

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Upper Stages, Space Transfer, Entry and Landing Systems (3)

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ATV PROPULSION SYSTEM - WELCOME ON BOARD!
HOW THE ATV MISSIONS' FEEDBACK AND REAL-TIME MONITORING HAVE BEEN
MANAGED IN A CONTINUOUS IMPROVEMENT PROCESS

Abstract

Key elements of the European contribution to the International Space Station (ISS), three Automated Transfer Vehicles (ATV) have already successfully flown towards ISS, providing to the astronauts crews scientific equipments, spares, fuel, food, air and water needed for their missions. During approximately six months following their automated docking to the Russian service Module Zvezda, Jules Verne (ATV1), Johannes Kepler (ATV2) and Edoardo Amaldi (ATV3) have provided in addition a consequent propulsive support to ISS (re-boost, attitude control, debris avoidance manoeuvre) relying on an efficient and reliable propulsion system.

This saga success was partly possible thanks to an efficient autonomous on-board propulsion management involving simplified performance and consumption models computing and delivering to the Guidance, Navigation and Control system the necessary information for the vehicle control. That approach has been secured by the implementation on ground of a detailed complete propulsion tool monitoring the propulsion behaviour based on the telemetry fluxes and allowing the necessary corrective actions when needed.

After having presenting the implemented tools and logic, this paper provides a summary of the strategies applied during and between the ATV1 to ATV3 missions for the propulsion system improvement and the management of the deviations encountered during the ATV missions. A particular focus is given on the end-to-end implemented process and its closed loop from equipment acceptance to the missions' real time observation.