

Dr. Domenico SIMONE

CV and Professional Profile

PROFESSIONAL EXPERIENCE:

- To date: Consultant Engineer and Assistant Professor at University of Brasilia - Aerospace Engineering
- 2019 as consultant at DIMA, works on “GT AXCO blades erosion & corrosion adaptive model”, Baker Hughes-General Electric / Nuovo Pignone Tecnologie S.r.l.
- 2018 to 2019 as consultant at DIMA, works on “Study of condensation in a steam turbine”, Baker Hughes/General Electric) Nuovo Pignone Tecnologie S.r.l.
- 01/09/20014 to 01/09/2015: Assegno di Ricerca DIAEE – University of Rome “Sapienza” ssd ING/IND03, under supervision of Prof. P. Teofilatto
- 01/01/2014 as consultant at DIMA, works on “Alumina combustion instabilities and pressure oscillations in SRM” and “Aerodynamic data-package for AVUM re-entry” (Vega single payload configuration)
- 01/09/2008 to 01/09/2014: Assegni di Ricerca DIMA – University of Rome “Sapienza” ssd ING/IND07 (Aerospace Propulsion), under supervision of Prof. C. Bruno
- 01/07/2011 to 31/07/2013: works on “Numerical simulations of LOx/CH4 combustion
- 15/08/2010 to 15/08/2011: works on “LiH as Fuel for High Speed Propulsion” in the “EOARD” program, Grant Number FA8655-10-1-3091
- 01/09/2008 to 31/5/2010: works on “implementation in the OpenFoam code of an Eulerian-Eulerian model for multiphase dispersed flows” in the “TIMECOP-AE” project, AST5-CT-2006-030828, issued by European Community Sixth Framework Program
- 1/03/2010 to date: works on “Investigation of Nano fluid thermal conductivity: numerical model and implementation in the OpenFoam code” in the “HENIX” project issued by European Community 7th Framework Program (Contract ISIS-R&D S.r.l.)
- 01/11/2009 to 31/12/2009: works on “Numerical simulations of two-phase flows” (Contract DIMI - University of Rome “Roma Tre”)
- 25/05/2009 to 24/08/2009: works on “Numerical simulations of compressible flows” (Contract DIMI University of Rome “Roma Tre”)
- 02/2008 to 09/2008: Consultant Engineer, under supervision of Prof. C. Bruno
- 15/04/2008 to 14/05/2008: works on “Numerical simulation of two-phase unsteady flows” (Contract –

DIMI University of Rome “Roma Tre”)

- 01/2008 to 09/2008: works on LiH, LiAlH₄ and Li₃AlH₆ analysis for propulsion applications in the framework of INTAS Program
- 01/01/2008 to 31/08/2008: works on “LES Modeling and implementation for TVC configuration of CLEAN combustor” in the TLC European Program
- 01/12/2007 to 31/04/2008: works on Lander and High Mobility Lunar Vehicle propulsion subsystems study, in the framework of *ASI Moon Vision Program*
- 11/2003 to 12/2007: PhD, under supervision of Prof. C. Bruno
- 01/08/2007 to 31/12/2007: works on LiH – based scramjet propulsion in the “*Italia – Korea Cooperation Program*”, issued by Italian MAE
- 01/02/2007 to 31/07/2007: works on “SixHy oxidation in supersonic flows” in the “Multiphysics Modeling of Near Surface Phenomena” program, issued by ESA, n° 19181
- 01/01/2005 to 31/12/2009: works on Long-Term Advanced Propulsion concepts and Technologies (LAPCAT), FP6 Priority 1.4 Aeronautic and Space, issued by European Community Sixth Framework Program;

RESEARCH AREAS:

- **Space propulsion:** rocket (solid, liquid and hybrid rockets); micro thrusters (both chemical and cold gas); air breathing systems and combined cycles (Turbojet, Turbofan, Ramjet, Scramjet, RBCC, TBCC...) dealing with turbulent compressible reacting flows at low and high speed;
- **Internal fluid dynamics**
- **Fluid-Structure Interaction** good experience in using fluid dynamics and structural analysis software and in developing coupling tools
- **Combustion and chemical kinetics**, in particular:
 - Kinetics of combustion in gas phase for aviation fuel (both at low and high pressure)
 - Hydride-based solid and liquid fuels combustion analysis
 - Kinetics of multiphase combustion phenomena in solid and hybrid rockets
- **Aerothermodynamics** problems in external flows (from subsonic to hypersonic range)
- **CFD** of multiphase systems and hypersonic or turbulent compressible reacting flows.
- **Performance prediction and analysis** of hydride-based fuels for rocket and air breathing propulsion.
- **High Energy Density Materials (HEDM)** for aerospace propulsion
- **Nuclear Propulsion** for space applications
- **Hydrogen Storage**

