



# 2022 AFOSR/ONR/HVSI Annual High-Speed Aerodynamics Portfolio Review

Drs. Sarah Popkin, Eric Marineau; Russ Cummings | July 18-22, 2022 | Caltech, CA - hybrid

## Agenda Day 1 | Monday, July 18, 2022

Time	Thrust Area	Title	PI/Organization
7:45	Zoom Login		
8:00-8:10	Welcome and Opening Remarks		Sarah Popkin, AFOSR / Eric Marineau, ONR / Russ Cummings, HVSI
8:10-8:15	DFI	Introduction to Diagnostics, Facilities and Instrumentation (DFI)	Program Officers
8:15-8:35	DFI	Mach Number Independent Hot-wire Anemometry	D. Camello Barros, Universite D'Aix-Marseille
8:35-8:55	DFI	Canonical Validation Experiments for Fundamental Hypersonic Aerodynamics	C. Limbach, TAMU
8:55-9:15	DFI	Imaging Non-Equilibrium States in Hypersonic Flow by Slow Light Imaging Spectroscopy (SLIS) (virtual)	R. Miles, TAMU
9:15-9:35	DFI	ONR - Forward Thomson Scattering for the Measurement of Weakly Ionized Plasmas in Hypersonic Flows (virtual)	R. Miles, TAMU
9:35-9:55	<b>BREAK</b>		
9:55-10:20	DFI	ONR - Arc-Jet Flow Characterization / Arc-Jet Freestream Turbulence Characterization and its Influence on Laminar Heating Augmentation in the Stagnation Region (new start)	L. Maddalena, UTA
10:20-10:40	DFI	ONR- Spectrally-Resolved Laser Diagnostics for High-Enthalpy Flow Sensing	R. Hanson, Stanford U.
10:40-11:00	DFI	ONR - Scaling and Structure in Transitional and Turbulent Hypervelocity Flows (YIP)	N. Parziale, Stevens
11:00-11:10	DFI	ONR - Development and Assessment of Detonation-Drivers for Hypervelocity Expansion Tube Ground Testing (new start)	J. Shepherd, Caltech
11:10-12:10	<b>LUNCH</b>		
12:10-12:15	SBLI	Introduction to Shock-Boundary Layer Interactions (SBLI)	Program Officers
12:15-12:35	SBLI	High-fidelity simulation of hypersonic three-dimensional shock/boundary layer interactions	S. Pirozzoli, Sapienza Rome
12:35-12:55	SBLI	Study of SWBLI on the STORT configuration (virtual)	A. Guelhan, DLR S. Willems, DLR
12:55-13:15	SBLI	Hypersonic Boundary-Layer Response to Localized Shock-Induced Vorticity (virtual)	M. Borg, AFRL/RQ
13:15-13:35	SBLI	Investigation of the effects of ablation-induced distributed roughness on shock-wave/boundary-layer (YIP)	C. Combs, UTSA

