Paper ID: 44792
student

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Space Transportation Solutions for Deep Space Missions (8-A5.4)

Author: Mr. Dennis Scott
The Ohio State University, United States, SCOTT.776@OSU.EDU

Dr. John M. Horack
The Ohio State University College of Engineering, United States, horack.1@osu.edu
Dr. Elizabeth Newton
The Ohio State University, United States, newton.387@osu.edu
Mr. Michael Boazzo
The Ohio State University College of Engineering, United States, boazzo.2@osu.edu

ANALYSIS OF NUCLEAR THERMAL PROPULSION (NTP) ENABLED HELIOPAUSE TRAJECTORIES, USING SOLAR-OBERTH MANEUVERS AND INNER PLANETARY GRAVITY ASSIST

Abstract

This paper focuses on the application of nuclear thermal propulsion to reach the heliopause and exit the solar system on significantly shorter timescales than possible with chemical propulsion. We employ calculations based on the well-known Oberth Method, coupled with various optimal planetary slingshots from the inner planets of the solar system. Advances in nuclear thermal propulsion, such as those being pursued by NASA and private companies such as BWXT, will allow for multiple large deltaV burns to be executed within a single mission and at high ISP. We couple our analysis with existing mission data, such as the expected trajectory and perihelion of the Parker Solar Probe. We analyze the characteristics of multiple-burn-maneuver trajectories and assess their relative effectiveness from the prospective of time, energy, and velocity. Finally, an analytical approach is used to determine appropriate launch windows characterized by mission completion time, launch energy, and total mission energy efficiency.