EDUCATION:

- **PhD**, University of Rome “La Sapienza”, 12/02/2008. Ph.D. Thesis: “*Analysis of LiH Combustion in Solid Fuelled Scramjet Engine*”. Advisor: Prof. C. Bruno. (CIRA grant)
- **Master degree** in Aeronautics Engineering, University of Rome “La Sapienza”, 03/2003; thesis on “*Sloshing in Microgravity: Mathematical Model and Numerical Simulation*”. Supervisor: Prof. F. Stella

SCIENTIFIC SOFTWARE:

CFD:

- Ansys Fluent, with extended experience in UDF programming
- OpenFoam

Computational Chemistry:

- Reaction Design Chemkin
- NASA CEA2

Programming languages:

Fortran 77-90 and C++.

High-performance computing: professional experience (as consultant for Digital Solutions S.r.l.)

LANGUAGES:

English, French, Portuguese

PUBLICATIONS ON INT. JOURNALS

AGATI, GIULIANO ; DI GRUTTOLA, FRANCESCA ; GABRIELE, SERENA ; **SIMONE, DOMENICO** ; VENTURINI, PAOLO ; BORELLO, DOMENICO . Water washing of axial flow compressors: numerical study on the fate of injected droplets. E3S Web of Conferences, v. 197, p. 11015, 2020.

SHYNKARENKO, OLEXIY; **SIMONE, DOMENICO**. Oxygen-Methane Torch Ignition System for Aerospace Applications. Aerospace, v. 7, p. 114, 2020.

ADRIANOV, A. ; **SIMONE, D.** ; SHYNKARENKO, O. ; LEE, J. ; BERTOLDI, A. E. M. . Experimental study of severity level of structural discontinuities in paraffin grains of hybrid propellant rocket. ACTA ASTRONAUTICA, v. 162, p. 256-265, 2019.

TRINDADE, D. B. ; BUGALA, P. ; **SIMONE, D.** . Review of Loss Models for High pressure Turbines. Journal of KONES, v.25, p. 37-44, 2018.

SIMONE, D.; BRUNO, C. ; CZYSZ, P. A. . Investigation of nuclear electric powered interstellar precursor missions. ACTA ASTRONAUTICA, v. 68, p. 1193-1200, 2011.

HIDDING, B.; PFITZNER, M.; **SIMONE, D.**; BRUNO, C. Spiking of Hydrocarbon Fuels with Silanes-based Combustion Enhancers. TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES, AEROSPACE TECHNOLOGY JAPAN, v. 8, p. Pa_39-Pa_45, 2010.

SIMONE, D.; BRUNO, C. Modeling LiH Combustion in Solid Fuelled Scramjet Engine. TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES, AEROSPACE TECHNOLOGY JAPAN, v. 8, p. Pa_47-Pa_56, 2010.

SIMONE, D.; BRUNO, C. Preliminary Investigation on Lithium Hydride as Fuel for Solid-Fueled Scramjet Engines. Journal of Propulsion and Power, v. 25, p. 875-884, 2009.

SIMONE, D.; BRUNO, C.; HIDDING, B. Silanes as Fuel for Aerospace Propulsion. TRANSACTIONS OF THE JAPAN SOCIETY FOR AERONAUTICAL AND SPACE SCIENCES, SPACE TECHNOLOGY JAPAN, v. 7, p. Pa_33-Pa_39, 2009.

AMATI, V. ; **SIMONE, D.** ; SCIUBBA, E. ; BRUNO, C. . Exergy analysis of hypersonic propulsion systems: Performance comparison of two different scramjet configurations at cruise conditions. ENERGY, v. 33, p. 116-129, 2008.

HIDDING, B.; **SIMONE, D.**; BRUNO, C.; PFITZNER, M. Silanes/H₂O₂: A High-Performance Synthetic Bipropellant for Chemical Space Propulsion. Journal of Propulsion and Power, v. 24, p. 150-154, 2008.

