Interim Design – Team 6
Solid Panel Interlocking Mechanism for a Solid Reflector

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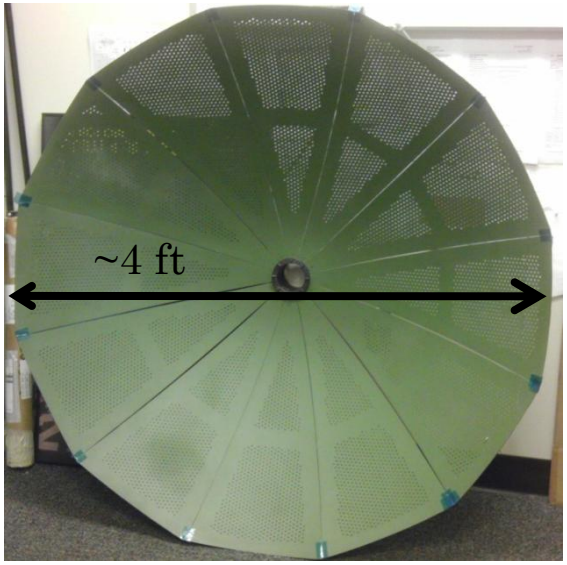
Overview

- Introduction
- Selection Criteria
- Decision Matrix
- Design Concept
- Analysis of Design
- Summary

Introduction

Solid Panel Interlocking Mechanism

- Multiple panels stacked
- Autonomous deployment capabilities
- No gapping in fully deployed configuration
- Reversibility
- Dimensions
  - Minimum thickness = 0.072 inches
  - Maximum thickness = 0.421 inches
  - Diameter = 4.29 feet



