

14th HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM (A5)
Going beyond the Earth-Moon system: Human Missions to Mars, Libration points, and NEO's (4)

Author: Mr. Bernd Bischof
EADS Astrium Space Transportation GmbH, Germany, bernd.bischof@airbus.com

Mr. Uwe Derz
EADS Astrium Space Transportation GmbH, Germany, uwe.derz@eads.astrium.net
Mr. Christian Gilbert
Astrium Space Transportation, Germany, christopher.gilbert@airbus.com

CONCEPT FOR A FUTURE DEEP SPACE EXPLORATION ATV-CREW VEHICLE

Abstract

The Automated Transfer Vehicle (ATV) performs an important European contribution to ISS logistic services following its first mission in March 2008. The ATV consists mainly of two main elements, the Integrated Cargo Carrier (ICC), which can transport several tons of cargo in a pressurized environment, and the ATV Service Module, comprising an avionics bay and a propulsion bay, which together provide the orbit transfer and docking capabilities which enable the payload to be automatically delivered to the ISS.

For several years ideas have been studied to exploit the unique capabilities of ATV to form the basis of new vehicles. Such derivatives are vehicles adapted from the present ATV baseline to perform future tasks. One significant idea was to use the ATV as basic element to support a variety of re-entry spacecraft replacing the ICC. Another idea studied at Astrium was to evolve the ATV into an ATV-Crew vehicle, providing in-space accommodation to astronauts in the modified payload compartment.

The study aimed to develop a concept for a habitat for a crew of four, together with a Service Module to support human LEO missions or missions to lunar orbits. One particular application was conceived by an International Industrial Working Group to use the ATV-Crew vehicle as a contribution to an international EML2 Human Outpost demonstration mission. This would use the Orion Crew Vehicle as the human transportation element to bring the crew from Earth to EML2, where it would dock with the human outpost element (ATV-Crew), and subsequently return them to Earth. Such a mission could take place earliest by the end of this decade, or shortly afterwards, with the following objectives:

Would be the farthest human mission from Earth to date, Would demonstrate deep space /extended mission capability of the Orion and the ATV-Crew vehicles, Would demonstrate L2 habitation/operation capability of the Hab vehicle Would supports potential next generation space station concepts and operations

Several modifications have to be carried out on the existing ATV to produce an ATV-Crew vehicle, including: Include international (low impact) docking system (IDS) Habitable pressurized environment inside ICC Upgraded life support system Upgraded attitude control system Upgraded power- and thermal control system Radiation protection items

The paper will describe the system concept and the possible future applications in different scenarios.