Analysis of optimal three-impulse transfer to an artificial lunar satellite orbit

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The article studies a problem of optimal transfer of a spacecraft from the Earth into a high circular Artificial Lunar Satellite (ALS) polar orbit with the radius of 6000 km. The single-impulse scheme is compared with the three-impulse one. The analysis is performed taking into account lunar gravitational field harmonics, gravitational attractions of the Earth and the Sun, and the engine thrust being limited. The results show that the three-impulse transfer from the initial selenocentric hyperbolic orbit to the final ALS one is better in terms of final mass than ordinary single-impulse deceleration. Control parameters implementing this operation and providing virtually the same power consumption as in the Keplerian case are given. The study reveals that there exists an optimal maximum distance of the maneuver in the case of real gravitational field, unlike in the Keplerian case.

Keywords: *spacecraft, lunar trajectories, optimal transfer, three-impulse transfer, lunar satellite.*

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