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TRAJECTORY DESIGN OF H3 ROCKET AND HTV-X FOR GATEWAY LOGISTICS MISSION

Abstract

The lunar orbital platform Gateway will be constructed in 2020s as the staging point for crewed and robotic lunar exploration. JAXA and MHI are currently conducting studies to contribute to NASA Artemis program by utilizing H3 and HTV-X. Both H3 and HTV-X are currently being developed. H3 is based on the heritage of H-IIA/H-IIB and maiden flight will be JFY2021. H3 intends to be more customer friendly launch vehicle by increasing reliability and launch capability while decreasing its price. On the other hand, HTV-X is an advanced version of H-II Transfer Vehicle (HTV) to increase supply cargo capability for ISS and provide an on-orbit demonstration opportunity for future exploration mission. For Gateway, HTV-X is studied to be further advanced. Compared with ISS's low earth orbit, a larger delta-v is required for Gateway. Therefore, we study "two H3 launches and HTV-X/H3 rendezvous/docking" for acquiring the necessary delta-v. It mentions that 1st H3 launches HTV-X, 2nd H3 does without payloads, HTV-X rendezvous/docks to 2nd H3 second stage in parking orbit, and then goes to Gateway. Delta-v and rendezvous functions assignment of HTV-X and H3 2nd stage is also studied to maximize supply cargo capability to Gateway. This paper shows a consistent trajectory plan from launch, rendezvous and finally to Gateway.