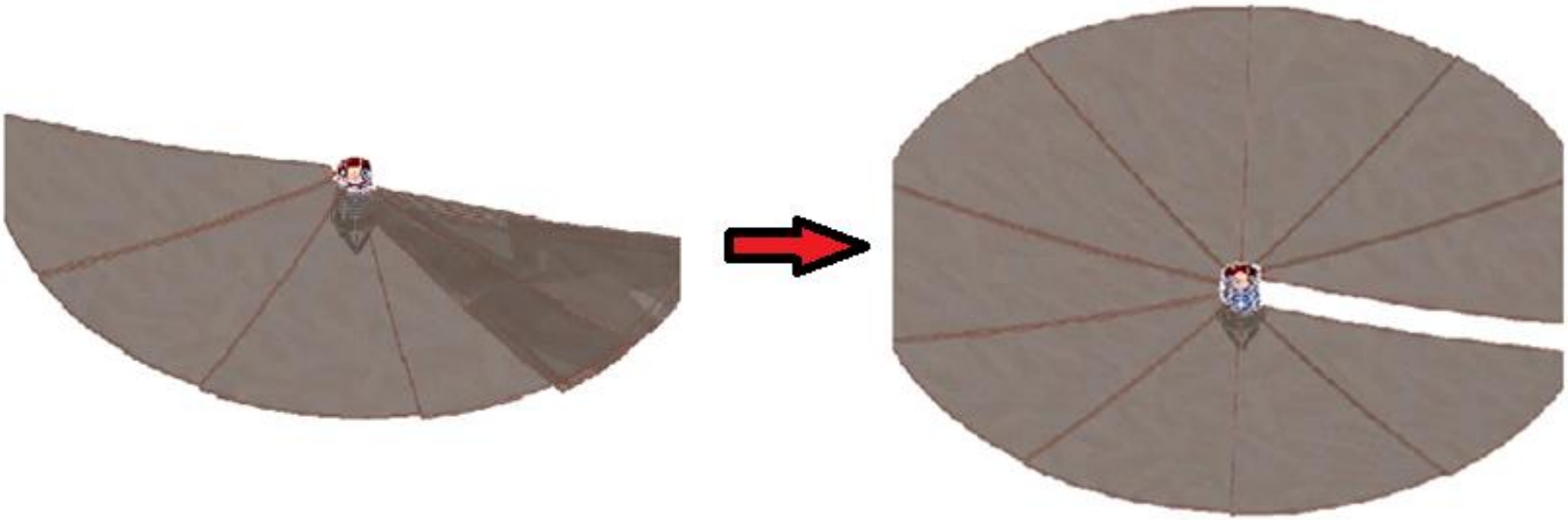
VIDEO

Deployment Stages

- Stage 1
  - Stowed

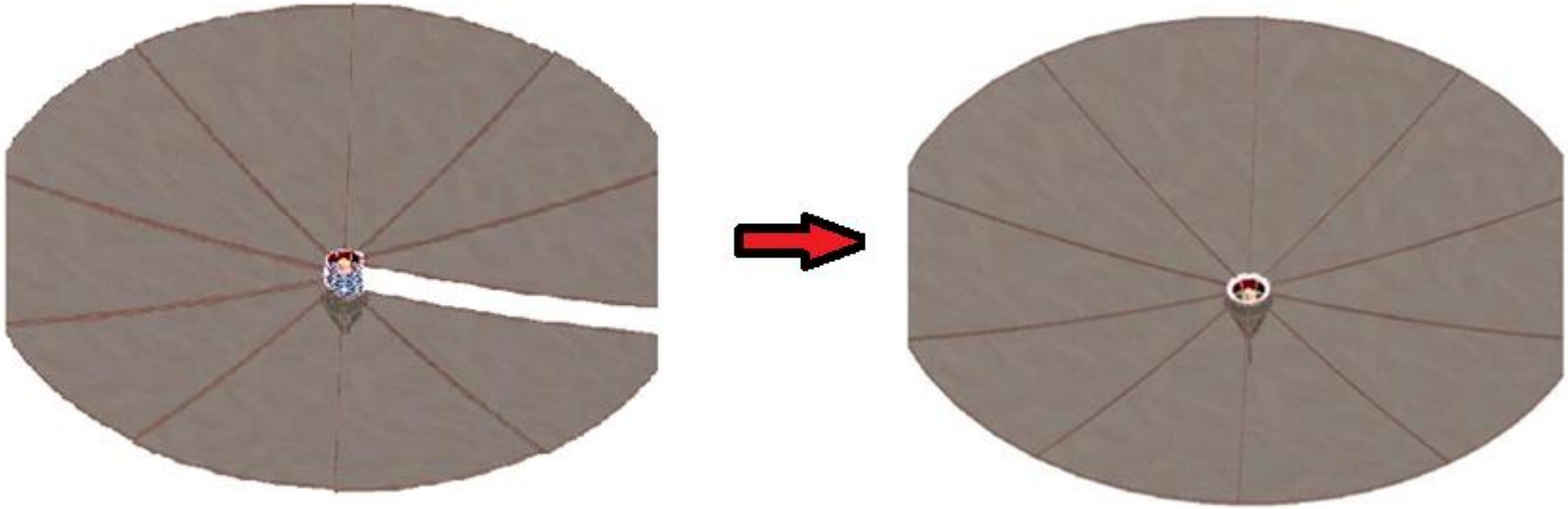
Deployment Stages

- Stage 2
  - Rotational Deployment



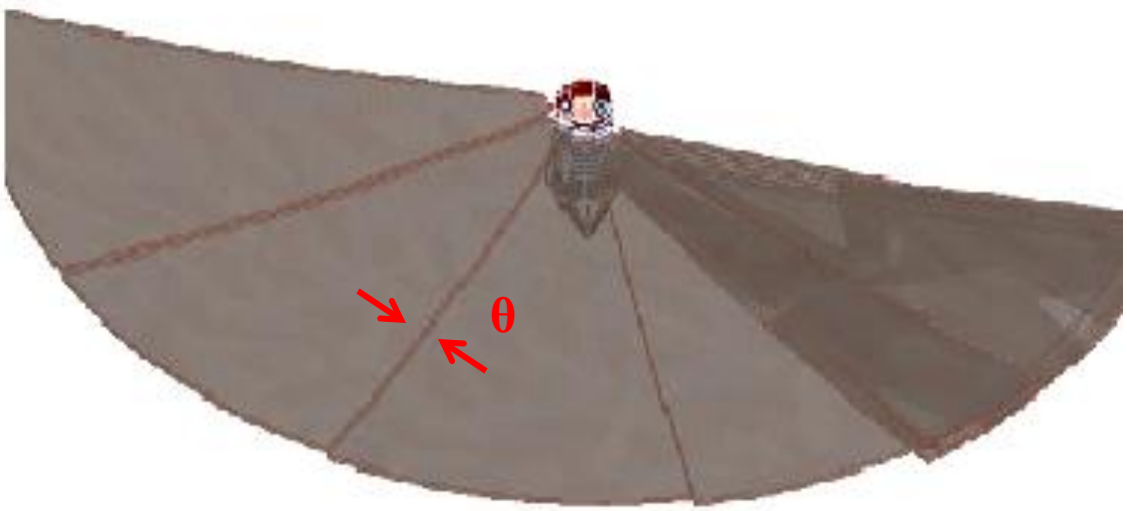
Deployment Stages

- Stage 3
  - Lateral Deployment (Collapsing)
  - Fully Deployed Dish



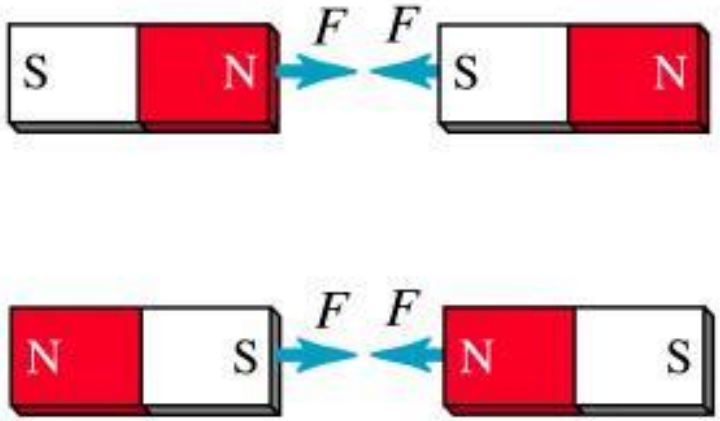
Selection Criteria

- Reliability – 30%
  - Engagement Proximity
    - This is the minimum distance between adjacent panels before the interlocking mechanism can engage.



Selection Criteria

- Engagement Force
  - The force required to engage the interlocking mechanism.
    - Magnets create a force

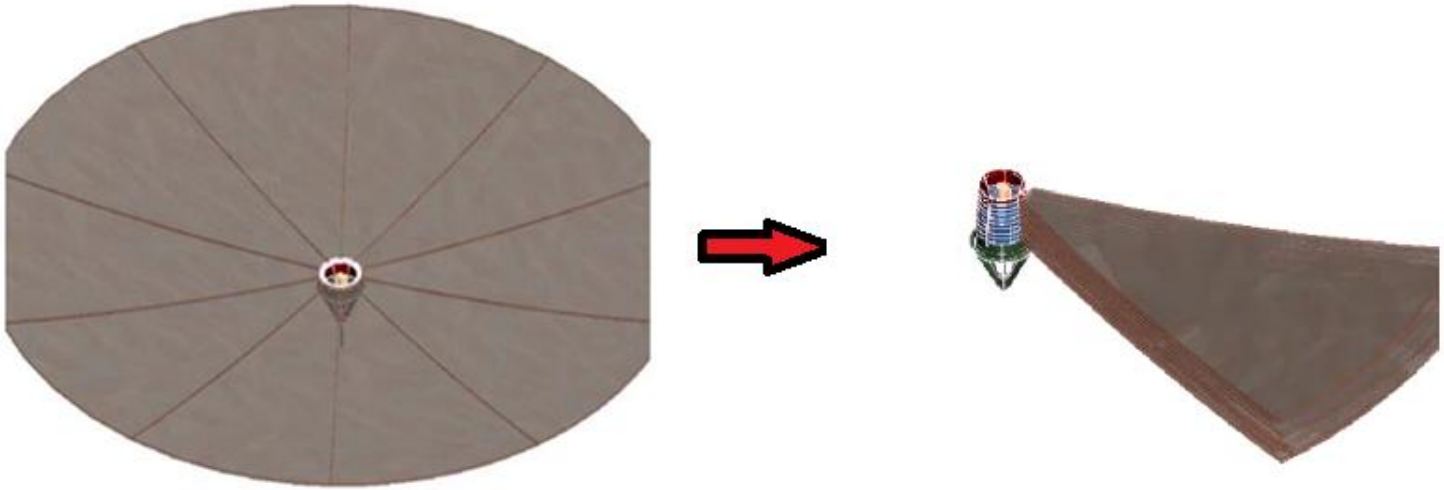


Selection Criteria

- Security – 30%
  - Separation Failure
    - The potential of the panel seams to separate once the interlocking mechanisms have engaged.
  - Stability
    - The ability of the individual components to maintain the continuity of the parabolic curve necessary in the design of the dish.
  - Gapping
    - Misalignment between adjacent panels. Any gap should be less than 5 mil (0.127 mm)

Selection Criteria

- Reversibility – 20%
  - The ability to reset the mechanism to allow the panels to return to the stowed position
  - Does not require motor to reset, but is preferred



Selection Criteria

- Complexity – 10%
  - Intricate designs will incur increased costs for production, and increase potential sources of failure.

