Marco Nanni

West Lafayette, 47906 - USA | mnanni@purdue.edu | +1 765 (715) 0879 | LinkedIn profile | Portfolio

Experience

Propulsion Systems Engineer, Purdue Space Program – West Lafayette, IN May 2024 – present

- Optimized cooling channel geometry for Purdue Space Program's first regeneratively cooled rocket engine, reducing pressure drop by 10% to mitigate losses caused by the high surface roughness of 3D-printed material. Design successfully validated in a hot fire test.
- Led the redesign of a 3D-printed injector manifold by integrating test data and performing CAD revisions followed by detailed ANSYS Fluent CFD analysis. Refined the mesh to a wall y+ of 2.6, which improved mixing and velocity distribution at the injector outlet—validated by successful water testing in the second-generation prototype.

Graduate Research Assistant, Herrick Laboratories – West Lafayette, IN Jan. 2024 – present

- Engineered a validated, multi-physics SIMULINK model of a Methane-Oxygen Aerospike engine that spans all critical subsystems (pumps, turbines, gas generator, injectors, cooling channels, combustion chamber, and nozzle). This model simulated transient engine performance during ascent and boost-back burn, providing insight into cooling channel behavior under off-nominal conditions.
- Designed centrifugal pump components (inducer and impeller) and integrated turbine systems using velocity triangles, achieving pump performance maps with 1%–5% accuracy against experimental data.
- Employed PID controllers with time-delay functions to mimic real-world valve actuation responses (mixture ratio and thrust).
- Developed a custom NPSS/C++ regenerative cooling model using CEA package for thermochemistry that performed precise transient heat transfer calculations with 3% validation accuracy.
- Improved fluid and thermal system robustness for the Aerospike rocket engine by 10% using 1D thermal analysis in MATLAB Simulink, implementing fault-tolerant control strategies for dynamic coolant mass flow adjustments, and analyzing transient turbine, pump, and valve behavior during critical mission phases.

Teaching Assistant, Purdue University – West Lafayette, IN Aug. 2023 – May 2024

- Provided academic support and practical guidance in 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 led a 50-member multidisciplinary team in the complete design, construction, and testing of a solid rocket launcher. Developed medium- to long-term timelines, successfully launching the engine within 12 months of the team's formation.

Education

Purdue University, Master of Science in Aeronautical and Astronautical Engineering Expected May 2025
GPA: 3.9
Relevant Coursework: Advanced Rocket Propulsion, Hypersonic Propulsion, Advanced Thermodynamics

Politecnico di Milano, Bachelor of Science in Aerospace Engineering March 2022
Final degree grade: 100/110

Skills

CAD & Modeling: Proficient with SolidWorks, Fusion 3D (Siemens NX-like environments).

CFD & Simulation: Expert in ANSYS Fluent, Numerical Propulsion System Simulation (NPSS), C++, Matlab, Simulink, and CoolProp for high-fidelity flow and thermal analyses.

Control Systems & Testing: Experienced in PI control strategies (including tuned PID), robust test plan development, and hands-on engine testing in laboratory and flight environments.