

Synthetic Aperture Radar Imager

Team 18 Spring 2016: Presentation I

MEMBERS:

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DESMOND PRESSEY

SPONSOR: NORTHROP GRUMMAN

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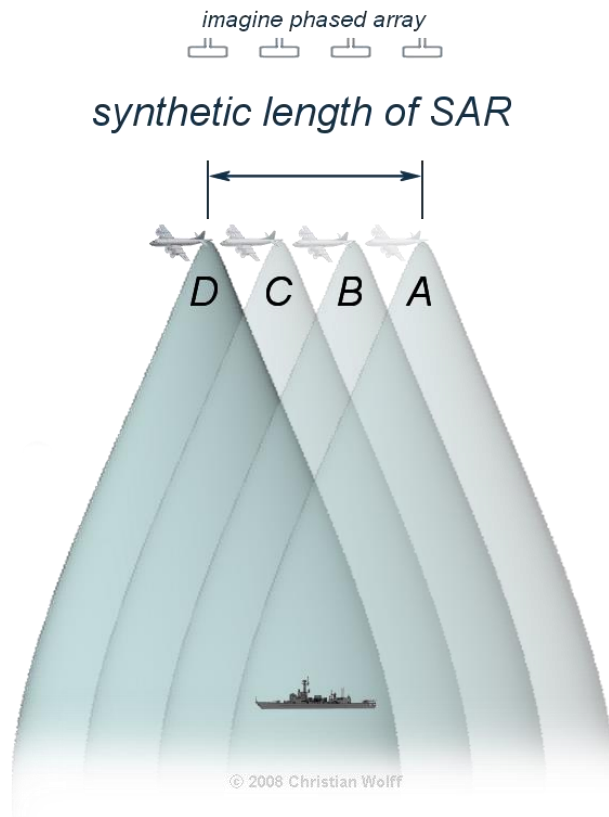
INSTRUCTOR: DR. NIKHIL GUPTA

DATE: 1/19/2016

Outline

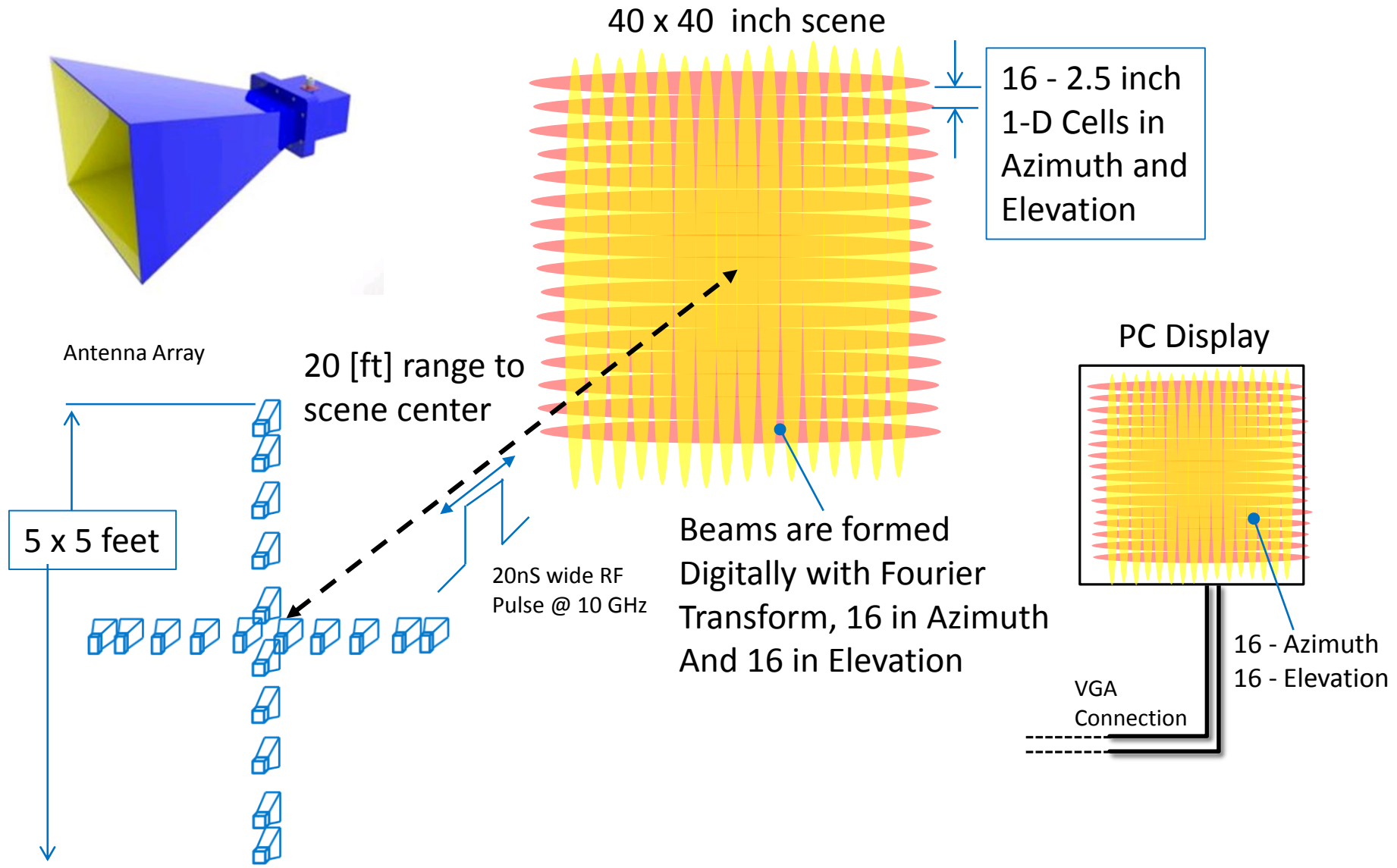
- Review of Project Scope
- Review Previous Progress
- Design Updates
- Procurement
- Schedule and Future Plans

Working SAR



[1]

Imaging Radar Operational Concept



[4]

Project Goals

Create a Synthetic Aperture Radar:

- Project Features:
 - Weapons detection for homeland security
 - Stationary
 - Low resolution
 - Concealable
 - Low Cost
 - Relatively mobile



Project Organization

- ME Team
 - Structure
 - Horn holders
- EE Team
 - Hardware Box
 - Signal processing

Second Generation Improvements

- Mobility
 - Attach wheels
- Weight
 - < 80 lbs
- Horn Adjustment
 - Aligned within 1ft circle at 20ft away
- Stability
 - Movement causes artificial phase shift
 - Max movement: 1/72 inch
- Cost
 - Minimize



1st Generation Project – Class of 2015

Prioritizing Engineering Characteristics

Customer Requirements	Customer Importance	Engineering Characteristics								
		Structural Thickness	Material Used	Locking Mechanism	Axis Adjustability	Mounting Mechanism	Base size	Height Above Ground	Number of Crossbeams	Weight
Increased Stability	5	9	3	6		3	9	6	6	
Lower Weight	5	3	9				6	3	6	9
Good Images	5			6	9	9		3		
Better Horn Mounting	5			9	9	9				
Cost	4	3	6	3		3	3		3	
Hardware Box	2	3	6							3
Portability	2		6				9	6		9
Score		18	30	24	18	24	27	18	15	21
Relative Weight		78	108	117	90	117	105	72	72	69
Rank		6	3	1	5	1	4	7	7	9

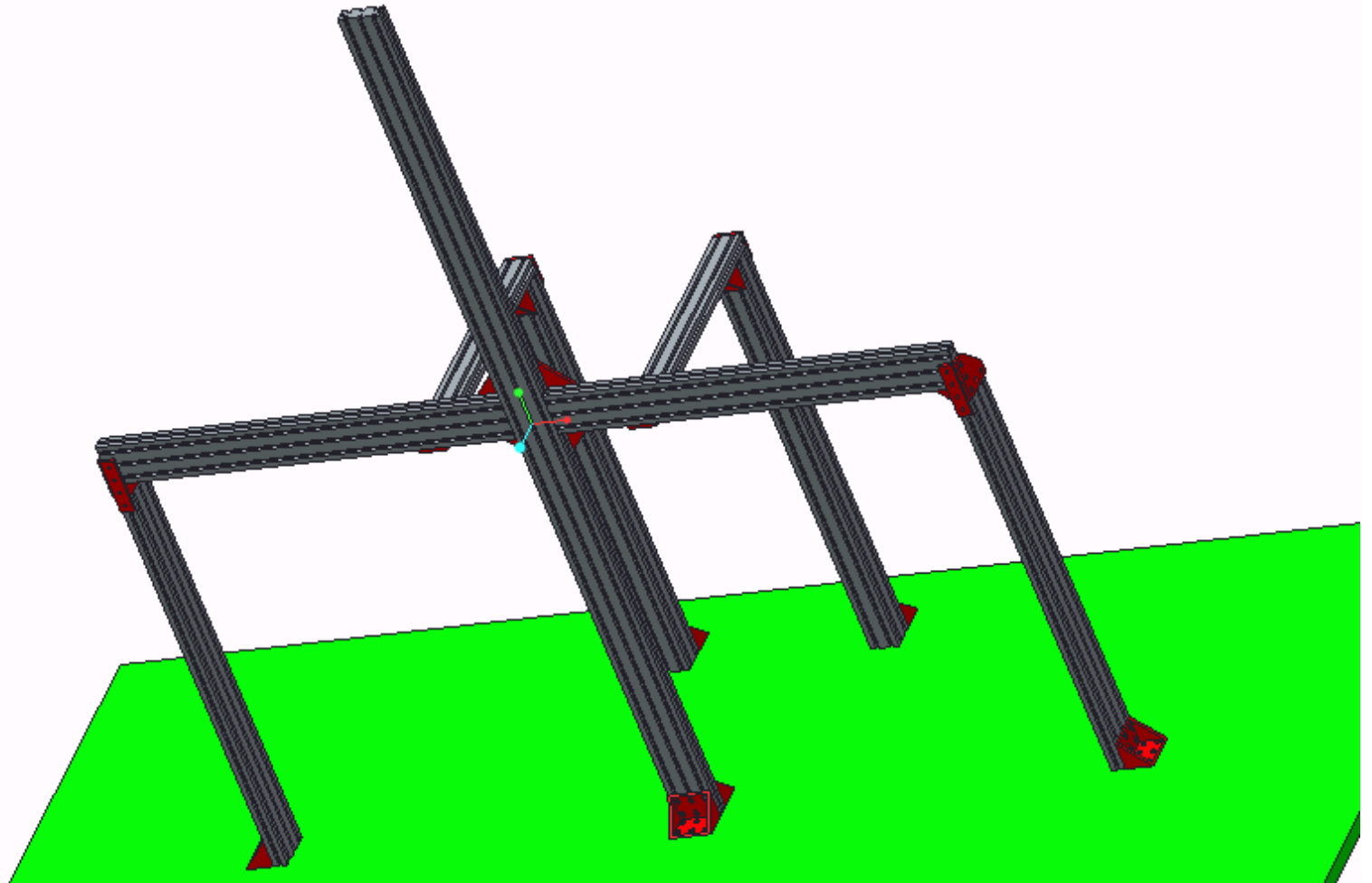
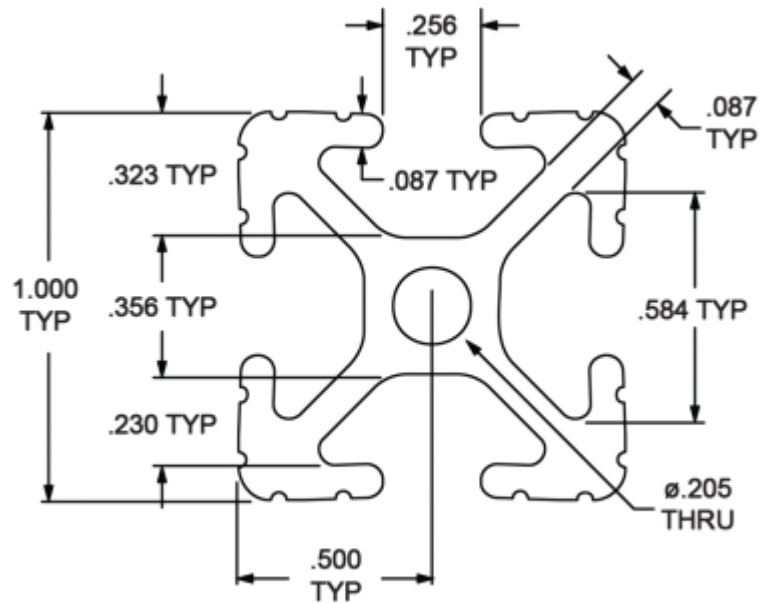
Most Important EC's:

