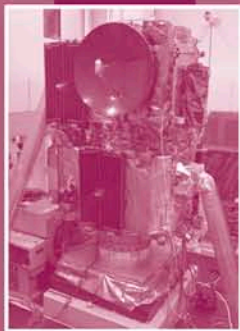


*Helping the World's
Space Programs
Push the Envelope
of Exploration and
Discovery*

24th Space Simulation Conference

Nov. 6–9, 2006

**Doubletree
Hotel Annapolis
Annapolis, Maryland**




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Message from the General Chair

“Helping the World’s Space Programs Push the Envelope of Exploration and Discovery”

Greetings to the 2006 24th Space Simulation Conference participants and guests. On behalf of the management committee and our sponsors, I want to extend a sincere welcome and emphasize our desire for you to enjoy and get the most out of this worthwhile opportunity. These conferences have proven to be a valuable resource to the Space Community and have provided its participants with a practical and comprehensive information base. We bring together a well-focused group of presenters, vendors, and attendees who work closely together with a common interest for information and technologies with genuine team spirit. I feel that you will be delighted with the program that we have prepared for you this year.



With the Shuttle “back-in-flight” and the many successful unmanned missions continuing, the Space Program has a bright future. We are persistent in our endeavors to further support the World’s thirst for scientific exploration and discovery. This ongoing commitment spawns strong team building, which is at the foundation of mission success. Also, the lessons learned from both failures and successes must be effectively integrated into well-planned and executed environmental test programs to ensure continued achievement.



The 24th Space Simulation Conference will begin with a day of tutorials with topics covering a broad range of informative discussions related to space simulation testing. These include Cryogenic Safety— an alternate method for Acoustic Testing; Vibration Isolation in Space Simulation; and Helium Leak Detection. I hope these topics are of interest to you, either in your present job or for broadening your knowledge.

This year we are pleased to have Phil Sabelhaus of NASA Goddard Space Flight Center with us once again as our distinguished keynote speaker. I look forward to his update on the James Webb Space Telescope (JWST) Program.

As usual, we are providing a vendor exhibition during the conference. The leading vendors in environmental testing, space simulation, and data acquisition & analysis will be displaying their latest advances in technical products to support your testing needs. Please take full advantage of this exhibit during your time at the conference. It is a great chance to make personal contact with those with whom you may have only had telephone contact.

At the heart of this conference are the technical presentations. As in past conferences, we strive to offer a range of topics covering space environments, dynamics, simulations, and facilities. I believe our authors and presenters have come through for us once again. I am eager to hear the presentations on New Horizons, STEREO, Mars Rover, as well as others on various topics including test techniques, analysis, facilities, and equipment. Thanks to all of the authors and presenters for providing us with interesting and informative topics.

Lastly, I want to sincerely thank all who made this conference a success. Thanks to the vendors for their support in displaying their products, and thanks to all the speakers. Thanks to the management, technical, and tutorial committees for their great team effort in planning and executing this year's conference. Great job to Ed Packard for the technical program leadership, Bill Breeden as past chairman, John Hazen for his never-ending support with logistics, Dave Feick, Hadi Navid, Bill Wilkinson, Hal Fox, Andy Webb, and too many others to list; thank you all, and great job!

Make sure you take part in the social events—I guarantee that they will be an experience you won't forget and a great opportunity to network with others.

Again: "WELCOME & ENJOY"

Robert L. Tomkiewicz
General Chair

TUTORIALS
Monday, November 6, 2006

7:30 AM **Registration**

8:10 AM **Introduction**

*Co-Chair: Hadi Navid
The Johns Hopkins University
Applied Physics Laboratory*

*Co-Chair: Nabil Copty
ManTech International Corporation*

8:15 AM **Session 1**
Cryogenic Handling and Safety

9:30 AM *Coffee Break*

9:45 AM **Session 2**
**Advanced Leak Checking
Techniques**

Noon *Lunch on your own*

1:00 PM **Session 3**
**Vibration Isolation in Space
Simulation**

3:00 PM *Coffee Break*

3:30 PM **Session 4**
Acoustic Testing on Demand

4:30 PM **Tutorial sessions end**

Hotel and IEST Information

Hotel contact number: (410) 224-3150

IEST contact number: (847) 255-1561

TUTORIAL DESCRIPTION

Session 1 – Cryogenic Handling and Safety

Instructor: Darrell Gretz
Cryogenic Handling and Safety
Indium Wire Extrusion
Ellicott City, Maryland
www.nicecorp.com

