

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

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## LESSONS LEARNT OF TO DATE FLOWN ATV MISSIONS

**Abstract**

The Automated Transfer Vehicle (ATV) is an unmanned transport vehicle designed to provide support services to the International Space Station (ISS) during approximately six months following its docking to the Russian Service Module *Zvezda*. The main mission objectives are:

- Propulsive support to the ISS (re-boost, attitude control, Control Moment Gyro de-saturation and debris avoidance)
- ISS refuelling
- Delivery of cargo, water and gas
- Retrieval of wastes

Due to the complex nature of the mission, the ATV project does encompass many different challenges like:

- The involvement of many partners during the design phases and the subsequent production ones
- The design complexity of the vehicle itself: in order to successfully accomplish the mission, the vehicle is tolerant to 1 (one) failure and is in safe mode if 2 (two) failures occur
- A high variety of phases during its flight (LEOP, phasing, rendezvous, attached phase and re-entry)
- Human presence during attached phase: safety conditions should be taken into account for the pressurized module

The final paper will provide a description of the different characteristics and particularities of the three first ATV missions. Also, the main difficulties that arose during the flights of ATV-1 and ATV-2 will be presented, as well as which strategies were undertaken to resolve them (either during flight operations or as design improvements for the next flight). The presentation will also include available relevant information on the ATV-3 mission which could also be of interest for the completeness on the subject.