

Announcements and Acknowledgments

Summary

THIS editorial announces recent policy changes, reports on editorial personnel changes, reports on progress concerning the planned special 100th Anniversary of Flight issue of the journal, and acknowledges service to the journal.

Length Limitations

The *AIAA Journal* is continuing its policy, begun two years ago, of no length limitations for full-length papers. Thus, longer papers can be accommodated although all manuscripts should be as *brief and concise* as proper presentation of the ideas will allow. Length limitations on Technical Notes (maximum of nine double-spaced manuscript pages) and Readers' Forum items (maximum of four double-spaced manuscript pages) continue, however, in keeping with the intent of these publishing vehicles for prompt disclosure of information having a relatively limited scope. The detailed requirements of all types of manuscripts can be found in the **Information for Contributors to Journals of the AIAA**, which appears on the inside back cover of each issue of the journal.

Scope

The statement of scope of the *AIAA Journal* appears on the inside front cover of each issue. The topics within our scope include aeroacoustics, aerodynamics, combustion, fundamentals of propulsion, fluid mechanics and reacting flows, fundamental aspects of the aerospace environment, hydrodynamics, lasers and associated phenomena, optimization, plasmas, research instrumentation, and facilities, structural mechanics and materials, thermomechanics, and thermochemistry. Papers also are sought that review, in an intensive manner, the results of recent research developments in any of the topics listed. Every effort is made to accommodate the decision of authors that the *AIAA Journal* is the most appropriate journal for their manuscript. Manuscripts that depart excessively from the scope of the journal, however, are returned to authors along with suggestions about more appropriate alternative journals.

Suggested Reviewers and Associate Editors

To assist the review process, authors are asked to include the names and addresses of five (5) suggested reviewers for their manuscript in the covering correspondence for submitted manuscripts. It is also helpful for authors to suggest Associate Editors (AEs) for their submission; such requests are honored whenever possible. To help authors suggest potential AEs, brief biographical sketches providing the background of all of the currently active AEs are published in the January issue of the journal each year. The AE handling each published paper is also noted at the end of each paper in order to help indicate the types of papers that particular AEs are handling.

Reappointed Associate Editors

Seven individuals have agreed to serve another term as an Associate Editor, as follows: Promode R. Bandyopadhyay, U.S. Naval Undersea Warfare Center; Josette R. Bellan, Jet Propulsion Laboratory; Eric R. Johnson, Virginia Polytechnic Institute and State University; Achille Messac, Rensselaer Polytechnic Institute; Anthony N. Palazotto, U.S. Air Force Institute of Technology; Martin Sichel, University of Michigan; and Ronald M. So, Hong Kong Polytechnic University. The past service of these individuals, and their willingness to continue to serve in order to help maintain the editorial continuity of the journal, is very much appreciated.

Newly Appointed Associate Editors

I am very pleased to announce the appointment of three new Associate Editors, as follows: Mehdi Ahmadian, Virginia Polytechnic Institute and State University; Graham V. Candler, University of

Minnesota; and Kirti N. Ghia, University of Cincinnati. The willingness of these individuals to help carry out the editorial duties of the journal is very much appreciated.

Continuing Associate Editors

Individuals who are continuing their service as an Associate Editor for the coming year are as follows: Suresh K. Aggarwal, University of Illinois at Chicago; Hafiz M. Atassi, University of Notre Dame; Alex Berman, Bloomfield, CT; Aditi Chattopadhyay, Arizona State University; William J. Devenport, Virginia Polytechnic Institute and State University; Peyman Givi, State University of New York at Buffalo; Iskender Gökalp, Université D'Orleans; Jay P. Gore, Purdue University; Eli Levine, University of Washington; Robert P. Lucht, Texas A&M University; Christophe Pierre, University of Michigan; Allen Plotkin, San Diego State University; Sunil Saigal, Carnegie Mellon University; Kunigal N. Shivakumar, North Carolina A&T; and Anthony M. Waas, University of Michigan. In addition, Pasquale M. Sforza, University of Florida, is continuing to serve as Book Review Editor for the coming year. The past and continuing service of these individuals to the journal is very much appreciated.

