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Author: Mr. Anton Sumarokov
S.P. Korolev Rocket and Space Corporation Energia, Russian Federation, avsumarokov@gmail.com

AN INVESTIGATION OF FLYWHEELS ROTORS UNBALANSES INFLUENCE ON MICROACCELERATIONS ON BOARD OF PERSPECTIVE SPACECRAFT

Abstract

An orientation control of perspective spacecraft OKA-T is considered. This spacecraft is periodically docked to orbital space station ISS. During the autonomous flight the control system must provide on board the spacecraft a conditions for carrying long-time experiments on micro gravitation (with a level of micro accelerations 10^{-5}g - 10^{-6}g). Flywheels are used as an executive devices on this spacecraft. While conducting the experiments on micro gravitation the control system maintains an orientation in which permanent gravitational torque is absent and with the help of rotating solar batteries maximum power supply is provided. Relative to the given orientation a smooth angle maneuvers is carrying out with a purpose of gravitational unloading of the accumulated flywheels momentum. Modeling of dynamics of motion spacecraft maintaining micro gravity conditions was conducted and values of micro accelerations in the places of target equipment mounting were calculated. An influence of aerodynamic forces, gradient of gravitational forces, angular motion of spacecraft, construction elastic vibration, drives of solar batteries rotation, static and dynamic unbalances of flywheels rotors were taken into account during modeling. After modeling were conducted a comparison of micro accelerations levels was made for the case of flywheels rotors unbalance presence and in case of it absence. It was shown that in case of flywheels rotors unbalance absence the level of micro accelerations 10^{-6}g is achieved. When flywheels rotors unbalance were take into account the level of micro accelerations $5 \bullet 10^{-6}$g is achieved. Conducted analysis showed that exceeding of micro accelerations in case of taking into account flywheels rotors unbalance in comparison with case of flywheels rotors unbalance absence take place only in frequency range from 10 to 100 Hz, in other frequency ranges less than 10 Hz, micro accelerations is not exceed 10^{-6}g.