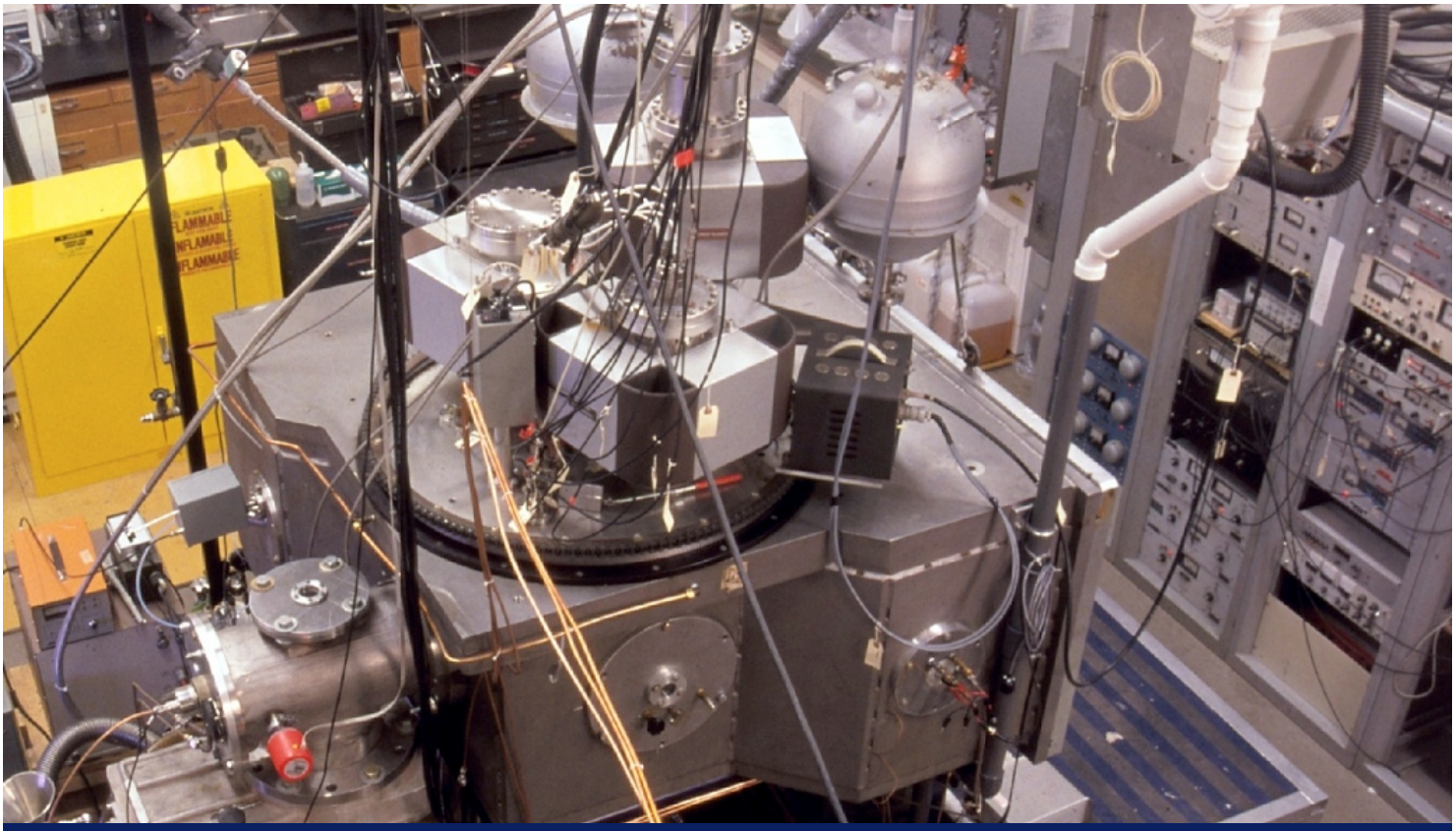
9th Ablation Workshop

August 30 - September 1, 2017
Montana State University
Bozeman, MT
http://ablation2017.engineering.uky.edu

