

# Christmas Ornament Display Structure

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# Overview

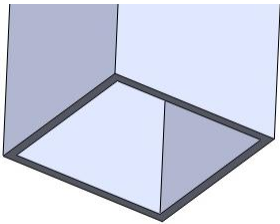
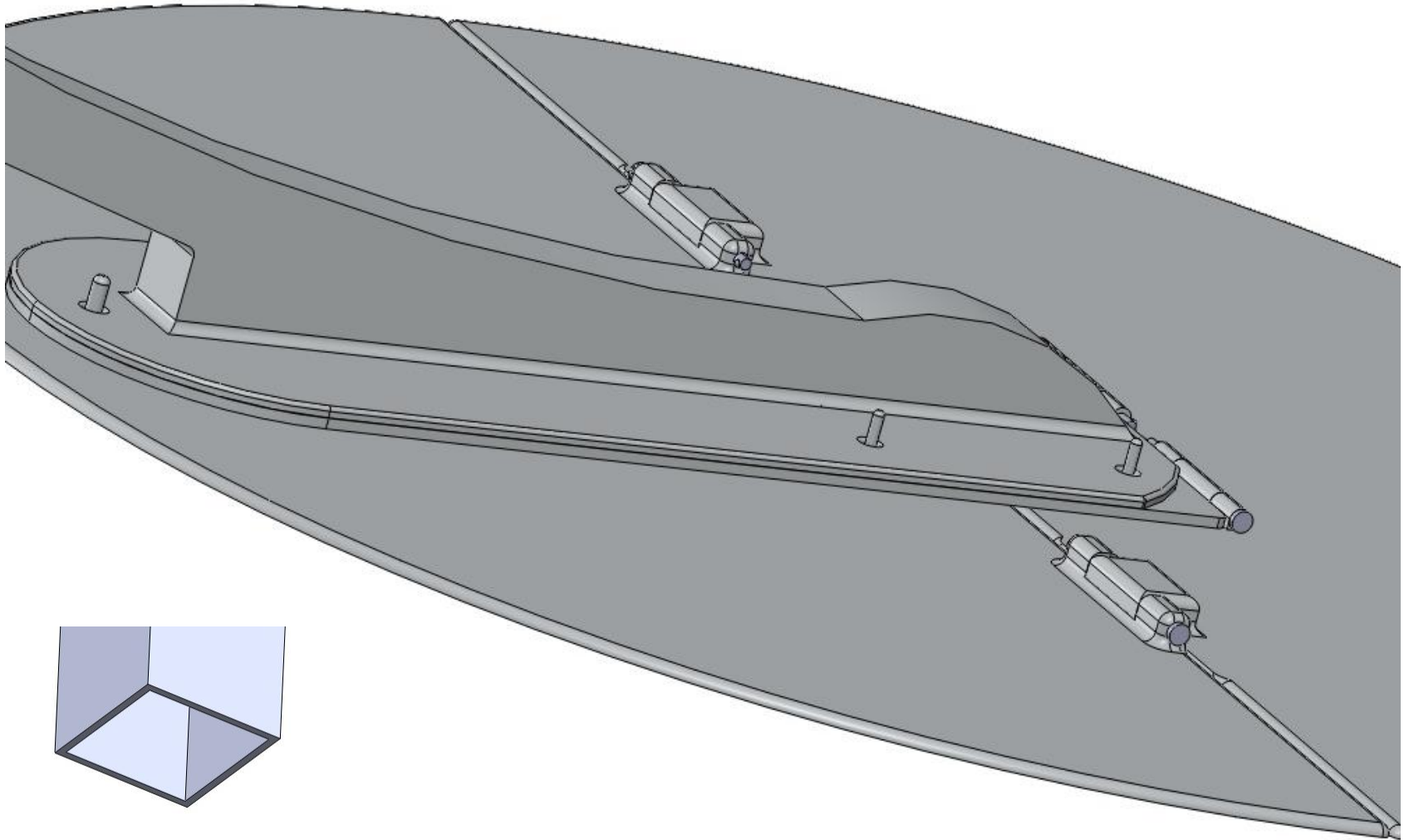
- Problem statement
- Final design modifications
- Final Design
- Stress/Strain/Force Analysis
- Cost analysis
- Constraints
- Project timeline
- Conclusion
- References

