

Lunar Far Side Tracking and Communication Relay System

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Overview: The P30 platform is a 300 x 300 x 300 mm structure which has a modular internal configuration that was tested successfully and allows for between 9U and 12U volume within an optimized, modular structure. The proposed design will include the P30 external structure as the 'Parent' spacecraft placed at the Earth-Moon L2 point for imaging and tracking operations, and multiple 1U CubeSats or 'children' deployed from the P30 to act as a communication relay to enable data transmission from the system to the ground station.

Payload: The capability to provide a customizable internal configuration for the Payload and additional space than generally available on a similar CubeSat platform is unique to the P30 structure and can be utilized for a wide range of applications. The P30 platform can accommodate upto 3 CubeSats of the 1U form factor that can be deposited at multiple locations in the same orbital plane and will help increase the downlink time for communication between the 'parent' satellite and the ground station.

The P30 structure, placed in a halo orbit at the L2 point, will consist of multiple instruments, including a high resolution multispectral imager for accurate tracking of ground based systems on the far side of the moon. Additionally, the spacecraft will contain an infrared spectrometer to enable thermal profiling of the region and identify the surface composition. The P30 'parent' spacecraft will allow for distributed correlation of the data that is then transmitted from the 'children' satellites for downlinking using a Disruption Tolerant Network (DTN). This system of satellites can assist the guidance and navigation of future landers and rovers exploring the area.

Mission Design: The platform will be designed to have a nominal mission lifetime of 3 years. The structure will include 3-axis attitude stabilization using reaction wheels and star trackers. The inter-satellite link using the DTN system will be developed to enable autonomous data transmission between the 'children' and 'parent' spacecraft, to be downlinked to the ground station with minimal latency.

Furthermore, the 1U CubeSats will be developed based on the necessary application and integrated within the P30 platform. The P30 structure will be updated to include a deployment system for orbit insertion of the 1U CubeSats. Further research will be conducted into control of the internal thermal environment and communication capabilities with respect to interplanetary missions.