Curriculum Vitae

Lian Duan

Contact Information

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Education

- Ph.D. in Mechanical and Aerospace Engineering, May 2011
  Princeton University, Princeton, NJ, USA
  Doctoral Advisor: M. Pino Martín
  Dissertation Title: *DNS of Hypersonic Turbulent Boundary Layers*

- M.A. in Mechanical and Aerospace Engineering, April 2008
  Princeton University, Princeton, NJ, USA

- B.E. in Engineering Mechanics, July 2005
  Beihang University (BUAA), Beijing, China

Research Areas

- Direct numerical simulation (DNS) and large eddy simulation (LES)
- High-speed transitional and turbulent flows
- Aerothermodynamics and high-temperature gas dynamics
- Automotive aerodynamics and aeroacoustics
- Large-scale, high-performance computing

Academic Positions

- **Associate Professor**, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, OH, USA (September 2019 - present)

- **Honda Endowed Chair in Transportation**, College of Engineering, The Ohio State University, Columbus, OH, USA (September 2019 - present)

- **Assistant Professor**, Department of Mechanical and Aerospace Engineering, Missouri University of Science and Technology, Rolla, MO, USA (August 2013 - August 2019)

- **Research Scientist**, National Institute of Aerospace and Computational Aerosciences Branch, NASA Langley Research Center, Hampton, VA (November 2010 - July 2013)

- **Graduate Research Assistant**, Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ, USA (September 2005 - October 2010)

- **Visiting Graduate Research Assistant**, Department of Aerospace Engineering, University of Maryland, College Park, MD, USA (September 2009 - October 2010)

Awards and Honors

- Honda Chair in Transportation (September 2019 - Present)
  (An Endowed Chair position is one of the highest academic honors that can be bestowed on a faculty member by the College of Engineering of The Ohio State University)
- Team Member, NATO STO AVT Panel Excellence Award for AVT-240: "Hypersonic Boundary-Layer Transition Prediction", 2019
- Henry J. E. Reid Award, 3rd place winner, 2017
  (The H. J. E. Reid Award is NASA Langley's top award recognizing technical excellence in research publications)
- Air Force Research Lab Summer Faculty Fellowship, 2016
- AIAA St. Louis Section Young Professional Engineer Award, 2015
- Wright Patterson AFB Summer Visiting Faculty, 2015
- AFOSR Young Investigator Program (YIP) Award, 2014
- Fluid Dynamics Year in Review Highlight, AIAA Magazine Aerospace America, 2013 & 2016
- AIAA Hampton Roads Section Laurence J. Bement Award for Young Professional Paper Competition (1st place winner), 2012
- Crocco Award for Teaching Excellence, Princeton University, 2008
- Princeton University Graduate Fellowship, 2005-2006

Grants and Contracts Awarded
(Investigator portion totaling $2,542,013)

1. Proposal Title: "Simulation and Modeling of Hypersonic Turbulent Boundary Layers Subject to Pressure Gradient and Wall Cooling". Sponsor: Office of Naval Research. Total Amount: $257,833. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: April 1, 2020 - March 31, 2023.

2. Proposal Title: "CBET-EPSRC: Transition and Turbulence in Compressible Boundary Layers Subjected to Concave Surface Curvature". Sponsor: National Science Foundation. Total Amount: $264,990. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: May 15, 2019 - April 30, 2022.

3. Proposal Title: "Predicting Hypersonic Laminar-Turbulent Transition with Direct Numerical Simulation". Sponsor: Office of Naval Research. Total Amount: $932,402, Responsibility: Co-PI (Duan's Share 45%, $423,238). (Project PI: Jonathan Poggie, Purdue University). Status: Awarded. Duration: June 1, 2017 - May 31, 2022.

4. Proposal Title: "DNS Computations of Turbulent Pressure Fluctuations on a Cone in a Wind Tunnel". Sponsor: Sandia National Laboratories, Albuquerque, NM. Total Amount: $200,000. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: March 16, 2018 - September 30, 2021.

5. Proposal Title: "Interaction of a Shock Wave with a Homogeneous Field of Acoustic Waves: Theory and Simulation". Sponsor: National Science Foundation. Total Amount: $259,910. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: September 1, 2017 - August 31, 2021.

6. Proposal Title: "Automated Design and Prediction Tool (ADAPT) for Aerial Mobility Vehicles". Sponsor: Air Force STTR Phase I (through Bihrle Applied Research Inc.) Total Amount: $45,000. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: January 1, 2021 - June 30, 2021.

7. Proposal Title: "CFD Predictions for SUV-related Vehicle Aerodynamics and Throb/Greenhouse Noise". Sponsor: Honda R&D Americas, Inc.. Total Amount: $200,000. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: July 1, 2020 - June 30, 2021.

8. Proposal Title: "Assessment of CFD Methods for External Vehicle Aerodynamics and Aeroacoustics". Sponsor: Honda R&D Americas, Inc.. Total Amount: $199,949. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: September 1, 2019 - June 30, 2020.

9. Proposal Title: "Experimental Program to Stimulate Competitive Research (EPSCoR) - (RID) - Direct Numerical Simulation of Acoustic Disturbance in High-Speed Wind Tunnel". Sponsor: NASA Goddard Space Flight Center. Total Amount: $10,000. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: October 1, 2017 - May 5, 2019.

