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LESSONS LEARNED FROM DEVELOPING AND OPERATING MISSE - THE FIRST EXTERNAL, COMMERCIAL TESTING FACILITY IN SPACE

Abstract

This paper explores the many lessons learned from the design, development, implementation, launch, installation, commissioning, and first 18 months of on-orbit operations of the MISSE platform and payloads. MISSE is a privately owned and operated testing facility permanently installed on the exterior of the ISS. Its owner, Alpha Space Test Research Alliance, LLC, provides commercial testing services in the external environment of space through arrangements with the ISS National Lab and NASA. Alpha Space is a woman-owned small business.

The first ten months of MISSE service (April-Jan 2018) included the launch, robotic installation, and commissioning of the MISSE fixed facility on the ISS at the ELC2 location; the commissioning and ongoing operation of the Alpha Space payload operations control center (POCC); the robotic installation of 11 MISSE Science Carriers (MSC) carrying over 700 scientific samples and experiments; the planned removal and return of one MSC; and the unplanned replacement of one of two MISSE avionics boxes. 2019 planned activities include: the robotic installation of up to six more integrated MSCs; the robotic removal of up to six previously-installed MSCs for return to earth; de-integration and return of the experiments to their owners; replacement of the second MISSE avionics box.

Items to be addressed in the paper include: • MISSE achievements to-date, forward plans, and long-term outlook • MISSE planning, accommodation, and implementation, including how to find the balance between minimizing the non-recurring costs of developing a commercial space facility and designing for long-term on-orbit operations. • A description of the planning, implementation, and results of the 2019 activities • NASA and private scientific and industrial utilization of MISSE to-date • NASA and private engineering research and technology demonstration using MISSE to-date • The challenges of providing a commercial service through government entities • The challenges of creating a market for a new commercial space service • The outlook for commercial test beds in LEO aboard the ISS and other orbiting facilities