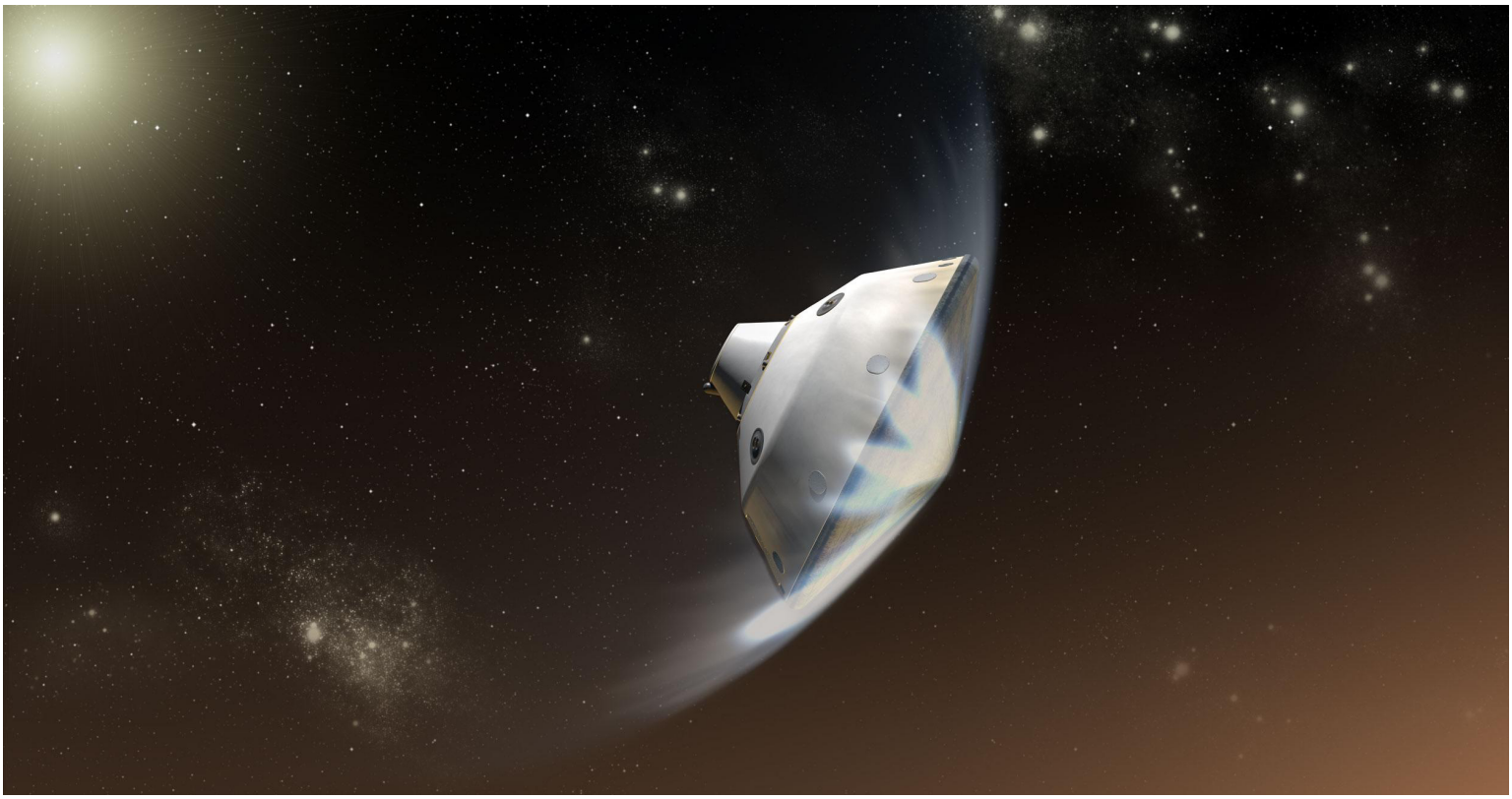
5th Ablation Workshop

February 28th - March 1st 2012
Hilton Lexington/Downtown, Lexington, Kentucky
http://ablation2012.engineering.uky.edu

Hosted by
UK UNIVERSITY OF KENTUCKY



Steering Organizations

Sandia National Laboratories

NASA

AFOSR AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

Agenda

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Foreword

We, the scientific committee, are very pleased to welcome you to the 5th Ablation Workshop in Lexington, Kentucky. Many thanks to the University of Kentucky and Prof. Alexandre Martin, We, the scientific committee, are very pleased to welcome you to the 5th Ablation Workshop in Lexington, Kentucky. Many thanks to the University of Kentucky and Prof. Alexandre Martin, head of the Local Organizing Committee, for his initiative and active fundraising to ensure continuation of this workshop in such a picturesque venue!

