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OPERATIONS OF THE EUROPEAN AUTOMATED TRANSFER VEHICLE: A HISTORY OF TRILATERAL COOPERATION

Abstract

The European Automated Transfer Vehicle (ATV) was a pressurised unmanned resupply vehicle designed to refurbish the International Space Station with propellants and cargo. ATV was also capable of providing ISS with propulsive support to reboost the station into a higher orbit, of performing debris avoidance manoeuvres as well as attitude manoeuvres to assist docking/berthing or undocking/unberthing of other ISS visiting vehicles.

The ATV operational adventure started in 1998 when the CNES was selected by the European Space Agency to develop the Control Centre in Toulouse (France) and to prepare and carry out the operations.

ATV has successfully flown to the ISS with five flights since 2008 when ATV 1 (Jules Verne) was the first non-Russian and non-US visiting vehicle to autonomously dock to the ISS. During their recurrent services to the station, ATV missions have witnessed part of the construction of the ISS, seen the raising of commercial flights to the station, concluded the space shuttle era and observed the evolution of operational products and orbital segments.

On 15th of February 2015 at 18:11:30Z, the first era of the autonomous European contribution to the human spaceflight has been successfully closed with the end of the fifth ATV mission. At that time the ATV vehicle, named George Lemaitre, splashed down in a nominal destructive re-entry into the South Pacific Ocean Uninhabited Area (SPOUA), after six months spent attached to the ISS.

The ATV vehicle featured several characteristics making it unique in the ISS world. It was an European made vehicle able to safely perform automatic rendezvous with the ISS. It incorporated on-board some Russian equipment to automatically dock to the station on the Russian aft docking port. Once attached to the station, it was able to be commanded by the Russian O/B computer to perform refuelling of the station and propulsive supports. This, being functionally considered as an US Orbital Segment module. From these features, that mixed responsibilities as never done before, the challenge induced to the operational organisation clearly emerges.

This paper wants to present and highlight, in a structured way, the real need and the great effort made to put in place ATV operations and carry them out trilaterally in a smooth and synergic cooperation among the three Mission Control Centres (Moscow, Houston and Toulouse). The main operational results will be also reported, particularly focusing on the fifth and last flight concluded this year.