Hosted and organized by

MONTANA STATE UNIVERSITY

University of Kentucky



Steering Organizations

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Agenda

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WEDNESDAY

7:00 am – 8:00 am	Breakfast	Rooms 233-235
8:00 am – 9:55 am	**Introduction and Keynote Lectures**	
	Session Chair: **Alexandre Martin** (University of Kentucky)	
8:00 am – 8:15 am	Welcome by **Mary Cloninger** (Montana State University)	
8:15 am – 8:40 am	**Michael Wright** (NASA Ames Research Center) "Current Technology Investments in the Entry Systems Modeling Project"	
8:40 am – 9:05 am	**Ivett Leyva** (Air Force Office of Scientific Research) "Overview of AFOSR Interests in Ablation"	
9:05 am – 9:30 am	**Gregory Pinaud** (Airbus Safran Launchers) "Development of the European Conformal Ablative-Charring Material and Performance Assessment"	
9:30 am – 9:55 am	**Ethiraj Venkatapathy** (NASA Ames Research Center) "Thermal Protection for Mars Sample Return Earth Entry Vehicle: A Grand Challenge for Design Methodology and Reliability Verification"	
9:55 am – 10:20 am	Coffee Break	
10:20 am – 12:00 pm	**Modeling Material Response at the Macro Scale – I**	
	Session Chair: **Michael Wright** (NASA Ames)	
10:20 am – 10:45 am	**Jeremie Meurisse** (STC at NASA Ames Research Center) "Full-Scale Mars Science Laboratory Tiled Heatshield Material Response"	
10:45 am – 11:10 am	**Eric Stern** (NASA Ames Research Center) "Overview of the Icarus Material Response Solver"	
11:10 am – 11:35 am	**Alessandro Turchi** (von Karman Institute, Belgium) "Unified Flow-Material Simulations of Light-Weight Carbon Ablators in the VKI Plasmatron: A Step Forward"	
11:35 am – 12:00 pm	**Alexandre Martin** (University of Kentucky) "Understanding Surface Balance Equations without the Excruciating Pain"	

12:00 pm – 2:05 pm	Lunch and Poster Session	Rooms 233-235
2:05 pm – 3:20 pm	**Multi-Scale Modeling – I**	
	Session Chair: **Kelly Stephani** (University of Illinois)	
2:05 pm – 2:30 pm	**Abhilash Harpale** (University of Illinois) "Analysis of Ablative TPS Using Scale-Bridging Molecular Dynamics"	
2:30 pm – 2:55 pm	**Revathi Jambunathan** (University of Illinois) "Prediction of TPS Material Permeability and Tortuosity Factor using Direct Simulation Monte Carlo"	
2:55 pm – 3:20 pm	**Tom Schwartzentruber** (University of Minnesota) "Modeling Nonequilibrium Gas-Surface Interactions at High Temperature"	
3:20 pm – 3:45 pm	Coffee Break	
3:45 pm – 5:25 pm	**Oxidation of Carbon**	
	Session Chair: **Tom Schwartzentruber** (Univ. of Minnesota)	
3:45 pm – 4:10 pm	**Steven Sibener** (University of Chicago) "STM Visualization of Oxidation Reaction Kinetics Linked with Morphological Evolution of Highly Ordered Pyrolytic Graphite (HOPG) using Energy Selected Supersonic Beams of Molecular Oxygen"	
4:10 pm – 4:35 pm	**Scott Anderson** (University of Utah) "High Temperature Carbon Surface Chemistry by Single Particle Mass Spectrometry"	
4:35 pm – 5:00 pm	**Savio Poovathingal** (Montana State University) "Dynamics of Carbon Oxidation at High Temperatures"	
6:00 pm – 9:00 pm	Reception and Banquet (Hosted bar)	Museum of the Rockies

