

CubeSAT Centrifuge Terrarium

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Abstract

As the Svalbard Global Seed Vault faces imminent danger from glacial melting, Wildcat Engineers Dedicated to Guarding the Ecosystem through Space (WEDGES) have taken on the challenge of developing a solution. Sponsored by NASA and University of Arizona's Asteroids Laboratory, the team aims to demonstrate that organic life can be maintained and stored in a 3U CubeSAT. The CubeSAT utilizes artificial gravity via centrifuge, and an autonomous life support system to preserve the health of the plant. The prototype uses a BME 280 and Raspberry Pi 3A+ coupled with a water pump and IR lights to mitigate potential temperature losses from the dark side of the Earth. The CubeSAT will be considered a success if the contained organism can live for two weeks isolated with only the life support package. Parameters such as pressure, temperature, and humidity will be monitored and evaluated. Sensor data will be sent to a server which then can be queried from a computer. Several trials will be run to ensure the heating actuation is capable of desired heat addition. The water pump is used in tandem with the humidity sensor to ensure proper habitat for the organism. When presenting WEDGES's prototype, a two week long data history of different temperature, humidity, and pressure cycles can be observed. Alongside the data, the CubeSAT will demonstrate deployment of the scissor lift under centrifugal force.