2019 AFOSR/ONR/HVSI Hypersonic Aerothermodynamics Portfolios Review

Venue: **University of Colorado, Aerospace Engineering Sciences Building, 3775 Discovery Drive, University of Colorado Boulder, Boulder, CO 80309**

Day 1: Mon, 8 Jul 2019

Start	Stop	Time	Thrust Area	PI	ORGANIZATION	TITLE
06:30	08:00	90	**REGISTRATION**			
08:00	08:10	10		Ivett Leyva/ Eric Marineau	AFOSR / ONR	Welcome and Opening Remarks
08:10	12:00	230	MURI REVIEW	B. Argrow, U of Colorado D. Lawrence, U of Colorado G. Rieker, U of Colorado G. Candler, U of Minn. A. Barjatya, ERAU D. Fritts, GATS Inc.		Integrated Measurement and Modeling Characterization of Stratospheric Turbulence
12:00	12:25	25	STTR Review	A. Mangalam, TAO Systems S. Laurence, U of MD		Balloon-Based Disturbance Measurements in the Upper Atmosphere
12:25	13:25	60	**LUNCH**			
13:25	13:50	25	SBLI	P. Moin, Stanford U		Wall-Modeled LES for High-Speed Transitional Boundary-Layers Interacting with Incident Shock Waves
13:50	14:15	25	SBLI	J. Larsson, U of MD		The Effects of Strong Wall Cooling on Supersonic and Hypersonic Shock/Boundary-Layer Interactions
14:15	14:40	25	SBLI	A. Wagner, DLR Goettingen		Experimental Hypersonic SWBLI and Passive Hypersonic Transition Control
14:40	14:55	15	**BREAK**			
14:55	15:20	25	SBLI	P. Martin, U of MD		Flow Instability Analyses of Shock-Induced Separation Bubbles
15:20	15:45	25	SBLI	S. Laurence, U of MD		ONR - Experimental Investigation of Unsteadiness in Swept Hypersonic Shock-Wave / Boundary-Layer Interactions
15:45	16:10	25	SBLI	V. Narayanaswamy, NCSU		Investigation of SBLI to Unravel the Physics of Unstart in Axisymmetric Inlets
16:10	16:25	15	**BREAK**			
16:25	17:25	60	SBLI	F. Alvi, FSU D. Gaitonde, OSU N. Clemens, U of TX R. Kumar, FSU B. Thurow, Auburn		A Comprehensive Study of 3-D Shock/Turbulent Boundary Layer Interaction Physics Flow Morphology and System Dynamics through Imposed Disturbances

Day 2: Tue, 9 Jul 2019

Start	Stop	Time	Thrust Area	PI	ORGANIZATION	TITLE
07:30	08:00	30	**BADGING & COFFEE**			
08:00	08:25	25	SBLI	V. Theofilis, U of Liverpool		Global Modal and Non-Modal Instability Analyses of Shock-Induced Separation Bubbles
08:25	08:50	25	SBLI	J. Schmisseur, U of TN R. Glasby, U of TN C. Combs, U of TX		ONR - Characterization of the Strucutre and Dynamics of Transitional Shock/Boundary Layer Interactions
08:50	09:15	25	SBLI	J. Poggie, Purdue U		Unsteady Separation Mechanism and Mitigation
09:15	09:40	25	SBLI	R. Kumar, FAMU		A Comprehensive Study of Shock-wave-boundary-layer Interactions on Curved Surfaces
09:40	09:55	15	**BREAK**			
09:55	10:10	15	Transition	L. Alves, U Federal Fluminense		Instability Free Three-Dimensional Hypersonic Laminar Boundary Layer Steady-States for Linear and Nonlinear Stability Analyses
10:10	10:35	25	Transition	S. Smith, Howard U		The Effect of Multi-mode Induced Transition in a Hypersonic Boundary Layers
10:35	11:00	25	Transition	T. Juliano, U of ND		Plasma-Actuated Flow Control of Hypersonic Crossflow-Induced Boundary-Layer Transition in a Quiet Tunnel
11:00	11:25	25	Transition	S. Schneider, Purdue U		Experimental Studies of BL Instability and Transition in the M-6 Quiet Tunnel
11:25	12:25	60	**LUNCH**			
12:25	12:50	25	Transition	S. Schneider , Purdue U		ONR - Towards a mechanism-based procedure for predicting B/L transition on slender models with highly swept fins
12:50	13:15	25	Transition	S. Girimaji, TAMU		Non-linear Growth and Breakdown Toward Turbulence in Hypersonic BLs: Investigation of Fundamental Physical Mechamisms
13:15	13:30	15	Transition	C. Brehm, U of Kentucky		ONR - Numerical Investigations of Particle Interactions with Navy Relevant High-Speed Flows (YIP) (new start)
13:30	13:55	25	Transition	J. Poggie, Purdue U L. Duan, MUS&T		ONR - Predicting hypersonic laminar-turbulent transition with direct numerical simulation
13:55	14:10	15	**BREAK**			
14:10	14:35	25	Transition	J. Nichols, U of MN		ONR - Adjoint methods for understanding distributed induced transition in hypersonic B/L
14:35	15:00	25	Transition	D. Gaitonde, OSU		ONR - Understanding hypersonic transition mechanisms through interactions between hydrodynamic, acoustic and thermal mode
15:00	15:25	25	Transition	A. Tumin, U of AZ X. Zhong, UCLA		ONR - Real Gas Effects on Sound Radiation By Unstable Modes in Hypersonic Boundary Layers
15:25	*15:40*	*15*	***BREAK***			
15:40	16:05	25	Transition	H. Fasel, U of AZ		Numerical Investigation of Non-linear Transition Stages in Hypersonic Boundary Layers for Wind-Tunnel and Free-Flight Conditions
16:05	16:30	25	Transition	H. Fasel, U of AZ		ONR - Numerical investigations of the nonlinear transition stages in hypersonic boundary layers for Navy relevant mach numbers and model geometries
16:30	16:55	25	Transition	A. Wagner, DLR Goettingen		Boundary Layer Transition Control Using CC-SiC
16:55	17:25	30	Transition	C. Scalo, Purdue U		Direct Numerical Simulation of Hypersonic Transition Delay Over Carbon/Carbon Ultrasonically Absorptive Coatings (AFOSR) and Progress on Ultrasonic Benchtop Experiments (ONR)

