SEE Bulletin

NASA's Space Environments and Effects Program April 2002

SEE Program and Living With A Star/Space Environment Testbeds NRA Selections

Fifteen (15) New Contracts Issued

The National Aeronautics and Space Administration's (NASA) Space Environments and Effects (SEE) Program and the Space Environments Testbeds (SET) Project within the Living With A Star Program are pleased to announce that new proposals have been selected for funding.

Fifteen proposals out of a total of 52 submitted were selected for funding in the technical areas of:

SEE Program:

- Spacecraft Charging (SC)
- Ionizing Radiation (IR)
- Materials and Processes (M&P)
- Meteoroid and Orbital Debris (MOD)
- Neutral External Contamination (NC)

SET Project:

- Microelectronics (ME)
- Detectors (DT)
- Spacecraft Charging (SC)

Following a thorough review process, the Recommendation Selection Committee, composed of technical experts from the Government (not affiliated with the SEE Program), industry, and academia examined the reviewers' results and made the preliminary recommendations. Mr. Bill Kilpatrick, Director of MSFC's Engineering Directorate was the Selecting Official.

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SEE Program and Living With a Star/Space Environment Testbeds NRA Selections

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The SEE proposals selected are:

- Non-Ionizing Energy Loss Tool for Space Applications; GSFC; (IR)
- Improved Solar Particle Risk Assessment Tool; GSFC; (IR)
- Improved Thermal Control Coating Development; AFRL; (M&P)

SEE

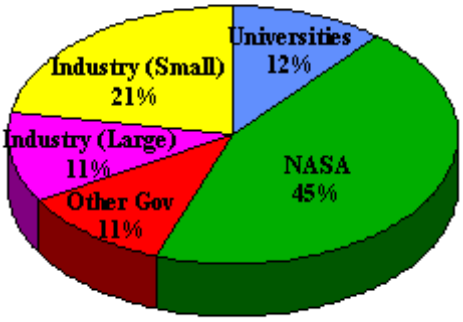


Figure 1. Proposals Selected for Award

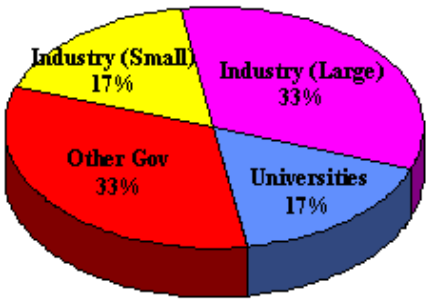
- Insitu Materials Properties Sensor; AZ Technology, Inc.; (M&P)
- Determination of Meteoroid Masses, Densities and Ballistic Coefficients Using Decelerations Obtained From Multi-Frequency Radar and Optical Data; MSFC; (MOD)
- Origin of the Projectile Residues in the Largest LDEF Craters; JSC; (MOD)
- Space Environmental Effects Knowledgebase; Bob Wood Aerospace Consulting Services, Inc.; (NC)
- Electric Propulsion Interactions Code (EPIC): Integrated Guidelines and Tools for the Assessment of Electric Propulsion Impact on Spacecraft; SAIC; (SC)
- Measurement of Charge Storage Decay Time and Resistivity of Spacecraft Insulators; Utah State University; (SC)

The SET proposals selected are:

- Data Mining of MPTP Experiment Boards & SAMPEX Instrument; The Aerospace Corporation; (ME)
- Analysis of CRRES PHA Data for Low-LET Events; Clemson University; (ME)
- Mining Enhanced Low-Dose Rate Sensitivity (ELDERS) Data from the MPTB Space Experiment; Naval Sea Systems Command, Crane Division (NAVSEA Crane); (ME)
- Displacement Damage Effects in Solar Cells; Naval Research Lab (NRL); (DT)
- Modeling Charge Collection in Detector Arrays; PR&T; (DT)
- Characterization of Magnetospheric Spacecraft Charging Environments Using the LANAL Magnetospheric Plasma Analyzer Data Set; SAIC; (SC)
- Mining CRRES ISM Pulse Data and CRRES Environment Data to Improve Spacecraft Charging/Discharging Models and Guidelines; JPL (SC)
- Electrostatic Return of Contaminants; ROR Enterprises, Inc. (SC)

All these proposals range from one to three years with a start date in late 2001.

LWS/SET*



* NASA did not receive any funding in the LWS/SET portion of the awards.