1. **Mounting Mechanism**
1. **Locking Mechanism**
3. Material Used
4. Base Size
5. Axis Adjustability
6. Structural Thickness
7. Height Above Ground
7. Number of Crossbars
9. Weight

Key:	
■	#1 Important EC
■	#2 Important EC
■	#3 Important EC

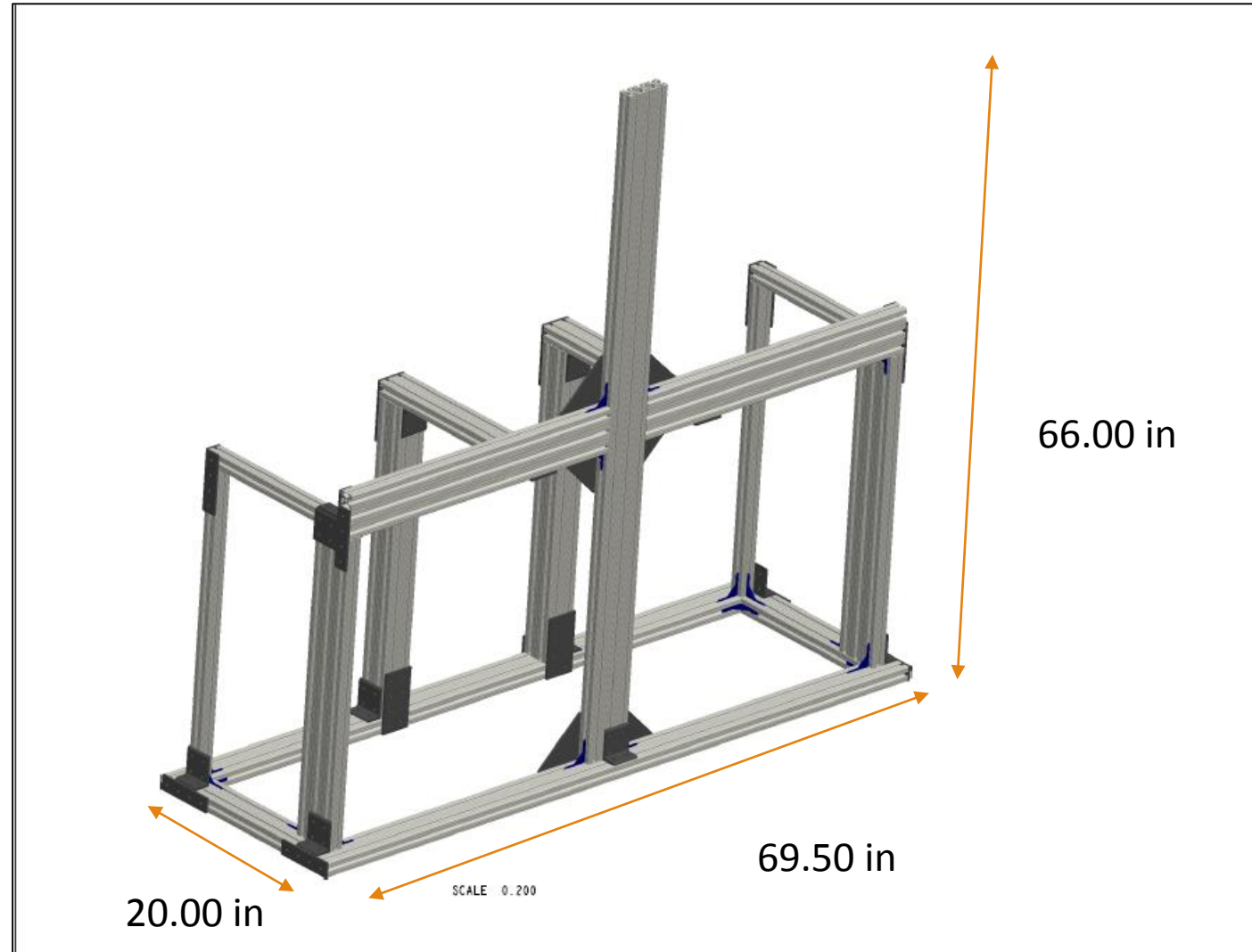
Structure: Version 1

- 80/20 Design
 - Lightweight
 - Cheap
 - Modular
 - Light machining required



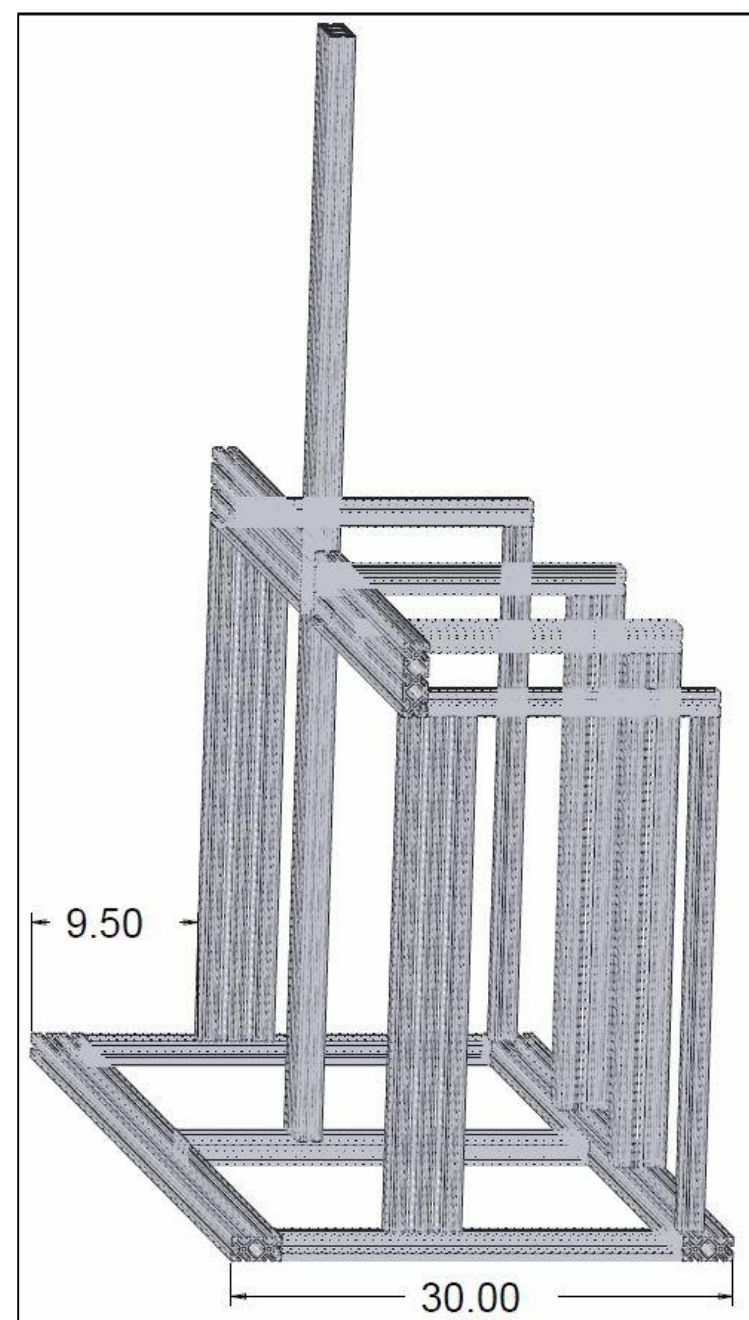
Structure: Version 3

- Increased cross section width from 1.00" to 1.50"
- Added:
 - Bottom frame
 - Outer Braces
 - Brackets
- Possible leveling castors



