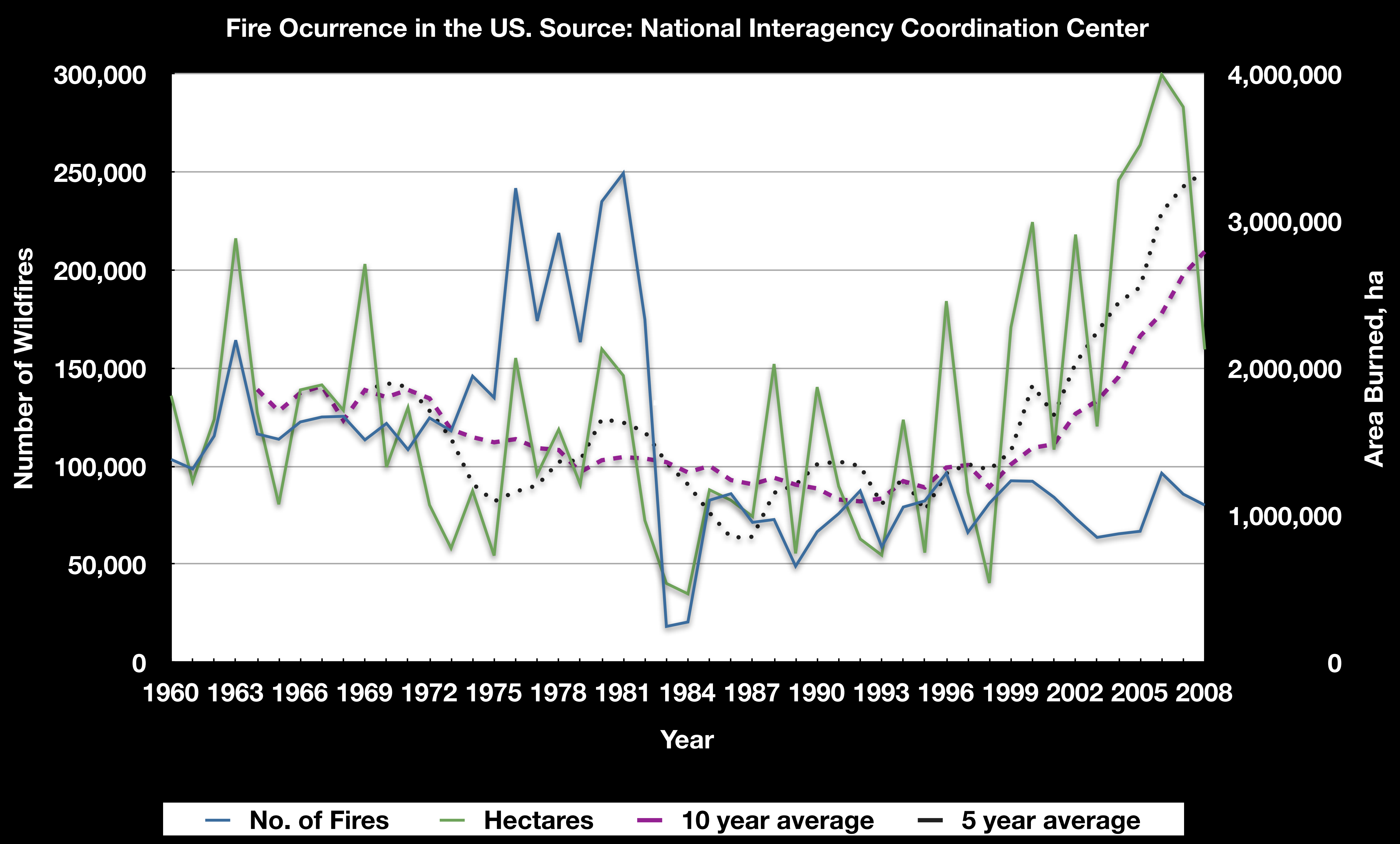
Thermal Camera

Ramses Alcaide — Team Lead

John Thomson — Electrical Lead

Adrian Haruta — Mechanical Lead

Increase of Wildfires



Design Criteria

- Power On Automatically
- Handle 1200C Heat for 2 min
- 225C Smoldering for 2 Hours
- Rotate in 20 Sec
- Handle 50 MPH Wind
- Keep Camera Under 50 C
- Record Infrared Data
- Rotate 360 Degrees
- Less than 50 lbs.
- Reusable Phase Change Material

Multiple Environments

Development Outline

- Thermal Materials and Modeling
  - Titanium αβ
  - Firebrick
  - Pyrogel
  - PCM
  - Performance
- Mechanical Design and Lens
  - Housing Leg Design
  - Rotational System
- Electrical and System
  - Control System
  - Thermopiles
  - Estimator
  - Simulation
- Prototype

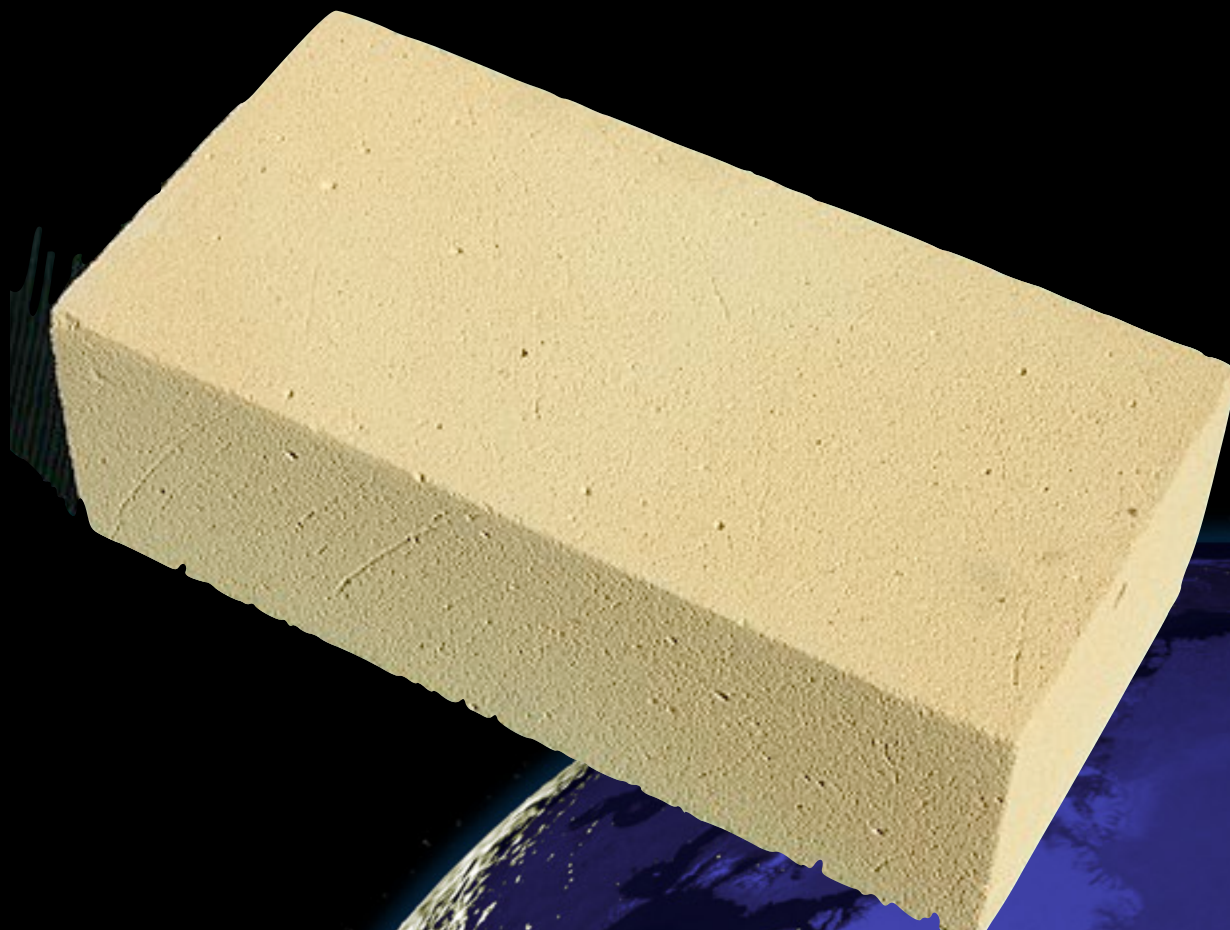
Thermal Materials and Modeling

Adrian Haruta

Titanium αβ

- Cheap Compared to Inconel
- Easy to Acquire
- Easier to Weld and Form
- Highly Corrosion and Oxidation resistant
- Can withstand 1200C

