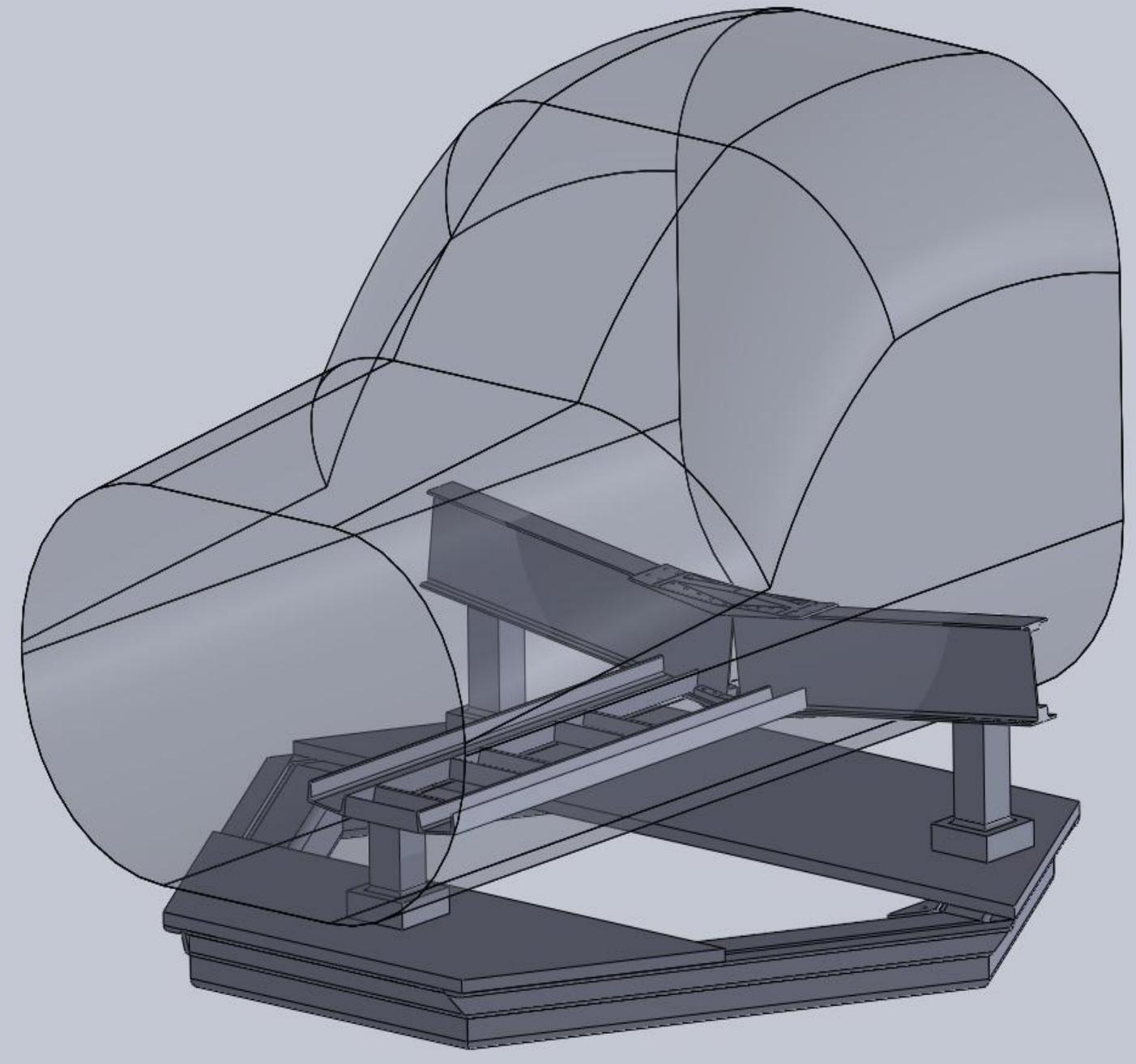
