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OPTIMIZED ORBIT TRANSFER OF A GRAVIDYNE WITH LOW-THRUST PROPULSION

Abstract

The Gravidyne devised by Vladimir Beletski is a tethered spacecraft formed by 2 masses orbiting in parallel planes to the spacecraft center of mass. By controlling the distance between the masses, it is possible to increase or decrease the energy of the orbit without the need to spend propellant. However, the Gravidyne needs to be of large dimensions to provide any substantial benefit, which makes it impractical to deploy, hazardous to other spacecraft and in any case, this device alone does not allow to circularize orbit nor change the orbital plane. It is clear that to be practical, the Gravidyne spacecraft needs to use some other type of propulsion. This raises the question of when and where it is more beneficial to use each type of propulsion. This paper presents the results of the optimization of orbital raising and circularizing of a hybrid Gravidyne/low-thrust spacecraft along with conclusions about the benefits of each type of propulsion in each part of the maneuver.