Division on Engineering and Physical Sciences
Army Research Laboratory Technical Assessment Board
Panel on Mechanical Science and Engineering at the Army Research Laboratory

Panel on Mechanical Science and Engineering at the Army Research Laboratory (Sciences for Maneuver)

Biographical Sketches

Chair

WESLEY L. HARRIS (NAE) is the Charles Stark Draper Professor of Aeronautics and Astronautics and director of the Lean Sustainment Initiative at the Massachusetts Institute of Technology. He was elected to the NAE "for contributions to understanding of helicopter rotor noise, for encouragement of minorities in engineering, and for service to the aeronautical industry." He has performed research and published in refereed journals in the following areas: fluid mechanics; aerodynamics; unsteady, non-linear aerodynamics; acoustics; lean manufacturing processes; and military logistics and sustainment. Dr. Harris has substantial experience as a leader in higher education administration and management. Dr. Harris also has demonstrated outstanding leadership in managing major national and international aeronautical and aviation programs and personnel in the executive branch of the federal government. He is an elected fellow of the AIAA, AHS, and of the NTA for personal engineering achievements, engineering education, management, and advancing cultural diversity. He holds a Ph.D. (1968) in fluid mechanics/applied mathematics from Princeton University.

Members

ROMESH C. BATRA is the Clifton C. Garvin Professor of Engineering Science and Mechanics at Virginia Polytechnic Institute and State University (Virginia Tech). Dr. Batra has been teaching courses on the finite element method, continuum mechanics and nonlinear elasticity to M.Sc. and Ph.D. students since 1974. His research group has worked in several areas of applied mechanics such as adiabatic shear bands (narrow regions of intense plastic deformation that form during high strain-rate deformations of most metallic alloys and generally precede fracture), composite structures, functionally graded materials/structures, nanostructures, smart materials/structures, micro-electro-mechanical systems, and computational mechanics including the finite element and meshless methods. Dr. Batra's group has developed software based on the finite element and meshless methods for analyzing contact problems for rubber-covered rolls, adiabatic shear bands, crack propagation in functionally graded materials, damage evolution in fiber-reinforced laminated composites, and transient deformations of structures made of thermo-elasto-visco-plastic materials. Dr. Batra has authored the book, Elements of Continuum Mechanics, AIAA. His research group has published more than 400 papers in reputable refereed and widely read journals. He has served for two 5-year terms on the National Research Council panel to review the performance of the Warhead Mechanics and the Lethality/Survivability Directorates of the Army Research Laboratory; for one year as president of the Society of Engineering Science; for three years as secretary of the American Academy of Mechanics; and for five years as chair of the ASME Elasticity Committee. He is an honorary member of the American Society of Mechanical Engineers (ASSME), and a fellow of the American Academy of Mechanics, ASME, American Society of Engineering Education, Society of Engineering Science, and the US Association of Computational Mechanics. He is a founder and editor of the journal: Mathematics and Mechanics of Solids. He received the American Society of Mechanical Engineers Honorary Membership Award; the Engineering Science Medal from the Society of Engineering Science (2009); the Hind Rattan Award (2016) from the Non-Residents of India Welfare Society; the Commonwealth of Virginia Outstanding Scientist Award (2011); the Virginia Outstanding Faculty Award (2010); an honorary D.Sc. from Thapar University (2006); the Alexander von Humboldt

Award (1992) for senior scientists; and the Virginia Tech Alumni Award for excellence in graduate advising. Dr. Batra earned his B.Sc. (mechanical engineering), M.A. Sc. (mechanical engineering) and Ph.D. (mechanics and materials science) degrees, respectively, in 1968, 1969 and 1972 from Thapar University (India), University of Waterloo (Canada) and the Johns Hopkins University (USA).

