

Exponent®
Engineering & Scientific Consulting

Cesar Rodriguez Saenz, Ph.D.

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Professional Profile

Dr. Rodriguez Saenz is a mechanical (B.S.) and aerospace (Ph.D.) engineer with expertise in mechanical design and testing, battery and electric mobility systems, product compliance and regulatory standards, and intellectual property litigation. He supports matters involving mechanical characterization, product teardown and benchmarking, design reviews, failure analysis, and field evaluations for clients across the consumer electronics, electric mobility, and consumer products industries.

Dr. Rodriguez Saenz's technical expertise includes mechanical testing protocols, advanced imaging and analysis techniques, compliance frameworks (including UL 4200A, EU CE marking, and North American safety standards), and field evaluation methodologies. In addition to his technical skill set, he has experience supporting intellectual property and litigation matters, including patent infringement analyses for automotive components, sports equipment used in professional athletics, and consumer product liability investigations. His work also includes large-scale photovoltaic installation damage assessments, expert report development, and preparation of technical documentation for commercial litigation proceedings.

Before joining Exponent, Dr. Rodriguez Saenz earned his Ph.D. at the University of Virginia in collaboration with Rolls-Royce North America. His doctoral research focused on the experimental and computational study of axisymmetric inertial particle separators for gas turbine engines. Through this work, he developed subject matter expertise in multiphase flow, computational fluid dynamics (CFD), particle tracking, particle image velocimetry (PIV), flow visualization, and gravimetric testing. He also served as a consultant to Honeywell Aerospace Technologies, supporting projects in centrifugal separation, multiphase flow, and particle separation, including leading the design of a custom centrifugal particle separator test rig for auxiliary power unit (APU) development.

Prior to graduate school and joining Exponent, Dr. Rodriguez Saenz worked as a mechanical design engineer at a regional brake manufacturing company. During his tenure, he led the design and implementation of more than 20 specialized tooling and machinery infrastructure projects. He also served as interim production supervisor during the height of the COVID-19 pandemic, overseeing a 40+ person production line and coordinating just-in-time manufacturing to meet export deadlines across South America and the Caribbean.

Academic Credentials & Professional Honors

Ph.D., Mechanical and Aerospace Engineering, University of Virginia, 2025

B.S., Mechanical Engineering, Universidad San Francisco de Quito, 2019

B.S., Mechanical Engineering, Texas A&M University, 2018

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Mechanical and Aerospace Engineering Distinguished Fellow, University of Virginia, 2021–2025

Chairperson's Fellow, University of Virginia, 2021

Cum Laude Graduate, Universidad San Francisco de Quito, 2019

National Defense Scholarship, Republic of Ecuador, 2014–2019

Academic Appointments

Representative to the Graduate Studies Committee, School of Engineering and Applied Science, University of Virginia, 2022–2023

Representative to the Graduate Engineering Student Council, Department of Mechanical and Aerospace Engineering, University of Virginia, 2022–2023

Prior Experience

Rolls-Royce Doctoral Researcher, University of Virginia, 2021–2025

Consultant, Honeywell Aerospace Technologies, 2023–2025

Design Engineer, EGAR S.A. Frenos Automotrices, 2019–2021

Production Supervisor (Interim), EGAR S.A. Frenos Automotrices, 2020

Engineering Intern, EGAR S.A. Frenos Automotrices, 2018

Professional Affiliations

Member, American Institute of Aeronautics and Astronautics (AIAA), 2024

Member, Human Factors and Ergonomics Society (HFES), 2022

Member, American Society of Mechanical Engineers (ASME), 2018

Member, Society for the Advancement of Material and Process Engineering (SAMPE), 2018

Member, Material Advantage, 2015

Publications

Peer-Reviewed Journal Papers

Rodriguez-Saenz, C.R. and Loth, E., “Axisymmetric-Sector Inertial Particle Separator Efficiency,” Journal of Propulsion and Power, AIAA, Articles in Advance. DOI: https://doi.org/10.2514/1.B39881.