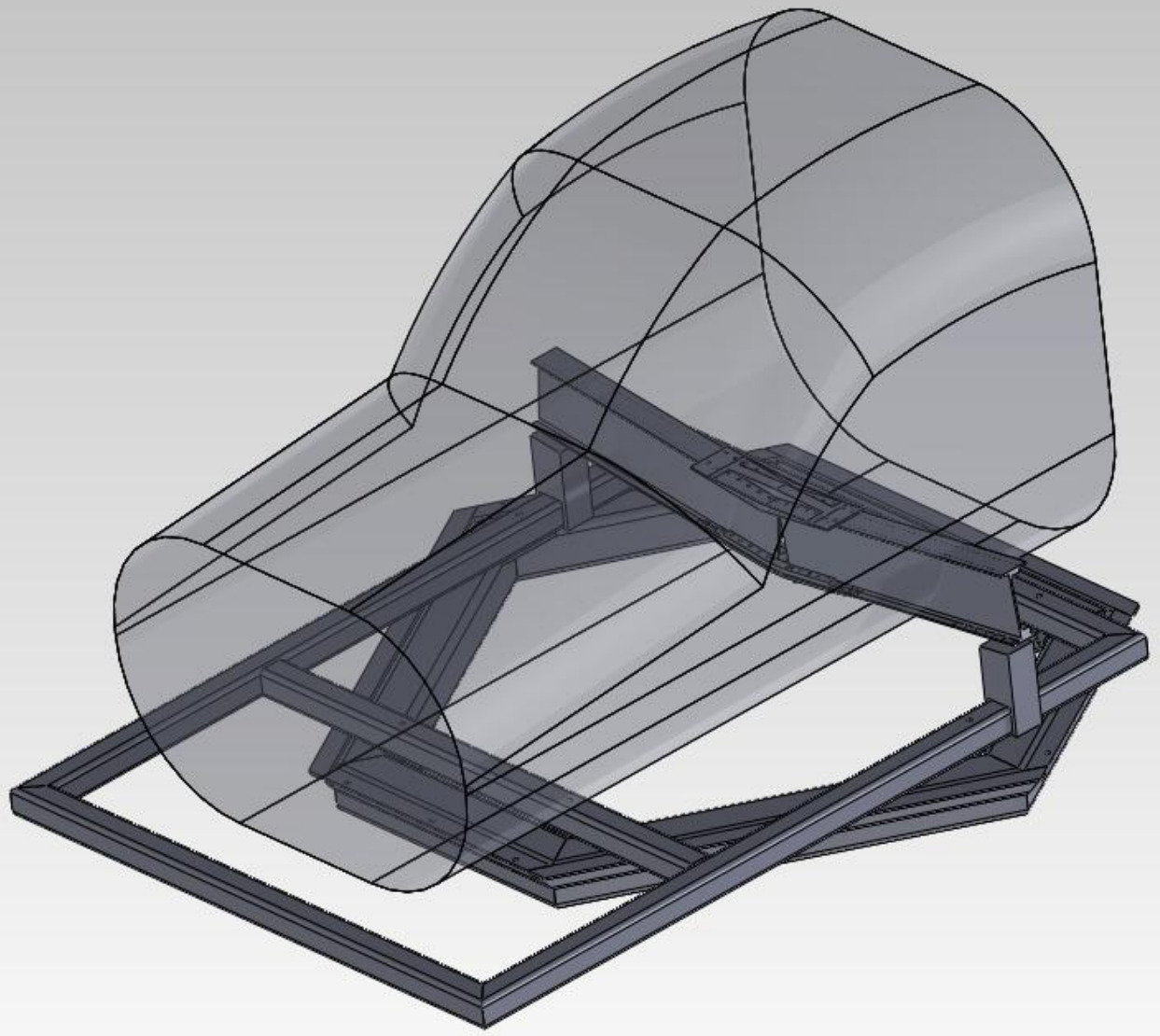
Design Concept 1: Plate Design