Day 3: Wed, 10 Jul 2019

Start	Stop	Time	Thrust Area	PI	ORGANIZATION	TITLE
07:30	08:00	30	**BADGING & COFFEE**			
08:00	08:25	25	Transition	T. Corke, U of ND		High Reynolds Number Quiet Mach 6 Nozzle Fabrication and Natural Transition Experiments
08:25	08:40	15	Transition	T. Corke, Notre Dame		ONR - High Reynolds Number Quiet MACH 6 Swept-Fin Cone Experiments: Flow Instabilities and Transition Control (New Start)
08:40	09:05	25	Transition	A. Craig, U of AZ		ONR - Nonlinear interaction between first and Mack-mode instabilities in high-supersonic flow
09:05	09:30	25	Transition	A. Craig, U of AZ		ONR - Secondary Instabilities of Hypersonic Crossflow Vortices (YIP)
09:30	09:45	15	**BREAK**			
09:45	10:10	25	Transition	G. Candler, U of MN J. Nichols, U of MN		ONR - Input/Output Analysis of Complex Hypersonic Boundary Layers
10:10	10:35	25	Transition	R. Kimmel, AFRL/RQ		Laminar-to-Turbulent Transition in Hypersonic Boundary Layers with Spanwise Inhomogeneity
10:35	10:50	15	Transition	X. Zhong, UCLA		Development of 3-D Freestream Receptivity DNS Database for Hypersonic Flow over Spherical and Elliptical Cones (new start)
10:50	11:15	25	Transition	H. Reed, TAMU		ONR - Hypersonic Finned Cones
11:15	12:15	60	**LUNCH**			
12:15	12:40	25	Transition	N. Parziale, Stevens I Tech		Radiative and Dispersive Behavior of Instabilities in a Highly Cooled Hypersonic Boundary Layer
12:40	13:05	25	Transition	P. Moin, Stanford U		ONR - Global stability and sensitivity analysis of a hypersonic slender cone
13:05	13:30	25	Transition	T. Zaki, JHU		ONR - Nonlinear optimization in high-speed B/L: The most unstable nonlinear disturbances & robust flow design
13:30	13:45	15	TF	T. Zaki, JHU		Enhanced-Fidelity Predictions of Hypersonic Transition: Embedded Measurements and Optimal Sensing (new start)
13:45	14:00	15	**BREAK**			
14:00	14:25	25	TF	J. Chen, U of Buffalo		A Multiscale Morphing Continuum Analysis on Energy Cascade of Compressible Turbulence (YIP)
14:25	14:50	25	TF	J. Araya, U of PR K. Jansen, U of Colorado		Collaborative Research: Effects of wall curvature on hypersonic turbulent spatially-developing boundary layers
14:50	15:05	15	TF	C. Brehm, U of Kentucky P. Ireland, Oxford U N. Ashton, Oxford U		HVSI - Development of a RANS-Based Wall-Modeled LES Approach for Hypersonic Flows (new start)
15:05	15:20	15	**BREAK**			
15:20	15:35	15	TF	G. Candler, U of MN		HVSI - Development of Physics-Based Turbulence Models for Hypersonic Flows (new start)
15:35	15:50	15	TF	J. Komives, AFIT M. Reeder, AFIT K. Gross, AFIT		HSVI - Turbulence Modeling for Hypersonic Flows (new start)
15:50	16:05	15	TF	D. Gaitonde, OSU G. Candler, U of MN		HVSI - Reynolds-Averaged Navier-Stokes Based Turbulence Modeling for High-Speed Configurations (new start)
16:05	16:20	15	**BREAK**			
16:20	16:35	15	TF	J. Edwards, NCSU D. Stefanski, U of Tennessee		HVSI - Development of Improved RANS and Hybrid LES/RANS Turbulence Models for Hypersonic Flow Applications (new start)
16:35	16:50	15	TF	M. Semper, USAFA J. Seidel, USAFA		HVSI - Evaluation of State-of-the-Art Hypersonic Turbulence Modeling Using M = 6 Benchmark Experiments (new start)
16:50	17:05	15	TF	R. Bowersox, TAMU		ONR / HVSI - Hypersonic Turbulent Heat Transfer Prediction and Validation (new start)
17:05	17:20	15	TF	L. Duan, MUS&T		ONR - Simulation and Modeling of Hypersonic Turbulent Boundary Layers Subject to Pressure Gradient and Wall Cooling (new start

