

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Space Vehicles – Mechanical/Thermal/Fluidic Systems (7)

Author: Mr. Marco Caporicci  
European Space Agency (ESA), The Netherlands, marco.caporicci@esa.int

Mr. Peter Urmston  
European Space Agency (ESA), The Netherlands, peter.urmston@esa.int

Mr. Oscar Gracia  
European Space Agency (ESA), The Netherlands, oscar.gracia@esa.int

IBDM: THE INTERNATIONAL BERTHING DOCKING MECHANISM FOR HUMAN MISSIONS TO  
LOW EARTH ORBIT AND EXPLORATION

**Abstract**

The ability to dock and or to berth different spacecrafts is a pre-requisite for any advanced human space activity. Currently, all spacecrafts docking to the ISS use Russian docking systems, either on the Russian segment using the RDS probe and cone system as does Soyuz, Progress and ATV or using the APAS docking system to the US segment. The alternative to docking is to berth to the Common Berthing Mechanism (CBM).

The IBDM is an ongoing European development of a mechanism that enables docking and/or berthing of spacecrafts of various masses that has its origins in a Crew Rescue Vehicle co-operation that was being developed by NASA and ESA.

The IBDM is designed to be an androgynous system with both the target and chaser spacecraft being identically equipped with a Hard Docking (HDS) and Soft Docking Systems (SDS). The HDS forms the pressured passageway and the structural connection and provides most of the interface services, while the SDS which is an actively controlled Steward platform performs the initial low impact capture of the spacecraft, damping of the remaining relative motion and alignment of the HDS for the structural connection to be established.

An engineering development model of IBDM SDS is currently undergoing open and closed loop dynamic testing. Several integrations of the HDS structural latching system have been designed and units tested, leading to a design which features individually actuated androgynous hooks positioned outside and tangential to the tunnel wall.

An updated version of the IBDM is being designed which will implement the features of a new international standard identified by a dedicated effort by the ISS partners. This will represent the basis to achieve real inter-operability of space docking systems at international level. Its adoption for the ISS new docking adapters after Shuttle withdrawal is being considered by NASA.

The compatibility with the new ISS docking system drives the development schedule of the IBDM, which will undergo design, development and testing of its evolved version in the period 2010 -2012, to allow verification of the compatibility with the new US hardware. The flight version of the IBDM will be qualified in coherence with the ESA Advanced Re-entry Vehicle (ARV) development, aiming at a first orbital flight in 2016.

This paper describes the functionality of the IBDM, the evolution of the design, the current status of the development, the test results and the compatibility with the new international docking standard.