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AN ANALYSIS OF THE POINT-TO-POINT CARGO TRANSPORTATION SYSTEM USING REUSABLE LAUNCH VEHICLES

Abstract

This paper aims to analyze the point-to-point cargo transportation system that employs reusable launch vehicles by deriving mission profiles. In order to accomplish this objective, we establish the concept of operation for the return to launch site (RTLS) scenario and describe the characteristics of each phase of the flight. The trajectory optimization problem is defined to obtain mission profiles of the RTLS scenario with the main parameters of flight phases as optimization variables. Moreover, various flight constraints and boundary conditions are considered to derive feasible trajectories of the cargo transportation system. Given that the goal of this system is to maximize the cargo mass under specific conditions, we set the payload ratio as the objective function. Furthermore, we establish reasonable cargo transportation system parameters to perform the flight simulation. Finally, we perform a parametric study of the given conditions based on the numerical simulation results to analyze the mission profile, particularly in terms of payload mass tendencies.