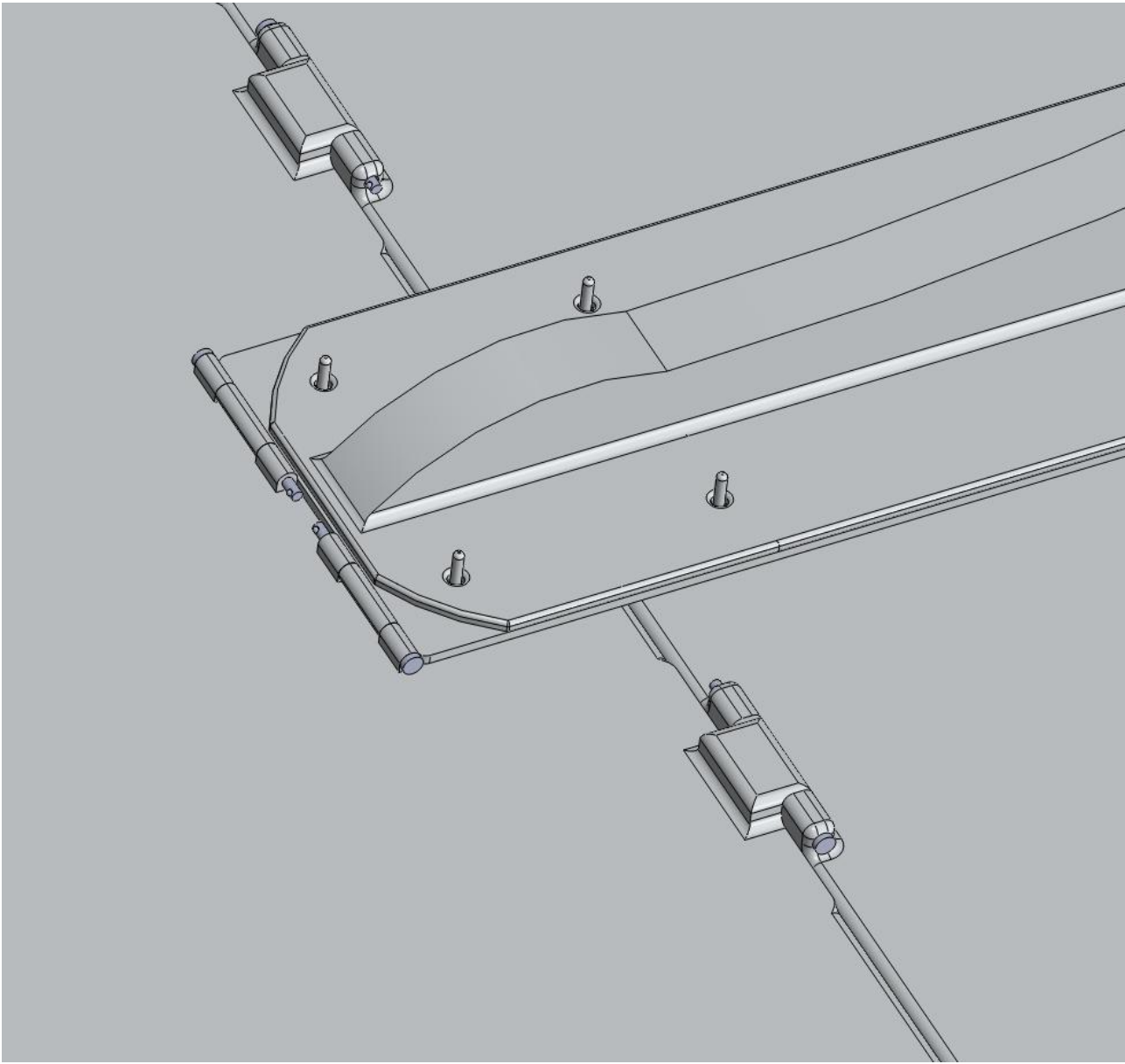
# Problem Statement

**Need:** My Star of Bethlehem LLC does not have an aesthetically pleasing way to display their products at multiple venues.