- Use Plates for interfacing the cockpit pylons and motion table
- Assuming Screen Visuals not mounted on the Motion Table
- Mount casters off pylons
- Aesthetically pleasing



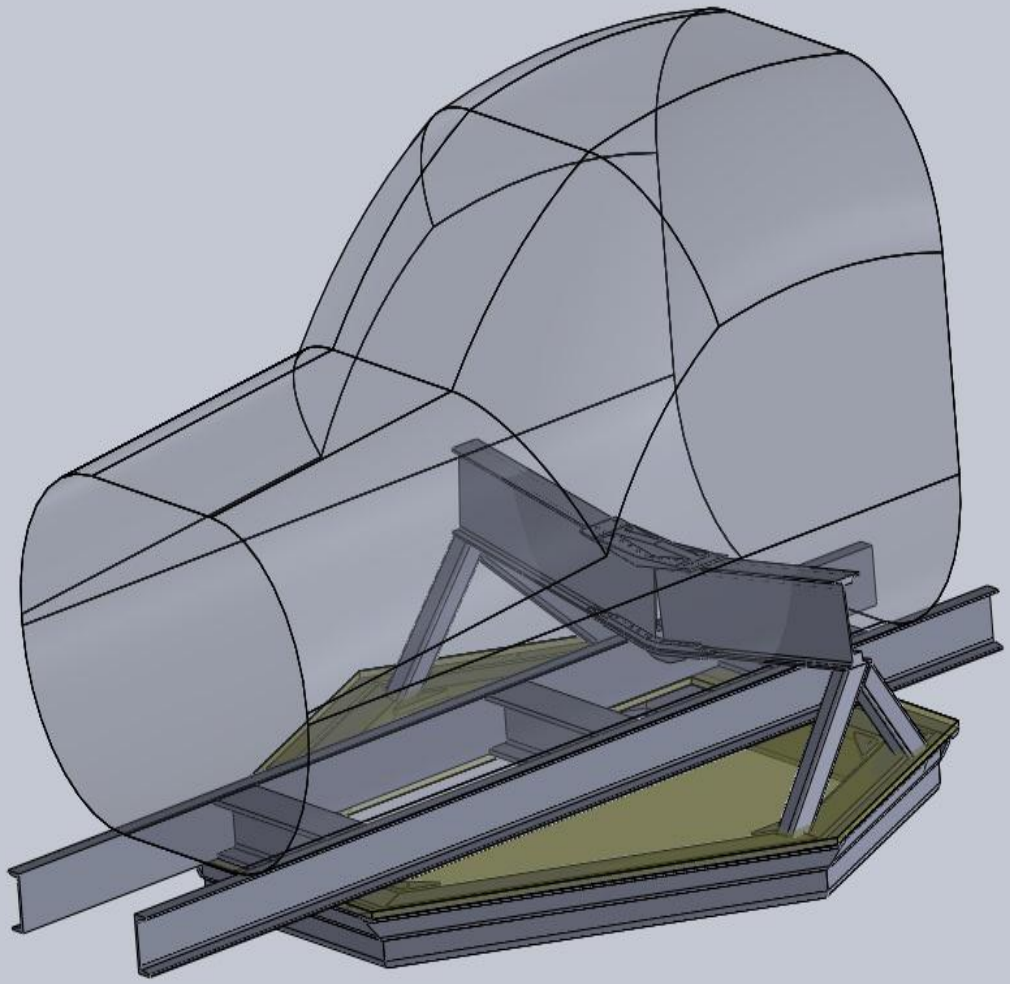
Design Concept 2: Tube Framework

- Use Framework for interfacing the cockpit pylons and motion table
- Mount visual screen(s) equipment off framework
- Mount casters off pylons



Design Concept 3:Framework & Plate

- Use Plate for interfacing the cockpit pylons and motion table
- Mount visual screen(s) equipment off framework
- Mount casters off pylons



Design Comparison Matrix

		Concepts								
		A			B			C		
		(reference)								
		Plate			Framework			Plate & Framework		
Selection Criteria	Weight	Rating	Notes	Wtd	Rating	Notes	Wtd	Rating	Notes	Wtd
Rigidity	30%	1		0.30	2		0.60	3		0.90
Cost of Materials	10%	2	need to outsource labor	0.20	3	labor done by us	0.30	1	need to outsource labor	0.10
Manufacturability	15%	2		0.30	3		0.45	1		0.15
Ease of Dissassembly	10%	3	unbolt plate from motion table	0.30	3	unbolt framework from motion table	0.30	3	unbolt plate from motion table	0.30
Weight	5%	2		0.10	3		0.15	1		0.05
Optimal Use of Materials	5%	2		0.10	3		0.15	1		0.05
Aesthetically Pleasing	25%	3		0.75	1		0.25	2		0.50
	Total Score	2.05			2.20			2.05		
	Rank	2			1			2		