10. Proposal Title: "Direct Numerical Simulation of Receptivity to Roughness in a Swept-Wing Boundary Layer". Sponsor: NASA Langley Research Center (through the National Institute of Aerospace). Total Amount: $29,977. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: September 12, 2016 - October 31, 2018.

11. Proposal Title: "DNS of Pressure Fluctuations Induced by Supersonic Turbulent Boundary Layers". Sponsor: National Science Foundation (ACI-1640865). Total Amount: $6,326 + 8.0 M node-hours on the Blue Waters supercomputer. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: September 1, 2016 - August 31, 2019.

12. Proposal Title: "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layers Transition". Sponsor: Air Force Office of Scientific Research. Total Amount: $395,485. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: July 1, 2014 - June 30, 2017.

13. Proposal Title: "Numerical Simulation of Transitional and Turbulent Flows". Sponsor: NASA Langley Research Center (through the National Institute of Aerospace). Total Amount: $78,658. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: August 1, 2013 - September 25, 2017.

14. Proposal Title: "GAANN: Doctoral Research and Training in Mechatronics". Sponsor: Department of Education. Total Amount: $887,202. Responsibility: Co-PI. (Share 7%, PI: Douglas Bristow, Missouri S&T) Status: Awarded. Duration: September 1, 2015 - August 31, 2018.

15. Proposal Title: "Numerical Simulation of Shock Tunnel Acoustics Interaction and its Effect on Hypersonic Boundary Layer Transition". Sponsor: Air Force Research Laboratory (through the Universal Technology Corporation). Total Amount: $18,558, Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: May 27, 2015 - July 29, 2015.

16. Proposal Title: "IRAD: Higher-Order RANS Turbulence Models for Separated Flow Prediction". Sponsor: NASA Langley Research Center (through the National Institute of Aerospace).

Total Amount: $43,215, Responsibility: Institutional PI. (Share 100%) Status: Awarded. Duration: February 6, 2015 - September 30, 2015.

17. Proposal Title: "Acoustic Radiation from Turbulent Boundary Layer at High Mach Number". Sponsor: NASA Langley Research Center (through the National Institute of Aerospace). Total Amount: $12,822. Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: February 1, 2014 - December 15, 2014.

18. Proposal Title: "Energy Harvesting and Flow Control using Piezo-Riblets". Sponsor: University of Missouri Research Board. Total Amount: $33,878, Responsibility: Sole PI. (Share 100%) Status: Awarded. Duration: August 12, 2014 - August 11, 2015.

Refereed Journal Papers

(21 published Google Scholar Profile: Citations: 952 (740 since 2016); h-index: 16 (14 since 2016); i10-index: 25 (19 since 2016) *students supervised)

1. H. Xiao, J.-L. Wu, S. Laizet, and **L. Duan**, "Flows Over Periodic Hills of Parameterized Geometries: A Dataset for Data-Driven Turbulence Modeling From Direct Simulations", Computers and Fluids, vol. 200, 104431, 2020.
2. J.-X. Wang, J. Huang*, and **L. Duan**, and H. Xiao, "Prediction of Reynolds Stresses in High-Mach-Number Turbulent Boundary Layers using Physics-Informed Machine Learning", *Theoretical and Computational Fluid Dynamics*, vol. 33, Issue 1, pp. 1-19, 2019.
3. **L. Duan**, M. M. Choudhari, A. Chou, F. Munoz, R. Radespiel, T. Schilden, W. Schröder, E. C. Marineau, K. M. Casper, R. S. Chaudhry, G. V. Candler, K. A. Gray, and S. P. Schneider, "Characterization of Freestream Disturbances in Conventional Hypersonic Wind Tunnels", *Journal of Spacecraft and Rockets*, Vol. 56, No. 2, pp. 357-368, 2019 (**Invited**).
4. J. Huang*, J. Bretzke* and **L. Duan**, "Assessment of Turbulence Models in a Hypersonic Cold-Wall Turbulent Boundary Layer", *Fluids*, vol. 4, No. 1, pp. 37-46, 2019.
5. C. Zhang*, **L. Duan** and M. M. Choudhari, "Direct Numerical Simulation Database for Supersonic and Hypersonic Turbulent Boundary Layers", *AIAA Journal*, vol. 56, No. 11, pp. 4297-4311, 2018.
6. R. Saini, N. Karimi, **L. Duan**, A. Sadiki, and A. Mehdizadeh, "Effects of Near Wall Modeling in the Improved-Delayed-Detached-Eddy-Simulation (IDDES) Methodology", *Entropy*, Vol. 20, no. 10, pp. 771, 2018.
7. C. Zhang*, **L. Duan** and M. M. Choudhari, "Effect of Wall Cooling on Boundary-Layer-Induced Pressure Fluctuations at Mach 6", *Journal of Fluid Mechanics*, vol. 822, pp. 5-30, 2017.
8. F. Li, M. M. Choudhari, P. Paredes-Gonzalez, and **L. Duan**, "High-Frequency Instabilities of Stationary Crossflow Vortices in a Hypersonic Boundary Layer", *Physical Review Fluids*, vol. 1, 053603, 2016.
9. **L. Duan**, M. M. Choudhari and C. Zhang*, "Pressure Fluctuations induced by a Hypersonic Turbulent Boundary Layer", *Journal of Fluid Mechanics*, vol. 804, pp. 578-607, 2016.
10. F. Li, M. M. Choudhari, **L. Duan**, and C-L Chang, "Nonlinear Development and Secondary Instability of Traveling Crossflow Vortices", *Physics of Fluids*, vol. 26, 064104, 2014.
11. **L. Duan**, M. M. Choudhari and M. Wu, "Numerical Study of Acoustic Radiation due to a Supersonic Turbulent Boundary Layer", *Journal of Fluid Mechanics*, vol. 746, pp. 165-192, 2014. (**Third place winner of 2017 Henry J. E. Reid Award, NASA Langley's top award recognizing technical excellence in research publications**)
12. **L. Duan**, A. M. Feldick, M. P. Martín, M. F. Modest and D. A. Levin, "Study of Turbulence-Radiation Interaction in Hypersonic Turbulent Boundary Layers", *AIAA Journal*, vol. 50, no. 2, pp. 447-453, 2012.

