Paper ID: 23247
oral

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

Author: Dr. Vsevolod Koryanov
Bauman Moscow State Technical University, Russian Federation

METHOD OF CALCULATING THE DESCENT OF THE SPACECRAFT IN THE ATMOSPHERE USING TECHNOLOGY ADAPTATION LANDING IN DIFFERENT ENVIRONMENTAL CONDITIONS

Abstract

Landing stage of the spacecraft is one of the most important for the success of this mission. Need to reduce the high speeds required to landing necessitates the use of special devices for braking. At the same time, small size the landing vehicle make limitations on applied brakes devices. Proposed to apply brake inflatable devices that due to changes in the geometric shape the landing vehicle promote its inhibition. The presented work is devoted to developing a method for calculating the motion the landing vehicle with inflatable constructions in the planet's atmosphere. Analysis of the projects on dynamics of motion devices with non-rigid constructions, showed that they consider highly deformable, mostly permeable, such as parachutes unclosed shells and soft wings, usually used for braking the landing vehicle at subsonic speeds. The greatest difficulty is the problem of dynamic type, namely the behavior of the soft-shell during its opening in the presence of varying external load. Mathematical description of this process is encountering great difficulty solely because this problem belongs to the class of strong interaction bluff spatial object changes shape with the flow. In our case, the braking device the landing vehicle is hard enough inflatable balloon cone type undergoing large external aerodynamic load during descent into the atmosphere. Therefore, at present work propose a method for calculating the parameters of angular motion the landing vehicle, based on joint integration of the differential equations of motion and partial differential equations describing the change in the form of an inflatable braking device during descent vehicle in the atmosphere. Proposed method for studying the influence of the deformation of the inflatable braking device on the dynamics of the angular motion of a space lander allows the design stage to determine the required lateral rigidity inflatable braking device, which provides a stable movement of various space landers throughout descent trajectory.