Fire Brick



- Extremely Low Thermal Conductivity
- Very Cheap
- Light Weight
- Equal Inside and Outside Steady State Temperature

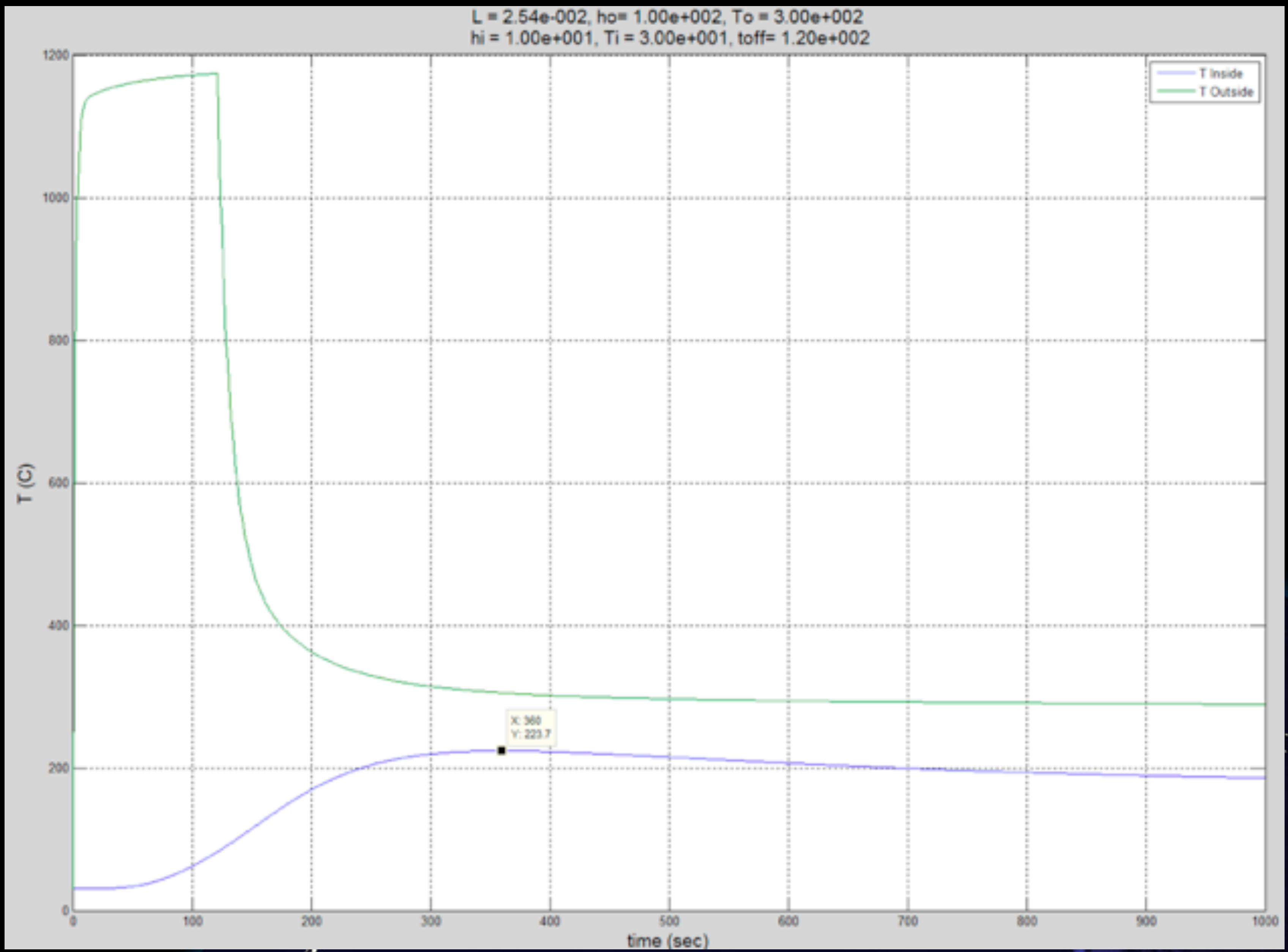
Pyro-Aerogel

- Silica Nanogel
- Lowest Thermal Conductivity of any Material
- Very Low Weight 99% Air
- Low Internal Steady State Temperature

Phase Change Material

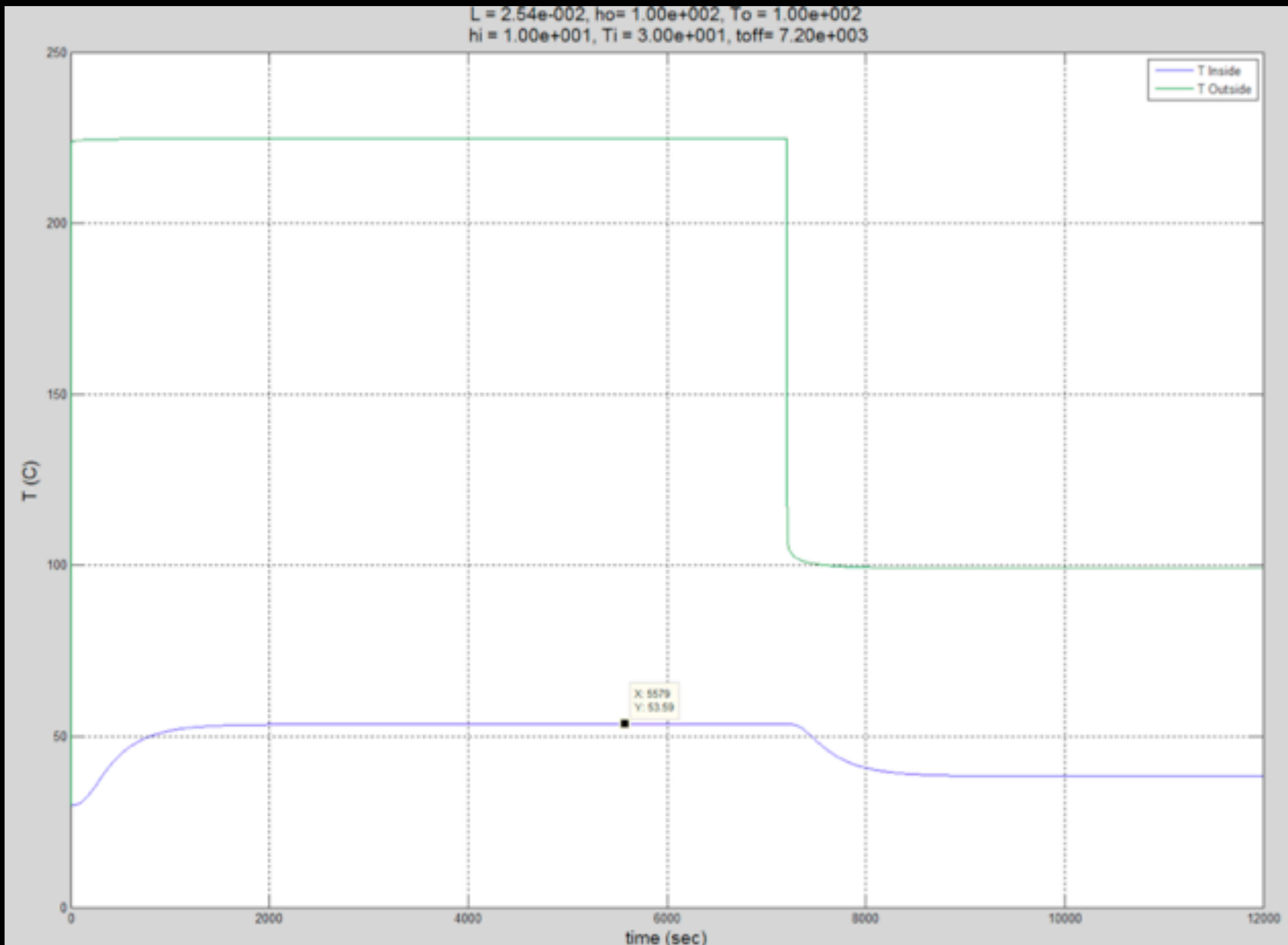
- Plus Ice PCM
- Solid-Solid Phase Change
- 40C Phase Change
- High Energy Absorption

