Tommy Sailor Koeplinger

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Education

- **North Carolina State University** **Raleigh, NC**
  College of Engineering, Ph.D. Aerospace Engineering *Anticipated Graduation Fall 2026*
  - Focus on advanced computational analysis methods applicable to high-speed air breathing propulsion.
  - Minor in Mathematics
- **North Carolina State University** **Raleigh, NC**
  College of Engineering, B.S. Aerospace Engineering *May 2022*
  - Overall GPA: **3.906**
  - Minors in Mathematics (PDEs and Numerical Analysis) and Physics

Core Technical Skills

Coding Languages: C/C++, Fortran, CUDA, Rust, Python, MatLab
Coding Experience: High-Order PDE Discretizations, Shock Capturing Techniques, MPI & CUDA Parallelism, Thermal and Chemical Nonequilibrium, Streamline-Tracing and Shape Transition Flowpath Geometries.
Commercial/Public CFD Software: GFR (Glenn Flux Reconstruction), Ansys Fluent, SU2
Other Software: HPC & Unix Environments, Tecplot, ParaView, Gmsh, Solidworks, Autodesk 3DS Max, Autodesk Netfabb, Blender

Experience

- **Hypersonic Computational Fluid Dynamics Laboratory** **Raleigh, NC**
  Graduate Research Assistant (*PhD Research Topics*) *August 2022 - Present*

  High Order Methods for Large Eddy Simulation of HSABP Flowpaths
  - Explore shock capturing methods for high order finite elements (See recent internships with NASA GRC).
  - Perform large eddy simulations of a high-altitude, high-enthalpy scramjet combustor using GFR equipped with novel shock capturing methods.

  Methods for Design and Quick Analysis of Scramjet Inlets and Nozzles.
  - Developed a Parabolized Navier Stokes solver with immersed boundary capabilities(PNS-IB) for the rapid (<10 minutes), design-level analysis of hypersonic inlets and nozzles.
  - Verified PNS-IB solver against NCSU's REACTMB-IB immersed boundary Navier-Stokes code.
  - Performed analysis the performance of a variable geometry inlet concept at various angles of attack.
  - Developed a streamline-traced shape-transition nozzle design and analysis workflow for hypersonic vehicle applications.

- **NASA Glenn Research Center** **Cleveland, OH**
  Summer Intern with Inlets and Nozzles Branch *July-August 2024 & June - August 2025*
  - Investigated the shock-capturing capability of the filtering methods present in the GFR Code.
  - Created a method for scaling filter strength that enabled a smoother solution with less extraneous accuracy loss to the shock-capturing method.
  - Further developed the shock-capturing capability in GFR for use in high-speed reacting flow applications.
  - Explored pairing the dynamic filtering method for shock-capturing with a boundedness-triggered filtering for fine-grained stabilization.
  - Applied/Tested the filtering techniques on a subsection of a scramjet flowpath.
  - Implemented and verified a finite rate mechanism for Ethylene-Air combustion in GFR

- **NASA Glenn Research Center** **[TeleWork] Cleveland, OH**
  Summer Intern with Inlets and Nozzles Branch *June - September 2022*
  - Contributed to the development the SUPIN design tool used to design and analyze supersonic inlets.
  - Ported the support for streamline traced inlets to a standalone Python program.

- Analyzed the advantages of Python and made recommendations for future development.
- Developed a method for constructing 3D interpolation curves using NURBS with intuitive controls.
- Wrote a code which uses a GUI to construct various types of streamline traced inlets with additional throat and subsonic diffuser sections optional.

- **NASA Langley Research Center** **[TeleWork]** **Hampton, VA**
  Intern with Advanced Measurements and Data Systems Branch *June - December 2021*
  - Designed and developed a tool to calculate wavenumber-frequency information from test data.
  - Reviewed literature of signal processing and frequency domain analysis.
  - Experience working with large experimental datasets.

- **High Powered Rocketry Club at NC State (HPRC)** **Raleigh, NC**
  Mentoring as a Graduate Student *August 2023 - Present*
  - Lead the development of Python package (written in Rust), for simulating various ODE models to describe the flights of high-powered rockets. (See https://pypi.org/project/hprm/)
  - Mentored a subteam of the club to develop airbrakes with the intent of targeting a specific vehicle apogee.
  - Use of Kalman filtering for estimating vehicle state from data collected in flight.
  - Employ optimization and uncertainty quantification strategies for processing flight data.

  Senior Design Lead - Payload Electronics and Data Handling *August 2021 - May 2022*
  - Competed in the 2021-2022 NASA Student Launch Challenge.
  - Developed a payload to estimate the vehicle's post-flight location without GPS or magnetic compasses.
  - Wrote concise technical documents on the engineering design process from trade studies to final design.
  - Undertook failure mode analysis and risk mitigation for the payload subsystem.
  - Worked with various microprocessors and MEMS sensors to process and gather flight data.
  - Created code infrastructure for collecting data, recording video, and responding to flight events.
  - Constructed a system which used radio to communicate with the launch vehicle before and during flight.

Publications

Conference Proceedings

- Koeplinger, T. S., Edwards, J., Spiegel, S. *Large Eddy Simulation of an Axisymmetric Scramjet Combustor using a High-Order Spectral Element Method*, ESSCI Meeting, Spring 2026
- Liu, J., Koeplinger, T. S., Edwards, J. *Combustor and Nozzle Design and Analysis for the VENM Scramjet Engine*, JANNAF APS, 2026
- Schram, M., Koeplinger, T. S., Edwards, J., Narayanaswamy, V. *Variable Geometry Rectangular to Circular Shape Transition Inlet for Improved Operational Limits*, JANNAF APS, 2026
- Koeplinger, T. S., Hash, C., Edwards, J., Spiegel, S. *High-Order Flux Reconstruction for the Implicit Large Eddy Simulation of an Axisymmetric Scramjet Combustor*, AIAA Scitech 2026
- Koeplinger, T. S., Liu, J., Moss, M., Edwards, J. *Improved RANS and PNS solution strategies for high-speed air-breathing engine component analysis*, JANNAF APS, 2023.

Awards and Honors

- Top 3 Student Poster Recognition 2023 UCAH Spring Technical Exchange, and 2025 UCAH Forum.
- NCSU Provost's Doctoral Fellowship 2022-2023 School Year.
- 2nd Place Payload Design in the 2021-22 NASA Student Launch Challenge.
- Member of the Tau Beta Pi honor society
- NCSU University Scholars Program

Extra Curriculars, Interests, and Other

- Level 2 Certification with the Tripoli Rocketry Association
- Regularly launch High Powered Rockets, Current personal bests: Apogee 7600′ Speed: Mach 1.5
- Volunteer as game-day staff with the NC State Marching Band
- Semi-Fluent in German and French