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Estimated Costs

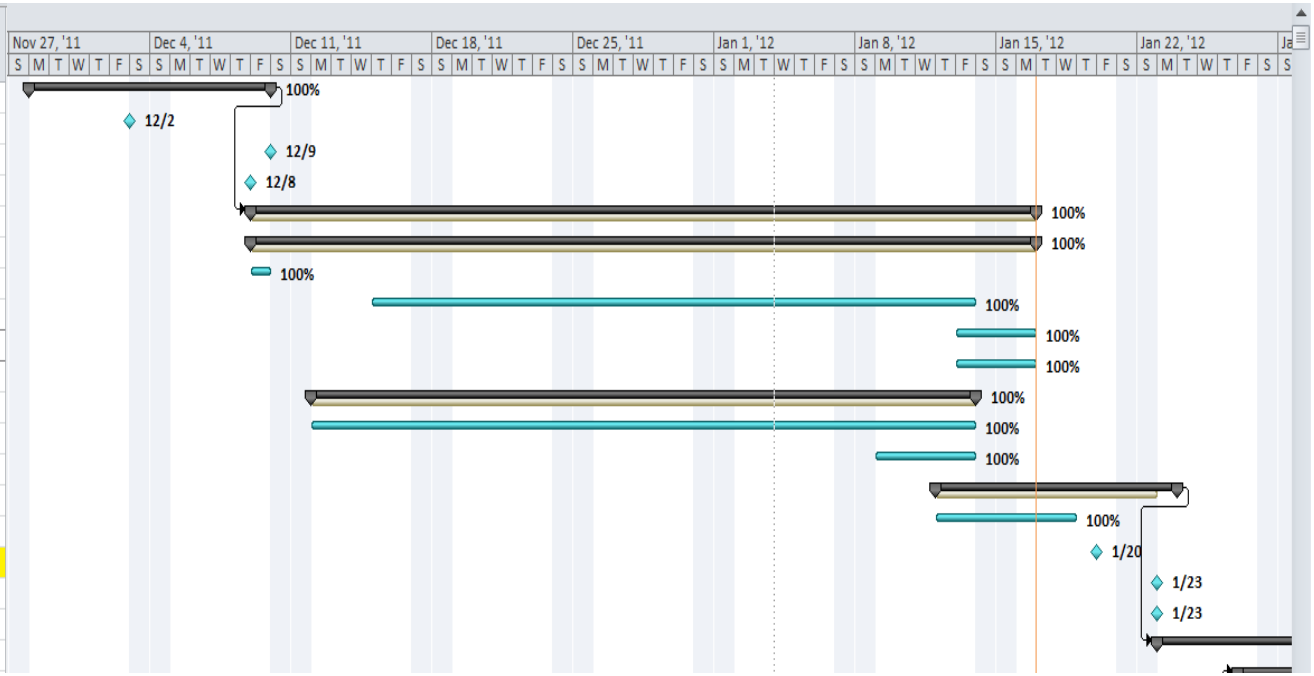
Concept	Suggested Materials	Range
(1) Plate	1/2"-1" steel	$2000-$3000
(2) Frame	sq tubing (3" x 3")	$750-$800
(3) Plate & Frame	both	$3000-$4000

Risk Assessment

Function	Potential Failure	Cause	Mitigation Strategies	Level of Risk
Motion Table must support Cockpit and all equipment for the simulation	Motion Table cannot move the cockpit	The Design is too heavy	Design an interface that is not too heavy for the Motion Table	low
Design must be rigid	Part or all of the interface flexes while Motion Table is moving	The Design is not rigid enough to withstand the given forces	Peform force tests to ensure the design will not flex	medium
Design may need to support visual displays	The interface is too small to incorporate the visual display system	The Design was not made large enough for the visual display system	Consult with Visual Display Team to ensure our design can incorporate their design	medium
Design needs to be done within the budget	Design costs more than the budget	Materials chosen were too expensive, Needed to redo the design, etc	review all calculations prior to material ordering, scope out vendors	low
Design needs to be finished at the end of next quarter	Design is not finished by the end of spring quarter	the lead time for manufacturing or materials is delayed	Ask for lead times before a vendor is chosen	high
Need materials delivered to RIT	Materials cannot be delivered here	no transportation that can get materials to RIT	investigate how material can be delivered to RIT before ordered	medium