Structure: Version 4

- Increased stability
 - Extended horizontal bar on bottom



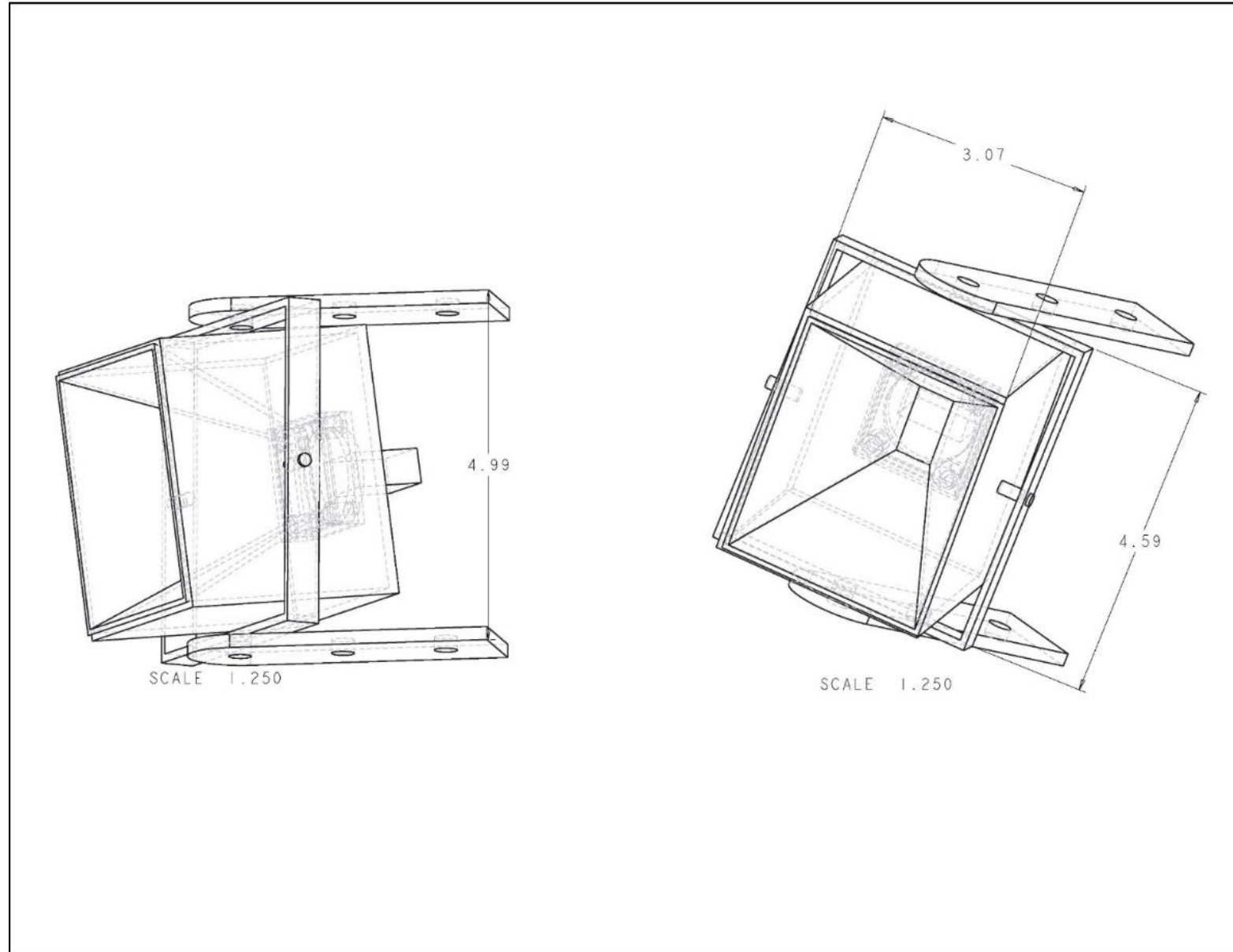
Structure: Version 5

- Reduced weight
 - Change from 1.50" cross section width bar to 1.00"
- Fixed possible radar interference
 - Removed horizontal bar, kept protruding struts on bottom
- Increased stability
 - Added braces at some joints



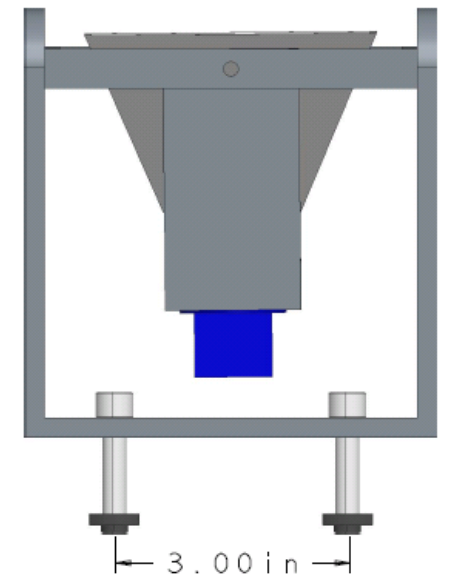
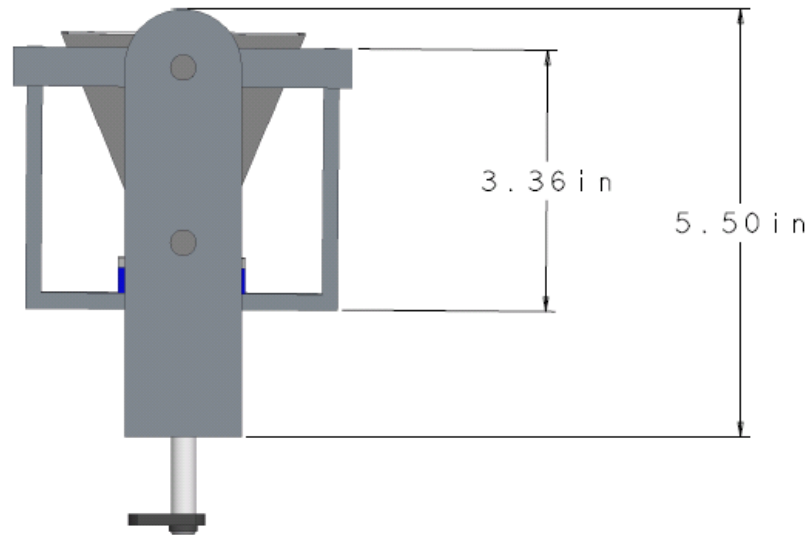
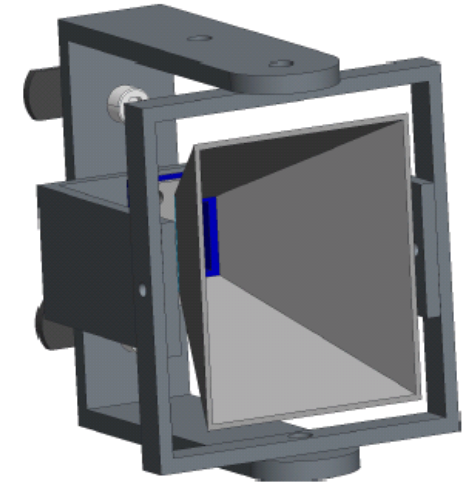
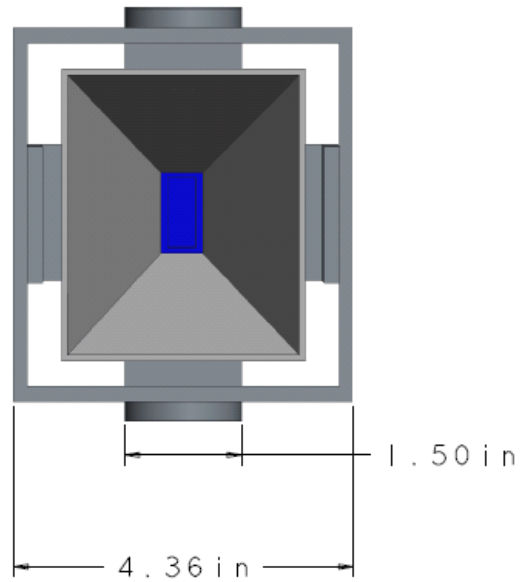
Horn Holder: Version 1

