1.1 Project Scope

Product Description

Design a low-cost air vehicle with an internal CubeSat class payload to be dropped from an altitude range of 400 to 4,000 feet by a drone. This vehicle must produce a microgravity event in free fall with an ultimate goal of advancing research in altered gravitational conditions.

Key Goals

The air vehicle must produce a microgravity event and must be able to accommodate a 3U CubeSat class payload. The air vehicle must come safely to the ground after free fall to prevent any damage to the system. The design must reduce noise in the horizontal plane during free fall for accuracy in the experimental process that occurs within the CubeSat. The design must reduce air drag to accomplish extending microgravity conditions. Materials chosen for the design must be low-cost and effective to minimize the budget without sacrificing competency. The completion of these goals will ensure a product worth presenting to space exploration research facilities.

Markets

Currently, NASA and other space exploration institutions have limited access to microgravity research. The primary means of conducting microgravity experimentation is through drop towers. A drone paired with our air vehicle design will provide ease of access to microgravity testing conditions for the primary market of this project. The primary market for this design will be research groups interested in microgravity research. Such groups include, but are not limited to, Universities Space Research Association (USRA),

Space Science Institute (SSI), Space Frontier Foundation (SFF), and American Astronomical Society (AAS). Secondary markets are public universities and private companies seeking to contribute to space exploration and understanding.

Assumptions

Assumptions being made for the project's timely completion are that all team members will supply quality work on the prescribed due date, allocate sufficient time to complete tasks assigned to them, and abide by the Code of Conduct. There is also the assumption that communication with our sponsor's liaison, Michael Conroy, about the date of competition will provide sufficient time for completion. An assumption pertaining to the product is that a drone will be provided, can carry a significant weight, and will reach the altitude necessary for the competition. Also, our team will not be responsible for flying the drone. Along with the drone, we will assume that the GoPro used in testing will be provided and fully charged. Another assumption our team is making is that all teams will compete under the same environmental circumstances; if there is wind on the day of competition, each team will be subject to those conditions. It is also assumed all teams will have the same form of attachment connecting their vehicle to the drone. When an air vehicle is dropped, it will be subject to Earth's normal gravitational acceleration conditions without being redirected or intercepted by any foreign objects. We are assuming the budget will be provided and no team member will be responsible for financial contributions.

Stakeholders

Those directly involved with the production of the microgravity machine include Florida Space Grant Consortium (FSGC) as our sponsor, Michael Conroy as our sponsor's

liaison, and Dr. Chiang Shih as our project advisor. An individual indirectly involved is Dr. McConomy as the overseer of all Senior Design projects. While there are many groups of people who will benefit from the further development of microgravity, the group most affected will be astronauts. With microgravity technology being developed, further research can be done to prevent a variety of health and psychological issues that those who experience zero-gravity often suffer from.