Paper ID: 42032
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IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Upper Stages, Space Transfer, Entry and Landing Systems (3)

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INTERPLANETARY SUPPLY CHAIN NETWORK FOR SPACE EXPLORATION: STUDY OF A MODELING FRAMEWORK

Abstract

This paper has the starting intention to present a method for designing and optimizing an interplanetary transfer in flight regime from low Earth orbit within a very close vicinity of Mars by targeting its B-Plane, traced thanks to the software 'NASA General Mission Analysis Tool' that uses the Newton-Raphson method to identify a feasible space path in order to reach the desired orbit around Mars. In particular quantitative considerations of propellant mass consumed to produce each maneuver and so costs at stake come from the Tsiolkovsky equation. Secondly, this stable space trajectory can be the input to produce a modeling framework of the exploration from a supply chain and 'logistics architecture' perspective, that means the evaluation of scenarios and their analysis with respect to measures of effectiveness that fall into basic logistics performances, exploration capabilities, relative scenario costs and scenario risks. In order to proceed, it was used the software 'SpaceNet' that produced and analyzed the space campaign 'Flexible Path to Mars' that has the final goal to land a crew of astronauts on the surface of Mars. At the moment it's beyond the paper to provide an end-to-end approach in which eventually the results of each phase should be iteratively used in a 'input-output' loop to improve the quality of the overall system, while it can be considered as a foretaste of the potentialities of the analysis.