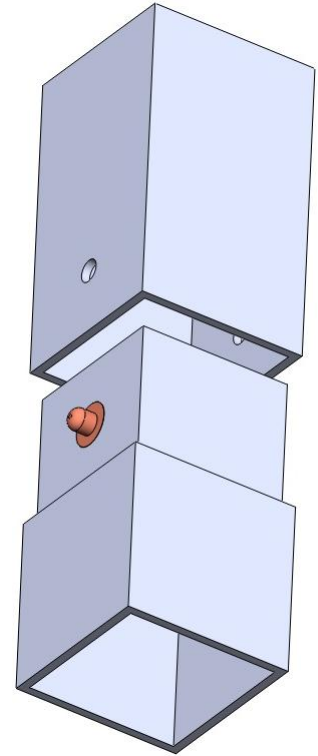
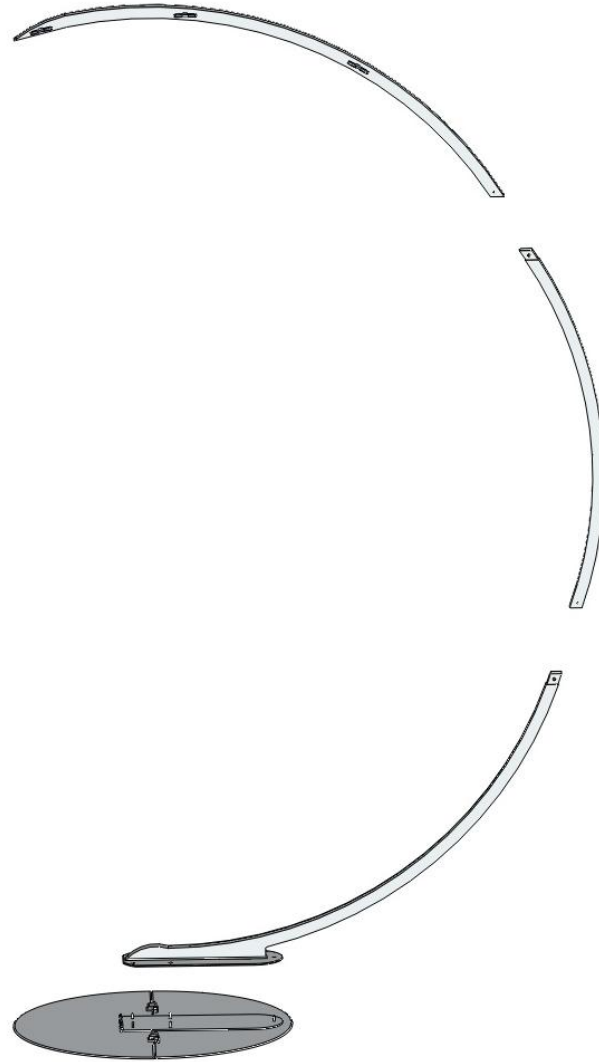
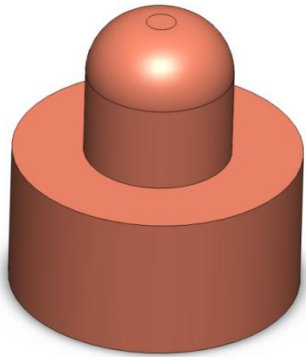
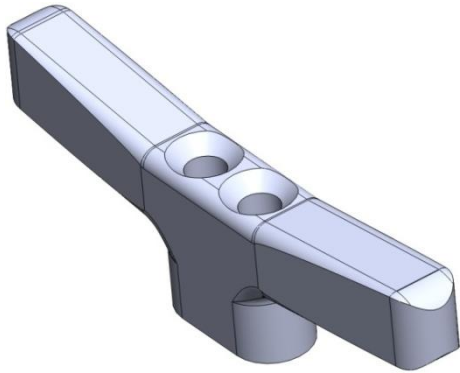
**Goal:** Design and build a portable display structure that will showcase the ornaments of My Star of Bethlehem LLC when being marketed.

