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LOGISTICS & MAINTENANCE SUPPORT FOR MPLM MODULES IN THE FRAME OF ISS
OPERATION - OVERVIEW AND LESSONS LEARNED

Abstract

The MPLM's are the three pressurized logistic modules built by the Italian Space Agency (ASI) to travel on the NASA Space Shuttle between Earth and the International Space Station, transporting experiments, supplies and materials for the astronauts' life and the scientific activities and returning cargo to Earth. The MPLM's were designed to support 25 missions each, in two different configurations, active (for freezer-racks) and passive, depending on the environmental requirements of the cargo to be uploaded. Once attached to the ISS, the MPLM provided habitable space for two astronauts as well as active and passive storage. In view of their typical mission timeline and scenario, the MPLM maintenance activities were performed on ground, in the frame of a quite complex series of turn-around activities between consecutive missions. As far as MPLM is concerned, the concept of ORU (orbital replaceable unit) was replaced by the concept of LRU (line replaceable unit). Twelve MPLM missions to the International Space Station have been successfully flown with the Leonardo and Raffaello modules between 2001 and 2011 when Shuttle was retired. Today, the first Module, Leonardo, suitably modified to become PMM (Permanent Multi-purpose Module) is part of ISS, the other two, Raffaello and Donatello are stored as flight hardware at Kennedy Space Center. In the frame of the bi-lateral agreement established for MPLM program, ASI not only provided the modules, but also committed to provide to NASA their post-delivery Sustaining Engineering and Logistic support. This activity has been performed by ALTEC, as ASI Contractor, organized as Engineering Support Center for the provision of engineering support for the entire life-cycle of the MPLM; it has been focused on the MPLM design baseline evolution, the related logistics and maintenance support, including spares and depot maintenance. ALTEC also operated the Italian Space Agency (ASI) Liaison Office at the NASA Kennedy Space Center (KSC) that, through a team of Resident engineers acting in close coordination with the Engineering Support Center in Torino, provided NASA with on-site frontend support during day by day, extended or round the clock operations and supported ASI in the Payloads integration process and in the preparation of the Italian astronauts missions to the ISS. This paper describes how ALTEC performed Integrated Logistics Support (ILS)

activities during the 10 years of MPLM operational utilization, including description of logistic tools developed, and finally outlines the associated lesson learned.