EARL H. DOWELL (NAE) is William Holland Hall Professor and Dean Emeritus in the Edmund T. Pratt, Jr. School of Engineering at Duke University. The fundamental areas of Dr. Dowell's research interests are dynamics, fluid and solid mechanics, and acoustics. A particular focus at present is on the dynamics of nonlinear fluid and structural systems and their associated limit cycle and chaotic motions. Examples include flexible plates and shells excited by dynamic fluid forces, oscillating airfoils and wings in a transonic flow, and aero-mechanical instability of rotorcraft systems. Also of interest are studies of systems with many degrees-of-freedom. Three aspects of such systems are being considered: eigenfunctions of nonconservative (fluid or fluid-structure) systems, turbulence as a multi-mode chaotic phenomena, and the asymptotic behavior of a dynamical system as the number of degrees-of-freedom becomes very large (asymptotic model analysis). The potential applications for the results of these research efforts are very broad, but a principal emphasis is on aerospace, automotive, naval, and other transportation. Dr. Dowell received the Ph.D. in aeronautics and astronautics from the Massachusetts Institute of Technology in 1964.

DANIEL J. INMAN is the Clarence “Kelly” Johnson Collegiate Professor and Chair of the Department of Aerospace Engineering at the University of Michigan. Formerly he was the director of the Center for Intelligent Material Systems and Structures and the G.R. Goodson Professor in the Department of Mechanical Engineering at Virginia Tech and is the Brunel Chair in Intelligent Materials and Structures at the University of Bristol, UK. He holds an adjunct professorship at Virginia Tech in mechanical engineering. A former chair of the Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, he has held adjunct positions in the Division of Applied Math at Brown University and in math at the University of Southern California. Since 1980, he has published 8 books (on vibration, control, statics, dynamics and energy harvesting), eight software manuals, 20 book chapters, 350 journal papers and 600 proceedings papers, given 63 keynote or plenary lectures, graduated 62 Ph.D. students and supervised more than 75 M.S. degrees. He is a fellow of the American Academy of Mechanics (AAM), the American Society of Mechanical Engineers (ASME), the International Institute of Acoustics and Vibration (IIAV), the American Institute of Aeronautics and Astronautics (AIAA), the Society of Experimental Mechanics (SEM) and the National Institute of Aerospace (NIA). He has a B.S. (Grand Valley State College) in physics, and an M.A.T. in physics and a Ph.D.in mechanical engineering from the Michigan State University.

WILLIAM Q. MEEKER, JR. is a professor of statistics and distinguished professor of liberal arts and sciences at Iowa State University. He has done research and consulted extensively on problems in reliability data analysis, reliability test planning, accelerated testing, nondestructive evaluation, and statistical computing. He is a fellow of the American Statistical Association (ASA) and the American Society for Quality (ASQ) and a past editor of Technometrics. He is co-author of the books Statistical Methods for Reliability Data with Luis Escobar (1998), and Statistical Intervals: A Guide for Practitioners with Gerald Hahn (1991), six book chapters, and of numerous publications in the engineering and statistical literature. He has won the ASQ Youden prize four times and the ASQ Wilcoxon Prize three times. He was recognized by the ASA with their Best Practical Application Award in 2001 and by the ASQ Statistics Division’s with their W.G. Hunter Award in 2003. In 2007 he was awarded the ASQ Shewhart medal. He received the Ph.D. in administrative and engineering systems from Union College in 1975.

DANIEL I. NEWMAN is a senior technical fellow of the Boeing Company in aircraft configuration design and development, with a specialty in vertical lift aircraft design. He serves as chief engineer for the Phantom Works Rotary Wing Aircraft organization in Defense, Space, and Security. Within Phantom Works, Mr. Newman is responsible for the technical integrity of all vertical lift research, and coordinates technical activities with Phantom Works Air and Space,

Vertical Lift Business Unit, Boeing Research and Technology, and Commercial Airplanes. Boeing Phantom Works identifies and matures a full range of runway independent technologies, products and services to meet the demands of the warfighter including rotorcraft, tiltrotor and powered lift aircraft. He also supports commercial airplane product development focusing on advanced concepts. In commercial airplanes product development, Mr. Newman leads a variety of advanced feature and platform concept efforts, provides counsel and expertise across programs, and coordinates advancements in technology maturation and risk mitigation processes. Boeing Commercial Product Development develops and delivers the next generation of commercial aircraft products and services to advance global air transportation. He previously served as a program manager at the Defense Advanced Research Projects Agency (DARPA) in the Tactical Technologies Office, responsible for a variety of developments in unmanned aircraft, high-fidelity modeling, sensors, airspace network and architecture, and aircraft survivability. Prior to DARPA he was a technical fellow of The Boeing Company in a variety of roles on the RAH-66 Comanche Program and in the Advanced Rotorcraft organization. He served the technical director of the AHS International, the premier global vertical flight technical society. He also served as an adjunct professor in mechanical engineering at the University of Pennsylvania. He began his career in technical marketing for General Electric Plastics Division. He received his B.S. in mechanical engineering from the Sibley School at Cornell University and his Masters in aerospace engineering from the Alfred Gessow Rotorcraft Center at the University of Maryland.

