

MAVERIC: Exploring Space Visualization Technology through Academic Flight Programs

USC Engineering Research Center

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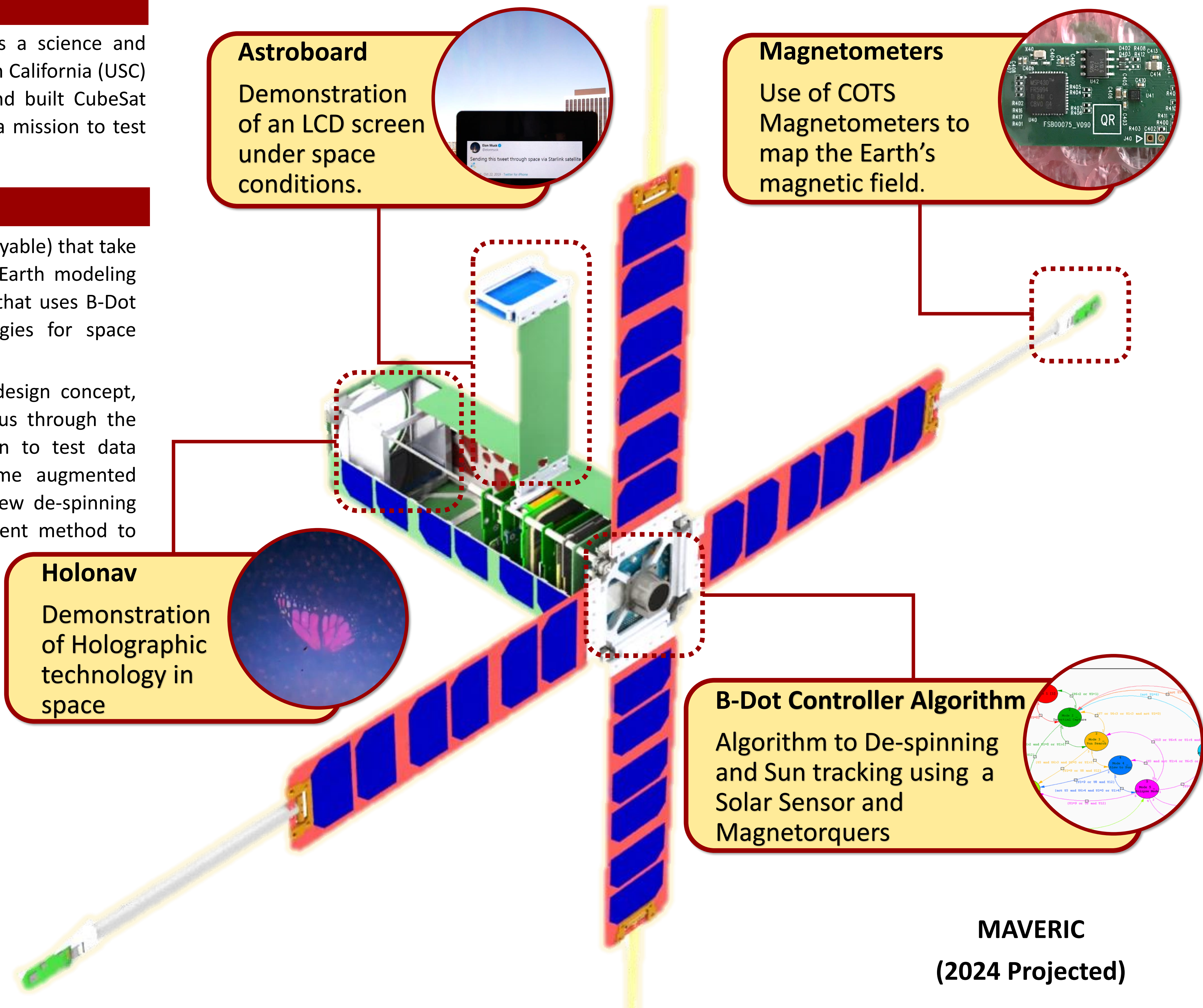
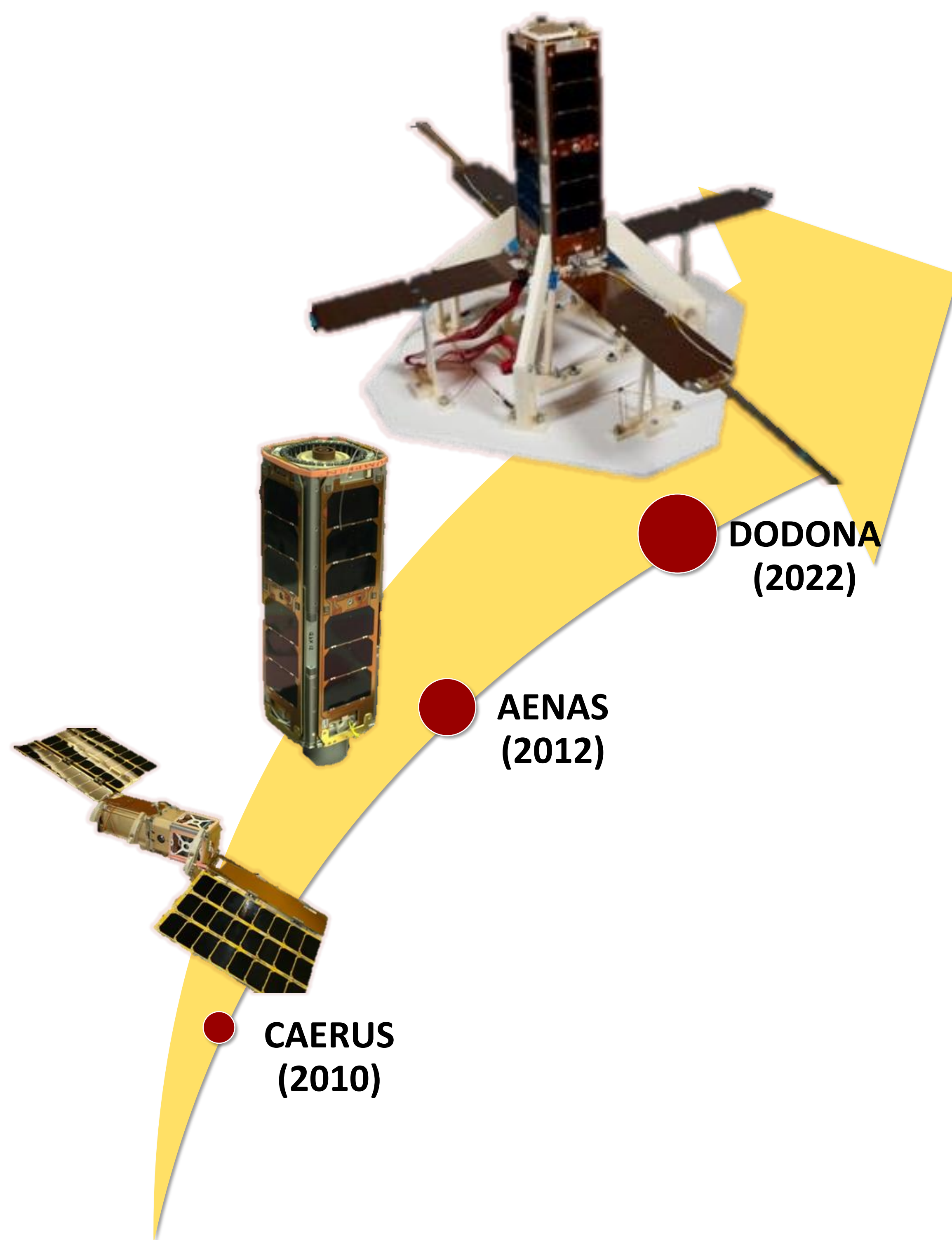
I. Origin

