Marco Nanni

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Experience

Thermal and Fluids Engineer – *Purdue Space Program*, West Lafayette, IN   May 2024 – May 2025
- Validated a regenerative cooling model in MATLAB using hot-fire test data, reducing heat flux prediction error from 200% to 15% and enabling more accurate rocket engine design decisions.
- Conducted 3D CFD modeling with ANSYS Fluent of internal propellant flow in the injector manifold, achieving a refined mesh with a wall y+ of 2.6.

Graduate Research Assistant – *Herrick Laboratories*, West Lafayette, IN   Jan. 2024 – May 2025
- Developed a physics-based Simulink model of an Aerospike engine thermal-fluid system—integrating pumps, valves, cooling channels, and combustion-chamber dynamics—to simulate off-nominal operating conditions and evaluate system-level robustness.
- Optimized cooling-channel geometry via 1D thermal analysis, maintaining nozzle hoop stress at least 10% below material yield strength at predicted wall temperatures.
- Implemented an iterative design framework using custom resilience metrics to assess alternative Aerospike thermal-system architectures—optimizing designs to ensure orbit insertion and maximize engine reusability throughout multiple missions and failure scenarios.
- Conducted thermo-structural analysis of GRCop-42 cooling channels across multiple mission profiles, demonstrating that integrating a mixture-ratio control valve reduced low-cycle fatigue damage and boosted system resilience by 10%.

Teaching Assistant – *Purdue University*, West Lafayette, IN   Aug. 2023 – May 2024
- Provided academic support and practical guidance for Thermodynamics, Fluid Dynamics, and Computational Fluid Dynamics (CFD), assisting students with applied engineering problem-solving.

Co-founder & Engineering Lead – *Red Propulsion*, Firenze, Italy   Sep. 2022 – Aug. 2023
- Co-founded and served as Engineering Lead of a 50-member student rocketry team. Led the full design, build, and test of a solid rocket launcher—overcame a tight 12-month schedule to achieve a successful engine launch.

Education

Purdue University – M.S. in Aeronautical and Astronautical Engineering   May 2025
GPA: 3.9

Politecnico di Milano – B.S. in Aerospace Engineering   March 2022
Final degree grade: 100/110

Projects

Nonlinear Finite-Element Analysis of a Bolted Assembly in F1-Engine Nozzle
- Performed nonlinear finite-element analysis of a bolted assembly in an F1-engine nozzle under thermal and structural loads using ANSYS Workbench. Verified results with 2% accuracy against analytical predictions.

Publications

- Nanni, M., et al. *Development of a Damageable Numerical Engine Cooling System for Resilient Aerospike Rockets.* Accepted for presentation at the **International Conference on Environmental Systems**, 2025.

Skills

Programming & Simulation: MATLAB/Simulink, ANSYS Fluent, ANSYS Workbench, Numerical Propulsion System Simulation (NPSS).

CAD & Modeling: SolidWorks, Fusion 360, Autodesk Inventor, DesignModeler.