The Ablation Workshops, steered by NASA, AFOSR and Sandia, provide a single meeting point for the integration and advancement of a multi-disciplinary research community of scientists and engineers working on aerothermodynamic ablation. This growing research community has members representing government agencies, the private sector, and university systems across the world. The primary objectives of the workshop are to:

1. foster improved communication across international boundaries;
2. expose the aerothermodynamic ablation modeling community to new ideas and techniques from adjacent disciplines;
3. bring new experimental techniques to bear on the problem; and
4. discuss challenges faced in adapting existing techniques to address new applications.

This year, the workshop will focus on the development, validation and uncertainty quantification of the high-fidelity models used to simulate the behavior of ablative materials. Sessions and comparison activities will be held on the various aspects of modeling the surface and in-depth performance of ablative materials, experimental techniques to validate the resulting models, and uncertainty quantification methodologies. The state of the art of ablation modeling has changed little in the past 40 years, largely because of a lack of validation data with which to justify improvements to the baseline models. However, in recent years significant progress has been made on the numerical side, and it is now time to develop a set of validation experiments to test key aspects of the new and proposed models, quantify remaining uncertainties, and prioritize limited research budgets on those aspects that will have the largest impact on minimizing mass and maximizing reliability of spacecraft thermal protection systems.

This workshop will take a break in 2013, but for a good cause. The proposal submitted by Dr. Cozmuta to the Gordon Research Council to initiate a Gordon Research Conference in the area of “Atmospheric Reentry Physics” was approved by the board and the first conference will take place February 3rd-8th of 2013 in Ventura, California. This is a great opportunity that ensures continuity for the community to meet and discuss technical topics of high interest in this area. We anticipate that the Ablation Workshop will return in 2014.

Thank you for coming! Please participate, learn something, and above all, have fun!

Dr. John D. Schmisseur, Air Force Office of Scientific Research, USA
Dr. Michael J. Wright, NASA Ames Research Center, USA
Dr. Jeffrey L. Payne, Sandia National Laboratories, USA
Dr. Ioana Cozmuta, STC Corporation, NASA Ames Research Center, USA

Agenda

Tuesday, February 28, 2012

Introduction and Overview
Chair: Alexandre Martin, University of Kentucky, USA

7:30 a.m. Breakfast and Registration
8:30 a.m. Introduction: the 5th Ablation Workshop and beyond
Alexandre Martin, University of Kentucky, USA
Ioana Cozmuta, STC/NASA Ames, USA
8:50 a.m. Merging Aerothermodynamic and High-Temperature Materials Research: An AFOSR Perspective
John Schmisseur, Air Force Office of Scientific Research, USA
9:15 a.m. Overview of ablation modeling and simulation at Sandia National Laboratories: past, present and future
Micah Howard, Sandia National Lab., USA
9:40 a.m. Preparing NASA for the 21st Century: OCT perspective on EDL
Harry Partridge, NASA Headquarters, USA
10:05 a.m. Questions and discussions
10:20 a.m. Coffee Break and Poster Session

New Developments in Ablation Science – I
Chair: Michael J. Wright, NASA Ames, USA

10:35 a.m. SPRITE: A TPS test bed for ground and flight
Dinesh K. Prabhu, ERC Inc./NASA Ames, USA
11:00 a.m. Characterization of material response during arc jet testing with optical methods status and perspectives
Michael W. Winter, UC Santa Cruz/NASA Ames, USA
11:25 a.m. Direct observation of mechanical ablation
Charles Powars, Saint Croix Research, USA
11:50 a.m. Questions and discussions
12:00 p.m. Lunch
1:30 p.m. The Mysteries of Real Materials
Bernard Laub, NASA Ames, USA

Keynote Presentation

2:00 p.m. A Perspective on the Design and Development of the SpaceX Dragon Spacecraft Heatshield
Daniel J. Rasky, NASA Ames, USA

Ablation Code Intercomparison
Chair: Mark Ewing, ATK, USA

2:30 p.m. Ablation test case series #2
Jean R. Lachaud, UC Santa Cruz/NASA Ames, USA
3:00 p.m. Ablation Thermochemistry for TACOT
Micah Howard, Sandia National Lab., USA
3:15 p.m. Questions and discussions
3:45 p.m. Coffee Break and Poster Session
4:00 p.m. Ablation Test Case Series #2: results and discussion
4:55 p.m. Ablation test case series #3
T*om van Eekelen, LMS-SAMTECH, Belgium*
5:25 p.m. Group discussion
5:40 p.m. Experimental test case
Alexandre Martin, University of Kentucky, USA
6:00 p.m. Adjourn