Editorial Advisory Board

The continuing members of the Editorial Advisory board are as follows: Satya N. Atluri, University of California, Los Angeles; Dennis M. Bushnell, NASA Langley Research Center; Earl H. Dowell, Duke University; Edward M. Greitzer, Massachusetts Institute of Technology; Robert G. Loewy, Georgia Institute of Technology; Robert W. McCormack, Stanford University; Simon Ostrach, Case Western Reserve University; Eli Reshotko, Case Western Reserve University; Anatol Roshko, California Institute of Technology; George W. Springer, Stanford University; Byron D. Tapley, University of Texas; Raymond Viskanta, Purdue University; Forman A. Williams, University of California, San Diego; and Israel J. Wygnanski, University of Arizona. The continued willingness of these individuals to provide editorial guidance to the journal is very much appreciated.

Special 100th Anniversary of Flight Issue

The Editorial board is continuing to select unusually significant papers that have appeared in the *AIAA Journal* and its predecessors (*Journal of Aeronautical Sciences*, *Journal of Aerospace Sciences*, *ARS Journal*, *ARS Bulletin*, *Astronautics*, *Journal of the American Rocket Society*, and *Jet Propulsion*). Nominated papers are being considered for reprinting in a special 100th Anniversary of Flight issue of the *AIAA Journal* that will appear in December 2003 to commemorate the remarkable achievement of the first flight of the Wright brothers on 17 December 1903. Nearly 150 papers have been nominated for publication in the special issue thus far. Nevertheless, nominations are still being accepted in order to ensure that papers that merit inclusion in the special issue are not overlooked, and they will be accepted until 31 December 2002. Individuals may submit any number of nominations. The nominations, consisting of information sufficient to identify the paper [e.g., author(s), title, journal, volume and/or number, year, and inclusive page numbers] should be sent to (mail, telephone, fax, and e-mail are all acceptable):

AIAA Journal

Attn: G. M. Faeth

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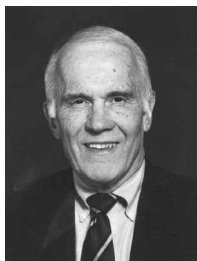
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Acknowledgments

The editorial staff of the AIAA deserve special mention for effectively dealing with the publication problems of a widely circulated monthly journal, as follows: Roger L. Simpson, Virginia Polytechnic Institute and State University (Vice President—Publications); Norma Brennan, AIAA (Director of Publications); and Luke McCabe, AIAA (Managing Editor, *AIAA Journal*). Special thanks are also due to our retiring Associate Editors, as follows: Amr Baz, University of Maryland; John Kallinderis, University of Texas at

Austin; and Philip J. Morris, The Pennsylvania State University. Among these John Kallinderis deserves special mention for serving an extra two years as an Associate Editor in order to help achieve a more uniform number of Associate Editors retiring each year. Finally, we all owe a debt of gratitude to the individuals who reviewed papers for the journal this year; a list of their names follows.

G. M. Faeth
Editor-in-Chief



GERARD M. FAETH, A.B. Modine Professor of Aerospace Engineering and Head of the Gas Dynamics Laboratories at the University of Michigan, received the B.M.E. from Union College (New York) in 1958 and the M.S. in 1961 and Ph.D. in 1964 from the Pennsylvania State University, both in Mechanical Engineering. He joined the faculty of the Department of Mechanical Engineering at the Pennsylvania State University in 1958, where he was promoted to the rank of Professor in 1975 before retiring as Professor Emeritus upon assuming his present position in 1985. His current research interests include homogeneous and heterogeneous combustion phenomena, multiphase flows, radiation in participating media, optical properties of particulate matter, and buoyant and nonbuoyant turbulent flows. Dr. Faeth has served as a Member of the AIAA Propellants and Combustion Technical Committee (1976–1978, 1979–1984, and 1994–2000). He is a recipient of the American Society of Mechanical Engineers (ASME) Heat Transfer Division's Memorial Award (1988), the AIAA Propellants and Combustion Award (1993), and the NASA Public Service Medal (1999). He is corecipient of best paper awards from ASME in 1984, 1985, 1988, and 1995; from AIAA in 1984, 1994, and 1999; and from the Combustion Institute in 1996. He is a Fellow of AIAA, ASME, and the American Association for the Advancement of Science and a Member of the National Academy of Engineering and the Combustion Institute. He was an Associate Technical Editor (1981–1985) and the Technical Editor (1985–1990) of the *Journal of Heat Transfer* of the ASME and a Deputy Editor (1984–1990) and the U.S. Editor (1990–1996) of *Combustion and Flame*, the journal of the Combustion Institute. He is a Member of the Editorial Advisory Boards of *Combustion Science and Technology*, *Progress in Energy and Combustion Science*, *Atomization and Sprays*, and the *Annual Review in Numerical Fluid Mechanics and Heat Transfer*. Dr. Faeth is author or coauthor of more than 400 articles and papers.

