

HUMAN SPACEFLIGHT SYMPOSIUM (B3)

Human and Robotic Partnerships in Exploration - Joint session of the Human Spaceflight and Exploration Symposia (6-A5.3)

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THE UTILIZATION OF ISS CANADIAN ROBOTICS TO ADVANCE VARIABLE AUTONOMY
ROBOTIC TECHNIQUES AND TECHNOLOGIES FOR FUTURE DEEP SPACE EXPLORATION
MISSIONS FROM CISLUNAR SPACE TO MARS

Abstract

The international space community is exploring methods of strategically building upon International Space Station (ISS) capabilities and partnerships to address the challenges associated with human exploration initiatives beyond low Earth orbit (LEO). This paper will justify the need for autonomy in robotics in beyond LEO missions and outline how the existing Canadian Mobile Servicing System (MSS) robotics and computing resources on the ISS are being leveraged to create a new autonomous operations control platform, called the MSS Application Computer (MAC), which will bring autonomy capabilities to the ISS robotics. These new capabilities will be discussed through an outline of the MAC architecture and a discussion of its approach to executing operations autonomously on the ISS. Through the use of these new capabilities, the MAC will bring near term operational benefits to the execution of ISS robotic tasks while also contributing to long term Canadian exploration objectives by proving the control techniques that will be needed to support future deep space exploration missions such as a cislunar habitat and human exploration of the Martian system. A roadmap for the development and on-orbit demonstration of autonomous robotic capabilities and techniques on the ISS with the MAC will be presented to illustrate the pathway to an ultimate goal of demonstrating an automated capture of an ISS visiting vehicles using the Canadarm2 – one of the few remaining ISS robotic operations that rely on on-orbit crew today, and a critical capability needed for future exploration missions.