

# Kelsea O. Souders

Ph.D. Student, Mechanical Engineering  
University of Colorado Boulder

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## Education

- 2021–Present **Ph.D. Mechanical Engineering**, *University of Colorado Boulder*, Boulder, Expected Graduation: Spring 2025.  
Advisor: Dr. Peter E. Hamlington
- 2020–2021 **M.S. Mechanical Engineering**, *Arizona State University*, Tempe, Combined B.S.E. and M.S. Program.  
Thesis title: *Modernization of a Vortex Lattice Method with Aircraft Design Applications* Co-Advisors: Dr. Timothy T. Takahashi and Dr. Marcus Herrmann
- 2016–2020 **B.S.E. Aerospace Engineering**, *Arizona State University*, Tempe.

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## Honors and Awards

- 2022 National Science Foundation Graduate Research Fellowship Program**
- 2022 David T. Spalding Graduate Teaching Fund Fellowship, *University of Colorado Boulder*
- 2021 Graduate School Travel Grant, *University of Colorado Boulder*
- 2021 Vogel Family Fellowship – Department of Mechanical Engineering, *University of Colorado Boulder*
- 2020 Ira A. Fulton Schools of Engineering IMPACT Awardee, *Arizona State University*
- 2020 Graduated *Magna cum Laude*, *Arizona State University*
- 2016 New American University Scholar - President's Award, *Arizona State University*

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## Professional Experience

- 2021–Present **Graduate Student Researcher**, *University of Colorado Boulder*, Boulder, CO.  
Turbulence and Energy Systems Laboratory (TESLa). I use computational fluid dynamics to study the fundamental flame physics governing turbulent combustion processes and affect factors such as flame stability and fuel consumption.
- 2018–2021 **Lead Aerospace Engineering Tutor - FSE Tutoring Centers**, *Arizona State University*, Tempe, AZ.  
Provided academic support to students in the aerospace engineering department. Ensured course competency among aerospace engineering tutors.
- Summer 2019 **Mechanical Engineering Intern**, *SmithGroup*, Phoenix, AZ.  
Designed and analyzed performance of heating and ventilation (HVAC) systems for commercial buildings.

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## Teaching Experience

- Fall 2023 **MCEN 5021 - Introduction to Fluid Dynamics**, *University of Colorado Boulder*, Boulder, CO, Course Assistant/Grader.  
Instructor: Jeremy Koch
- Spring 2023 **MCEN 7221/ASEN 6037 - Turbulence and Turbulent Flows**, *University of Colorado Boulder*, Boulder, CO, Course Assistant/Grader.  
Instructor: Peter Hamlington
- Spring 2022 **MCEN 3021 - Fluid Mechanics**, *University of Colorado Boulder*, Boulder, CO, Graduate Teaching Assistant.  
Instructors: Jeremy Koch and Xiaoyun Ding
- Fall 2021 **MCEN 3030 - Computational Methods**, *University of Colorado Boulder*, Boulder, CO, Graduate Teaching Assistant.  
Instructor: Robert MacCurdy
- Spring 2021 **AEE 468 - Aircraft Systems Design**, *Arizona State University*, Tempe, AZ, Graduate Course Grader.  
Instructor: Timothy T. Takahashi

- Spring 2021 **AEE 344 - Fundamentals of Aircraft Design**, *Arizona State University*, Tempe, AZ, Graduate Course Grader.  
Instructor: Timothy T. Takahashi
- Fall 2020 **MAE 563 - Aircraft Propulsion**, *Arizona State University*, Tempe, AZ, Graduate Course Grader.  
Instructor: Werner J.A. Dahm
- Fall 2020 **MAE 564 - Advanced Aerodynamics**, *Arizona State University*, Tempe, AZ, Graduate Course Grader.  
Instructor: Timothy T. Takahashi
- Fall 2020 **AEE 468 - Aircraft Systems Design**, *Arizona State University*, Tempe, AZ, Graduate Course Grader.  
Instructor: Timothy T. Takahashi
- Spring 2020 **AEE 344 - Fundamentals of Aircraft Design**, *Arizona State University*, Tempe, AZ, Undergraduate Teaching Assistant.  
Instructor: Timothy T. Takahashi
- Fall 2019 **MAE 215 - Introduction to Programming in MATLAB**, *Arizona State University*, Tempe, AZ, Undergraduate Course Grader.  
Instructor: Abhinav Kshitij
- Spring 2019 **FSE 104 - Engineering Projects in Community Service**, *Arizona State University*, Tempe, AZ, Undergraduate Teaching Assistant.  
Instructor: Jared Schoepf

## Research Interests

Turbulence, Reacting Flows, Computational Fluid Dynamics (CFD), High Performance Computing, Fuel Emissions and Green Energy

## Computational Skills

Languages Python, C++, MATLAB, FORTRAN, Visual Basic for Applications  
Programs AMReX, PeleC, Vortex-Lattice CFD (VORLAX), ANSYS Fluent