Associate Editors



SURESH K. AGGARWAL is Professor of Mechanical Engineering at the University of Illinois at Chicago and received his Ph.D. in Aerospace Engineering from the Georgia Institute of Technology in 1979. Since then, he has served on the Professional Research Staff at Princeton University and as a Senior Research Engineer at Carnegie–Mellon University. He joined the faculty of the University of Illinois at Chicago in 1984. His research interests include gaseous and spray combustion phenomena, direct numerical simulation of multiphase flows, nanoscale flows, high-pressure and multicomponent droplet phenomena, partially premixed flames, and microgravity combustion. Dr. Aggarwal has served as a Member of the AIAA Propellants and Combustion Technical Committee (1985–1989 and 1991–1994). He is currently serving as a Member of the AIAA Terrestrial Energy Technical Committee and the American Society of Mechanical Engineers (ASME)–International Gas Turbine Institute Fuels and Combustion Technical Committee. He is an Associate Fellow of AIAA and a Member of ASME and the Combustion Institute. He has been a Technical Organizer for the Propellants and Combustion Technical Committee at the AIAA Aerospace Sciences Meeting (1989) and Joint Propulsion Conference (1993) and for the ASME Turbo Expo–Fuel and Combustion Program (1994). He has also served on numerous occasions as a consultant to government and industrial organizations and as a Member of the National Science Foundation and U.S. Department of Energy review panels. Dr. Aggarwal is a recipient of the University of Illinois Scholar Award and a biographee in *Who's Who in Science and Engineering*, *Who's Who in America*, and *Who's Who in World*. He has authored or coauthored more than 160 articles and papers.



MEHDI AHMADIAN is Professor of Mechanical Engineering at Virginia Polytechnic Institute and State University, where he also holds the position of Director of the Advanced Vehicle Dynamics Laboratory. He received his B.S. (1980), M.S. (1982), and Ph.D. (1984) from the State University of New York at Buffalo. Dr. Ahmadian joined the faculty at Clemson University (Clemson, South Carolina) in 1984 as Assistant Professor in the Department of Mechanical Engineering. He performed research in adaptive and decentralized control of high-order structures for aerospace applications. In 1987 he joined the Lord Corporation (Erie, Pennsylvania), where he worked for the next six years developing various advanced isolation systems and ride improvement packages for vehicles. His efforts led to the development and first-ever successful testing of a semi-active suspension system for heavy trucks. In 1993, Dr. Ahmadian joined General Electric (GE) Transportation Systems (Erie, Pennsylvania), where he continued his research and development work in transportation-related systems for the next two years. His accomplishments at GE Transportation Systems included developing a patented electropneumatic valve and designing and developing an innovative steerable truck (bogie) for heavy freight locomotives. He received the General Manager's Award and two Manager's Awards for his efforts at GE Transportation Systems. Dr. Ahmadian joined Virginia Tech in 1995 as an Assistant Professor and was promoted to Associate Professor in 1998 and Professor in 2001. He continues his research in advanced transportation systems and vehicle dynamics analysis, modeling, and testing. He has authored more than 85 archival papers, made more than 100 technical presentations, holds 6 U.S. and international patents, and served as major advisor for more than 30 Ph.D. and M.S. students. He further served as an Associate Editor for the American Society of Mechanical Engineers (ASME) *Journal of Vibration and Acoustics* from 1989 to 1997. Dr. Ahmadian is a Fellow of ASME and a Senior Member of AIAA. Dr. Ahmadian serves as a consultant to the transportation industry and regularly teaches a short course to field engineers on vehicle dynamics.