13:35-13:55	<b>BREAK</b>		
13:55-14:15	SBLI	Investigation of 3D Shockwave Boundary Layer Interaction and Related Phenomena for the STORT Flight Program	J. Little, U of Arizona
14:15-14:35	SBLI	ONR - A Comprehensive Investigation of Transitional Shock Boundary Layer Interaction Using Experiments, Simulations and Stability Theory	J. Little, U of Arizona
14:35-14:55	SBLI	ONR - Experimental Investigation of Unsteadiness in Swept Hypersonic Shock-Wave / Boundary-Layer Interactions (virtual)	S. Laurence, U of MD
14:55-15:15	SBLI	ONR - Characterization of the Structure and Dynamics of Transitional Shock/Boundary Layer Interactions	J. Schmisser, U of TN
15:15-15:25	SBLI	ONR - Improved Simulation of Internal and External Hypersonic Flows using High-Order Implicit Shock Tracking (YIP) (new start)	M. Zahr, Notre Dame
15:25-15:45	<b>BREAK</b>		
15:45-16:05	SBLI	ONR - Multi-scale Modeling of Unsteady Shock-Boundary Layer Hypersonic Flow Instabilities (virtual)	D. Levin, UIUC V. Theofilis, Numerical Modeling
16:05-16:25	SBLI	ONR - The Origin and Scaling of Low-Frequency Unsteadiness in Shock-Separated Boundary layers using DNS, LES and Input/Output Analyses	P. Martin, U of MD J. Nichols, UMin
16:25-16:45	SBLI	Experimental Hypersonic ShockWave Boundary Layer Interaction Studies on a Flat Plate at Elevated Surface Temperature	A. Wagner, DLR
16:45-17:05	DFI	Improved simultaneous mapping of pressure and strain for hypersonic FSI experiments	K. Talluru, UNSW, Australia
17:05-17:25	DFI	Non-Intrusive, Reliable, and Portable Laser Induced Breakdown Spectroscopy for Instantaneous Gas Composition and Density Measurements in High-Speed Flows	H. Do, Seoul National U
17:25	<b>MEETING ADJOURN</b>		

<b>Agenda Day 2   Tuesday, July 19, 2022</b>			
<b>Time</b>	<b>Thrust Area</b>	<b>Title</b>	<b>PI/Organization</b>
7:45	<b>Zoom Login</b>		
8:00-8:05	Transition	Introduction to Hypersonic Boundary Layer Transition	Program Officers
8:05-8:25	Transition	Instability Free Three-Dimensional Hypersonic Laminar Boundary Layer Steady-States for Linear and Nonlinear Stability Analyses	L. Alves, U Federal Fluminense

8:25-8:45	Transition	Receptivity of compressible boundary layers over porous walls	P. Ricco, Sheffield U
8:45-9:05	Transition	Experimental study of the effect of nose bluntness on hypersonic boundary-layer transition	A. Craig, U of AZ
9:05-9:25	Transition	Competing instability mechanisms in hypersonic boundary layers	J. Kuehl, U of Delaware
9:25-9:45	Transition	Effects of Thermal Gradients on Boundary Layer Transition Mechanisms	J. Kuehl, U of Delaware
9:45-10:05	<b>BREAK</b>		
10:05-10:25	Transition	Multi-mode Induced Transition in Hypersonic Boundary Layers	S. Smith, Howard U
10:25-10:45	Transition	Hypersonic boundary-layer transition on control surfaces with separation bubbles	S. Schneider, Purdue U
10:45-11:05	Transition	ONR - Towards a mechanism-based procedure for predicting B/L transition on slender models with highly swept fins	S. Schneider, Purdue U
11:05-11:25	Transition	ONR - Hypersonic Finned Cones	H. Reed, TAMU
11:25-11:50	Transition	ONR - A Numerical Investigation of Particle and Droplet Impingement for Hypersonic Flow Conditions Including Material Response Modeling / Numerical Investigations of Particle Interactions with Navy Relevant High-Speed Flows	C. Brehm, U of MD
11:50-12:50	<b>LUNCH</b>		
12:50-13:10	Transition	ONR - Input/Output Analysis of Complex Hypersonic Boundary Layers	J. Nichols, U of MN
13:10-13:30	Transition	ONR - Predicting hypersonic laminar-turbulent transition with direct numerical simulation	J. Poggie, Purdue U L. Duan, OSU
13:30-13:55	Transition	ONR - Understanding Hypersonic Transition Mechanisms through Interactions Between Hydrodynamic, Acoustic and Thermal Modes / Receptivity to Breakdown Mechanisms During Transition on Hypersonic Forebodies	D. Gaitonde, OSU
13:55-14:15	Transition	ONR - Transition Prediction and Control for Blunt Hypersonic Configurations with Hemispherical and Ogival Nostetips	P. Paredes Gonzalez, Nat. Inst. Of Aerospace
14:15-14:35	<b>BREAK</b>		
14:35-14:55	Transition	Novel Concepts for Transition Delay in Hypersonic Boundary Layers and their Optimization	P. Paredes Gonzalez, Nat. Inst. Of Aerospace
14:55-15:15	Transition	ONR - Wave Packets in High-Speed Boundary Layers	E. Kerschen, U of AZ
15:15-15:35	Transition	Numerical Investigation of Non-linear Transition Stages in Hypersonic Boundary Layers for Wind-Tunnel and Free-Flight Conditions	H. Fasel, U of AZ
15:35-15:55	Transition	HVSI - Development and Testing of RANS Transition Models for Hypersonic Boundary Layers	H. Fasel, U of AZ
15:55-16:05	Transition	ONR - Numerical Investigations of the Nonlinear Transition Stages in Boundary Layers for High Mach Numbers (new start)	H. Fasel, U of AZ

