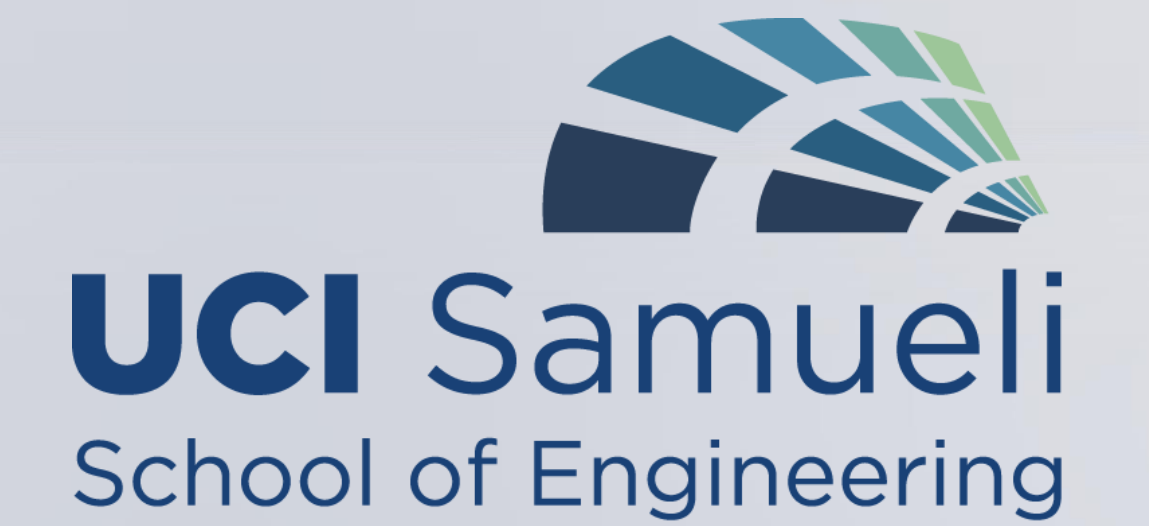# Thermal Orientation Test Bed

Advisors: Dr. John LaRue, Dr. Khalid Rafique, Dr. George Horansky

Background:

Thermal Orientation Test Bed is a joint-research project with Air Force Research Laboratory to design and manufacture an apparatus capable of mimicking conditions in space. The apparatus will test the thermal qualities of heat pipes and satellite components at specific orientations.

Objective:

- Research methods of making ground equipment vacuum compatible
- Accurately simulate torque applied on motor
- Machine gearboxes
- Create a comprehensive Graphic User Interface (GUI) that allows full control over the test table while displaying thermal data readouts
- Design new methods of mounting cold plates, heat pipes and heat sources with minimal heat loss

Goal:

The design, development, fabrication, and testing of a test frame capable of precise orientation adjustments.

Requirements:

