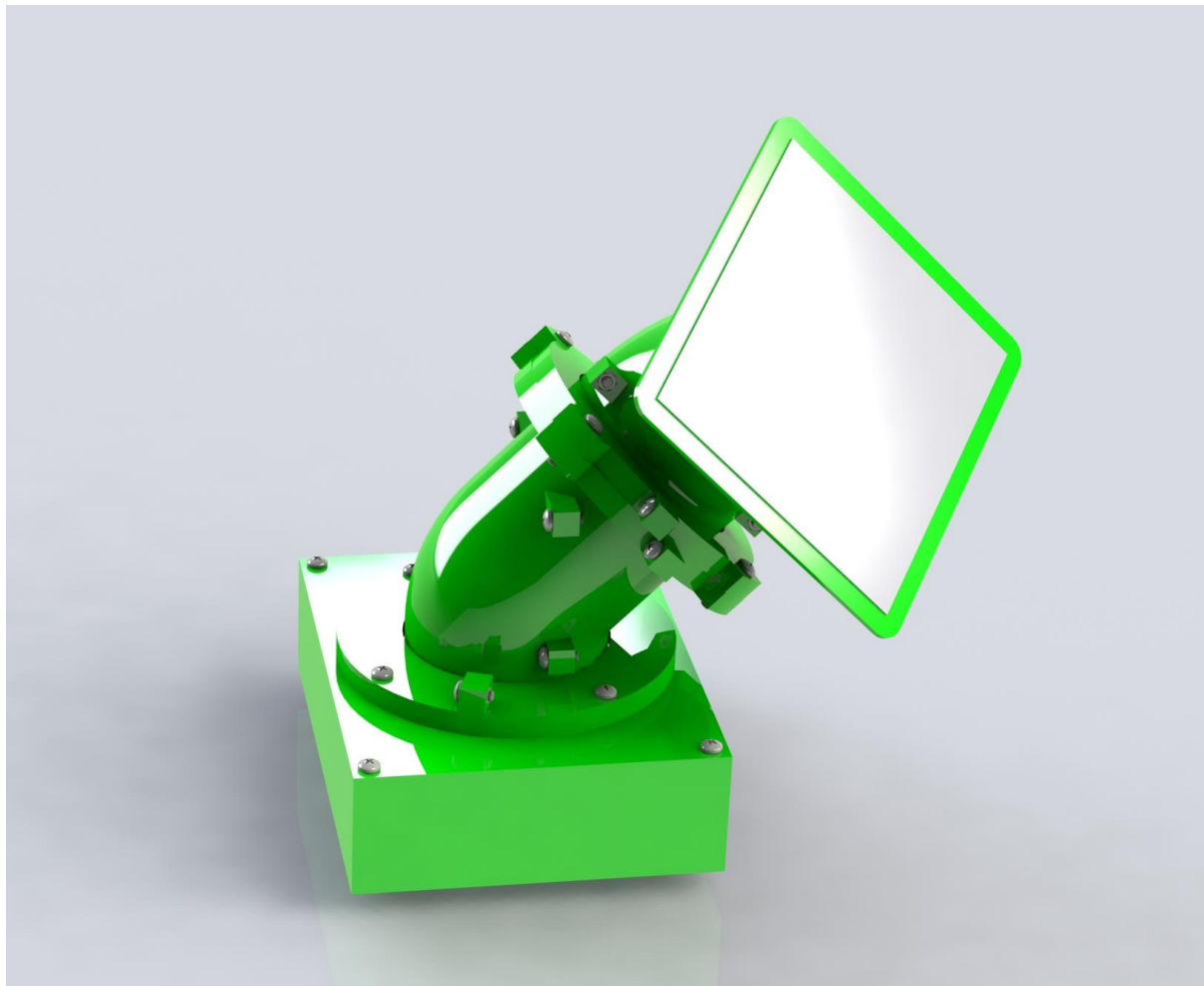


Department Name

Solaris Heliostats

Alexandra Gaskins, Cassidy Hoag, Steven Jenkins, Matthew Maloney,
Pedro Marcano, Cameron Nann, Davis Whitfield

Solaris Heliostat



Solaris Hedgehog Concept



Maximize Cost Efficiency:

Lowering the costs throughout the project allows for higher manufacturability



Increase Heliostat Longevity:

All gears, wires, and motors are internal to protect from the Las Vegas weather conditions



Increase Accessibility:

In case of motor malfunction, the detachable panels can be easily removed, and the motors can be replaced