ARMANDO ANTONIO RODRIGUEZ is a professor of electrical engineering at Arizona State University (ASU) and the executive director of the Southwest Institute for Engineering Transfer Excellence and the Intelligent/Autonomous Embedded Systems Laboratory (IAeSL). He is the executive director of an NSF $5M, 5 year, 10 institution, Arizona-wide Engineering Scholarship program. The program involves over 100 faculty mentors and 70-90 scholars per semester – each working on a career-shaping project in an area of national importance. The program has served over 1000 students since 2001. Dr. Rodriguez' areas of research include modeling and control of advanced aerospace systems, hypersonic vehicles, missile systems, unmanned aerial vehicles, intelligent vehicles, robotic systems; modeling and control of socio-ecological and bio-economic systems; modeling and control of semiconductor manufacturing processes; modeling, control, and design of low power electronic systems; robust fault-tolerant, multivariable, sampled-data and multi-rate control of nonlinear distributed parameter (infinite-dimensional) and lumped parameter (finite-dimensional) dynamical systems; approximation of complex dynamical systems; and design and rapid prototyping of fault-tolerant embedded systems. Prior to joining the ASU faculty in 1990, Dr. Rodriguez worked at MIT, IBM, AT&T Bell Laboratories, and Raytheon Missile Systems. He has also consulted for Eglin Air Force Base, Boeing Defense and Space Systems, Honeywell, Intel and NASA. Dr. Rodriguez is the author of three texts addressing feedback systems, linear systems and the design of multivariable control systems. He has also authored over 200 technical publications. He has delivered over 100 invited presentations – 15 plenary – at international/national forums, conferences, universities and corporations. He has received numerous research, teaching and mentoring awards including a 1997 Boeing A.D. Welliver Faculty Fellowship Award and a 1998 White House Presidential Excellence Mentoring Award from President Bill Clinton. Dr. Rodriguez received his Ph.D. and M.S. degrees in electrical engineering and computer science from the Massachusetts Institute of Technology and his B.S. degree from the Polytechnic Institute of New York

JAYANT S. SABNIS is senior lecturer in the Department of Aeronautics and Astronautics at Massachusetts Institute of Technology. In this role at MIT, he is engaged in teaching undergraduate and graduate courses in propulsion, turbomachinery, thermo-fluid sciences and aircraft/energy systems as well as research programs in these disciplines. Prior to joining MIT, Dr. Sabnis was Vice President of Engineering – Module Centers, at Pratt and Whitney. In this role, he was responsible for providing leadership to about 3000 engineers in the Module Center Engineering organization who execute the design, development and field support of all the Pratt and Whitney engines components. Prior to this position, he was Chief of System Functional Design and responsible for functional design of all Pratt and Whitney gas turbine engines. Dr. Sabnis played the lead role in defining the thermodynamic cycle for the Pratt and Whitney geared turbofan engine™ family as well as securing air-framer/airline acceptance of this step change in engine architecture. He has also provided the leadership to the team responsible for the

aerodynamic design of these engines, which provide over 15% improvement in fuel consumption for the aircraft engines while simultaneously reducing the noise. The step change in fuel consumption and the noise reduction provided by these engines has enabled the launch of six different next generation aircrafts. Dr. Sabnis holds ten patents and has authored over 20 technical publications. He is a member of the advisory board for the American Institute of Aeronautics and Astronautics (AIAA) Journal of Propulsion and Power. He is a fellow of the AIAA and the American Society of Mechanical Engineers (ASME) and member of the Connecticut Academy of Science and Engineering. The Indian Institute of Technology, Bombay has recognized Dr. Sabnis' accomplishments with the Distinguished Alumni Award, their highest level of recognition. Dr. Sabnis received the Ph.D. in mechanical engineering from Syracuse University in 1980.

