Paper ID: 85261
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IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (IP)

Author: Mr. Paul Iustin Vartolomei
Romania

PAYLOAD ORBIT MODIFICATION USING MAGLEV ACCELERATORS

Abstract

One of the most important aspects of any launch mission is the allocated budget. It determines both the payload's maximum mass and its orbit's altitude, necessary details regarding satellite constellations or other large-scale missions. There have been many attempts to modify the latter aspect through external means, such as using tethers or space tows and even the satellite's thrusters. These methods prove to be efficient in the case of slight orbit alterations, however, they do not exchange enough energy for more significant changes, such as transit orbits or escaping Earth's gravitational field. This paper proposes using a separate spacecraft to accelerate any payload to effectively modify its total energy, thereby changing its overall orbit. The cylinder-shaped spacecraft is split into two hollow parts, one where the load is accelerated using a motor that spins around the axis of symmetry of the cylinder, and another that is used to cancel out its angular momentum using counterweights. The upper motor acts on a ring-like section, the rotor, that connects to the payload with a strong electromagnet. Once the desired energy level has been reached, the magnet is disabled and due to its inertia, the load is expelled out of the accelerator through a short pipe section, continuing its course until its final orbit. Similarly, the lower motor acts on the counterweight, rotating it to account for the angular momentum of the payload and to ensure that it is adequately accelerated. Furthermore, this paper displays the efficiency and advantages of this orbital modification type, along with a thorough analysis of the spacecraft's engineering and its method of accelerating payload.