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# CAL POLY CUBESAT KIT – A HANDS-ON SOLUTION FOR THE DEVELOPMENT OF TOMORROW'S SPACE WORKFORCE

**Abstract**

The Cal Poly CubeSat Laboratory is developing a CubeSat Kit for educational and professional training. As a university, Cal Poly's main strengths are education and overall workforce development. In particular, Cal Poly's motto is to form day-one ready professionals using hands-on projects. Embracing this philosophy, the CubeSat Laboratory undertook to develop a CubeSat Kit to be used as a practical platform to demonstrate various engineering principles in and outside the classroom. The development of the CubeSat Kit started in Fall 2019 and since then, eleven undergraduate students and three graduate students have been involved in the initiative. The first phase, CubeSat Kit Mk I, is planned to be completed by spring 2021. For Mk I, the Kit includes a structure, integrated payload processing module (IPPM), electrical power subsystem (EPS), and a backplane. The Kit's Mk I structure was designed to enable additive and subtractive manufacturing. Hence, a wide range of the CubeSat community is able to manufacture the structure depending on their use case, manufacturing capabilities, and overall availability of resources. The IPPM is the interface between the CubeSat bus and payloads. The functions of the IPPM are to autonomously manage and operate all the payloads mounted on the CubeSat Kit, such as CMOS camera and thermal sensors. The IPPM integrates its own processing unit and memory independently of the on-board computer subsystem. The EPS is based on direct-energy transfer, includes 5V and 3.3V voltage regulation, and implements lithium-ion battery pack with two battery cells in parallel providing a total capacity of 4400mAh. The IPPM and EPS boards are integrated on the CubeSat Kit using the backplane concept. In parallel to the structure, IPPM, EPS, and backplane, flight software is being developed to be integrated on the Kit's on-board computer for Mk II. The flight software is planned to be implemented on a Raspberry Pi computer and its development is based on open source available resources. Upon completion, the flight software will enable the tasks management of the various elements of the CubeSat Kit. The conference manuscript and presentation will detail the design, performances, and verification of the CubeSat Kit Mk I. Moreover, the status of the Kit Mk II will be presented, including preliminary design of the communication and attitude determination subsystems. Finally, examples of curricula for enabling the future of space engineering and exploration from high school curricula to professional training will be introduced.