Document:	Project Planning
Project:	Weather Balloon Altitude Control System
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Introduction

This report will detail the Project planning for the Weather Balloon Altitude Control system currently being designed. This report will contain risk analysis information that covers the severity and probability of the failure modes possible for this system. Next, plans for mitigating risk items above the design threshold will be detailed. A brief breakdown of the work structure for the project will also be included. This will cover high level tasks that need to be completed for the project. The responsibility matrix will assign various design goals to certain members of the design team. Finally, the report will be concluded with a project schedule that will include a timeline for project goal completion.

Risk Analysis

- Open failure: The valve could fail to open on command, resulting in the balloon to rise to a terminal altitude and burst, causing the project to fail the mission parameters and potentially become lost.
- Flow failure: the valve could fail to vent an adequate amount of Helium to satisfy the mission requirements.
- Close failure: The valve could fail to close after the venting cycle is completed, causing the balloon to become negatively buoyant before float is achieved resulting in mission failure.
- Mechanical Failure: The mechanical linkage between the balloon and payload could fail, resulting in the payload descending before mission completion.
- Communications Failure: The wireless link between the main payload and the valve controller could fail and the ability to control the valve could be lost. This could result in the balloon gaining excessive altitude and bursting if control is lost before burst, if control is lost after neutral buoyance was achieved the balloon could go derelict, or if control is lost when the valve is open the balloon could vent excess helium and land before intended.
- Autonomous valve algorithm failure: If the algorithm to come to neutral buoyance fails the balloon will either never vent helium and gain excessive altitude and burst of, vent too much helium and land early, or the valve may open and close undesirably.
- Code failure: Any type of infinite loop which may occur in the code would effectively terminate the microcontroller's ability to control the valve or make other decisions.

- Electronics failure: the power system which runs the electronics could fail or short and draw more current than intended. This could cause the microcontroller to reset, damage to the power system or electronics, or reduced battery life.

0=lowest severity, probability 10=High severity, probability

Risk Item	Severity	Probability
Open Failure	3	2
Close Failure	2	2
Flow Failure	1	3
Mechanical Failure	5	1
Communications Failure	5	1
Autonomous Valve Algorithm Failure	5	3
Code Failure	5	2
Electronic Failure	5	1

Mitigation Strategy (it was determined that none of the risk factors were unacceptable, so mitigation strategies were created for each one, independent of a trend line)

- Open failure: This problem can be solved by appropriate tolerancing of mechanical components, and correct execution of the autonomous vent code.
- Flow failure: This problem can be solved by increasing the effective flow area of the valve.
- Close failure: This problem can be solved by appropriate tolerancing of mechanical components, and correct execution of the autonomous vent code.
- Mechanical Failure: This problem can be solved by applying appropriate safety factors to all mechanical components in the system.
- Communications Failure: Thorough testing will the full system to insure there is no interference or other unforeseen problems that would result in communications failure.
- Autonomous valve algorithm failure: In order to mitigate the risks associated with the algorithm rigorous simulation and testing will be done to assure that the algorithm performs as intended.
- Code failure: Full systems testing will mitigate most common code failure modes. Watchdog timers can be used to prevent total system failure if unforeseen infinite loops occur. Recursion
- Electronics failure: Full systems testing will mitigate any issues experienced with the electronics design or power system. Current draw during different modes of operation will be measured and analyzed to ensure the power system can perform as required. Environment testing can be performed in the BOREALIS lab vacuum chamber.

Responsibility Matrix and Work Breakdown Structure

Task	Tim Basta	Trevor Clark	Scott Miller
Valve 3D Modeling	x		
Mechanical Calculations	x		
Order Mechanical Components	x		
Order Electronic Components		x	x
Electronic Prototyping		x	x
Mechanical Prototype	x		
Casing Design	x		
Code Development			x
PCB Design		x	x
PCB Assembly		x	x
Website Construction			x
Final Mechanical Systems Assembly	x		
Final Electronic Systems Assembly		x	x
Testing	x	x	x
Documentation	x	x	x

Project Schedule