**2023-24 KSC Senior Design Proposal**

Proposer – Faculty Advisor for Senior Design Project

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University’s Name & Address: University of South Florida (USF), 4202 E Fowler Ave Tampa Fl 33620

Date the Senior Design Course will begin 8/21/23 and end 6/15/24 (Period of Performance)

Title of Project to be Studied: CubeSat size plants growing autonomous system for weather balloon test

Senior Design Course: c One semester, or √ Two semesters

KSC Mentor’s Name and Organization: Dr. Jose Nunez (KSC)

Approximate number of student participants: 4

Will there be a graduate student as a mentor for this project: c Yes √ No c Maybe

Proposed approach to solving the problem/s and/or completing the project:

As humankind begins their endeavor towards becoming a multi-planetary species, the necessity towards establishing a reliable and sustainable food supply system in these extraterrestrial environments becomes imperative. Furthermore, this project aims to address this problem by providing a robust system capable of monitoring and controlling the environment outlined by NASA’s KSC to ensure successful growth of organic specimen(s) as identified by Dr Nunez and his team.

**Objectives:**

· Develop an automated system for specimen life support.

· Integrate a data monitoring and transmission system.

**Efficiency Focus:** The function of this project is to maximize system performance while minimizing electrical power consumption and optimizing water distribution.

**Microprocessor-Based Environmental Data Collection:** This project will employ a microprocessor-based system to collect environmental data from sensors throughout the CubeSat. These sensors will measure the specimen’s growth in space.

**Real Time Analysis:** The progression of the system will be recorded and analyzed using wireless data transmission.

**Weather Balloon Test:** To test the system’s reliability and robustness in a low-pressure, low-temperature environment, we will deploy it on a weather balloon. This will provide crucial data for assessing its effectiveness in near-space conditions.

**Collaborative Design:** This system is a collaborative effort with the University of South Florida’s team of mechanical engineers. This team has focused on designing the packaging apparatus and its fluid flow mechanism.

**Collaboration with Kennedy Space Center (KSC):** The University of South Florida teams are committed to close collaboration with KSC researchers to tailor the system to their needs for growing and studying specimens of interest. Multiple visits to KSC will facilitate project coordination.

**Final Prototype:** The final prototype will utilize off-the-shelf sensors, microprocessors, and transmitters. It will undergo testing with a real specimen after consultation with Dr. Nunez.

In partnership with the University of South Florida's Mechanical Engineering team, our project seeks to design and implement an efficient, microprocessor-based system for specimen life support and environmental data collection within a CubeSat. The impending weather balloon test will be instrumental in evaluating the system's performance in challenging near-space conditions. Our commitment to real-time data analysis, collaboration with Kennedy Space Center researchers, and consultation with Dr. Nunez will ensure the system's adaptability and utility. We are eager to contribute to the advancement of space research and look forward to the opportunity to demonstrate the effectiveness of our prototype. Your consideration is greatly appreciated.

Provide a schedule/timeline covering all aspects of the problem/project: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Date Submitted: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_