

Exponent®
Engineering & Scientific Consulting

Ryan Klock, Ph.D., P.E.

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Professional Profile

Dr. Klock received his Ph.D. from the University of Michigan in Aerospace Engineering, with specialties in multi-disciplinary design analysis, gas dynamics, and multi-physics numerical simulation. As a Senior Managing Engineer at Exponent, he oversees the testing and analysis of mechanical systems spanning scales from microscopic electro-mechanical devices to large-scale industrial machinery, with particular focus on the commercial electronics and automotive sectors.

During his time with Exponent, Dr. Klock has led, or made major contributions to, project teams investigating high vacuum system component performance, printed circuit board (PCB) surface-mounted component fatigue life, and the conduct of automotive regulatory testing for the United States Environmental Protection Agency (EPA) and California Air Resources Board (CARB). These projects and others have provided Dr. Klock with a broad set of capabilities, including:

- International Protection Code or Ingress Protection Code testing and failure analysis
- Highly accelerated life testing
- Failure modes and effects analysis
- Static and dynamic material mechanical property characterization at low and high temperatures
- Drop, impact, and shock testing
- Micro-mechanical material and structural strength testing

Prior to joining Exponent, Dr. Klock studied the coupled-physics of thermodynamic, aerodynamic, and structural dynamic systems for ultra-high-speed hypersonic scramjet-based flight vehicles using finite element analysis (FEA) and computational fluid dynamics (CFD) simulations while researching at the University of Michigan and the Air Force Research Laboratory (AFRL). His work garnered him the honors of being named a Rackham Merit Fellow and Defense Advanced Research Projects Agency (DARPA) Rising Leading in Science and Technology.

Academic Credentials & Professional Honors

Ph.D., Aerospace Engineering, University of Michigan, Ann Arbor, 2017

M.S.E., Aerospace Engineering, University of Michigan, Ann Arbor, 2014

B.S.E., Aerospace Engineering, University of Michigan, Ann Arbor, 2012

DARPA Rising Leader in Science and Technology, 2015

Rackham Merit Fellow, 2013

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Licenses and Certifications

Professional Engineer Mechanical, California, #39672

Prior Experience

Research Contractor, Air Force Research Laboratory Munitions Directorate, 2015-2017

Graduate Research Assistant, University of Michigan, 2012-2017

Scientific Advisor, Harrington Electronic LLC, 2011-2016

Solar Probe Plus Spacecraft Autonomous Fault Management Intern, Johns Hopkins University Applied Physics Laboratory, 2012

Research Assistant, NASA Glenn Aeronautics Academy, 2011

Professional Affiliations

American Society for Testing and Materials (member since 2023)

American Institute of Aeronautics and Astronautics (member since 2014)

Tau Beta Pi Engineering Honor Society (member since 2010)

Patents

US Patent 9,486,235: Surgical Device Employing a Cantilevered Beam Dissector, March 2015 (with Harrington RH, Krapf CW, Rontal M).

US Patent 9,581,135: Cable-suspended Wind Energy Generator, November 2013 (with Harrington RH).

Publications

Klock R, Cesnik CES. Local Aeroelastic Instability of High-Speed Cylindrical Vehicles. AIAA Journal 2019; 57(6):1-9.

Klock R, Cesnik CES. Nonlinear Thermal Reduced-Order Modeling for Hypersonic Vehicles. AIAA Journal 2017; 55(7):2358-2368.

Klock R, Owens D, Schwartz H, Plencner R. Integrated Intermodal Passenger Transportation System. NASA Technical Reports Server, March 2012, (NASA/TM-2012-217286).

Conference Proceedings and Presentations

Klock R, Cesnik CE. Rapid Simulation of a Hypersonic Vehicle Through Singular Value Decomposition. 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum, (AIAA 2017-0178).

Klock R, Cesnik CE. Aeroelastic Stability of High-Speed Cylindrical Vehicles. 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum, (AIAA 2017-0406).

Dreyer E, Klock R, Grier B, McNamara JJ, Cesnik CE. Multi-Discipline Modeling of Complete Hypersonic Vehicles Using CFD Surrogates. 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and

Materials Conference, AIAA SciTech Forum, (AIAA 2017-0182).

Klock R, Cesnik CE. Nonlinear Thermal and Thermoelastic Reduced Order Models of a Hypersonic Vehicle. 15th Dynamics Specialists Conference, AIAA SciTech Forum, (AIAA 2016-1322).

Klock R, Cesnik CE. Aerothermoelastic Reduced-Order Model of a Hypersonic Vehicle. AIAA Atmospheric Flight Mechanics Conference, AIAA Aviation Forum, (AIAA 2015-2711).

Klock R, Cesnik CE. Aerothermoelastic Simulation of Air-Breathing Hypersonic Vehicles. 55th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum, (AIAA 2014-0149).

Peer Reviews

Journal of Failure Analysis and Prevention

American Institute of Aeronautics and Astronautics Journal

Journal of Spacecraft and Rockets