Customer Needs

Total cost is less than \$100

Tracking error less than 5°

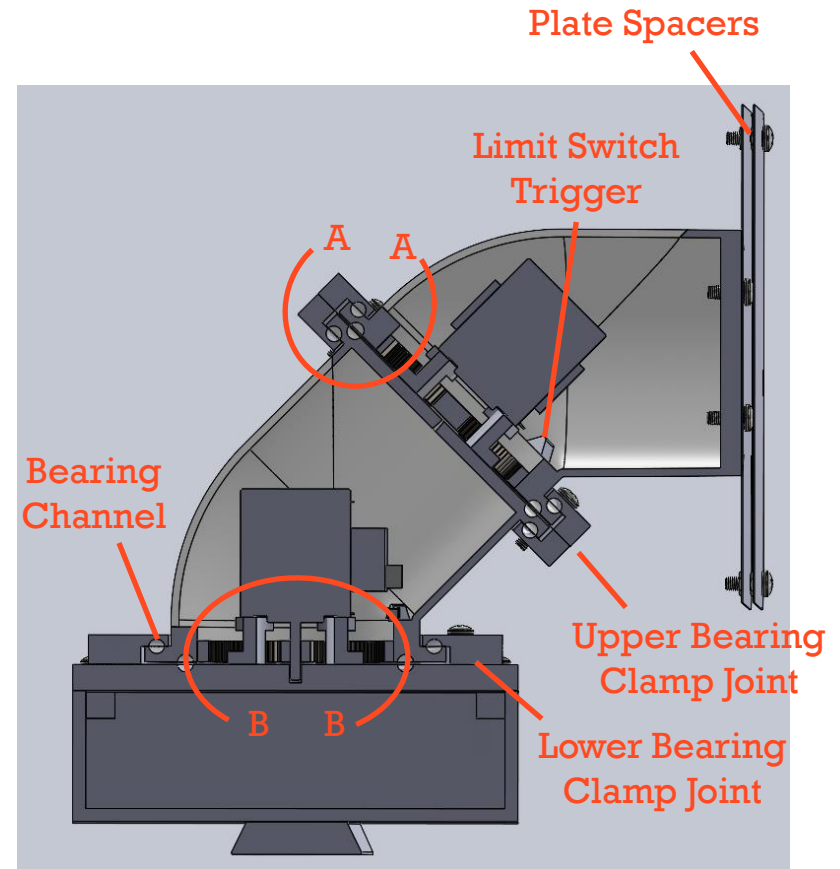
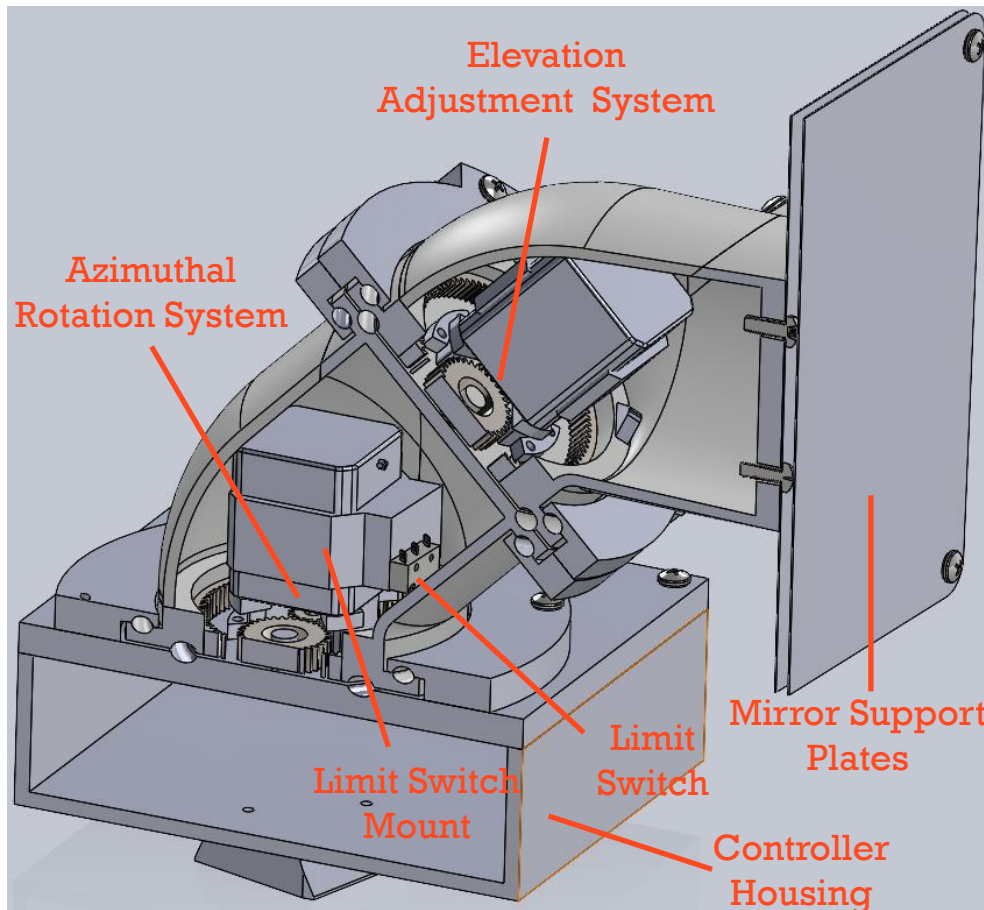
Onboard controller within module