HIDDING, B.; **SIMONE, D.**; BRUNO, C. Review of the potential of silanes as rocket/scramjet fuels. ACTA ASTRONAUTICA, v. 63, p. 379-388, 2008.

SIMONE, D.; BRUNO, C.; HIDDING, B. Silanes as Fuels for Scramjets and Their Applications. JOURNAL OF PROPULSION AND POWER, v. 22, p. 1006-1012, 2006.

AMATI, V. ; **SIMONE, D.**; SCIUBBA, E. ; BRUNO, C. . Development of a Novel Modular Simulation Tool for the Exergy Analysis of a Scramjet Engine at Cruise Condition. International Journal of Thermodynamics, v. 9, p. 181-191, 2006.

STELLA, F.; GAUDENZI, P.; GIANGI, M.; PAGLIA, F.; **SIMONE, D.** A Numerical Simulation of Fluid-Structure Interaction in Internal Flows. NUMERICAL HEAT TRANSFER PART B-FUNDAMENTALS, v. 47, p. 403-418, 2005.

CONFERENCES

Di GRUTTOLA, F. ; AGATI, G. ; VENTURINI, P. ; BORELLO, D. ; **SIMONE, D.** ; GABRIELE, S. ; RISPOLI, F. . Numerical Study of Erosion due to Online Water Washing in Axial Flow Compressors. In: ASME 2020 Turbo Expo September 21-25, 2020, Virtual Conference, Online. Proceedings of ASME Turbo Expo 2020, Turbo machinery Technical Conference and Exposition, September 21-25, 2020, London, 2020.

AGATI, G. ; Di GRUTTOLA, F. ; GABRIELE, S. ; **SIMONE, D.** ; VENTURINI, P. ; BORELLO, D. . Water Washing of Axial Flow Compressors: Numerical Study on the Fate of Injected Droplets. In: 75° Congresso Nazionale ATI September 15-16, 2020, Rome, virtual conference. Proceedings, 2020.

LEE, J.; RHEE, S.; KIM, J.; MOON, H.; **SIMONE, D.**; SHYNKARENKO, O. . Combustion Instability for Hybrid Rocket Motors with a Diaphragm. In: 8th EUROPEAN CONFERENCE FOR AERONAUTICS AND SPACE SCIENCES (EUCASS), 2019, Madrid. Proceedings, 2019.

BERTOLDI, A. E. M. ; BOUZIANE, M. ; LEE, J. ; VERAS, C. A. G. ; HENDRICK, P. ; **SIMONE, D.** . Theoretical and Experimental Study of Combustion Instability in Hybrid Rocket Motors. In: 8th EUROPEAN CONFERENCE FOR AERONAUTICS AND SPACE SCIENCES (EUCASS), 2019, Madrid. Proceedings, 2019.

SHYNKARENKO, O.; **SIMONE, D.** ; ADRIANOV, A. ; LEE, J. ; BERTOLDI, A. E. M. ; SOUZA, K. M. . Flame Initiation inside the Gas Torch Ignition System for a Hybrid Rocket Motor. In: 70th International Astronautical Congress 2019, 2019, Washington. Proceedings - IAC paper 50874, 2019.

SHYNKARENKO, O.; **SIMONE, D.** Numerical Study of the Continuous Hypersonic Flow Around the Reentry Capsule. In: 1 Congresso Aeroespacial Brasileiro – Edição Especial Plêiade 01 a 03 de Novembro de 2018 –, 2018, Foz do Iguaçu, PR – Brasil. Proceedings, 2018.

COSTA FILHO, J. A. ; **SIMONE, D.** ; SHYNKARENKO, O. . Numerical Study of the Cooling Effect inside a CH₄/O₂ Torch Ignition System for Hybrid RM. In: 1 Congresso Aeroespacial Brasileiro – Edição Especial Plêiade 01 a 03 de Novembro de 2018, 2018, Foz do Iguaçu, PR – Brasil. Proceedings, 2018.

SHYNKARENKO, O.; **SIMONE, D.** ; ADRIANOV, A. . Hybrid rocket motor ignition system development and testing in Chemical Propulsion Laboratory of the University of Brasilia. In: 2nd Polish-Brazilian Conference on Science and Technology, 2016, Varsovia. Journal of Polish-Brazilian Science and Technology. Varsovia: Institute of Aviation, 2016. v. 2.