13. **L. Duan** and M. P. Martín, "Direct Numerical Simulation of Hypersonic Turbulent Boundary Layers. Part 4: Effect of high enthalpy", *Journal of Fluid Mechanics*, vol. 684, pp. 25-59, 2011.
14. **L. Duan**, I. Beekman and M. P. Martín, "Direct Numerical Simulation of Hypersonic Turbulent Boundary Layers. Part 3: Effect of Mach number", *Journal of Fluid Mechanics*, vol. 672, pp. 245-267, 2011.
15. **L. Duan** and M. P. Martín, "An Effective Approach for Estimating Turbulence-chemistry Interaction in Hypersonic Turbulent Boundary Layers ", *AIAA Journal*, vol. 49, no. 10, pp. 2239-2247, 2011.
16. **L. Duan**, M. P. Martín, I. Sohn, D. A. Levin and M. F. Modest, "Study of Emission Turbulence-radiation Interaction in Hypersonic Turbulent Boundary Layers", *AIAA Journal*, vol. 49, no. 2, pp. 340-348, 2011.
17. **L. Duan** and M. P. Martín, "Assessment of Turbulence-chemistry Interaction in Hypersonic Turbulent Boundary Layers ", *AIAA Journal*, vol. 49, no. 1, pp. 172-184, 2011.
18. **L. Duan**, I. Beekman, and M. P. Martín, "Direct Numerical Simulation of Hypersonic Turbulent Boundary Layers. Part 2: Effect of Wall Temperature", *Journal of Fluid Mechanics*, vol. 655, pp. 419-445, 2010.
19. D. A. Pejaković, J. Marschall, **L. Duan** and M. P. Martín, "Direct Detection of Nitric Oxide Produced in the $O + N \rightarrow NO$ Surface Reaction on Quart from 298 to 1200 K ", *Journal of Thermophysics and Heat Transfer*, vol. 24, no. 3, pp. 603-611, 2010.
20. **L. Duan** and M. P. Martín, "Procedure to Validate Direct Numerical Simulations of Wall-bounded Turbulence including Finite-rate Reactions", *AIAA Journal*, vol. 47, no. 1, pp. 244-251, 2009.
21. D. A. Pejaković, J. Marschall, **L. Duan** and M. P. Martín, "Nitric Oxide Production from Surface Recombination of Oxygen and Nitrogen Atoms ", *Journal of Thermophysics and Heat Transfer*, vol. 22, no. 2. pp. 178-186, 2008.

Refereed Conference Papers and Reports
(46 in total; *students and # postdocs supervised)

1. G. L. Nicholson*, J. Huang*, **L. Duan**, M. M. Choudhari, and R. Bowersox, "Simulation and Modeling of Hypersonic Turbulent Boundary Layers Subject to Favorable Pressure Gradients due to Streamline Curvature", AIAA Paper 2021-1672, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2021.
2. C. Prasad, J. Huang*, **L. Duan**, and D. V. Gaitonde, "On the Nature of Freestream Disturbances in a Two-Dimensional Supersonic Test Section", AIAA Paper 2021-0162, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2021.
3. M. Aultman*, R. Auza-Guiterrez, Z. Wang, and **L. Duan**, "Characterization of the Flow Past the Fastback DrivAer Automotive Model Using Unsteady Simulations", AIAA Paper 2021-1329, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2021.
4. J. Huang*, **L. Duan**, K. M. Casper, R. M. Wagnild, and N. P. Bitter, "Direct Numerical Simulation of Turbulent Pressure Fluctuations over a Cone at Mach 8", AIAA Paper 2020-1065, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2020.
5. N. Hildebrand, M. M. Choudhari, and **L. Duan**, "Direct Numerical Simulations of Acoustic Disturbances in Various Rectangular Nozzle Configurations", AIAA Paper 2020-0587, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2020.
6. J. Huang*, G. L. Nicholson*, **L. Duan**, M. M. Choudhari, and R. Bowersox, "Simulation and Modeling of Cold-Wall Hypersonic Turbulent Boundary Layers on Flat Plate", AIAA Paper 2020-0571, AIAA SciTech Forum and Exposition, Orlando, FL, January, 2020.