Rodriguez-Saenz, C.R. and Loth, E., "Experimental Characterization of an Axisymmetric-Sector Inertial Particle Separator Wind Tunnel," Aerospace Science and Technology, vol. 163. Elsevier BV, p. 110281, Aug. 2025. DOI: 10.1016/j.ast.2025.110281.

Peer-Reviewed Conference Proceedings Papers

Rodriguez-Saenz, C.R. and Loth, E., "Large Eddy Simulation with Lagrangian Particle Tracking of an Inertial Particle Separator," in 2025 AIAA Aviation Forum, Las Vegas, Nevada, USA, Jul 2025. DOI:

https://doi.org/10.2514/6.2025-3860.

Rodriguez-Saenz, C.R., Ritchie, S., and Loth, E., "Experimental Particle Separation Efficiency for an Axisymmetric-Sector Inertial Particle Separator," in 2025 AIAA Aviation Forum, Las Vegas, Nevada, USA, Jul 2025. DOI: https://doi.org/10.2514/6.2025-3542.

Rodriguez-Saenz, C.R., Loth, E., and Smith, C.F., "Development and Aerodynamic Performance of an Axisymmetric-Sector Inertial Particle Separator Wind Tunnel," in Proceedings of the ASME 2023 International Mechanical Engineering Congress and Exposition, New Orleans, Louisiana, USA, Nov 2023. DOI: https://doi.org/10.1115/IMECE2023-111752.

Presentations

Rodriguez-Saenz, C.R., Loth, E., and Loebig, J., “Efficiency of an Axisymmetric Inertial Particle Separator,” in UVA Rolls-Royce University Technology Center Annual Review 2024, Charlottesville, Virginia, USA, Sep 2024.

Rodriguez-Saenz, C.R., Loth, E., and Smith, C.F., “Development and Aerodynamic Performance of an Axisymmetric-sector Inertial Particle Separator Wind Tunnel,” in UVA Rolls-Royce University Technology Center Annual Review 2023, Indianapolis, Indiana, USA, Oct 2023.

Rodriguez-Saenz, C.R., Loth, E., and Smith, C.F., “Development of an Axisymmetric-Sector Inertial Particle Separator Wind Tunnel,” in UVA Rolls-Royce University Technology Center Annual Review 2022, Charlottesville, Virginia, USA, Oct 2022.

Rodriguez-Saenz, C.R., Loth, E., and Smith, C.F., “Design and Installation of an Axisymmetric-Sector Inertial Particle Separator Facility,” in UVA Rolls-Royce University Technology Center Annual Review 2021, via Microsoft Teams, Oct 2021.

Rodriguez-Saenz, C.R., Loth, E., and Smith, C.F., “Inertial Particle Separator,” in Mechanical and Aerospace Engineering Fall 2021 Research Fair, Charlottesville, Virginia, USA, Oct 2021.

Project Experience

Litigation / Automotive

Automotive component intellectual property litigation support with technical reference research, expert report development, and editorial quality control for patent infringement proceedings.

Litigation / Consumer Products

Consumer equipment product liability investigation with mechanical design assessment, forensic analysis of equipment modifications, and technical documentation for litigation support.

Medical Devices

Medical device product benchmarking and characterization involving 3D modeling, design review, and technical documentation review for regulatory and product development purposes.

Product Safety Standards Compliance

Consumer product safety compliance evaluation with third-party testing against UL 4200A standards, multi-product assessment, and documentation to support new product market introduction.

Multi-jurisdictional regulatory compliance review with assessment of product portfolio against EU CE marking and North American safety standards, gap analysis, and compliance documentation.

Electronic security system safety compliance assessment with evaluation against local, state, and federal regulatory requirements for new product introduction.

Battery Technology

Wearable device battery cell mechanical characterization and damage assessment with development of mechanical testing protocols, analysis, and extraction of material parameters for cell integrity evaluation and development.

Electric mobility battery pack mechanical design review and compliance verification with assessment against industry standards, multi-product evaluation, and documentation of design recommendations.

Advisory Appointments

Member, Inlets, Nozzles, and Propulsion System Integration (INSPI) Technical Committee, American Institute of Aeronautics and Astronautics (AIAA), 2025

Peer Reviews

Journal of Aerospace Engineering (American Society of Civil Engineers)