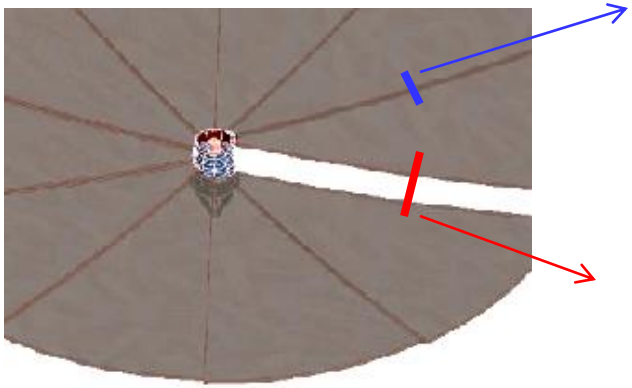
- Price – 10%
  - Cost of the system

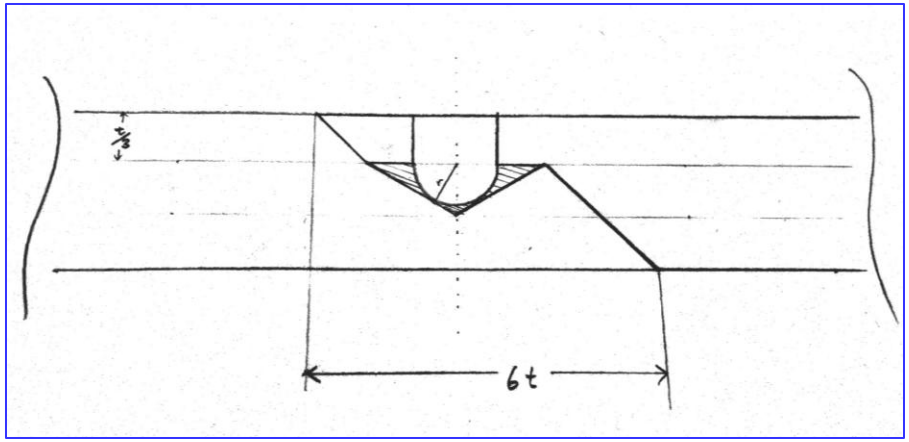
Decision Matrix

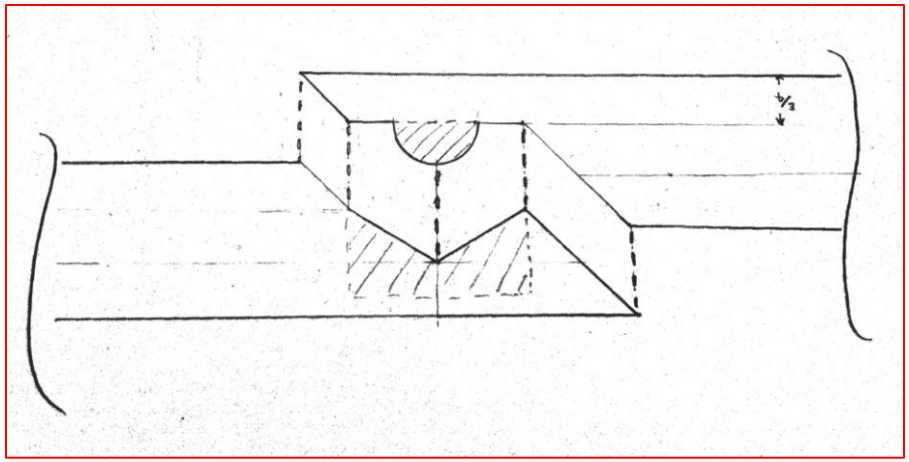
		Magnets		Cup and Cone	
Specifications	Weight Factor	Rating	Score	Rating	Score
Reliable					
Engagement Proximity	0.15	5	0.75	4	0.6
Engagement Force	0.15	5	0.75	4	0.6
Security					
Separation Failure	0.1	5	0.5	4	0.4
Stability	0.1	4	0.4	4	0.4
Gapping	0.1	4	0.4	5	0.5
Reversibility	0.2	5	1	5	1
Complexity	0.1	5	0.5	5	0.5
Price	0.1	4	0.4	5	0.5
		Total:	4.7	Total:	4.5