Performance 1



- 1 inch firebrick
- 1200 C for 2 min
- Max Temp 223.7C

Performance II

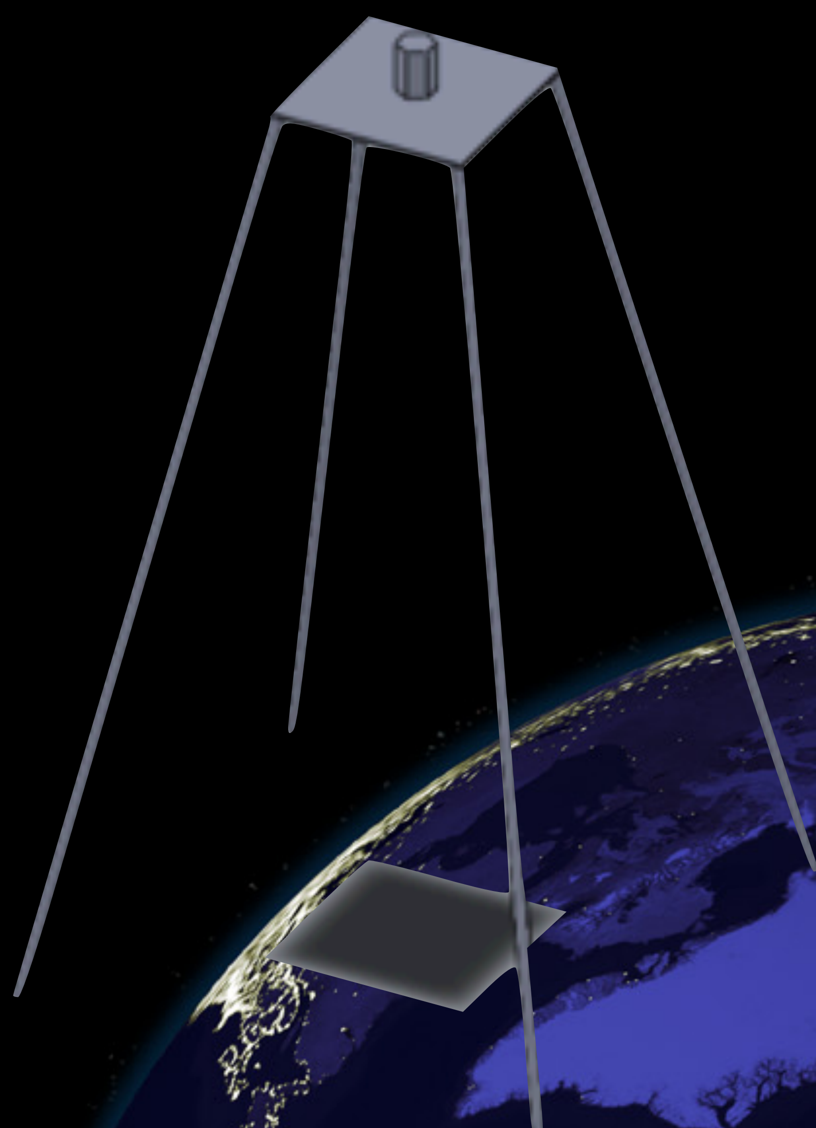


- 1 inch Pyrogel
- 225 C for 2 Hours
- Max Temp 55.59
- Steady State 38.39

Mechanical Design

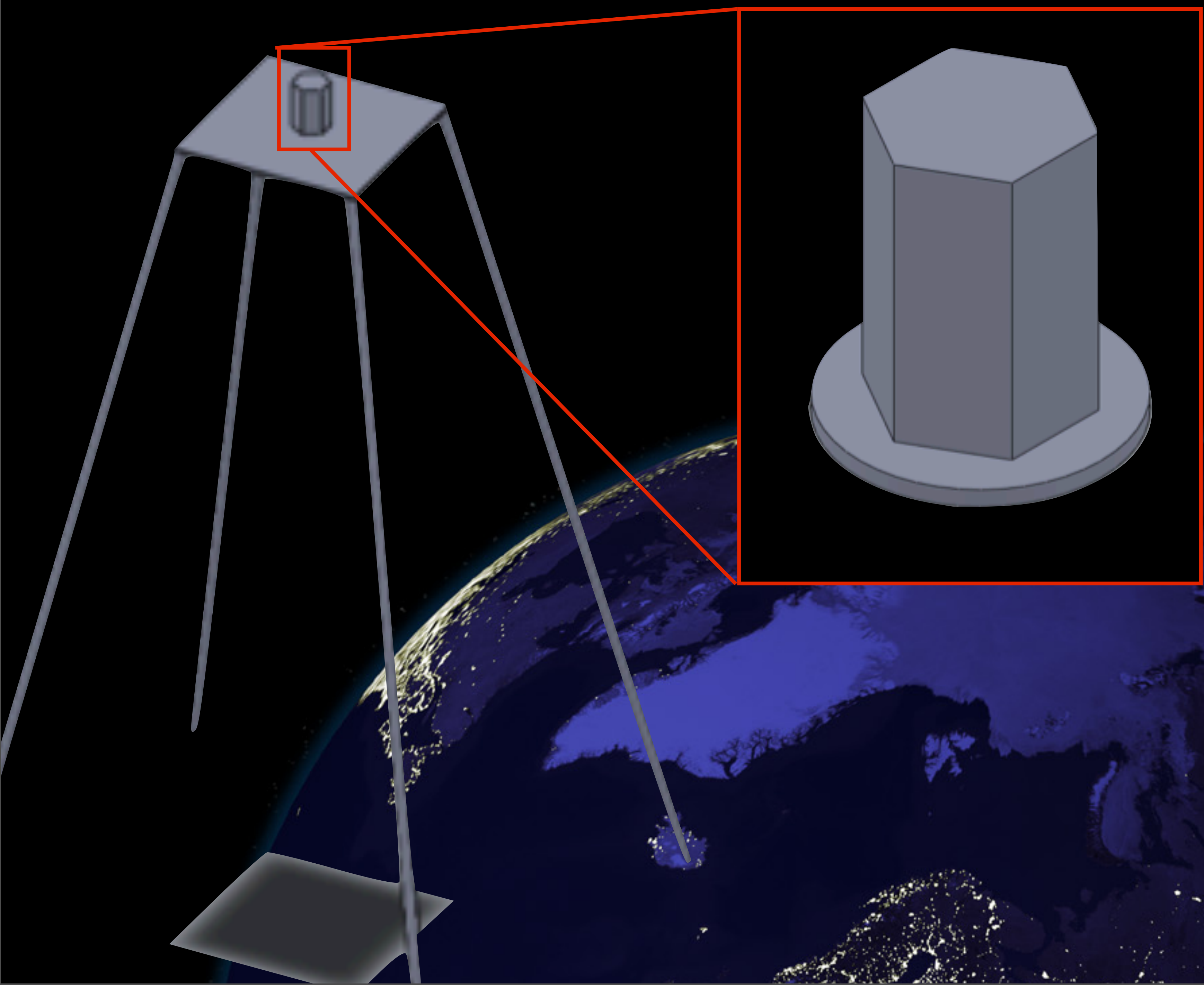
Adrian Haruta

Housing Leg Design



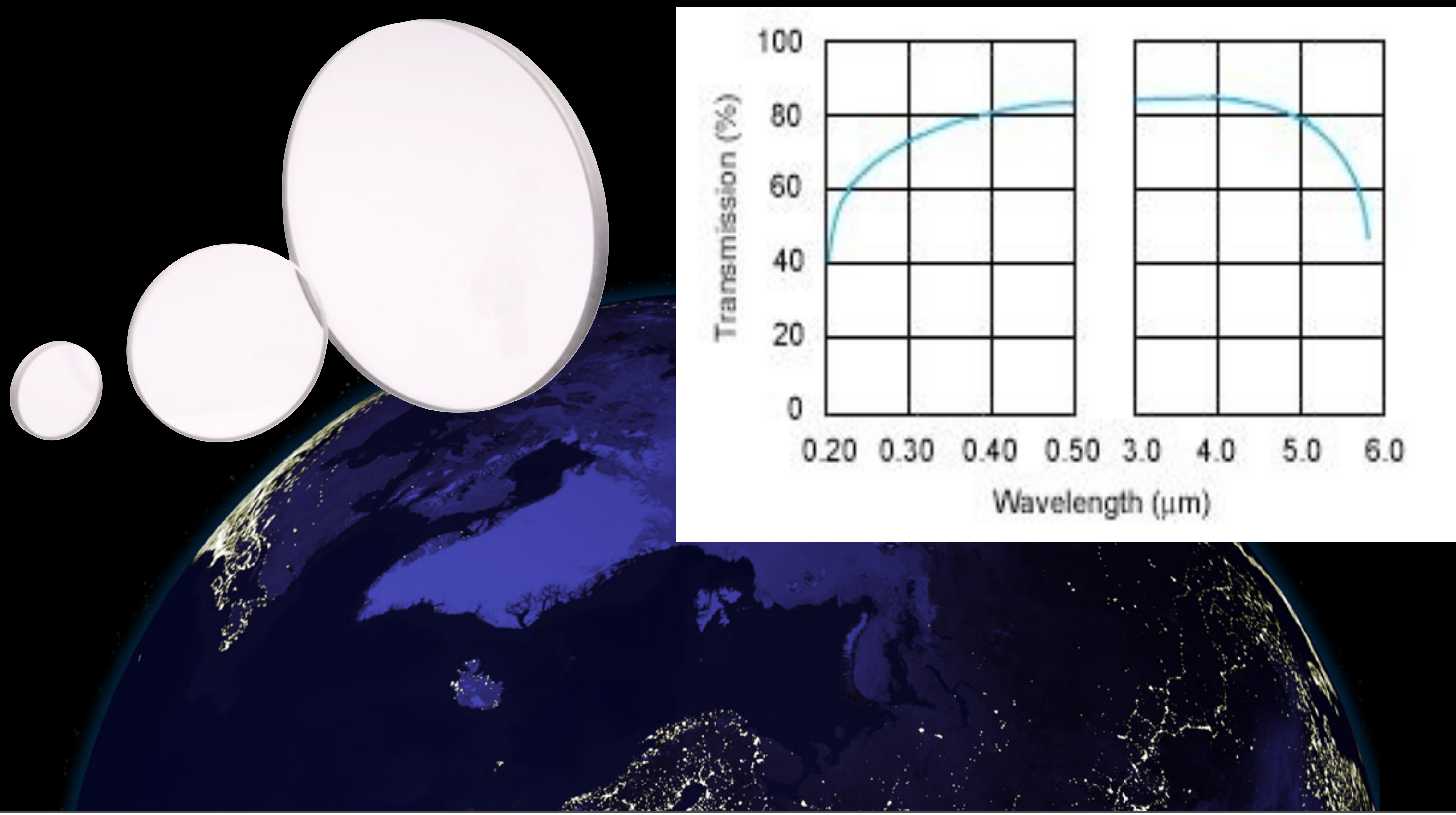
- Weight Distributed to Handle 50 mph winds
- 16 inches/side of Cube
- Calculate Using Drag Force Equations
- Low Internal Steady State Temperature
- Stake-able to the Ground

Rotational System



- Hexagonal Bearing Rotation
- Fully Enclosed
- Detachable
- 360 Degree Rotation
- Pulley System