- **Environment:** Vacuum (Vacuum rating of 10^{-7} Torr)
- **Minimum Rotation About Primary Axis:** 180°
- **Minimum Rotation About Secondary Axis**: 90°
- **Orientation Accuracy:** 0.1°
- **Max Test Bed Size**: 39.5"x71"x40
- **Minimum Test Article Size:** 2"x6"x0.08"
- **Maximum Test Article Size**: 24"x24"x30"
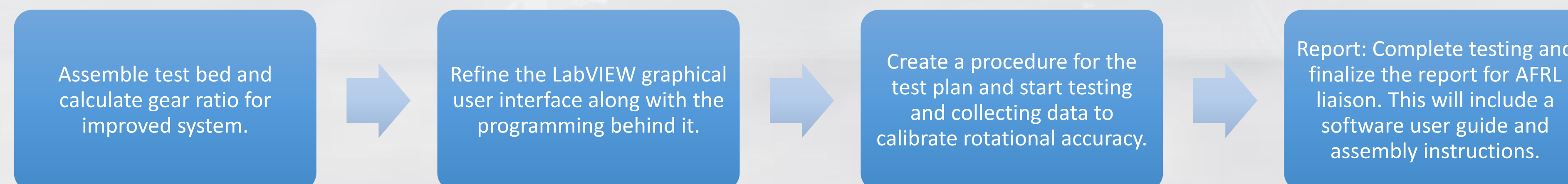- **Maximum Payload Weight:** 200lb
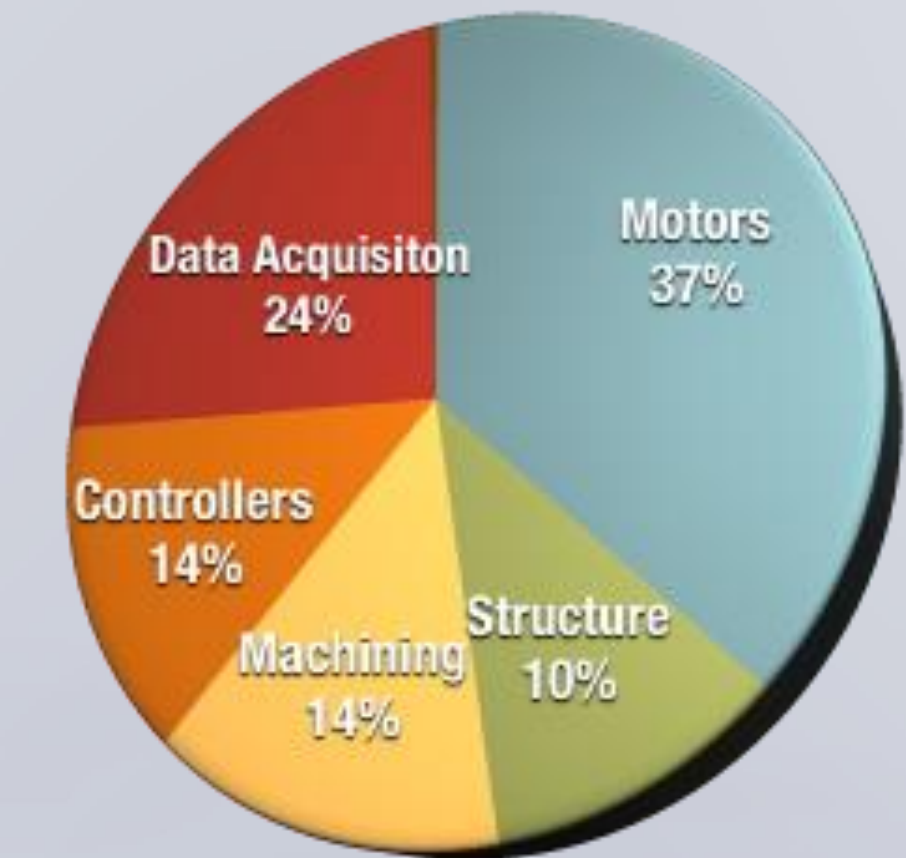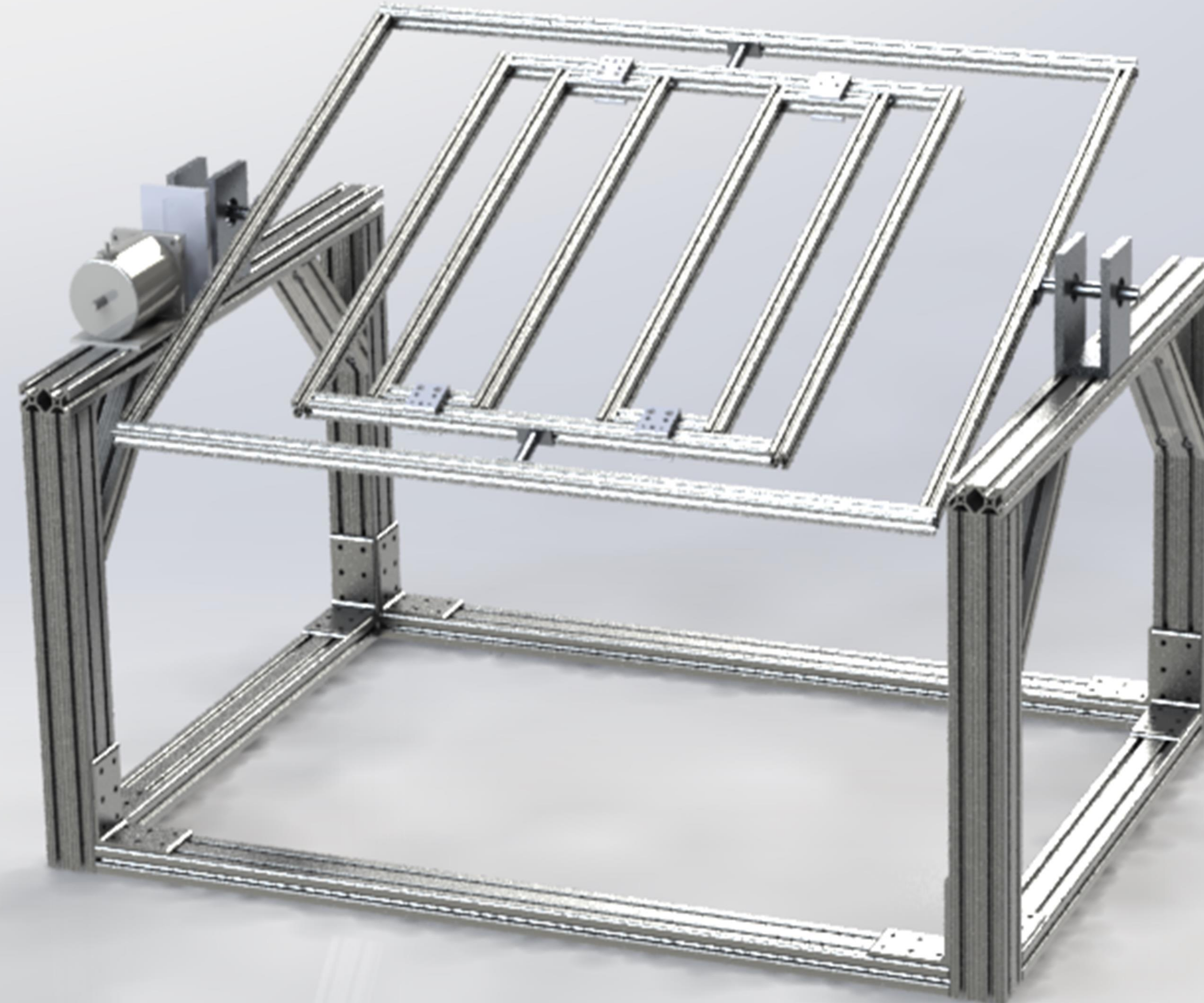
Budget

