

# The 2015 Aerothermodynamics, Transition and Turbulence, and MURI Review

Drs. Ivett Leyva and "Pon" R. Ponnappan | July 13-17, 2015 | UTSI, TN

University of Tennessee Space Institute (UTSI) - Auditorium  
411 B H Goethert Pkwy, Tullahoma, TN 37388

## Day 1 – Monday, July 13, 2015

Time	Topic	Speaker
7:45-8:10	Registration	
8:10-8:30	<a href="#">Welcome/Intro</a>	I. Leyva, AFOSR/RTA
8:30-9:00	<a href="#">Flow-Structure Interactions in Hypersonic Vehicles (Invited Talk)</a>	R. Chona, ST, AFRL/RQ
Session 1: MURI: Fundamental Processes in High-temperature Hypersonic Flows Chair: I. Leyva, AFOSR/RTA		
9:00-9:45	<a href="#">MURI Introduction</a>	G. Candler, U of MN
9:45-10:00	BREAK	
10:00-10:40	<a href="#">Electronic Structure and QCT Calculations for High-Enthalpy Air Reactions</a>	J. Bender, U of MN
10:40-11:00	<a href="#">Molecular Simulation of Dissociation</a>	T. Schwartzentruber, U of MN
11:00-11:30	<a href="#">Molecular Beam Experiments of High-Enthalpy Processes</a>	T. Minton, Montana State
11:30-12:45	LUNCH	
12:45-13:15	<a href="#">Gas-Surface Interaction Simulations with MD/DSMC</a>	T. Schwartzentruber, U of MN A. van Duin, Penn State
13:15-13:45	<a href="#">Oxidation Behavior of Aerospace Materials in High-Enthalpy Flows</a>	E. Corral, U of AZ
13:45-14:15	<a href="#">High-Enthalpy Experiments for Model Validation</a>	R. Parker, U Buffalo/ CUBRC
14:45-14:45	<a href="#">Design and Analyses of Nonequilibrium Gas Kinetic Experiments using DSMC</a>	D. Levin, UIUC
14:45-14:55	Summary	G. Candler, U of MN
14:55-15:10	BREAK	
Session 2: International Efforts Chair: I. Leyva, AFOSR/RTA		
15:10-15:40	JAXA research in Hypersonics (Invited Talk)	M. Yoshida, JAXA Kakuda SC
15:40-16:10	<a href="#">High Enthalpy Experiments at UNSW</a>	S. O'Byrne, UNSW
16:10-16:40	<a href="#">Coupled Ablation-Radiation Simulations</a>	R. Greendyke, AFIT
16:40	MEETING ADJOURNED FOR THE DAY	

