

# **On the Efficacy of Student Operations for Interplanetary Spacecraft: Benefits and Challenges**

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Lunar Flashlight (LF) is a 6U CubeSat developed by NASA's Jet Propulsion Laboratory (JPL) with the original purpose of demonstrating a novel green propulsion system and mapping surface water ice concentrations at the Lunar South Pole. In a novel approach to interplanetary mission operations, Lunar Flashlight was fully operated by students, both undergraduate and graduate, at the Georgia Institute of Technology (GT). This presentation analyzes the steps and effectiveness of having students operate a low-class mission such as LF. Before launch, student operators were trained by JPL experts, contributed to integration and testing (I&T) activities, and developed critical procedures and ground data system (GDS) software to be used in flight. After launch, the team worked with the Deep Space Network (DSN) daily and satisfied all mission success criteria while ensuring the health and safety of the spacecraft. Although the primary mission was cut short due to a malfunctioning propulsion system, students in conjunction with JPL executed multiple incidental activity campaigns including a propulsion diagnostic, imaging, and laser firing campaign. While the official JPL end of mission was declared in May 2023, GT operations continued until December 2023. During the extended mission, ownership of the spacecraft was completely given to GT. The fully student-driven extended mission led to the success of an optical navigation campaign. Several challenges emerged due to the uniqueness of having students operate an interplanetary spacecraft, such as dealing with a high turnover rate, academic scheduling conflicts, and the knowledge gap between undergraduates and graduates. However, several benefits emerged as well: reduced operations overhead, stronger institutional partnerships, and a streamlined transition from school to industry. The valuable learning opportunities from Lunar Flashlight operations are applicable to future parties who may wish to pursue a similar operations structure in the future.

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