SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

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STUDY ON THE ORBITAL MANEUVERING CAPABILITY OF THE LOW-THRUST UPPER STAGE

Abstract

The Japan Aerospace Exploration Agency(JAXA) is now planning the next Japanese flagship launch system, H-X. The currently assumed launch capability of H-X is to launch a 5-6 tons of payload into Geostationary Transfer Orbit(GTO). For this purpose, a two-stage launch vehicle will be an optimized solution, however a small sized optional kick stage will expand flexibility of H-X to meet wide variety of space missions. This paper describes a concept study for the optional kick stage system of H-X that can be applied to multiple space missions including interplanetary missions. In this paper, mainly two cases of the orbital maneuvering simulations are conducted: First, orbit maneuvering placing 1 ton of piggyback payload or 6 tons of primary payload from Low Eath Orbit(LEO) to GTO. Second, orbit maneuvering placing 500 kg of piggyback payload or 2-3 tons of primary payload from LEO to deep space destination such as Mars. On the other hand, the relatively low thrust levels are assumed i.e. 1 ton maximum for piggyback payloads, and 3 tons maximum for primary payloads, which will reduce the manufacturing cost of the kick stage however, will also reduce the performace efficiency. To improve the performance of the low thrust kick stage, the split delta-Vs such as Proton/Breeze-M is employed in this study. The gravity loss is focused on to measure the performance efficiency of the low cost and low thrust kick stage. Throughout the simulations, some optimized configurations of the kick stage which covers the wide variety of space missions are suggested in this paper.