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| Rocket Tracks |
| Project Design Specifications |
| 2014 Capstone |

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| Robin Davis  1/12/2014 |

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# associates

## Industry Sponsor

Andrew Greenberg – PSAS

## Faculty Advisor

Dr. Malgorzata Chrzanowska-Jeske

## Team Members

Robin Davis – Project Manager and Hardware Engineer

Rob Gaskell – Technical Lead and Software Engineer

Robert Corkran – Digital Design Engineer

# Objective

Design, build, and test a system that will track a PSAS launch vehicle utilizing the existing mechanical structure, motor divers, and Sightline SLA1500.

# Specific Deliverables

Documentation of design process including:

* Level 0 and Level 1 block diagrams
* Explanation of all components used
* All versions of schematic and board files

# Top-Level Requirements

The system will:

1. Be capable of tracking the PSAS launch vehicle throughout the duration of its boost stage of flight
2. Be portable / self-powered
3. Withstand exposure to rain while powered down (Excluding payload)
4. Be operable in temperatures typical of Brothers, OR year-round
5. Prevent single points of failure from causing injury or permanent damage to the unit or properly attached payloads
6. Allow manual control of individual axes
7. Interface with existing mechanical design and motor drivers
8. Support remote operation
9. The system will contain an API for relevant communications via Ethernet
10. Interface with Sightline SLA1500 via Ethernet
11. System must provide power over Ethernet to payload devices

# Engineering Requirements

## Functionality

1. System should be able to switch between two modes (Manual and Automatic).
2. The system will use a PID control loop to control the position of each axis.
3. The system must be able to read the current position of each axis.
4. The system must be able to drive each axis.
5. When in manual mode a turn of \_\_\_\_ degrees will correspond to the arm moving \_\_\_ degree.
6. The system must have the ability to interface with a PC over Ethernet during operation.

## Energy

1. The system will operate off of batteries.
2. The system will operate from a 24V nominal supply.
3. The system must be operational, in an idle state, for a minimum of 4 hours without needing to be recharged.
4. The batteries must be able to supply the maximum motor current for \_\_\_ min continuously.

## Economic

1. The cost for developing the system should target $500 and should not exceed $1000.

## Health and Safety

1. An FMEA will be conducted to determine single points of failure.

## Maintainability

1. The system must interface with the current motor drivers which have two axes, but include hardware support of two additional axes for future expansion.

## Manufacturability

1. The system must be able to fit on a 4 layer PCB.
2. The PCB must comply with OSH Park’s design rules.
3. The PCB should have dimensions no greater than \_\_\_\_.
4. The system will utilize an STM32 family microprocessor.
5. The firmware environment will be ChibiOS/RT.

## Operability

1. The system must be able to operate in the temperature range of -31o to 105oF
2. The PCB(s) must be contained in a water resistant enclosure.
3. The PCB(s) must be able to withstand vibrations caused by the movement of the mechanical structure.
4. All external digital connections will be designed to conform to IEC 61000-4-2 for ESD protection.