	Day 4: Thu, 11 Jul 2019					
Start	**Stop**	**Time**	**Thrust Area**	**PI**	**ORGANIZATION**	**TITLE**
07:30	08:00	30	**BADGING & COFFEE**			
08:00	08:25	25	TF	P. Subbareddy, NCSU		Structure and Modeling of Hypersonic Boundary Layers in Transitional and Turbulent Regimes
08:25	08:50	25	TF	B. McKeon, CalTech		Resolvent Analysis for Compressible Wall Turbulence
08:50	09:15	25	TF / NEE	A. Veeraragavan, U of Queensland		Examining Growth of Turbulence over Heated Walls in Hypersonic Flows / Rapidly Expanding Non-Equilibrium Hypersonic Flow
09:15	09:40	25	FSI	M. Spottswood, AFRL/RQ		Structural-Scale Modeling and Experiments for Hypersonic Vehicles
09:40	09:55	15	**BREAK**			
09:55	10:20	25	FSI	S. Laurence, U of MD D. Bodony, UIUC		An Experimental/Computational Investigation of the Response of a Compliant Panel to Turbulent and Transitional Shock-wave/Boundary-Layer Interactions in Hypersonic Flow
10:20	10:45	25	FSI	P. Tiso, ETH, Switzerland		Reduced Order Modeling for Hypersonic Aeroelasticity
10:45	11:10	25	FSI	D. Reasor, AFRL/RW		Multi-Physics Modeling and Analysis of Munitions in Extreme Environments
11:10	11:35	25	FSI	J. McNamara, OSU		Dynamics of Interactions Between Turbulent Boundary Layers and Compliant Surfaces
11:35	12:35	60	**LUNCH**			
12:35	13:00	25	FSI	D. Mavriplis, U of WY R. Fertig, U of WY M. Garnich, U of WY		ONR - Aero-Thermo-Servo-Elastic Analysis and Optimization for High Speed Vehicles
13:00	13:25	25	FSI	A. Neely, UNSW, Australia		Unit Cases to Investigate Hypersonic Fluid-Structure Interaction
13:25	13:40	15	FSI	V. Narayanaswamy, NCSU		Investigations of Structural and Aerodynamic coupling over panels and control surfaces of hypersonic vehicles
13:40	14:05	25	FSI	P. Hubner, U of AL		Luminescence-based Pressure and Strain Measurement for Fluid-structure Interactions
14:05	14:30	25	DFI	R. Miles, Princeton		Imaging Non-Equilibrium States in Hypersonic Flow by Slow Light Imaging Spectroscopy (SLIS)
14:30	14:45	15	**BREAK**			
14:45	15:10	25	DFI	N. Parziale, Stevens I Tech		Instantaneous Velocity Profiles of Wall-Bounded Shear Flows in Thermochemical Non-Equilibrium
15:10	15:35	25	DFI	S. Grib, AFRL/RQ		High-Repetition-Rate Imaging of Hypersonic Flow, Boundary-Layer Structures, and Velocity Profiles
15:35	16:00	25	DFI	J. Austin, Caltech J. Shepherd, Caltech H. Hornung, Caltech		ONR - Advancing transition experiments in high enthalpy flows
16:00	16:25	25	DFI	S. Schneider, Purdue U		ONR - Laminar flow control in hypersonic quiet nozzle using wall suction: feasibility studies
16:25	16:40	15	**BREAK**			
16:40	16:55	15	DFI	L. Maddalena, UTA		ONR - Arc-Jet Flow Characterization (new start)
16:55	17:10	15	Propulsion	S. Heister, Purdue C. Slabaugh, Purdue		ONR - Combustion in Solid Fuel Ramjets (New Start)
17:10	17:25	15	Propulsion	D. Kessler, NRL R. Johnson, NRL G. Goodwin, NRL		ONR - Combustion Behavior Within a Solid-Fuel Ramjet at High Altitudes (New Start)