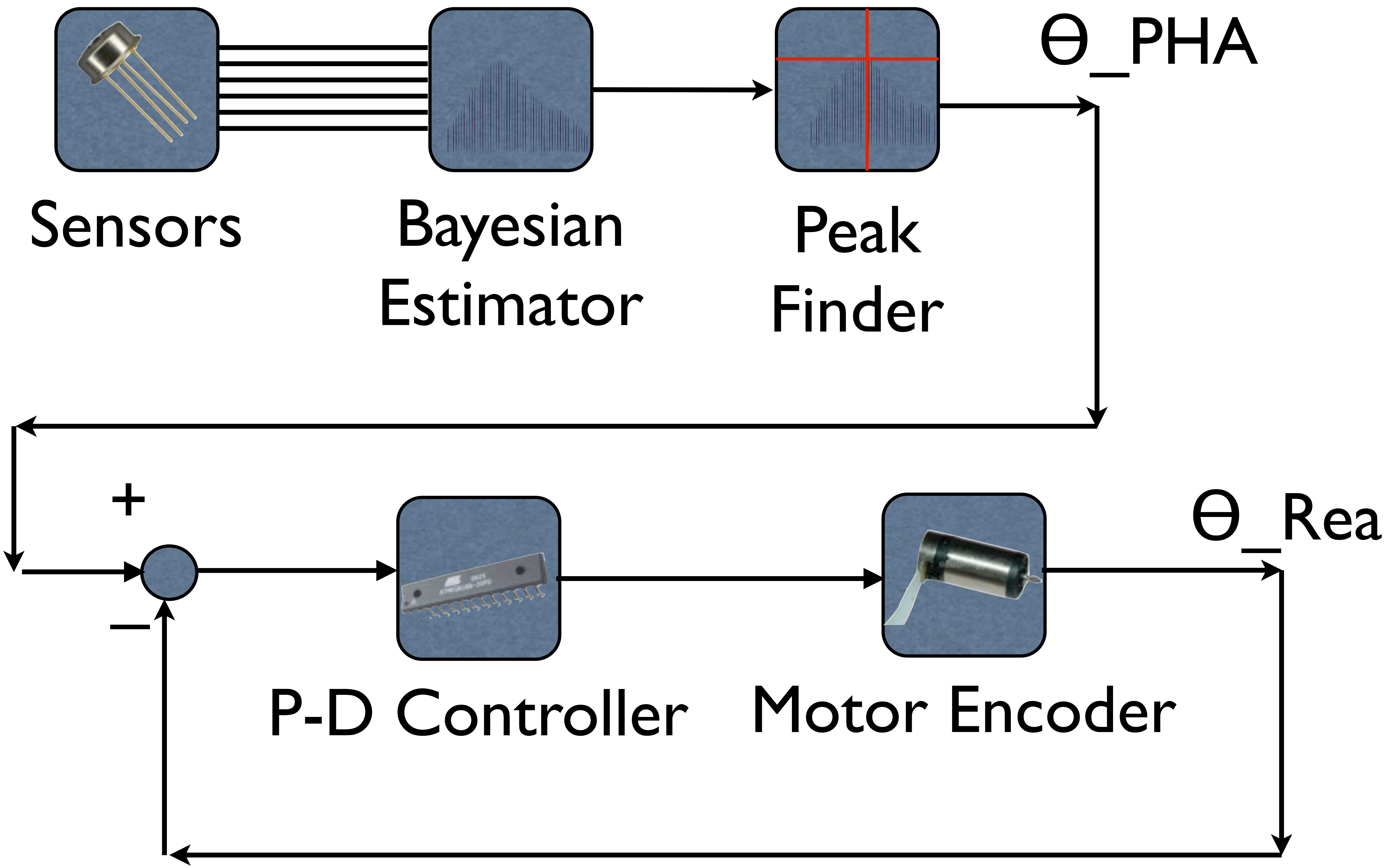
Sapphire Lens



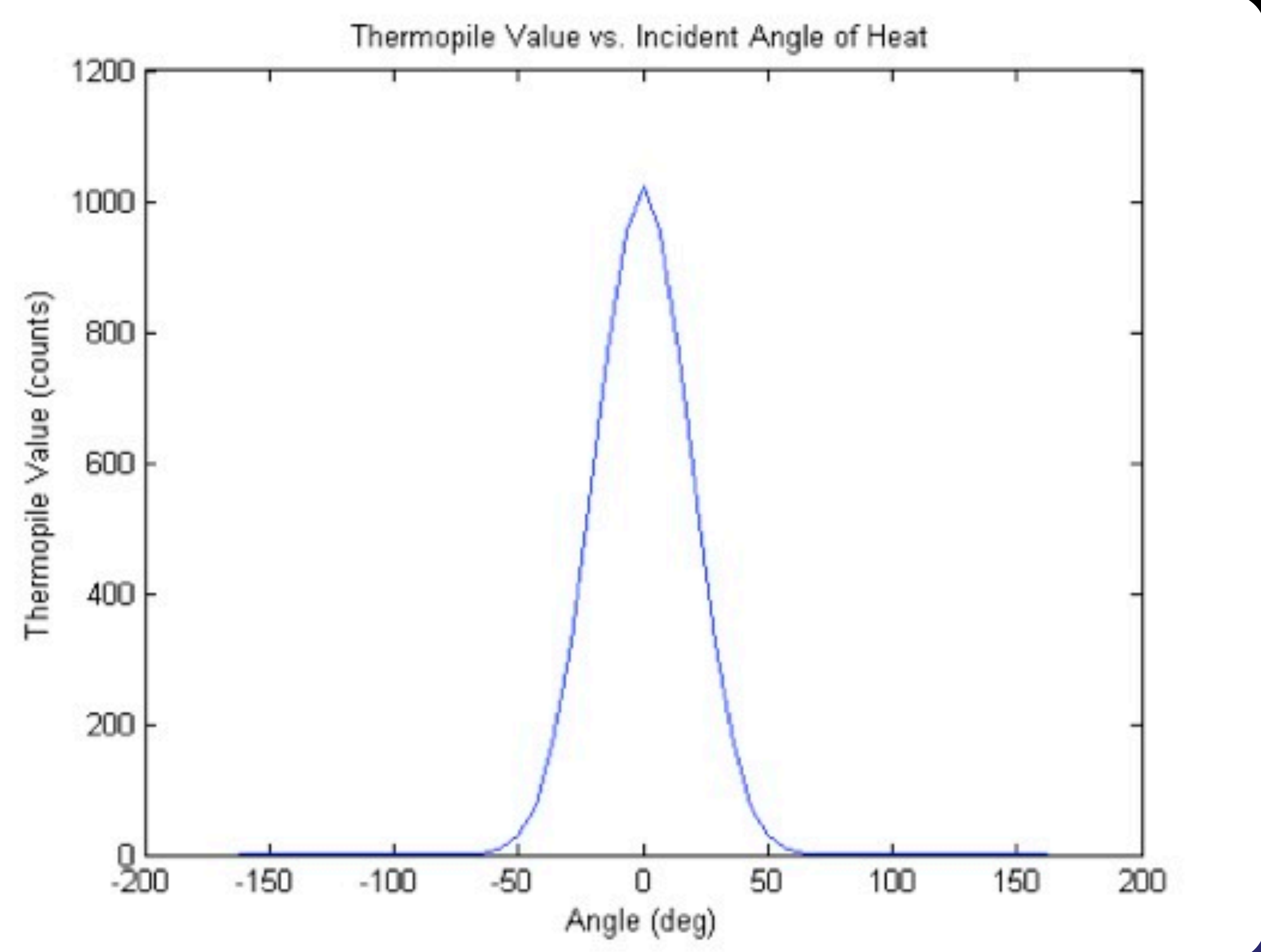
Electrical System

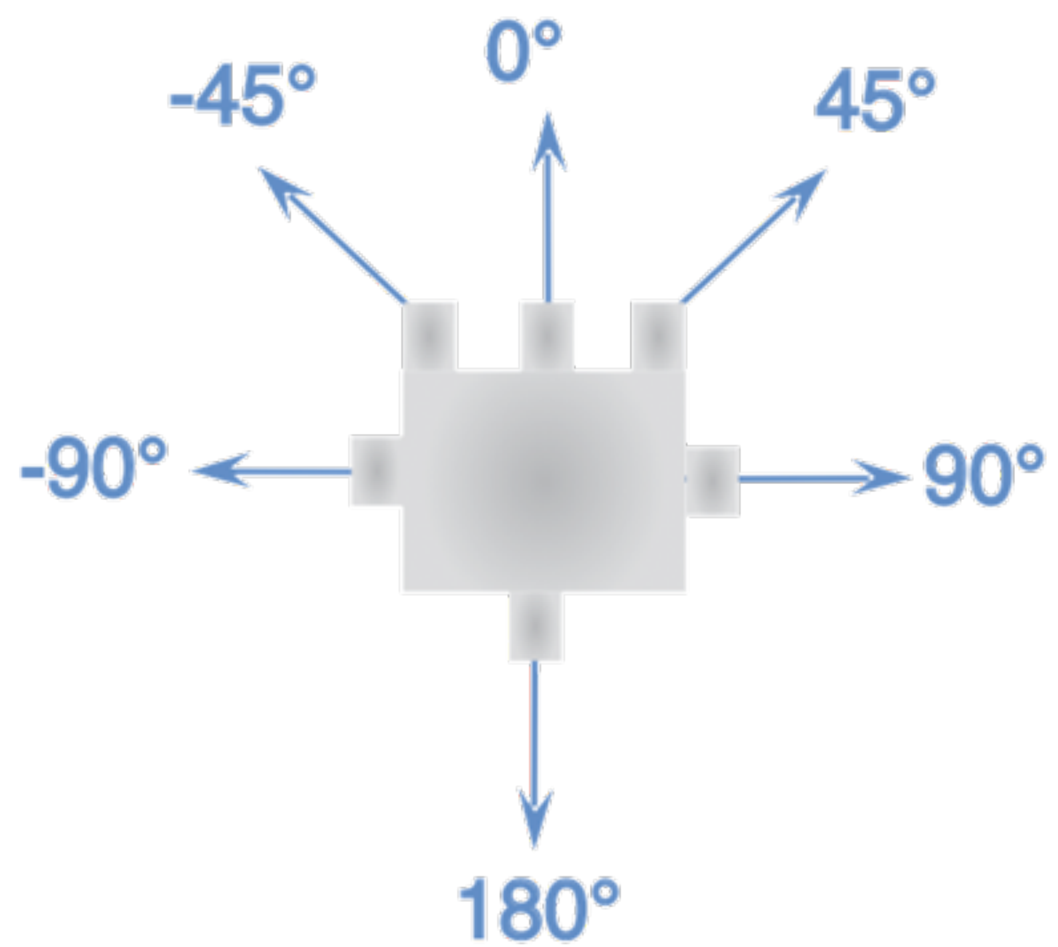
John Thomson

Control System

