Team 508 Project Scope

Dylan Hampton, Wyatt Abrams, Logan Shvartsman, Carter Thomas, Adrian Arocha, Adin Weatherby

FAMU - FSU College of Engineering

Engineering Design Methods

Professor McConomy

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**Project Description**

The objective of this project is to design, build, and fly a reusable high-powered rocket for the 2025 NASA Student Launch Competition.

**Key Goals**

The goal of our project is to create a reusable high-powered rocket that will carry a payload, designed by Team 509, throughout its flight and land at a designated “safe” speed for the STEMnauts onboard. The team also aims to develop the rocket program further in the realm of systems testing and integration. The project can be considered successful when the following capabilities are accomplished:

1. Rocket’s design has a quick assembly/disassembly time.

2. Our team has effective methods to test rocket systems proactively.

3. Full-scale rocket launch is within 100 feet of projected apogee.

4. Full-scale rocket lands with kinetic force that applies less than 30G’s of impact force to model STEMnauts.

5. All NASA deadlines are met with quality paper submissions.

The first key goal for the project is to make the rocket easy to construct and deconstruct. This goal comes from NASA’s recommendation in their student handbook to be able to have the rocket fully flight ready in one hour’s notice. This goal also stems from difficulties discovered by last year’s team, specifically those of the avionics team taking roughly 2 hours to configure the electronics on flight days. Proper design could greatly reduce this time.

The second key goal of the project is to research and develop better means of testing the rockets’ individual systems. Last year’s team lacked the ability to properly test the rocket’s separation and recovery systems, causing the team to perform 2 extra flights than necessary. Testing capabilities like custom test stands/rigs will be considered and implemented if possible.

The third and fourth key goals are requirements to signify a successful full-scale launch. With no active-braking system in the rocket to compensate for varying flight conditions, anywhere within 100ft of our simulated apogee is considered an accurate flight. Landing with an impulse less than 30G’s on the STEMnauts will be another way to verify a successful flight and will assist Team 509 in their project goals.

The fifth and final key goal is to stay within all NASA deadlines and submit all required NASA paperwork. While this is not technically required for Senior Design, the NASA Student Launch Competition is the primary motivation for this project and the Zenith Program. These deadlines and high standards will “motivate” the team to gain a deep understanding of the rocket and all its subsystems and will be a valuable professional experience for the team and program members alike.

**Markets**

There are two diverse types of markets involved in the project, primary and secondary. The primary includes the Office of Stem Engagement at NASA Marshall Space Flight Center (MSFC) and the NASA Student Launch Competition judges. The competition judges will evaluate the success of the rocket by scoring the deliverables based on the flights. Feedback will be provided to the team from these judges. The Office of Stem Engagement sets launch vehicle parameters that must be met.

The secondary markets for this project are the Artemis Mission which the competition supports, local schools, news media, FAMU-FSU College of Engineering (COE) and undergraduate students. The team is part of a club at the COE called the Zenith Program which involves and receives contributions from undergraduate students. A successful rocket launch will enhance this goal leading to active engagement and hands-on-learning from undergraduate students. Leading to FAMU-FSU Zenith Program’s club participation in the NASA Student Launch competition from year to year positively helping the campus. The campus is also looking to expand its involvement in aerospace, so a successful project will help the campus with this goal. Local schools impact the project because students who engage with this project through outreach efforts, such as participating in STEM events for elementary, middle, and high school students cover a requirement by NASA. The undergraduate students and local schools indirectly benefit from the project making them secondary markets. News media may also cover the event.

**Assumptions**

For the launch of the rocket and overall success of the Zenith program, several assumptions must be made regarding launch day and fabrication access. On launch day, we must assume that proper clearances are obtained by the licensed motor handler and mentor after request. We must assume that weather projections are accurate, including acceptable wind speeds within acceptable OpenRocket simulations. There must also be no major obstacles such as aircraft or wildlife flying overhead at the time of launch.

We also assume that the rocket will follow a flight path that does not risk getting caught in obstructions or result in personal or property damage. It is also assumed that the team has a good launch window under Tom’s direct supervision and other potential launch events do not interfere with the Zenith Program’s.

To build and complete our rocket design, we need to assume we have Sliger room access where building and prototyping takes place. Beyond shop access, we need additional access to equipment for fabrication. Examples include 3D printers, laser cutters, and machine shop access. We must assume that these resources are provided to the team at a low or zero cost to support our budget.

**Stakeholders**

|  |  |  |
| --- | --- | --- |
| Stakeholder Matrix | Low Interest | High Interest |
| High Power | Project Sponsors | NASA |
| Low Power | Project Adviser | Project Mentor & Financial Sponsors |

Table 1: *Stakeholder Matrix*

Our project sponsor, Dr. McConomy, is low interest and high power. His input is integral to the direction of the project, but he will have little interest in the specifics of the rocket. It is our responsibility to make his support beneficial for him.

NASA holds both high interest and high power in this project since they have set the regulations the team follows when designing/constructing the rocket. They also have the power to decline our team permission to fly in competition and are overseeing our progress at multiple steps by way of flight reports/reviews.

Our project mentor Tom McKeown has high interest and low power as he gives advice on launching and helps us attain motors and other parts critical for construction. He is not directly involved in the project, however, as he can only provide insight and feedback. Our financial sponsors also have high interest and low power. Our financial sponsors give us the ability to compete every year and donate because of their interest in the project. However, their donations are given as either broad donations, with no stipulation on use, or direct donations in the form of buying certain parts for the rocket itself.

Our project adviser, Dr. Shih, has low interest and low power. We will have temporary meetings updating him on our progress and any questions we have for him, but he is not in charge of or responsible for any of the teams.