Marco Nanni

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Education

Purdue University, Master of Science in Aeronautical and Astronautical Engineering — Expected May 2025
GPA: 3.8

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

Experience

CFD and Thermal Systems Engineer, Purdue Space Program – West Lafayette, IN — May. 2024 – present

- Improved the MATLAB algorithm to predict the chamber wall heat transfer using regenerative and film cooling, achieving 3 times reduction of run time.
- Conducted 3D CFD modeling of propellant flow in the injector manifold, achieving a refined mesh with a wall y+ of 2.6. This validated model was instrumental in iterating and optimizing the injector outlet design, reducing velocity maldistribution.

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

- Utilized NPSS for 1D thermal analysis to explore the effects of transient conditions on cooling channels, laying the groundwork for future robustness enhancements.
- Validated the NPSS model for coupled regenerative cooling and hot gas flow with MATLAB (steady state), ensuring a reliable foundation for future transient analysis and design iterations.
- Applied 2D FEA in ANSYS Workbench to preliminarily assess hot spots in cooling channels, with the goal of enhancing system resilience for extended space missions.
- Conducted a literature review on improving the resilience of thermal management systems for aerospike rocket engines, focusing on the impact of turbopump performance and cooling channel integrity on thermal fatigue and creeping failure.

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

- Served as a Teaching Assistant for "Thermodynamics", "Fluid Dynamics" and "Introduction to CFD".

Founder & Team Leader, Red Propulsion – Firenze, IT — Sep. 2022 – Aug. 2023

- Led a 50-person team to conduct trade studies and produce a small rocket launcher, which was successfully launched in 2023. The project met the design requirements for the trajectory, stage separation and safe parachute landing, ensuring rapid reusability.
- Oversaw all components at the system level as a project manager, increasing workflow efficiency through Agile methodology and testing for rapid design iterations.
- Successfully presented the project at the European Rocketry Challenge 2023, showcasing innovative solutions and teamwork.

Projects

Ablative cooling for X43 Hypersonic Vehicle

- Designed a combined ablative and regenerative cooling system that reduced the leading-edge wall temperature of the X43 by 45%, keeping it below the maximum allowable for a carbon-carbon composite.

Parametric Study on Aspect Ratio Optimization of RL10A-3-3A Cooling Jackets

- Optimized the aspect ratio of cooling channels in the RL10A-3-3A rocket engine, reducing hydrogen pump power consumption by 6% while maintaining wall temperature below 880K and subsonic coolant.

Skills

Programming: MATLAB/Simulink, Python, C, C++, Numerical Propulsion System Simulation (NPSS)

Engineering software: CAD, ANSYS Fluent, ANSYS Mechanical, Thermal Desktop