HUMAN SPACEFLIGHT SYMPOSIUM (B3)
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INTERNATIONAL DOCKING SYSTEMS STANDARD STATUS AND PROSPECTS

Abstract

The history, current status and possible development trends for the International Standard on space vehicles docking systems are addressed. The first successful experience in cooperative effort undertaken by the two Russian and American teams was acquired from 1972 through 1975 during development of compatible but structurally different docking assemblies for Soyuz and Apollo space vehicles. The report mentions the main participants and contributions of the teams to building matched docking interfaces. The second stage of international cooperation is associated with using Russian docking assembly APDA-89 and its modification APDA-95 to dock Space Shuttle Orbiter to MIR and ISS orbital stations. That assembly can be regarded as the next International Standard version, because it provided the dockings of Soyuz space vehicle and Space Shuttle Orbiter to the Mir station. In early 2009 development of the International Docking Systems Standard in its present form was initiated by NASA jointly with RSCE/RSA, ESA, CSA and JAXA. Initially, attempts were made to use LIDS assembly of NASA as a basis for this standard. Bat later not tested and flight proven design was rejected. At first it was decided to use interface of APDA interface pressurization mechanism. In early 2013, a decision was taken to use APDA docking ring and mechanical latches for capture as a basis for docking mechanism interface. As a result the current version of standard has APDA-featured interface. Taking into account that a Chinese docking assembly is characterized by similar geometry and operating principles, this version is regarded as truly international. Agreed technical solutions on electrical and hydraulic connectors, certification procedure, etc. need to be added to this standard. Up-to-date programs for deep space exploration raise new requirements for docking systems, first of all small mass, a simpler and more reliable design, as well as a broader range of docking initial conditions. Space vehicles and modules foreseen in follow-up programs will not possess such unique geometric and inertial characteristics as those for Space Shuttle. This makes the requirements for docking mechanism attenuation system much easy. Comparative analysis of different types of docking units presented in this paper allows make conclusion that the “probe-cone” system which ensured in a few past decades more than 400 successful dockings is most expedient to use and standardize in the programs of deep space exploration.