# Modifications

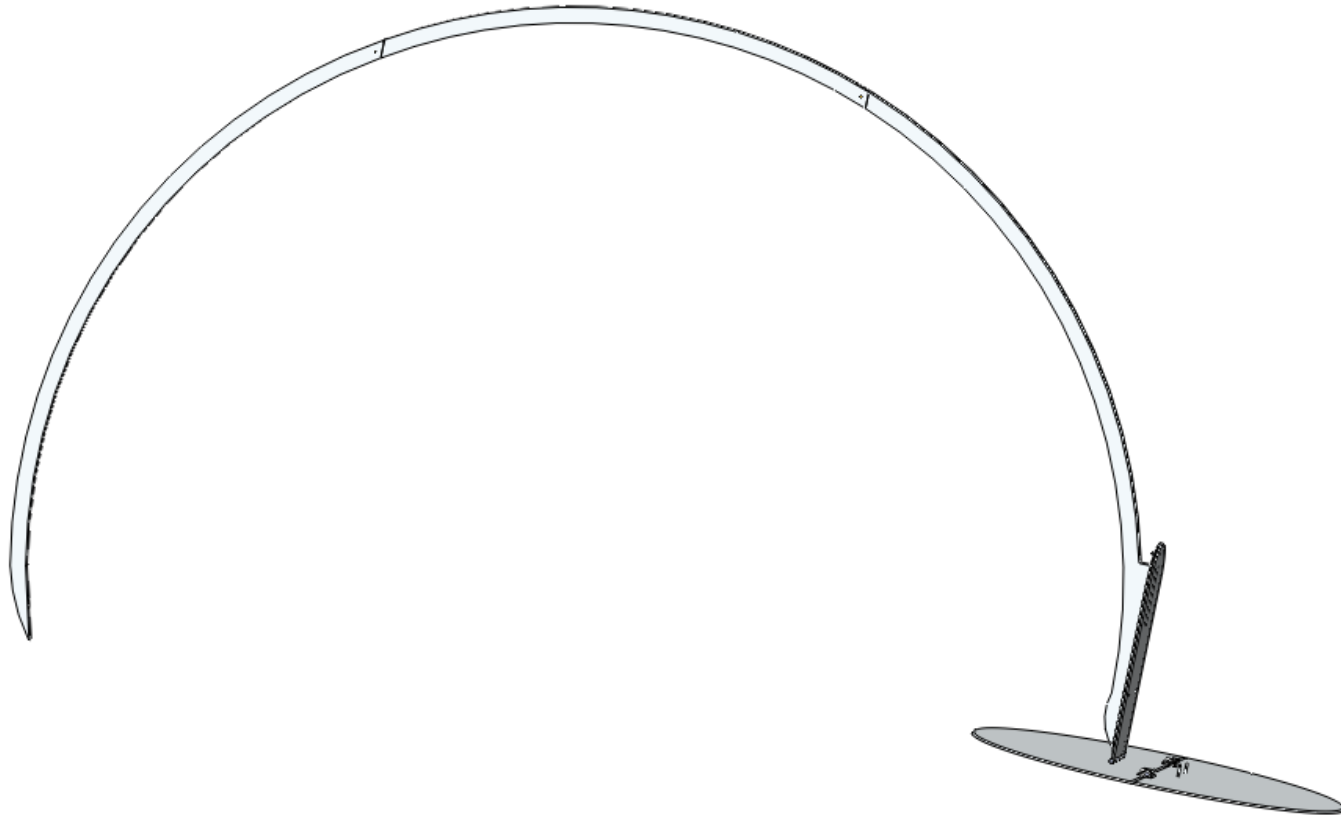




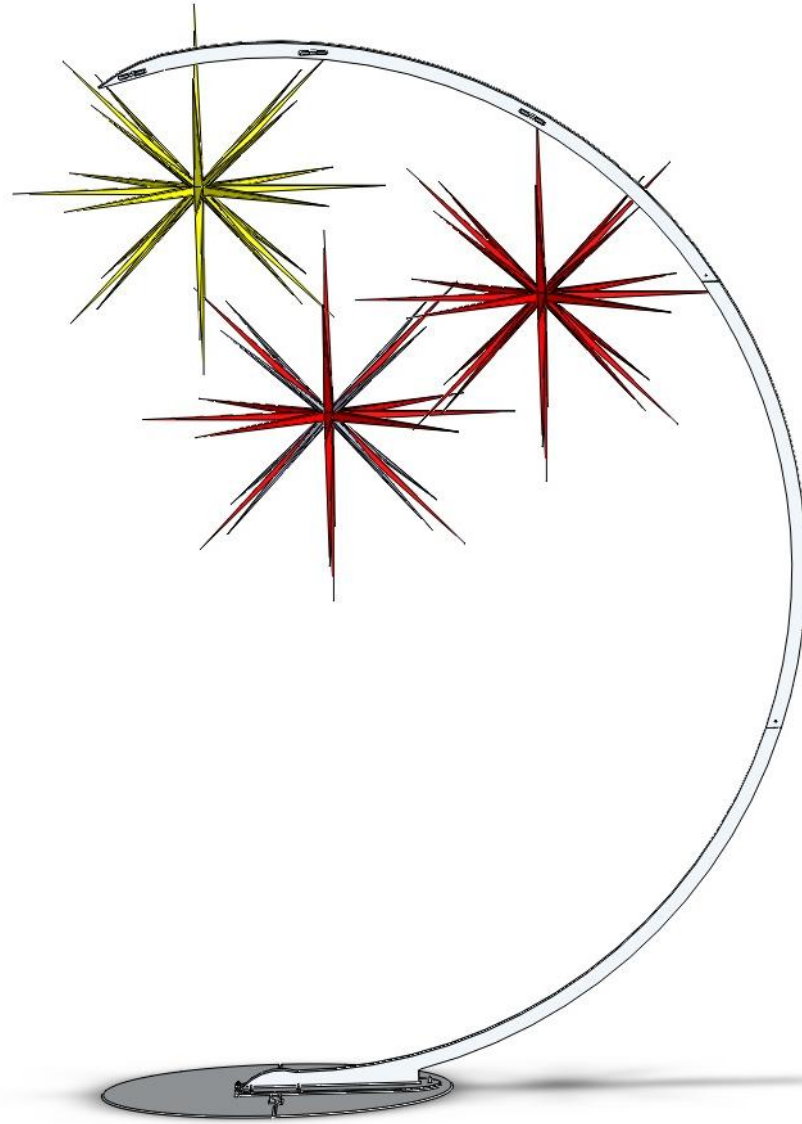
# Exploded Views



# Assembly