

## Background

Hot air balloons are a widely known mode of transportation used all over the world. On the other hand, the community of hot air balloon users is very small. Because of this there is very little research toward improving the vehicle's performance. With propane being constantly consumed, large operating companies spend approximately \$1,000,000 on propane annually, proving there is a need for improved burner technology.

## Project Goal

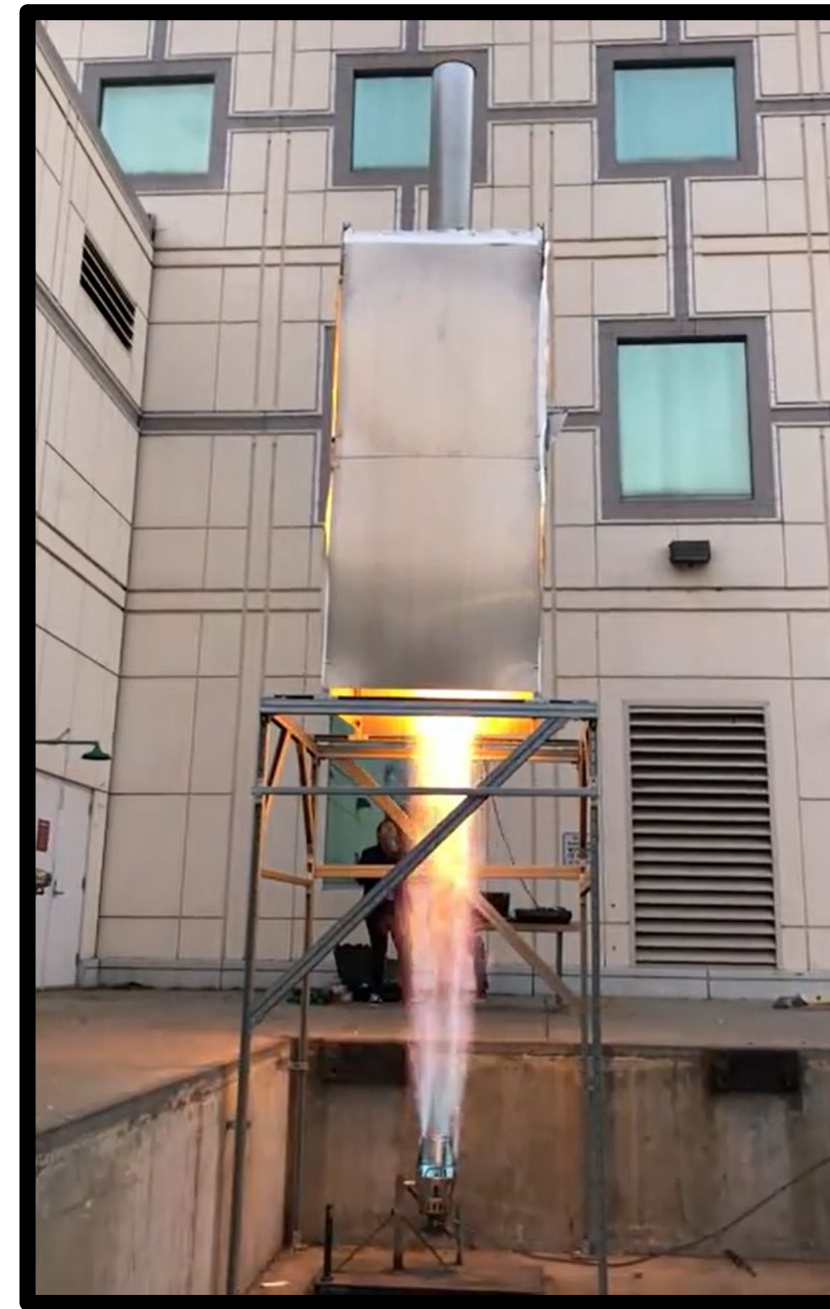
In order to study the behavior/efficiency of and optimize an UltraMagic's 3.2MW MK-32 burner, a testing facility is to be designed and built. This testing facility consists of a 20 foot tower with a ventilation duct that draws emissions using a fan. An Enerac 700 Gas Analyzer will then be used to measure emissions in the duct.

