National Aeronautics and Space Administration

NASAfacts

MISSE-X

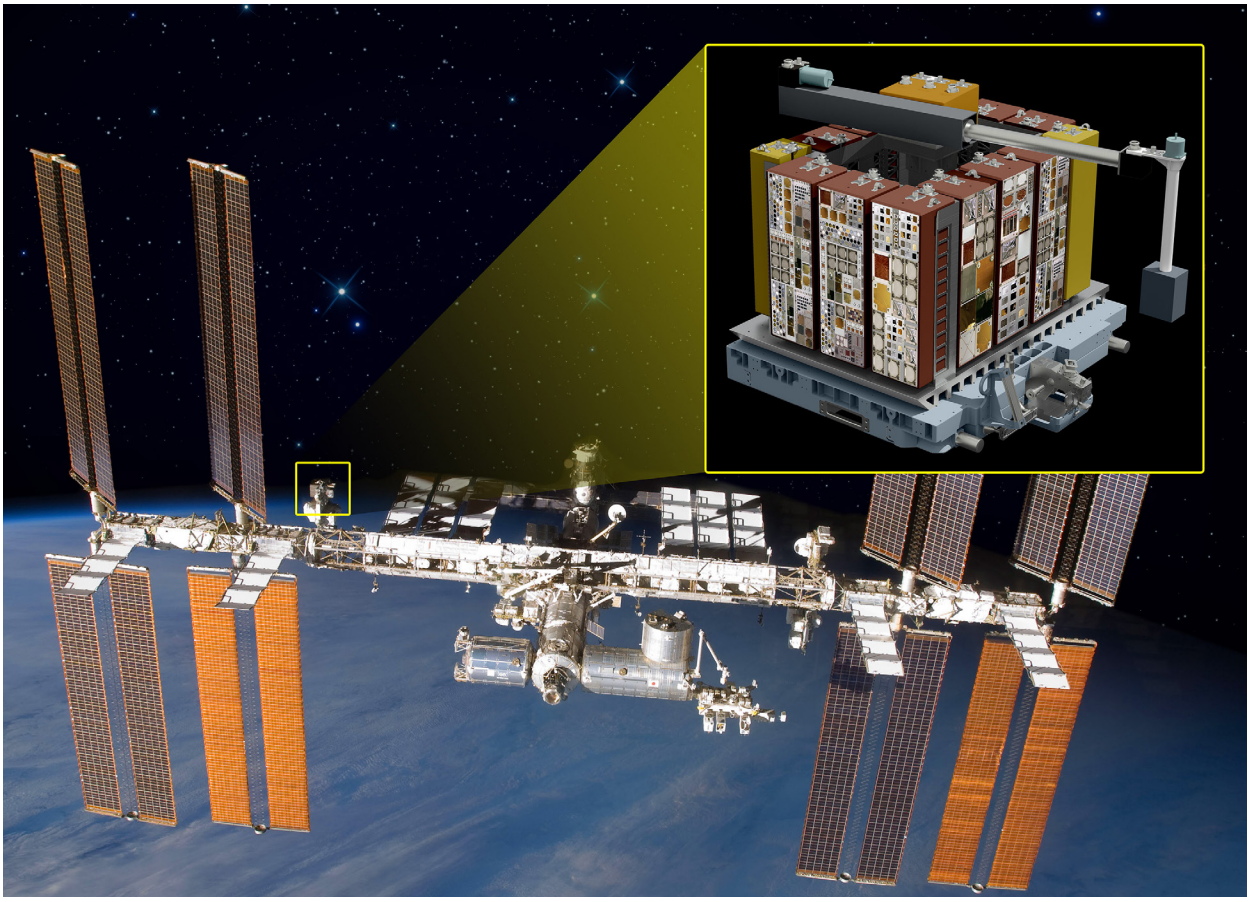
Materials International Space Station Experiment-X

MISSE-X OVERVIEW

One of the greatest challenges NASA faces when incorporating advanced technologies into future missions is bridging the mid-technology readiness level (TRL) gap between early conceptual studies and infusing new technology into exploration and science missions.

