

# Geoffrey Andrews

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## Education

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### **Purdue University** - West Lafayette, IN

- Ph.D. in Aeronautical and Astronautical Engineering – August, 2022  
Research Topic: Acoustic Influences on Boundary Layer Transition in Hypersonic Wind Tunnels  
GPA: 3.44
- M.S. in Aeronautical and Astronautical Engineering – May, 2017  
Research Topic: Computational Modeling of Rocket-Based Combined Cycle Propulsion Systems  
GPA: 3.64

### **Lehigh University** - Bethlehem, PA

- Bachelor of Science in Mechanical Engineering – May, 2015 (*expected: May, 2016*)  
Minor: Aerospace Engineering  
Capstone Project: Scavenging Energy from Diaphragm Pumps Using Piezoelectrics  
GPA: 3.27

## Research Experience

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### **Technical Staff**, MIT Lincoln Laboratory (2022-2023)

- Leads multiple research efforts in topics relevant to hypersonic flight as a member of the Structural and Thermal-Fluids Engineering group.
- Contributes modeling expertise for a variety of efforts including flight test programs, computational campaigns, and rapid capability assessments.
- Finds funding and sets up institutional collaborations to further develop technologies and capabilities for Department of Defense missions.
- Supervises interns in the pursuit of independent research projects contributing towards the Laboratory's mission.
- Co-leads the Fluids Working Group, a monthly seminar and discussion meeting designed to foster sharing of ideas and dissemination of useful information between aerodynamicists.

### **Graduate Research Assistant**, Purdue School of Aeronautics and Astronautics (2015-2022)

- Demonstrated the effects of freestream noise on hypersonic boundary layer transition in a conventional wind tunnel using massively parallel computer simulations.
- Developed a model for acoustic noise produced within hypersonic wind tunnels.

### **Graduate Research Fellow (BAEF-VKI)**, von Karman Institute for Fluid Dynamics (2020-2021)

- Studied hypersonic boundary layer stability in the VKI Longshot hypersonic gun tunnel.

### **Graduate Co-op Student**, NASA Glenn Research Center (2016-2021)

- Created MONTE, a modern object-oriented environment for solving method of characteristics problems pertaining to the design of supersonic nozzles.
- Led successful micro-seedling project focused on the conceptual design of an air transportation concept to alleviate congestion in highly-trafficked airspaces (*A Wing-in-Ground-Effect (WIG) Aircraft for Coastal Transport* – NASA CAS Micro-Seedling 2016)

- Developed thermodynamic cycle model of a dual-mode scramjet for use in a turbine-based combined cycle engine analysis.
- Worked on multi-disciplinary optimization problems using OpenMDAO.

**Research Assistant**, Lehigh University Aerospace Systems Laboratory (2013-2015)

- Assisted, supervised, and performed tests using the lab's closed-loop subsonic wind tunnel.
- Performed aerodynamics tests on a gun-launched surveillance drone for the U.S. Army.
- Upgraded tunnel test setup by designing and installing new instrumentation.

**Undergraduate Research Fellow**, Lehigh University Bionanomechanics Laboratory (2014-2015)

- Created a computer program and novel apparatus to rapidly creating microfluidic devices in an out-of-cleanroom environment using Digital Light Processing technology and greyscale lithography.

## Teaching and Educational Experience

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**Teaching Assistant**, Purdue University (2015 – 2017)

- AAE 439 (Fundamentals of Rocket Propulsion)
- AAE 334 (Aerodynamics)

**Program Director**, Purdue Space Day Outreach Program (2017 – 2022)

- Founded and oversaw a STEM advocacy initiative which brings educational engineering activities to over 1,000 students in Northern Indiana each year.
- Led classroom training sessions for undergraduate and graduate volunteers.
- Supervised multiple concurrent classroom lessons in a K-12 setting.

**Creator and Director**, Project HALO (2019 – 2021)

- Secured NASA funding to build and launch high-altitude balloon payloads with multiple local high schools
- Taught students the stages of the design, build, and test process in the course of developing a scientific balloon payload, then launching and tracking it to approximately 100,000 feet in altitude.