16:05-16:25	<b>BREAK</b>		
16:25-16:45	Transition	Radiative and Dispersive Behavior of Instabilities in a Highly Cooled Hypersonic Boundary Layer	N. Parziale, Stevens
16:45-17:05	Transition	Boundary Layer Transition (BOLT) Post-Flight Research and BOLT II Flight Test Support	B. Wheaton, JHU/APL
17:05-17:25	Transition	HVSI - Measuring the influence of wall-temperature ratio distribution on transition using optical diagnostics	S. O'Byrne, UNSW Canberra
17:25-17:45	SBLI	Nonlinear Flow Receptivity in Shock-Wave Boundary-Layer Interaction	G. Rigas, Imperial College
17:45	<b>MEETING ADJOURN</b>		

<b>Agenda Day 3   Wednesday, July 20, 2022</b>			
<b>Time</b>	<b>Thrust Area</b>	<b>Title</b>	<b>PI/Organization</b>
7:45	<b>Zoom Login</b>		
8:00-8:20	Transition	Direct numerical simulation of hypersonic boundary layer transition over distributed surface porosity (YIP)	C. Scalo, Purdue U
8:20-8:40	Transition	ONR - Measurement-infused simulations of hypersonic transition on cones with flares	T. Zaki, JHU
8:40-9:00	Transition	Enhanced-fidelity predictions of hypersonic transition: Embedded measurements and optimal sensing	T. Zaki, JHU
9:00-9:20	Transition	ONR - High Reynolds Number Quiet MACH 6 Swept-Fin Cone Experiments: Flow Instabilities and Transition Control	T. Corke, Notre Dame
9:20-9:40	<b>BREAK</b>		
9:40-10:00	Transition	ONR - Detailed Investigation of Hypersonic Instability, Breakdown, and Natural Transition under Quiet Flow with Simulated Ablation-Gas Injection	J. Jewell, Purdue U
10:00-10:20	Transition	ONR - One-way Navier-Stokes for transition prediction in high-speed boundary layers	T. Colonius, CalTech
10:20-10:40	Transition	ONR - Assessment of Hypersonic Transition and Turbulent Heating	D. Araya, APL N. Bitter, APL
10:40-11:00	Transition	Development of 3-D Freestream Receptivity DNS Data Base for Hypersonic Flow over Spherical and Elliptical Cones	X. Zhong, UCLA
11:00-11:20	Transition	HVSI - Hypersonic Transition Modeling Using an Amplification Factor Transport Equation	J. Coder, U of Tennessee
11:20-12:20	<b>LUNCH</b>		
12:20-12:25	TF	Introduction to Turbulent Flows (TF)	Program Officers

