Jake Davies

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Aerodynamics Engineer

Aerospace engineering MS candidate at Auburn University researching rotating detonation rocket engines with NASA MSFC where I first-author published, hardware tested, and simulation-literate across CFD, FEA, and acoustics. Seven years of hands-on engineering experience spanning propulsion research, environmental test, and structural analysis. Building toward a career in F1 aerodynamics, with an active Monte Carlo race strategy simulator as proof of both the interest and the engineering approach.

WORK EXPERIENCE

QC Manufacturing • Temecula, CA — 2023 - 2023

Design Engineer Intern • Internship

Independently designed a passive in-window ventilation system in SolidWorks, producing 10+ parts and 5 assemblies. Developed an Excel test suite to evaluate prototype functionality and injection molding feasibility, presenting findings directly to the lead engineer and CEO.

USC Rocket Propulsion Laboratory • Los Angeles, CA — 2018 - 2022

Project Leader and Propulsion Engineer

Led a 10-person team in the structural redesign of a solid rocket thrust stand after a test failure, conducting ANSYS FEA and bolted joint analysis to produce a certification report for the test site. Separately designed and fabricated Ammonium Perchlorate composite propellants (APCP) finocyl grain geometry from scratch using custom hot-wire tooling, mill, and lathe.

Second Order Effects • El Segundo, CA — 2022 - 2022

Test Engineering Intern • Internship

Wrote and executed environmental test plans (thermal, vacuum, vibration, shock, EMI, lightning) for aerospace electronics clients including Sierra Space. Identified a lightning compliance gap through independent research of MIL-STD-461 and DO-160, prompting design updates. Designed complex Hardware in the Loop (HITL) harness drawings in SolidWorks and co-built two 7-ft test racks, managing power and signal routing across hundreds of wires, valve simulators, and controller interfaces.

USC Space Engineering and Research Laboratory • Los Angeles, CA — 2020 - 2022

Student Researcher

Investigated low-temperature mechanical properties of Ammonium Perchlorate composite propellants (APCP) for the Air Force Research Laboratory (AFRL), formulating and testing 7 variants at -50°C across solids loading, curative, and additive configurations. Characterized ultimate tensile strength (UTS), percent elongation, and work of fracture via custom MATLAB data pipelines. Authored the team's AIAA paper, handled all edits for submission, and presented solo. Also designed a strand burner and P&ID in CAD as part of broader experimental infrastructure work.

United Airlines • **San Francisco, CA** **2019 - 2019**

Component Shop Support Engineering Intern • **Internship**

Authored repair and engineering authorizations for landing gear and engine core cowl components, independently assessing incoming hardware and writing step-by-step repair procedures from scratch when no prior authorization existed. Identified approved replacement hardware through Airbus/Boeing OEM documentation. Managed large-scale Excel part-tracking across multiple aircraft. During a two-week staffing gap, assumed full coverage of a senior engineer's responsibilities, attending company-wide ops calls, leading technician meetings, and walking the hangar floor while successfully advocating for approval of all submitted repairs.

Newport Farms • **Corona, CA** **2019 - 2019**

Automation Specialist • **Internship**

Co-designed and built a prototype automated inventory retrieval system from scratch, self-teaching Python and G-code to develop a network control server interfacing with Arduino and Raspberry Pi hardware. Implemented stepper motor control via G-code for rack-mounted mechanical retrieval.

Vaniman Manufacturing • **Fallbrook, CA** **2018 - 2018**

Mechanical Engineering Intern • **Internship**

Iterated on hardware designs for desktop dental sandblasting units in response to customer-reported clogging and spray inconsistency, conducting airflow performance tests across different PVC inlet configurations, particles, and particle sizes. Synthesized results into formal reports and contributed design recommendations, with heavy use of SolidWorks throughout.

Kelly Manufacturing • **Murrieta, CA** **2017 - 2017**

Mechanical Engineering Intern • **Internship**

Operated large-scale CNC mills and lathes in a high-mix machine shop environment, machining tight-tolerance aluminum, steel, and copper parts across rotating aerospace and industrial customer orders. Performed dimensional inspection using calipers and micrometers.

EDUCATION

Master of Science, Aerospace Engineering

Auburn University • GPA: 3.62 2025 - Present

- Research focus on Rotating Detonation Rocket Engines
- Courses: Compressible Fluid Dynamics, Experimental Statistics, Project Management, Computational Fluid Dynamics, Aeroacoustics, Viscous Fluid Dynamics

Bachelor of Science, Aerospace Engineering

University of Southern California 2018 - 2022

Dual enrollment

Liberty University 2017 - 2017

Dual enrollment

Letourneau University 2016 - 2017

PROJECTS

F1 Race Strategy Simulator
2026 - Present

Independently developed a stochastic F1 race strategy simulator in Python, treating pit strategy as a probabilistic engineering problem. Monte Carlo engine runs exhaustive or sampled simulations with multiprocessing support, modeling tire compound degradation, safety car probability, reliability failures, and circuit-specific parameters. Predicted a two-stop strategy for the 2025 Chinese Grand Prix ahead of the race.

PUBLICATIONS

Design and Test of an Augmented Spark Igniter with Interchangeable Flow Control Orifices
2026

AIAA SciTech

First-authored AIAA SciTech 2026 paper documenting design and hot-fire validation of a novel augmented spark igniter. Operated successfully at over 2000 kPa and O/F mass ratios exceeding 25. Key finding: demonstrated that chamber characteristic length (L*) directly governs combustion efficiency via characteristic velocity (C*) analysis, a result with broad implications for propulsion test infrastructure design.

Low Temperature Solid Propellant Investigations for Mechanical Properties
2022

AIAA Aviation Forum

Characterized mechanical behavior of seven APCP composite propellant formulations at -50°C for AFRL, measuring tensile strength, percent elongation, and work of fracture to evaluate performance under upper atmosphere conditions.

Characterization of Additively Manufactured Fuel Grains for Hybrid Rocket Applications
2022

AIAA Student Conference Region VI

Co-authored regional AIAA student conference paper (3rd place) on a hybrid rocket motor study comparing straight and helical port geometries. Characterized 3D-printed propellant grains with gaseous oxidizer flow testing and contributed post-firing data analysis. Designed and fabricated an integrated thrust stand with blast protection, housing all valves, piping, and electronics as a self-contained hotfire system.

SKILLS

Simulation and Analysis: COMSOL Multiphysics, ANSYS Structural (FEA), Computational Fluid Dynamics (CFD), Cantera

Programming and Data: Python, MATLAB, Machine Learning (Neural Networks), High Performance Computing (HPC), LaTeX

CAD and Design: Solidworks, Siemens NX, 3D Printing

Lab and Controls: LabVIEW, Mill, Lathe, Band Saw, Table Saw, Basic Tools

Project Management: Confluence, Jira, Microsoft Office

Manufacturing: Gcode, CNC Machining