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MATHEMATICAL MODEL FOR SELECTING THE AUXILIARY EQUIPMENT PARAMETERS OF AERODYNAMIC DEORBIT SYSTEMS

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The goal of this work is to develop a model for selecting the design parameters of auxiliary equipment for aerodynamic deorbit systems. For normal operation, an aerodynamic deorbit system, according to its class, is equipped with the following support systems: for deployment, inflation, and storage onboard the space object to be deorbited. The deployment system consists of two components: a mast deployment system, in which four rolled-up masts are stored and deployed, and an airfoil storage spindle, on which four quadrants of a film material are wound. Aerodynamic systems can be inflated in several ways: using a system of gas storage and supply to the shell, using the residual pressure, or using the sublimation of a powder substance. The characteristics of sublimable substances and inert gases for inflation are given. The paper presents a methodology for determining the inflating gas parameters taking into account the exposure of the aerodynamic system to space debris fragments. The following requirements are imposed on the storage system materials: resistance to space factors, resistance to dynamic loads in orbital injection, and resistance to thermal deformations. A mathematical model for selecting the auxiliary system parameters of aerodynamic deorbit systems is presented. This model includes deployment system mass estimation, relationships for determining the inflation system mass for aerodynamic systems of various configurations, wall thickness estimation for gas cylinders of different configurations, and relationships for determining the storage system mass for aerodynamic deorbit systems of different configurations.

Keywords: *space object, aerodynamic deorbit system, auxiliary equipment, design parameters, mathematical model.*

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