## Project Tasks

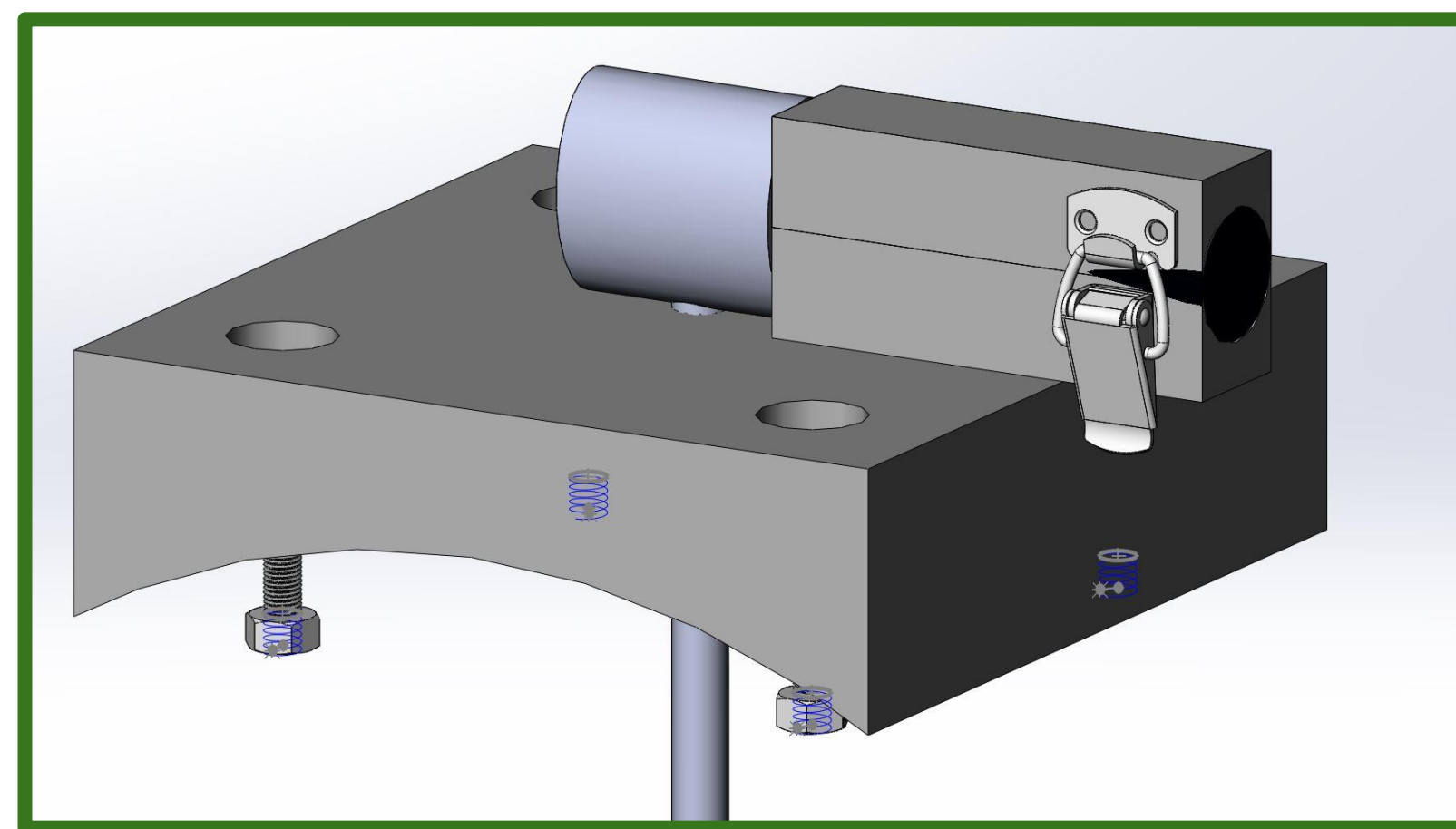
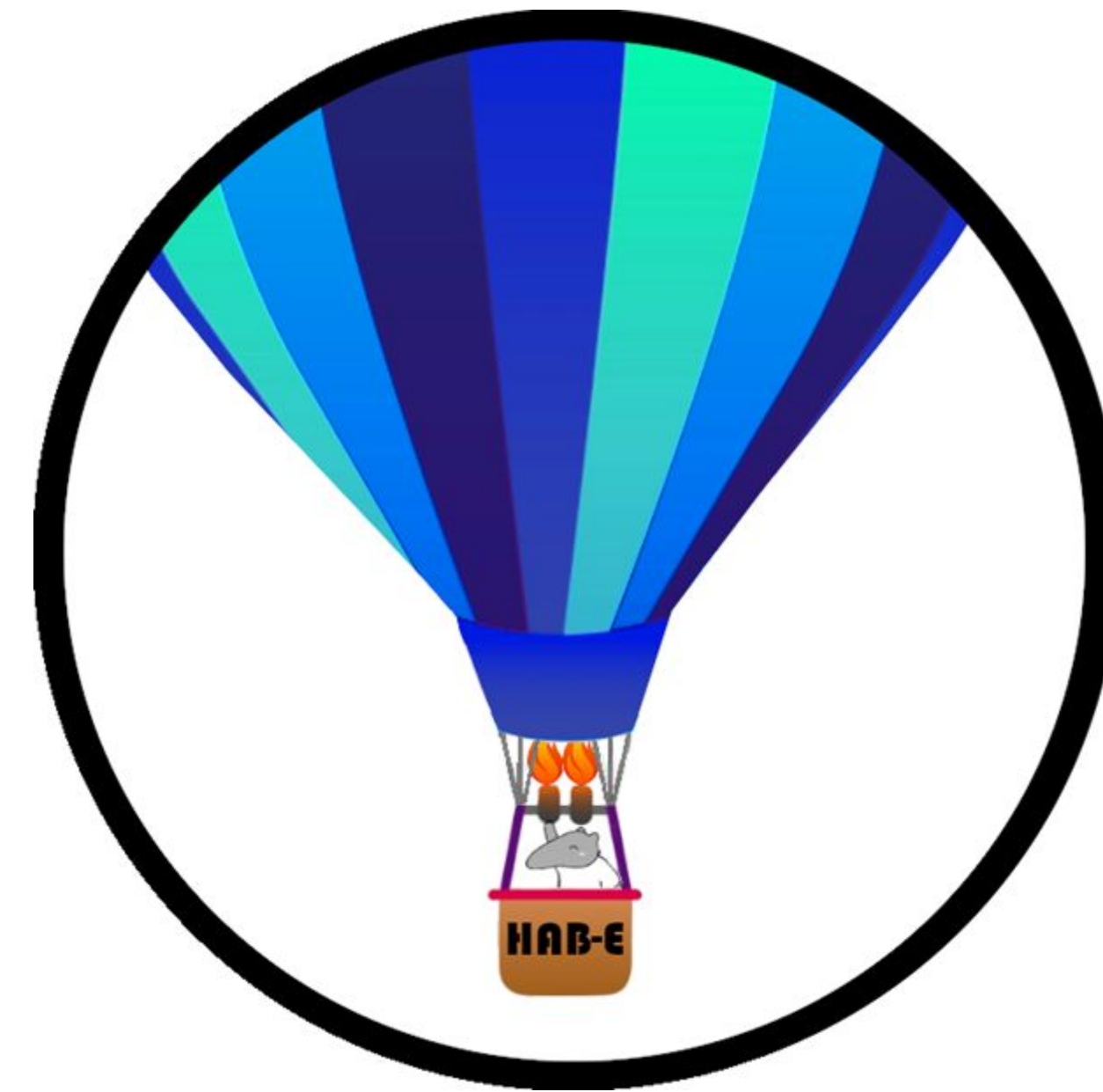
- Design a method to test burners in the field
- Optimize the method to hold the probe at the UCI test facility
- Determine the ideal size of the duct at the test facility

