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MODEL OF MOTION OF SMALL RADIAL SPACE TETHERED SYSTEM BY THE ACTION OF AERODYNAMIC MOMENT

The possibility of using the electrodynamic space tethered systems (EDSTS) for deorbiting the space debris is currently being studied extensively. However, a preliminary analysis demonstrated the instability of a radial position of EDSTS due to aerodynamic effects included. The work subject is to construct the motion model of a small radial space tethered system (STS) relative to the center of mass, which is suitable for analytical studies of resonant motions of the STS by the action of the variable aerodynamic moment and for the estimation of the effect of system parameters on these fluctuations. The system motion near the equilibrium position is examined: a longitudinal axis of the STS moves near a local vertical, amplitudes of the longitudinal axis oscillations are small, the tether is stretched by gravitational forces. The model of a dumbbell has been chosen for the estimation of the effect of the aerodynamic moment on the STS motion. The model of the aerodynamic moment takes into account the variability of atmospheric density along orbit and its dependency on the STS orientation relative to the mainstream. The class of small STS under consideration has been selected and ranges of variations in model parameters have been defined for it. The results will be used to study the resonant aerodynamic instability of the radial STS, including EDSTS.

Keywords: space tethered system, motion model relative to center of mass, variable aerodynamic moment.

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