MDSGC Summer Exchange Internship Program 2018

Project: (CACTUS-1) Coordinated Applied Capitol Technology University Satellite

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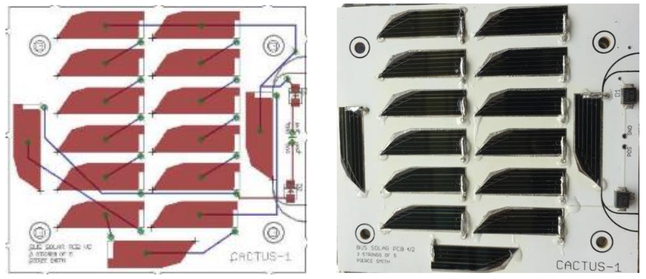
Mission Description: CACTUS-1 will demonstrate a method of capturing and profiling micro debris using silica aerogel, as well as testing a low-cost high bandwidth IP based communication system, instead of conventional radio based communications.

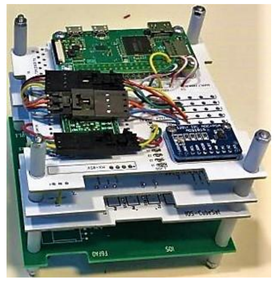
Student Achievements: Successfully constructed, tested, and integrated solar cell and TRAPSat Payload components, as well as performing power bus integration and wiring, camera trade studies on focal lengths, conformal coding on circuitry, construction and installation of multilayer thermal insulation, and final assembly of the CACTUS-1 CubeSat.

Solar Cell PCB Layout and Wiring Installation

- Consist of over 200, highly efficient solar cells
- Each cell has a dimension of 26.3mm by 8mm
- Each solar board is connected to the main power bus on the stack

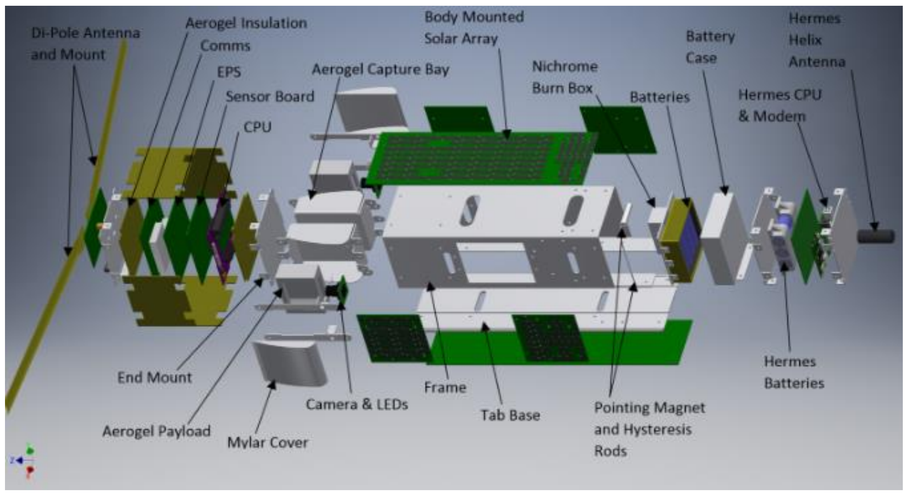


Solar Panel Design (Left) and Construction (Right)

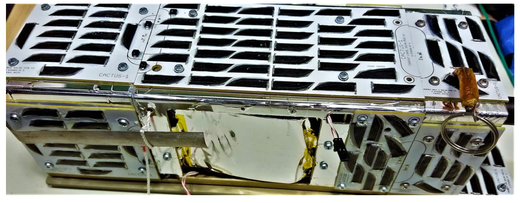


CACTUS-1 Stack

Integration of CACTUS-1 and Final Assembly



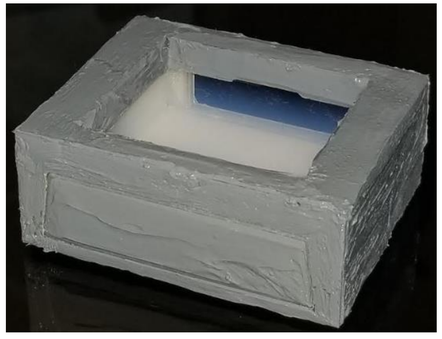
Expanded view of CACTUS-1

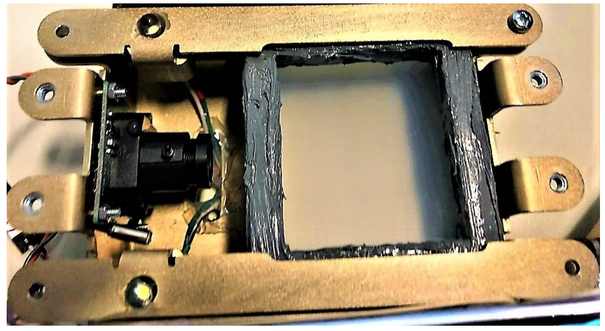


CACTUS-1 Fully Assembled

TRAPSat

- Primary science payload of CACTUS-1
- Consists of two bays loaded with Silica Aerogels that will capture orbital debris
- Each bay contains a mounted camera that will be used to capture images of the debris within the Aerogel





Loaded Aerogel (Left) and Camera Bays with the loaded Aerogel (Right)

Challenges Encountered

Solar cell packing efficiency was reduced due to the shape of the cells. Integration of the Aerogels was also challenging due to the extremely fragile nature of the substance.

What I learned

I learned how to construct, test, and integrate mission critical systems, as well as learning the importance of working as a team to overcome various challenges.

CACTUS-1 Mission Team: Alex “Sandy” Antunes – PI, Ryan M. Schrenk – Co PI/Lead Engineer, R. Pierce Smith – Designer/Student Engineer