12:25-12:45	TF	HVSI - Double Cone Experiment in the X3 Expansion Tube	M. McGilvray, Oxford U
12:45-13:05	TF	ONR / HVSI - Hypersonic Turbulent Heat Transfer Prediction and Validation	R. Bowersox, TAMU
13:05-13:25	TF	Hypersonic Boundary Layer Turbulence (BOLT-II) Flight Test Experiment	R. Bowersox, TAMU
13:25-13:45	TF	HVSI - Development of a RANS-Based Wall-Modeled LES Approach for Hypersonic Flows	C. Brehm, U of MD P. Ireland, Oxford U M. McGilvray, Oxford U
13:45-14:05	TF	HVSI - Development of Improved RANS and Hybrid LES/RANS Turbulence Models for Hypersonic Flow Applications	J. Edwards, NCSU D. Stefanski, U of Tennessee
14:05-14:25	<b>BREAK</b>		
14:25-14:45	TF	HVSI - Evaluation of State-of-the-Art Hypersonic Turbulence Modeling Using M = 6 Benchmark Experiments (virtual)	M. Semper, USAFA J. Seidel, USAFA
14:45-15:05	TF	HVSI - Turbulence Modeling for Hypersonic Flows (virtual)	M. Reeder, AFIT K. Gross, AFIT
15:05-15:25	TF	HVSI - Development of Physics-Based Turbulence Models for Hypersonic Flows	G. Candler, U of MN
15:25-15:45	TF	ONR- A Quasi-Spectral Viscosity (QSV) Dynamic Large-Eddy Simulation Technique for Hypersonic Turbulence (YIP)	C. Scalo, Purdue U J. Larsson, U of MD
15:45-15:55	TF	Coherent structure assessment in high-speed crossflow jets (new start)	G. Araya, U of PR K. Jansen, U of CO
15:55-16:15	<b>BREAK</b>		
16:15-16:35	TF	Hypersonic Base Flow Characterization	R. Gosse, U of FL
16:35-16:55	TF	Uncertainty estimation in large eddy simulations of realistic hypersonic	J. Larsson, U of MD
16:55-17:15	TF	Examining Growth of Turbulence over Heated Walls in Hypersonic Flows	A. Veeraragavan, U of Queensland
17:15-17:35	TF	Advanced Ground Testing and Simulation of the Boundary Layer Transition (BOLT) Flight Experiment	A. Veeraragavan, U of Queensland
17:35	<b>MEETING ADJOURN</b>		

<b>Agenda Day 4   Thursday, July 21, 2022</b>			
Time	Thrust Area	Title	PI/Organization
7:45	Zoom Login		
8:00-8:20	TF	HVSI - Reynolds-Averaged Navier-Stokes Based Turbulence Modeling for High-Speed Configurations	D. Gaitonde, OSU G. Candler, U of MN