WILLIAM A. SIRIGNANO (NAE) is the Henry Samueli Endowed Chair in Engineering and a professor of mechanical and aerospace engineering at the University of California, Irvine. His research and teaching interests have covered the topics of spray and droplet science and technology, combustion, aerospace propulsion, combustion instability, noise suppression and applied mathematics. His research accomplishments include analysis predicting periodic nonlinear oscillations with shockwaves in an unstable combustor; analysis of driving mechanisms for combustion instability in rockets and ramjets; explanation of the nonlinear fluid dynamics associated with Helmholtz resonators; determination of admittance for oscillatory, three-dimensional nozzle flows; theory for flame spread above liquid and solid fuels; theory for ignition of combustible gas by a hot projectile; resolution of turbulent flame and propagation in reciprocating and rotary internal combustion engines; theory of droplet vaporization and convective heating with internal circulation; computational methods for spray flows; theory of droplet interactions in a dense spray; liquid atomization theory; and miniature combustor technology. He received the Ph.D. in aerospace and mechanical sciences in 1964 from Princeton University.

ALEXANDER J. SMITS (NAE) is the Eugene Higgins Professor in the Department of Mechanical and Aerospace Engineering at the Princeton University. His research interests are fundamental, experimental research in turbulence and fluid mechanics. He is interested in the behavior of low and high Reynolds number turbulent boundary layers at subsonic, supersonic and hypersonic speeds; shock wave/turbulent boundary layer interactions; the effects of roughness on wall-bounded turbulent flows; flow control; Taylor-Couette flows; biomimetic flows; sports ball aerodynamics; and the development of new and improved measurement techniques. His work has application to the design of more efficient vehicles, improving the prediction of turbulent flows in pipes, channels and boundary layers, including heat, mass and momentum transport in atmospheric surface flows, and high-speed flows over supersonic and hypersonic vehicles. He also studies the swimming of fish and other animals, and how biology can often inspire new and improved solutions to engineering applications. He has a B.Eng. and a Ph.D. in mechanical engineering from the University of Melbourne.

ANNA G. STEFANOPOULOU is the William Clay Ford Professor of Manufacturing at the University of Michigan. She has been on the faculty of the Department of Mechanical Engineering since 2000. She obtained her Diploma (1991, Nat. Tech. Univ. of Athens, Greece) in Naval Architecture and Marine Engineering and her Ph.D. (1996, University of Michigan) in Electrical Engineering and Computer Science. She served as the Director of the Automotive Research Center a multi-university U.S. Army Center of Excellence in Modeling and Simulation of Ground Vehicles (2009-2018). She was an assistant professor (1998-2000) at the University of California, Santa Barbara and a technical specialist (1996-1997) at Ford Motor Company where she developed nonlinear and multivariable models and controllers for advanced engines; her algorithms were implemented and tested in experimental vehicles. She has been recognized as a Fellow of three different societies; the ASME (08), IEEE (09), and SAE (18). She is an elected member of the Executive Committee of the ASME Dynamics Systems and Control Division and the Board of Governors of the IEEE Control Systems Society. She is the Founding Chair of the ASME DSCD Energy Systems Technical Committee and a member of a U.S. National Research Council committee on the 2025 US. Light Duty Vehicle Fuel Economy Standards. She is a

recipient of the 2017, IEEE Control System Technology award, the 2012 College of Engineering Research Award, the 2009 ASME Gustus L. Larson Memorial Award, a 2008 Univ. of Michigan Faculty Recognition award, the 2005 Outstanding Young Investigator by the ASME DSC division, a 2005 Henry Russel award, a 2002 Ralph Teetor SAE educational award, a 1997 NSF CAREER award and selected as one of the 2002 world's most promising innovators from the MIT Technology Review. She has co-authored a book, 20 US patents, and more than 250 publications (5 of which have received awards) on estimation and control of internal combustion engines and electrochemical processes such as fuel cells and batteries.

