

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems (4)

Author: Mr. Philippe Berthe

European Space Agency (ESA), The Netherlands, philippe.berthe@esa.int

Mr. Marco Caporicci

European Space Agency (ESA), The Netherlands, marco.caporicci@esa.int

Mr. Massimiliano Bottacini

European Space Agency (ESA), The Netherlands, massimiliano.bottacini@esa.int

Mr. Bob Chesson

European Space Agency (ESA), United Kingdom, bob.henderson@jhuapl.edu

THE ADVANCED RE-ENTRY VEHICLE – A VERSATILE VEHICLE TO SUPPORT ISS AND  
EXPLORATION**Abstract**

The European Space Agency member states decided in November 2008 the study of an Advanced Re-entry Vehicle (ARV) derived from the Automated Transfer Vehicle (ATV) which successfully flew early in the same year. The ARV Phase A, investigating the evolution of the present ATV, has multiple objectives: support ISS logistics, provide valuable assets to the international exploration scenario that will develop in the future, and maintain and expand the European industry competence by preparing for the long term the possibility of European human access to space and independent operational capability.

The ARV stepped development approach foresees the implementation of an ARV logistic transportation capability first, with the objective of it being used for cargo upload and download in support of ISS operations beyond 2016, and incremental crew and cargo transportation capabilities in the longer term.

The ARV three-module configuration foresees a Re-entry Module (RM) designed to carry active and passive pressurized cargo for transfer to the ISS and return, an Unpressurized Cargo Module (UCM) to carry unpressurized cargo or propellant for ISS reboost and a Versatile Service Module (VSM), to provide the orbital and attitude control of the vehicle during the orbital phases of the mission, including rendezvous.

The RM, carrying up to 2 t of cargo to the ISS and 1.5 t back to Earth, is a capsule shape vehicle designed taking already into account its evolution toward a crew transportation system.

The UCM is capable to carry up to 4000 kg of cargo or reboost propellant.

The VSM, ATV spacecraft derivative, is designed with built-in capability to evolve towards a space tug. Such a tug, with adaptations for the specific missions, could be able to carry modules and elements to the ISS or to other orbital infrastructure elements, to perform various on-orbit servicing, relocation and disposal missions and in the future to support exploration missions.

In parallel to the basic ARV requirements the industrial team, led by Astrium GmbH, is assessing optional VSM requirements relevant for the above missions to identify in detail their impacts on the system design and development.

The ARV Phase A requirements and concept definition will be completed by the end of 2011 and it is planned to continue with a Phase B1 to provide inputs to the ESA Member States 2012 decision, to support the extension of the European participation in the ISS until 2020 and to prepare future European human exploration activities.