Cryogenic safety could be covered in essentially five minutes or less: wear your hard-toe shoes, safety glasses, protective smock, and cryo gloves. The problem with this simplistic explanation is that lacking understanding of the hardware and cryogenic principles can lead to catastrophic failure during a lapse in human consciousness when the individual fails to evaluate all the implications of his or her actions. This class will address the issues of processes and procedures to safely perform various operations while dealing with cryogenics.

Session 2 – Advanced Leak Checking Techniques

Instructor: Ray Hula
Leak Detection Application Specialist
Varian Vacuum Technologies
Palo Alto, California
www.varianinc.com

This technical seminar will begin with the basics of helium leak detection and explain both leak rate and pressure delta. The speaker will outline the various types of techniques available and how to determine the best method for the specific task at hand. He will also give tips on decreasing response time, dealing with background issues, helium management, helium clean-up methods, and troubleshooting. We will discuss leak testing techniques for large volume chambers using some real-world examples from both industry and government test facilities. Questions are welcome. We will have a follow-up consultation following the seminar to address questions not answered due to time constraints.

Session 3 – Vibration Isolation in Space Simulation

Instructor: Dr. David A. Kienholz
Principal Engineer/Vice President
CSA Engineering
Mountain View, California
www.csaengineering.com

Space simulation usually involves isolating the test article from ambient vibration and often requires doing so in a vacuum and for large isolated payloads. This tutorial presents the basics of vibration isolation with emphasis on applications to ground testing of space structures. The typical design process is reviewed. Examples of real isolation systems are used extensively to illustrate specific points. Examples of both active and passive systems are reviewed although most of the material is concerned with passive isolation since these systems are the most common. Advanced methods such as active pneumatics and magnetic damping are also covered. Performance testing of isolation systems and its special problems are discussed. Two recent systems for testing of large spacecraft in vacuum are presented. Several examples of launch isolation systems for spacecraft are also covered.

Session 4 – Acoustic Testing on Demand

Instructor: Robert Goldstein
President
Maryland Sound International (MSI)
Baltimore, Maryland
www.marylandsound.com

This tutorial will introduce you to methods of “in-facility” acoustic testing that have proven successful for several spacecraft development companies. You will learn some of the key ingredients to successful tests and facility requirements for such tests. After a brief introduction to these methods, Mr. Goldstein will join participants in a Q&A format. Mr. Goldstein is the Founder and President of Maryland Sound International, the pioneer in on-site acoustic testing.

SOCIAL EVENTS

Tuesday Evening

Welcome Reception

5:30 to 7:00 PM in Arundel B&C

Hot hors d'oeuvres, carving station and cash bar

Wednesday Afternoon

Tour of the Steven F. Udvar-Hazy Center
National Air and Space Museum



Wednesday Evening

Conference Reception

at the

Mount Vernon Inn Restaurant

and private tour of

George Washington's Mount Vernon



Wednesday afternoon and evening will be very special with a tour of the Steven F. Udvar-Hazy Center of the National Air and Space Museum, followed by a grand reception at the Mount Vernon Inn Restaurant.

The Steven F. Udvar-Hazy Center near Washington Dulles International Airport is the companion facility to the National Air and Space Museum on the National Mall. The center opened in December, 2003 and provides enough space for the Smithsonian to

display the thousands of aviation and space artifacts that cannot be exhibited at the National Mall location. The two sites together showcase the largest collection of aviation and space artifacts in the world.

Following the tour, please join us at the Mount Vernon Inn Restaurant, where the atmosphere provides a unique and memorable experience, for a delightful evening of scrumptious hors d'oeuvres while socializing with the attendees and their guests.