8:20-8:40	TF	ONR - Development of Hybrid Simulation Models for Heat Transport in Hypersonic Turbulent Flow (virtual)	P. Durbin, Iowa State U
8:40-9:00	TF	ONR - Simulation and Modeling of Hypersonic Turbulent Boundary Layers Subject to Pressure Gradient and Wall Cooling (virtual)	L. Duan, OSU
9:00-9:10	TF	ONR - Aero-Optical Studies of Mixing Flows at Supersonic and Hypersonic Speeds (new start)	S. Gordeyev, Notre Dame
9:10-9:30	TF	High-Altitude Turbulence and Particulate Measurements Near the BOLT-II Flight Trajectory	B. Argrow, U of Colorado
9:30-9:50	<b>BREAK</b>		
9:50-10:10	TF	Collaborative Research: Effects of wall curvature on hypersonic turbulent spatially-developing boundary layers (virtual)	G. Araya, U of PR K. Jansen, U of Colorado
10:10-10:30	TF	Research in Support of Flight Experiment BoLT 2: Simulations and Characterization of the Turbulent Flow Regime	P. Martin, U of MD
10:30-10:50	TF	DNS and Constrained Nonlinear Analysis of the BOLT-II Flight Experiment	G. Candler, U of MN
10:50-11:10	TF	Absolute Instability of Interacting Planar Mixing Layers and Wakes / Influence of Mach number, non-adiabatic walls and nonlinear interactions in resolvent analysis of compressible turbulent boundary layers	B. McKeon, CalTech
11:10-12:10	<b>LUNCH / AFRL Workforce Outreach – B. Smarslok, AFRL/RQ</b>		
12:10-12:15	Propulsion	Introduction to High Speed Propulsion	Program Officers
12:15-12:35	Propulsion	ONR - Combustion in Solid Fuel Ramjets	C. Slabaugh, Purdue U
12:35-12:55	Propulsion	ONR - Transport Physics in Reacting Turbulent Boundary Layers	C. Slabaugh, Purdue U
12:55-13:15	Propulsion	ONR - Combustion Behavior Within a Solid-Fuel Ramjet at High Altitudes	D. Kessler, NRL
13:15-13:35	Propulsion	ONR - Experimental and Numerical Investigation on the Combustion Characteristics of Solid Fuels in Supersonic Combustors	G. Young, Virginia Tech
13:35-13:45	Propulsion	ONR - Mach 4 Inlet Unstart Investigation and Mitigation with Self Energizing Vortex Generating Jets (new start)	G. Hobson, NPS
13:45-14:05	<b>BREAK</b>		
14:05-14:15	Propulsion	ONR - Active Mitigation of Unstart in Scramjets (new start)	R. Acharya, UTSI
14:15-14:25	Propulsion	ONR - High Fidelity Modeling of Hypersonic Air-Breathing Propulsion (new start)	T. Taylor, APL
14:25-14:35	Propulsion	ONR - Optimized Simulations of High-Speed Turbulent Combustion (new start)	G. Candler, U of MN
14:35-14:45	Propulsion	ONR - Data-Driven Input-Output Models for Reacting, High-Enthalpy Flows (new start)	B. McKeon, CalTech
14:45-14:55	Propulsion	ONR - High Fidelity Simulations of Combustion in High-Speed Propulsion Engines (new start)	R. Johnson, NRL

14:55-15:05	Propulsion	ONR - Integration of Physics-Based and Data-Driven Turbulent Combustion Models in the JENRE® Multiphysics Framework and Computational Performance Analysis (new start) (virtual)	P. Pal, ANL T. Dunn, LLNL
15:05-15:10	GSI	Introduction to Gas-Surface Interaction (GSI)	Program Officers
15:10-15:30	GSI	High-Fidelity Quantitative Measurements of Hypersonic Carbon Ablation (YIP)	F. Panerai, UIUC
15:30-15:40	GSI	Surface catalytic recombination on carbon-based TPS materials (new start)	K. Stephani, UIUC
15:40-16:05	GSI	ONR - Combined Computational and Experimental Study of UHTCs for Thermal Protection of Hypersonic Vehicles	I. Boyd, U of Colorado D. Fletcher, U of VT
16:05-16:25	<b>BREAK</b>		
16:25-16:30	NEE	Introduction in Non-Equilibrium Effects (NEE)	Program Officers
16:30-16:50	NEE	Fundamental non-equilibrium experiments for hypersonic flight	M. McGilvray, Oxford U
16:50-17:10	NEE	Study of Non-equilibrium Wakes Model	T. McIntyre, U of Queensland
17:10-17:30	NEE	Wall Temperature and Bluntness Effects in High Enthalpy Hypersonic Separated Flows	S. Gai, UNSW, Australia
17:30-17:40	NEE	ONR - Experimental Study of Non-Equilibrium Turbulence-Chemistry Interaction in External Hypersonic Flows (new start)	A. Veeraragavan, U of Queensland
17:40	<b>MEETING ADJOURN</b>		

