Title: MISSE in the Materials and Processes Technical Information System (MAPTIS)

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Materials International Space Station Experiment (MISSE) data is now being collected and distributed through the Materials and Processes Technical Information System (MAPTIS) at Marshall Space Flight Center in Huntsville, Alabama. MISSE data has been instrumental in many programs and continues to be an important source of data for the space community. To facilitate great access to the MISSE data the International Space Station (ISS) program office and MAPTIS are working to gather this data into a central location.

The MISSE database contains information about materials, samples, and flights along with pictures, pdfs, excel files, word documents, and other files types. Major capabilities of the system are: access control, browsing, searching, reports, and record comparison. The search capabilities will search within any searchable files so even if the desired meta-data has not been associated data can still be retrieved. Other functionality will continue to be added to the MISSE database as the Athena Platform is expanded.
MISSE in the Materials and Processes Technical Information System (MAPTIS)

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Background

- Materials International Space Station Experiment (MISSE) is a series of experiments on the International Space Station to gather data on materials’ durability in the space environment and increase confidence in ground simulations.
- Nearly 4,000 material samples flown since 2001.
- MISSE-1 through -4 were almost entirely passive experiments with only post-flight analysis. Later flights were more active and included downlinked data.
Past Successes

- MISSE data has been instrumental in many programs and continues to be an important source of data for the space community
- Significant ROI, cost and time savings for testing, risk assessment, and mission planning
- Provided invaluable data for sustaining engineering of most external hardware on ISS, including eliminating an EVA
- Provided data on contamination control on ISS
- Conductive thermal control coatings qualified for Curiosity rover and Dragon capsule, with positive feedback from astronaut Don Pettit
Past Successes

- Development of an AO erosion yield predictive tool for polymers
- Eliminated an EVA for the Hubble Space Telescope Service Mission 4
- On-orbit current-voltage curves for multi-junction and thin film solar cells
- Thin film polymer mechanical & optical property data facilitating more accurate prediction of in-space performance of thermal control & gossamer materials
- Evaluated environmental effects on candidate seal materials, including leakage rate and dimensional changes for the Low Impact Docking System

Data is now being collected and distributed through the Materials and Processes Technical Information System (MAPTIS) at Marshall Space Flight Center in Huntsville, Alabama. This is a challenge because of the number of investigators and aerospace entities involved and because there is every kind of material – thermal control coatings, polymers, metals, optics, insulation, composites, solar cells, shielding materials, part labeling – and a variety of postflight analyses.
To facilitate greater access to the MISSE data, the International Space Station (ISS) program office and MAPTIS are working to gather this data into a central location with controlled access and safe storage for any ITAR-restricted, export-controlled, or proprietary data.
Materials & Processes Technical Information System (MAPTIS) is a single point source for
– Acquiring...
– Assessing...
– Archiving...
– Disseminating...
…materials information to ensure successful performance, increase safety, and to save resources throughout a product life cycle
Welcome to the MISSE Web Site.

Please note:
The data for this database is still being collected, organized and uploaded. If you cannot find some information please check back as data is continually being updated. If you have MISSE data please contact us so that your data can be included in this project.

Materials International Space Station Experiment (MISSE)

MISSE is a series of experiments mounted externally on the International Space Station (ISS) that investigates the effects of long-term exposure of materials to the harsh space environment.

The MISSE project evaluates the performance, stability, and long-term survivability of materials and components planned for use by NASA, commercial companies and the Department of Defense (DOD) on future low Earth orbit (LEO), synchronous orbit and interplanetary space missions. The Long Duration Exposure Facility (LDEF), which was retrieved in 1990 after spending 69 months in LEO, revealed that space environments are very hostile to many spacecraft materials and components. Atomic oxygen, which is the most prevalent atomic species encountered in low earth orbit, is highly reactive with plastics and some metals, causing severe erosion.

There is also extreme ultraviolet radiation due to the lack of an atmospheric filter. This radiation deteriorates and darkens many plastics and coatings. The vacuum in space also alters the physical properties of many materials. Impacts of meteoroids and settling micrometeoroids can damage all materials exposed in space. The combined effects of all of these environments on spacecraft can only be investigated in space. MISSE evaluates materials currently being used and those planned for use in future space missions.

MISSE is a direct successor of the Life Environmental Effects Payloads (LEEPP) that were attached for over a year to the Mid-Deck Module of the space station for between shuttle flights STS-79 and STS-95, and is a descendant of the Long Duration Exposure Facility.

The MISSE Projects is a cooperative endeavor managed by NASA Langley Research Center. Participants include Johnson Space Center, Marshall Space Flight Center, Glenn Research Center, the Materials Laboratory at the Air Force Research Laboratory, Infostud Corporation, the Boeing Phantom Works and others.
Organization

- MISSE Overview
  - Helpful articles and descriptions for those with less experience with Space Environmental Effects
- MISSE Flights
- MISSE Samples
- Materials
- Papers & Reports
- Images
Browsing

Draggable panels for easier navigation
Mimicking Windows/Mac experience

Quickly see what data has been loaded

Filtering and Paging

Close unused panels
Searching

General search – searches all metadata and within attached files (Word, excel, PDF, etc.)

Advanced search – narrow the search to select metadata

Draggable record panels for data comparison
Advanced Search

Search by

Instantly see your results

Mix and match metadata to fine tune your results
Images

Links from overview images to samples
Raw Data Files

AZ93 on composite MISSE 1

File: az93 on composite MISSE 1.xls

Data Source: MISSE

<table>
<thead>
<tr>
<th>MISSE Flights</th>
<th>Displaying 1 records.</th>
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| Materials     | Displaying 1 records. |

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Graphical data and table columns labeled with various data points and measurements.
Where possible the publication pdf is entered into the system
Turning MISSE Data into knowledge

- 3,331 records created
  - MISSE Samples, Material, Experiments, MISSE Flights
- 13,948 record to record connections
  - Linking a publications to materials to MISSE samples
  - Connections between records creates knowledge
- 22,037 pieces of metadata created
  - Metadata is the MISSE sample details, flight details, materials, sample survived, etc.
Turning MISSE Data into knowledge

- Metadata on alternate material names, e.g., Ag/TFE, Ag/Teflon, silver/Teflon all point to same records.
- If funded, future effort will add material codes for commercially available materials and links to other MAPTIS databases, e.g., if RM550IB thermal control coating meets optical property needs, can click to outgassing database for ASTM-E-595 or E-1559 data.
More MISSE data

- The data for this database is still being collected, organized and uploaded
- Papers, reports, raw and analyzed data, images, and any other data are all being accepted
- Contact MAPTIS at MAPTISsupport@mail.nasa.gov
Conclusions

- MISSE data has been instrumental in many programs and continues to be an important source of data for the space community.
- MISSE data in a central repository will increase the usage and impact of this data.
- We need more cooperation from all MISSE investigators to continually improve this resource.
Acknowledgments

- Dr. Julie Robinson, Annette Sledd, and Ginger Flores for their support of this effort
- All the MISSE investigators who have provided data, especially Dr. Gary Pippin and Kim de Groh
- Teresa Miller and Ginger Pierce for their contributions