## Publications

### Conference Proceedings

- [5] **K.O. Souders**, Samuel H.R. Whitman, Michael A. Meehan, Peter E. Hamlington. Combined Effects of Pressure Gradient Tailoring and Free-Stream Turbulence on Bluff Body Stabilized Flame. *AIAA AVIATION Forum*, 2023.
- [4] S.H.R. Whitman, **T.J. Souders**, M.A. Meehan, J.G. Brasseur, and P.E. Hamlington. Pressure gradient tailoring effects on vorticity dynamics in the near-wake of bluff-body premixed flames. *Proceedings of the Combustion Institute 39*, 2022
- [3] **T.J. Souders**, Heitmann, K., and Takahashi, T.T.. Life in the Fast Lane: Project-Based Learning of Advanced Aerodynamics Using a Rapid Potential Flow Code, AIAA 2022-1350. *AIAA SciTech Forum*, 2022
- [2] **T.J. Souders** and Takahashi, T.T.. VORLAX 2020: Making a Potential Flow Solver Great Again, AIAA 2021-2458. *AIAA AVIATION Forum*, 2021
- [1] **T.J. Souders** and Takahashi, T.T.. VORLAX 2020: Benchmarking Examples of a Modernized Potential Flow Solver, AIAA 2021-2459, 2021. *AIAA AVIATION Forum*, 2021

## Conference Presentations

### Presentations by K.O. Souders

- [P.12] **Souders, K.O.** and Hamlington, P.E.. Vorticity Dynamics in Bluff Body Stabilized Premixed Flames with External Pressure Gradients and Free-Stream Turbulence. *76<sup>th</sup> Annual Meeting of the Division of Fluid Dynamics*, Washington, D.C., November 19-21, 2023.

- [P.11] **Souders, K.O.**, Whitman, S.H.R., Meehan, M.A., and Hamlington, P.E.. Combined Effects of Pressure Gradient Tailoring and Free-Stream Turbulence on Bluff Body Stabilized Flame. *AIAA AVIATION Forum*, San Diego, CA, June 12-16, 2023.
- [P.10] **Souders, T.J.**, Whitman, S.H.R., Meehan, M.A., and Hamlington, P.E.. Effects of Turbulence and Mean Pressure Gradients on the Recirculation Region of a Bluff Body Stabilized Flame. *Combustion Institute, 13<sup>th</sup> U.S. National Combustion Meeting*, College Station, TX, March 19-22, 2023.
- [P.9] **Souders, T.J.**, Whitman, S.H.R., Meehan, M.A., and Hamlington, P.E.. Effects of Mean Pressure Gradient and Free-Stream Turbulence on a Bluff Body Stabilized Premixed Flame. *ASME International Mechanical Engineering Congress and Exposition*, Columbus, OH, October 30 - November 3, 2022.
- [P.8] **Souders, T.J.**, Whitman, S.H.R., Meehan, M.A., and Hamlington, P.E.. Pressure Gradient Tailoring Effects for Bluff-Body Stabilized Flames Subjected to Freestream Turbulence. *Rocky Mountain Fluid Mechanics Research Symposium*, Boulder, CO, August 9, 2022.
- [P.7] **Souders, T.J.**, Heitmann, K., and Takahashi, T.T.. Life in the Fast Lane: Project-Based Learning of Advanced Aerodynamics Using a Rapid Potential Flow Code. *AIAA SciTech Forum and Exposition, Virtual*, January 3-7, 2022.
- [P.6] **Souders, T.J.**, Whitman, S.H.R., Ahmed, K., and Hamlington, P.E.. Pressure Gradient Tailoring Effects on Simulated Flow Behind a Ballistic Bluff Body. *74<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics*, Phoenix, AZ, November 21-23, 2021.
- [P.5] **Souders, T.J.** and Takahashi, T.T.. VORLAX 2020: Benchmarking Examples of a Modernized Potential Flow Solver. *AIAA AVIATION Forum, Virtual*, August 2-6, 2021.
- [P.4] **Souders, T.J.** and Takahashi, T.T.. VORLAX 2020: Making a Potential Flow Solver Great Again. *AIAA AVIATION Forum, Virtual*, August 2-6, 2021.

#### Conference Poster Sessions

- [P.3] **Souders, T.J.**, Whitman, S.H.R., Meehan, M.A., Hamlington, P.E.. Simulated Bluff Body Flames Subjected to Mean Pressure Gradients and Inlet Turbulence. *The 39<sup>th</sup> International Symposium on Combustion, Poster Session*, Vancouver, BC, CA, July 24-29, 2022.

#### Conference Presentations by Others

- [P.2] Mathurin, C., Long, D.A., Mathews, G.C., Cich, M.J., Heiniger, A.T., **Souders, T.J.**, Frymire, A., Hamlington, P.E., and Rieker, G.. High-speed velocity measurements with mid-infrared electro-optic modulator dual comb spectroscopy. *Combustion Institute, 13<sup>th</sup> U.S. National Combustion Meeting*, College Station, TX, March 19-22, 2023.
- [P.1] Whitman, S.H.R., **Souders, T.J.**, Meehan, M.A., Brasseur, J.G., and Hamlington, P.E.. Pressure gradient tailoring effects on vorticity dynamics in the near-wake of bluff-body premixed flames. *The 39<sup>th</sup> International Symposium on Combustion*, Vancouver, BC, CA, July 24-29, 2022.

### Conference, Symposium and Seminar Participation

- 2022 **Committee**, Rocky Mountain Fluid Mechanics Research Symposium, Boulder, CO. August 9, 2022
- 2021 **Committee**, Rocky Mountain Fluid Mechanics Research Symposium, Virtual. August 10, 2021

### Professional Service

- 2019–2021 **Member at Large**, American Institute of Aeronautics and Astronautics at ASU, Arizona State University, Tempe, AZ.
- 2019–2020 **Logistics Director**, Society of Women Engineers, Arizona State University, Tempe, AZ.
- 2016–2020 **Vice President**, Fulton Ambassadors, Arizona State University, Tempe, AZ.