BRUNO, C. ; INGENITO, A. ; **SIMONE, D.** ; CZYSZ, P. A. . Aeronautical Approach and Support to Mars Exploration. In: 47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 2011, S. Diego. Proceedings, 2011.

GESSINI, P. ; BRASIL, A. C. M. ; SILVA, R. M. ; BARCELOS JUNIOR, M. N. D. ; FERREIRA, J. L. ; FERREIRA, I. S. ; **SIMONE, D.**; BRUNO, C. . Preliminary Study of an Arcjet Plasma Torch for Gasification and Material Processing Applications. In: 32th International Electric Propulsion Conference, 2011, Wiesbaden. Proceedings, 2011.

VERGINE, F.; **SIMONE, D.**; BRUNO, C. ; HIDDING, B. . Mars Exploration: Silanes as Fuels for Martian Ramjet and Scramjet Engines. In: 61th International Astronautical Congress, 2010, Prague. Proceedings, 2010.

SIMONE, D.; BRUNO, C. LiH as Fuel for Solid Fuelled Scramjet Engines. In: 47th AIAA Aerospace Sciences Meeting, 2009, Orlando, Florida. Proceedings of 47th AIAA Aerospace Sciences Meeting, AIAA paper 2009- 813, 2009.

BRUNO, C.; **SIMONE, D.** Nuclear Electric Propulsion for Interstellar Precursor Missions. In: 6th IAA Symposium on Realistic Near-term Advanced Scientific Space Missions, 2009, Aosta. Proceedings, 2009.

SIMONE, D.; BRUNO, C. Modelling LiH Combustion in Solid Fuelled Scramjet Engines. In: 27th ISTS, 2009, Tsukuba. Proceedings, 2009.

HIDDING, B.; **SIMONE, D.**; PFITZNER, M.; BRUNO, C. . Spiking of Hydrocarbon Fuels with Silanes-based Combustion Enhancers. In: 27th ISTS, 2009, Tsukuba. Proceedings, 2009.

BRUNO, C.; **SIMONE, D.** Investigation of nuclear electric powered interstellar precursor missions. In: 60th International Astronautical Congress, 2009, Daejeon. Proceedings of 60th IAC, Paper IAC-09-D4.1-D4.3.7, 2009.

SIMONE, D.; BRUNO, C. Silanes as Fuels for Aerospace Propulsion. In: 26th International Symposium on Space Technology and Science (ISTS), 2008, Hamamazu. ISTS Paper 2008-a-10, on-line CD_ROM, 2008.

AMATI, V.; **SIMONE, D.** ; SCIUBBA, E. ; BRUNO, C. . Influence of the Aircraft Body Cooling Requirements on the Performance of a Scramjet Vehicle: an Exergy Analysis. In: 20th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS 2007), 2007, Padova. Proceedings of ECOS 2007, 2007. v. 2. p. 1441-1450.

HIDDING, B.; **SIMONE, D.**; PFITZNER, M.; BRUNO, C.. Silicon Hydrides as High Energy Fuels: Facts and Perspectives. In: 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, 2007, Cincinnati. Proceedings of 43rd AIAA/ASME/SAE/ASEE JPC, 2007.

HIDDING, B.; **SIMONE, D.**; BRUNO, C. Review of the Potential of Silanes as Rocket/Scramjet Fuels. In: 58th International Astronautical Congress, 2007, Hyderabad. Proceedings of 58th IAC, 2007.

SIMONE, D.; BRUNO, C.; HIDDING, B. LiH as Fuel for Aerospace Propulsion. In: 25th International Symposium on Space Technology and Science, 2006, Kanazawa. Proceedings of 25th International Symposium on Space Technology and Science, 2006.

AMATI, V. ; **SIMONE, D.** ; SCIUBBA, E. ; BRUNO, C. . Exergy Analysis of Hypersonic Propulsion Systems: Performance Comparison of Two Different Scramjet Configurations at Cruise Conditions. In: 19th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems, 2006, Aghia Pelagia, Crete. Proceedings of ECOS2006, 2006. v. 1. p. 145-156.

HIDDING, B.; **SIMONE, D.**; PFITZNER, M.; BRUNO, C. Silanes/H₂O₂ Bipropellant System and Spin-off Applications. In: 3rdESA International Conference on Green Propellants for Space Propulsion, 2006. Proceedings of ESA Space Propulsion Conference, 3rd International Conference on Green Propellants for Space Propulsion. Poitiers: ESA Publication Division, 2006.