7. F. Munoz, J. Wu, R. Radespiel, M. T. Semper, R. M. Cummings, T. Schilden, and **L. Duan**, "Freestream Disturbances Characterization in Ludwieg Tubes at Mach 6", AIAA Paper 2019-0878, AIAA SciTech Forum and Exposition, San Diego, CA, January, 2019.
8. M. M. Choudhari, F. Li, P. Paredes-Gonzalez, and **L. Duan**, "Effect of 3D Roughness Patch on Instability Amplification in a Supersonic Boundary Layer", AIAA Paper 2019-0877, AIAA SciTech Forum and Exposition, San Diego, CA, January, 2019.
9. **L. Duan**, G. L. Nicholson*, J. Huang*, K. M. Casper, R. M. Wagnild, and N. P. Bitter, "Direct Numerical Simulation of Nozzle-Wall Pressure Fluctuations in a Mach 8 Wind Tunnel", AIAA Paper 2019-0874, AIAA SciTech Forum and Exposition, San Diego, CA, January, 2019.
10. G. L. Nicholson*, **L. Duan**, M. R. Malik, and F. Li, "Stabilization of a Swept-Wing Boundary Layer by Discrete Roughness Elements at High Reynolds Numbers", AIAA Paper 2019-0334, AIAA SciTech Forum and Exposition, San Diego, CA, January, 2019.
11. G. L. Nicholson*, C. Zhang*, **L. Duan**, M. R. Malik, F. Li and A. Uzun, "Direct Numerical Simulation of Receptivity to Roughness in a Swept-Wing Boundary Layer at High Reynolds Numbers", AIAA Paper 2018-3076, AIAA AVIATION Forum, Atlanta, GA, June, 2018.
12. C. P. Deegan*, **L. Duan**, and M. M. Choudhari, "Direct Numerical Simulation of Acoustic Disturbances in the Rectangular Test Section of a Hypersonic Wind Tunnel", AIAA Paper 2018-3219, AIAA AVIATION Forum, Atlanta, GA, June, 2018.
13. **L. Duan**, M. M. Choudhari, A. Chou, R. F. Munoz, S. Ali, R. Radespiel, T. Schilden, W. Schröder, E. C. Marineau, K. M. Casper, R. S. Chaudhry, G. V. Candler, K. A. Gray, C. J. Sweeney and S. P. Schneider, "Characterization of Freestream Disturbances in Conventional Hypersonic Wind Tunnels", AIAA Paper 2018-0347, AIAA SciTech Forum and Exposition, Kissimmee, FL, January, 2018.
14. M. M. Choudhari, F. Li and P. Paredes-Gonzalez and **L. Duan**, "Nonlinear Evolution and Breakdown of Azimuthally Compact Crossflow Vortex Pattern over a Yawed Cone", AIAA Paper 2018-1823, AIAA SciTech Forum and Exposition, Kissimmee, FL, January, 2018.
15. F. Li, M. M. Choudhari, and **L. Duan**, "Stationary Crossflow Breakdown due to Interaction Between Secondary Instabilities", AIAA Paper 2017-4302, AIAA AVIATION Forum, Denver, CO, June, 2017.
16. M. M. Choudhari, F. Li, P. Paredes-Gonzalez, and **L. Duan**, "Computations of Crossflow Instability in Hypersonic Boundary Layers", AIAA Paper 2017-4300, AIAA AVIATION Forum, Denver, CO, June, 2017.
17. J. Huang*, **L. Duan**, and M. M. Choudhari, "Direct Numerical Simulation of Acoustic Noise Generation from the Nozzle Wall of a Hypersonic Wind Tunnel", AIAA Paper 2017-3631, AIAA AVIATION Forum, Denver, CO, June, 2017.
18. J. Huang*, **L. Duan**, and J. Wang, R. Sun and H. Xiao, "High-Mach-Number Turbulence Modeling using Machine Learning and Direct Numerical Simulation Database", AIAA Paper 2017-0315, AIAA Aerospace Sciences and Technology Forum and Exposition, Grapevine, TX, January, 2017.
19. J. Huang*, C. Zhang*, **L. Duan**, and M. M. Choudhari, "Direct Numerical Simulation of Hypersonic Turbulent Boundary Layer inside an Axisymmetric Nozzle", AIAA Paper 2017-0067, AIAA Aerospace Sciences and Technology Forum and Exposition, Grapevine, TX, January, 2017.
20. F. Li, M. M. Choudhari, and **L. Duan**, "Stationary Crossflow Breakdown due to Mixed Mode Spectra of Secondary Instabilities", AIAA Paper 2016-3789, 46th AIAA Fluid Dynamics Conference, Washington, D.C., June, 2016.
21. J. Huang*, C. Zhang*, and **L. Duan**, "Turbulent Inflow Generation for Direct Simulations of Hypersonic Turbulent Boundary Layers and their Freestream Acoustic Radiation", AIAA-2016-3639, 46th AIAA Fluid Dynamics Conference, Washington, D.C., June, 2016.

