Colin A. Z. Towery

PhD Candidate
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Education

August 2017 *(Expected)* **Ph.D. in Mechanical Engineering**, *University of Colorado - Boulder*, Boulder, CO.
Dissertation: Multi-scale interactions in turbulent premixed reacting flows.
Advisor: Dr. Peter E. Hamlington.

May 2010 **B.S. in Mechanical Engineering**, *Washington University in St. Louis*, St. Louis, MO.

Professional Experience

Research Experience

2013–Present **Research Assistant**, *Turbulence and Energy Systems Laboratory*, University of Colorado - Boulder.

Summer 2016 & Summer 2015 **Department of Defense High Performance Computing Intern**, *Naval Research Laboratory*, Washington, DC.

Design Experience

2012 – 2013 **Lead Systems, Integration, & Test Engineer**, *Colorado Space Grant Consortium*, University of Colorado - Boulder, ALL-STAR/THEIA.

2012 – 2012 **Propulsion Engineer**, *Colorado Space Grant Consortium*, University of Colorado - Boulder, ALL-STAR/PropSat.

2009 – 2009 **Interim Program Manager**, *Space Systems Research Laboratory*, Saint Louis University, COPPER/Bandit.

2008 – 2009 **Propulsion Engineer**, *Aerospace Systems Laboratory*, Washington University in St. Louis, Akoya/Bandit.

Research Interests

Computational physics, turbulent flows, reacting flows, thermofluid systems, multi-scale analysis, uncertainty quantification, data assimilation, design optimization

Publications

Refereed Journal Publications - Published

[1] J. O'Brien, C. A. Z. Towery, P. E. Hamlington, M. Ihme, A. Y. Poludnenko, and J. Urzay. The cross-scale physical-space transfer of kinetic energy in turbulent premixed flames. *Proc. Comb. Inst.*, 36(2), 2017. Distinguished Paper on Turbulent Flames, *36th International Symposium on Combustion*.

[2] C. A. Z. Towery, A. Y. Poludnenko, J. Urzay, J. O'Brien, M. Ihme, and P. E. Hamlington. Spectral kinetic energy transfer in turbulent premixed reacting flows. *Phys. Rev. E*, 93(5), 2016.

Refereed Journal Publications - Submitted

[3] P. E. Hamlington, R. Darragh, C. A. Briner, C. A. Z. Towery, and A. Y. Poludnenko. Lagrangian analysis of high-speed turbulent premixed reacting flows: thermochemical trajectories in hydrogen-air flames. *Phys. Rev. Fluids*. (Submitted for review in 2017).

Refereed Journal Publications - In Preparation

[4] R. Darragh, C. A. Z. Towery, A. Y. Poludnenko, and P. E. Hamlington. Lagrangian analysis of high-speed turbulent premixed reacting flows: enstrophy budget in hydrogen-air flames. *Phys. Rev. Fluids.* (In preparation for submission in 2017).

[5] C. A. Z. Towery, A. Y. Poludnenko, and P. E. Hamlington. Inter-scale energy transfer in compressible isotropic turbulence. *J. Fluid Mech.* (In preparation for submission in 2017).

[6] C. A. Z. Towery, A. Y. Poludnenko, and P. E. Hamlington. Reynolds and Mach number dependence of eddy shocklets in compressible isotropic turbulence. *Phys. Rev. Lett.* (In preparation for submission in 2017).

Peer-Reviewed Conference Proceedings - Published

[7] C. Towery, K. Smith, P. Hamlington, and M. Van Schoor. Examination of turbulent flow effects in rotating detonation engines. In *AIAA Paper 2014-3031*, 2014.

[8] C. A. Z. Towery, A. Y. Poludnenko, J. Urzay, M. Ihme, and P. E. Hamlington. Spectral energy dynamics in premixed flames. In *Proceedings of the Summer Program 2014.* Center for Turbulence Research, Stanford University, 2014.

Peer-Reviewed Conference Proceedings - Accepted for Publication

[9] R. Darragh, C. A. Z. Towery, A. Y. Poludnenko, and P. E. Hamlington. Lagrangian analysis of vorticity dynamics in turbulent premixed flames. In *AIAA Paper*, 2017. (Accepted to the 47th AIAA Fluid Dynamics Conference).

[10] C. A. Z. Towery, R. Darragh, A. Y. Poludnenko, and P. E. Hamlington. Compressible turbulence effects on premixed autoignition. In *AIAA Paper*, 2017. (Accepted to the 47th AIAA Fluid Dynamics Conference).

