UCI Rocket Project

Project Advisor: Professor Kenneth Mease

UCI Samueli School of Engineering

Mission

Design and build a cost effective means of reaching space by using a Rockoon system with the ultimate goal of carrying a Cube Satellite to orbit.

Background

Traditional CubeSat launch costs to space for a sounding rocket cost $40,000/Cube to $2,000,000/Cube and launches to the mesosphere cost $25,000/kg to $40,000/kg. Currently there is a push from both Academia and Industry to develop these small satellites because of their low cost and proportional functionality compared to a large (full scale) satellite.

Objectives

Avionics:

1. **Precision landing System (04/16 -3/16)**
2. **Avionics for Rocket (01/15-1/17)**
3. **Avionics for Rockoon (01/16-01/17)**

Structures:

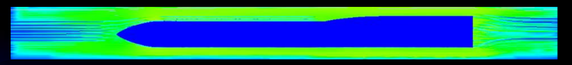
1. **Finish Prototype 2 and Launch (10/15-1/16)**
2. **Rocket Airframe (11/16-5/17)**
3. **Large Rockoon, Prototype 3 (03/17-05/18)**

Propulsion:

1. **Develop Hybrid Engine (01/16-2/17)**
2. **Successful Engine Test (2/17)**
3. **Mass Production and Flight Ready Engine (2/17- 6/17)**

Rocket

Sea Launch: ~45km; 147,000 ft
Rockoon launch: ~270 km; 886,000ft
Weight: ~140 kg (60kg of propellant)



Hybrid Chemical Rocket Engine

- Thrust: 1000 lbf .
- Propellants: Liquid Oxygen (oxidizer) + High Density Polyethylene (fuel)
- Cooled Ablatively using carbon ceramics similar to that used on the Space Shuttle
- Engine Made from Carbon Fiber Composite to drastically reduce weight

Four Engine Cluster

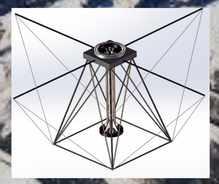
Plumbing System

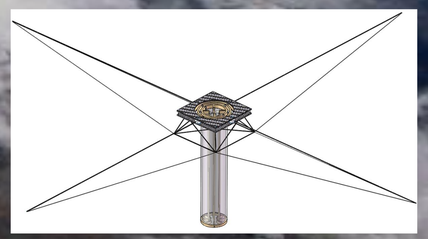
Test Stand

Fuel Grain Mold

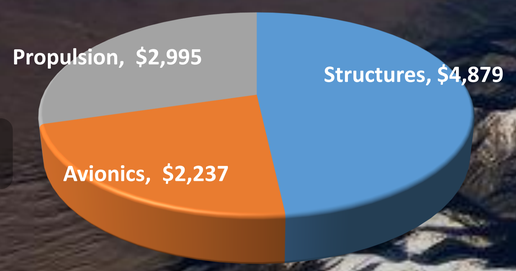
Rockoon:

Tows rocket to 20km (65,000ft) before rocket launches. Replaces first stage of rocket in addition to giving the rocket an advantage in both initial height and operation in a less dense atmosphere





Budget



Structures
Team lead: Linh Ly
Members: Aleeza Roque, Norberto Abadias, Kevin Chen, Stephen Moes, Phong Huynh

Avionics
Team lead: Jesse Inoyue
Members: Tarik Snyder, Joshua Yang, Zhiyang Feng, Roger Yao, Santiago Martin, Samuel Tse, Aroosa Ansari

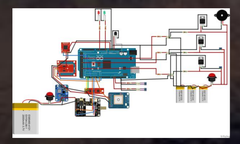
Propulsion
Team lead: Tai Wei Chen
Members: Oziel Ortiz, Luis Gallegos, Omar Medina, Grant Wu, Justin Block

Prototype 1 Prototype 2 Prototype 3

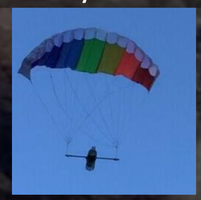
Avionics

Capable of launching rocket, deploying parachute, and communicating with both Rocket and Rockoon. Must survive very cold environment and run on limited battery power to reduce weight.

Circuit Diagram



Precision Landing System



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