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LOW-COST MISSION TO MULTIPLE ASTEROID FLYBYS AND SAMPLE RETURN FOR THE 2015-2025

Abstract

Asteroids exploration missions attract many scientists' interest, because asteroids hold key clues to understanding the origin of our solar system and the information of the planets. Human have carried out many small celestial body missions (such as DS-I, NEAR, Stardust, Deep impact, etc) and gained a plenty of valuable experience. With many new asteroid or comet missions in various stages of development (Dawn, ROSETTA, Hayabusa-II), the situation regarding our understanding of these bodies can improve in the future. With the success of "Chang-Er" program for lunar exploration and the development of "Ying-Huo" program for Mars exploration, it will provide the great opportunity for Chinese development of the deep space exploration. Here, the low-cost mission to multiple asteroid flybys and sample return for the 2015-2025 is proposed, with the goal of selecting the potential candidates and studying schemes for the mission. This mission will be treated with the post "Ying-huo" program possibly. We investigated scientific justification and feasible mission scenarios. The selected target asteroid (potential candidates) has different spectral type and physical properties. According to the constraints of the mission, we search and present the optimal rendezvous and flyby opportunities for potential candidates. The planetary swingby are used for the transfer to candidate. In addition, when the spacecraft passes through the asteroid belt, it will take advantage of other asteroid flyby opportunities. The preliminary design results of the proposed missions will be reported. Finally, we analyze the trajectory characteristics and gave some key parameters, which would have a direct impact on communication system, power system and thermal control system of spacecraft etc.