SIMONE, D.; BRUNO, C. Silanes as Fuels for SCRJ. In: 13th AIAA/CIRA International Space Planes and Hypersonic Systems and Technologies Conference, 2005, Capua. Proceedings of 6.	13th AIAA/CIRA International Space Planes and Hypersonic Systems and Technologies Conference, 2005.

SIMONE, D.; BRUNO, C. Lithium Hydrides for Micro rockets Applications. In: 2nd ESA International Conference on Green Propellants, 2004, Cagliari. Proceedings of 2nd ESA International Conference on Green Propellants. Noordwijk, NL: ESA Publication Division, 2004.

STELLA, F. ; GAUDENZI, P. ; GIANGI, M. ; PAGLIA, F. ; **SIMONE, D.** . Fluid-Structure Interaction in internal flows: coupled numerical simulation. In: 3rd International Symposium on Advances in Computational Heat Transfer, 2004, na. Proceedings of the CHT-04: An ICHMT International Symposium on Advances in Computational Heat Transfer. New York: Begell House, 2004.

SIMONE, D.; GIANGI, M. ; BUCCHIGNANI, E. ; STELLA, F. . Fully coupled numerical simulation of fluid-structure interaction in a deformable tank. In: AIDAA XVII Congresso Nazionale, 2003, Rome. Proceedings AIDAA XVII Congresso Nazionale. Rome:University of Rome La Sapienza, 2003. v. 2. p. 1131.

TECHNICAL REPORTS

BORELLO, D.; **SIMONE, D.**; VENTURINI, P. Calcolo della portata di flusso nei drenaggi di una turbina a vapore in condizioni di avviamento, la-vaggio ed esercizio. PO 440800911 Line 2 ST water drain study - Step1.

STELLA, F. ; **SIMONE, D.** ; GIANGI, M. . Alumina Combustion Instability and Pressure Oscillation in SRM. 2015.

STELLA, F. ; **SIMONE, D.** ; GIANGI, M. . Aerodynamic Data Package for AVUM reentry (Vega Single Payload Configuration).2014.

BRUNO, C.; **SIMONE, D.** IAA Study - Technologies to Enable Near-Term Interstellar Precursor Missions, Final Report of Study Group III.10 to Commission III. 2013.

SIMONE, D.; INGENITO, A. ; FAUSTO, G. . Avio S.p.a - Theseus Thruster Evolution for Space Exploration and Upper Stage Program. 2012.

STELLA, F.; **SIMONE, D.** ; GIANGI, M. ; NARDECCHIA, F. . Methodology to evaluate the SRM inner TP heat fluxes: CFD analyses. 2012.

BRUNO, C.; **SIMONE, D.** LiH as Fuel for High Speed Propulsion - EOARD GRANT 10-3091. 2011.

STELLA, F. ; **SIMONE, D.** ; NARDECCHIA, F. ; GIANGI, M. . ODP demonstrator: PTFI S3 hardware design. 2011.

STELLA, F. ; **SIMONE, D.** ; PAGLIA, F. ; GIANGI, M. . Propellant grain - Thermal protection gap - Fluid-dynamic analysis. 2008.

SIMONE, D.; FERRARI, C.; BRUNO, C. Moon Vision: High Mobility Vehicle - Propulsion SS Requirements. ISIS HMLV-ENG-TN-021-A. 2007.

STELLA, F. ; PAGLIA, F. ; **SIMONE, D.** ; CASATA, A. ; GIANGI, M. . Pressure Oscillation in SRM (2004-7). 2007.

STELLA, F. ; IANNUCELLI, M. ; RINALDI, S. ; **SIMONE, D.** ; GIANGI, M. . Lyra LV - Retro rockets plume impingement at separation 1-2: preliminary analysis. 2007.

STELLA, F. ; GAUDENZI, P. ; PAGLIA, F. ; CASATA, A. ; GIANGI, M. ; **SIMONE, D.** . PTF protrusion control in SRM - threedimensional numerical simulations. 2003.

STELLA, F. ; GAUDENZI, P. ; PAGLIA, F. ; GIANGI, M. ; CASATA, A. ; **SIMONE, D.** . PTF S3 3D-EG2 Coupled Numerical Simulations. 2003.

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