

MISSE Platform for Orbital Testing: The Next Step

Mark Shumbera, Director of Business Development

Alpha Space Test and Research Alliance, LLC. Houston, TX 77058 (e-mail: mark.shumbera@alphaspace.com)

I. INTRODUCTION

After successful suborbital technology testing, there are limited options for quickly and cost effectively taking the next step into orbital validation. MISSE is a commercial, orbital facility owned and operated by Alpha Space Test and Research Alliance, LLC (Alpha Space) that enables easy, frequent, reliable access to Low Earth Orbit (LEO) for extended testing of new and existing technologies. The International Space Station (ISS) provides an excellent platform for technology testing and has frequent visiting vehicles that transfer experiments, equipment and supplies. However, getting access to the ISS through NASA and a ride on one of the supply flights can be daunting. As an Implementation and Commercialization Partner of the ISS National Laboratory, Alpha Space has greatly simplified access to the ISS and has created a uniquely accessible option for orbital testing with flights about every six months.

II. THE MISSE SYSTEM

The MISSE facility and support hardware are specifically designed to minimize impacts to the testing budget and experiment design. MISSE is composed of three primary elements, the MISSE Flight Facility (MISSE-FF), MISSE Science Carriers (MSC) and the MISSE Transfer Tray (MTT).

The MISSE Flight Facility is permanently installed on the ISS truss. It provides structural support for up to twelve MSCs as well as the utilities required for operational testing. Any orbital directional face is available on the MISSE-FF (ram, wake, zenith and nadir). Utilities include up to 75W of 28 VDC power, RS-422 data/commanding, HD photographs, as well as data from a suite of sensors including temperature, contamination, atomic oxygen, radiation and UV intensity.

The MSCs transport customer test hardware to and from the MISSE-FF. They are designed to protect customer technologies during launch, off-nominal orbital situations and landing, provide the technology with space exposure, and distribute utilities to each customer's experiment. Each MSC has two exposure decks that are roughly 13 X 7 inches with about 3 inches of clearance under the deck. MSCs are launched inside ISS resupply capsules and unpacked by the crew. The crew uses the MTT to transfer the MSCs through the JEM airlock for robotic installation on the external MISSE-FF and then again to return MSCs after completion of testing.

III. FLIGHT OPERATIONS

Flight operations begin with the initial contact with Alpha Space to acquire a portion of an MSC and the required utilities. Customers provide their technology hardware to Alpha Space about five months before launch. The hardware is integrated into an MSC and then



Figure 2. MISSE Science Carrier

Alpha Space certifies the MSC (instead of each experiment individually) for flight. The MSCs are transferred to NASA for stowage in the launch vehicle. Once installed on the MISSE-FF, the MSCs are opened and customer technology testing is initiated through the Alpha Space Payload Operations Command Center (POCC). Orbital testing typically lasts for about six months; after which, the MSCs are removed from the MISSE-FF and returned to Earth. Each customer receives the flown hardware a few weeks after return.

IV. CONCLUSION

Taking the next step into orbital testing has never been easier. The MISSE platform has launches/returns roughly every six months and modular carriers that accommodate virtually any type of technology including electronics, CPUs, solar cells, materials, antennas, optics and RF systems. Manifesting and flight certification are handled entirely by Alpha Space at the MISSE carrier level, so MISSE customers never have to directly interface with NASA to arrange a flight manifest or to obtain flight certification. After the MISSE facility was installed on the ISS truss in 2018, four launches have taken MSCs to the flight facility carrying over 700 individual experiments. Upcoming launches are scheduled for March 2020 and October 2020 with additional launches planned for Spring and Fall of every year for the life of the ISS.