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Engineering & Scientific Consulting

Torstens Skujins, Ph.D., P.E.

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Professional Profile

Dr. Skujins's background is in mechanical and aerospace engineering, and his expertise spans structural analysis, fluid flow, and industrial safety. At Exponent, he specializes in analysis of wind turbines and wind turbine components, industrial equipment, and machinery and equipment safety.

Dr. Skujins has investigated an extensive array of issues pertaining to wind turbines. Specific experience includes failure analyses of both horizontal- and vertical-axis wind turbine blades, structural analysis of blade damage, development of a wind turbine blade aerodynamic model, remaining life estimations for wind turbines, analysis of wind turbine brakes, and analysis of wind turbine ladder safety. He is familiar with wind-industry standards, and his work routinely includes the comparison of design and operational documentation to applicable standards.

He has substantial experience investigating issues pertaining to industrial equipment, both in the realms of safety analysis and failure analysis. Examples of such equipment include forklifts, dock levelers, ladders, manufacturing equipment, and wood chippers, among others. His experience also encompasses analysis of food processing and agricultural machinery, including equipment used for handling nuts, tomatoes, lettuce, potatoes, and poultry. Dr. Skujins is familiar with machine guarding and safety standards and analyzes industrial accidents with an eye toward those standards.

Prior to coming to Exponent, as a graduate student, Dr. Skujins was a part of the Michigan-AFRL Collaborative Center in Control Science (MACCCS), an Air Force-sponsored effort to develop a six-degree-of-freedom hypersonic vehicle controls simulation framework and then to use that framework to study vehicle controllability. Dr. Skujins developed a computationally efficient model for the calculation of unsteady aerodynamic loads for general vehicle configurations which could be used throughout the duration of a hypersonic vehicle's entire flight, from subsonic up through hypersonic speeds.

Academic Credentials & Professional Honors

Ph.D., Aerospace Engineering, University of Michigan, Ann Arbor, 2013

M.S., Aerospace Engineering, University of Michigan, Ann Arbor, 2009

B.S., Mechanical Engineering, Duke University, 2007

Departmental Fellowship, University of Michigan, 2007-2008

Pratt Fellowship, Duke University, 2006-2007

Co-president, Pi Tau Sigma mechanical engineering honor society (Duke chapter), 2007

Licenses and Certifications

Licensed Professional Mechanical Engineer, California, #M37379

Professional Affiliations

American Institute of Aeronautics and Astronautics (member)

Publications

Skujins T, Rakow JF. A preexisiting fracture in a helicopter composite rotor blade system. ISASI Forum, Journal of the International Society of Air Safety Investigators, April-June 2018; 51(2): 22-27.

Rakow JF, Skujins, T. Analysis of aged wind turbines for continued operation. Wind Systems Magazine, Vol.09, Issue 07, pp. 17-19, July 2017.

Skujins T, Cesnik CES. Reduced-order modeling of unsteady aerodynamics across multiple mach regimes. Journal of Aircraft 2014 Dec; 51(6):1681-1704.

Skujins T, Cesnik CES, Oppenheimer MW, Doman DB. Canard-elevon interactions on a hypersonic vehicle. Journal of Spacecraft and Rockets 2010 Feb; 47(1):90-100.

Conference Proceedings

Skujins T, Cesnik CES. Toward an unsteady aerodynamic ROM for multiple mach regimes. Proceedings, 53rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA-2012-1708, April 2012.

Skujins T, Cesnik CES. On the applicability of an unsteady aerodynamic ROM to the transonic regime. Proceedings, AIAA Atmospheric Flight Mechanics Conference, AIAA-2011-6525, August 2011.

Skujins T, Cesnik CES. Reduced-order modeling of hypersonic unsteady aerodynamics due to multi-modal oscillations. Proceedings, 17th AIAA International Space Planes and Hypersonic Systems and Technologies Conference, AIAA-2011-2341, April 2011.

Skujins T, Cesnik CES. Reduced-order modeling of hypersonic vehicle unsteady aerodynamics. Proceedings, AIAA Atmospheric Flight Mechanics Conference, AIAA-2010-8127, August 2010.

Frendreis SGV, Skujins T, Cesnik CES. Six-degree-of-freedom simulation of hypersonic vehicles. Proceedings, AIAA Atmospheric Flight Mechanics Conference, AIAA 2009-5601, August 2009.

Skujins T, Cesnik CES, Oppenheimer MW, Doman DB. Applicability of an analytical shock/expansion solution to the elevon control effectiveness for a 2-D hypersonic vehicle configuration. Proceedings, AIAA Atmospheric Flight Mechanics Conference and Exhibit, AIAA-2008-6384, August 2008.

Oppenheimer MW, Skujins T, Cesnik CES, and Doman DB. Canard-elevon interactions on a hypersonic vehicle. Proceedings, AIAA Atmospheric Flight Mechanics Conference and Exhibit, AIAA-2008-6383, August 2008.

Oppenheimer MW, Skujins T, Bolender MA, Doman DB. A flexible hypersonic vehicle model developed with piston theory. Proceedings, AIAA Atmospheric Flight Mechanics Conference and Exhibit, AIAA-2007-6396, August 2007.

Presentations

AIAA Structures, Structural Dynamics, and Materials Conference, 2012.

AIAA Atmospheric Flight Mechanics Conference, 2008, 2010, 2011.

AIAA International Space Planes and Hypersonic Systems and Technologies Conference, 2011.