17:25	17:50	25	Propulsion	T. Lee, UIUC V. Narayanaswamy, NCSU		Inlet Isolator and Combustion Physics at Take-Over Region of Scramjet Engines
	Day 5: Fri, 12 Jul 2019					
Start	**Stop**	**Time**	**Thrust Area**	**PI**	**ORGANIZATION**	**TITLE**
07:30	08:00	30	**BADGING & COFFEE**			
08:00	08:15	15	NEE	D. Levin, UIUC		Formulation of a General Collisional-Radiative Model for NO to Study Non-Equilibrium, Hypersonic Flows (new start)
08:15	08:40	25	NEE	P. Schmid, Imperial College		Sensitivity to Model Parameters and Roughness in Finite-Rate Reacting Hypersonic Flows
08:40	09:05	25	NEE	I. Wysong, AFRL/RQ		Determination of Key Physics for Nonequilibrium Modeling of Hypersonic Air
09:05	09:30	25	NEE	T. Schwartzentruber, U of MN G. Candler, U on MN D. Truhlar, U on MN		Nonequilibrium Kinetics in High-Enthalpy Air
09:30	09:45	15	**BREAK**			
09:45	10:10	25	NEE	D. Donzis, TAMU		Turbulence Control Through Thermal Non-Equilibrium: Molecular Relaxation Models and Implications for Turbulence
10:10	10:35	25	NEE	I. Boyd, U of MI		Multi-Step Computational Modeling and Shock-Tube Study of Energy Transfer Processes in High-Enthalpy Air
10:35	11:00	25	NEE	I. Adamovich, OSU		Molecular Energy Transfer Processes in Non-Equilibrium Hypersonic Flows
11:00	11:25	25	NEE	E. Josyula, AFRL/RQ		Characterizing Energy Storage and Exchange Mechanisms for High-Speed ISR Missions
11:25	12:25	60	**LUNCH**			
12:25	12:40	15	NEE	J. Austin, Caltech T. Schwartzentruber, U of MN D. Truhlar, U of MN		Spectroscopic Measurements and Nonequilibrium Modeling for High-Enthalpy Air (new start)
12:40	12:55	15	NEE	L. Doherty, Oxford		Compressing and Expanding Non-Equilibrium Flows
12:55	13:20	25	NEE	M. Panesi, UIUC		Modeling of Non-Equilibrium Hypersonic Air Flows by means of Multi-Group Maximum Entropy Method
13:20	13:45	25	NEE	G. Candler, U of MN T. Schwartzentruber, U of MN		ONR - Hybrid DSMC/CFD Method Development for High Altitude Hypersonic Flows
13:45	14:10	25	NEE	G. Candler, U of MN		Validation of Hypersonic Flow Simulations via Molecular-Scale Physics
14:10	14:25	15	**BREAK**			
14:25	14:50	25	GSI	T. Schwartzentruber, U of MN		Nonequilibrium Gas-Surface Interactions at High Temperature
14:50	15:15	25	GSI	F. Panerai, UIUC		High-Fidelity Quantitative Measurements of Hypersonic Carbon Ablation (YIP)
15:15	15:40	25	GSI	I. Boyd, U of MI D. Fletcher, U of VT		ONR - Combined Computaitonal and Experimental Study of UHTCs for Thermal Protection of Hypersonic Vehicles
15:40	15:55	15	**BREAK**			
15:55	16:20	25	GSI	G. Bellas, VKI G. Grossir, VKI		Nonequilibrium Gas-Surface Interactions at High Temperature, VKI Plasmatron facility and MUTATION++ Library
16:20	16:45	25	GSI	J. Grana-Otero, U Kentucky		Carbon Oxidation in Extreme Evironments
16:45	17:10	25	GSI	K. Stephani, UIUC		Fundamental Energy Transfer Mechanisms in High Temperature Phonon-Mediated Gas-Surface Interactions (YIP)