- Compatible with 80/20
- Independent locking and adjustability
- Compact



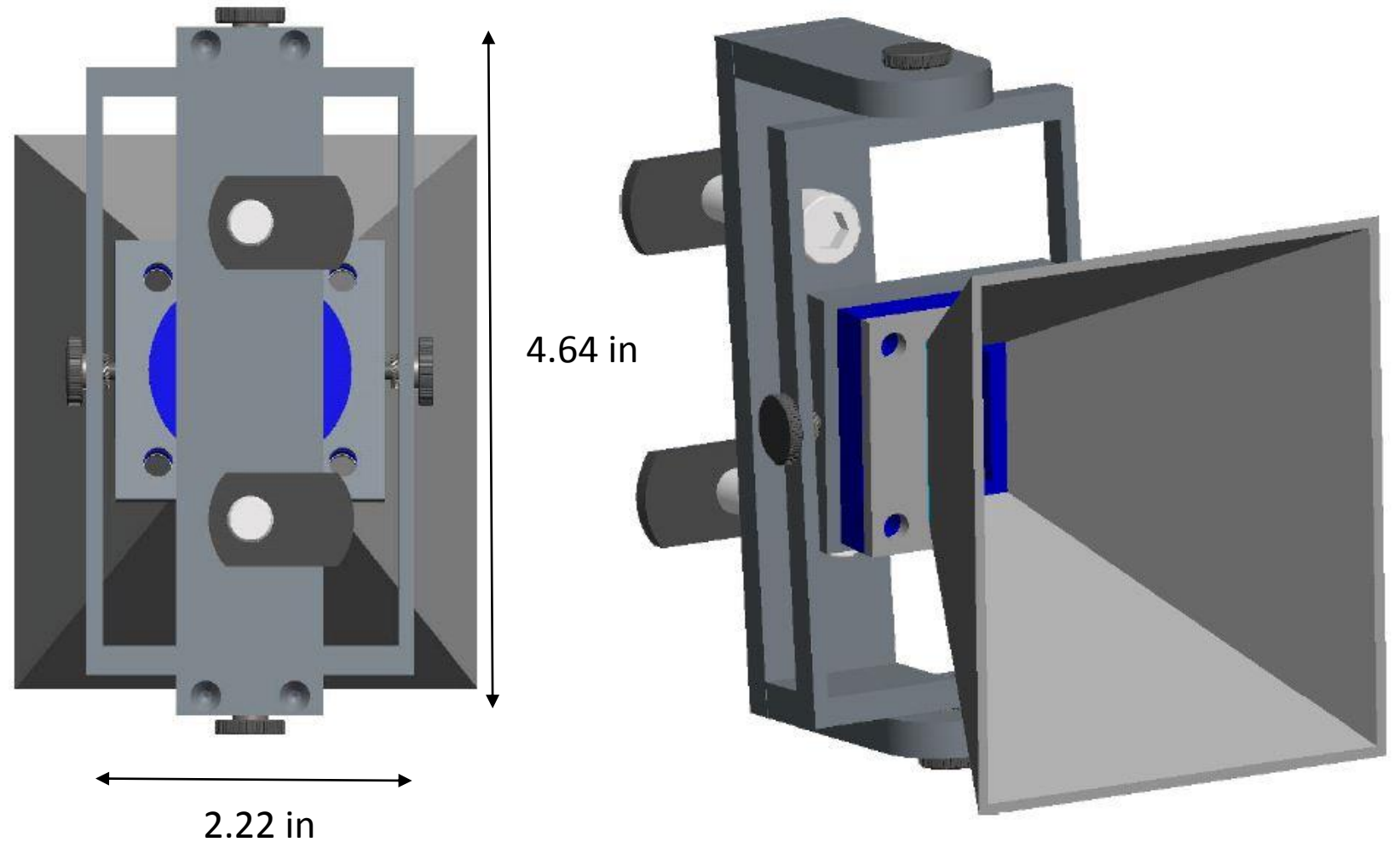
Horn Holder: Version 2

- Removed box shell
- Refined rotation locking
- Added 80/20 connection



Horn Holder: Version 3

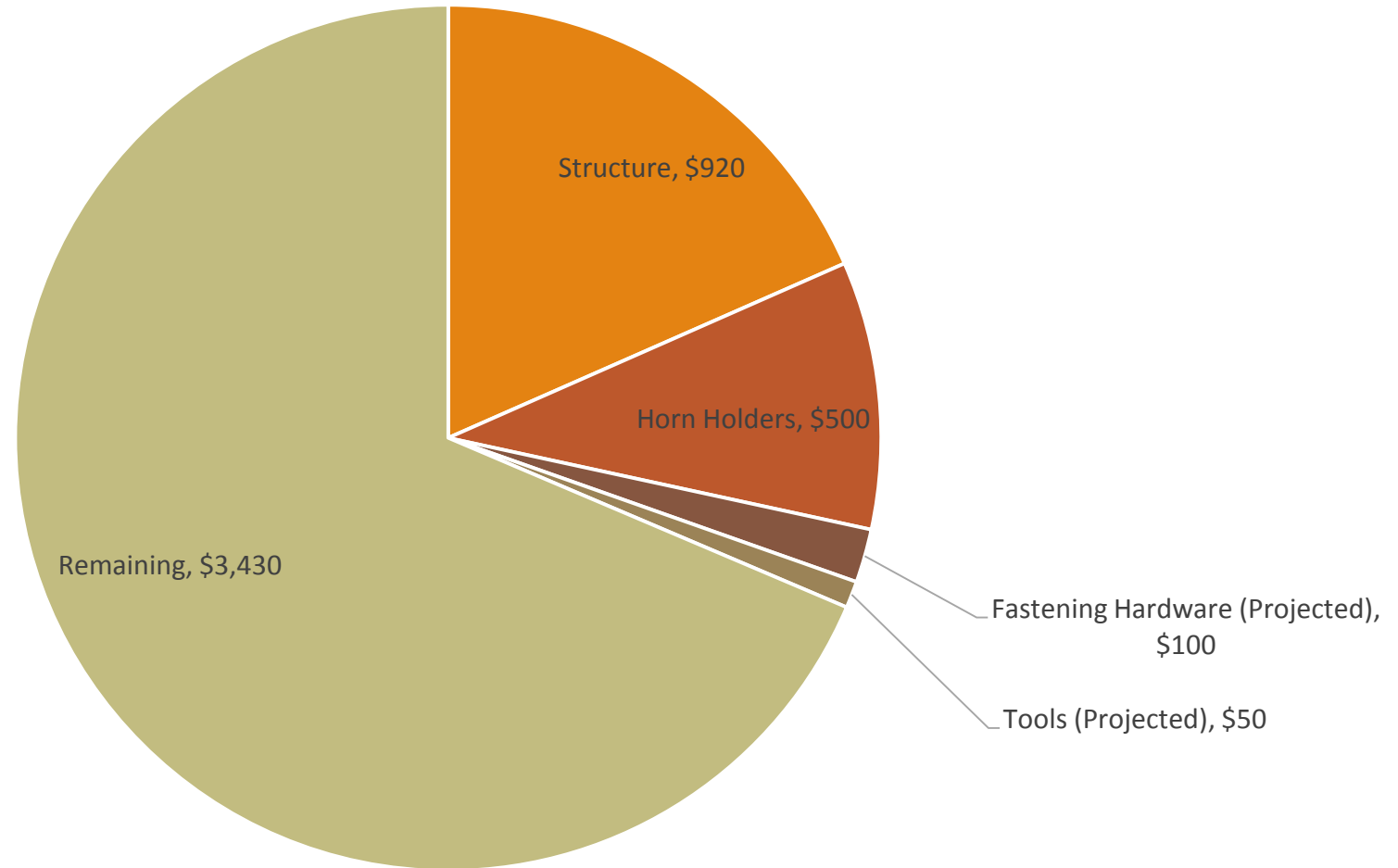
- Clearance
 - Moved horn forward in assembly
- Standardization
 - Small changes in dimensions



Procurement Status

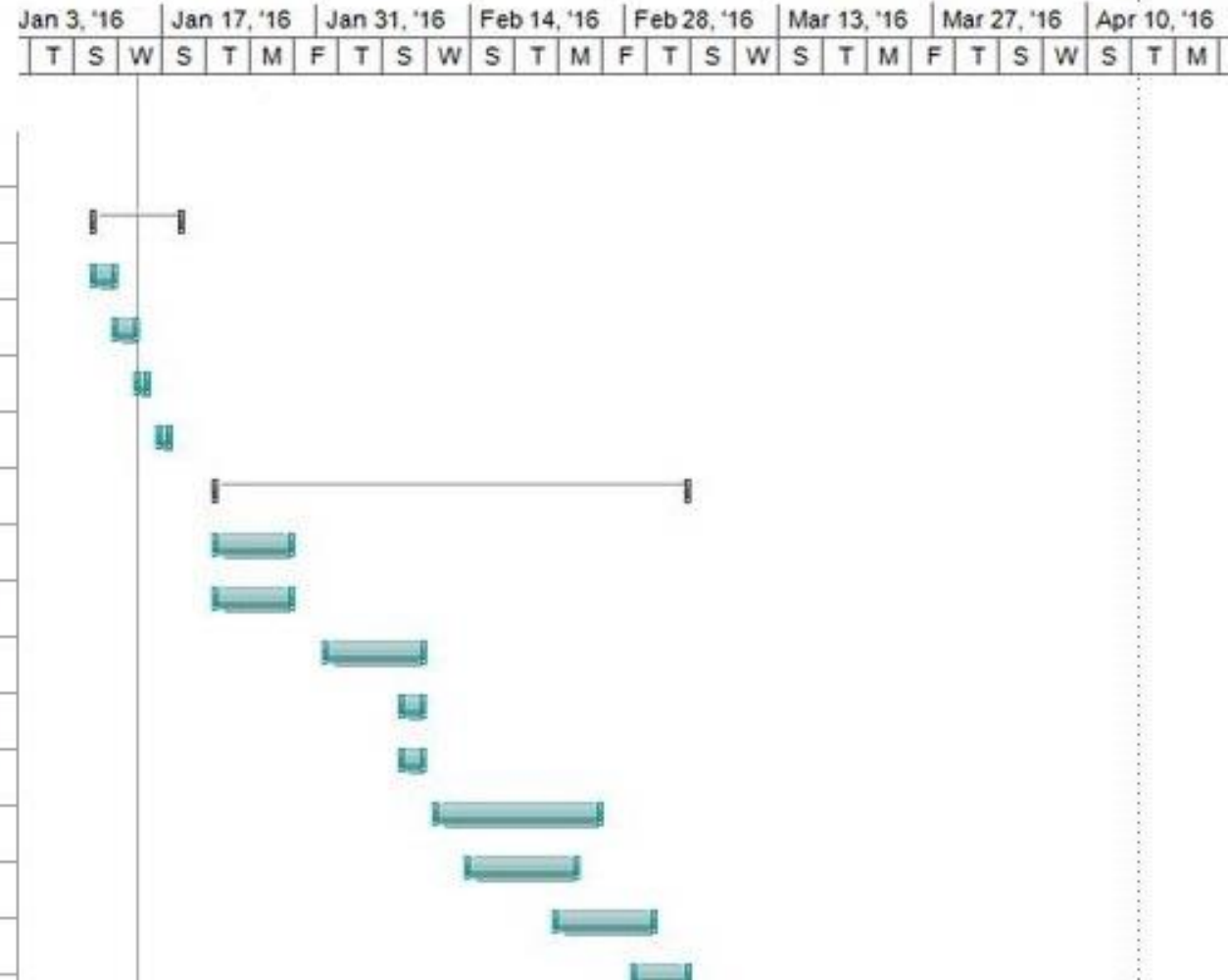
Component	Vendor	Product	Team Member(s)	Price	Purchase Order
Structure	8020 Inc	8020 Hardware	Kegan	\$920	Submitted
Horn Holders	OnlineMetal	Aluminum Sheet	Kaylen	\$500	Under review
Fastening Hardware	Local hardware store	Bolts, washers, nuts	Desmond	TBD	TBD
Assembly Tools		Wrenches		TBD	TBD

Budget



Schedule

Procurement	6 days	Mon 1/11/16	Mon 1/18/16
Prepare Drawings for Manufacturing	2 days	Mon 1/11/16	Tue 1/12/16
Bill of Materials	2 days	Wed 1/13/16	Thu 1/14/16
Submit for Quotation	1 day	Fri 1/15/16	Fri 1/15/16
Submit Purchase Order	1 day	Sun 1/17/16	Sun 1/17/16
Fabrication	31 days	Fri 1/22/16	Fri 3/4/16
Prepare Schematics	5 days	Fri 1/22/16	Thu 1/28/16
Prepare Drawings for machining	5 days	Fri 1/22/16	Thu 1/28/16
Fabricate 2 horn holders for testing	7 days	Mon 2/1/16	Tue 2/9/16
Submit remaining HH for fabrication	2 days	Mon 2/8/16	Tue 2/9/16
Submit 8020 Parts to COE Shop	2 days	Mon 2/8/16	Tue 2/9/16
Begin Assembly of Structure	11 days	Thu 2/11/16	Thu 2/25/16
Attach Horn Holders to Structure	8 days	Sun 2/14/16	Tue 2/23/16
Complete Assembly, Propose Plans for Im	7 days	Mon 2/22/16	Tue 3/1/16
Implement any improvements	5 days	Mon 2/29/16	Fri 3/4/16



Summary

- Review of Project Scope
- Review Previous Progress
- Design Updates
- Procurement

Future Plans

- Submit remaining purchase orders
- Create operational instructions
- Fabrication
- Testing & modification

