Paper ID: 44955
oral

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Flight & Ground Operations of HSF Systems (A Joint Session of the Human Spaceflight and Space Operations Symposia) (4-B6.4)

Author: Ms. Vivian Truong
MDA Corporation, Canada

Mr. Iqbal Kassam
MDA Robotics & Automation, Canada
Mr. Tom Greco
MDA Corporation, Canada
Mr. Oneil D'Silva
MDA Robotics & Automation, Canada
Mr. Ernest Tan
Canadian Space Agency, Canada
Mr. Richard Rembala
MDA, Canada

A COST EFFECTIVE METHODOLOGY FOR BUILDING FLIGHT SPARES FOR ROBOTIC LIFE EXTENSION ON THE INTERNATIONAL SPACE STATION

Abstract

The Mobile Servicing System (MSS) is a suite of robotic systems built by MDA to maintain, service, and provide robotic capability on the International Space Station (ISS). It includes the Robotic Workstation (RWS) (launched 2000), the Canadarm2 (launched 2001), the Mobile Base System (MBS) (launched 2002), and the Dextre (launched 2008). All four systems were certified for ten years on-orbit life. The RWS, Canadarm2 and MBS have well-exceeded their design life to-date and the Dextre is at its end of life.

In order to extend the utilization of the MSS to support ISS missions to 2024, the Canadian Space Agency (CSA) and MDA initiated a sparing effort. From a systems reliability perspective, the main focus of the effort is to ensure sufficient spares are available to support and maintain MSS functionality and availability to the end of 2024.

The main challenges with building spares are cost, schedule, and on-orbit storage availability. Flight ready spares are costly due to the need for long lead time procurement, complex workmanship, extensive testing, verification and certification. Depending on the complexity of the design, assembly time will generally take 2+ years. Additionally, limited on-orbit storage and up-mass availability to the ISS have become rising concerns. As such, it is not cost effective nor time permissive to build multiple flight ready spares for the entire MSS. CSA/MDA's Launch on Need (LON) sparing readiness methodology strives to maintain on-orbit system availability while simultaneously optimizing cost and schedule.

Sparing readiness can be maintained by identifying and grouping physical and functional commonalities at the Orbital Replaceable Unit (ORU) level; the Shop Replaceable Unit (SRU) level; and/or the subassembly/component levels. To accomplish this, unique and individual common subassemblies can be built, tested, verified and placed on standby. When required on orbit, the subassemblies/SRUs can then be integrated for the required flight ready spare. Verification is also a challenging aspect in building spares due to legacy specifications written at original design and build.

This paper will summarize CSA/MDA's LON methodology in cost-effective preparation of flight spares including manufacture, assembly, test and verification. This methodology was recently applied to the

successful build of two Electronics Platforms (EP) critical to Dextre's functionality and continues to prepare CSA and MDA for the extended support of the ISS to 2024 or beyond.