The evening will be topped off with a private candlelight tour of the Mount Vernon Mansion, a national historic treasure. You will enjoy an intimate and memorable experience featuring an exclusive Mansion tour that includes the rarely-seen third floor. Stunning Potomac River views and lantern-lined lanes will frame your elegant evening.

*The conference management team would like to express appreciation to **XL Technology Systems** for hosting this outstanding reception; to **Varian** for sponsoring the private tour; and to **DynaVac** for sponsoring the lunch served during the trip from Annapolis to the Udvar-Hazy Center.*

Sponsors



CONFERENCE
Tuesday, November 7, 2006

- 7:30 AM **Registration**
8:15 AM **Welcome – Conference General Chair**
Bob Tomkiewicz
Naval Surface Warfare Center
Dahlgren Division
- 8:20 AM **Welcome – IEST**
Geoff Cmar
IEST Immediate Past President
- 8:25 AM **Keynote Speaker**
Phil Sabelhaus
NASA Project Manager
James Webb Space Telescope
- 9:05 AM **Welcome – Technical Program Chair**
Ed Packard
NASA Goddard Space Flight Center

SESSION 1 Data Acquisition and Analyses

- Chair: Mark St. Pierre – Lockheed*
Martin Space Systems Co.
Co-Chair: Bill Raynor – Naval
Research Laboratory
- 9:10 AM **Educating Engineers and Technicians for Environmental Testing**
Joe Morreale – Spectral Dynamics, Inc.
- 9:35 AM **Goddard Dynamic Analysis Software**
Christopher McLeod – ManTech Aerospace, NASA Goddard Space Flight Center
- 10:00 AM **Calibration of a Large Channel Count Data Acquisition System**
Jim Fallon – Lockheed Martin Space Systems Co.
- 10:25 AM **Coffee Break – Visit Vendor Booths**

SESSION 2 Contamination

- Chair: Randy Hedgeland – NASA*
Goddard Space Flight Center
Co-Chair: Glenn Rosecrans – Swales and Associates, Inc.
- 10:55 AM **Ground Simulation Studies of Outgassing Parameter for Commercially Available Black Paints**
Alexander Laikhtman – Soreq NRC
- 11:20 AM **Investigation of Organic Molecule Kinetics in Thermal Vacuum Environment**
Hideki Saruwatari – Japan Aerospace Exploration Agency
- 11:45 AM **QCM Thermo-Gravimetric Analysis with Concurrent Deposition**
David Hughes – NASA Goddard Space Flight Center
- 12:10 PM **Lunch (on your own)**

SESSION 3 New Capabilities and Facilities

- Chair: Dave Cornog – Boeing*
Co-Chair: Andy Rose – Jet Propulsion Laboratory
- 1:30 PM **Pan and Tilt Platform for a Thermal Vacuum Video Camera**
Yan Lui – NASA Goddard Space Flight Center
- 1:55 PM **GSFC Vaporizer Upgrade**
Bill Bond – ManTech Aerospace, Goddard Space Flight Center
- 2:20 PM **The Space Systems Facility at Arnold Engineering Development Center**
Dustin Crider – Aerospace Testing Alliance, Arnold Engineering Development Center
- 2:45 PM **Coffee Break – Visit Vendor Booths**

- 3:15 PM **Modernizing Older Thermal Vacuum Systems**
*William Wilkinson, Consultant
Paul Calvi, Chris Martin – XL
Technology Systems, Inc*
- 3:40 PM **The Good, the Bad and the Toasty in New Facilities**
*Andrew T. Webb – The Johns Hopkins
University Applied Physics Laboratory*
- 4:05 PM **Cryogenic Test Capability at Marshall Space Flight Center’s X-ray Cryogenic Test Facility**
*Jeffrey Kegley – NASA Marshall Space
Flight Center*
- 4:30 PM **Development of a Plasma Chamber for Solar Panel Testing**
*Mr. Miyamoto – Japan Aerospace
Exploration Agency*
- 5:30 to
7:00 PM **Welcome Reception in Arundel B&C**

