

DYNAMICS OF SPACECRAFT IN DESIGN DEPLOYMENT OF ELASTIC STRUCTURE OF LARGE DIMENSIONS

The paper deals with the dynamics of the spacecraft, which carries an elastic variable-geometry body, during the deployment of a compact system of the circular antenna type in accordance with a given program. A research objective is to simulate mechanically and mathematically the dynamic processes. Methods of analytical mechanics of bodies with non-stationary coupling are used. Mechanical and mathematical models of the system under consideration are built, a comprehensive numerical simulation of the deployment dynamics is made and the basic laws of the spacecraft dynamics are derived. The numerical simulation was carried out considering the theorem of changes in a total moment of momentum of the system. Similar problems in the field of the spacecraft dynamics were not earlier investigated for various reasons. They became actual with the advent of small spacecraft, whose dynamics depends essentially on the deployment of the carried transformable structures. The obtained results demonstrate a method of the mathematical description of the dynamics of the system with a programmably-changed geometry and the behaviour of a real small spacecraft during the deployment of the large elastic structure. Data of the numerical simulation allow the selection of parameters of the practical deployment law.

Keywords: spacecraft, circular antenna, deployment, dynamics.

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