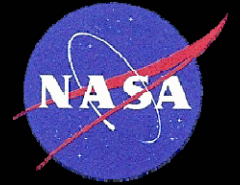


Title: MISSE in the Materials and Processes Technical Information System (MAPTIS)

Authors: DeWitt Burns, Mail Code EM50, NASA Marshall Space Flight Center
Miria Finckenor, Mail Code EM50, NASA Marshall Space Flight Center
Ben Henrie, Mail Code EM60, MSFC Information Technology Services (MITS)

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)

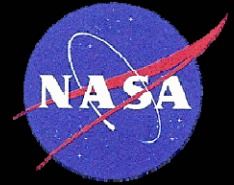
Dewitt Burns
Miria Finckenor
Ben Henrie

Background



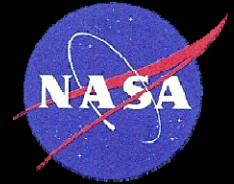
- Materials International Space Station Experiment (MISSE) is a series of experiments on the International Space Station to gather data on materials' durability in the space environment and increase confidence in ground simulations.
- Nearly 4,000 material samples flown since 2001.
- MISSE-1 through -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

Reference: "Overview of the Materials International Space Station Experiment Program: MISSE 1-7",
Kim K. de Groh, Karen B. Gibson, Robert J. Walters, Phillip P. Jenkins, Donald A. Jaworske, ISMSE-11, Sept. 2009

Background



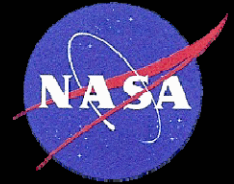
- Data is now being collected and distributed through the Materials and Processes Technical Information System (MAPTIS) at Marshall Space Flight Center in Huntsville, Alabama
- This is a challenge because of the number of investigators and aerospace entities involved and because there is every kind of material – thermal control coatings, polymers, metals, optics, insulation, composites, solar cells, shielding materials, part labeling – and a variety of postflight analyses.

Background



- 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.

MAPTIS is...



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

MISSE in MAPTIS



MAPTIS

MATERIALS AND PROCESSES TECHNICAL INFORMATION SYSTEM



[Advanced Search](#)

MISSE

BROWSE BY -

[Images](#)

[Materials](#)

[MISSE Flights](#)

[MISSE Overviews](#)

[MISSE Samples](#)

[Papers/Reports](#)



home



help

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)

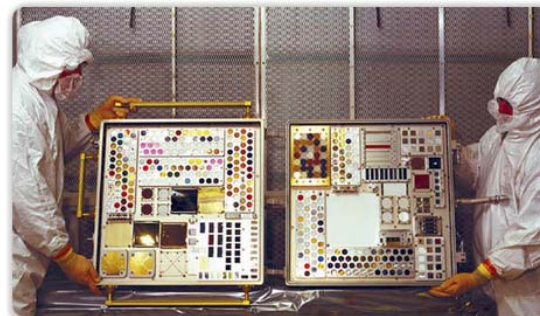
MISSE is a series of experiments mounted externally on the International Space Station (ISS) that investigates the effects of long-term exposure of materials to the harsh space environment.

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 68 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.

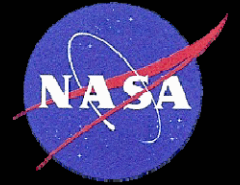
There is also extreme ultraviolet radiation due to the lack of an atmospheric filter. This radiation deteriorates and darkens many plastics and coatings. The vacuum in space also alters the physical properties of many materials. Impacts of meteoroids and orbiting man-made debris can damage all materials 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 Mir Environmental Effects Payloads (MEEP) that were attached for over a year to the Mir Docking Module of the space station Mir between shuttle flights STS-76 and STS-86; and is a descendant of the Long Duration Exposure Facility.

The MISSE Project 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, Infosight 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

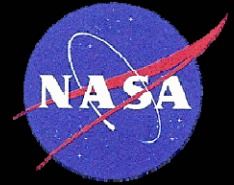
Quickly see what data has been loaded

The screenshot shows a web interface for browsing MISSE data. At the top, there is a search bar and an 'Advanced Search' link. Below that, a 'BROWSE BY' section contains buttons for 'Documents', 'Materials', 'MISSE Flights', 'MISSE Samples', and 'Add Record'. A 'MISSE Flights' panel is open, showing a table with columns for flight ID, Experiment, Material, Document, and MISSE Sample. A 'Materials on MISSE Flight: MISSE 1' panel is also open, showing a table with columns for material name, MISSE Flight, Experiment, Material, Document, and MISSE Sample. A 'Filtering and Paging' section at the bottom of the materials panel includes a 'starts with' dropdown menu and a pagination control showing 'page 1 of 4' with buttons for 'first', 'prev', 'next', and 'last'. Annotations include green arrows pointing to the 'BROWSE BY' buttons, a blue arrow pointing to the 'MISSE Sample' column in the flights table, a purple arrow pointing to the 'X' close button on the materials panel, and an orange arrow pointing to the pagination controls.