Can withstand Las Vegas weather conditions

Must reflect light up to 100 m central tower

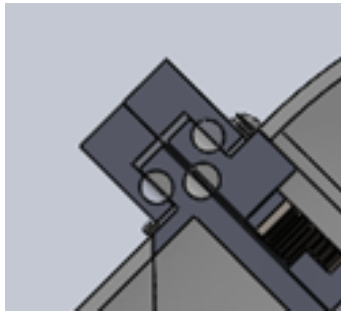
Must be able to track the sun throughout the day

Critical Component Breakdown



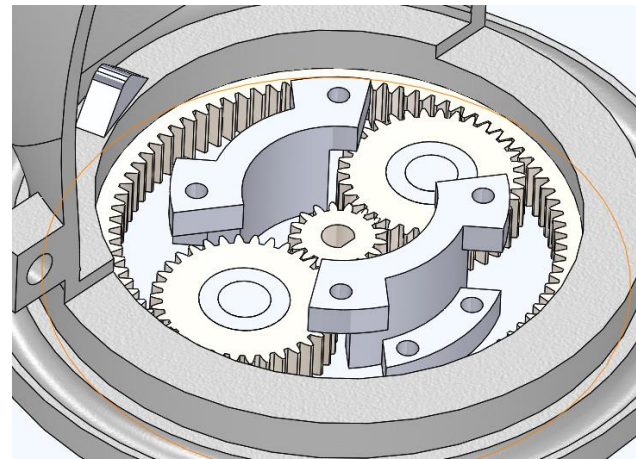
Critical Component Breakdown

Detail View
A-A



- Detail View A-A shows the triple bearing clamp system
- Triple bearing clamp system allows for nearly frictionless 360° elbow rotation
- Clamps are held together using M5 x 25 mm screws in 4 mounting flanges not pictured here

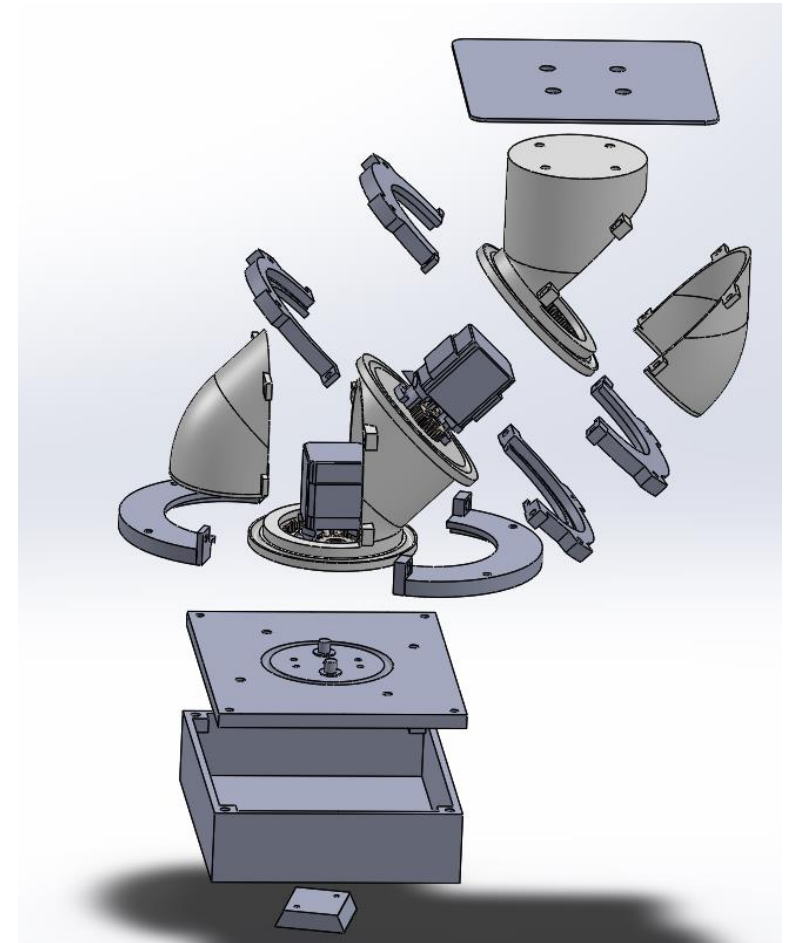
Detail View
B-B



- Detail View B-B shows Gearing and Motor Mounting system
- Bearings are used on the sandwiched gears for frictionless rotation

