SPEC-14-*RP*

PROJECT SPECIFICATION

APPROVALS

ROLE	NAME	SIGNATURE	DATE
General Manager	*Brandon Hernaez*		
Advisor	*Kenneth Mease*		
Advisor	*Dave McCue*		
Propulsion Lead	*Jaspal Sidhu*		
Structures Lead	*Yuan Zhang*		
Avionics Lead	*Michael Rappuhn*		

Revision History

REV	DESCRIPTION	DATE	APPROVED BY
-	Initial Release	*5/8/15*	*Brandon Hernaez*

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1 PROJECT SPECIFICATION OVERVIEW

1.1 Executive Summary

The Purpose of this document is to summarize UCIRP Team. The goal of the Rocket Project this year will be taking a step in a new direction. The research and work put into this project is geared toward at a multi-year goal. That goal is, in short, to carry the payload of a CubeSAT to the edge of the earth's atmosphere via Rockoon. The team needs to design and develop an Engine, Avionics System, and Launching Apparatus to complete this task. All three sub teams are tasked with fabricating and testing a preliminary design this year.

Typically this senior project is has been geared towards simple competitions that involve altitude goals and rocket performance. In most cases sounding rockets are used for research purposes to gather data at certain altitudes when studying the atmosphere. A rocket's performance is reliant on many factors, however. Weather, Drag, Weight, Thrust, Balance, Size, Geometry, are a few professional rocketeers as well as students carefully balance in order deliver an adequate vehicle specified to perform a specific task and to do so within a budget. This project, however, is not about competing the moment at it is purely research and development for the students involved to design and create their solutions to the original goal.

The uniqueness of the project is that is combines essentially three sub teams with their own goals that will come together later on. For now they will act separate and focused on their own objectives.

2 Product Description

The Rocket Project is no longer looking to deliver basic solid engine sounding rockets. For years the UCI Rocket Project has had a desire to make their own liquid bi-propellant engine. This year we aim to provide that and more. We want to produce a high performance liquid engine that is self-stabilized and launched at near 65,000ft from a balloon.

2.1 Product Context

The delivery method for CubeSATs is expensive in its current state. Our team aims to deliver a rocket system that can deliver the payload of a CubeSAT to LEO at a fraction of the cost. Using our system we aim to produce a system that is 80% reusable.

2.2 User Characteristics

The essential users of this system can be Universities, Research Agencies, Military, and Commercial Companies, who all can benefit from the versatility and cost of a CubeSAT. The system is meant to be quick and can be readily produced in a month's time.

2.3 Assumptions

To use this system, it must be considered that we are dealing with a balloon that is subject to drift. Recovery of the balloon and launch pad will be the unexpected key factors in the success of this product. We assume that all users plan launch windows on good weathered days in open remote areas.

2.4 Constraints

*The main constraint for this project has been funding.. We are allotted less than $3000 a year from the school. We can do so much as to design everything we need to optimized specifications. A majority of the fabrication will be outsourced as the engine must be CNC Machine, along with purchasing and the delivery of liquid oxygen the cost of the initial tests can be large. We hope to work out a proper process in the future to determine effective propellant amounts and lighter simpler engine parts that takes a minimal time to machine. *

Another constraint we have been faced with is the loss of our lab space. So far the Project has moved 3 times in the past year and a half. In some spaces we aren't allowed to do any fabrication.

2.5 Dependencies

This product will depend on the availability and market cost of propellant reactants. If the undergraduate school was allowed access to a 5-axis CNC machine the fabrication process can be entirely done in house. For now we must settle with the market rates of 3rd party machinists.

We do not provide the CubeSAT.

3 Requirements

3.1 Functional and Performance Requirements

- *The system must carry the payload of a Typical CubeSAT at near 1.5kg*
- *The Liquid Engine must be reusable for at least 2 attempts. The system should allow for at least a second attempt for the user if the initial attempt has a correctable issue.*
- *The Balloon System must carry the weight of the rocket, launch pad, and CubeSAT.*
- *The Rocket must be stable and correct its trajectory during ascent.*
- *The Recovery system must not fail, in any case, a launch must be done in a very remote area. Easy release of the parachute will be implemented with a GPS to allow for total recovery.*

3.2 User Requirements

- *All Launches must take place over remote areas.*
- *Fill Balloon with hot air and allow the sun to take care of ascent.*
- *Fill LOX and JP4 Tanks just before launch.*
- *Have a recovery crew on hand.*

3.3 Maintenance Requirements

The Balloon will need to be replaced every launch. The Airframe will be reusable and can be repaired if the rocket fails to eject the recovery system. At times where the recovery system fails typically the finbox can be salvaged.

3.4 Standards Compliance

FAA and FCC Standards apply to CubeSAT Telemetries and High Altitude Launches.

4 Appendix

4.1 Definitions, Acronyms, and Abbreviations

CubeSAT – Cube Satellite
LOX – Liquid Oxygen