Close unused panels

Filtering and Paging

Searching



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

Advanced search – narrow the search to select metadata

BROWSE BY: Documents Materials MISSE Flights MISSE Samples Add Record

home help

MISSE Flights X

starts with: MISSE 1 X

Edit Record New Record Generate PDF

General

MISSE Flight: MISSE 1

Launch Mission: STS-105

Date Placed Outside ISS: 2001/08/16

Location on ISS: Installed on the Quest Joint Airlock and High Pressure Gas Tank (HPGT). MISSE 1 and 2 contained 910 specimens of various materials.

MISSE-1 and 2 are a test bed for materials and coatings attached to the outside of the ISS is being evaluated for the effects of atomic oxygen, direct sunlight, and extremes of heat and cold. This experiment allows the development and testing of new materials to better withstand the rigors of space environments. Results will provide a better understanding of the durability of various materials when they are exposed to the space environment. Many of the materials may have applications in the design of future spacecraft.

Researchers from the private and public sector prepared a wide range of samples for the first externally mounted experiment on ISS. Materials International Space Station Experiment (MISSE)-1 and -2 are testbeds for more than 400 materials and coatings samples, testing their survivability under the corrosive effects of the space environment, including micrometeoroid and orbital debris strikes, atomic oxygen attack, intense ultraviolet radiation from the sun, and extreme temperature swings. Results will provide a better understanding of the durability of various materials in this environment. Many of the materials may have applications in the design of future spacecraft.

Both MISSE-1 and -2 were deployed in August 2001 on Expedition 3 and were planned for a one-year exposure. Due to the delays incurred following the Columbia accident, they were not retrieved until four years later during ISS Expedition 11 in August 2005.

Tray Orientation: Ram & Wake

Retrieval Mission: STS-114

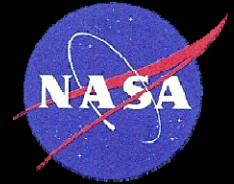
Date Retrieved from ISS: 2005/07/30

LEO Exposure Duration: 3.95 Years

Environments: AO (E+21 atoms/cm2) Solar

Draggable record panels for data comparison

Advanced Search



Search by

Instantly see your results

Select a Record Type

- Experiment
- Images
- Materials
- MISSE Flights
- MISSE Overviews
- MISSE Samples
- Papers/Reports

MISSE Samples

Contact: **add**

Exposure: **add**

Material Category: **add**

Material Description: **add**

Material ID: **add**

MISSE Flight:
MISSE 2
MISSE 3
MISSE 4 **add**

Organization: **add**

Orientation:
Wake **add**

Sample ID: **add**

Sample Size: **add**

Sample Survived:
Yes **add**

Q Search Found

Record Count: 195

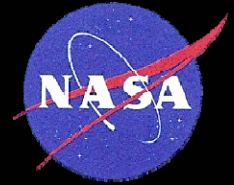
Display Search Results **Clear**

MISSE Samples

- × MISSE Flight: MISSE 3
- × Orientation: Ram

Mix and match metadata to fine tune your results

Images



MISSE 3 PEC Images

Edit Record New Record Download Record Generate PDF

Image

Image Gallery:

[Download All Images](#)

Description: Pre-flight images of MISSE 3 Passive Experiment Containers (PEC)
Tags: PEC
MISSE Flight: MISSE 3
Pre/Post Flight: Pre-Flight
MISSE Samples: Displaying 397 records.

Links from overview images to samples

MISSE 3 Tray 1 / Holder 1-J16-1

Edit Record New Record Download Record Generate PDF

Image

Image Gallery:

[Download All Images](#)

Description: MISSE 3: 1-J16-1
Polymers - bulk
Upilex
Tags: August 2006 – August 2007 AO and Solar.
Polymers - bulk
Upilex
MISSE Flight: MISSE 3
Pre/Post Flight: Pre-Flight
MISSE Samples: Displaying 1 records.
1-J16-1

Raw Data Files



AZ93 on composite MISSE 1

[Edit Record](#) [New Record](#) [Download Record](#) [Generate PDF](#)

General

Document Title: AZ93 on composite MISSE 1
Authors: Finckenor, Miria
File: [az93 on composite MISSE 1.xls](#)
[Download All Files](#)
Data Source: MISSE