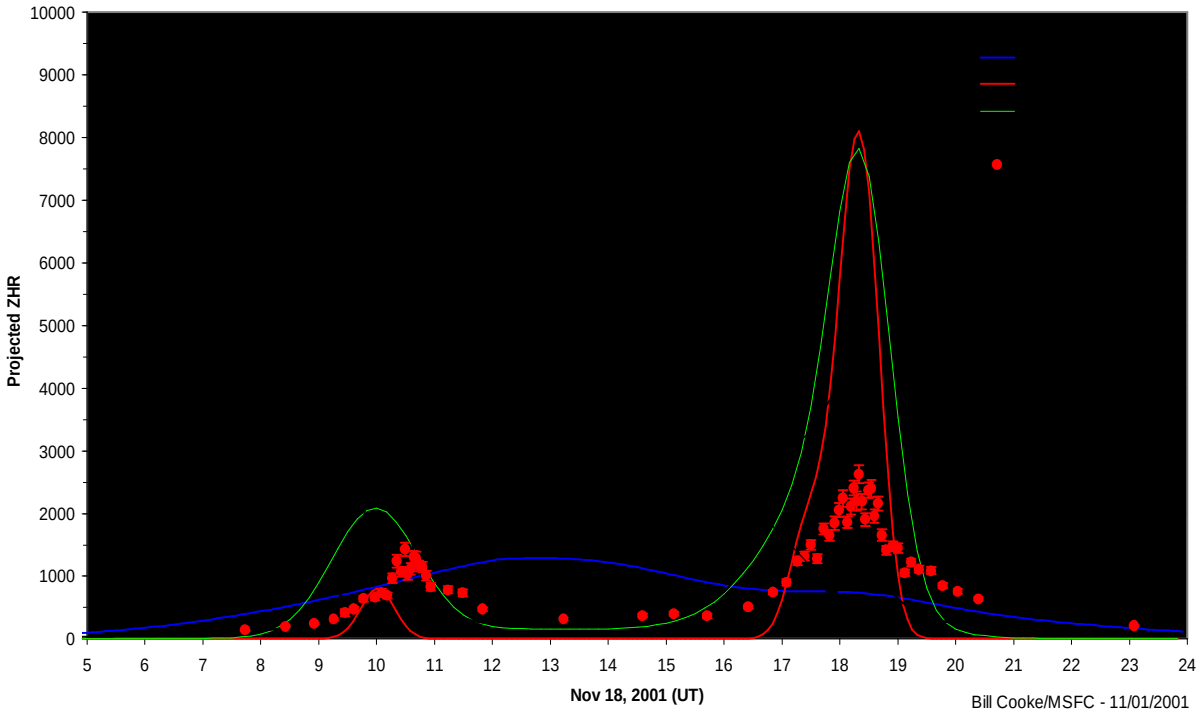
An Early Look Back At The 2001 Leonids

Determined to collect data that would validate newly developed techniques in meteor shower activity forecasts, members of the Marshall Space Flight Center's Engineering Directorate and their support contractors, along with colleagues from the University of Western Ontario in Canada, manned six sites in the United States, Hawaii, Guam, and Mongolia. Of these, only Guam had cloudy weather on the night of the Leonid storm; observers at the other sites not only obtained excellent video data on the meteor rates and brightnesses, but also were rewarded with a spectacular visual display of celestial fireworks. It is estimated that over 50,000 Leonids were recorded on some 180 hours of video, the analysis of which will take at least several months. Nonetheless, preliminary information indicates that none of the forecasts were as accurate as hoped – all had some things right and some things wrong (mainly with regard to the level of activity – see the graph below).

Another wildly successful component of this year's campaign was the dissemination of shower information to spacecraft projects and the public through the SEE website (http://see.msfc.nasa.gov/see/Leonid_Forecast_2001x.html), which was frequently updated with forecast information for vehicles in low Earth orbit and the Geostationary belt, as well as predictions for casual meteor observers in major cities throughout the United States and in other countries. Live video from one of the low light level meteor cameras (set up at MSFC) was shown on NASA TV, and segments of this were rebroadcast on all major networks.

In short, the 2001 Leonid shower was an event that will not be soon forgotten, especially by those of us who have to reduce the data collected on the night of the best meteor storm since 1966.

For additional information, please contact Dr. Bill Cooke, CSC, 256-544-9136 or email at bill.cooke@msfc.nasa.gov.



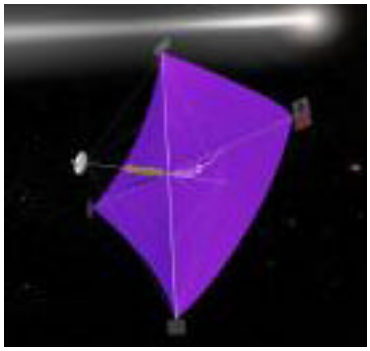
STATE-OF-THE-ART MATERIALS KNOWLEDGEBASE (SAMK)

New forms of in-space propulsion (including solar sails) and extra solar observatories will require extremely thin-films and membranes, ultra-lightweight structures that can be cured in space and environment tolerant adhesives. Collectively, these new types of materials are referred to as Gossamer materials, referring to their extremely light and delicate nature.

The SEE Program has initiated a new task to compile, in a single location, materials properties information for Gossamer spacecraft systems.

