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THE SPACE RIDER OBSERVER CUBE (SROC) CUBESAT MISSION

Abstract

The SROC project aims at demonstrating the critical capabilities required for successfully executing a rendezvous and docking mission in a safety-sensitive context. The European Space Agency (ESA), have funded the development of Space Rider Observer Cube (SROC) through the contribution of the Italian Space Agency (ASI) to ESA's General Support Technology Programme (GSTP). The project is lead by Tyvak International as prime contractor of a fully Italian consortium, including Politecnico di Torino, Università di Padova and Stellar Project.

The SROC System includes two systems within its Space Segment: the SROC spacecraft and the Multi-Purpose Cubesat Deployer (MPCD) deployment retrieval system. MPCD is intended to be installed within Space Rider's Multi-Purpose Cargo Bay (MPCB) and hosts the SROC spacecraft during launch. MPCD would then release SROC to perform a free-flight proximity operation demonstration mission. MPCD and SROC also support by design the possibility for SROC to dock again with MPCD and be restowed, for return to Earth within Space Rider. The SROC spacecraft is baselined to be a 12U CubeSat based on a standard Tyvak platform.

The MPCD system will leverage upon the Tyvak 12U CubeSat Deployer design, adding new ad-hoc elements and modifications to support the docking, retrieval, and restowing functionalities, unavailable in a normal deployer. Additional equipment, based on Tyvak MkII avionics, will also provide interfacing with Space Rider, and TMTC functionality.

The activity also includes preparation of the Ground Segment and operational planning to conduct the first demonstrator mission of SROC, that will leverage on existing Ground Segment assets owned by the Consortium.

Due to the novelty and perceived complexity of the mission objectives, the SROC program requires multiple sequential missions at an incremental level of complexity.

Two mission scenarios have been conceived:

Observe mission. The spacecraft is deployed from Space Rider and it is disposed into space after the inspection of the rider. The reduced scenario can also be seen as the off-nominal scenario of the Observe Retrieve case should any failure occur that prevents docking of SROC to SR.

Observe Retrieve mission. The spacecraft is deployed from Space Rider, observes the vehicle from a close distance, and eventually approaches Space Rider, performs docking, and is retrieved and stowed into the cargo bay for re-entry Earth.

The execution of the implementation phases started in October 2023 and the launch is planned to be part of the Space Rider Maiden Flight, currently planned in 2025.