Position

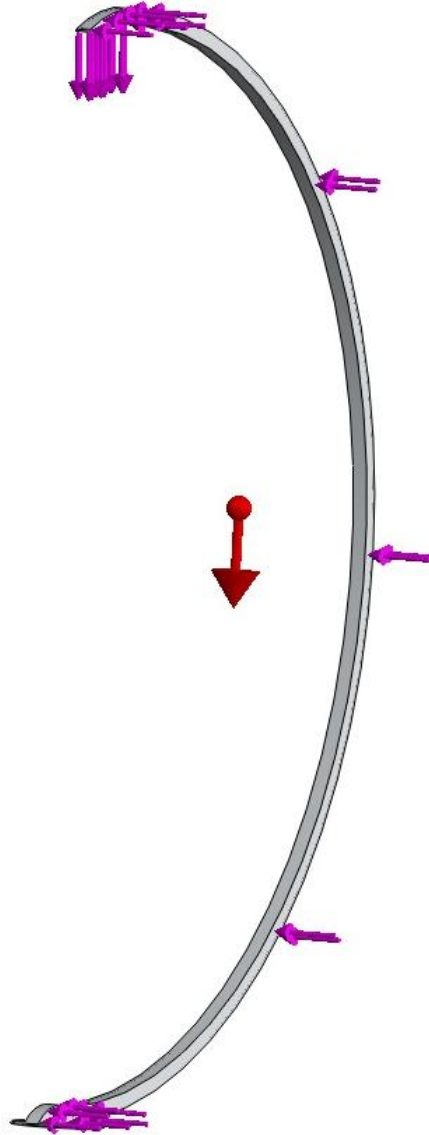


# Final Design



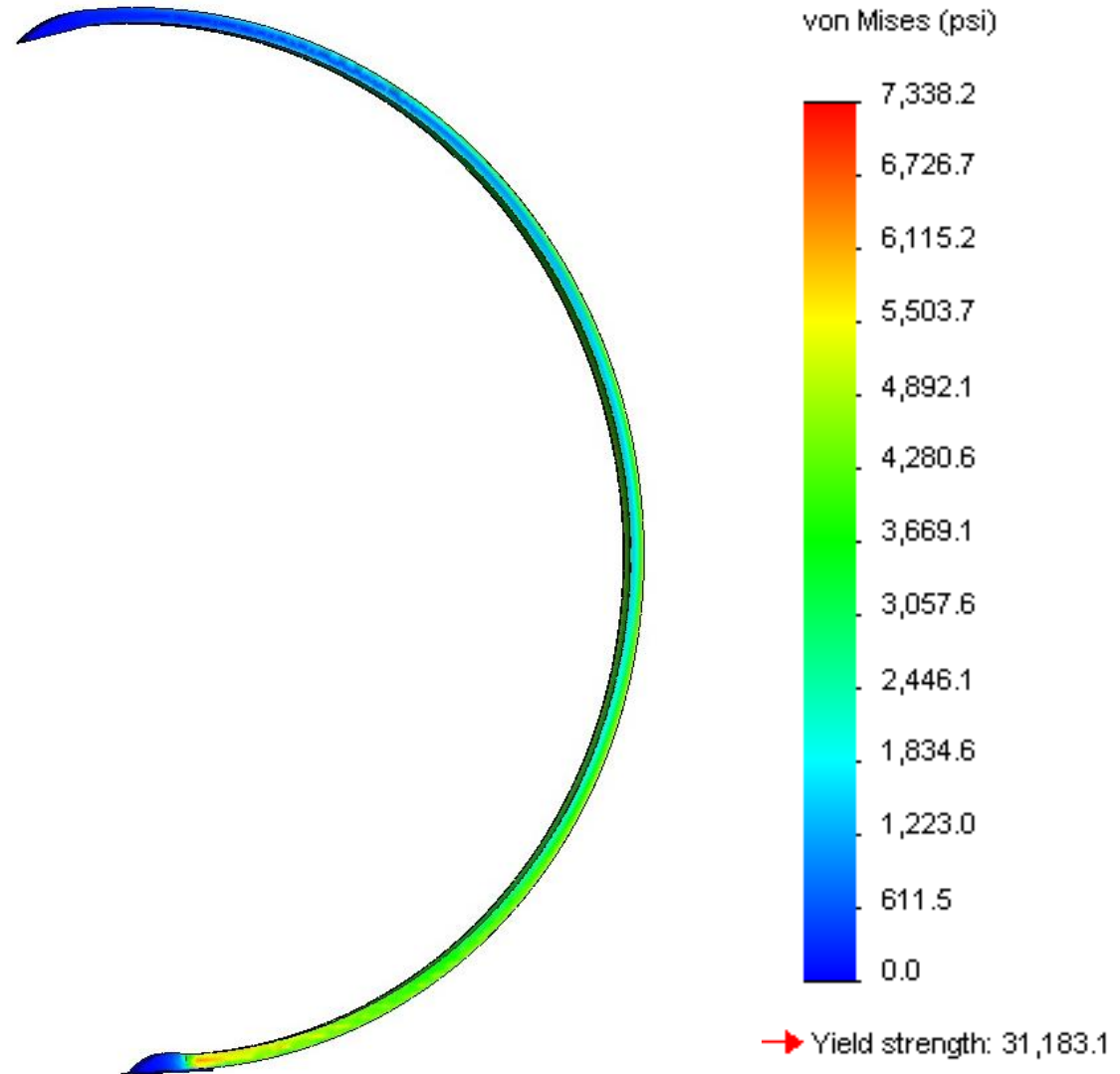