HAFIZ M. ATASSI is the Viola D. Hank Professor of Aerospace and Mechanical Engineering at the University of Notre Dame. He received his *licence es sciences* from the University of Paris and a diploma in Aerospace Engineering from the Ecole Centrale de Paris, both in 1963, and doctorate degree from the Sorbonne (Paris) in 1966. After one year as a Research Engineer at the Office National d'Etudes et de Recherches Aérospatiales and two years as Research Associate at Cornell University, he joined the faculty of the University of Notre Dame in September 1969, and he was Director of the Notre Dame Center for Applied Mathematics from 1987 to 1997. His current research interests include aeroacoustics, unsteady aerodynamics, aeroelasticity, hydroacoustics, turbulence modeling, and mathematical computational methods. He has served as a Member of the AIAA Structural Dynamics Committee (1979–1982) and the Aeroacoustics Committee (1992–1995). Dr. Atassi is a Fellow of both the AIAA and the American Society of Mechanical Engineers. He received the NASA Addison P. Rothrock Distinguished Scientist Award (1983), the Japan International Aircraft Fund Award (1996), the AIAA Aeroacoustics Award (2000), and the American Society of Mechanical Engineers Moody Award (2001) and was named *Chevalier des Palmes Academiques* by the French Government (1993). Dr. Atassi was a Member of the *Applied Mechanics Reviews* Editorial Board and Associate Editor for *Aerodynamics and Aeroelasticity* (1985–1990). He is author or coauthor of more than 130 articles and papers.



PROMODE R. BANDYOPADHYAY is interested in understanding the vortex organization of turbulent flows. His earlier research in Cambridge, Houston, and Langley has sought to elucidate the hairpin structure of turbulent boundary layers and the thinning effect of Reynolds numbers on them, and the vortex manifestation of drag over rough surfaces. His later research has sought to build applications rooted on these first principles. He has served the *AIAA Journal* as an Associate Editor for six years. Earlier he was an Associate Editor of the American Society of Mechanical Engineers (ASME) *Journal of Fluids Engineering*. Currently, he is with the Office of Naval Research at Arlington, Virginia, where he manages the Biorobotics Program, which is attempting to distill science from biology and apply it to Navy needs. He has also been with the Naval Undersea Warfare Center at Newport, Rhode Island, for the past 10 years. There, he has been developing compliant coatings, electromagnetic and Stokes methods, and the MEMS-based air cushions for turbulence control. His work on the emerging technology of biorobotics led to the quantification of the gap in maneuverability between fish and underwater vehicles and a universally applicable combined Reynolds–Froude number scaling law. Before moving to Navy, he was with the NASA Langley Research Center as an in-house contractor for nine years. There, he codeveloped an oil film skin friction meter and the stepped axisymmetric nose employing the convex curvature concept of viscous drag reduction, which has since been found to have evolved in aquatic animals. He holds eight patents. Four of his works are cited in 12 textbooks, and two of his works have transitioned to undergraduate- and graduate-level classroom teaching. He received Ph.D. degrees from the University of Cambridge and IIT, Madras, a M.E. degree from the University of Calcutta, and a B.E. from the University of North Bengal. He is a Fellow of ASME and Wolfson College, Cambridge, and an Associate Fellow of AIAA.