Wednesday, November 8, 2006

- 7:30 AM **Registration**
- 8:05 AM **Welcome – Conference General Chair**
*Bob Tomkiewicz
Naval Surface Warfare Center
Dahlgren Division*

SESSION 4 Thermal Vacuum Testing

*Chair: Andy Webb – The Johns
Hopkins University Applied
Physics Laboratory
Co-Chair: Jimmy Sisco – NASA
Marshall Space Flight Center*

- 8:10 AM **Alignment Measurement of the New Horizons (NH) High Gain Antenna (HGA) in the Thermal/Vacuum Chamber Using Photogrammetry**
*Michel D. Hill – NASA Goddard Space
Flight Center*

- 8:35 AM **Fixture Designs for New Horizons and STEREO Thermal Vacuum Tests**
*Christopher Skocik – ManTech Aero-
space, NASA Goddard Space Flight
Center*
- 9:00 AM **New IR Technology used During Radarsat-2 Thermal Testing**
*Chris Olsen – MDA, David Florida
Laboratory*
- 9:25 AM **Coffee Break – Visit Vendor Booths**

SESSION 5 Simulations and Special Topics

*Chair: Dave Feick – Northrop
Grumman Corporation
Co-Chair: Brian Langmyer – Orbital
Sciences Corporation*

- 9:45 AM **Testing of the STEREO Spacecraft Solar Array Subsystem: Engineering Model Testing through Spacecraft Integration**
*Jennifer Tanzman – The Johns
Hopkins University Applied Physics
Laboratory*
- 10:10 AM **ST-5 Spacecraft Level Testing Utilizing the Renovated Goddard Magnetic Test Facility**
*Todd Bonalsky – NASA Goddard
Space Flight Center*
- 10:35 AM **Variable Gravity Simulation by Maglev**
*Yuanming Liu – California Institute
of Technology, NASA Jet Propulsion
Laboratory*
- 11:00 AM **Comparison of Surface Operation Temperatures to Prelaunch Testing Results for Mars Exploration Rovers**
*Alan R. Hoffman – California Institute
of Technology, NASA Jet Propulsion
Laboratory*
- 11:35 AM **Lunch on Bus, Udvar-Hazy Museum and Mount Vernon Reception**

Thursday, November 9, 2006

- 7:30 AM **Registration**
8:30 AM **Welcome – Conference General Chair**
Bob Tomkiewicz
Naval Surface Warfare Center
Dahlgren Division

SESSION 6 Structural Dynamics Testing

Chair: Elie Choueiry – Canadian Space Agency
Co-Chair: Raj Singhal – Canadian Space Agency

- 8:35 AM **Extending the Qualification Limits of the General Purpose Heat Source—Radioisotope Thermoelectric Generator (GPHS-RTG)—for the New Horizons Mission**
Edward D. Schaefer – The Johns Hopkins University Applied Physics Laboratory
- 9:00 AM **Modal Correlation of the Solar TERrestrial Relations Observatory (STEREO)**
Teresa M. Betenbaugh – The Johns Hopkins University Applied Physics Laboratory
- 9:25 AM **Vacuum Testing Goddard’s Mass Properties Measurement System**
Christopher McLeod – ManTech Aerospace, NASA Goddard Space Flight Center
- 9:50 AM **The Third Dimension of Random Vibration Control**
John Van Baren – Vibration Research Corporation
- 10:15 AM **Coffee Break**
- 10:35 AM **HST Super Lightweight Interchangeable Carrier (SLIC) Tiger Team Coupon Combined Thermal/Pull Test Design**
Bill Chambers – ManTech Aerospace, NASA Goddard Space Flight Center.