# Force Analysis

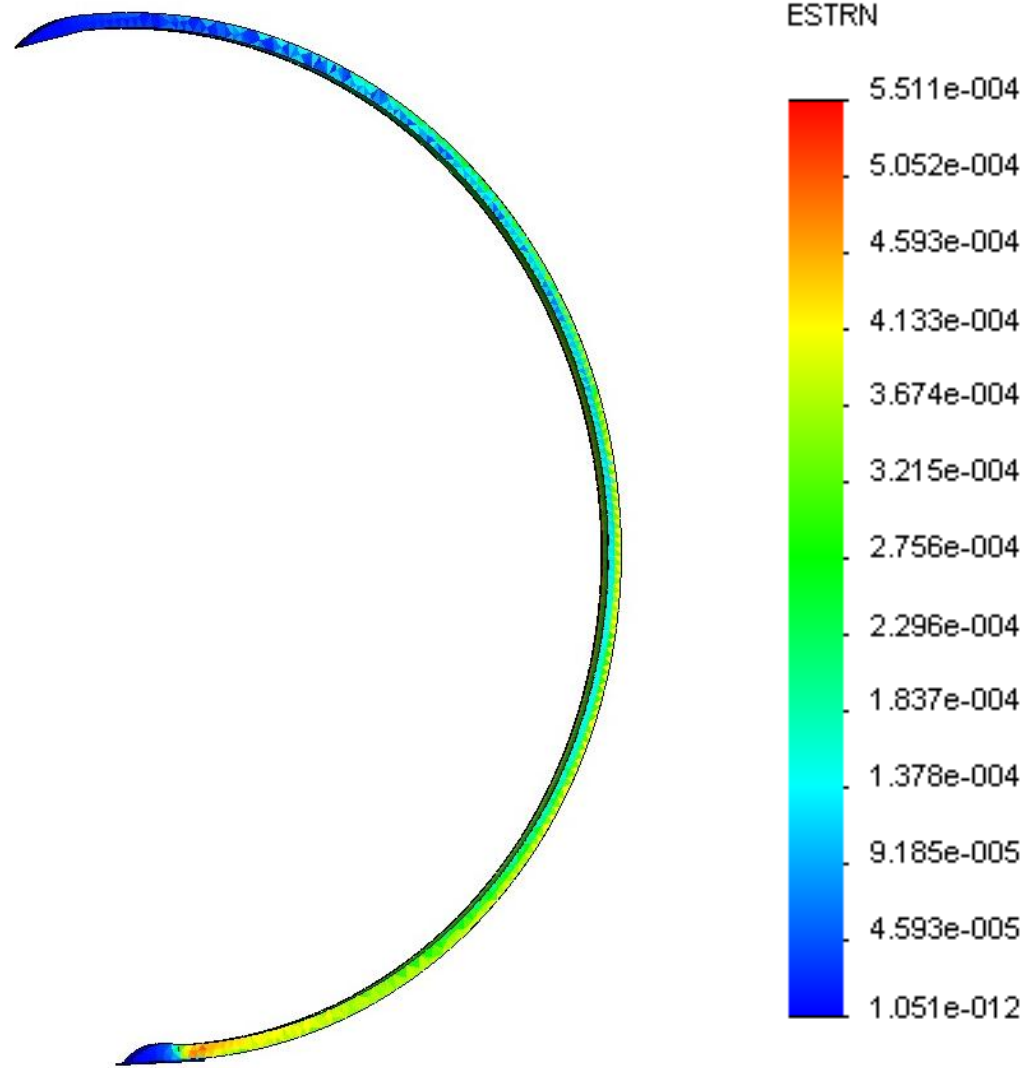


- Wind Force  $\approx 25$  lbf
- Combined weight of largest 3 ornaments  $\approx 22$  lbf

