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**ENERGY EXPENDITURES FOR MOVING SPACE DEBRIS OBJECTS
FROM LOW-EARTH ORBITS TO UTILIZATION ORBITS**

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The ever-increasing clogging of near-Earth space by space debris objects of various sizes significantly limits the possibilities of space activities and poses a great danger to the Earth's objects. This is especially true for low orbits with altitudes up to 2,000 km. The risk of collision of operating spacecraft with space debris threatens their functioning in near-Earth space. To control space debris, use is made of active and passive methods of space debris removal from operational orbits. At present, promising means of space debris removal are a space debris transfer to low-Earth orbits with a lifetime of less than twenty-five years, a transfer to a junk orbit, and in-orbit utilization. According to the latest recommendations, space debris objects moved to low-Earth orbits should have a lifetime of less than twenty-five years. In the dense atmosphere, small space debris objects usually burn up completely, while large ones burn up only partially and may reach the Earth. Since space debris motion in the atmosphere can only be predicted with large errors, a timely and accurate prediction of the place and time of fall of large space debris objects onto the Earth is impossible. Space debris objects can remain in junk orbits for hundreds of years without interfering with space projects. This method of space debris removal reduces the risk of collision with space debris objects in the initial orbit, but increases it in the junk one. According to the concept of in-orbit utilization, space debris is considered a resource for the in-orbit industry. An active space debris removal involves high energy expenditures of service spacecraft. In this regard, the task of their estimation becomes important. The goal of this paper is a comparative assessment of the energy expenditures for moving space debris objects into utilization orbits using service spacecraft with electrojet propulsion systems. The problem is solved using methods of flight dynamics, averaging, and mathematical simulation. The novelty of the obtained results lies in the development of a ballistic scheme and a fast procedure to calculate energy expenditures for moving space debris objects to a disposal orbit using service spacecraft with constant low-thrust electrojet propulsion system. The procedure may be used in substantiating and planning space debris transfer from low-eccentricity low-Earth orbits to utilization orbits.

Keywords: *space debris, removal, utilization, mathematical simulation.*

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