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ANALYSIS OF THE ANGULAR MOTION DYNAMICS OF A PROSPECTIVE DESCENT VEHICLE EQUIPPED WITH A DEPLOYABLE BRAKING

Abstract

The study of the angular motion of the descent vehicle, which is controlled by the method of shifting the center of mass, was carried out. The displacement of the center of mass of the descent vehicle leads to its rotation through a certain angle relative to the oncoming flow. As a result of the rotation of the descent vehicle relative to the oncoming flow, an aerodynamic force appears perpendicular to the direction of its movement. This force leads to a change in the trajectory of the descent vehicle. As a result of motion control by this method, a redistribution of masses occurs in the descent vehicle, which causes the appearance of centrifugal moments of inertia. The influence on the nature of the angular motion of the centrifugal moments of inertia, as well as the moments necessary to change the position of the center of mass, is considered in the work. The method of shifting the center of mass is based on changing the angular position of the structural elements of the descent vehicle. A mathematical model has been developed to study the angular motion of the descent vehicle. The simulation results made it possible to evaluate the effectiveness of this control method and formulate requirements for an automatic control system that implements this method.