

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

Author: Prof. Elbert E.N. Macau
Instituto Nacional de Pesquisas Espaciais (INPE), Brazil, elbert.macau@inpe.br

BUILDING INCLINATED AND EXCENTRIC HIGH EARTH ORBITS THROUGH SMALL
PERTURBATIONS: A FOUR-BODY DYNAMICS EXPLORATION**Abstract**

In specific applications, such as communication missions, require orbits with large journey time between the apogee and perigee, thus remaining for long periods at a specific point in space. Normally in these cases, the final inclination, eccentricity and semimajor axis values aimed demand too much fuel consumption when conducted by the conventional transfers methods. In this work, an alternative strategy transfer is proposed. It consists of exploring and take advantage of the natural dynamics associated to the unstable orbits and sensitive dependence present in the four body problem. In this perspective, a low cost transfer starting from a low to a high and inclined Earth orbit is built through a combination of a lunar gravity assisted maneuver and the application of judicious and small impulses to specific points of the trajectory. The method was validated in case studies carried out for a scenario composed of Sun, Earth, Moon and vehicle. The results obtained show that it is possible to obtain the desired stable orbits with a low total impulse magnitude, even in cases where conventional transfer methods are not feasible