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POTENTIAL BENEFITS TO THE EUROPA CLIPPER MISSION PROVIDED BY THE SPACE LAUNCH SYSTEM

Abstract

The National Aeronautics and Space Administration's (NASA's) proposed Europa Clipper mission would provide an unprecedented look at the icy Jovian moon, which is believed to hold a subsurface ocean with more than twice the quantity of water on Earth, and investigate its environment to explore the possibility that it could host life. Focused on observing the water, chemistry, and energy conditions on the moon, the spacecraft would examine Europa's ocean, ice shell, composition and geology by performing 45 low-altitude flybys of Europa from Jupiter orbit over 3.5 years, allowing detailed investigations of globally distributed regions of Europa. In hopes of expediting the scientific program, mission planners at NASA's Jet Propulsion Laboratory are working with the Space Launch System (SLS) Program, managed at Marshall Space Flight Center. Designed to be the most powerful launch vehicle ever flown, SLS is making progress toward delivering a new capability for exploration beyond Earth orbit. The SLS rocket will offer an initial low-Earth-orbit lift capability of 70 metric tons (t) beginning with a first launch in 2017 and would then evolve into a 130 t configuration. While the primary focus of the development of SLS is enabling human exploration missions beyond low Earth orbit using the Orion Multi-Purpose Crew Vehicle, the rocket could offer unique benefits to robotic planetary exploration missions, thanks to the high characteristic energy it will provide. This paper will provide an overview of both the proposed Europa Clipper mission and the Space Launch System vehicle, and explore options provided to the Europa Clipper mission for a launch within a decade by a 70 t version of SLS with a commercially available 5-meter payload fairing. Through comparison with a baseline of current Evolved Expendable Launch Vehicle (EELV) capabilities, the paper will examine potential benefits of SLS for planetary science in general, and in specific for the Europa Clipper mission, which could see transit time reduced to less than half, enabling faster return of scientific results, reduced operational cost and reduced mission risk.