48th STUDENT CONFERENCE (E2)
Educational Pico and Nano Satellites (4)

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CAPSAT-1: DEMONSTRATION OF A NOVEL CUBESAT ELECTRICAL POWER SYSTEM

Abstract

The CapSat-1 mission proposal was submitted to NASA's CubeSat Launch Initiative (CSLI) program in November of 2018.This mission was submitted on behalf of an extracurricular program known as The Wolverine CubeSat Development Team(WCDT), located within the Weiss School in Palm Beach Gardens, Florida. The Weiss School has been and still is the only middle school (grades 6th-8th) program nationwide to have successfully launched a CubeSat mission with NASA's CSLI Program. The CapSat-1 was submitted along with 4 other CubeSat proposals, and each proposal that was submitted utilized the experience each student gained prior when developing the WeissSat-1 mission. Students from The Weiss School have presented at NASA headquarters, multiple International Astronautical Congresses (IAC), the International SmallSat Conference, and many others.The Weiss School was specifically selected to present in these conferences for its experience in the field of aerospace engineering, and its novelty of allowing younger middle school students to develop their own individual satellite missions.

The CapSat-1 is a technology demonstration mission that was selected on March 14th, 2019 through NASA's tenth annual round of their CSLI program. This mission proposal is designed to validate a capacitor-based electrical power system in a1U CubeSat. Currently, all small CubeSats use lithium ion polymer batteries as their primary source of power. Capacitor shave been proven to be safer, more cost/volume-efficient, and more temperature-durable than lithium ion polymer batteries. This mission would validate their power/voltage efficiency and compare that to the status quo of the electrical power system (EPS) in CubeSats today. The CapSat-1 is planned to be nearly fully solar powered, with a secondary supply power of a lithium ion polymer battery in case the capacitors were to fail under the supply of the CapSat-1's solar panels. This CubeSat will launch as a 1U, and its launch date es expected within early-to-mid 2021. It has been the job of the mission's Co-Investigator to develop the CapSat-1 and ensure that it will complete all launch requirements.

Though its secondary mission is for technology demonstration, the CapSat-1's primary mission is education. The CapSat-1 mission is giving young middle-school engineers the opportunity to have hands-on experiential learning, with learning how to develop, build, test, and fly a satellite. The mission was initially submitted under the leadership of a 7th-grade middle school student and is now currently being developed by an 8th-grade Co-Investigator. Through this process students will network with both industries and major universities.