

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

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CONFIGURATIONAL ASPECTS OF AN AERO-BRAKING GEOSPACE EXPLORATION VEHICLE

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 evaluates possible configurations of a thermal protection system for an Aerobraking scenario, based on investigations of aero-thermodynamic simulations, aerodynamic stability, mission flexibility and topology. In contrast to orbit transfer vehicles studied in the 80s, an astronaut carrying Geospace Exploration Vehicle arrives at hyperbolic velocities and is much heavier than previously studied vehicles while a plane change is not required. The investigated configurations include inflatable front shield and rear shields, rigid integrated shields of various geometries and a rigid mushroom-shaped front shield with stabilizing fins at the back of the spacecraft. The latter configuration seems to be the most promising for the considered class of vehicles of about 20 to 30 tons.