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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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FLEXIBLE LANDING SYSTEM FOR EXPLORATION OF ROCKY CELESTIAL BODIES

Abstract

Through proper design and analysis, the requirements and effectiveness of flexible landing systems for space crafts were explored. Impact stresses developed at the time of landing were analysed for different types of system configurations to determine their applicability and extent of variability. The role of controlling parameters viz. the shape and size of the components, weight of the space craft, materials suitable for building the system etc. under different environmental conditions were probed and optimized for a wide range of terrains. Computational analysis was performed for fixed and flexible configurations. Results indicated that the use of flexible landing system is feasible up-to certain weight and stress limits under varying environmental conditions, because of the presence of pivots or hinges that act as points of stress concentration. However, the ability of the flexible system to stably position itself in a vast variety of landscapes gives it an edge over the fixed configuration. Thus, a flexible landing system offers extensive advantages when it comes to selection of landing spot. Proper selection of materials through intensive analysis of new materials having high strength to weight ratio while being thermally stable and having a high fracture or fatigue limit, favours the introduction of a flexible landing system as the primary configuration. The flexible landing system has the potential to play a major role in exploration of mysterious locations on celestial bodies, which hitherto remain unmapped due to the restricted choices of landing sites for fixed landing systems.

Key Words: Flexible landing system, landing site, impact stress analysis