NASA's MISSE–X project, the next generation of the highly successful series of Materials International Space Station Experiment (MISSE) flights, is designed to help bridge this gap. Since 2001, the MISSE project has tested 4,000 material samples and specimens — from lubricants and paints to fabrics, container seals and solar cell technologies — to demonstrate their durability in the punishing space environment.

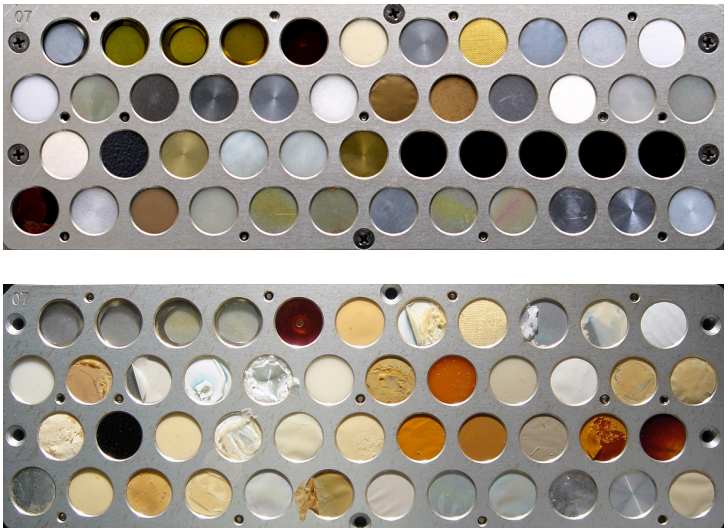
MISSE-X, being developed under the Technology Demonstration Missions Program, will host experiments that will be used to develop and space qualify new materials and devices critical to future space exploration missions. Because the materials are exposed to a relevant space environment, future mission risk is reduced. This enables NASA to pursue bolder and more sophisticated science, contributing to safe and rewarding human missions beyond low-Earth orbit (LEO) as well as new approaches to U.S. space operations.



The MISSE-X facility is to be mounted to the exterior of the International Space Station.

Flown 220 miles above the Earth, fixed to the exterior of the International Space Station (ISS) for periods of up to three years, these innovative experiments endure extreme levels of ultraviolet (UV) and x-ray radiation, “solar wind” particle radiation (electrons, protons), micrometeoroids and debris impacts (space particles), atomic oxygen (single oxygen atom), hard vacuum, temperature extremes and thermal cycling, and spacecraft induced contamination.

MISSE-X provides NASA and the space community low-cost access to space for technology demonstration experiments. It is designed as a permanent ISS test platform that will feature robotic installation and servicing. This plug-and-play capability allows technology demonstrations experiments (TDEs) in Modular Experiment Containers (MECs) to be tested individually.



Pre-flight (top) and post-flight (bottom) images of a tray of polymer samples degraded by 4 years of LEO atomic oxygen exposure during the MISSE 2 mission. *Reference: K. K. de Groh, et al, High Performance Polymers 20 (2008) 388-409.*

The MECs will be installed into a rack system that will be mounted to the exterior of the ISS, where they can experience various environmental exposures (i.e. ram, zenith, wake, and nadir). The modular containers housing active or passive TDEs, will be individually removed and replaced with other TDE containing MECs following periods ranging from six months to three years. This facilitates cost-effective, timely replacement of individual experiment modules in orbit. Once removed, desired experiments will be returned to Earth, where scientists will closely analyze environmental effects on the materials and devices.

MISSE-X will be robotically installed on the International Space Station ExPRESS Logistics Carrier 2 (ELC 2) payload platform. The image above is a MISSE-X computer rendering superimposed on an International Space Station image.

The MISSE-X flight data, difficult to accurately simulate in Earth-based laboratories, provides the space community with insight into the challenges of protecting astronaut health and establishing a permanent human presence in space. Researchers gain unprecedented insight into development of durable materials and devices for spacecraft, flight hardware, and even astronaut spacesuits. The MISSE-X flight data will be used in the development of new space materials and devices for future space flights. The data will help with development of more durable Earth observation, weather, and communications satellites, impacting daily life on Earth.

The Space-X Dragon capsule will ferry the MECs to and from the International Space Station.

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Langley Research Center
100 NASA Road
Hampton, VA 23681-2199

www.nasa.gov

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