One of NASA's (and the aerospace community's) biggest problems when trying to design Gossamer spacecraft systems is the lack of centralized materials properties information regarding Gossamer materials. Trying to find the right material information can be very time consuming as well as draining on a company's manpower, often with very little to show for it. A Gossamer Program Workshop was held in 1998 and the Gossamer community asked the SEE Program to compile all known, non-proprietary data concerning Gossamer-type materials information into one comprehensive knowledgebase available to NASA and the aerospace community. This new effort is called the State-of-the-Art Materials Knowledgebase (SAMK) and will be structured after our successful Satellite Contamination and Materials Outgassing Knowledgebase.

SAMK will first concentrate on ***polymers, composites*** and ***adhesives*** used for thin-film membranes and ultra-lightweight structures. It will be web-based, have a hierarchal structure, and will showcase mechanical and optical materials properties data, including tabulated and graphical data. A cornerstone of the design will be a summary table in a standardized format so that it will be relatively easy to compare different materials without having to dig through each company's data sheets and reports to find the relevant data. Experimental test reports, manufacturing information and a PDF published paper reference section will also be included. SAMK will be populated, maintained and periodically updated by the SEE Program. Materials information is being received from the US Government, industry and academic institutions. As the success of SAMK grows, we will consider expanding the scope to include other types of materials.



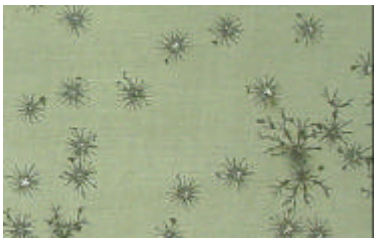
The effect of long-term exposure to the space environment is also a very big interest for us. Once a minimum number of materials have been compiled into the knowledgebase (this number is still TBD), we plan to identify the missing information and hope to provide experimental materials testing to fill in the gaps.

By compiling this information into one knowledgebase, we hope to give the Gossamer community the information it needs to better design the next generation of orbiting observatories and help make unconventional propulsion systems, such as solar sails, a common reality.

If your company would like to be involved in contributing non-proprietary data to this effort, or have any other questions concerning SAMK, please contact Jody Minor at 256-544-4041 or **jody.minor@msfc.nasa.gov**.

Coming Soon!

Electronic Properties of Materials with Applications to Spacecraft Charging: The SEE Program, in cooperation with Utah State University, has identified nearly 63 materials that are either in use today or provide a promising future use in tomorrow's spacecraft designs. Many of these materials have never undergone laboratory testing to measure their electrical properties applicable to spacecraft charging. Utah State University is investigating these material properties, especially looking at the secondary and backscattered electron total yields from electron-induced, ion-induced and photon-induced incident energies. Look for it soon on the SEE website.

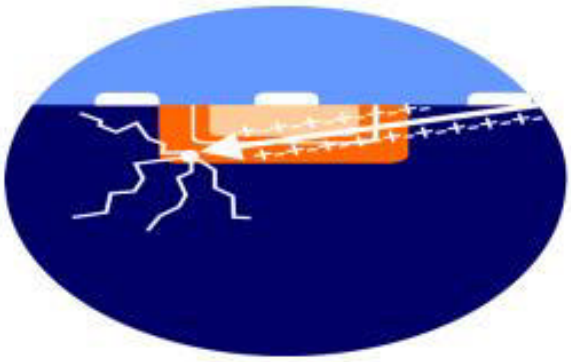


PLASMA INTERACTION WITH HIGH VOLTAGE SYSTEMS CAN DEGRADE MATERIALS

8th SPACECRAFT CHARGING TECHNOLOGY CONFERENCE 2003 Huntsville ALABAMA USA

8TH SPACECRAFT CHARGING TECHNOLOGY CONFERENCE LOGO

"INFO COMING SOON"



TRAPPED PROTON MODEL -- PROTON EMBEDDED IN ELECTRONICS

The Trapped Proton Model (TPM) is an entirely new model of the trapped proton population based primarily on data from the TIROS/NOAA series of spacecraft and the CRRES satellite. This model contains solar cycle variations at low altitudes and covers an energy range from 1MeV to 100MeV. This TRM will replace the current AP8 model. More information on this new model will be in the next issue of the SEE Bulletin.

CONTACT INFORMATION:

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Miscellaneous

UPCOMING EVENTS

THE SEE PROGRAM WILL HAVE ITS DISPLAY BOOTH AT THE FOLLOWING CONFERENCES IN 2002.

- National Space & Missile Materials Symposium, Colorado Springs, CO, June 24th-28th, 2002.
- Nuclear & Space Radiation Effects Conference, Phoenix, AZ, July 15th-19th, 2002.
- World Space Congress, Houston, TX, October 10th-19th, 2002.

IN THE NEXT ISSUE:

Information on the New Spacecraft Materials Selector Expert System

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