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AOCS/GNC DESIGN AND DEVELOPMENT FOR RISE MISSION

Abstract

In the last few years, the concept of a circular space economy has steadily gained momentum, pushed by the increased awareness of the importance of sustainability and efficiency, that in turn impose focusing on maximizing the use of existing space resources and minimizing waste. In this context, D-Orbit is tackling the challenge head-on with its groundbreaking platform, GEA (General Expansion Architecture).This platform is designed to develop an extremely cost-effective and refuellable vehicle to meet market demand, allowing also to create a solid base for future applications.

D-Orbit's has been involved in the European Space Agency's (ESA) Active Debris Removal/In-Orbit Servicing project, started with the In-Orbit Servicing Proposal Request (IOSPR) initiative in 2021, that aims to provide Europe with an in-space validated sovereign and commercial in-orbit servicing infrastructure in the geostationary orbit region. In 2024, D-Orbit signed a 119 million contract with ESA as co-funding prime contractor to implement the RISE mission, that is the first European commercial mission designed to exploit in-orbit demonstration of the platform capabilities under ESA supervision. Following this, it will delivery commercial services, consisting in the life extension of an operational telecom spacecraft for an anticipated duration of seven years.

The flexibility requested to GEA imposes an extreme complexity to all the subsystems, particularly on AOCS that is requested to assure a wide range of tasks from orbit release to servicing and disposal, through different operational conditions and system configurations. In particular, besides the constraints related to the use of an electric thruster, the design of AOCS must take into account the challenge of rendez-vous and robotic capture operations, in accordance with ESA standard for RPO (Relative Phase Operation).

This paper firstly presents a description of the RISE mission, featuring an overview of the concept of operations and an insight of the system modes defined to fulfill the goals on each phase. Then, the status of the GEA AOCS S/S design, featuring the description of the defined architecture, an overview of the chosen GNC algorithms against the operative modes and the preliminary performances achieved are reported. Finally, the logic proposed for the development and validation for the next phases of the project will be illustrated.