

Selecting the rendezvous control program of spacecraft debris collector at geostationary orbit with low transversal thrust

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The article considers the problem of utilization of space debris, located at geostationary orbit. A special spacecraft - debris collector (chaser spacecraft) with low thrust electric propulsion is proposed for this purpose. The most difficult part of the utilization of space debris operation – space debris fragment rendezvous is studied. A model of relative motion in cylindrical coordinate system with origin located in the space debris fragment center of mass is used. The simple analytical algorithm for controlling spacecraft with low transverse thrust consists of two active areas where thrust sign is constant - deceleration and acceleration - and a passive area between active ones, where the propulsion system is switched off. This control program provides a minimum flow rate. Relative motion control is divided to control the secular and periodic components. The analytical relations for calculating the duration of areas with constant thrust sign (eliminating the secular component) as well as formula for calculating the initial phase angle characterizing the position of active spacecraft on the relative motion ellipse are obtained. In this case, at the final time the periodic component of the relative motion is zero.

Keywords: utilization of space debris, spacecraft debris collector, relative motion, motion control.

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