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PROBLEMS OF NAVIGATIONAL TRACKING OF TETHER SYSTEM DEPLOYMENT ON AN EXAMPLE OF YES2 EXPERIMENT ON SPACE VEHICLE "FOTON-M3"

Abstract

Tether systems are a perspective direction of development of space technologies. They can be used for the various purposes, including for delivery of small capsules from near-earth orbits as, for example, in YES2 experiment which carried out by European Space Agency during space vehicle (SV) "Foton-M3" mission. Key element of each space experiment success is qualitative navigational tracking. At the Samara State Aerospace University the navigational system for tracking of space experiments has been created and tested on SV "Foton-M3" . This navigational system worked during all time of realization of YES2 experiment on deployment of a tether system. The received data were stored onboard of space vehicle, and after completion of flight have been delivered to the Earth inside of the descent capsule. The navigational receiver measured of Foton-M3 motion parameters before the beginning of YES2 experiment, during deployment of a tether system, and also after cutting a tether. The problem has been put not only to restore motions of space vehicle and to confirm the fact of completion of tether deployment and its cutting under measurements of the navigational receiver, but also to study perturbation influence of tether deployment process on SV motion. In the report solutions of listed problems are discussed and confirmed the successful fulfillment of a main goal of YES2 experiment - deployment in space of a 30-kilometer tether system. The results of navigational measurements processing on the basis of which estimated the perturbation motion of SV "Foton-M3" during experiment are demonstrated. Indirect conclusions about real process of deployment of a tether system are done. Works have been fulfilled at financial support of the Russian Fund of Basic Researches (RFBR grant 09-08-00842-).