Critical Component Breakdown

- Exploded view shows the elbow design for Solaris.
- Removable back removes need for print in place of original design.
- Backs held together using M5 x 14 mm screws on the 4 mounting flanges shown.



Wind Survivability test

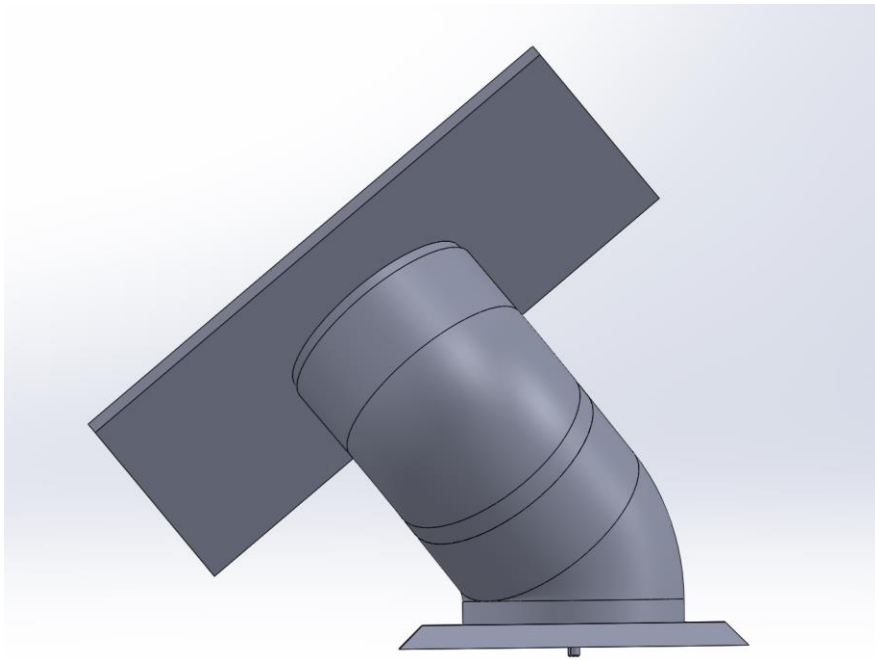


Laser Reflection Target Test

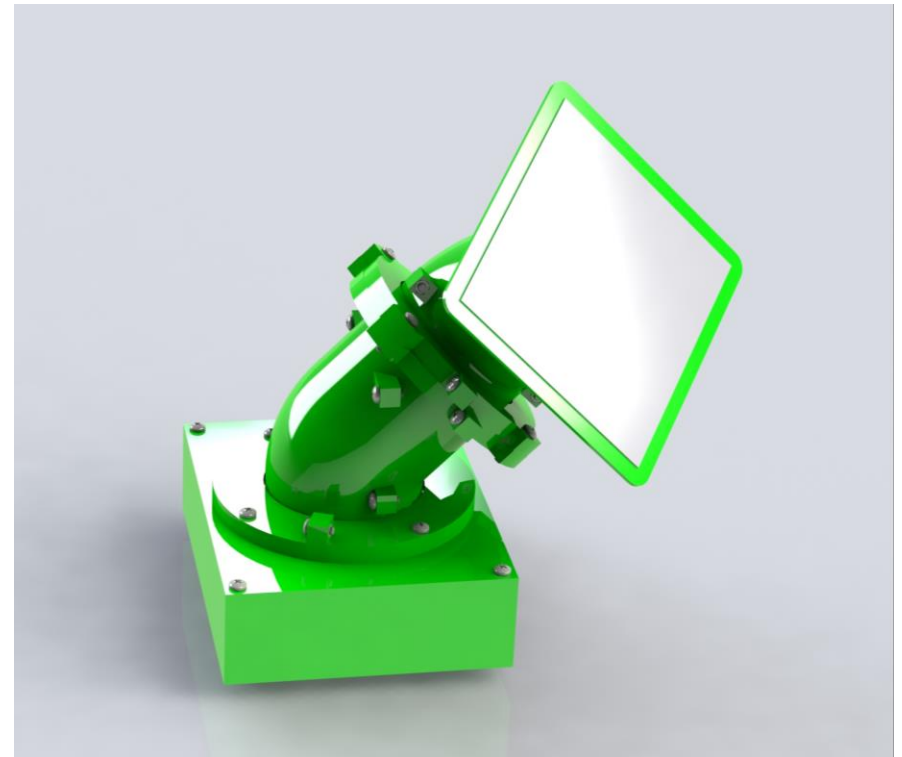


Start to Finish

Initial Design



Final Design



Engineering Analysis

Mirror Plate Change

- Previous 20 Gauge Steel Plate had a weight of 2 lbs
- Overloaded the 0.587 lbm stall torque of the Nema 17 elevation motor and prevented motion
- Design change: PLA mirror plate was implemented with an overall weight of 0.03 lbs
- Motor rotation was uninhibited

Gear Reduction