## Project Significance

- Reduce fuel costs required by hot air balloons.
- Can monitor the emissions produced by hot air balloon burners to continue to work on developing eco-friendly burner designs

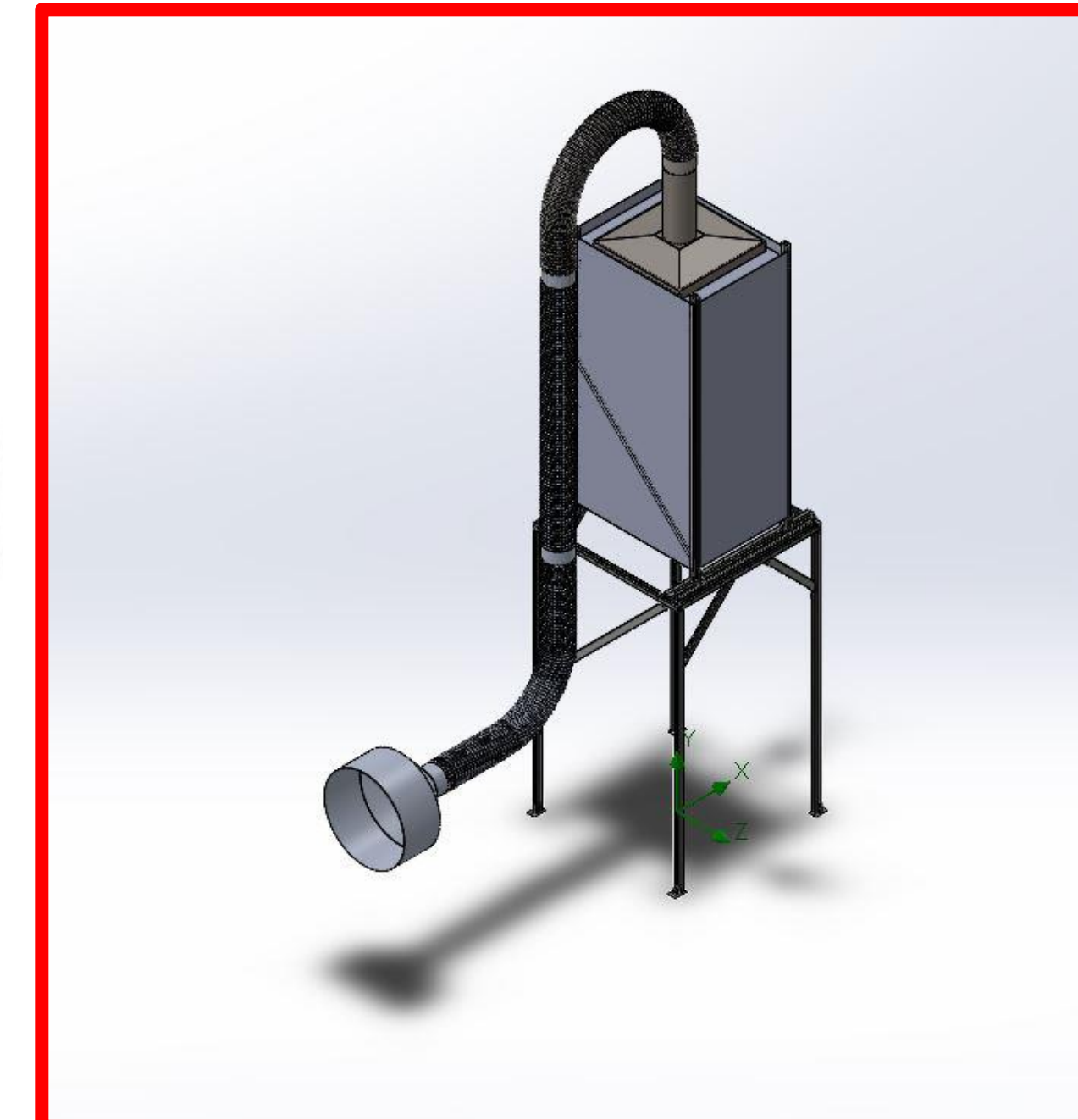
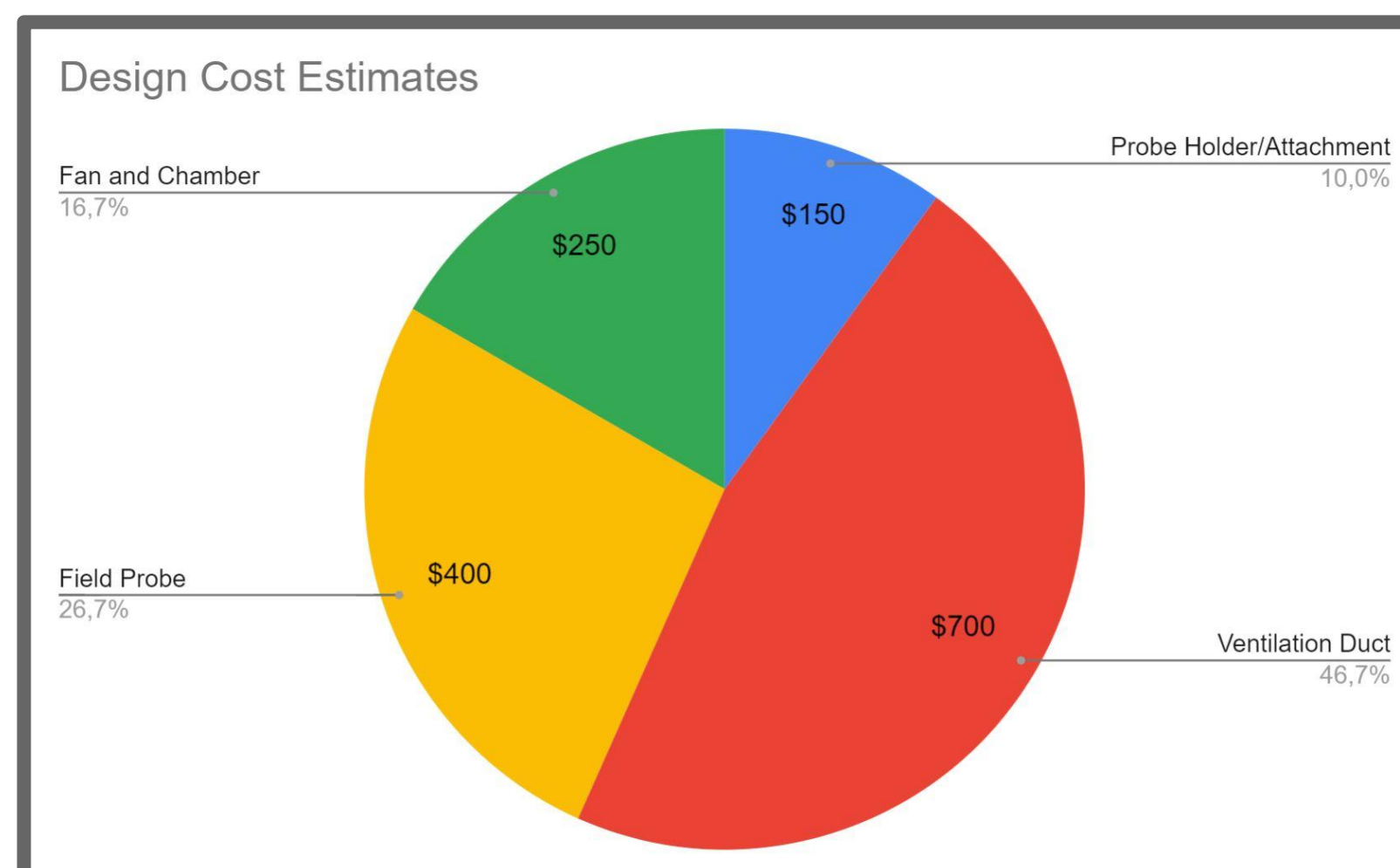