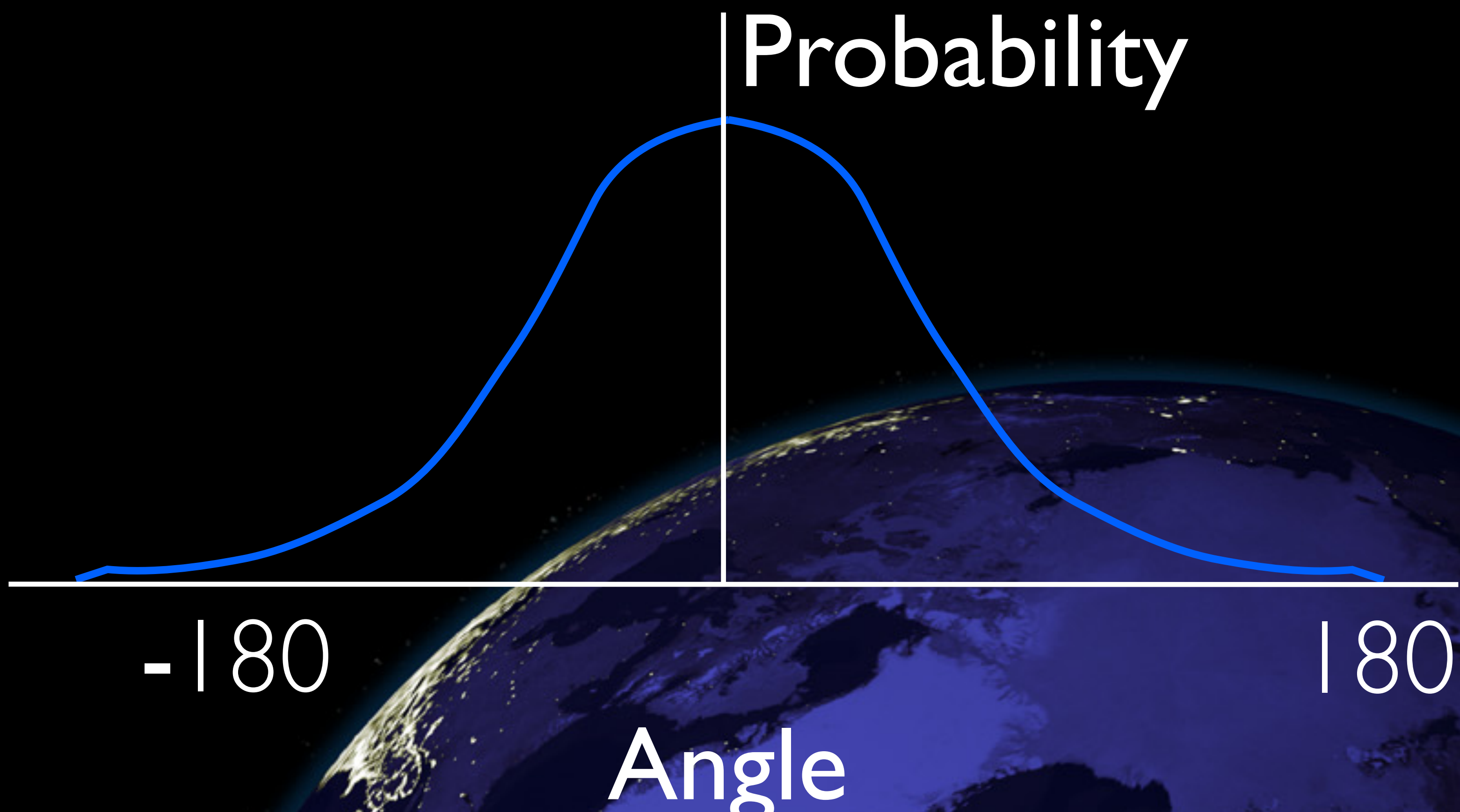


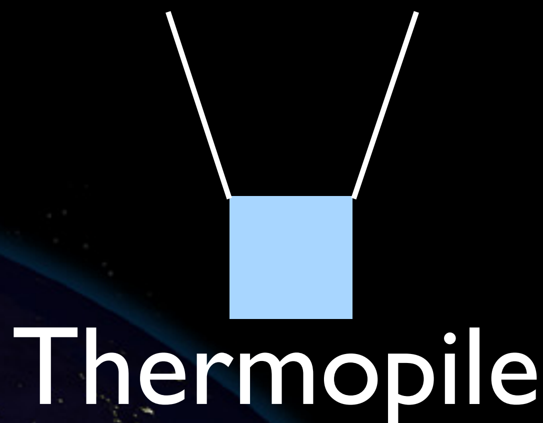
Thermopiles



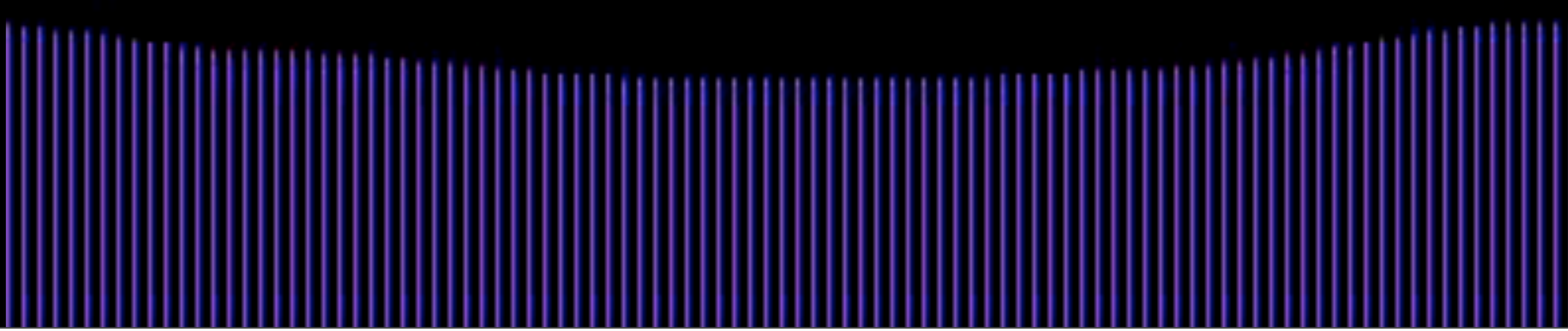


Fire Estimator: Kalman