- Planetary gear system connecting the shaft of each motor to the gear teeth on the inside surfaces of each elbow
- 5:1 gear ratio to reduce the step size from 1.8 degrees/step to 0.36 degrees/step
- Sun gear is mounted directly to motor shaft; sun gear engages with two planetary gears which then rotate the ring gear/elbow

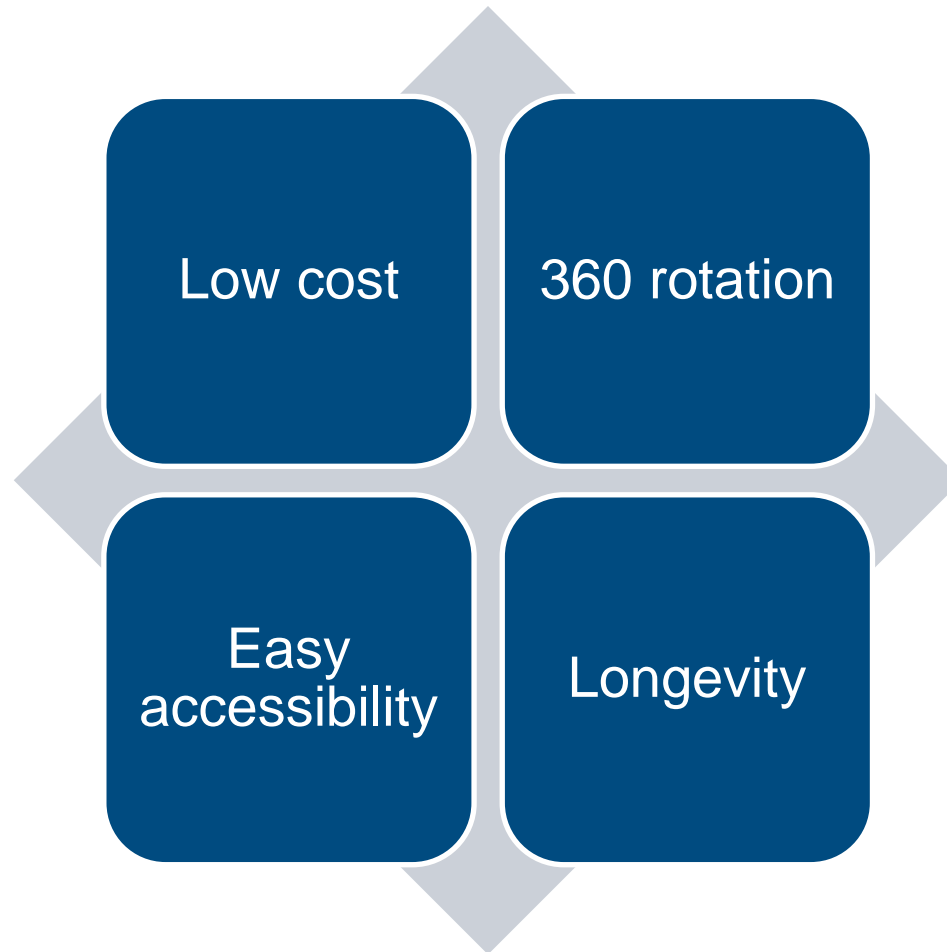
Cost Breakdown QTY 1

Part	Cost
3-D Printed parts	\$ 24.02
Fasteners (M5x25mm, M5x14mm)	\$ 31.14

Cost Breakdown QTY 3000

Part	Cost
3-D Printed parts	\$ 72,060
Fasteners (M5x25mm, M5x14mm)	\$ 93,420

Why you should choose Solaris



Our product is a prime example of applying unique design tactics that minimize the overall cost of manufacturing and increase the heliostat's longevity.