Agenda

Wednesday February 29, 2012

Coupling of Material Response and Aerothermal Models
Chair: John Schmisseur, Air Force Office of Scientific Research, USA

7:30 a.m. Breakfast and Registration
8:15 a.m. Ablation Modeling of a Solid Rocket Nozzle
Mark E. Ewing, ATK, USA
8:40 a.m. Modeling of heat transfer attenuation by ablative gases during the Stardust re-entry
Alexandre Martin, University of Kentucky, USA
9:05 a.m. A radiative transfer equation solver module for coupled simulation of hypersonic flow with ablation
Ranjan S. Mehta, CFD Research Corporation, USA
9:30 a.m. CFD Ablation predictions with coupled GSI modeling for charring and non-charring materials
Alessandro Turchi, University of Rome "La Sapienza", Italy
9:55 a.m. Coffee Break and Poster Session
10:10 a.m. Uncertainty analysis of reaction rates in a finite rate gas-surface model
Thomas E. Schwartzentruber, University of Minnesota, USA
10:35 a.m. Coupled computation of fluid and material response for non-charring ablative materials in hypersonic flow
Jonathan Wiebenga, University of Michigan, USA
11:00 a.m. Thermo-chemical and mechanical coupled analysis of swelling, charring and ablative materials for reentry applications
Gregory Pinaud, Astrium, France
11:25 a.m. Real-Time Ablation Recession Rate Sensor System for Advanced Reentry Vehicles
George Papadopoulos, ATK, USA
11:50 a.m. Questions and discussions
12:00 a.m. Lunch

Oxidation Studies
Chair: Erica Corral, University of Arizona, USA

1:30 p.m. Methodology for ablation investigations of innovative ablators in the VKI plasmatron facility: first results on a carbon fiber preform
Bernd Helber, von Karman Institute, Belgium
1:55 p.m. Oxidation Behavior of Ultra-High Temperature Ceramics Using Dynamic Non-Equilibrium TGA
Erica Corral, University of Arizona, USA
2:20 p.m. Aerothermal Characterization of silicon carbide based TPS in high-enthalpy airflow
Olivier Chazot, von Karman Institute, Belgium
2:45 p.m. Graphite ablation experiments in the LHMEL laser facility
Ryan Gosse, Air Force Research Lab., USA
3:10 p.m. Questions and discussions
3:25 p.m. Coffee Break and Poster Session

Chemistry of Thermal Decomposition
Chair: Jean R. Lachaud, UC Santa Cruz/NASA Ames, USA

3:40 p.m. Pyrolytic analysis of a charring ablator
Alexandre Bennett, Dstl, United Kingdom
4:05 p.m. A combined experimental and mechanistic modeling approach to study polymer pyrolysis
Hsi-Wu Wong, Aerodyne Research, USA
4:30 p.m. Study of mechanical and thermal behavior of polymeric ablator using MD
Abhishek Kumar, University of Michigan, USA
4:55 p.m. Investigation of Pyrolyzing Ablator in an Inductively Coupled Plasma Torch Facility
Douglas G. Fletcher, University of Vermont, USA
5:25 p.m. Questions and discussions
5:30 p.m. Adjourn

Off site activity
6:15 p.m. Banquet "Taste of Kentucky" at Buffalo Trace Distillery

Agenda

Thursday March 1st, 2012

UQ for Material Response and Aerothermal
Chair: Ioana Cozmuta, STC/NASA Ames, USA

7:30 a.m. Breakfast and Registration
8:30 a.m. Ablative Thermal Protection System Study
Lawrence L. Green, NASA Langley, USA
8:55 a.m. Efficient UQ and Sensitivity Analysis for Hypersonic Flow and Material Response Simulations under inherent and model-form uncertainties
Serhat Hosder, Missouri University of Science and Technology, USA
9:20 a.m. A statistics-based material property analysis to support ablation simulation UQ efforts
Sean R. Copeland, Stanford University, USA
9:45 a.m. 3D microstructural characterization of materials
Ryan M. White, North Carolina State University, USA
10:10 a.m. Questions and discussions
10:20 a.m. Coffee Break and Poster Session

New Developments in Ablation Science – II
Chair: Ioana Cozmuta, STC/NASA Ames, USA