Day 2 – Tuesday, July 14, 2015		
Time	Topic	Speaker
7:45-8:00	Registration	
8:00-8:20	<a href="#">Welcome/Intro</a>	R. Ponnappan, AFOSR/RTA
8:20-8:50	<a href="#">NASA-LaRC Hypersonics Mission Overview (Invited talk)</a>	K. Rock, NASA LaRC
<b>Session 3: Turbulence</b>		<b>Chair: M. Malik, NASA/LaRC</b>
8:50-9:50	Exploration of Critical Non-equilibrium Processes in High Speed Viscous Dominated Flows	<a href="#">M. Samimy, OSU</a> <a href="#">D. Gaitonde, OSU</a> <a href="#">I. Adamovich, OSU</a>
9:50-10:15	<a href="#">Fundamental Turbulence Mechanisms in Multi-Stream Flows</a>	M. Glauser, Syracuse U
10:15-10:30	<b>BREAK</b>	
10:30-11:00	<a href="#">Physics Based Modeling of Compressible Turbulence</a>	P. Moin, Stanford U
11:00-11:30	<a href="#">Study of Turbulent Flows using Vected Momentum and Energy Addition</a>	S. Roy, UF (Gainesville)
11:30-12:00	<a href="#">Cross-flow Instability Receptivity to Environmental Disturbances at Hypersonic Speeds</a>	R. Bowersox, TAMU
12:00-13:10	<b>LUNCH</b>	
<b>Session 4: Non-equilibrium Process</b>		<b>Chair: J. Poggie, AFRL/RQ</b>
13:10-14:10	<a href="#">Thermal &amp; Mechanical Non-equilibrium Effects on Turbulent Flows: Studies of Energy Exchanges thru DNS, Molecular Simulations and Experiments</a>	D. Donzis, TAMU R. Bowersox, TAMU S. North, TAMU B. Hase, TX Tech
14:10-15:10	<a href="#">The Multi-scale Interaction of Vibrational Energy Transfer and Turbulent Combustion in Supersonic Flows</a>	P. Varghese, UT Austin N. Clemens, UT Austin V. Raman, U of MI
15:10-15:25	<b>BREAK</b>	
15:25-15:55	<a href="#">Mechanisms of Energy Transport in Gaseous Media</a>	G. Candler, U of MN
15:55-16:25	<a href="#">Non-equilibrium and Basic Energy Exchange Mechanisms in High Energy Flows</a>	E. Josyula, AFRL/RQ
16:25-16:55	<a href="#">(YIP) A Reduced-order Modeling Approach to Enable Kinetic Simulations of Non-equilibrium Hypersonic Flows</a>	M. Panesi, UIUC
16:55-17:25	<a href="#">Non-equilibrium Shock-shock and SBLI</a>	J. Austin, Caltech D. Levin, UIUC
17:25	<b>MEETING ADJOURNED FOR THE DAY</b>	

Day 3 – Wednesday, July 15, 2015		
Time	Topic	Speaker
7:45-8:00	Registration	
<b>Session 4: Non-equilibrium Processes</b>		<b>Chair: J. Poggie, AFRL/RQ</b>
8:00-8:30	<a href="#">Energy Transfer in Nonequilibrium Air</a>	I. Boyd, U of MI
<b>Invited Talk</b>		
8:30-9:00	<a href="#">S&amp;T for High Speed Systems Test (Invited Talk)</a>	E. Tucker, AEDC/TSTH
<b>Session 5: Shock-Shock and Shock-Boundary Layer Interactions</b>		<b>Chair: J. Eswar, AFRL/RQ</b>
9:00-9:30	<a href="#">Investigation of Shock Boundary Layer Interactions in Junction Flows to Understand Inlet Unstart Physics</a>	V. Narayanaswamy, NCSU
9:30-10:00	<a href="#">Investigation of 3D Shock-Boundary Layer Interaction: A Combined Approach using Experiments, Numerical Simulations and Stability Analysis</a>	J. Little, U of AZ, H. Fasel, U of AZ A. Gross, NMSU
10:00-10:15	<b>BREAK</b>	
10:15-11:15	<a href="#">3-D Shock/Turbulent BL Interaction Physics: Flow Morphology and System Dynamics through Imposed Disturbances</a>	F. Alvi, FSU D. Gaitonde, OSU N. Clemens, U of TX R. Kumar, FSU B. Thurow, Auburn
11:15-11:45	<a href="#">Scale Resolution in Numerical Simulation of Compressible, Turbulent Flow</a>	J. Poggie, AFRL/RQ N. Bisek, AFRL/RQ
11:45-12:15	<a href="#">(YIP) Material Mixing and Turbulence in Variable Density Flows</a>	D. Ranjan, GA Tech
12:15-13:30	<b>LUNCH</b>	
<b>Session 6: Transition-1</b>		<b>Chair: M. Chaudhary, NASA/LaRC</b>
13:30-14:00	<a href="#">Measurements of BL Instability and Transition in the M-6 Quiet Tunnel</a>	S. Schneider, Purdue U
14:00-14:30	<a href="#">A DNS Study on Hypersonic BL Receptivity</a>	X. Zhong, UCLA
14:30-15:00	<a href="#">(YIP) Numerical Simulation of Free-stream Acoustic Disturbances in Hypersonic Ground Facilities &amp; Their Effect on BLT</a>	L. Duan, MUS&T (Rolla)
15:00-15:30	<b>BREAK</b>	
15:30-16:00	<a href="#">Turbulent BL Over Complex Roughness - Advancing the Predictive Capabilities of Large-Eddy Simulation</a>	K. Christensen, ND C. Pantano, UIUC
16:00-16:30	<a href="#">DNS of Compressible Turbulent Flows with Compliant Boundaries</a>	D. Bodony, UIUC
16:30-17:00	<a href="#">Nonlinear Transition Stages in Hypersonic Boundary Layers: Fundamental Physics, Transition Control and Receptivity</a>	H. Fasel, U of AZ
17:00	<b>MEETING ADJOURNED FOR THE DAY</b>	

