

**Mathematical model for determining the design parameters of an inflatable payload-bearing space platform**

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The development and application of inflatable space structures is of considerable interest in modern space science and technology. Today, these structures enjoy wide application from aerodynamic inflatable deorbit means to inflatable residential sections for the International Space Station. This is because the masses of inflatable structures are smaller in comparison with others, which in turn minimizes the cost of their orbital injection. In view of the considerable interest in orbital constellations, the authors of this article propose the use of an inflatable space aerodynamic system as a platform for a payload. In doing so, we obtain a distributed satellite system on an inflatable space platform. The advantage of this technology is that it assures the maintenance of the relative position of the elements (payload) of a distributed satellite system of this type with minimal energy consumption.

In its turn, to analyze the features of the operation of a particular space technology, its mathematical model is required. Because if this, the aim of the article is to develop a mathematical model for estimating the design parameters of an inflatable payload-bearing space platform.

The mathematical model of the operation of an inflatable payload-bearing space platform developed in this work consists of three modules: a module of orbital motion, a module of calculation of the thermodynamic parameters of the inflatable platform, and a module of calculation of its variable inertia tensor. The article also identifies four gas modes of operation of the inflatable segment of the space platform and gives the inertia tensor as a function of the ambient temperature, which is necessary for further research. It should be noted that the application of the mathematical model allows a priori analysis of a wide range of inflatable space platform design parameters. On this basis, a design parameter analysis method that uses this model was developed. The application of this method may greatly simplify further research into the synthesis of an angular motion controller for an inflatable payload-bearing space platform, the choice of the design parameters of inflatable segment shell materials, and the study of the platform operation in different gas modes.

**Keywords:** *inflatable space platform, payload, mathematical model, design parameters, thermodynamic parameters.*

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Received on November 15, 2021,  
in final form on December 1, 2021