10:35 a.m. Ultrasonic thermometry for recession measurements in ablative materials
Donald Yuhas, Industrial Measurement Systems Inc, USA
11:00 a.m. On the modelling of high speed turbulent flows with applications towards reentry ablation
Rodney D. W. Bowersox, Texas A&M, USA
11:25 a.m. An adjoint method to determine the effective material properties of an ablator
Emma Johnstone, Fluid Gravity Engineering LTD, United Kingdom
11:50 a.m. Questions and discussions
12:00 p.m. Outcome of the workshop and future directions
Alexandre Martin, University of Kentucky, USA
12:20 p.m. Group discussion
12:30 p.m. Adjourn

Posters

Investigation of blowing effects on turbulent flow over a rough surface
Mark Miller, University of Kentucky, USA

Numerical investigation of three-dimensional effects within a charring ablator
Alexandre Martin, University of Kentucky, USA

DST-Shells used as an Ablative Material
Vicky Kurtz, Deep Springs Technology, USA

Advanced thermal protection systems (TPS) and transition analysis
Luca Maddalena, University of Texas at Arlington, USA

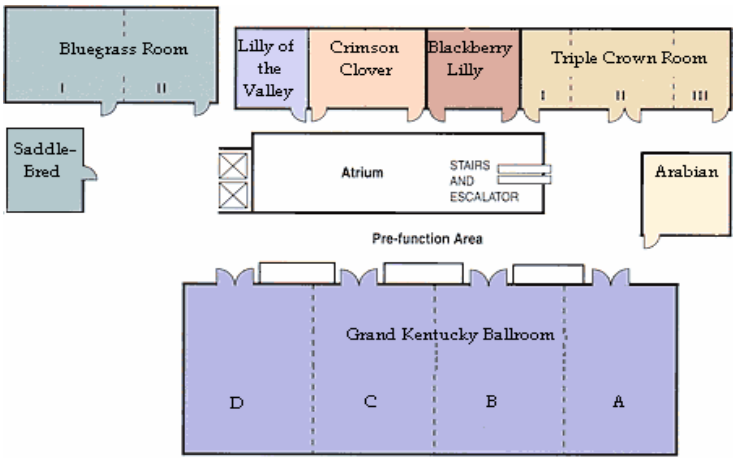
Development and validation of SACRAM: a Swiss Approach to the Computational Response of an Ablative Material
Ojas Joshi, École Polytechnique Fédérale de Lausanne, Switzerland

Computation of Surface Catalysis for Graphite Exposed to high enthalpy nitrogen flow
Abhilasha Anna, University of Michigan, USA

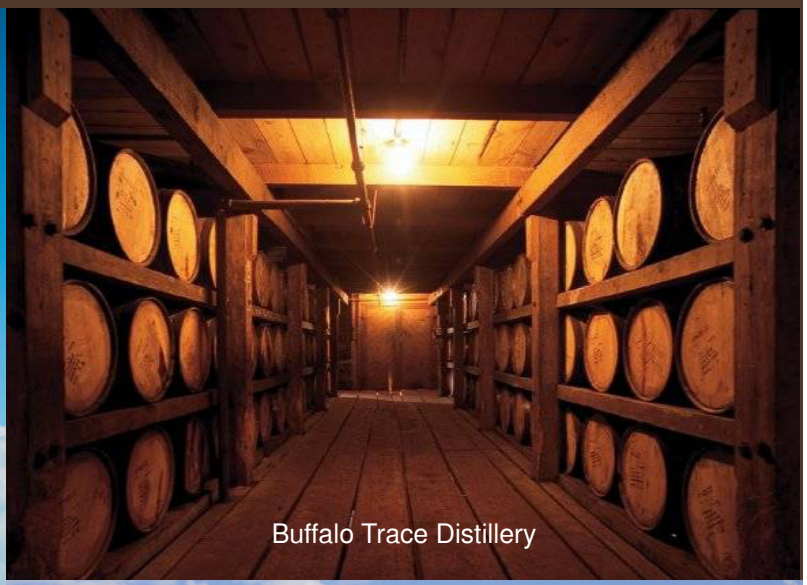
Computational Chemistry modelling of the oxidation of highly oriented pyrolytic graphite
Savio Poovathingal, University of Minnesota, USA

Dynamic non-equilibrium thermal gravimetric analysis of oxidation rate measurements for ultra-high temperature ceramics up to 1600° C
Melia J. Miller-Oana, University of Arizona, USA

Hilton
Lexington/Downtown



Lexington Skyline


Buffalo Trace Distillery


Lexington Horse Farm

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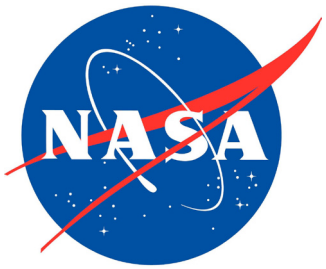
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