COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Research Horizons Day & Research Week March 16-20, 2020

Research Horizons Day

Development of a High Altitude Visual Orientation Control (HAVOC) System for Balloon Payloads

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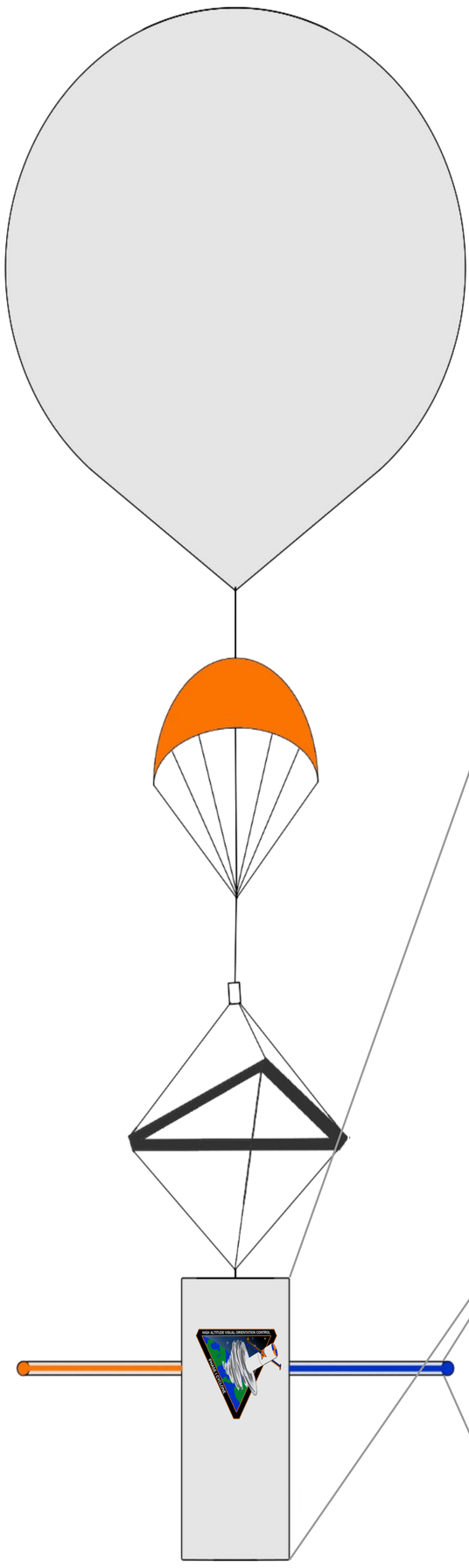
Introduction

HAVOC is a system intended to control the orientation of a weather balloon payload. Balloon payloads are valuable research tools but are inherently unstable during flight. Recording video of the upper atmosphere is difficult due to the uncontrolled nature of payload rotation. HAVOC solves this issue by using high-pressure air (HPA) thrusters to control payload orientation and a small form factor camera to record video during flight.

Previous Findings

During the UAH Space Hardware Club's Two-Month training program in Fall 2019, balloon payloads used limited amounts of CO_2 gas to control their rotational velocity in order to obtain better quality video footage.

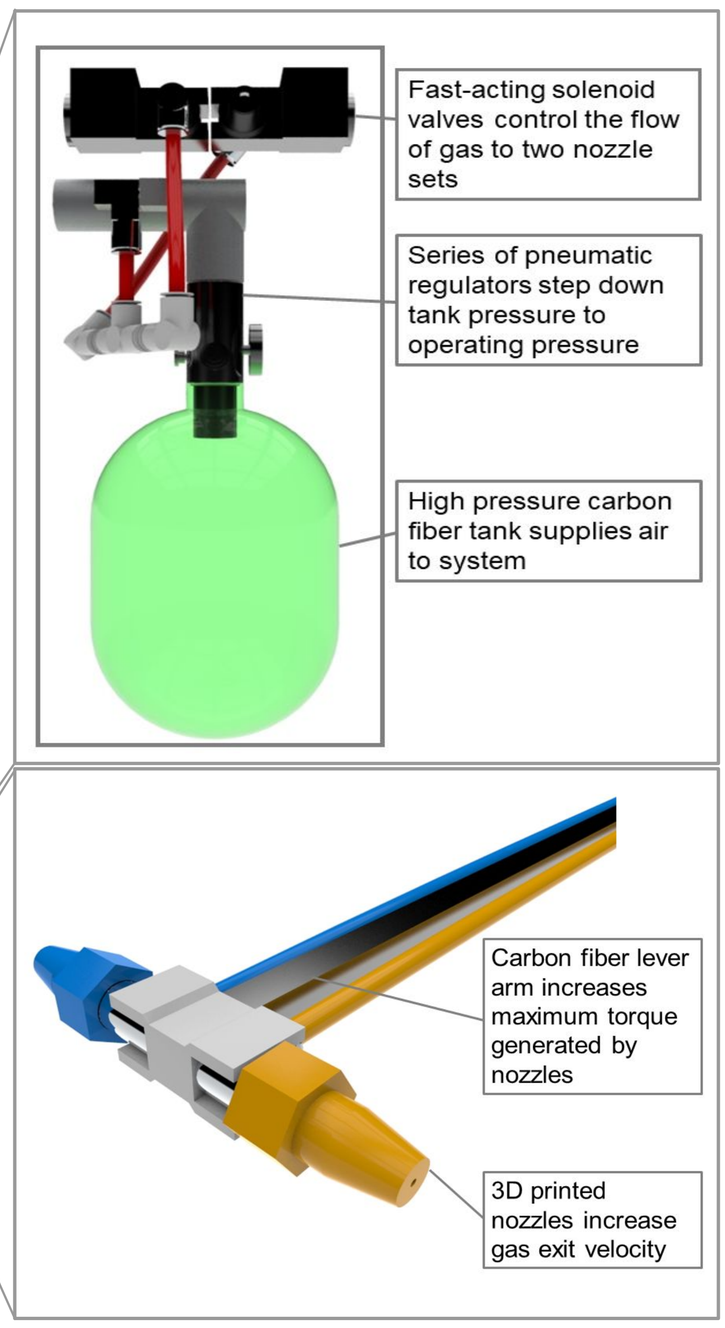
The data from one of these payloads is shown below in Figure 1. The payload attempted to keep its rotational speed within an acceptable threshold represented by the red dotted lines. This data established a positive proof of concept for controlling payload rotation and is now being built upon with HAVOC.



