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AUTOROTATION: AN INNOVATIVE ALTERNATIVE TO PARACHUTES FOR SPACECRAFT LANDING

Abstract

The success of many space exploration mission depends on its ability to safely land on a celestial body, making the landing phase a crucial part of the mission. Traditional landing systems, such as parachutes and propulsion systems, have been used for decades. Yet, they have limitations in terms of control and efficiency. As space exploration missions become more challenging and the demand for efficient and reliable landing systems increases, investigating alternative landing systems has become more critical than ever before.

Autorotation is a promising alternative landing system. Unlike conventional propulsion systems, autorotation does not require any fuel, offering significant advantages in terms of cost and complexity. Instead, autorotation relies on the vehicle's aerodynamic properties to generate lift during descent, providing control and steerability that is not available with parachute systems. The use of autorotation could also enable landing in challenging environments, such as those on other planets, where conventional landing systems may not be feasible.

The research presented in this paper provides valuable insights into the potential of autorotation as a viable alternative landing system for spacecraft. By comparing the flight performance of different vehicles equipped with autorotation, parachutes, and propulsion systems, the study establishes a baseline for the potential of autorotation in future missions and landing systems.

The importance of investigating alternative landing systems for space exploration missions cannot be overstated. As space agencies plan for future missions to Mars, Venus, and beyond, it is essential to develop landing systems that are reliable, efficient, and capable of landing in challenging atmospheres. This paper highlights the potential of autorotation as a promising alternative landing system, offering control and steerability without the need for fuel. The results of this study can inform the development of landing systems for future missions on earth or other planets, contributing to the advancement of space exploration.