

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures - Dynamics and Microdynamics (3)

Author: Dr. Vsevolod Koryanov
Bauman Moscow State Technical University, Russian Federation, vkoryanov@mail.ru

METHODOLOGY OF EVALUATION THE INFLUENCE OF SMALL ASYMMETRY EXTERNAL
FORMS OF SPACE LANDING VEHICLE ON A DEVIATION OF THE LONGITUDINAL AXIS AT
MOVEMENT UNDER RESONANT MODE

Abstract

For the implementation of the braking in an atmosphere that is the implementation of "soft" landing, proposed using special inflatable braking devices. Due to sharp changes in the geometry of the spacecraft during descent is its braking in the atmosphere. Inflatable braking system non-rigid body. At movement such a device in the atmosphere may occur asymmetry external shape, the device may be deformed, and the oscillations of such a device can lead to a resonance effect. The combination of these negative factors can badly affect the performance of the descent mission spacecraft in atmosphere. Accordingly, the design of such space landing vehicles must take into account the asymmetry of the external shape, deformation and resonant mode motion. In previous papers considered the analysis of the calculation of the angular motion parameters space landing vehicles with aeroelastic inflatable braking device, and was also investigated the effects of wind on the dynamics of the angular motion of the descent vehicle with the braking device on the final trajectory. In this paper present a methodology for assessing the impact of small asymmetries external shape space landing vehicle deviating longitudinal axis while moving in a resonant mode, used in the design of these landing vehicles. Numerous studies have resonant mode motion unguided devices showed that the development of a resonant mode (the maximum deviation from the longitudinal axis of vehicle velocity vector) is held for a short time of a few seconds. As a result of this work, proposed analytical methodology rapid assessment of the impact of small asymmetries in the magnitude of the deviation of the spatial angle of attack landing vehicle in a resonant motion. The methodology allows analyze the value of the design parameters and the aerodynamic coefficients on the degree of their influence through the asymmetry of a deviation of the longitudinal axis of landing vehicle of the velocity vector. An example of the influence of small asymmetries in the resonance conditions for landing vehicle designed for the descent into the planet's atmosphere.