Recovery System Telemetry Module

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1 Overview

A crucial part of engineering is recovering from mistakes and critically analyzing failures. However, it often is not as easy as one might think to determine exactly what went wrong after a system has failed. The NSL team from this past year is very familiar with this scenario. After the first test flight when the drogue parachute failed to deploy, nobody was 100% certain what the cause was.

For peace of mind during the nail-biting few minutes of the launch as well as to aid in post-launch analysis, I am proposing the development of a recovery system status detection module. The goal of this project would be to make a compact electromechanical system capable of detecting whether or not parachutes have deployed from the launch vehicle and sending this information to a ground station receiver. Furthermore, the system would also transmit the status of black powder ejection charges throughout the flight. Time permitting, other useful features could be added to the system as they are thought of.

Although a system such as this one is not entirely necessary (since after receiving information of a recovery system failure it would already be too late to remedy the problem), it can be a excellent learning experience for everyone involved. This also can greatly aid in safety since those on the ground can prepare themselves for a ballistic descent if the ground team knows in advance that such a descent is likely.

2 Project Outline

This project will involve both electrical and mechanical systems, so people of any background are encouraged to participate. The project can be broken up into the following sections listed below. This list is non-exhaustive and more will be thought of as the project is underway.

1. Electronics design
    - Which microcontroller will we use?
    - What peripherals will we need? (Sensors, transmitters, etc.)
    - How will the board be layed out and will be use a PCB?
    - Design of the ground station
2. Mechanical design
    - How will the electronics be housed to minimize space and weight?
    - How will the electronics/housing be securing in a rocket?
3. Software/hardware interface and detection systems
    - How will the system detect separation of the launch vehicle?
    - How will the system detect ejection charge status?

2.1 Timeline

A rough timeline is presented in Table 1. This is a very rough estimate and it is likely it will change greatly as the project is underway and the various parts of the project are better understood.

7/1 to 7/15	Initial design phase
7/15 to 8/5	Prototyping electrical components
8/5 to 8/15	Prototyping mechanical components
8/15 to end	Final testing/modifications

Table 1: Rough Project Timeline

2.2 Learning Objectives

Considering many NUSTARS members may not have all the required experience to undertake this project immediately, emphasis will be placed on learning new skills along the way. Some topics we will get the chance to learn about through this project are:

- Microcontroller programming and interfacing with external modules/peripherals
- Git source control and GitHub
- RF data transmission
- CAD
- Basic 3D printing/manufacturing