

Cubesat-Minimoon Rendezvous Mission Synthesis and Analysis

This paper introduces a mission concept for the remote characterization of a temporarily-captured asteroid, or “minimoon,” based on the utilization of the CubeSat form-factor. Minimoons are a subpopulation of Near-Earth Objects which approach the Earth-Moon System with velocities that allow them to make at least one orbit around Earth before exiting the system again. These temporary objects do not remain in the Earth-Moon system very long, typically less than one year, and are thus difficult to develop spacecraft missions for. A potential solution to this problem is to utilize the typically rapid-development timelines that CubeSat missions possess. This paper will analyze the requirements and limitations in developing a mission for a CubeSat to rendezvous or fly by a minimoon. This includes exploring the orbital properties of the minimoon population, the capabilities and applicability of the CubeSat technologies for such a mission, and finally presenting a case study of this mission on the only known minimoon, Asteroid 2006 RH₁₂₀.