4-4-2005

# State of Utah Space Environment & Contamination Study (SUSpECS) MISSE-6 Payload to Investigate Their Effects on Electron Emission and Resistivity of Spacecraft Materials

JR Dennison
*Utah State Univesity*

L. Pearson

L. Davis

J. W. Burns

R. S. Hyde

James S. Dyer
*Space Dynamics Laboratory, Utah State University*

***See next page for additional authors***

[9th Spacecraft Charging Technology Conference]
**April 4-8, 2005**
**EPOCHAL TSUKUBA, TSUKUBA, JAPAN**

# *S*tate of *U*tah *Sp*ace *E*nvironment & *C*ontamination *S*tudy (*SUSpECS*) MISSE-6 Payload to Investigate Their Effects on Electron Emission and Resistivity of Spacecraft Materials

**SATELLITE ON-ORBIT INVESTIGATIONS POSTER SESSION**

J.R. Dennison
*Physics Department, Utah State University*
*SER 250 UMC 4415*
*Logan, UT, USA 84322-4415*
Phone: 435.797.2936
Fax: 436.797.2492
JR.Dennison@usu.edu

James S. Dyer
*Contamination Control/Materials Chemistry Group*
*Space Dynamics Laboratory*

Tina Andrus, Andrew Auman, Jeff Duce,
Tim Neilsen, Rob Leishman
*Utah State University Get-Away-Special Program*

L. Pearson, L. Davis, J.W. Burns, R.S. Hyde
*ATK Thiokol*
*Health Management Focus Group*
*Brigham City, Utah 84302-0707*

A study of the effects of prolonged exposure to the space environment and of charge-enhanced contamination on the electron emission and resistivity of spacecraft materials, the ***S***tate of ***U***tah ***Sp***ace ***E***nvironment & ***C***ontamination ***S***tudy (***SUSpECS***), is planned for flight aboard the MISSE-6 payload. The ***M***aterials ***I***nternational ***S***pace ***S***tation ***E***xperiment (***MISSE-6***) program is designed to characterize the performance of candidate new space materials over the course of approximately four to eight month exposure periods on-orbit on the International Space Station, with a target flight date of mid-2006. The study is conducted by the Utah State University Materials Physics Group, in cooperation with the USU Get-Away Special Program and ATK Thiokol. Electron emission and transport properties of materials are key in determining the likelihood of deleterious spacecraft charging effects and are essential parameters in modeling these effects with engineering tools like NASCAP-2K code. While preliminary ground-based studies have shown that contamination can lead to catastrophic charging effects under certain circumstances, little direct information is presently available on the effects of sample deterioration and contamination on emission properties for materials flown in space.

Approximately 40 samples will be mounted on panels on both the ram and wake sides of the ISS. They have been carefully chosen to provide needed information for different ongoing studies and a broad cross-section of prototypical materials used on the exteriors of spacecrafts. Much of the pre-flight testing has already been done in conjunction with previous studies through the NASA Space Environments and Effects Program and other projects. The materials will be tested for resistivity and dielectric strength, and for electron-, ion-, and photon-induced electron emission yield curves and emission spectra. Characterization measurements include optical and electron microscopy, reflection spectroscopy, resistivity and Auger electron spectroscopy. In addition, studies of the service life of composite and ceramic materials of the ATK Thermal Protection Systems and Lightweight Structure Systems will evaluate chemical and mechanical properties as a function of depth from the AO and UV exposure surface.