Other Conference Proceedings - Published

[11] C. A. Z. Towery, A. Y. Poludnenko, and P. E. Hamlington. Direct numerical simulation of premixed autoignition in non-linear subsonic and sonic compressible turbulence. In *10th U.S. National Combustion Meeting*, 2017.

Conference and Seminar Presentations

[P.1] To be given: Compressible Turbulence Effects on Premixed Autoignition. 46th Fluid Dynamics Conference, American Institute of Aeronautics and Astronautics. Denver, CO, June 5-9, 2017.

[P.2] Direct numerical simulation of premixed autoignition in non-linear subsonic and sonic compressible turbulence. 10th U.S. National Combustion Meeting, US Sections of the Combustion Institute. College Park, MD, April 23-26, 2017.

[P.3] Detailed Analyses of Compressible Turbulence Thermodynamics in Direct Numerical Simulations. 69th Meeting of the Division of Fluid Dynamics, American Physical Society. Portland, OR, November 21, 2016.

[P.4] Small-scale Resolution Requirements for DNS of Supersonic Turbulence. 11th European Fluid Mechanics Conference, European Mechanics Society. Sevilla, ES, September 16, 2016.

[P.5] Multi-Scale, Multi-Physics Interactions in High-Speed Turbulent Combustion. 13th Graduate Engineering Annual Research and Recruitment Symposium, Dept. Mechanical Engineering, Univ. Colorado Boulder. Boulder, CO, March 3, 2016.

[P.6] Dynamics of Strongly Compressible Turbulence. 68th Meeting of the Division of Fluid Dynamics, American Physical Society. Boston, MA, November 22, 2015.

[P.7] Turbulence in Thermofluid Systems. 1st RMACC HPC Symposium, Rocky Mountain Advanced Computing Consortium. Boulder, CO, August 12, 2015.

[P.8] The Dynamics of Strongly Compressible Turbulence. 1st Rocky Mountain Fluid Mechanics Symposium. Boulder, CO, August 4, 2015.

[P.9] The Dynamics of Strongly Compressible Turbulence. LCP&FD Seminar Series, Naval Research Laboratory. Washington, DC, July 23, 2015.

[P.10] Detonation Combustion for Aerospace and Power Plant Applications. 12th Graduate Engineering Annual Research and Recruitment Symposium, Dept. Mechanical Engineering, Univ. Colorado Boulder. Boulder, CO, March 5, 2015.

[P.11] Spectral Kinetic Energy Transfer Through a Premixed Flame Brush. 67th Meeting of the Division of Fluid Dynamics, American Physical Society. San Francisco, CA, November 23, 2014.

[P.12] Examination of Turbulent Flow Effects in Rotating Detonation Engines. Boulder Fluid Dynamics Seminar, Dept. Mechanical Engineering, Univ. Colorado Boulder. Boulder, CO, June 17, 2014.

[P.13] Examination of Turbulent Flow Effects in Rotating Detonation Engines. 44th Fluid Dynamics Conference, American Institute of Aeronautics and Astronautics. Atlanta, GA, June 19, 2014.

[P.14] Modeling the Effects of Turbulence in Rotating Detonation Engines. 2014 March Meeting, American Physical Society. Denver, CO, March 6, 2014.

Honors

March 2017 Kenneth Johnsen Graduate Student of the Month, Dept. Mechanical Engineering, Univ. Colorado Boulder

2015 Best Talk in Thermofluid Sciences, 12th Graduate Engineering Annual Research and Recruitment Symposium, Dept. Mechanical Engineering, Univ. Colorado Boulder

Activities

2017 Timing Chair, 70th Meeting of the Division of Fluid Dynamics, American Physical Society, Denver, CO

2014 – 2017 Secretary, Mechanical Engineering Graduate Student Research and Recruitment Committee, Dept. Mechanical Engineering, Univ. Colorado Boulder

2014 – 2016 Fundraising Chair, Graduate Engineering Annual Research and Recruitment Symposium, Dept. Mechanical Engineering, Univ. Colorado Boulder

2008 – 2010 Election Commissioner, Washington University in St. Louis Student Union

2007 – 2008 Senator, Washington University in St. Louis Student Union

2006 – 2007 Treasurer, Freshman Class Council, Washington University in St. Louis Student Union