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Author Dr. Stefan Voegt
EADS Space Transportation, Germany, stefan.voegt@space.eads.net

Mr. Thomas Walloschek
EADS – SPACE Transportation, Germany, thomas.walloschek@space.eads.net
Mr. Claus-Juergen Reimers
ESA/ESTEC, Netherlands, claus-juergen.reimers@esa.int

ISS PAYLOAD RETRIEVAL SYSTEM (PARES) - CONCEPT OF A DOWNLOAD SYSTEM FOR SMALL AND MEDIUM ISS PAYLOADS -

Abstract

With the announced retirement of the US Shuttle in 2010, the need for an own download capability from the ISS for Europe becomes more and more important in order not to loose the attractivity of the ISS as research facility. The capability to download the processed or collected samples has to be guaranteed further on. As Soyuz does not offer sufficient capability, ESA decided to investigate complementary systems for ISS logistics which can take over essential tasks. One of them, the ATV, Progress and HTV based PARES can provide a frequent download capability for small and medium sized samples and equipment from ISS in the time frame 2008 to 2016. Hence, in order to generate these frequent mission opportunities, PARES is designed to be compatible not only with ATV, but also with Progress and HTV, which in addition will further develop the cooperation between ESA, Russia and Japan.

The purpose of this paper is to describe the PARES download system concept in general, covering all relevant mission phases as launch preparation, stowage and handling onboard the carrier vehicle, stowage and handling onboard the ISS, return flight preparation, download phase and the recovery operations phase after sea-landing.

To be able to operate such a cargo download system on an economically attractive basis, optimization of cost per downloaded kg of payload is an essential concept de-sign driver. Consequently, this task requires some innovative subsystems, rather than standard off-the-shelf solutions. For instance, a dedicated spin-up and ejection mechanism needs to be designed for the separation of PARES from the carrier vehi-cle prior to atmospheric reentry, as systems available on the market are either too heavy or do not provide sufficient functionality.

An important constraint strongly related to the carrier vehicle are limited carrier vehicles airlock dimensions, leading more or less to the basic shape of a stretched cylin-der with a maximum outer diameter bounded by the airlock dimensions and a maxi-mum length limited by both internal ISS and carrier vehicle constraints.

In order to achieve an economically reasonable payload concept even under the given accommodation constraints, the capsules center of gravity has to be located close to the capsules geometrical center, which in turn has a considerable impact on stability during flight. Flight stability even under these unfavourable conditions is achieved by a new

solution in form of a deployable aerodynamic stabilizer, which will also be addressed in the paper.