Blake Pingleton

Propulsion Engineer
B.S. AAE
Purdue University

bp-aero.com
765-655-3490
bpingle@purdue.edu
www.linkedin.com/in/24bapingleton

Education

- **Purdue University** **Expected May 2028**

Bachelor of Science in Aeronautical and Astronautical Engineering
– Major GPA: 3.3/4.0

Experience

- **Space Force | AFIT - Research Intern** **May 2026 – July 2026**

Bibliometric Analysis for Operational Intelligence **WPAFB | Dayton, OH**
– Developed **predictive algorithms** using tensor-based metrics to identify trends in international research performance across thousands of publications.
– Evaluated and deployed lightweight **local LLMs** for semantic classification, optimizing accuracy-runtime tradeoffs for large-scale bibliometric analysis.
– Presented final research findings to **U.S. Space Force sponsors** and other Pentagon officials.

- **Purdue Undergraduate Rocket Propulsion Lab (PURPL)** **August 2024 – Present**

DEIMOS - a Methane-GOx RDRE | Nozzle & Injector Design **West Lafayette, IN**
– Designed **aerospike nozzle** contour for a 1350 N methane-GOx RDRE, reducing oblique shock losses by implementing Angelino's axisymmetric **Method of Characteristics** in MATLAB with 400-point resolution and validating with RANS / Computational Fluid Dynamics **(CFD)** simulations in **ANSYS Fluent**.
– Sized doublet and triplet **injector orifices** to meet a 0.59 kg/s mass flow target by applying **Fanno flow** choking analysis with Colebrook-White friction and Sutherland viscosity models.
– Co-authored a **published AIAA Region III paper** and presented at the 2026 student conference, documenting engine design and analysis of chamber, injector, nozzle, thermal, and structural performance.

Projects

- **RDE Toolbox** **Summer 2026**

Quasi-1D Transient RDE Performance Model
– Developed a **quasi-1D transient MATLAB model** resolving temporal chamber pressure, temperature, characteristic velocity, and thrust coefficient for rocket and air-breathing Rotating Detonation Engine applications.
– Integrated Shepherd & Kasahara's **exponential pressure decay** framework with Stechmann's performance models, replacing steady-state deflagration analogs standard in preliminary RDE design.
– Enforced internal consistency across **momentum flux, Fanno flow, and continuity** equations through a nested convergence loop, resolving pre-detonation chamber state from injector sonic plane conditions.

- **MoC Solver & PURPL Learning Series** **Summer 2026**

Minimum length bell nozzle and CFD
– Derived the **Method of Characteristics** from first principles for a PURPL club teaching deck, showing that supersonic potential flow is governed by a hyperbolic PDE whose full internal flowfield can be resolved exactly along a **net of characteristics**, reducing the PDE to point-by-point algebraic compatibility relations.
– Implemented a **MATLAB MoC solver** and ran a **characteristic mesh convergence study** (N = 15, 50, 200 lines) on a Mach 3 planar bell nozzle design, converging exit-to-throat area ratio to 4.234 against the 4.235 target from Deng's SJSU thesis, matching his published nozzle geometry.
– Validated the resulting flowfield against **inviscid and viscous (SST k-omega) ANSYS Fluent CFD**, predicting exit Mach number to within -0.43% and -2.63% error respectively.

- **Advanced Avionics – IR Launch Control System** **Spring 2024**

Wireless Rocket Ignition System
– Designed and built a **wireless IR trigger system** using two Arduino Nano boards; achieved approximately 100m range in field testing.
– Developed **embedded C firmware** for transmitter and receiver nodes to replace direct-wire ignition with a safe at-distance trigger.

Technical Skills

Programming: MATLAB, C, Arduino IDE
CAD: Fusion360, NX, Solidworks
Simulation: ANSYS Fluent (RANS, CFD), ANSYS Mechanical (FEM, FEA)
Methods: Compressible flow modeling, Method of Characteristics, signal processing