Day 4 – Thursday, July 16, 2015		
Time	Topic	Speaker
7:45-8:00	Registration	
8:00-8:30	<a href="#">HIFiRE (Invited Talk)</a>	D. Dolvin, AFRL
<b>Session 7: Transition-2</b>		<b>Chair: R. Ponnappan, AFOSR/RTA</b>
8:30-9:00	<a href="#">The Role Of Kinetic Fluctuations in Laminar-Turbulent Transition of High-Speed Boundary-Layer Flows</a>	A. Tumin, U of AZ
9:00-9:30	<a href="#">New Approaches to Understanding Roughness-Induced Transition</a>	D. Goldstein, UT Austin E. White, TAMU
9:30-10:00	<a href="#">(YIP) Turbulent Boundary Layer Flows Over Sharp Aerodynamic Drag Transitions</a>	W. Anderson, UT Dallas
10:00-10:30	<a href="#">(YIP) The Influence of Multiple Interacting Primary Modes and Mode Representation on Hypersonic Boundary-layer Stability and Ttransition Prediction</a>	J. Kuehl, Baylor U
10:30-10:45	<b>BREAK</b>	
<b>Session 8: Labtask and Related Research</b>		<b>Chair: R. Kimmel, AFRL/RQ</b>
10:45-11:15	<a href="#">Measurement of Hypersonic Glide Vehicle Flow Fields</a>	R. Kimmel, AFRL/RQ
11:15-11:45	<a href="#">Global Transient Growth Mechanisms in High-Speed Flows with Application to the Elliptic Cone</a>	V. Theofilis, Madrid Spain
11:45-12:30 (45 mts)	<a href="#">Passive and Active Patterned Roughness for Cross-flow Transition Control at Mach 6</a>	T. Corke, UND T. McLaughlin, USAFA
12:30-13:45	<b>LUNCH</b>	
<b>Session 9 : Diagnostics/STTR Programs</b>		<b>Chair: M. Brown, AFRL/RQ</b>
13:45-14:15	<a href="#">(STTR) Shear Sensors for High Speed, High Temperature Flow Applications</a>	N. Hall, Silicon Audio Inc
14:15-14:45	<a href="#">(STTR) Highly-Resolved Wall-Shear-Stress Measurement in High Speed Flows</a>	T-A. Chen, Interdisciplinary Consulting Corp
14:45-15:15	<a href="#">Investigating Sensor Characteristics for Scramjet Engine Control</a>	M. Brown, AFRL/RQ
15:15-15:30	<b>BREAK</b>	
15:30-16:00	<a href="#">Understanding and Predicting Shockwave Turbulent Boundary Layer Interactions</a>	P. Martin, U of MD
16:00-16:30	<a href="#">Femtosecond Laser Electronic Excitation Tagging (FLEET) for Quantitative Measurements in Turbulent Flows</a>	D. Miles, Princeton U
16:30-17:00	Discussions	All
17:00	<b>REVIEW ADJOURN</b>	

[Group photo of attendees in front of UTSI](#)