IAF ASTRODYNAMICS SYMPOSIUM (C1)
Interactive Presentations - IAF ASTRODYNAMICS SYMPOSIUM (IP)

Author: Dr. Kenta Oshima
Hiroshima Institute of Technology, Japan, k.oshima.nt@cc.it-hiroshima.ac.jp

EARTH'S RETROGRADE PERIODIC ORBITS AND LUNAR GRAVITY ASSISTS

Abstract

The present study investigates capture and escape dynamics associated with high-energy retrograde periodic orbits around the Earth as applications to spacecraft trajectories. A lunar gravity assist plays the central role in both capture and escape scenarios. In the capture analysis, the trade-off among time-of-flights, launch energies, and insertion delta-vs are revealed. A variety of solutions exists including fast, multi-revolutional, and Sun-perturbed transfers. The escape analysis, on the other hand, focuses on transfers with short time-of-flights. The search finds that a double lunar gravity assist, occurring after a departure delta-v on the periodic orbit, enables efficient escape from the Earth with substantial hyperbolic excess velocities. The overall result leads to a concept "Comet Interception from eArth retrOgrade orbIT viA Lunar gravIty Assist" using the retrograde periodic orbit as a staging post and enabling fast lunar encounters to travel toward the interplanetary region.