CURRICULUM VITAE

Timothy T. Aiken

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Education

University of Colorado, Boulder, CO December 2023
Doctor of Philosophy, Aerospace Engineering Sciences 4.0 GPA

- Advised by Dr. Iain D. Boyd
- Dissertation entitled "Detailed Modeling and Sensitivity Analysis of Nonequilibrium Thermochemistry in Shock-Heated Gases"

University of Colorado, Boulder, CO May 2022
Master of Science, Aerospace Engineering Sciences 4.0 GPA

- Hypersonics Graduate Certificate

University of Kansas, Lawrence, KS May 2019
Bachelor of Science, Aerospace Engineering 3.8 GPA

Peer-Reviewed Publications

Aiken, T.T. and Boyd, I.D., "Sensitivity Analysis of Ionization in Two-Temperature Models of Hypersonic Air Flows," Journal of Thermophysics and Heat Transfer, pp. 1-13, 2024.

Aiken, T.T. and Boyd, I.D., "State-resolved modeling of electronic excitation in weakly ionized oxygen mixtures," Physical Review E, Vol. 109, No. 4, pp. 045203, 2024.

Aiken, T.T. and Boyd, I.D., "Collisional-radiative modeling of shock-heated nitrogen mixtures," Journal of Applied Physics, Vol. 135, No. 9, pp. 093301, 2024.

Aiken, T.T. and Boyd, I.D., "Two-Temperature Modeling of Nonequilibrium Relaxation and Dissociation in Shock-Heated Oxygen," Journal of Thermophysics and Heat Transfer, Vol. 37, No. 4, 2023.

Conference Proceedings

Aiken, T.T. and Boyd, I.D., "Critical Rate Processes for Ionization in Shock-Heated Air," Presented at the 2023 AIAA Aviation Forum, San Diego, CA., 2023.

Aiken, T.T. and Boyd, I.D., "Modeling of Electronic Excitation in Shock-Heated Nitrogen Mixtures," Presented at the 2023 AIAA Aviation Forum, San Diego, CA., 2023.

Aiken, T.T. and Boyd, I.D., "Assessment of Detailed Thermochemistry and Excitation Models for Shock-Heated Oxygen Mixtures," AIAA Paper 2022-3500, Presented at the 2022 AIAA Aviation Forum, Chicago, IL., 2022.

Aiken, T.T., Boyd, I.D., Huang, J., Duan, L., "Assessment of Reynolds Averaged Navier-Stokes Models for a Hypersonic Cold-Wall Turbulent Boundary Layer," AIAA Paper 2022-0586, Presented at the 2022 AIAA SciTech Forum, San Diego, CA., 2022.

Adler, E.A., Aiken, T.A., Byrd, C., Howell, E., McClure, T., Nichols, J., Bartel, N., Weibrecht, R., Zhang, M., "Subscale Demonstration and Validation of the Hercules Ascent, Descent, and Entry Vehicle," AIAA Paper 2020-2015, Presented at the 2020 AIAA SciTech Forum, Orlando, FL, 2020.

Honors and Awards

2023 AIAA David Weaver Thermophysics Best Student Paper

Skills

Programming Languages

- Fortran – 4 years, advanced
- Python – 5 years, advanced
- MATLAB – 8 years, expert
- C – 1 year, intermediate
- Julia – 1 year, intermediate

Operating Systems

- Linux
- MacOS
- Windows

Software Tools

- Intel VTune Profiler
- GDB
- Slurm
- Jupyter notebook
- Tecplot
- Pointwise
- LaTeX
- PATRAN and NASTRAN
- Siemens NX
- Athena Vortex Lattice (AVL)

Relevant Graduate-Level Coursework

Physics

- Electromagnetic Theory I (CU)
- Electromagnetic Theory II (CU)
- Introductory Plasma Physics (CU)
- Fundamentals of Gas Dynamics (CU)
- Fluid Mechanics (CU)
- Turbulent Flows (CU)
- Mechanics II (KU)

Mathematics and Numerical Methods

- Partial Differential Equations (KU)
- Numerical Solution of Partial Differential Equations (CU)
- Computational Fluid Dynamics: Unstructured Grid (CU)
- Aerospace Mathematics (CU)

Work Experience

Center for National Security Initiatives, Boulder, CO January 2024 – Present
Postdoctoral Research Associate

- Perform fundamental computational research on nonequilibrium processes occurring in hypersonic flows.
- Assist in the design of shock tube experiments to probe the high temperature thermal decomposition, electronic excitation, and ionization of air and carbon species.
- Provide feedback and guidance to doctoral students performing related research.

NASA Langley Research Center, Hampton, VA May 2019 – August 2019
Aeronautics Research Intern – NASA Academy

- Led an interdisciplinary team tasked with completing low-speed wind tunnel testing in under eleven weeks for landing trajectories of a reusable rocket concept.
- Presented weekly for advisory board and principal investigator to ensure adequate progress toward project goals.
- Exceeded expectations by completing testing within six weeks.
- Coordinated facility and resource use, model design and fabrication, test planning, data post-processing, verification, and handoff.
- Presented results at the 2020 AIAA SciTech conference.

Air Force Research Laboratory, Eglin AFB, FL May 2018 – July 2018
Intern – Air Armament Scholar

- Programmed an Extended Kalman Filter with Monte Carlo consistency checks in MATLAB to explore the impact of the path traveled on terminal position covariance for navigation without GPS.
- Explored when trajectory optimization becomes beneficial for two vehicles navigating cooperatively.

- Presented results to AFRL scientists and leadership at the completion of the internship.