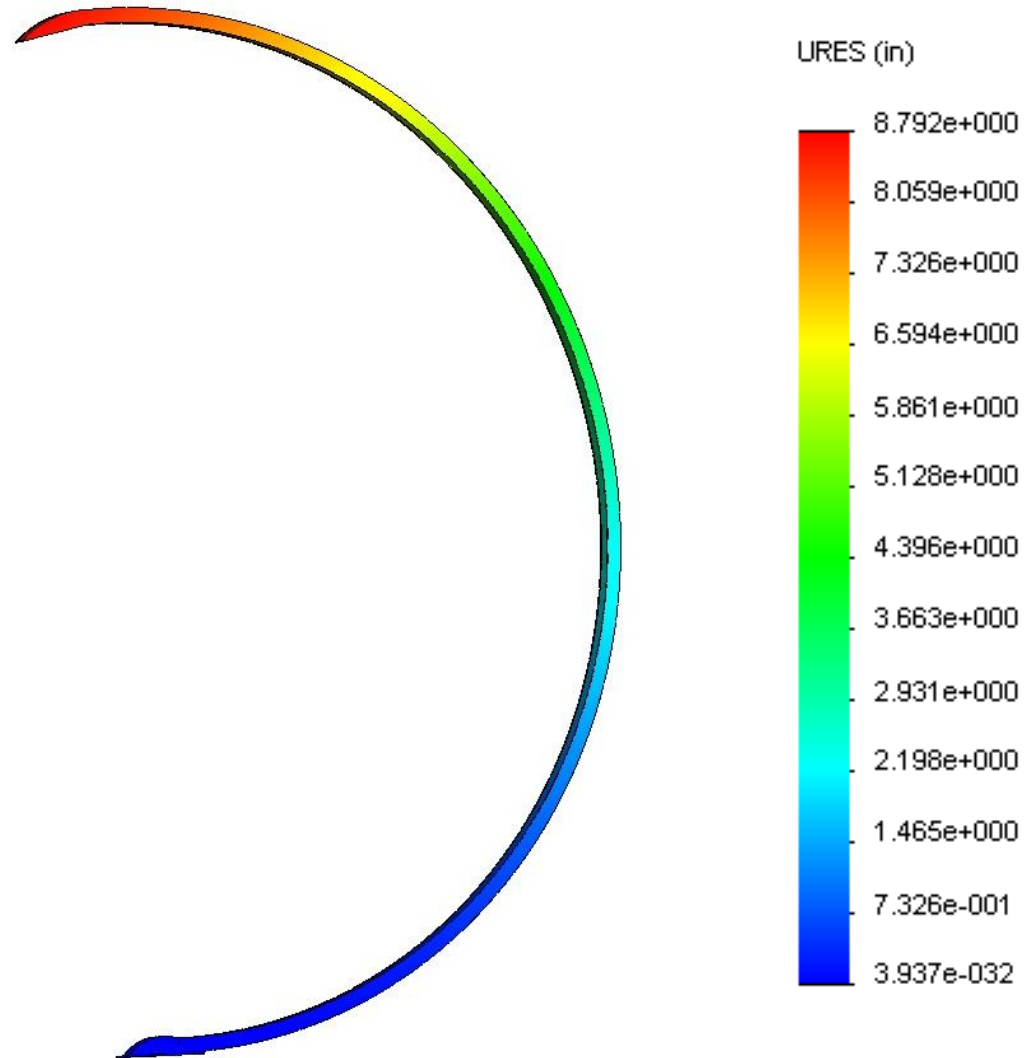
# Stress Analysis



# Strain Analysis



# Deflection



# Cost Analysis

Qty	Item Description	Size (w x h x t)	Length	Price (each)	Total Cost
2	6063-T52 Square Aluminum Tube	2 x 2 x 0.125	96	\$62.80	\$125.60
1	6063-T52 Square Aluminum Tube	2 x 2 x 0.125	72	\$47.10	\$47.10
2	3003-H14 Aluminum Plate	24 x 48 x 0.25	48	\$171.04	\$342.08
1	3003-H14 Aluminum Plate	12 x 24 x 0.25	24	\$42.76	\$42.76
		<b>Size (D)</b>			
2	18-8 Stainless Steel Quick Release Pin	0.25	6	\$2.84	\$5.68
2	Zinc-Plated Steel Quick Release Pin	0.25	4.5	\$2.39	\$4.78
4	PSL2-04-4CN, Type PSL2 Spring-Loaded Plunger Carbon Steel	0.51 (base), 0.25 (pin)	0.78	\$1.36	\$5.44
6	S-D-046104-1 Sea Dog Closed Base Die-Cast Aluminum Cleat		4	\$3.49	\$20.94
4	Type FH4 Flush Head Stud Stainless Steel	0.138	1.25	\$0.11	\$0.44
				<b>Sales Tax</b>	\$0.55
				<b>Shipping</b>	\$19.70
				<b>Final Cost</b>	\$615.07