- 11:00 AM **Mechanical Verification of the Solar TERrestrial Relations Observatory (STEREO) High Gain Antenna**
Teresa M. Betenbaugh – The Johns Hopkins University Applied Physics Laboratory
- 11:25 AM **Novel Guided Head Expander Design**
Doug Lund – Team Corporation
- 11:50 AM **Optimizing Facility Time During Satellite Vibration Testing**
Chris Wilcox – m+p International
- 12:15 PM **Farewell – Conference General Chair**
Bob Tomkiewicz
Naval Surface Warfare Center
Dahlgren Division
- 12:30 PM **Completion of Technical Program**

SPEAKER INFORMATION

Keynote Speaker: **Phil Sabelhaus**



Phil Sabelhaus serves as the Manager of the James Webb Space Telescope (JWST) Project at NASA's Goddard Space Flight Center. The JWST project is responsible for the development, launch, operations, and science data processing for the 21st century follow-on of the highly successful Hubble Space Telescope.

Phil has over 20 years of distinguished experience at NASA. During this time, he has served as the Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics (TIMED) Deputy Project Manager, the total Ozone Mapping Spectrometer (TOMS) Project Manager, the Geostationary Operational Environmental Satellites (GOES) Deputy Project Manager, and the Landsat 7 Project Manager. In late 1998, Phil was appointed the Deputy Associate Director of Flight Projects for EOS Development. As part of these duties, he served as the ESSP VCL Project Manager and the EOS Aqua Project Manager. In September 2001, Mr. Sabelhaus was appointed the Associate Director of Flight Projects for EOS. Phil graduated from the University of Maryland with a BS in Mechanical Engineering.

The JWST project is currently in phase B with its launch scheduled for August 2011. The project is a partnership between NASA, ESA and CSA. The U.S. JWST team is in place with the selection of Northrop Grumman Space Technology (NGST) as the prime contractor for the telescope and the Space Telescope Science Institute (STScI) as the mission operations and science data processing lead.

As our keynote speaker, Phil will provide an overview of the planned JWST science, current architecture, and mission status, including technology developments and risks.

MEETING MANAGEMENT COMMITTEE

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Naval Surface Warfare Center
Dahlgren Division

Technical Program Chair

Edward A. Packard
NASA Goddard Space Flight Center

Tutorial Co-Chairs

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The Johns Hopkins University
Applied Physics Laboratory

Nabil Coptly
ManTech International Corporation

Budget Chair

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Jet Propulsion Laboratory

Glenn Rosecrans

Swales and Associates, Inc

Raj Singhal

Canadian Space Agency

Jim Sisco

NASA Marshall Space Flight Center

Andy Webb

The Johns Hopkins University

Applied Physics Laboratory

*Program provided by
The Johns Hopkins University
Applied Physics Laboratory*



John Neal Packard

The 24th Space Simulation Conference is dedicated to the memory of John Packard.

Over the last few decades, John had supported this conference both through his personal participation in various roles, as well as through whatever corporate support he could muster. Initiating his engineering career at the Glen L. Martin Company in 1957, he became one of our pioneers in the space test industry, especially when he moved to NASA Goddard Space Flight Center in 1968. Although John had received many awards over his career, he cherished the friendships and camaraderie gained through his participation in the IEST Chesapeake Chapter and the Space Simulation Conference. John will be sorely missed. God bless his soul.

VENDOR EXPOSITION

VENDOR	BOOTH
<i>Linde BOC Process Plants</i>	1
<i>Kistler Instrument Corporation</i>	2
<i>Fabreeka International</i>	3
<i>VAT</i>	4
<i>PCB Piezotronics, Inc.</i>	5
<i>PHPK Technologies</i>	6
<i>XL Technology System, Inc.</i>	7
<i>Plug in SARL</i>	8
<i>Pascal Technologies, Inc.</i>	9
<i>CSA Engineering</i>	10
<i>Douglas Electrical Components</i>	11
<i>Fluid Systems Solutions, LLC</i>	12
<i>m + p international</i>	13
<i>Dynavac</i>	14
<i>Varian, Inc.</i>	15
<i>Data Physics Corporation</i>	16
<i>Pfeiffer Vacuum</i>	17
<i>Team Corporation</i>	18
<i>OROS</i>	19
<i>Spectral Dynamics, Inc.</i>	20

The conference management team would like to express appreciation to all the vendors for their support and participation.

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