JOHN C. WALL (NAE) is retired vice president and CTO of Cummins, Inc. Internal combustion engine design, emission control and fuels, particularly diesel, have been the primary focus of his professional work. Control of diesel exhaust emissions has included analytical modeling and experimental work with combustion system design, cooled exhaust gas recirculation systems, variable geometry turbochargers, fuel injection systems and exhaust after-treatment systems, diesel oxidation catalysts, diesel particulate filters, NOx adsorber systems and selective catalytic reduction NOx control systems. Advanced engine design has included design and analysis of all major engine components and subsystems. He has been involved in environmental policy and technology with the U.S. EPA and California Air Resources Board, and in studies of detailed chemistry and health effects of diesel exhaust emissions through the Health Effects Institute. His interests also include alternative fuels for transportation and power generation, energy and environmental policy, and management of research and engineering. He received the Ph.D. in mechanical engineering from the Massachusetts Institute of Technology in 1978.

BEN T. ZINN (NAE) is the David S. Lewis, Jr. Chair and the Joint Regents Professor of Mechanical Engineering at the Georgia Institute of Technology. He joined the Georgia Institute of Technology in 1965 and attained the rank of regents' professor in 1973. His fields of research include: control of combustion processes, combustion instabilities in rocket motors, ramjets, jet engine and gas turbines, oscillatory flame phenomena, reacting flows, acoustics and pulse combustion. He has published 117 refereed papers and 213 reports and unrefereed papers, edited two AIAA Progress Series books on combustion diagnostics, wrote the section on "Pulsating Combustion" for a book entitled Advanced Combustion Methods, which was published by Academic Press, and he has given 354 seminars/lectures at various universities and conferences throughout the world. He is also a co-holder of seven patents. He is a fellow of the of the AIAA and the ASME; and has a honorary professorship at the Beijing University of Aeronautics and Astronautics, Beijing, China. He received the Ph.D. in aeronautical engineering and mechanical science from Princeton University in 1965.

ARLTAB Chair

JENNIE S. HWANG (NAE) is CEO of H-Technologies Group, and board trustee and distinguished adj. professor at Case Western Reserve University. Her career encompasses corporate and entrepreneurial businesses, international collaboration, research management, technology transfer and global leadership positions, as well as corporate and university governance. Among her many honors and awards are U.S. Congressional Certificates of Recognition; induction into International Hall of Fame –Women in Technology and Ohio Women Hall of Fame; named the R&D-Stars-to-Watch; Distinguished Alumni Awards; Honorary Doctoral degree; and YWCA Achievement Award. She was the CEO of International Electronic Materials Corp. and has held senior executive positions with Lockheed Martin Corp., Hanson, PLC and Sherwin-Williams Co. and co-founded entrepreneurial businesses. She is internationally recognized as a pioneer and long-standing leader in the infrastructure development of electronics miniaturization and green manufacturing. She has served as Global President of the Surface Mount Technology Association and in other global leadership positions. An international speaker and author of 475+ publications including several internationally-used books, she has lectured to tens of thousands of managers, engineers and researchers on professional development courses. Her speeches range from university commencement addresses to keynote at DoD Federal Women's Program to tutorials at the U.S. Patent and Trademark Office. She is also a prolific author and speaker on education, workforce, and social and business issues. Additionally,

Dr. Hwang has served as a board director for Fortune 500 NYSE-traded and private companies and various university and civic boards, and on the International Advisory Board of the Singapore Advanced Technology and Manufacturing Institute and a number of international industry boards. On serving the National Academies, she chairs the Technical Assessment Board of Army Research Laboratory, and has served as NAE Membership Search Executive (Materials Section), National Materials and Manufacturing Board, DoD R&D Globalization Board, Committee on Forecasting Future Disruptive Technologies and NAE Award Committee, among others. She also has served as a reviewer for National Academies Reports and other national/international publications. Her formal education include Harvard University Executive Program, Columbia University Business School Governance Program, and four academic degrees (Ph.D., M.A., M.S., B.S.) in Materials Science and Metallurgical Engineering, Chemistry, and Liquid Crystal Science. The Dr. Jennie S. Hwang Award for Faculty Excellence was established at her Alma Maters. The Dr. Jennie S. Hwang YWCA Award is established in her honor, now for 17 years running, to encourage and recognize outstanding women students in STEM, Further info: www.JennieHwang.com.