**Instructor & Course Developer**, Destination: Space (2018)

- Taught a course on spacecraft mission design for middle school students as part of Purdue's Gifted Education Research Institute Summer Residential Program.
- Developed and delivered 20 hours of course material and led students in self-directed design projects culminating in final presentations which were reviewed by NASA & Purdue researchers.

**Subcommittee Chair**, American Institute of Aeronautics and Astronautics (AIAA) (2017 – present)

- Directs national working group targeted with building engagement between K-12 educators and the aerospace community
- Developed and implemented AIAA's "Teacher Friday" initiative, a one-day professional development workshop hosted by AIAA at the annual SciTech conference
- Developed and implemented AIAA's "Engage an Expert" program, a resource connecting K-12 educators with professional engineers and researchers for virtual classroom visits.

## Publications and Presentations

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- G. Andrews, and J. Poggie, "Direct Numerical Simulation of Acoustically-Driven Transition in a Hypersonic Wind Tunnel," AIAA Aviation 2023, San Diego, California.
- G. Andrews, "Stability of the Nozzle Wall Boundary Layer in the VKI Longshot Tunnel," von Karman Institute for Fluid Dynamics, 2020.

- G. Andrews, J. Poggie; “Effects of Freestream Acoustic Disturbances on Hypersonic Boundary Layer Stability,” AIAA Aviation 2020.
- G. Andrews, J. Poggie; “Stability of Cylindrical and Conical Boundary Layers,” AIAA SciTech 2019, San Diego, California.
- G. Andrews; “A Hybrid Length Scale Similarity Solution for Swirling Turbulent Jets,” ICAS 2018, Belo Horizonte, Brazil.
- G. Andrews, A. Black, J. Graham, O. Rique; “Preliminary Design of a Rotating Detonation Engine for Launch Vehicle Applications,” AIAA SciTech 2018, Kissimmee, Florida.
- R. He, S. Wang, G. Andrews, W., and Y. Liu, “Generation of Customizable Micro-wavy Pattern through Grayscale Direct Image Lithography,” *Scientific Reports*, 2016

## Honors and Awards

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- Three Minute Thesis Competition, Second Place (Purdue University, 2021)
- Belgian-American Educational Foundation–Von Karman Institute for Fluid Dynamics Graduate Fellowship (2020)
- Outstanding Service Scholarship (Purdue University College of Engineering, 2020)
- Abe M. Zarem Award for Distinguished Achievement in Aeronautics (American Institute of Aeronautics and Astronautics, 2018)
- Aviation Week & Space Technology’s 20 Twenties 2017 Recipient
- Graduate Individual Aircraft Design Competition, Second Place (American Institute of Aeronautics and Astronautics, 2016)
- Purdue Forever Fellowship (Purdue University, 2017 and 2019)
- Ross Graduate Fellowship (Purdue University, 2015)
- Y. B. Wei Prize in Mechanical Engineering and Mechanics (Lehigh University, 2014) – *“In Recognition of Outstanding Academic Achievements and Demonstrated Leadership Qualities”*
- Undergraduate Research Fellowship (Lehigh University, 2013)

## Skills

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- Computational modelling (thermodynamic and fluids analysis) at both low- and high-fidelity levels using a variety of commercial, open-source, and home-grown tools
  - CFD codes:
    - DoD HPCMP Kestrel/Sierra Aria
    - US3D
    - SU2
    - ANYS Fluent
  - CFD tools:
    - Pointwise
    - Link3D
    - ICEM CFD
    - Tecplot
    - Paraview
  - Programming languages:
    - Python
    - Fortran
    - C++
    - MATLAB

- Other:
  - LASTERAC and STABL (boundary layer stability)
  - SolidWorks, OpenVSP (CAD)
  - Bash/shell scripting
- Petascale computing using MPI and OpenMP
- Strong hands-on background in hardware fabrication and prototyping

## Professional Memberships

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- AIAA (American Institute of Aeronautics and Astronautics) – *Senior Member*
- RAeS (Royal Aeronautical Society)
- ASEE (American Society for Engineering Education)
- Pi Tau Sigma
- Sigma Gamma Tau

## Other Skills

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- Instrument-rated commercial pilot with tailwheel, complex, and high-performance endorsements
- PADI open-water certified diver
- Classical musician (French horn, piano, voice, organ, vuvuzela)
- Travel, hiking, and adventure enthusiast

## References

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