

# Patrick W. Spencer

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## Education

**University of Louisville | Louisville, KY**

Bachelor of Science in Mechanical Engineering, GPA 3.00

Expected Graduation May 2024

## Skills

**Programming:** Python, basic web dev (JavaScript/HTML/CSS), Qt GUI framework, C, MATLAB, LabVIEW

**CAD/FEA:** SolidWorks (CAD, CAM, FEA, CFD), Inventor, Ansys, KiCad

**Fabrication:** Machining (manual, CNC), printing (FDM, SLA), welding (MIG, TIG), soldering, waterjet, composites, DFM

**Design:** fluid systems, electrical, test design, aerodynamic, thermal, combustion, structural

## Experience

**NASA Ames Research Center | Mountain View, CA | Software Engineering Intern**

Aug 2023 – Dec 2023

- Developed rotor testing software (GUI, data acquisition) software using Python + Qt GUI framework for rotor airflow tests
- Worked with software's users and other software engineers to create maintainable, easy-to-use, robust testing tool
- Developed computer vision software (Python + OpenCV) to determine pointing angle of aerodynamic tufts
- Miscellaneous: Added features to Mars helicopter software, wrote library for sensor, wrote CFD output parsing program

**Masten Space Systems | Mojave, CA | Propulsion Engineering Intern**

Sept 2021 – Apr 2022

- Managed propulsion system routing inside of XL-1 lunar lander, including valves, regulators, fittings, tubes, clamps
- Coordinated with structures, integration, and systems teams on structural interfaces, integration schedule, mass budgets
- Communicated with vendors for component information including availability, cost, certifications, material compatibility
- Supported VTVL rocket flights and engine static firings: various system checkouts, armed abort system, propellant mgmt.

**Conn Center for Renewable Energy (university lab) | Louisville, KY | Mechanical Engineering Intern**

Feb – May 2021

- Managed research project evaluating performance of sodium and black phosphorus as battery electrode materials
- Assembled experimental batteries in argon glovebox then electrically tested to determine voltage, capacity, cyclability
- Performed Raman and X-ray diffraction spectroscopy on batteries in various discharge states to assess microstructure

## Projects

**NASA: Rotor Testing Software (Python, Qt, OpenCV)**

Aug 2023 – Dec 2023

- Developed (from scratch) and thoroughly validated safety-critical software for controlling tests and visualizing data
- Continuously showcased new features to future software users and integrated feedback into next version
- Worked with SW engineers to ensure proper maintainability, conciseness, and documentation (for both users and devs)

**NASA: Mars Helicopter Software (MATLAB)**

Dec 2023

- Developed new data visualization features for Mars Sample Return helicopter flight performance estimation program
- New features enabled discovery of previously unknown flight dynamics effect, requiring further investigation

**Masten: XL-1 (Lunar lander) Propulsion Routing**

Sept 2021 – Apr 2022

- Used Solidworks to position valves, tubes, clamps, etc. to meet bending, structural, integration, pressure drop, mass reqs
- Supported rework of propulsion integration order, greatly easing schedule pressure by enabling more parallel assembly
- Created visuals and animations to clearly communicate changes in positioning and assembly order to other teams

**Masten: Xodiac (VTVL rocket) Testing**

Sept – Nov 2021

- Setup, armed, and monitored flight termination system (radio relay disabling vehicle's autonomous navigation abilities)
- Performed checkouts: valve operation, torque stripe, leak, electrical, rapidly resolved issues to maintain schedule
- Assisted with propellant and pressurant fill (including cryogenic), vehicle transportation, equipment preparation

**Rocket Team: Captain, Propulsion Lead**

Oct 2019 – Apr 2023

- Captained team of 30+ engineering students to finish in top third of teams at Spaceport America Cup / IREC 2022
- Personally secured \$50k+ in funding from various donors. Managed conflicts, held design reviews, lead recruiting efforts
- Lead propulsion team for 2 years in development of solid and liquid engines, mainly 1000lbf kerosene/oxygen engine
- Taught all parts of propulsion design: fluid systems, combustion, cooling, component selection, P&ID design, safety

**Rocket Team: Hopper**

Aug 2022 – Jan 2023

- Coordinated small team to create and optimize design of small cold-gas VTVL rocket capable of 30s flight time
- Designed, built, programmed self-stabilizing stick using compressed air nozzles, IMU sensor, solenoid valves, Raspberry Pi

**Interests:** AI, biotech/biology, neuroscience, paleontology, hiking, running, RC drones + planes, unicycling, rocketry