

# **Dexterous Operations on ISS and Future Applications**

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## **Abstract**

The Mobile Servicing System (MSS) is a complex robotics system used extensively in the assembly, inspection and maintenance of the International Space Station (ISS). Its external components are comprised of the Space Station Remote Manipulator System (SSRMS), the Mobile Base System (MBS), and the Special Purpose Dexterous Manipulator (SPDM or “Dextre”). Dexterous robotic maintenance operations on the ISS are now enabled with the launch and deployment of “Dextre” in March 2008 and the recently completed commissioning to support nominal operations. These operations include allowing for maintenance of the MSS capability to be executed uniquely via robotic means. Examples are detailed inspection and the removal and replacement of On-orbit Replaceable Units (ORUs) located outside the pressurized volume of the ISS, alleviating astronauts from performing numerous risky and time-consuming extra-vehicular activities (EVAs).

In light of the proposed extension of the ISS to 2020 and beyond, “Dextre” can also be seen as a resource for the support and conduct of external ISS experiments. “Dextre” can be utilized to move experiments around ISS, as test bed for more elaborate experiments outside the original design intent, and as a unique platform for external experiments.

This paper summarizes the status of “Dextre”, its planned use, and future potential for dexterous operations on the ISS. Lessons learned from the planning and execution of SPDM commissioning are first introduced, and significant differences between “Dextre” and SSRMS operations are discussed. The use of ground control as the predominant method for operating “Dextre” is highlighted, along with the benefits and challenges that this poses. Finally, the latest plans for dexterous operations on ISS are summarized including visiting vehicle unloading, nominal maintenance, and operations of a more experimental flavor.