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VENUS HUMAN FLYBY MISSION DESIGN AND BENEFITS

Abstract

Venus has long been an object of interest for potential exploration and science goals. The fact that human surface landings are out of reach with current technology restricts human missions to Venus to flyby or orbital missions. However, significant science can be enabled by placing humans in the vicinity of Venus even if not on the surface. Flyby missions also place Venus as a demonstration stepping stone to destinations such as Mars.

This paper presents a proposed crewed Venus flyby mission launched by the new NASA Space Launch System (SLS), which successfully flew its first mission late last year. The mission aims to study the planet's atmosphere and surface features while also providing the first opportunity for human interaction at Venus. The data collected will improve our understanding of Venus' geology and geophysics, as well as its atmosphere and climate. Additionally, the mission will also investigate potential similarities and differences between Venus and Earth, which will improve our understanding of how planets evolve over time. The human presence on the mission will allow responsiveness and real-time decision making that is simply not possible with a robotic mission.

This paper also analyzes mission design, trajectories, element combinations, and aggregation points to compare various mission scenarios. The resulting scenarios are reviewed and the challenges and benefits of an early flyby mission to Venus are discussed. This mission would provide the first human close encounter of Venus and is achievable in the near term. By using systems already in use and development today, such as the SLS and Orion, a flyby mission will prove human courage and perseverance in the deep space environment, focus technology, and create unparalleled interest in human space exploration and education.