Acknowledgements

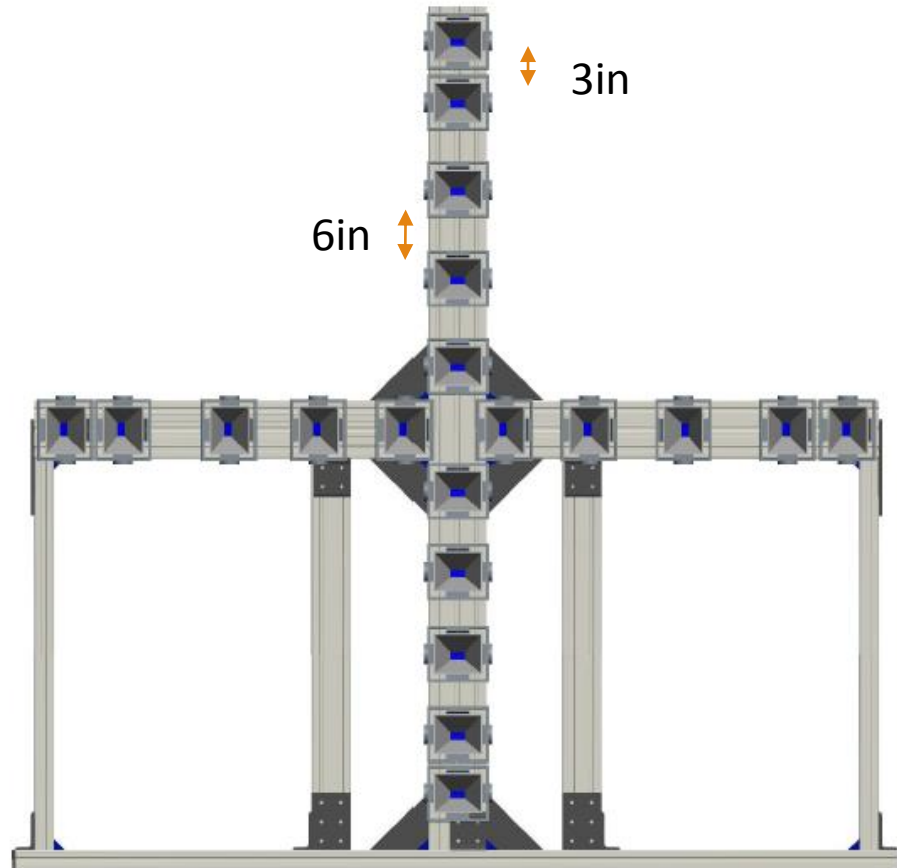
- Sponsor: Northrop Grumman
 - Mike Blue
 - Pete Stenger
- Senior design instructors:
 - Dr. Nikhil Gupta
 - Dr. Chiang Shih

References

1. NASA AirSAR, <https://upload.wikimedia.org/wikipedia/commons/a/a6/AirSAR-instrument-on-aircraft.jpg>
2. Radar Tutorial, http://www.radartutorial.eu/20.airborne/pic/sar_principle.print.png
3. Cammuse, Matthew. "SAR Final Presentation."
http://eng.fsu.edu/me/senior_design/2015/team27/Webpage/presentations/Team%20E%20311_Milestone%20%237%20Presentation_%20Final%20Report.pptx. Web 10/18/2015.
4. E11 Milestone – Final Report, http://eng.fsu.edu/me/senior_design/2015/team27/
5. http://www.northropgrumman.com/Photos/pgM_BA-10002_067.jpg

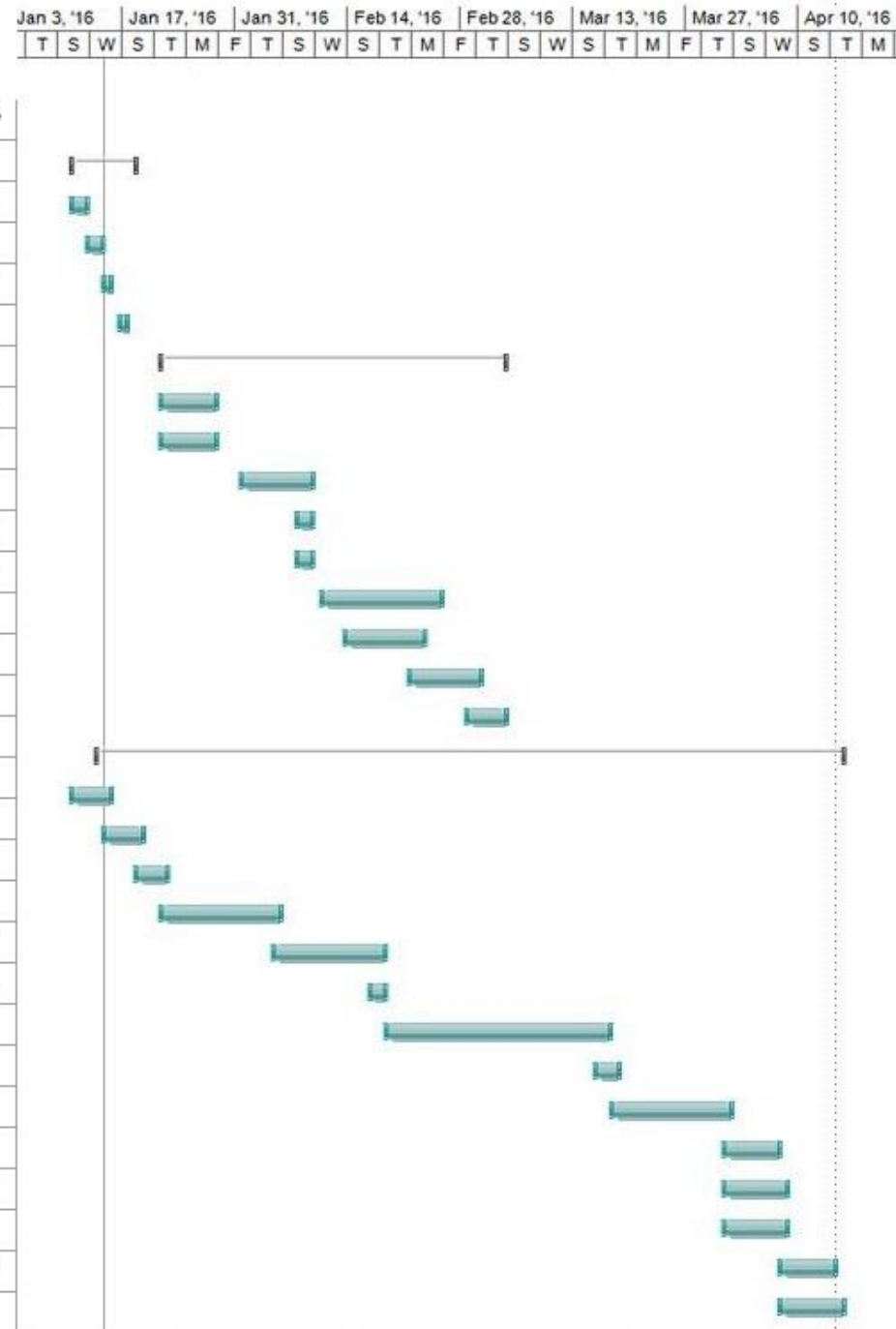
Questions?

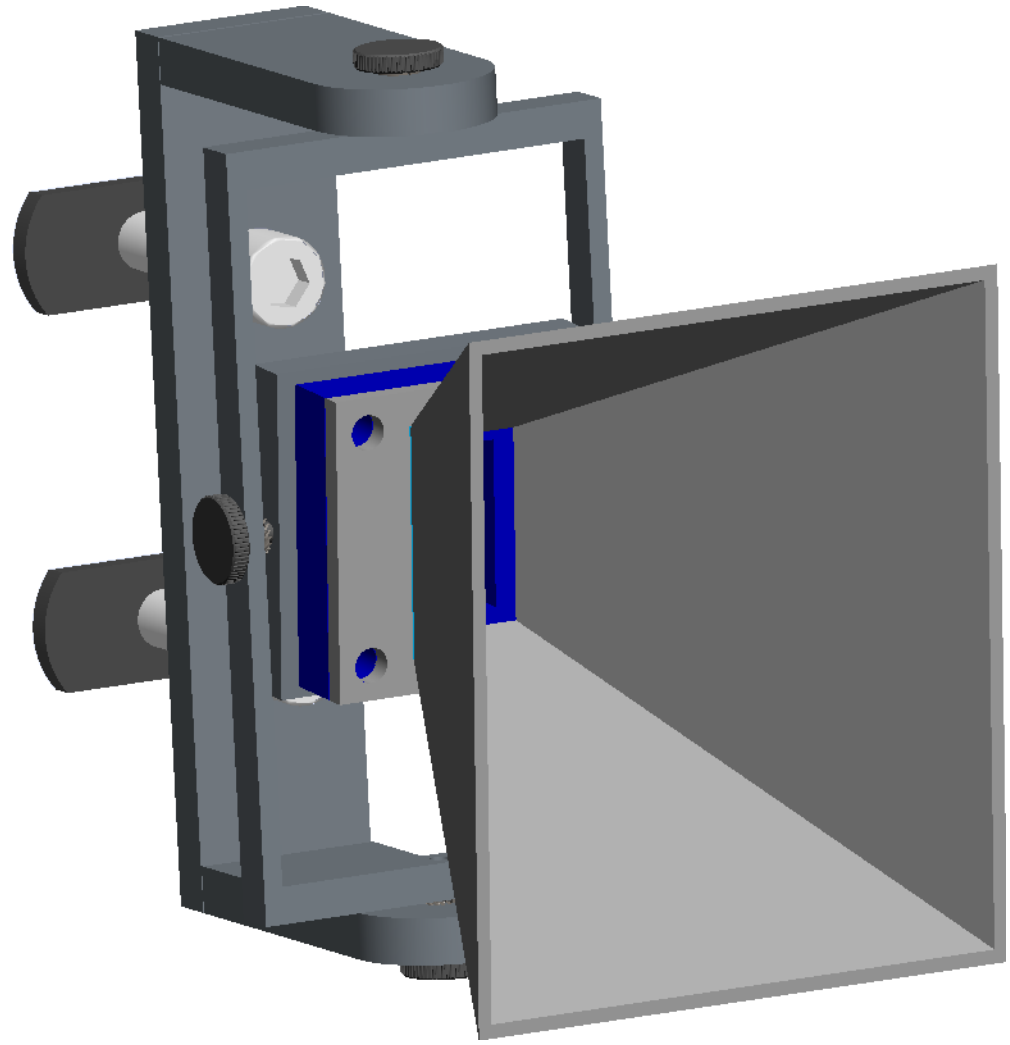
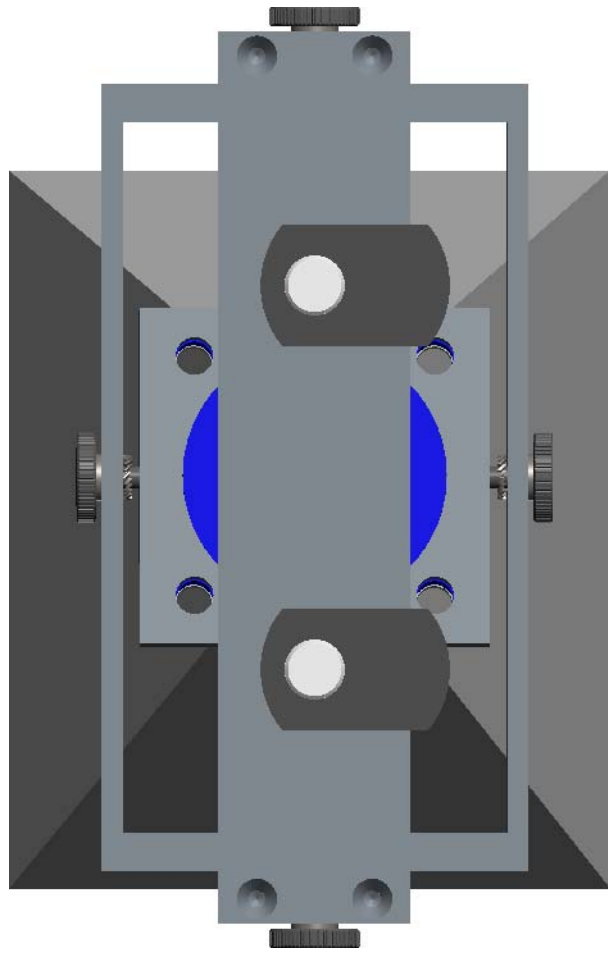
Structure Version 3
Horn Holder Version 2
Full Assembly