Current UCI hot air balloon burner test rig



### Probe Holder:

Located on the lower end of the ventilation duct. Holds Enerac 700 Gas Analyzer in place as it measures emission gases.



### Ventilation Duct:

Ventilation duct used to draw gases out of the testing rig burner area to a point where a gas analyzer can collect a sample for analysis and data collection.



### Field Probe Holder:

Connects to the hot air balloon rig to hold the Enerac 700 Gas Analyzer. This can be used out on the field. Reaches a height of 15 feet and can be assembled on site.

## Accomplishments

- Designed a ventilation duct to connect to the current testing rig in order to assist in the removal of gases from the system, as well as collect data from these gases
- Designed for the implementation of a fan on the duct to draw the gases through at the desired rate to prevent ambient air from entering the duct and altering the data
- Designed a new system for data collection from the testing rig, involving a gas analyzer to collect gases from within the flow of the duct, allowing for more accurate data
- Designed a similar data collection system to be used in the field on an actual hot-air balloon, allowing for analysis of real-world hot-air balloons while in use

## Future Plans

- Manufacture the parts and systems designed this fall and implement them onto the testing rig
- Run some tests on the new testing rig
- Collect new, more accurate data from those tests
- Return to original purpose of the project, improving the efficiency of a hot-air balloon burner