22. C. Zhang* and **L. Duan**, "Multivariate Statistics Analysis of the Pressure Field Induced by High-Speed Turbulent Boundary Layers", AIAA Paper 2016-3190, 46th AIAA Fluid Dynamics Conference, Washington, D.C., June, 2016.
23. C. Zhang*, **L. Duan** and M. M. Choudhari, "Acoustic Radiation from a Mach 14 Turbulent Boundary layer", AIAA Paper 2016-0048, AIAA Aerospace Sciences and Technology Forum and Exposition, San Diego, CA, January, 2016.
24. F. Li, M. M. Choudhari, P. Paredes-Gonzalez, and **L. Duan**, "Secondary Instability of Stationary Crossflow Vortices in Mach 6 Boundary Layer over a Circular Cone", NASA/TM-2015-218997, December, 2015.
25. J. Wei# and **L. Duan**, "Piezoelectric-Based Rotary Electrical energy generator for Harvesting Energy from Low and Highly Variable Rotary Motion", Proceedings of ASME 2015 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS2015), Colorado Springs, Colorado, September, 2015.
26. F. Li, M. M. Choudhari, and **L. Duan**, "Direct Numerical Simulation of Transition due to Traveling Crossflow Vortices", AIAA Paper 2015-2771, 45th AIAA Fluid Dynamics Conference, Dallas, TX, June, 2015.
27. C. Zhang* and **L. Duan**, "Acoustic Radiation from High-Speed Turbulent Boundary Layers in a Tunnel-like Environment", AIAA Paper 2015-0836, AIAA Aerospace Sciences and Technology Forum and Exposition , Kissimmee, FL, January, 2015.
28. **L. Duan**, M. M. Choudhari, and F. Li, "DNS of Laminar-Turbulent Transition in Swept-Wing Boundary Layers", Proceedings of the Summer Program, Center for Turbulence Research, Stanford University, 2014.
29. **L. Duan**, M. M. Choudhari, "Analysis of Numerical Simulation Database for Acoustic Radiation from High-Speed Turbulent Boundary Layers", AIAA Paper 2014-2912, 44th AIAA Fluid Dynamics Conference, Atlanta, GA, June, 2014.
30. **L. Duan**, M. M. Choudhari, "Direct Numerical Simulations of High-Speed Turbulent Boundary Layers over Riblets", AIAA Paper 2014-0934, AIAA Aerospace Sciences and Technology Forum and Exposition , National Harbor, MD, January, 2014.
31. F. Li, M. M. Choudhari, **L. Duan**, and C-L Chang, "Nonlinear Development and Secondary Instability of Traveling Crossflow Vortices", AIAA Paper 2014-1132, AIAA Aerospace Sciences and Technology Forum and Exposition, National Harbor, MD, January, 2014.
32. **L. Duan**, M. M. Choudhari, F. Li and M. Wu, "Direct Numerical Simulation of Transition in a Swept-Wing Boundary Layer", AIAA Paper 2013-2617, 43rd AIAA Fluid Dynamics Conference and Exhibit, San Diego, CA, June 2013.
33. M. M. Choudhari, F. Li, **L. Duan**, C.-L. Chang, M. Carpenter, C. Streett, M. R. Malik, "Towards Bridging the Gaps in Holistic Transition Prediction via Numerical Simulations", AIAA Paper 2013-2718, 43rd AIAA Fluid Dynamics Conference and Exhibit, San Diego, CA, June 2013.
34. H. Xiao, **L. Duan**, R. Sui, and T. Rosgen,"Experimental Investigations of Turbulent Wake Behind Porous Disks", Proceedings of the 1st Marine Energy Technology Symposium METS2013, Washington, DC, April, 2013.
35. **L. Duan**, M. M. Choudhari, "Numerical Study of Pressure Fluctuations due to a Mach 6 Turbulent Boundary Layer", AIAA Paper 2013-0532, 51st Aerospace Sciences Meeting, Grapevine, TX, January 2013.
36. **L. Duan**, M. M. Choudhari and M. Wu, "Numerical Study of Pressure Fluctuation Induced by High-Speed Turbulent Boundary Layers", AIAA Paper 2012-3070, 42nd AIAA Fluid Dynamics Conference and Exhibit, New Orleans, LA, June 2012.

