

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 2 (3B)

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OPTIMAL TRAJECTORY CORRECTION MANEUVER SCHEDULES FOR EARTH TO MARS
FLIGHT**Abstract**

Mars exploration is one of the most sophisticated missions currently being investigated. Trajectory design behind the launching of the spacecraft is important in the construction of a basic mission profile. We establish the preliminary reference trajectory using patched-conic approximation and then obtain the nominal trajectory by an iterative method of solving the boundary value problem based on linearized perturbation theory. Owing to the errors that exist in the measurement of spacecraft's state and the instrumentation of correction thrusts, an actual interplanetary orbit may deviate from the desired nominal trajectory. The trajectory correction maneuvers (TCMs) schedules through interplanetary cruise should be designed preliminarily. This paper describes how to optimize the number and location of the TCMs in order to attain the desired terminal position in the transfer trajectory. This type of problem was dealt with by R.H. Battin, J.V. Breakwell etc. We develop an optimization method to minimize a statistical measure of the propellant consumption where Pontryagin Maximum Principle is adopted. We also consider statistical properties of injection errors, measurement errors and TCM instrumentation errors. A detailed description and numerical results of a Monte Carlo simulation that is set up to determine the fuel requirements is presented.