Project Plan

Task Name	Duration	Start	Finish
Preliminary Actions	**10 days**	**Mon 11/28/11**	**Fri 12/9/11**
Determine Customer I	0 days	Mon 11/28/11	Fri 12/2/11
Determine Customer S	0 days	Mon 11/28/11	Fri 12/9/11
Determine Project Rol	0 days	Thu 12/8/11	Thu 12/8/11
Systems Level Design	**27 days**	**Fri 12/9/11**	**Mon 1/16/12**
Design Generation	**27 days**	**Fri 12/9/11**	**Mon 1/16/12**
Functional Decomp	1 day	Fri 12/9/11	Fri 12/9/11
Generate Concept D	22 days	Thu 12/15/11	Fri 1/13/12
Consult Visual Displ	2 days	Fri 1/13/12	Mon 1/16/12
Compare Design Ide	2 days	Fri 1/13/12	Mon 1/16/12
Modeling	**25 days**	**Mon 12/12/11**	**Fri 1/13/12**
Model the plane	25 days	Mon 12/12/11	Fri 1/13/12
Model the motion t	5 days	Mon 1/9/12	Fri 1/13/12
Systems Design Review	**8 days**	**Thu 1/12/12**	**Mon 1/23/12**
Make Design Review p	5 days	Thu 1/12/12	Wed 1/18/12
Present Systems Level	0 days	Fri 1/20/12	Fri 1/20/12
Review Design Review	0 days	Mon 1/23/12	Mon 1/23/12
Select Final Design for	0 days	Mon 1/23/12	Mon 1/23/12
Detailed Design	**25 days**	**Mon 1/23/12**	**Fri 2/24/12**



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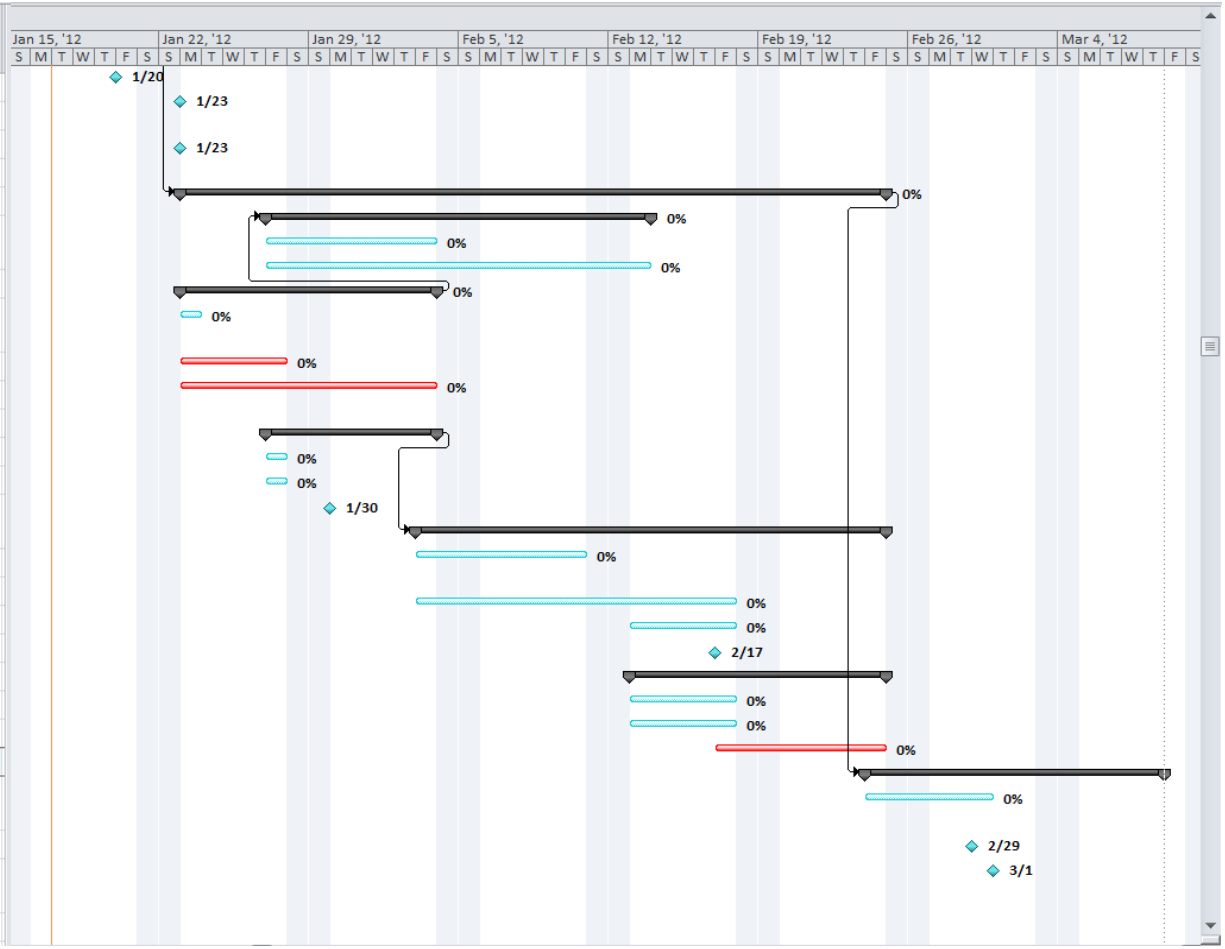
Project Plan (cont.)