37. **L. Duan** and M. M. Choudhari, "Effects of Riblets on Skin Friction and Heat Transfer in High-Speed Turbulent Boundary Layers", AIAA Paper 2012-1108, 50th AIAA Aerospace Science Meeting and Exhibit, Nashville, TN, January 2012.
38. **L. Duan** and M. P. Martín, "Study of Turbulence-chemistry Interaction in Hypersonic Turbulent Boundary Layers", AIAA Paper 2011-3217, 20th AIAA Computational Fluid Dynamics Conference, Honolulu, Hawaii, June 2011.
39. **L. Duan**, A. M. Feldick, M. P. Martín, M. F. Modest and D. A. Levin, "Study of Turbulence-radiation Interaction in Hypersonic Turbulent Boundary Layers", AIAA Paper 2011-0749, 49th AIAA Aerospace Science Meeting and Exhibit, Orlando, FL, January 2011.
40. **L. Duan** and M. P. Martín, "DNS of Hypersonic Turbulent Boundary Layers Varying Freestream Mach Number ", AIAA Paper 2010-0353, 48th AIAA Aerospace Science Meeting and Exhibit, Orlando, FL, January 2010.
41. A. Feldick, **L. Duan**, M. Modest, M. P. Martín and D. Levin, "Influence of Interactions between Turbulence and Radiation on Transmissivities in Hypersonic Turbulent Boundary Layers", AIAA Paper 2010-1185, 48th AIAA Aerospace Science Meeting and Exhibit, Orlando, FL, January 2010.
42. **L. Duan**, I. Sohn, N. Grube, M. P. Martín, D. Levin and M. Modest, "Effect of Turbulent Fluctuations on Radiative Heat Flux in Hypersonic Boundary Layers", AIAA Paper 2010-0354, 48th AIAA Aerospace Science Meeting and Exhibit, Orlando, FL, January 2010.
43. **L. Duan** and M. P. Martín, "Effect of Turbulence Fluctuations on Surface Heating Rate in Hypersonic Turbulent Boundary Layers", AIAA Paper 2009-4040, 39th AIAA Fluid Dynamics Conference, San Antonio, TX, June 2009.
44. **L. Duan** and M. P. Martín, "Effect of Finite-rate Chemical Reactions on Turbulence in Hypersonic Turbulent Boundary Layers", AIAA Paper 2009-0588, 47th AIAA Aerospace Science Meeting and Exhibit, Orlando, FL, January 2009.
45. **L. Duan** and M. P. Martín, "Validation of a DNS Code for Wall-bounded Turbulence including Finite-rate Reactions and Surface Catalysis", AIAA Paper 2008-0645, 46th AIAA Aerospace Science Meeting and Exhibit, Reno, NV, January 2008.
46. D. A. Pejaković, J. Marschall, **L. Duan** and M. P. Martín, "Nitric Oxide Production from Surface Recombination of Oxygen and Nitrogen Atoms", AIAA Paper 2008-1249, 46th AIAA Aerospace Science Meeting and Exhibit, Reno, NV, January 2008.

Additional Talks at National Technical Meetings
(*students and # postdocs supervised)

1. Yuchen Liu*, Gary Nicholson*, **L. Duan**, and Meelan Choudhari, "Turbulent Drag Reduction in High-Speed Boundary Layers via Riblets", AIAA SciTech Forum and Exposition, Orlando, FL, USA, January 8, 2020.

2. Junji Huang*, Gary Nicholson*, and **L. Duan**, "A Comparative Study of Inflow Turbulence Generation Methods for Hypersonic Boundary-Layer Flows", AIAA SciTech Forum and Exposition, Orlando, FL, USA, January 7, 2020.

3. Z. Wang* and **L. Duan**, "The Interaction of a Homogeneous Field of Acoustic Waves with a Shock Wave", American Physical Society 72nd Annual DFD Meeting, Seattle, WA, USA, November 23-26, 2019.

4. Y. Liu* and **L. Duan**, "The Interaction of a Homogeneous Field of Acoustic Waves with a Shock Wave", American Physical Society 72nd Annual DFD Meeting, Seattle, WA, USA, November 23-26, 2019.

5. J. Huang* and **L. Duan**, "Frequency-Wavenumber Spectrum of Pressure Fluctuations Induced by High-Speed Turbulent Boundary Layers", American Physical Society 72nd Annual DFD Meeting, Seattle, WA, USA, November 23-26, 2019.

6. C. Zhang*, **L. Duan** and S. L. Rani, "The Interaction of a Shock Wave with a Homogeneous Field of Acoustic Waves", American Physical Society 71st Annual DFD Meeting, Atlanta, GA, USA, November 17-20, 2018.

7. Y. Liu*, C. Zhang*, **L. Duan** and J.-X. Wang, "Recovery of Pre-shock Acoustic Disturbances From Post-shock Pitot Pressure Fluctuations", American Physical Society 71st Annual DFD Meeting, Atlanta, GA, USA, November 17-20, 2018.

8. J. Huang*, **L. Duan** and M. M. Choudhari, "Frequency-Wavenumber Spectrum of Acoustic Radiation from High-Speed Turbulent Boundary Layers", American Physical Society 71st Annual DFD Meeting, Atlanta, GA, USA, November 17-20, 2018.

9. C. Zhang* and **L. Duan**, "Interaction of a Shock Wave with a Homogeneous Field of Acoustic Waves", American Physical Society 70th Annual DFD Meeting, Denver, CO, USA, November 19-21, 2017.

10. J. Huang*, **L. Duan** and M. M. Choudhari, "Direct Numerical Simulation of Acoustic Noise Generation from the Nozzle Wall of a Hypersonic Wind Tunnel ", American Physical Society 70th Annual DFD Meeting, Denver, CO, USA, November 19-21, 2017.

11. J.-X. Wang, C. Zhang*, **L. Duan** and H. Xiao, "Inferring Pre-shock Acoustic Field From Post-shock Pitot Pressure Measurement", American Physical Society 70th Annual DFD Meeting, Denver, CO, USA, November 19-21, 2017.

12. **L. Duan**, "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layer Transition", 2017 AFOSR High Speed Aerodynamics Portfolio and ONR Hypersonics Portfolio Review Conference, NASA Langley Research Center, Hampton, VA, USA, July 24-27, 2017.

