

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
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AVUM ORBITAL MODULE GNC ARCHITECTURE FOR SPACE RIDER MISSION

**Abstract**

The Space Rider System (SRS) is the first fully reusable European space transportation system, able to be launched by the ESA VEGA-C launcher. It is designed to be able to perform experimentation and demonstration of multiple missions in Low Earth Orbit and safely be recovered on ground. It is a complex spacecraft made of the AVUM Orbital Module (AOM) and the Re-entry Module (RM) integrated in a single stack-up. The AOM inherited the VEGA upper stage AVUM+ and a Life Extension Kit (ALEK) in order to act as service module during the orbital phase for the re-entry module. The RM is instead the lifting body based on the IXV demonstrator, which carries the experimentation payload inside the Multi-Purpose Cargo Bay (MPCB) and will return to Earth for landing and re-flight. The AOM embarks a suite of sensors and actuators in order to guarantee the AOCS functionalities during the orbital phase, through to the algorithm developed and implemented by AVIO GNC team in the AOM OBSW. The challenge related to the definition of such a software is represented by the extreme level of versatility, robustness and autonomy requested by the high-level specification coming from ESA mission system requirement document. This paper presents the status of the AOM GNC subsystem, featuring the description of the architecture for both nominal and off-nominal phases managing, the algorithm overview and their performance against typical study case applicable to operative flights.