SPACE ENGINEER

PAOLO MARIA ZOLLA

EDUCATION AND RESEARCH

Ph.D. in Space Engineering – Sapienza University of Rome

2021 – Present

- Combustion instability prediction using low-order numerical simulations for liquid rocket engines
- Hybrid rocket engines low-order modeling and multidisciplinary optimization exploiting feedforward neural networks
- Design of high altitude test facilities using CFD
- Design and testing of water based noise suppression systems for small-scale superonic hot jets

Self-employment contract for occasional work – Department of Mechanical and Aerospace Engineering of "Sapienza" University of Rome

11th March 2024 – 10th June 2024

- Support in conducting simulations and post-processing activities for the study of combustion stability in liquid propellant rocket engines

Visiting student at German Aerospace Center (DLR – Lampoldshausen)

1st March 2023 – 1st July 2023

- Combustion instability prediction using low-order numerical simulations for liquid rocket engines. Comprehensive analysis of the BKD test case

Self-employment contract for occasional work – Department of Mechanical and Aerospace Engineering of "Sapienza" University of Rome

1st March 2023 – 30th April 2023

- Support for the parallelization of the software and post-processing activities of the numerical database for the study of combustion instability

Post-Graduate fellowship – CRAS (Center of Aerospace Research of Sapienza)

2020 – 2021

- Design of water based noise suppression systems for small-scale superonic hot jets
- Combustion instability numerical simulations using reduced order models, accounting for the real gas behavior of supercritical fluids
- Hybrid rocket engines multidisciplinary optimization exploiting feedforward neural networks and reduced order models

M.Sc. in Space and Astronautical Engineering – Sapienza University of Rome

2018 – 2020

Final grade: 110 cum laude/110
Weighted average: 29.5/30.0
Thesis: "Low-order modeling and performance analysis of hybrid rocket propulsion"
Advisor: Prof. Daniele Bianchi

Bachelor's degree in Aerospace Engineering – Sapienza University of Rome

2015 – 2018

Final grade: 110 cum laude/110
Weighted average: 30.0/30.0
Thesis: "Combustion instability in liquid rocket engines and solid rocket motors"
Advisor: Prof. Diego Lentini

SKILLS

IT Skills

Programming and software knowledge: Fortran, Matlab, Python, C, C++, Bash, Mathematica, LaTex, Tecplot, MS Office
Operative systems: Linux, Mac OS, Windows

Other Skills

- Adaptability and critical thinking in the workplace, aimed at problem solving
- Presentation and organization of scientific results, drafting of technical reports
- Capability of working individually and in a team
- Collaborative, resourceful, flexible, and stress tolerance
- Higly motivated, determined, perseverant, fast learner
- Exceptional leader skills and group management

AWARDS

BEST PAPER: 2021 Propulsion & Energy Forum Hybrid rockets session

"Machine Learning Techniques for Flight Performance Prediction of Hybrid Rocket Engines"

2021

WINNER: 17th Pegasus Student Conference

"A Computational Tool for the Design of Hybrid Rockets"

2021

PUBLICATIONS

P.M. Zolla, R. Rosa, M.T. Migliorino, D.Bianchi: "Multi-disciplinary Optimization of Single-stage Hybrid Rockets for Lunar Ascent". _Acta Astronautica_. 2024

P.M. Zolla, A. Montanari, S. D'Alessandro, M. Pizzarelli, F. Nasuti, R.C. Pellegrini, E. Cavallini: "Low-Order Modeling Approach for the Prediction of Transverse Combustion Instabilities in Multi-injector Engines". *CEAS Space Journal*. 2024

P.M. Zolla, A. Montanari, M. Grossi, F. Nasuti, W. Armbruster, M. Börner, J. Hardi: "Low-Order Modeling of Combustion Instability: A Comprehensive Analysis of the BKD Test Case". AIAA *SciTech Forum*. 2024

P.M. Zolla, A. Zavoli, M.T. Migliorino, D.Bianchi: "Integrated Optimization of a Three-Stage Clustered Hybrid Rocket Launcher using Neural Networks". AIAA *SciTech Forum*. 2024

P.M. Zolla, A. Zavoli, M.T. Migliorino, D.Bianchi: "Surrogate Neural Network Model for Integrated Ascent Trajectory Optimization of Throttleable Hybrid Rockets". *International Astronautical Congress*. 2023

F.Nasuti, D. Bianchi, M.T. Migliorino, M. Grossi, M. Fiore, M. Rotondi, **P.M. Zolla,** B. Latini, M. Fabiani, G. Cocirla, A. Sereno, A. Montanari, V. Barbato: "T(H)RUST: applied research activities on liquid rocket propulsion at Sapienza University of Rome". *International Astronautical Congress*. 2023

A. Montanari, **P.M. Zolla,** S. D'Alessandro, M. Pizzarelli, F. Nasuti, R.C. Pellegrini, E. Cavallini: "Sensitivity Study on a Low-Order Model for the Analysis of Transverse Combustion Instability". *Aerospace Europe Conference*. 2023

P.M. Zolla, R. Rosa, M.T. Migliorino, D.Bianchi: "Multi-disciplinary Optimization of Single-stage Hybrid Rocket with Swirl Injection for Lunar Ascent". AIAA *SciTech Forum*. 2023

P.M. Zolla, M. Fiore, P.E. Lapenna, D. Bianchi, F. Nasuti: "A Design Strategy for Water-based Noise Suppression Systems in Liquid Rocket Engines Firing Tests". *CEAS Space Journal*. 2022

A. Zavoli, **P.M. Zolla**, L. Federici, M.T. Migliorino, D. Bianchi: "Surogate Neural Network for Rapid Flight Performance Evaluation of Hybrid Rocket Engines". *Journal of Spacecraft and Rockets*. 2022

P.M. Zolla, A. Montanari, S. D'Alessandro, M. Pizzarelli, F. Nasuti: "Low Order Modeling of Combustion Instability Using a Hybrid Real/Ideal Gas Mixture Model". *EUCASS*. 2022

P.M. Zolla, M.T. Migliorino, D. Bianchi, F. Nasuti, R.C. Pellegrini, E. Cavallini: "A Computational Tool for the Design of Hybrid Rockets". *Aerotecnica Missili & Spazio.* 2021

A. Zavoli, **P.M. Zolla**, L. Federici, M.T. Migliorino, D. Bianchi: "Machine Learning Techniques for Flight Performance Prediction of Hybrid Rocket Engines". *Propulsion & Energy Forum*. 2021

S. D'Alessandro, **P.M. Zolla**, M. Pizzarelli, B. Favini, F. Nasuti: "A Hybrid Real/Ideal Gas Mixture Model in the Framework of Low Order Modeling of Combustion Instability". *Propulsion & Energy Forum*. 2021