



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

## Senior Design Project Description

|                      |  |                                  |               |
|----------------------|--|----------------------------------|---------------|
| <b>Company Name</b>  | UNCC COE                                     | <b>Date Submitted</b>            | 15 April 2018 |
| <b>Project Title</b> | NASA Student Launch Competition (USLI_COMP4) | <b>Planned Starting Semester</b> | Fall 2018     |

### Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

| <b>Discipline</b> | <b>Number</b> | <b>Discipline</b> | <b>Number</b> |
|-------------------|---------------|-------------------|---------------|
| Mechanical or MET | 8             | Electrical or EET | 2             |
| Computer          | 1             | Systems           | 1             |
| Other ( )         |               |                   |               |

### Project Overview:

As described by the NASA SLI handbook, “The NASA University Student Launch Initiative (USLI) involves students in designing, building, and testing reusable rockets with associated scientific payloads. This unique hands-on experience allows students to demonstrate proof-of-concept for their designs and gives previously abstract concepts tangibility. (SLI Handbook) The project also requires community outreach throughout the project as well preparing written documentation and oral presentations to NASA engineers and staff.

### Initial Project Requirements:

This project requires the design and construction of a re-useable dual deployment rocket capable of carrying a designated payload to a designated altitude. Rocket motor thrust will be tested extensively using the 49er Rocketry Club’s rocket motor test stand, and the team will generate and interpret the rocket motor thrust curves to determine final altitude. The payload will have a scientific value relevant to NASA’s mission, which may include performing a task and taking measurements. Several half scale launches and a minimum of two full scale launches will be conducted prior to competition in April, which is held in Huntsville AL. The team will be separated into two sub groups: Payload Team and Launch Vehicle Team.

### Expected Deliverables/Results:

1. All course deliverables
2. All competition deliverables as specified by NASA
3. System Block Diagram



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4. System Math Model, including stress analysis and dynamic performance
5. Payload concept ideation sketches
6. System detailed drawings
7. System assembly drawings and procedure
8. System transport configuration drawings
9. System / subsystem testing plan
10. Financial plan
11. Outreach plan
12. System preflight procedure and checklist
13. System launch procedure and checklist
14. Flyable Hardware
15. Transition Plan for knowledge retention for Tier 2 competition.

### **Disposition of Deliverables at the End of the Project:**

Hardware, software and equipment will be maintained by the team and the NASA authorized mentor for the duration of the project. At the completion of the project, all equipment, hardware and documentation will be turned over to the faculty advisor and maintained by the 49er High Powered Rocketry Club for following teams planning and use.

### **List here any specific skills, requirements, knowledge needed or suggested (If none please state none):**

Student should have an interest in one or more of the following:

Fluids, Compressible Flow, Instrumentation and Controls, Wireless Communication, Circuit Design, Dynamic Systems, Flight Dynamics, Carbon Fiber Construction, Rocketry Design and Construction,

Knowledge of the following software:

CAD - Pro/e and/or Solidworks

Matlab, Mathcad

Labview

C programming (for microcontrollers)

Java programming (for GUI)

Microsoft Project

Microsoft Word

Latex

RockSim