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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 and Hardware Engineer

# Need

As PSAS develops more sophisticated launch vehicles, the importance of proper tracking with video and antennas raises. The system currently being used (manual/shoulder mounted) is far outdated. Design work has already been done towards creating a new system called Rocket Tracks; however, this system is still only able to be manually controlled. A system that can track automatically is of the utmost importance.

# Objective

The goal of this project is to expand the existing Rocket Tracks design to include an automatic tracking function through use of Sightline’s SLA1500 and a flare camera.

# 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
* Completed PCB within an enclosure
* Demonstration of the system working in automatic and manual modes

# 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

# Lower-Level 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. 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 10 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 system will utilize an STM32 family microprocessor.
4. 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.