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Orbital Safety and Optimal Operations in an Increasingly Congested Environment (Joint
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THE CONCEPT OF THE FUNCTIONING OF A SPACE VEHICLE - A SPACE DEBRIS COLLECTOR
WITH A VIEW TO REMOVING OBJECTS OF SPACE DEBRIS INTO ORBIT OF A BURIAL

Abstract

Every year the concentration of objects of space debris is steadily growing, which significantly complicates the conduct of both modern and future space missions using automatic, and especially manned space vehicles. To date, over 15,000 artificial objects and fragments larger than 5 cm have been recorded in near-Earth space. Therefore, the issues of cleansing outer space from objects of space debris of various sizes are quite relevant. Within the framework of this work, the issues of putting to disposal the large debris objects in orbit, performing uncontrolled flight in high, medium and low orbits with the help of space vehicles - space debris collectors. The main task of the spacecraft - the collector of space debris during the implementation of the flight program - is the disposal of as many space debris as possible. During the orbital motion, various perturbing factors act on the spacecraft and, depending on the orbit of the location, the contribution of one or another disturbing effect can differ substantially. Therefore, high-precision algorithms for modeling the motion of the spacecraft are implemented in the framework of the problem to be solved. They take into account the following perturbing factors: the Earth's gravitational field (PZ-90 and EGM-2008), the gravitational effect of the Sun, Moon and the planets (DE/LE or EPM), dynamic model of the atmosphere, precession, nutation, pole motion, light pressure, albedo and radiation of the Earth, solid earth tides, ocean tides, relativistic perturbations. In this work assesses the time of ballistic existence of objects of space debris on circular and elliptical orbits with a height of perigee up to 2000 km. The fuel costs for transferring objects of space debris to the designated disposal zones have been calculated. The analysis of dynamic conditions for observing objects of space debris from the spacecraft - space debris collector with the use of optoelectronic equipment is carried out. Taking into account the received results, the forecast image of the spacecraft - the assembler was formed. The research was performed at Bauman Moscow State Technical University with the financial support of the Ministry of Education and Science of the Russian Federation under the Federal Target Program "Research and development on priority directions of scientific and technological complex of Russia for 2014-2020". Agreement 14.574.21.0146 (unique identifier RFMEFI57417X0146).