

Some Peculiarities of Operative “Okean-O” Control

V. A. Udaloy¹, N. M. Ivanov¹,
N. L. Sokolov¹, and V. U. Pazdnikov¹

Abstract: Russian-Ukraine spacecraft “Ocean-O” (S/C) was launched on July, 17, 1999. S/C is controlled from Mission Control Centre and Modeling (MCC-M), town Korolev, Moscow region. Purpose of the S/C “Ocean-O” is operative reception of Earth and World ocean remote probe information.

After the launch the control group came across complexity of S/C attitude control. In condition of atmosphere density difference control system nominal work turned out to be impossible because of lack of flywheel uncharge by electromagnetic plant in tangage channel.

Russian-Ukraine commission suggested and the control group accomplished unique scheme of S/C attitude control. The main idea of this scheme is performing periodic correction of the solar array position during communication session by issuing discrete commands to make necessary aerodynamic and gravitational moments combination that compensates disturbing moment. To support energy balance limits on angle of solar array turning were taken into consideration.

Analytic dependences were come out by input a number of simplifications into general system of differential equations, that describe the change dynamics of kinetic moment of flywheel. These dependences help to determine solar array inclination angle to provide necessary aerodynamic and gravitational moments combination.

Using such scheme turned out to be effective in S/C control in geomagnetic storms (July, 15-16, 2000; March, 30-31, 2001; November, 24-25, 2001). It is worth to note that during the geomagnetic storm on July, 15-16, 2000 Japanese X-Ray Telescope, that had worked on orbit since 1993 and studied black holes and other distant astrophysical objects, spun out of control.

¹ Mission Control Center and Modeling of Central Scientific and Research Institute of machine building
141070, 4, Pionerskaya str., t. Korolev, Moscow region, Russia
okean_o@mcc.rsa.ru