Tuskegee University Rocketry Club

National Aeronautics and Space Administration Student

Launch Initiative Preliminary Design Review

Atmospheric Measurement and Aerodynamic Analysis

TURC 2015-2016 NASA USLI Team Members

Tyran D. Singleton II	Team Lead	Aerospace Engineering	Junior
Jessica Dedeaux	Safety Officer	Aerospace Engineering	Sophomore
Nick Griffin	Technical Design Team Lead	Aerospace Engineering	Sophomore
Jamal Wilson	Payload Team Lead	Aerospace Engineering	Junior
Jihad Kinsey	Structural/Manufacturing Team Lead	Mechanical/Aerospace Engineering	Junior
John Powell	Equipment Facilities Officer	Mechanical Engineering	Junior
Justin Smith	Educational Engagement Co-Lead	Aerospace Engineering	Sophomore
Erin Johnson	Educational Engagement Co-Lead	Mechanical Engineering	Sophomore
Andrew White	Aerodynamic/Propulsions Officer	Aerospace Engineering	Junior
Amira Collier	Team Lead Assistant	Aerospace Engineering	Sophomore
Uthman Clark	Recovery/Launch Officer	Aerospace Engineering	Sophomore

Team Mission

The goal of Tuskegee University's Rocket Club is to establish an educated base of students who are able to efficiently design, modify, and execute mission purposed rockets. The underlying purpose of the University's participation in the University Student Launch Initiative is to test the effectiveness of jute fibers as a eco-friendly alternative to fiberglass in the design of fins. During the launch, we will be able to test the aerodynamic forces acting on the fiberglass fins.

Facilities

For the the 2015--2016 Nasa USLI, the Tuskegee University Rocketry will be utilizing various laboratory and rooms throughout Tuskegee University college of engineering and Material Science including but not limited to:

- Model Fabrication Laboratory
- Satellite Design Laboratory
- Material Science Lab Downstair
- Material Science Processing Laboratory Farm
- Tuskegee University Wind Tunnel Lab
- Tuskegee University Propulsion Laboratory

Equiptment

Model Fabrication Laboratory

- Band Saw
- Drill Press
- Table Saw

Satellite Design Laboratory

- Oscilloscope
- Optical Table

Material Science D

- Planetary Vac
- Ove
- Digital S

Changes Made Since Proposal

3.1 Launch Vehicle/Payload additions

- Solar Irradiance Sensor
- Humidity Sensor
- GPS
- UV Radiation Sensor
-

Changes Made Since Proposal (cont.

3.2 Structures Subsystem

- Divided Airframe into 4 sections
- Chose Fiberglass instead of Jute Fiber
- Pin Lock Mechanism to Stabilize airframe
- Tether connects 4 sections together during recovery process

Vehicle Criteria

4.1 Launch Vehicle Selection, Design, and Verification

- In order to consider the mission a success, the vehicle must abide by all rules and constraints put in place by the USLI officials.

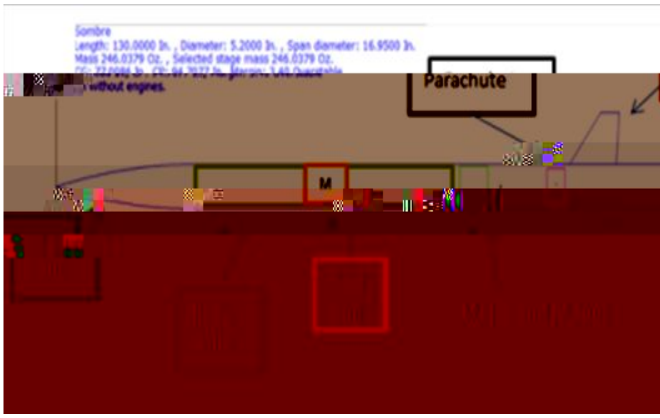
- Projected to reach an altitude of 5280 feet

Vehicle Criteria

4.2 Structure Subsystem

<u>4 .Structural Subassemblies</u>

1. Nose Cone
2. Body Tube
3. Payload/Avionics Bay
4. Motor Mount



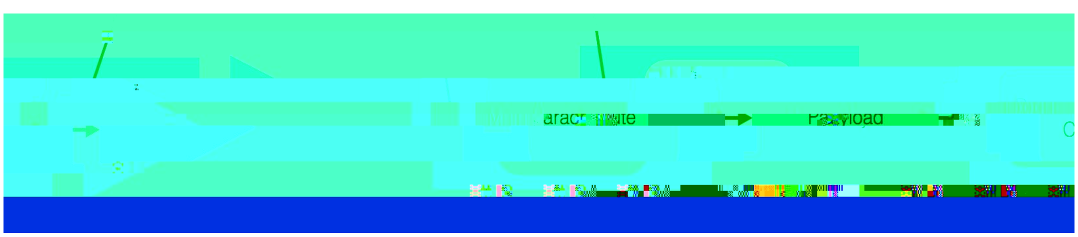
Vehicle Criteria

4.4 Avionics Subsystem

Vehicle Criteria(cont.)

4.5 Recovery Subsystem

The recovery system will be built into the front and rear body tubes as shown:



1)The front and rear body tubes (not directly related to the system)

2)The gunpowder charge (charge one and two)

3)The altimeters

4)The drogue parachute

4.7 Power Subsystems

- Eight 9 volt batteries
- Payload components
- GPS independent power source
- Avionics system.

4.6 Communication Subsystem

- Transmitter(s)
- GPS
- Ground Station

Payload Criteria

5.1 Payload Selection, Verification, and Design

The measurements of pressure, temperature, relative humidity, solar irradiance, and ultraviolet radiation shall be taken with its respective sensors verified by testing, analysis, inspection.

5.2 Payload Concepts Features and

The complexity of a fully functiona reusable payload is an extreme chal not only have to properly construct components together but they must in a manner that achieves accurate a tangible data. This requires proper i sufficient power supply, and adequa programming knowledge of all com the payload. We also have plans to screen to visually verify the functio results of each test of the payload.

Payload Criteria (cont.)

5.3 Science Value

The payload is designed to indicate the strain of the material on of the fins, study the pressure, temperature, relative humidity, solar irradiance, and ultraviolet radiation of the surrounding air from the time of apogee until either the rocket was recovered or ten minutes had passed after landing. By comparing the measured values to expected values, their credibility could be determined. ‘

5.4 Payload Safety and Environm

Risk Factors

Chemicals and materials
-Bodily injury: irritation, burns, and allergic reactions
-Work stoppage
-Material Safety Data Sheets of all hazardous chemicals and materials will be available to and reviewed by all members.
-Facilities with fume hoods will be used for caustic materials.
-Protective equipment including, but not limited to, gloves, safety glasses, and filtered face masks.

Misuse of Power Tools
-Bodily Injury: Cuts, Abrasions, and Bruises
- Work Stoppage
-Instructions will be given prior to student use of equipment.
-Experienced technicians or upperclassmen must be present for all machining.

Unintentional Ignition of Igniters or Electric Matches
-Bodily Injury: Minor Burns
-Fire
-Loss of critical supplies
-All electric matches will be shorted together at their ends.
-Proper storage in secure grounded case.

Unintentional Detonation of Black Powder
-Bodily Injury: Serious Burns, and hearing loss
-Ejection charges will be filled last with flight computers deactivated.
-Handlers will wear work gloves and ear plugs.

Questions?