

SPACE OPERATIONS SYMPOSIUM (B6)
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ROBOTIC PLANNING AND EXECUTION OF THE HTV6 END TO END BATTERY BOX MISSION

Abstract

The Mobile Servicing System (MSS), Canada's robotic contribution to the International Space Station (ISS), continues to play a crucial role in support of resupply to and maintenance of the ISS. During 36 robotics shifts over 49 days from December 2016 to January 2017, astronauts on the ISS and flight controllers in Houston, Texas and St-Hubert, Quebec, operated the Canadarm2 and Dextre to perform their most complex and ambitious robotic mission to date; handling 16 payloads to replace aging NiH2 batteries on the S4 truss.

Astronauts on the ISS used Canadarm2 to capture the HTV vehicle four days after a December 9, 2016 launch and then flight controllers on the ground controlled Canadarm2 to extract the Exposed Pallet (EP) from HTV6 and install it on the Payload ORU Accommodation (POA), so that replacement ISS batteries manifested on the EP would remain accessible for the mission. The EP contained nine new Li-Ion batteries which were swapped by Dextre for six of the older NiH2 batteries from the S4 Truss. Following the completion of the battery swaps, the EP was reinstalled and the HTV6 was demated and released by Canadarm2, completing the ISS portion of its mission.

From the planning and pre-mission analysis through execution and dealing with unexpected anomalies and robotic interface challenges, the ground operators and engineering personnel who support the MSS used their collective knowledge and skill from the past 15+ years of on-orbit operations to complete this important ISS robotic servicing mission. Particularly challenging during this mission were tight clearances when manipulating payloads with high push/pull forces.

This paper will present the results and findings of the robotic aspects of the complex on-orbit servicing operations for the HTV6 end to end resupply mission, as well as discuss how increasing autonomous capabilities could simplify the planning and execution of similar complex servicing operations in the future.