Budget	
Funds	$11,200
Projected Costs	$14,875

- Nema 42 motors have been selected to provide the most torque possible.
- Gears allow the small motors to provide enough torque for the system payload at lower speeds
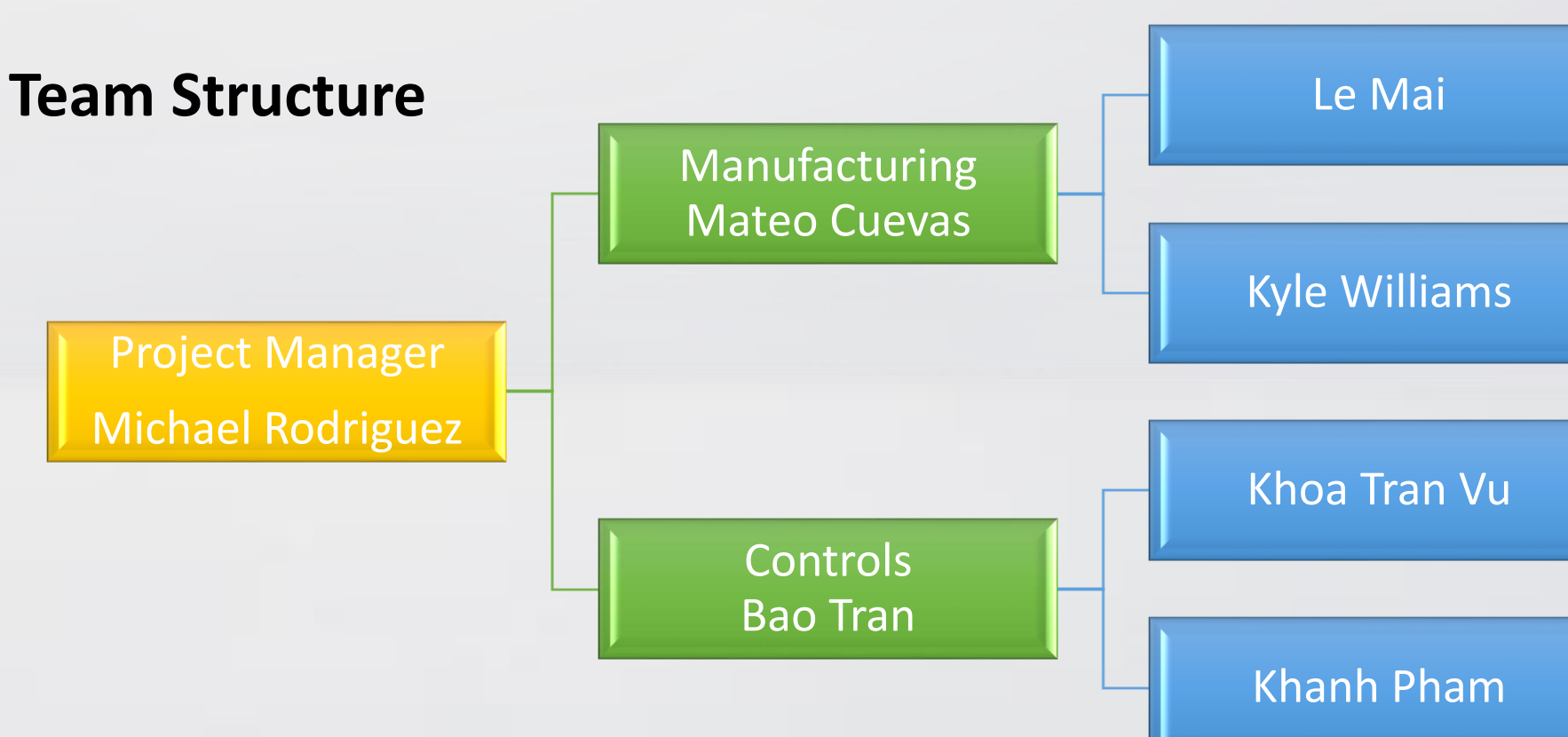
Next Steps:

- **Complete testing.**
- **Ship testbed to AFRL**
- **Finalize report and software manual.**

Timeline:

Assemble test bed and calculate gear ratio for improved system. → Refine the LabVIEW graphical user interface along with the programming behind it. → Create a procedure for the test plan and start testing and collecting data to calibrate rotational accuracy. → Report: Complete testing and finalize the report for AFRL liaison. This will include a software user guide and assembly instructions.

Team Structure

- Project Manager
  Michael Rodriguez
  - Manufacturing
    Mateo Cuevas
    - Le Mai
    - Kyle Williams
  - Controls
    Bao Tran
    - Khoa Tran Vu
    - Khanh Pham

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