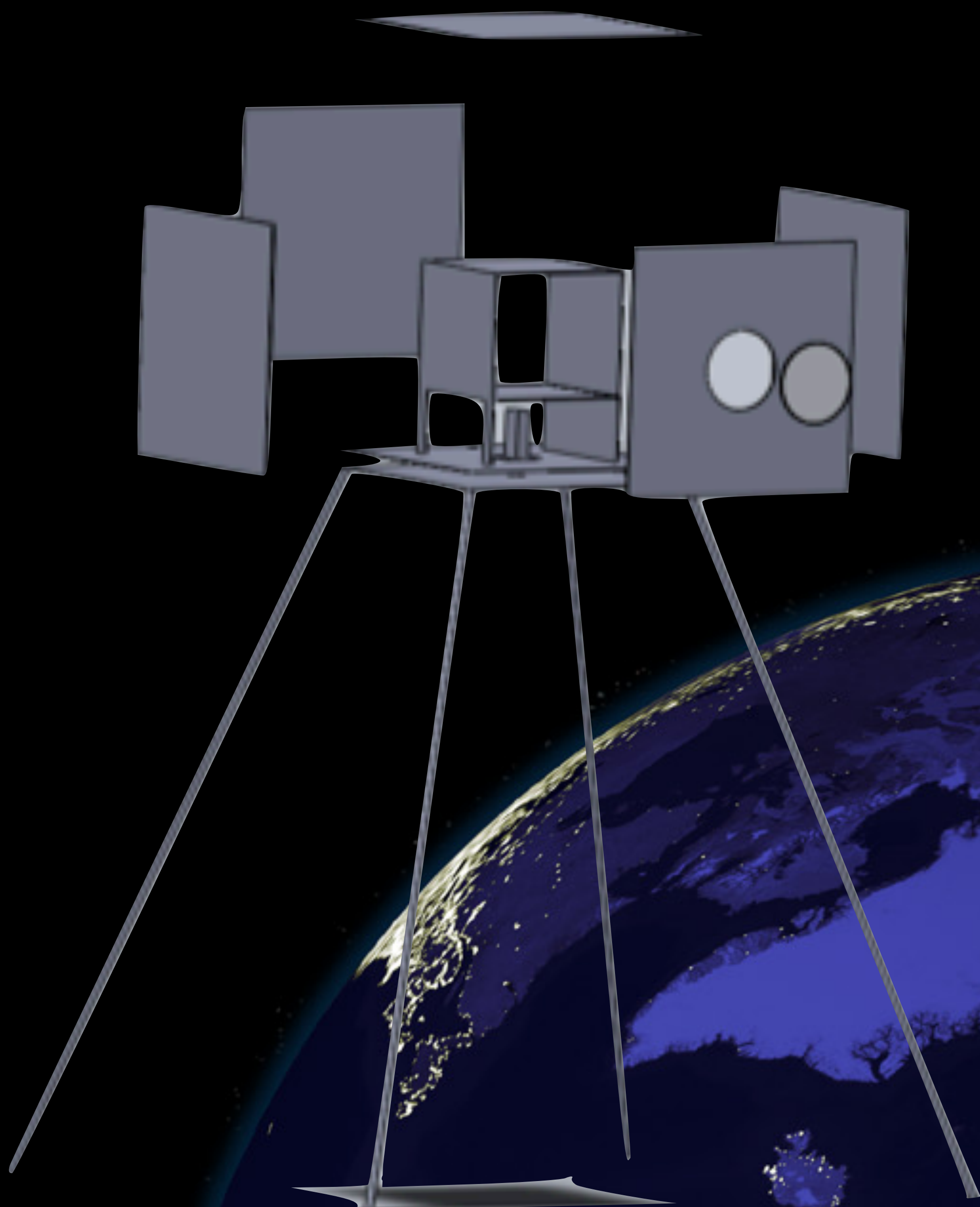
System Simulation



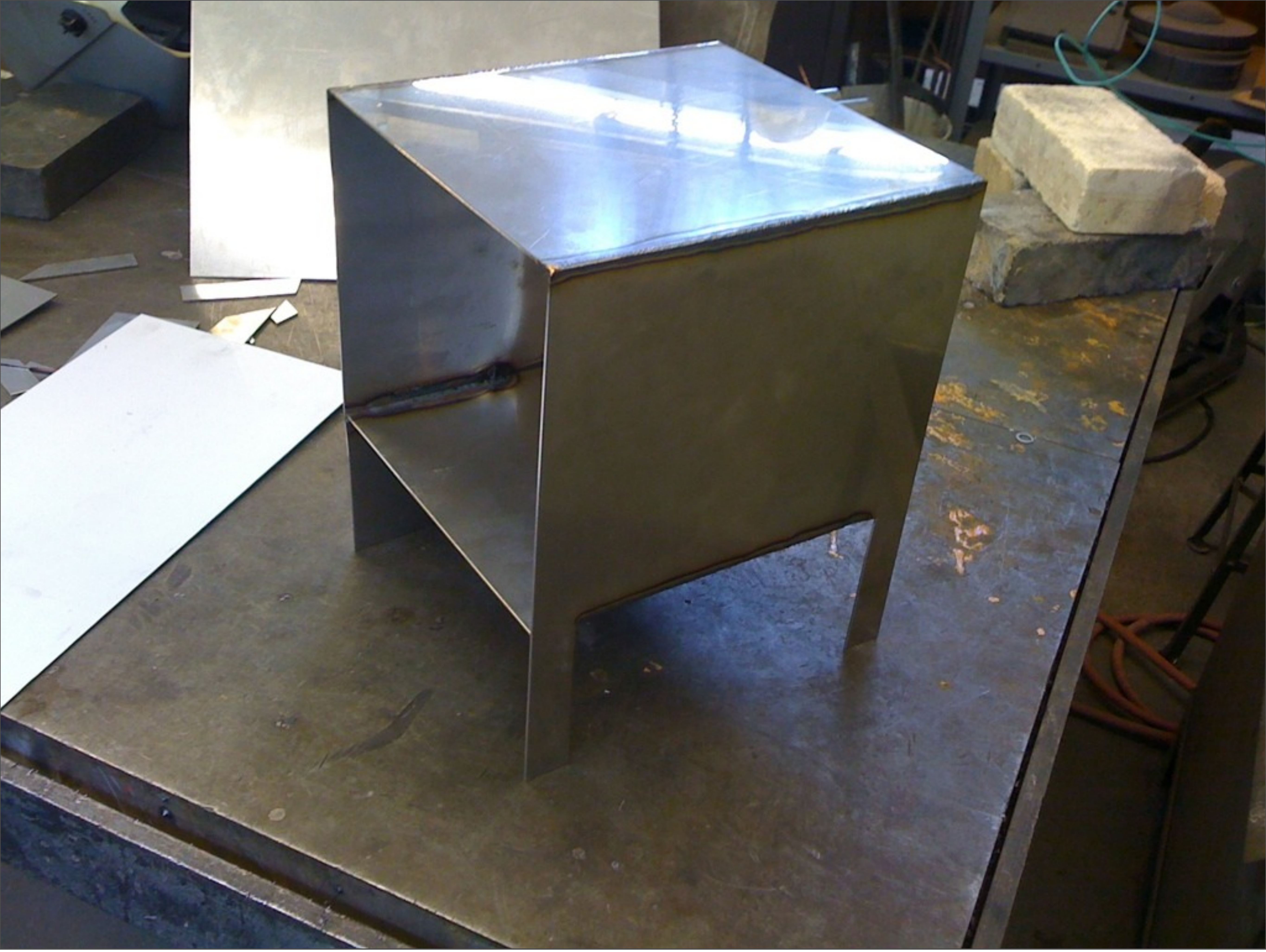
Prototype

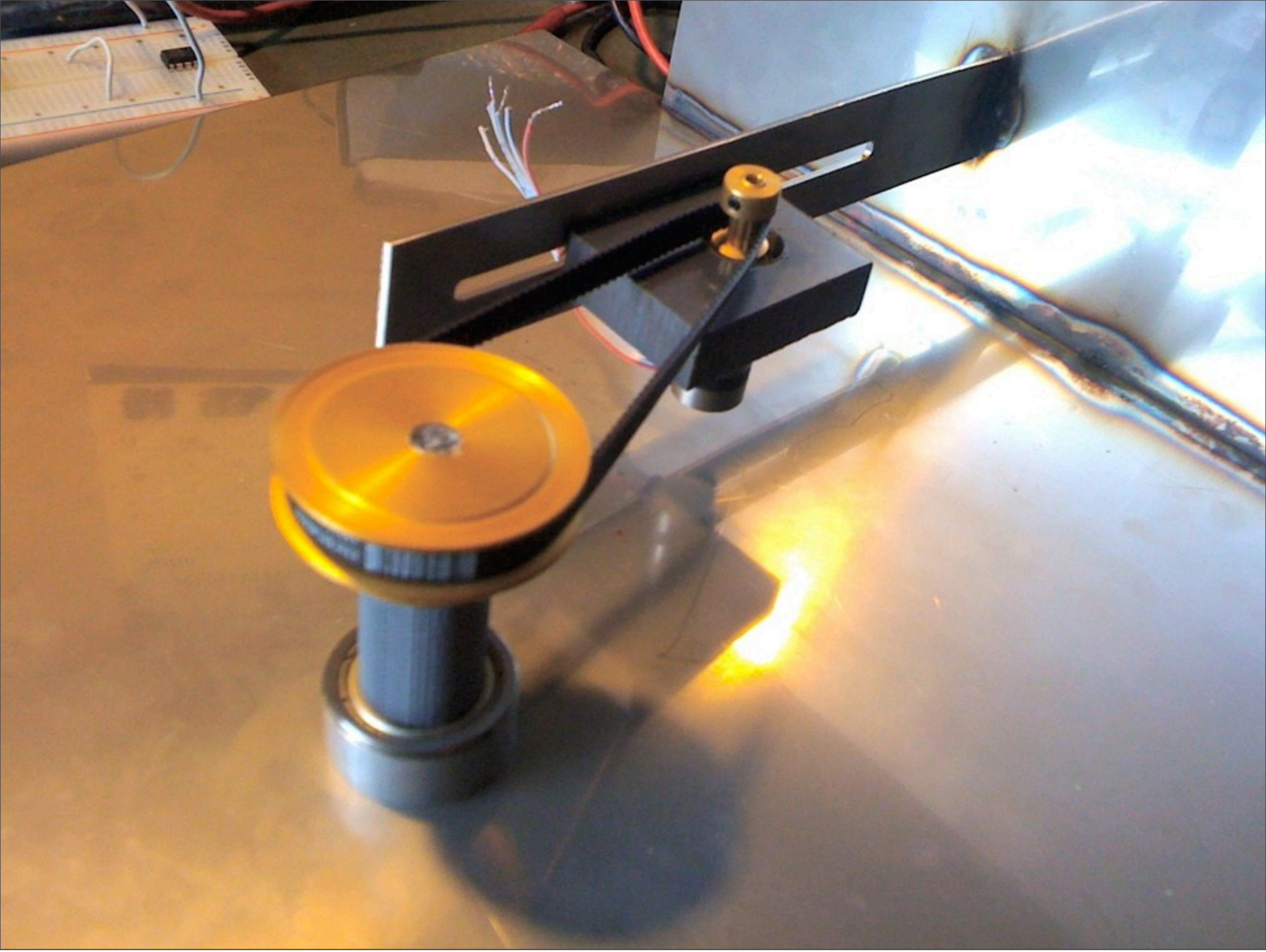
Ramses Eduardo Alcaide Aguirre