THURSDAY

7:00 am – 8:15 am	Breakfast	Rooms 233-235
8:15 am – 9:55 am	**Emerging Materials and Methods**	
	Session Chair: **Chuck Bersbach** (Ratheon)	
8:15 am – 8:40 am	**Erica Corral** (University of Arizona) "Ablation of Graphitic Materials in the Diffusion-Controlled Regime using Dynamic Non-Equilibrium Thermogravimetric Analysis and Oxyacetylene Torch Testing"	
8:40 am – 9:05 am	**Ramin Shilav** (Rafael Ltd. and Technion, Israel) "Development of Thermal Conductivity Apparatus for Composite Ablative Materials"	
9:05 am – 9:30 am	**J. Devin Sparks** (University of Kentucky) "The Kentucky Re-Entry Spacecraft (KRUPS) for TPS Testing: Overview of SRF-1"	
9:30 am – 9:55 am	**Brody Bessire** (Montana State University) "Thermal Decomposition of PICA at Heating Rates Relevant to Flight Conditions"	
9:55 am – 10:20 am	Coffee Break	
10:20 am – 12:00 pm	**Modeling Material Response at the Macro Scale – II**	
	Session Chair: **Mark Ewing** (Orbital ATK)	
10:20 am – 10:45 am	**A. Brandon Oliver** (NASA Johnson Space Center) "3D Material Response Analysis of PICA Pyrolysis Experiments"	
10:45 am – 11:10 am	**Przemyslaw Rostkowski** (University of Illinois) "Using Bayesian Inference in the Calibration of VISTA Material Database"	
11:10 am – 11:35 am	**Peter Cross** (Naval Air Warfare Center; Univ. of Michigan) "Conjugate Analyses of Ablation in Rocket Nozzles"	
11:35 am – 12:00 pm	**Ozen Atak** (Roketsan, Ankara, Turkey) "Numerical Modeling of Ablation Materials in Solid Rocket Motors"	
12:00 pm – 2:05 pm	Lunch and Poster Session	Rooms 233-235

2:05 pm – 3:20 pm	**Multi-Scale Modeling – I**
	Session Chair: **Nagi Mansour** (NASA Ames Research Center)
2:05 pm – 2:30 pm	**Krishnan Swaminathan-Gopalan** (University of Illinois) "Development of DSMC Surface Oxidation Model for Carbon from Analysis of Molecular Beam Experiments"
2:30 pm – 2:55 pm	**José Graña-Otero** (University of Kentucky) "Carbon Oxidation in Extreme Environments"
2:55 pm – 3:20 pm	**Joseph Ferguson** (STC at NASA Ames Research Center) "Particle Methods for Tortuosity Factors in Porous Media"
3:20 pm – 3:45 pm	Coffee Break
3:45 pm – 5:00 pm	**High-Enthalpy Experiments**
	Session Chair: **Erica Corral** (University of Arizona)
3:45 pm – 4:10 pm	**Joseph Koo** (University of Texas at Austin) "In-situ Ablation Sensor and Numerical Modeling of Three-Dimensional Woven Carbon/Phenolic Ablative Material"
4:10 pm – 4:35 pm	**Ranjith Ravichandran** (University of Queensland, Austrailia) "Interaction of Ablating Carbon with Expanding Earth Entry Flows in the X2 Expansion Tube"
4:35 pm – 5:00 pm	**Bernd Helber** (von Karman Institute, Belgium) "Ablation Experiments of the ZURAM Carbon-Phenolic Ablator for Test Case Definition and Material Code Validation"
5:00 pm – 7:00 pm	Poster Session Rooms 233-235 (hors d'Oeuvres and hosted bar)