All dimensions are in inches

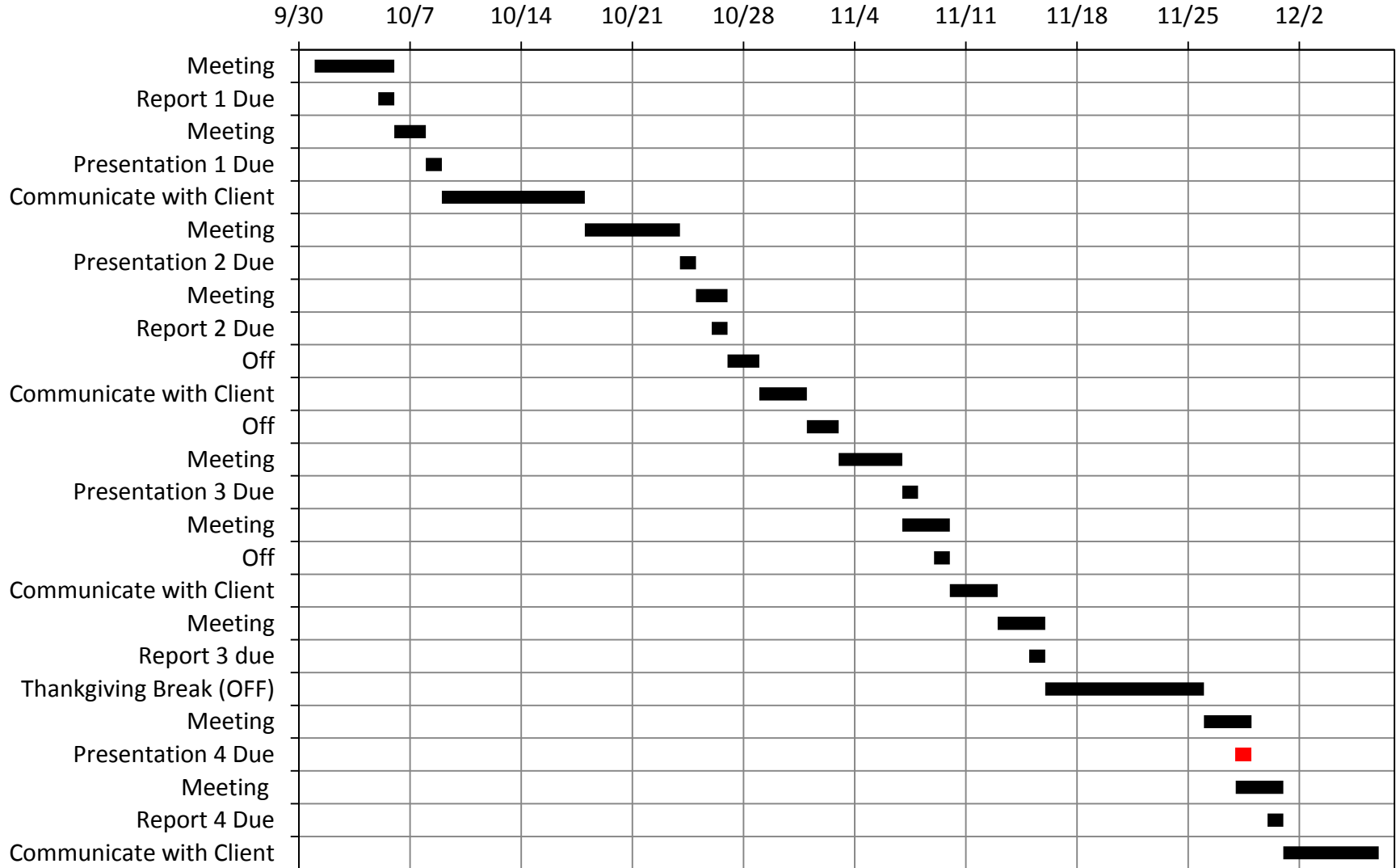
w = width, h = height, t = thickness, D = diameter

Sales tax only applies to products bought in Arizona

# Constraints and Proposal

- Highest ornament elevated a minimum of 6-8 ft from the stand base
- Can fit in a compact car when disassembled
- No individual component can weigh more than 50 lb
- Ornament(s) must be hung or mounted
- Assembly time cannot exceed 30 min
- Stand must support 2 different sized ornaments
- Freestanding
- Total costs must not exceed \$1000
- Lightweight – can be carried by one adult
- Collapsible

# Project Timeline



# Conclusion

- Problem
- Modifications
- Final design
- Engineering analysis
- Cost analysis
- Constraints
- Project timeline



# References

- [1] Dr. Dieter Otte  
Assistant Professor of Computer Science  
Department of Electrical Engineering/Computer Science  
CEFNS at Northern Arizona University  
Phone: 928-523-0876  
Email: Dieter.Otte@nau.edu
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- [4] McMaster-Carr. (n.d.). *Quick-Release Pins*.  
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# Questions

All dimensions are in inches