13. **L. Duan**, "Tackling Shock Tunnel-Acoustics Interaction through DNS and Linear Interaction Analysis ", AIAA Boundary Layer Transition Discussion Group Open Forum, AIAA AVIATION Forum, Denver, CO, USA, June 6, 2017.

14. **L. Duan**, "Direct Numerical Simulation of Pressure Fluctuations Induced by Supersonic Turbulent Boundary Layers ", 2017 Blue Waters Symposium, Sunriver, OR, USA, May 16-19, 2017.

15. **L. Duan** and M. M. Choudhari, "DNS of Freestream Acoustic Disturbances in Full-Scale Hypersonic Wind Tunnels", NATO STO AVT-240 Specialist Meeting on Hypersonic Boundary-Layer Transition Prediction, The University of Tennessee Space Institute, Tullahoma, TN, USA, April 9-10, 2017.

16. **L. Duan**, "Progress on simulations of tunnel acoustic noise and shock tunnel-acoustics interaction in conventional hypersonic wind tunnels", AIAA Boundary Layer Transition Discussion Group Open Forum, AIAA Aerospace Sciences and Technology Forum and Exposition, Grapevine, TX, January 11, 2017.

17. **L. Duan**, "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layer Transition", 2016 AFOSR High Speed Aerodynamics Portfolio and ONR Hypersonics Portfolio Review Conference, Arlington, VA, USA, June 27-30, 2016.

18. **L. Duan**, "Progress on Tunnel Noise Simulation and Modeling", NATO STO AVT-240 Specialist Meeting on Hypersonic Boundary-Layer Transition Prediction, University of Notre Dame, South Bend, IN, USA, April 11-12, 2016.

19. **L. Duan**, "Development of Acoustic Model for Receptivity in Conventional Hypersonic Wind Tunnels", AIAA Boundary Layer Transition Discussion Group Open Forum , San Diego, CA, USA, January 4-8, 2016.

20. C. Zhang*, **L. Duan** and M. M. Choudhari, "Acoustic Radiation from a Mach 14 Turbulent Boundary Layer", American Physical Society 68th Annual DFD Meeting, Boston, MA, USA, November 22-24, 2015.

21. **L. Duan**, "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layer Transition", 2015 AFOSR Aerothermodynamics/Turbulence and Transition Program Review Conference, The University of Tennessee Space Institute, Tullahoma, TN, USA, July 13-17, 2015.

22. **L. Duan**., "Direct Numerical Simulation for Laminar-to-Turbulent Transition Prediction", 1st Annual Meeting of SIAM Central States Section, Rolla, MO, April 11-12, 2015.

23. E. Jeyapaul# and **L. Duan**, "Predicting Riblet Performance Using Anisotropy-Resolving Turbulence Models", 1st Annual Meeting of SIAM Central States Section, Rolla, MO, April 11- 12, 2015.

24. C. Zhang* and **L. Duan**, "Radiation from Tunnel-Wall Turbulent Boundary Layers", 1st Annual Meeting of SIAM Central States Section, Rolla, MO, April 11-12, 2015.

25. **L. Duan**, "Simulation of Acoustic Radiation from Turbulent Boundary Layers at High Mach Numbers", NATO STO AVT-240 Specialist Meeting on Hypersonic Boundary-Layer Transition Prediction, Tucson, AZ, March 26-27, 2015.

26. **L. Duan**, "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layer Transition", AFOSR Aerothermodynamics/Turbulence and Transition Program Review, Arlington, VA, USA, July 15-17, 2014.

27. **L. Duan** "Numerical Simulation of Acoustic Radiation from Tunnel-Wall Turbulent Boundary Layers", NATO STO AVT-240 Specialist Meeting on Hypersonic Boundary-Layer Transition Prediction, U.S. Air Force Academy, Colorado Spring, CO, USA, April 3-4, 2014.

28. **L. Duan** and M. M. Choudhari, "Acoustic Radiation from High-Speed Turbulent Boundary Layers," 66th APS Division of Fluid Dynamics Meeting, Pittsburgh, PA, November, 2013.

29. **L. Duan**, M. M. Choudhari, F. Li and M. Wu, "Computations of Crossflow Transition in Swept Wing Boundary Layers", 65th APS Division of Fluid Dynamics Meeting, San Diego, CA, November, 2012.

30. **L. Duan** and M. P. Martín, "DNS of Turbulent Boundary Layers under High-enthalpy Conditions", 63rd APS Division of Fluid Dynamics Meeting, Long Beach, CA, 2010.

31. **L. Duan**, I. Beekman and M. P. Martín, "Effect of Wall Cooling in Hypersonic Turbulent Boundary Layers", 62nd APS Division of Fluid Dynamics Meeting, Minneapolis, MN, 2009.

32. **L. Duan** and M. P. Martín, "Direct Numerical Simulations of Reacting Boundary Layers", 61st APS Division of Fluid Dynamics Meeting, San Antonio, TX, 2008.