Objectives

1. **Control payload rotation above 15km**
2. **Maintain camera orientation within a 90° target range**
3. **Operate above target altitude for a minimum duration of 5 minutes**

Hardware



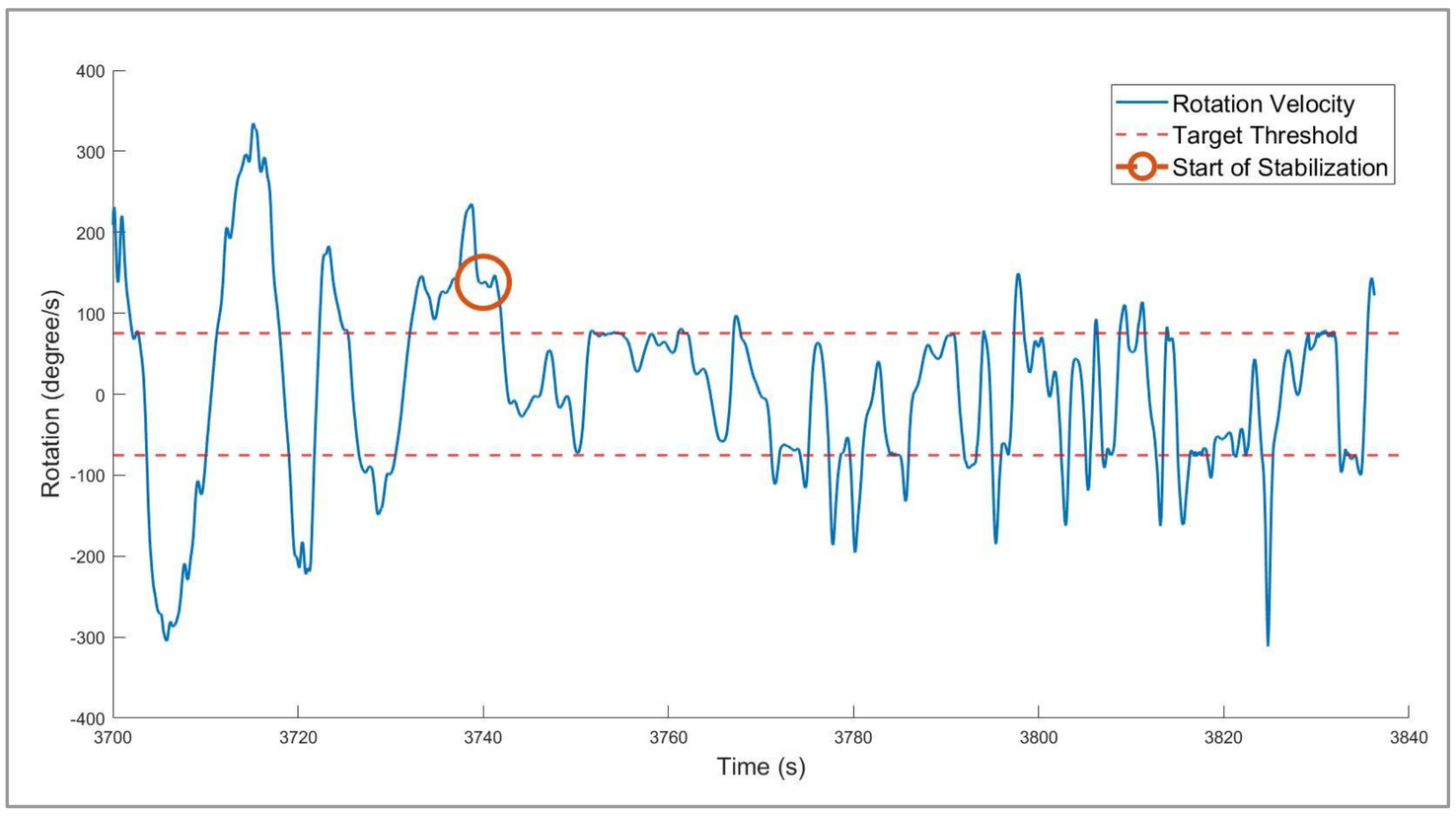


Figure 1

Conclusions

The HAVOC payload will enable the recording of stable video from balloon flights. Through this research, we will gain a better understanding of factors that influence the stability of a payload on a balloon line and be able to transfer this knowledge to other balloon research flights. A prototype is currently under construction.

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