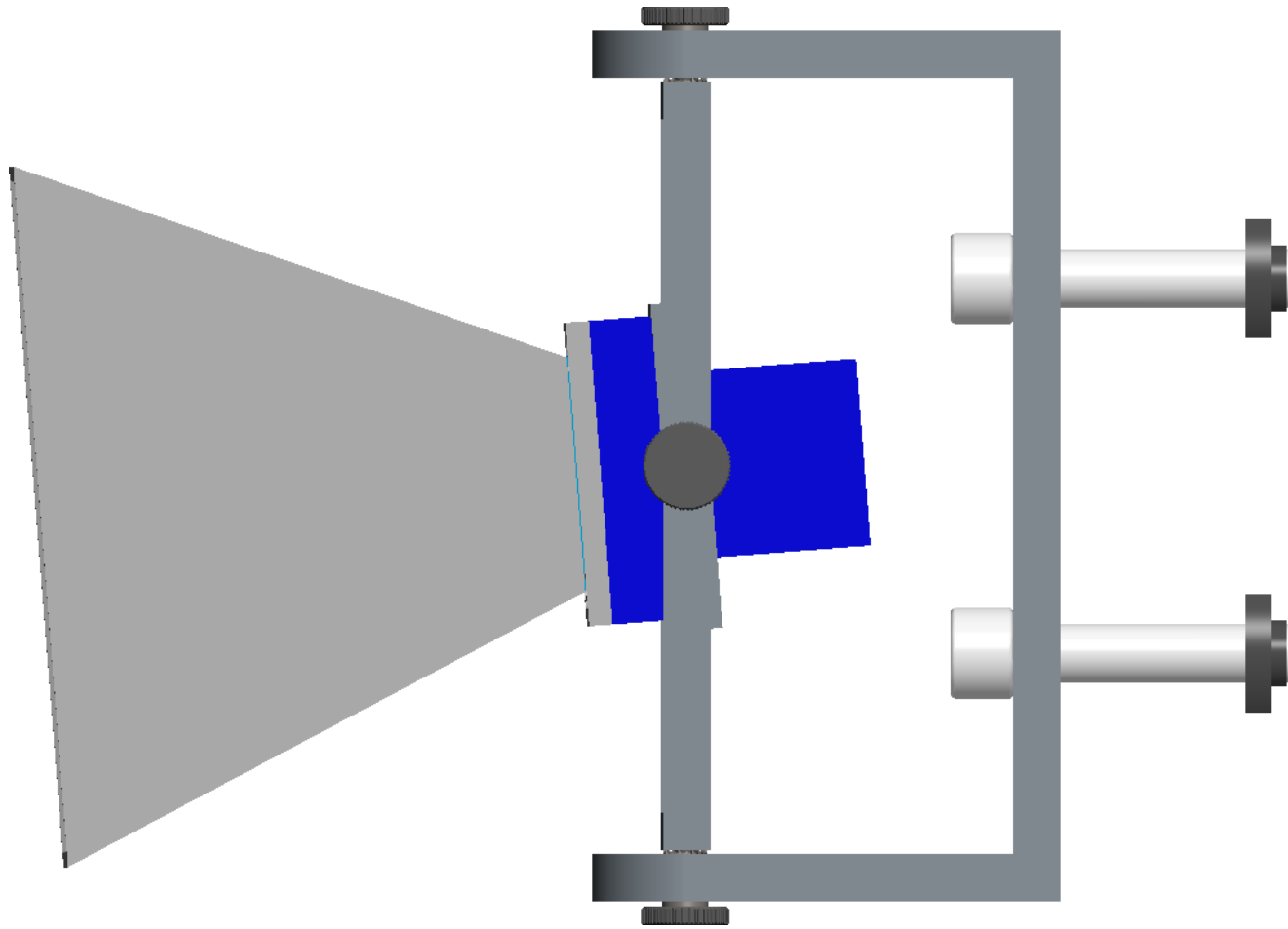
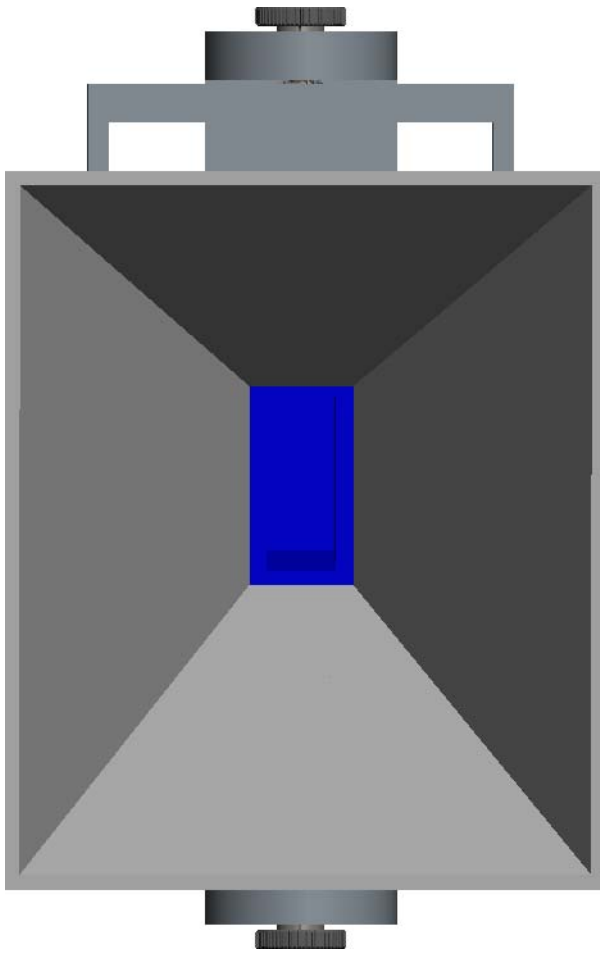
Full Schedule (including deliverables)

Procurement	6 days	Mon 1/11/16	Mon 1/18/16
Prepare Drawings for Manufacturing	2 days	Mon 1/11/16	Tue 1/12/16
Bill of Materials	2 days	Wed 1/13/16	Thu 1/14/16
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Attach Horn Holders to Structure	8 days	Sun 2/14/16	Tue 2/23/16
Complete Assembly, Propose Plans for Im	7 days	Mon 2/22/16	Tue 3/1/16
Implement any improvements	5 days	Mon 2/29/16	Fri 3/4/16
Deliverables	67 days	Thu 1/14/16	Fri 4/15/16
Restated Project Definition and Scope/Pla	5 days	Mon 1/11/16	Fri 1/15/16
Presentation I	3 days	Fri 1/15/16	Tue 1/19/16
Team Evaluation Report I	4 days	Tue 1/19/16	Fri 1/22/16
Web Page Update	11 days	Fri 1/22/16	Fri 2/5/16
Midterm Presentation I	10 days	Fri 2/5/16	Thu 2/18/16
Team Evaluation Report II	2 days	Wed 2/17/16	Thu 2/18/16
Midterm Presentation II	20 days	Fri 2/19/16	Thu 3/17/16
Team Evaluation Report III	3 days	Wed 3/16/16	Fri 3/18/16
Operational Manual, Design Report	11 days	Fri 3/18/16	Fri 4/1/16
Walk Through Presentation	5 days	Fri 4/1/16	Thu 4/7/16
Final Report	6 days	Fri 4/1/16	Fri 4/8/16
Final Web Page	6 days	Fri 4/1/16	Fri 4/8/16
Final Presentation	5 days	Fri 4/8/16	Thu 4/14/16
Team Evaluation Report IV	6 days	Fri 4/8/16	Fri 4/15/16

