

SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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A FLEXIBLE CONCEPT OF AN AEROBRAKING SYSTEM FOR GEOSPACE EXPLORATION
VEHICLES

Abstract

In 2004 the International Academy of Astronautics identified in its Cosmic Study on “The next Steps in Exploring Deep Space” a so called Geospace Exploration Vehicle for the transportation of astronauts. The return of such a vehicle requires a large amount of fuel for braking at the Earth into a Low Earth Orbit. This paper presents a variable aerobraking system concept that can be applied to an entire class of exploration vehicles returning from the Moon or Libration Points. A parameterized mass model incorporating an aerodynamic database, a transient thermal analysis and an analytical structural model is developed. A comparison is drawn between trajectory control through an adjustment of the number of passes and through drag control. It is shown that the aerobraking system for the preferred option accounts for about 15 percent of the total vehicle mass for an aerobraking phase of 41 days. The system is applicable to vehicles with a mass of twenty to fifty tons while being compatible with the available payload diameter of current launchers. The sensitivity to a change in the center of mass is very low indicating a flexible operational feature.