FRIDAY

7:00 am – 8:15 am	Breakfast	Room 235
8:15 am – 12:00 pm	**ITAR Session – Restricted Access**	
	Session Chair: **Stan Bouslog** (NASA Johnson Space Center)	
8:15 am – 8:40 am	**Erica Corral** (University of Arizona) "Ultra-High Temperature Ceramic Coated Carbon-Carbon Composites for Hypersonics"	
8:40 am – 9:05 am	**Bhavesh Patel** (Southern Research Institute) "Thermal and Mechanical Characterization of Silica Cloth Reinforced Benzoxazine (SCB) Composites up to 2500 °F"	
9:05 am – 9:30 am	**Nagi Mansour** (NASA Ames Research Center) "Development of Type 3 Ablator Response Model under the ESM Project"	
9:30 am – 9:55 am	**Stan Bouslog** (NASA Johnson Space Center) "Orion Multi-Purpose Crew Vehicle (MPCV) Heat Shield: Background Information"	
9:55 am – 10:20 am	Coffee Break	
10:20 am – 10:45 am	**A. Brandon Oliver** (NASA Johnson Space Center) "Challenges and Progress towards Reconstruction of EFT-1 Heatshield Aerothermal Environments"	
10:45 am – 11:10 am	**Susan White** (NASA Ames Research Center) "Avcoat Versus Radiation"	
11:10 am – 11:35 am	**Debbie Levin and Huck Beng Chew** (University of Illinois) "Bridging Micro-Scale and Continuum Material Models for AVCOAT-Like TPS"	
11:35 am – 12:00 pm	**Discussion**	
12:00 pm – 1:30 pm	Lunch (in ITAR-controlled room)	Room 235
1:30 pm	Adjourn	

Poster Presentations

Ashwin Dev Achambath (University of Minnesota)
"Molecular Simulation of Boundary Layer Flow over Thermal Protection System Microstructure"

Brody Bessire (Montana State University)
"In Situ Studies of Ablation Product Yields from PICA and Reacting FiberForm"

Arnaud Borner (STC at NASA Ames)
"Investigation of the High-Energy Oxidation of FiberForm from DSMC Analysis of Molecular Beam Experiments"

Samuel Chen (University of Michigan)
"Modeling of Gas-Phase Chemical Kinetics for Pyrolyzing Ablators"

Raghava S. C. Davuluri (University of Kentucky)
"Numerical and Experimental Reconstruction of Spalled Particle Trajectories in an Arc-Jet Environment"

Brian Donegan (U.S. Air Force Institute of Technology)
"Preliminary Investigation of Ablating Hypersonic Radiating Wake Flows"

Anthony Hollywood (NASA Ames Research Center)
"Constructing a New Pyrolysis Model for Carbon/Phenolic Ablators"

John F. Maddox (University of Kentucky, Paducah)
"Modal Thermal Conductivity Measurement of Fibrous Insulation Materials using a Comparative Cut-Bar Apparatus"

Alexandre Martin (University of Kentucky)
"Reduction/Oxidation Experiments on Fibrous Carbon"

Vanessa Murray (Montana State University)
"Dynamics of Graphite Oxidation at High Temperatures"

Ali Omidy (University of Kentucky)
"Development of VISTA, an Open-Source Avcoat Material Model"

Oğuz Kaan Onay (Roketsan, Ankara, Turkey)
"Solid Rocket Motor Nozzle Erosion Modeling using Finite-Rate and Equilibrium Methods"

Grant Palmer (NASA Ames Research Center)
"Thermal Response Analysis of Meteorite Arcjet Experiments Using the Icarus Code"

Francesco Panerai (NASA Ames Research Center)
“Flow-Tube Reactor Experiments on the High Temperature Oxidation of Carbon Weaves”

Savio Poovathingal (Montana State University)
“Scattering Dynamics of Hyperthermal O and O_2 on a Carbon Fiber Network”

Pooja Rao (University of Illinois)
“Hybrid Walker Approach to Conduction-Radiation Coupling in Micro-Scale Ablation Modeling”

Olivia Schroeder (University of Kentucky)
“Verification and Validation of the Icarus Material Response Code”

Joseph Schulz (AMA Inc. at NASA Ames Research Center)
“Development of Implicit Time Integration Schemes for Material Response using Icarus”

Christen Setters (University of Kentucky)
“Validation of KATS CFD with Flight Data from KRUPS's KUDOS Launch”

Sadaf Sobhani (NASA Ames Research Center)
“Radiative Heat Transfer Modeling in Fibrous Porous Media”

John Thornton (NASA Ames Research Center)
“Modeling the Relationship between Porosity and Permeability during Oxidation of Ablating Materials”

Haoyue Weng (University of Kentucky)
“KATS-Universal Solver: Validation of Flow Tube Experiments”