<b>Agenda Day 5   Friday, July 22, 2022</b>			
Time	Thrust Area	Title	PI/Organization
7:45	<b>Zoom Login</b>		
8:00-8:10	NEE	ONR - Deep Learning Closure of Non-Equilibrium Fluid Mechanics (new star)	J. MacArt, Notre Dame
8:10-8:30	NEE	Sensitivity to model parameters in finite-rate reacting hypersonic flows	P. Schmid, Imperial College
8:30-8:50	NEE	Molecular processes at the extreme temperatures relevant for the hypersonic flight regime	O. Denis Alpizar, Universidad Autonoma de Chile
8:50-9:10	NEE	Reactive Collisions and Final State Analysis of C- and O-Involving Reactions	M. Meuwly, Univ. of Basel
9:10-9:30	NEE	Investigation of thermal non-equilibrium effects in rapid flow expansions	O. Chazot, VKI
9:30-9:50	NEE	Evaluation of Aerothermochemistry Models Through Sensitivity Analysis and Low-Uncertainty Experiments	I. Boyd, U of CO

9:50-10:10	<b>BREAK</b>		
10:10-10:30	NEE	Quantification and Mitigation of Thermochemical Non-Equilibrium in High-Enthalpy Hypersonic Wind Tunnels	D. Baccarella, U of TN
10:30-10:50	NEE	Formulation of a General Collisional-Radiative Model for NO to Study Non-Equilibrium, Hypersonic Flows (virtual)	D. Levin, UIUC
10:50-11:10	NEE	Modeling of Recombination in Hypersonic Flows: A Combined Theoretical and Experimental Approach	M. Panesi, UIUC
11:10-11:40	NEE	Spectroscopic Measurements and Nonequilibrium Modeling for High-Enthalpy Air / Spectroscopic Measurements for Recombination Modeling in High-Enthalpy Expanding	J. Austin, Caltech
11:40-12:00	NEE	Energy Exchanges and Transport Phenomena in Aerothermodynamics of High-Speed Platforms	A. Verhoff, AFRL/RQ M. Brown, AFRL/RQ
12:00-12:20	NEE	Determination of Key Physics for Nonequilibrium Modeling of Hypersonic Air (virtual)	S. Gimelshein, USC
12:20-13:20	<b>LUNCH</b>		
13:20-13:25	FSI	Introduction to Fluid Structure Interactions (FSI)	Program Officers
13:25-13:45	FSI	Aeroelastic Characterization of Thin-Panel Structures in High Speed Flow	S. Peltier, AFRL/RQ D. Reasor, AFRL/RW
13:45-14:05	FSI	Fluid Structural Thermal Interactions (FSTI) in Hypersonic Flow	V. Narayanaswamy, NCSU E. Dowell, Duke J. Oefelin, Georgia Tech
14:05-14:25	FSI	Decoding fluid-structural coupling during shock-boundary layer interactions acting on compliant surfaces (virtual)	J. McNamara, OSU
14:25-14:45	FSI	An Experimental/Computational Investigation of the Response of a Compliant Panel to Turbulent and Transitional Shock-wave/Boundary-Layer Interactions in Hypersonic Flow (virtual)	S. Laurence, U of MD
14:45-15:05	FSI	Luminescence-based Pressure and Strain Measurement for Fluid-structure Interactions	P. Hubner, U of Alabama
15:05-15:25	<b>BREAK</b>		
15:25-15:45	FSI	The Role of Cavitation in Droplet Breakup: Understanding and Predicting Hypersonic Structural Loading through Multiscale Simulations and Shock-tube Experimentation (virtual)	S. Grace, Boston U
15:45-16:05	FSI	Aerothermoelastic Experiments and Simulation of High-Speed Vehicle Structures	S.M. Spottswood, AFRL/RQ
16:05-16:15	FSI	Measurement and Modeling of an Oblique Shock Grazing a Compliant Panel (new start)	D. Bodony, UIUC
16:15-16:35	FSI	ONR - Fluid-thermal-structure Interaction of a Finned Model at Mach 6	D. Bodony, UIUC
16:35-16:55	FSI	ONR - Peridynamic Modeling Development for High Velocity Weather Encounter Damage	I. Guven, VA Commonwealth U
16:55-17:55	FSI	Unit Cases to Investigate Hypersonic Fluid-Structure Interaction	A. Neely, UNSW, Australia

17:55

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