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GETTING TO ERIS AND HAUMEA USING SOLAR ELECTRIC PROPULSION

Abstract

We explore the capability of a VASIMR® solar slingshot concept to send a 4000+ kg spacecraft to Kuiper Belt objects. The VASIMR® performs a slingshot pass close to the Sun and uses the high level of available solar energy to produce a sustained burst of high thrust. Enough kinetic energy is provided to the probe to reach Jupiter orbit while still within 0.7-1. AU. This study identifies the important parameters in the propulsion system operation (power level, propellant mass, payload release point, distance of closest approach to the Sun), and scan these parameters to understand and optimize the capabilities of the proposed system. The VASIMR® engine's power rating must match the peak power available when the spacecraft is closest to the Sun. The solar array is assumed to be a planar array rather than a concentrator since it will have to operate near the Sun, where a concentrator would overheat photovoltaic cells. The feasibility of using the VASIMR® to provide thrust along the transfer orbit until the transfer orbit reaches >5 AU will also be examined. Spacecraft speed in excess of 60 kps is achieved within Earth's orbit. This paper will extend our IAC 2019 paper to present results from Kuiper Belt flybys. A Neptune flyby served as a gravity assist for an Eris flyby and coast to 1000 AU. The Neptune model took 3.5 years. The Eris flyby took 9.6 years using VASIMR® and 15 using HiPEP. This simulation reached 1000 AU in 125 years. Studies of Jupiter gravity assist trajectories to other objects will be presented.