Magnetic Vector and Remote Imaging Communication satellite (MAVERIC) is a science and technology CubeSat designed and built by students at the University of Southern California (USC) and Space Engineering Research Center (SERC). MAVERIC is a student-led and built CubeSat under the Department of Astronautical Project Class for Microsatellites, with a mission to test out science and technology.

II. Mission details and Payloads

MAVERIC's scientific payload is a set of COTS magnetometers (internal and deployable) that take magnetic field readings around the orbit and compare them to the current Earth modeling satellites. In addition, the technical payloads include a new control algorithm that uses B-Dot controller for de-spin and control and the study of novel LCD technologies for space visualization applications.

The design for this CubeSat is an improved version of a previous satellite design concept, MAGNETO, a 1.5 U CubeSat that was started in 2019 but then put on hiatus through the pandemic. The new design for MAVERIC includes a unique 2D LCD screen to test data visualization in space and a holographic 3D screen for exploring real-time augmented visualization to enhance close in RPO operations in space. Furthermore, a new de-spinning algorithm using only magnetorquers will be tested to validate a more efficient method to remove rotational anomalies experienced by small satellite platforms in flight.



III. Development Strategy

The bus of this satellite and other critical subsystems are building on legacy designs from previously constructed and operated missions executed by SERC including CAERUS, AENEAS, and DODONA. The improved method is obtained after addressing the lessons learned from the previous projects and also through an extensive testing program in the laboratory. The result of this approach is a more simple and more reliable satellite for this mission.

IV. Academic Program Goals

MAVERIC is a joint effort between the academic curriculum in the ASTE Department and the SERC to get students hands-on training and experience in Astronautics before graduation. The design, implementation, integration, and testing of the different elements of the satellite involve students from different Engineering disciplines at USC and surrounding colleges, including Mechanical, Aerospace, Electrical, Systems, Astronautical, and Computer Sciences, at different levels (Undergraduates, Masters, and Ph.D.). These students work through several instances as courses, research credits, or project interns during the different phases of the project. Finally, all the integration stages are performed at the SERC facilities before environmental testing and final review for launch. The goal is to develop the CubeSat in roughly one academic year and have the integrated satellite available for launch in the first semester of 2024.

Mission
Development
Schedule

Q3-Q4 2022
Preliminary Design
Review (PDR)

Q1-Q2 2023
Critical Design
Review (CDR)

Q3-Q4 2023
Building &
Integration

Q1 2024
Testing

Q2 2024
Projected
Launch