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SPACE EXPLORATION SYMPOSIUM (A3)
Space Exploration Overview (1)

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BARRIERS TO SOLAR SYSTEM EXPLORATION IN THE CUBESAT AGE

Abstract

This research will determine whether CubeSat technology has eased the barriers against unmanned exploration of the solar system. The primary barrier to terrestrial exploration nowadays is one of cost. While cost is also the primary barrier to unmanned solar system exploration, the sheer amount of expenditure required has limited solar system exploration missions to space agencies, such as NASA and ESA. This cost barrier was once the case even for accessing Low Earth Orbit (LEO), but the rise of the CubeSat standard has dropped the costs of accessing LEO by several orders of magnitude, allowing smaller organisations, such as universities and startup companies the ability to access space. Starting in 2018, a number of CubeSat missions will be launched to targets such as the Moon, asteroids and Mars. Many more missions are proposed for launch in the coming years. Planned and proposed solar system exploration (SSE) CubeSat missions are examined to determine the barriers that they have already passed and expect to encounter. These barriers are compared with the barriers to non-CubeSat solar system exploration, terrestrial exploration, and launching CubeSats to Low Earth Orbit. Recommendations are made for methods for reducing the barriers to SSE CubeSat missions to the degree necessary for solar system exploration to be viable for smaller organisations. While barriers to solar system exploration have fallen, the dearth of opportunities for ridesharing on board space agency led exploration missions remains a significant non-cost barrier. Technological barriers also remain, with organisations having to tailor CubeSat parts for the deep space environment themselves instead of relying on expert contractors. By identifying where barriers to solar system exploration remain, this research highlights areas in which scientific, engineering and operational expertise in the space industry should be focused. Important science outcomes and valuable resources await mankind on the bodies of the solar system.