Interim Design

- Cup and Cone with Magnets

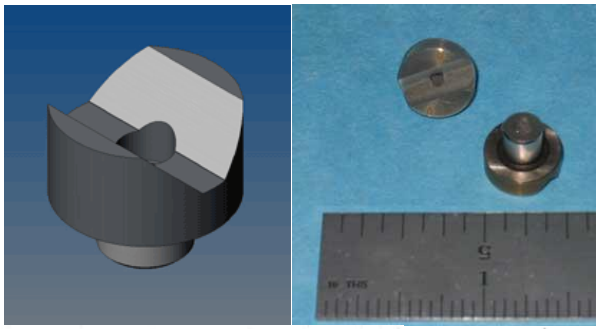


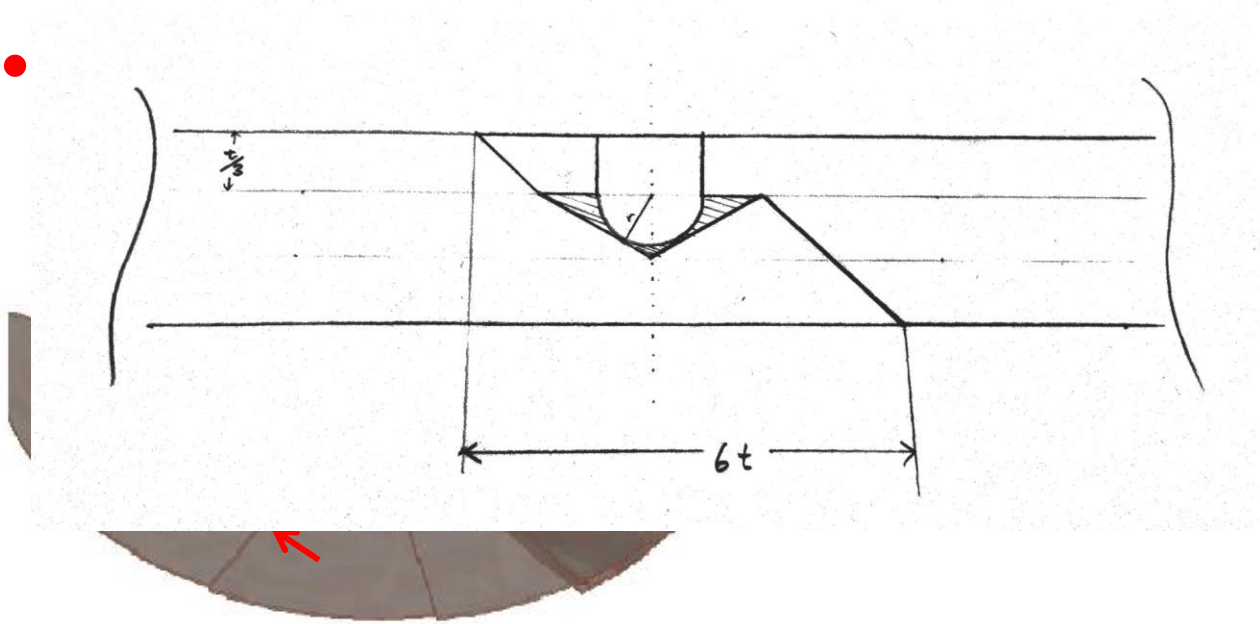




Experimental Analysis (1 of 2)
Kinematic Coupling (Cup & Cone)

- Geometry
- Dimensional Ratio
-





Experimental Analysis (2 of 2)

- Magnets
  - Shape
  - Force
  - Engagement Proximity

Cost Analysis

- Ideal/Space Applications:

Item	Specs	Quantity	Individual Price	Sub Total
Magnet		20	$2/magnet	$40
Panel Material	Graphite Honeycomb	10 panels	$/weight of material	$100,000+
			Total:	$100,040+

- Solely Demonstrating Mechanical Purposes:

Item	Specs	Quantity	Individual Price	Sub Total
Magnet		20	$2/magnet	$40
Panel Material	Plastic	10 panels	$0 (provided)	$0
			Total:	$40

Summary

- Interim design is electrically and mechanically passive
- Investigate precision engineering and kinematic coupling methods with magnets

Questions?