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INNOVATIVE PARACHUTE DESIGNS FOR MARTIAN ATMOSPHERE: ENHANCING SPACE VEHICLE RECOVERY

Abstract

This paper presents cutting-edge parachute designs tailored specifically for the Martian atmosphere, aiming to improve the recovery of space vehicles on the Red Planet. The unique challenges posed by Mars' thin atmosphere, approximately 1% of Earth's density, necessitate novel approaches to ensure safe and precise landings. Our research focuses on the development of advanced parachute systems optimized for efficient deceleration during entry, descent, and landing (EDL) phases in Martian conditions. We investigate various design parameters, including canopy size, shape, and material composition, as well as deployment mechanisms, to maximize performance while accounting for the sparse atmospheric density and unpredictable wind patterns prevalent on Mars. Key innovations include the integration of lightweight and durable materials, such as advanced composites and high-strength fabrics, to withstand the demands of Martian descent. Additionally, we explore novel deployment mechanisms to ensure reliable and timely parachute deployment in variable atmospheric conditions. By refining these parachute designs through testing and simulation, we anticipate significant improvements in landing accuracy and survivability on Mars. These advancements have the potential to enhance the success and safety of space vehicle recovery operations, contributing to the advancement of humanity's exploration.