Task Name	Duration	Start	Finish
Detailed Design	**25 days**	**Mon 1/23/12**	**Fri 2/24/12**
Create Final Models	**12 days**	**Fri 1/27/12**	**Mon 2/13/12**
Model the Attachments	6 days	Fri 1/27/12	Fri 2/3/12
Model the entire system	12 days	Fri 1/27/12	Mon 2/13/12
Gather Data for Design	**10 days**	**Mon 1/23/12**	**Fri 2/3/12**
Determine Mounting Locations	1 day	Mon 1/23/12	Mon 1/23/12
Weigh Cockpit	5 days	Mon 1/23/12	Fri 1/27/12
Procure Forces from Motion Table	10 days	Mon 1/23/12	Fri 2/3/12
Develop Test Plans	**6 days**	**Fri 1/27/12**	**Fri 2/3/12**
Generate Test Ideas	1 day	Fri 1/27/12	Fri 1/27/12
Review Test Ideas	1 day	Fri 1/27/12	Fri 1/27/12
Select Test Ideas	0 days	Mon 1/30/12	Mon 1/30/12
Analysis	**16 days**	**Fri 2/3/12**	**Fri 2/24/12**
Analyze Stress & Deflection on Base Plate	6 days	Fri 2/3/12	Fri 2/10/12
Analyze Fatigue	11 days	Fri 2/3/12	Fri 2/17/12
Risk Analysis	5 days	Mon 2/13/12	Fri 2/17/12
Verify Specifications are met	0 days	Fri 2/17/12	Fri 2/17/12
Material Selection	**10 days**	**Mon 2/13/12**	**Fri 2/24/12**
Research Materials	5 days	Mon 2/13/12	Fri 2/17/12
Research Material Vendors	5 days	Mon 2/13/12	Fri 2/17/12
Create BOM	6 days	Fri 2/17/12	Fri 2/24/12
Detailed Design Review	**10 days**	**Fri 2/24/12**	**Thu 3/8/12**
Make Design Review presentation	4 days	Fri 2/24/12	Wed 2/29/12
Present Systems Level Design	0 days	Wed 2/29/12	Wed 2/29/12
Review Design Review Feedback	0 days	Thu 3/1/12	Thu 3/1/12



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Open Discussion