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DEVELOPMENT STATUS OF MONO-PROPULSION SYSTEM FOR ACTIVE DEBRIS REMOVAL

Abstract

In order to remove larger debris of satellites and rocket upper stage, we have been researched and developed the spacecraft for active debris removal (ADR). One of the world's first technology demonstration of removing the large-scale debris by Astroscale Japan's spacecraft, called ADRAS-J spacecraft, from orbit at Commercial Removal of Debris Demonstration Project (CRD2) mission of Phase I by Japan Aerospace Exploration Agency (JAXA), the launch of ADRAS-J spacecraft is scheduled in 2023.

For our missions, the propulsion system is necessary to have the propulsive functions of rendezvous and collision avoidance capability at proximity operation and proximity approach with target. In addition, the propellant properties need to have with lower environmental loading that there are low toxicity and user friendly for expanding our commercial removal service missions. Thus, in this project, the propulsion system with ADRAS-J has been selected the ammonium-dinitramide based mono-propulsion system. The ammonium-dinitramide based monopropellant, called green monopropellant, demonstrated with various missions of PRISMA and ELSA-d. The propulsion system is designed based on the well-developed ELSA-d propulsion system and updating the design of system because the propulsive performances meet the requirements specification of minimum impulse bit and delta-V. The ADRAS-J propulsion system mainly consists of twelve 1N-class thrusters and blowdown monopropellant feed system.

This paper discusses the current development status of green mono propulsion system for ADRAS-J and the general specification of propulsive performance characteristics for Astroscale's future missions as one of the results which the trade-off evaluations of propulsion system were conducted.