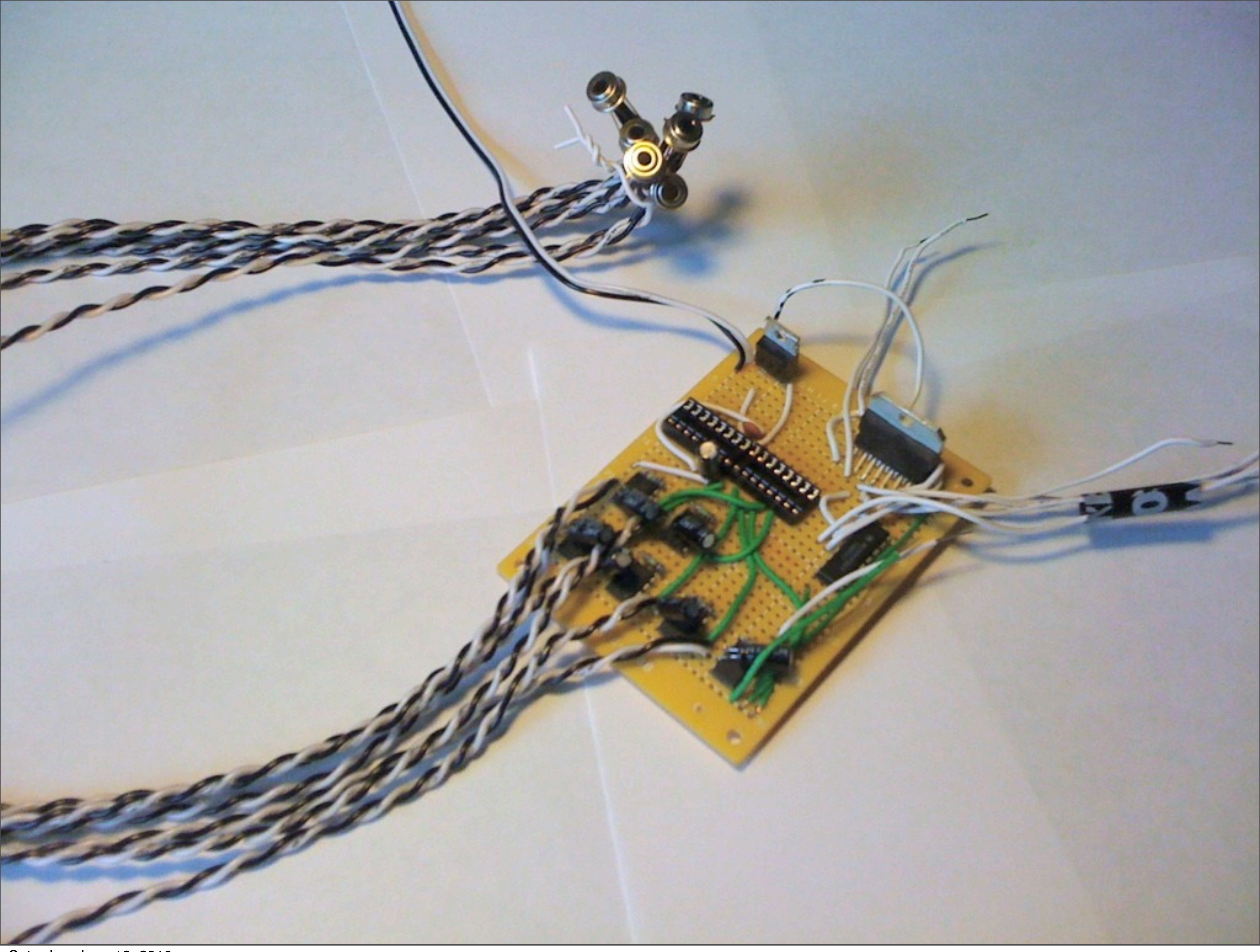
Rotational System

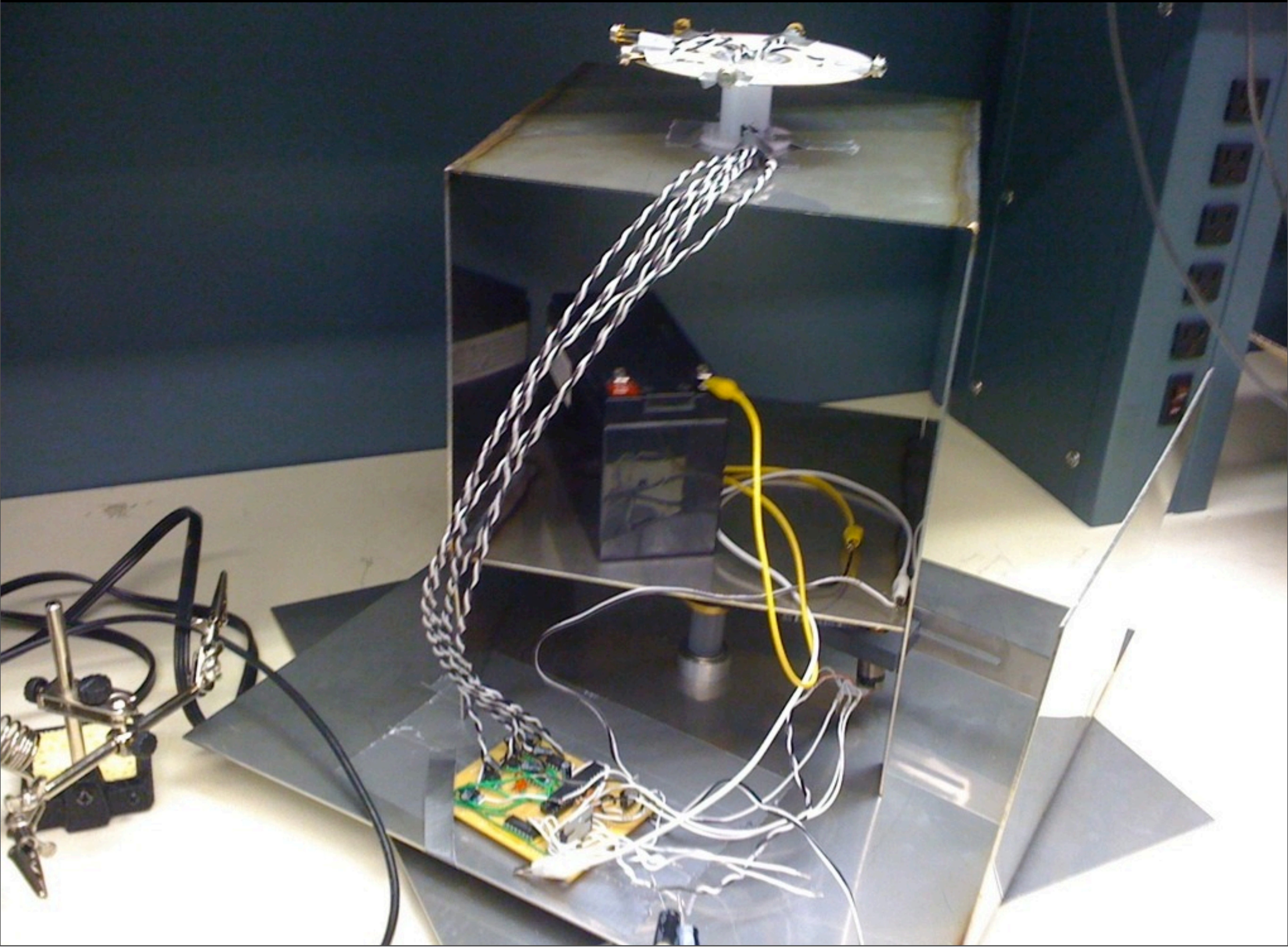


- Reason
  - Lead Time of Parts
  - Test Control System
  - Test Electrical System
  - Develop Rotational System
- Completed Work
  - Inner Box Finished
  - Control, Rotational and Electrical System Implemented









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