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DESIGN FOR EARTH-MARS CYCLER TRAJECTORIES BASED ON AERO ASSISTED ORBITAL
TRANSFER

Abstract

Earth-Mars cycler trajectories is a promising scenario for sustaining Mars exploration. In this approach, a cycling vehicle is arranged in the Earth-Mars cycler trajectories, the cycling vehicle can be continuously transferred between the Earth and Mars. Using this flight scheme, we can keep the life-support systems or other structures that only for space missions in the circular orbit for a long time. This makes it possible that it is no longer necessary to consume fuel at the missions of getting that equipment into/out to orbit. In this paper, we have introduced the aero assisted orbital transfer base on the traditional Earth-Mars cycler trajectories. the aerodynamic force is used as an auxiliary way to make the modification method of cycler trajectories more flexible. For the traditional Earth-Mars cycler trajectories, the perturbations between the planets will gradually diverge the cycler trajectories, additional fuel consumption is needed to maintain the long-term operation of the cycler trajectories. Preliminary calculation and analysis illustrate that when the aero assisted is introduced, the maneuverability of cycling vehicle is effective increased, so, the situation of cycler trajectories divergence can be effectively avoided. With the gradual maturity of hypersonic flight technology, Earth-Mars Cycler Trajectories based on aero assisted orbital transfer will play an important role in the mission of Mars exploration in future.