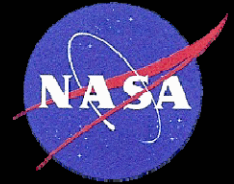
Related Information

MISSE Flights: [Displaying 1 records.](#)
Materials: [Displaying 1 records.](#)

az93 on composite MISSE 1 [Compatibility Mode] - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	AZ93 on composite					Control $\alpha = 0.152$ $\epsilon = 0.91$									
2						1-E3-10 $\alpha = 0.157$ $\epsilon = 0.91$									
3	Sample ID	Control	1-E3-10	1-E3-11		1-E3-11 $\alpha = 0.159$ $\epsilon = 0.91$									
4	Alpha	0.152	0.157	0.159											
5	Emittance	0.91	0.909	0.905											
6															
7	AO (atoms-		9.45E+21	9.45E+21											
8	UV (ESH) -		5545	5545											
9															
10	Wavelength	Control $\alpha =$	1-E3-10 $\alpha =$	1-E3-11 $\alpha =$	0.159										
11	2800	0.616	0.6671	0.6576											
12	2750	0.6504	0.6688	0.6598											
13	2700	0.639	0.6706	0.6622											
14	2650	0.6614	0.6724	0.664											
15	2600	0.6592	0.6729	0.6636											
16	2550	0.657	0.6719	0.6629											
17	2500	0.6737	0.673	0.6647											
18	2467	0.6749	0.684	0.676											
19	2433	0.6966	0.6947	0.6873											
20	2400	0.7009	0.7059	0.6994											
21	2367	0.7173	0.7195	0.7128											
22	2333	0.7252	0.7277	0.7212											
23	2300	0.731	0.7292	0.723											
24	2267	0.7332	0.7325	0.7264											
25	2233	0.7356	0.746	0.7401											
26	2200	0.7526	0.7628	0.7568											
27	2167	0.7707	0.793	0.7865											
28	2133	0.7919	0.8046	0.7983											
29	2100	0.7951	0.8023	0.7968											
30	2067	0.7908	0.8006	0.795											
31	2033	0.7888	0.7968	0.7905											
32	2000	0.785	0.7892	0.7837											
33	1967	0.7786	0.787	0.7811											
34	1933	0.7696	0.783	0.7772											
35	1900	0.7965	0.8038	0.7979											
36	1867	0.8182	0.8343	0.8291											
37	1833	0.8418	0.8444	0.8398											
38	1800	0.8442	0.8537	0.8506											

Publications



Papers/Reports				
starts with: <input type="button" value="All"/>				
65 Years in Space - A Timeline	MISSE Flight	Experiment	Material	MISSE Sample
7th Materials on the International Space Station Experiment (MISSE-7)	MISSE Flight	Experiment	Material	MISSE Sample
9th Spacecraft Charging Technology Conference. Held in Tsukuba, Japan, on 4-8 April 2005. Book of Abstracts.	MISSE Flight	Experiment	Material	MISSE Sample
A Novel Method For Measurement Of Total Hemispherical Emissivity	MISSE Flight	Experiment	Material	MISSE Sample
Access to ISS External Payload Facilities	MISSE Flight	Experiment	Material	MISSE Sample
Advances in power and energy research at NRL	MISSE Flight	Experiment	Material	MISSE Sample
Aeroglaze a276 with leafing aluminum MISSE 1 2 4	MISSE Flight	Experiment	Material	MISSE Sample
AFRL MISSE Update	MISSE Flight	Experiment	Material	MISSE Sample
Air Force Research - Materials in Space	MISSE Flight	Experiment	Material	MISSE Sample
Air Force Research Laboratory Technology Milestones 2008	MISSE Flight	Experiment	Material	MISSE Sample

page 1 of 23 << first < prev **1** 2 3 4 5 ... next > last >>

Where possible the publication pdf is entered into the system

Turning MISSE Data into knowledge

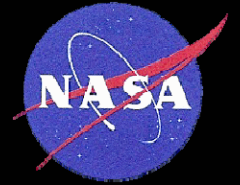


- 3,331 records created
 - MISSE Samples, Material, Experiments, MISSE Flights
- 13,948 record to record connections
 - Linking a publications to materials to MISSE samples
 - Connections between records creates knowledge
- 22,037 pieces of metadata created
 - Metadata is the MISSE sample details, flight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

Turning MISSE Data into knowledge

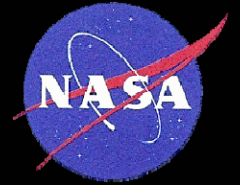
- Metadata on alternate material names, e.g., Ag/TFE, Ag/Teflon, silver/Teflon all point to same records.
- If funded, future effort will add material codes for commercially available materials and links to other MAPTIS databases, e.g., if RM550IB thermal control coating meets optical property needs,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

More MISSE data



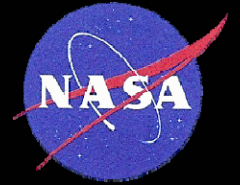
- The data for this database is still being collected, organized and uploaded
- Papers, reports, raw and analyzed data, images, and any other data are all being accepted
- Contact MAPTIS at MAPTISsupport@mail.nasa.gov

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 the 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