Invited Talks (*students and # postdocs supervised)

1. **L. Duan**, "Predictive Unsteady Simulations of High-Speed Turbulent Flows", Department of Mechanical Engineering, Texas Tech University, Lubbock, TX, USA, October 14, 2019.
2. **L. Duan**, "Pressure Fluctuations Induced by Hypersonic Turbulent Boundary Layers", Sandia National Laboratories, Albuquerque, NM, USA, August 12, 2019.
3. **L. Duan**, "Predictive Unsteady Simulations of High-Speed Turbulent Flows", Department of Mechanical Engineering, Stevens Institute of Technology, Hoboken, NJ, USA, November 2, 2017.
4. **L. Duan**, "Petascale Simulations of High-Speed Turbulent Flows", Department of Mechanical and Aerospace Engineering, The University of Missouri, Columbia, MO, USA, March 26, 2017.
5. **L. Duan**, "Numerical Simulation of Shock Tunnel-Acoustics Interaction and Its Effect on Hypersonic Boundary-Layer Transition", Air Force Research Laboratory, Dayton, OH, USA, August 05, 2015.
6. **L. Duan**, "Simulation of Acoustic Radiation from High-Speed Turbulent Boundary Layers", Technische Universität Braunschweig, Braunschweig, Germany, January 15, 2015.
7. **L. Duan**, "Numerical Simulation of Freestream Acoustic Disturbances in Hypersonic Ground Facilities and Their Effect on Boundary Layer Transition", Technische Universität München, München, Germany, January 13, 2015.

Teaching Experience

- **Instructor**, ME6505: Intermediate Fluid Dynamics, Autumn 2020, The Ohio State University.
- **Instructor**, ME7513/AAE7875: Turbulent Flows, Spring 2020 & 2021, The Ohio State University.
- **Instructor**, ME/AE 6135: Turbulent Flows, Spring 2016 & 2019, Missouri University of Science and Technology.
- **Instructor**, AE3131: Aerodynamics I, Fall 2014–2019, Missouri University of Science and Technology.
- **Instructor**, ME231: Thermo-Fluid Mechanics I, Fall 2013 & Spring 2014–2018, Missouri University of Science and Technology.
- **Assistant Instructor**, MAE501/APC501: Mathematical Methods of Engineering Analysis I, Fall 2007, Princeton University.
- **Assistant Instructor**, MAE433: Automatic Control Systems, Spring 2008, Princeton University.
- **Assistant Instructor**, MAE335: Fluid Dynamics, Fall 2008, Princeton University.

Current Student Advising

- Current PhD Students (six):
  - Junji Huang
  - Gary Nicholson
  - Yuchen Liu
  - Matthew Aultman
  - Colin Trussa (co-advised with Prof. Clifford Whitfield)
  - Brandon Teitelbaum (co-advised with Prof. Datta Gaitonde)

Former Student Advisees

- Former PhD Students (one):
  - Chao Zhang (PhD 2018, Missouri S&T), now postdoc at Argonne National Laboratory, Lemont, IL
- Former MS Students (two):
  - Jorge-Valentino Bretzke (MS 2020, Missouri S&T), now Aerospace Engineer at Naval Air Systems Command (NAVAIR), China Lake, CA
  - Andrew Taylor (MS 2018, Missouri S&T), now with NAVAIR, China Lake, CA
- Undergraduate Students (Fourteen at Missouri S&T):
  - Therese Galbraith, Yahya Abu-Hijleh, Timothy Victor, Jason Chau, Cole Deegan, Andrew Hinkle, Austin Foutch, Jinyu Wang, Daniel Jamrozik, Ryan Krattiger, Jason Chau, Brady Kuehl, Seth Spinner, Blake Coonrod

Professional Service

- Member, External Advisory Panel of CFD Validation Challenge, Sandia National Laboratories (2019 — Present)
- Organizing Committee, 2nd Automotive CFD Prediction Workshop (2020 — Present)
- AIAA Missouri S&T Student Branch Faculty Advisor (2017 — 2019)
- Member, Fluid Dynamics Technical Committee of AIAA (2012 — 2015)
- Associate Organizer, AIAA Computational Fluid Dynamics Conference (2012, 2014)
- Session Chairman, AIAA Aerospace Sciences (SciTech), Fluid Dynamics Conference (Aviation) (session chairman at 6 conferences in last 5 years)
- Reviewer for Journals: Journal of Fluid Mechanics, AIAA Journal, Physics of Fluids, Physical Review Fluids, Journal of Scientific Computing, Communications in Computational Physics, Theoretical and Computational Fluid Dynamics, Journal of Computational Physics, Flow, Turbulence and Combustion, International Journal of Thermal Science, Computer and Fluids
- Abstract reviewer for AIAA Conferences (6 AIAA conference abstract reviews in the last 5 years)
- Proposal reviewer for NSF, ONR, DoD NDSEG Fellowship, NASA Postdoctoral Program, NASA EPSCoR-Missouri, NASA EPSCoR-Vermont, Puerto Rico Science, Technology & Research Trust, The University of Texas at San Antonio

Professional Membership

- American Institute of Aeronautics and Astronautics (AIAA)
- American Physical Society (APS)
- American Society of Mechanical Engineers (ASME)
- Society for Industrial and Applied Mathematics (SIAM)
- Society of Automotive Engineers (SAE)