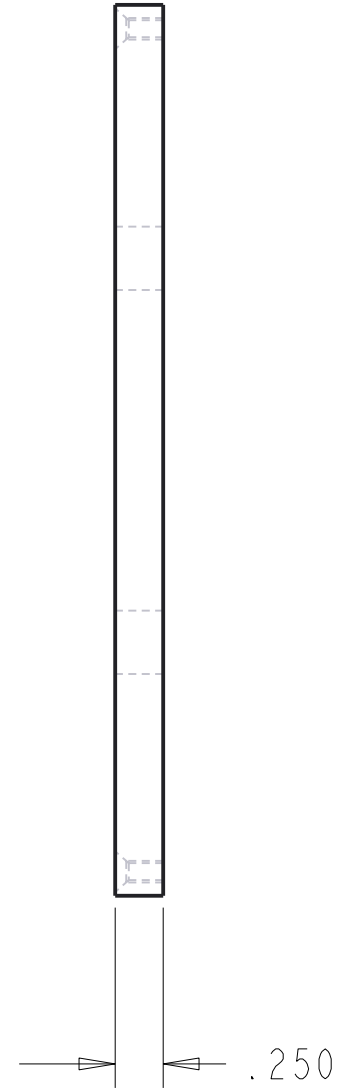
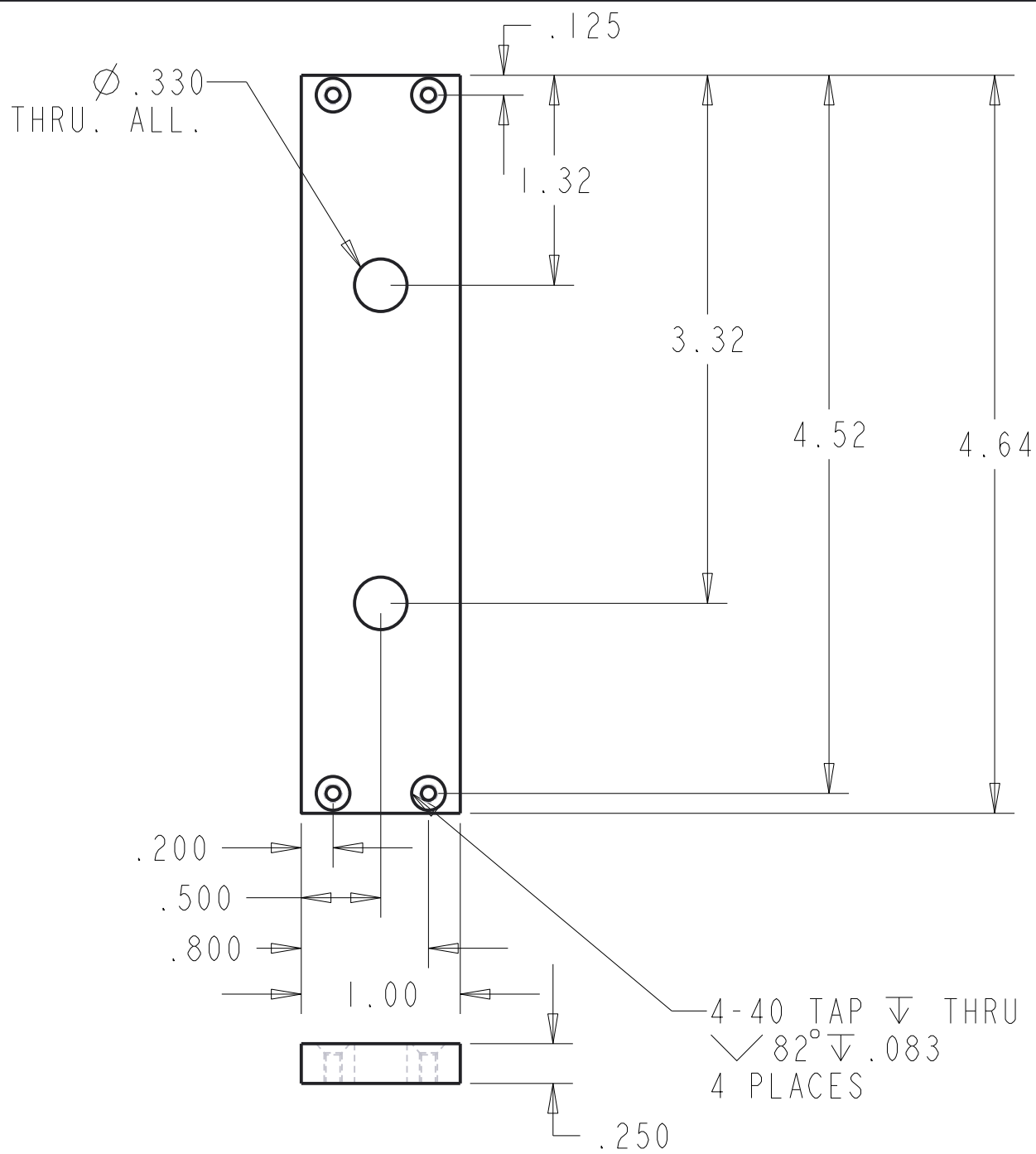




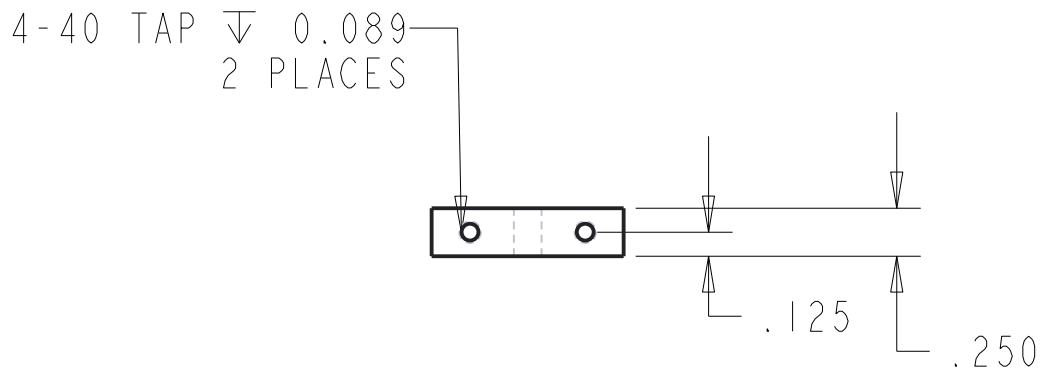
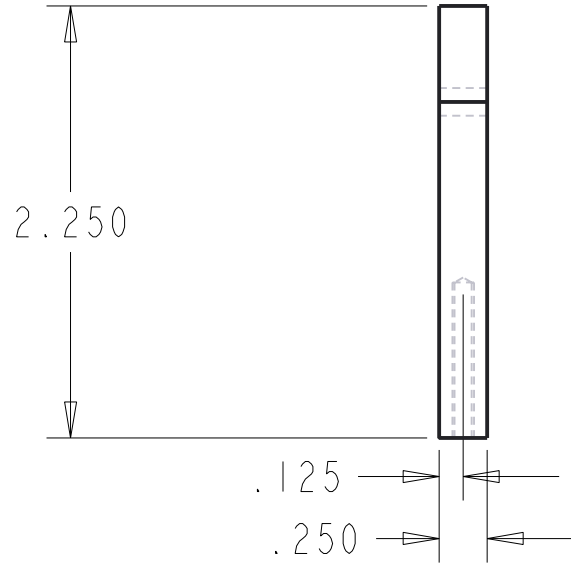
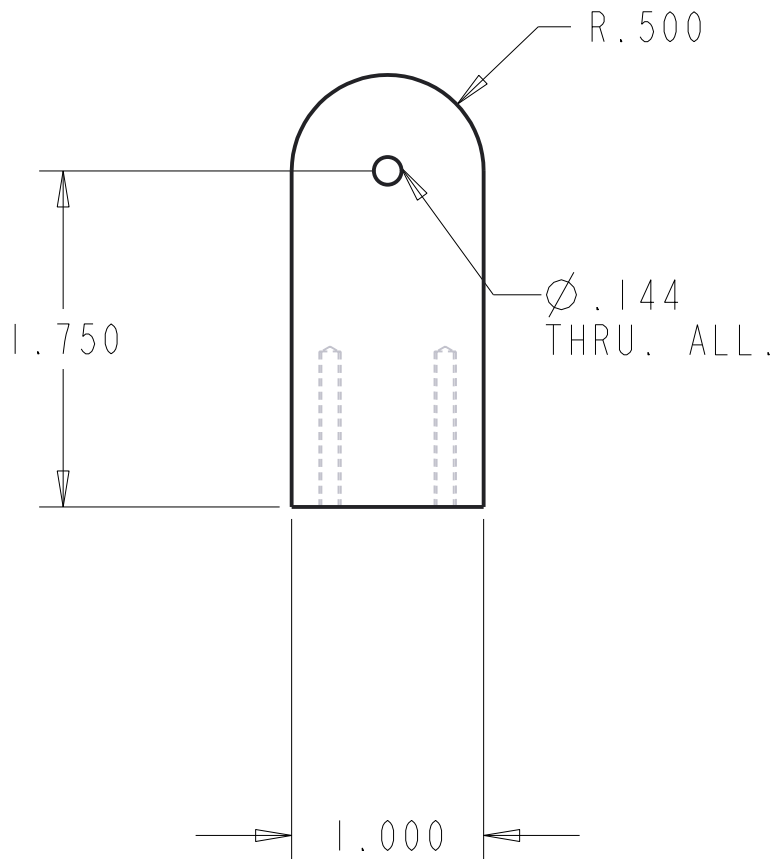
DIMENSIONS IN INCHES TOLERANCES: X.X± 0.1 X.XX± 0.01 X.XXX± 0.003 ANGLES± 0.5°	PART NAME: Back & Angled View		PROJECT NAME: Horn Holder	
	DRAWN BY: SD Team 18		DATE: 1/15/16	MATERIAL: Various
	SCALE: 1.000	REV: 0	SHEET #: 1 OF 1	PART #: P1



