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CUBESAT MINIMOON RENDEZVOUS MISSION SYNTHESIS AND ANALYSIS

Abstract

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 the estimated two million Near-Earth Objects (NEOs) under 2 meters in diameter, which pass within the Moon’s orbit every year. These temporarily-captured objects do not remain in the Earth-Moon system for long, typically less than one year, and are thus a challenge for developing conventional spacecraft missions. A potential solution to this problem is to utilize the typical 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 capabilities and applicability of the CubeSat technologies for such a mission, analyzing the erratic nature of minimoon orbits, laying out how such a mission project would be managed, and finally presenting a case study of such missions on the only known minimoon so far, Asteroid 2006 RH120.