

Using the ISS to Prepare for Exploration (01)  
Exploration Technology Demonstrations Using ISS (2)

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DEXTEROUS EXECUTION OF ROBOTICS REFUELING MISSION ON ISS

**Abstract**

In spring of 2012, the Canadian Space Agency's (CSA) Mobile Servicing System (MSS) will be employed to execute a novel robotic servicing demonstration of a representative client satellite on the International Space Station (ISS). Dextre (the Special Purpose Dexterous Manipulator SPDM), the dexterous robotics component of the MSS, will use specialized robotics tools to manipulate coolant and refueling interfaces on Goddard Space Flight Centre's (GSFC) Robotics Refueling Mission (RRM) payload.

The RRM was delivered to the ISS on the final shuttle mission, STS-135, and was installed on an ISS external stowage platform by Dextre following the end of that mission. Starting during the lead up to STS-135, CSA and its primary contractor, MacDonald Dettwiler Associates (MDA), have been preparing for the actual technical demonstrations that represent a new frontier for on-orbit robotics and challenge the original concepts of utilization for the MSS. Satellite servicing is a new field of operations for the MSS and requires a higher level of robotics accuracy, more rapid prototyping of operations and the necessary supporting software components, and new concepts of operations than what has been used for servicing the ISS.

This paper outlines the change in concept of operations required to tackle the special requirements of this trailblazing robotics demonstration, the system changes developed to facilitate the related operations, and the accelerated planning and generation of task specific software products to support the numerous and unique dexterous tasks contained within the RRM. A review of operations executed to date will also be provided taking into account conventional ISS operational and safety standards which always need to be met. In summary, this paper will discuss the lessons learned for using the MSS outside of its original design intent, the forward work involved in completing the objectives of the RRM, and the support of future novel robotic demonstrations on the ISS.