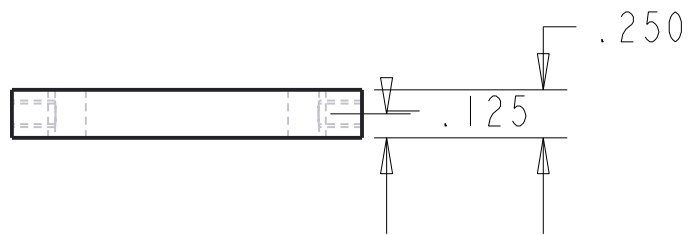
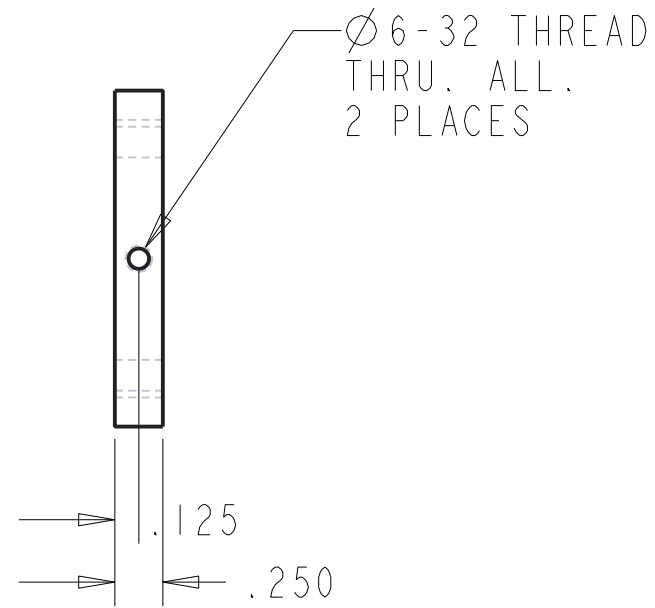
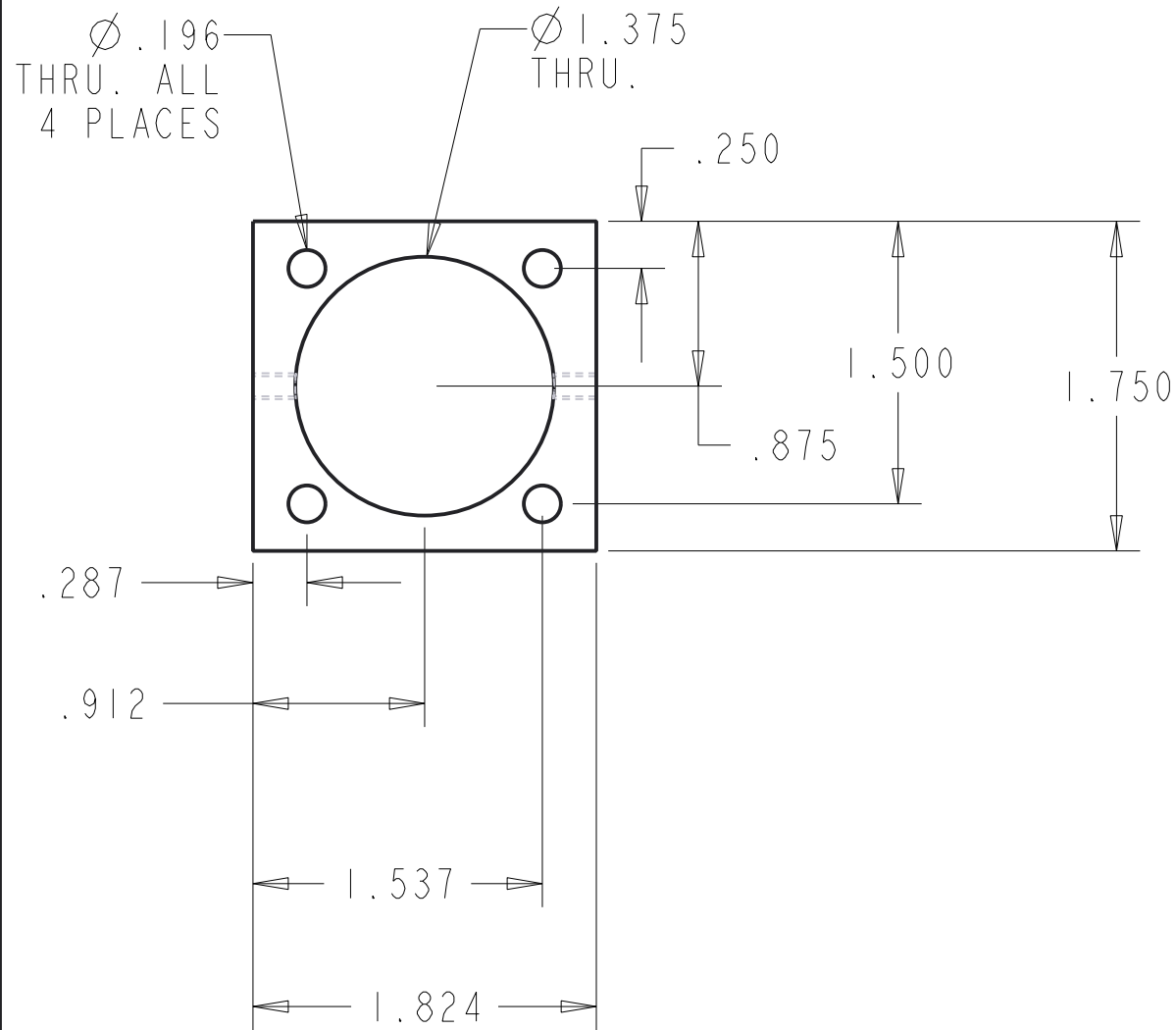
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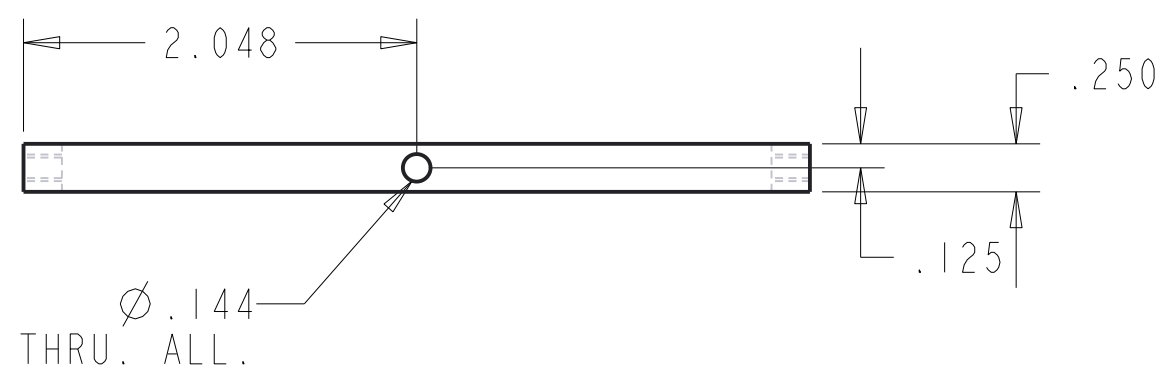
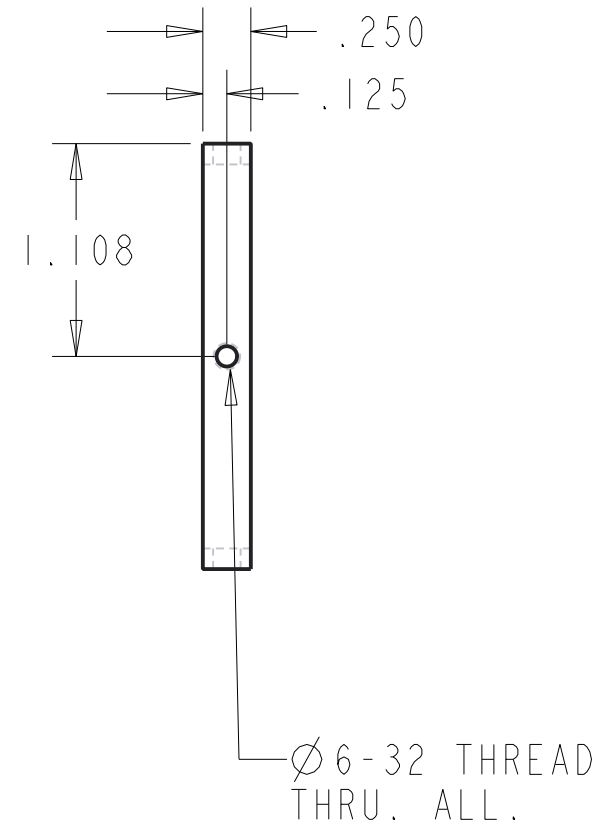
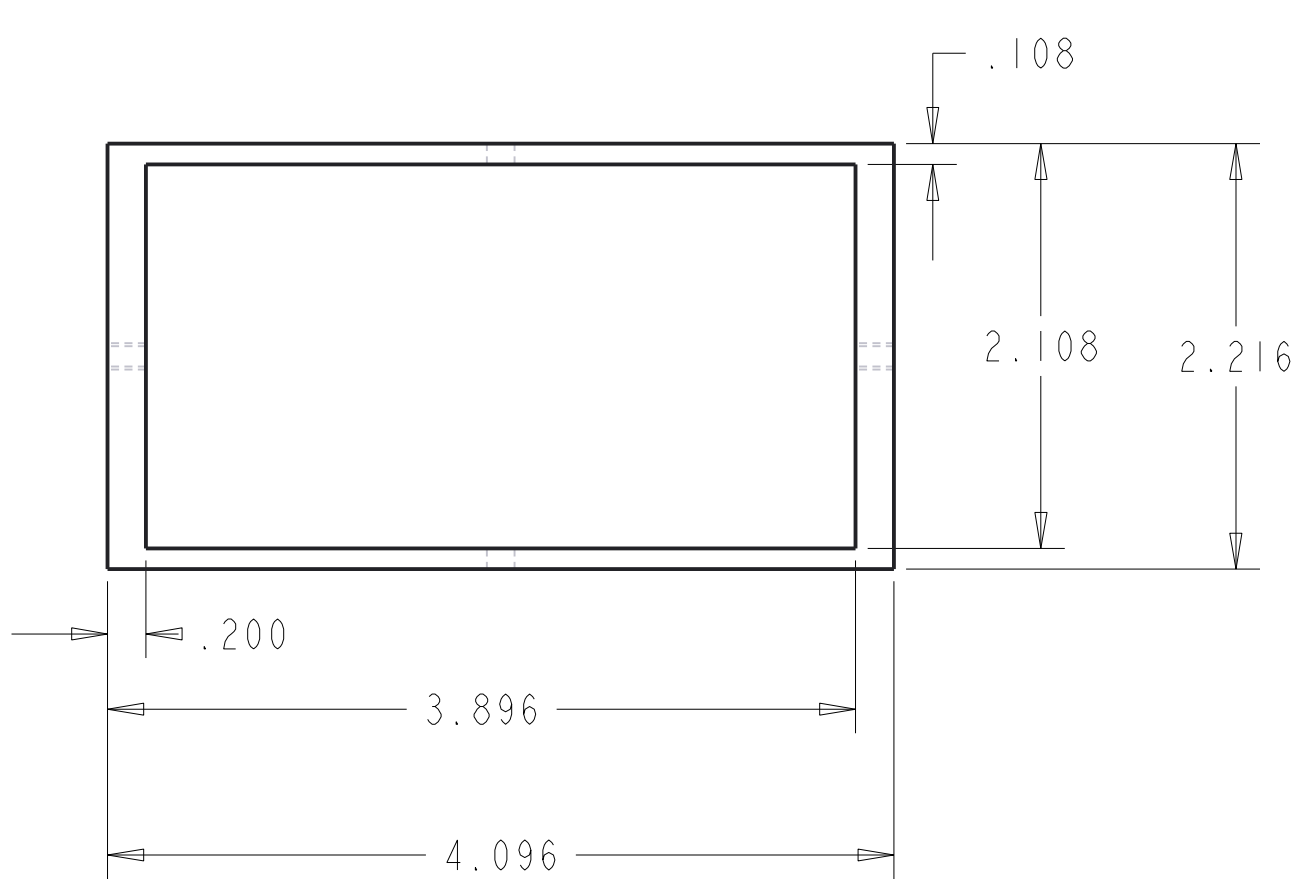
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	DRAWN BY: SD Team 18		DATE: 1/14/16	MATERIAL: Aluminum
	SCALE: 1.000	REV: 0	SHEET #: 1 OF 1	PART #: P1



DIMENSIONS IN INCHES TOLERANCES: X.X± 0.1 X.XX± 0.01 X.XXX± 0.003 ANGLES± 0.5°	PART NAME: Brace		PROJECT NAME: Horn Holder	
	DRAWN BY: SD Team 18		DATE: 1/12/16	MATERIAL: Aluminum
	SCALE: 1.000	REV: 0	SHEET #: 1 OF 1	PART #: P1



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DIMENSIONS IN INCHES TOLERANCES: X.X \pm 0.1 X.XX \pm 0.01 X.XXX \pm 0.003 ANGLES \pm 0.5°	PART NAME: Outer Bracket		PROJECT NAME: Horn Holder	
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