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IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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EARTH-MOON OBSERVATION CUBESAT: PAYLOAD SYSTEM DEVELOPMENT AND INTEGRATION

Abstract

This project focuses on the design, development, and integration of payload and onboard computer (OBC) subsystems for two 3U CubeSat missions: one in low Earth orbit (LEO) for Earth observation and another at the Earth-Moon L2 (EML2) libration point for lunar mineralogical analysis. The mission aims to enhance scientific understanding of Earth's environmental changes and the Moon's surface composition while demonstrating low-energy trajectory control techniques. Equipped with optical payloads, including cameras and multispectral imaging sensors, the CubeSats capture detailed Earth imagery for atmospheric and environmental studies and analyze reflected light from the Moon's surface to identify minerals and map surface composition. The OBC subsystem manages power distribution, data processing, and communication, with hardware selected for computational efficiency and low power consumption, alongside custom software to control payload operations, automate data management, and optimize communication protocols. A key priority is ensuring effective integration between payload systems and CubeSat architecture, requiring compatibility with power, thermal, and communication subsystems to enhance mission performance. Current efforts focus on optimizing hardware, advancing software development, and conducting performance tests, with operational approaches being actively designed and validated. By using imaging and spectroscopy technologies, this mission advances Earth remote sensing and lunar exploration, showcasing the versatility of small satellites for scientific investigations across different orbital regions. The project highlights how CubeSats can play a significant role in advancing space exploration and environmental monitoring effort.