JOSETTE BELLAN is a Senior Research Scientist at the Jet Propulsion Laboratory (JPL) and a Visiting Associate at the California Institute of Technology (Caltech) in the Department of Aerospace Engineering. She has also been a Lecturer at Caltech and a Chancellor's Distinguished Lecturer at the University of California, Irvine. Dr. Bellan obtained her Ph.D. in Aerospace and Mechanical Sciences from Princeton University in 1974; M.S. and M.A. degrees in the same discipline in 1972, also from Princeton; and an M.S. in Applied Mathematics and an A.E.A. in Continuum Mechanics from the University of Sciences of Paris in 1969. Following her Ph.D., she completed one year as a Postdoctoral Fellow at Princeton University and further became a Member of the Research Staff in the same department. Since 1978 she had conducted research at the JPL in a variety of topics. Her current interests include drop and spray evaporation and combustion with emphasis on dense-spray behavior and polydispersity; multicomponent liquid fuels, porous materials, and particularly biomass pyrolysis; granular flows; direct numerical simulation of multiphase flows; large eddy simulations of multiphase flows; and supercritical fluid behavior of isolated drops, drops in clusters, shear layers, jets, and sprays. She is the coauthor of four books and has numerous journal publications. She is also an Amelia Earhart Fellow, is the recipient of the JPL Exceptional Service Award, and has 55 NASA Certificates of Recognition. Dr. Bellan is an AIAA Associate Fellow, an American Society of Mechanical Engineers (ASME) Fellow, a Member of the Combustion Institute, and is on the Board of Directors of the Institute for Liquid Atomization and Spray Systems (ILASS). She has been a Member of the AIAA Propellants and Combustion Technical Committee during 1984–1987 and from 1995 to now and organized the 30th Aerospace Sciences program for this committee; she was a Member of the AIAA National Awards Committee in 1990–1992 and is currently chairing it. In ASME she is a Member of the K-11 Committee and organized sessions for the 1984 and 1990 Winter Annual Meetings. In the Combustion Institute she is a Member of the Executive Committee of the Western States Section and was Program and Paper Chairperson in 1987–1989 and 1997–1999, respectively. She was Paper Chairperson for ILASS during 1995–1997 and was the General Conference Chair for the International Conference on Liquid Atomization and Spray Systems in 2000. In addition to the *AIAA Journal*, Dr. Bellan is on the Editorial Boards of *Atomization and Sprays* and *Progress in Energy and Combustion Science*.



ALEX BERMAN is a retired Aerospace Engineer. He received a B.A. and an M.A. in Physics from the University of Connecticut in 1949 and 1952, respectively. He was employed by Kaman Aerospace Corporation from 1951 until 1991, when he retired. At that time, he was the Head of the Research Department as Assistant Director for Research. He was responsible for projects that included advanced structural dynamics, vibration analysis, structural system identification, generalized component synthesis, and advanced computer program architecture. He directed and was a major participant in numerous research projects funded by NASA, the U.S. Army, and the U.S. Air Force. He has published over 50 technical papers. He has made presentations at numerous technical conferences and workshops and has given seminars at universities in his fields of expertise. He has been an Associate Editor since 1995. He is a Member of the AIAA and the American Helicopter Society.



GRAHAM V. CANDLER is Professor of Aerospace Engineering and Mechanics at the University of Minnesota. He received his B.Eng. in Mechanical Engineering from McGill University in 1984 and his M.S. and Ph.D. in Aeronautics and Astronautics from Stanford University in 1985 and 1988, respectively. After one year as an aerospace engineer at the NASA Ames Research Center, he joined the faculty of North Carolina State University as an Assistant Professor. He then moved to the University of Minnesota in 1992. Prof. Candler's current research activities include the numerical simulation of high-temperature reacting flows, with application to reentry aerodynamics, hypersonic aerodynamics, aerothermodynamics, high-temperature gas physics, and plasma physics. He is also interested in low-density flows with application to microscale devices and high-altitude hypersonic flows. He is the author of over 150 papers on these topics. His work has twice won the AIAA Best Paper in Thermophysics Award. He has served as a Member of the AIAA Fluid Dynamics Technical Committee and is currently a Member of the AIAA Thermophysics Technical Committee. He also served as Associate Editor of the *Journal of Thermophysics and Heat Transfer*. He is an Associate Fellow of the AIAA.



ADITI CHATTOPADHYAY is a Professor in the Department of Mechanical and Aerospace Engineering at Arizona State University (ASU). She received her M.S. and Ph.D. degrees from the School of Aerospace Engineering at the Georgia Institute of Technology, Atlanta, Georgia. Her current research interests include mechanics of composites, adaptive structures, rotary wing dynamics, and multidisciplinary design optimization. Dr. Chattopadhyay is a Member of the AIAA Structures Technical Committee and is the Chair of the Composite Structures Subcommittee. She is a Member of the American Helicopter Society Aircraft Design Committee (Chair, 1996–1998) and Education Committee. Dr. Chattopadhyay is an Associate Editor of *Inverse Problems in Engineering* and is a Member of the Editorial Board of *Engineering Optimization*. She is the recipient of several academic, research and best paper awards. Dr. Chattopadhyay was inducted into the Georgia Institute of Technology Hall of Fame and received the Outstanding Engineering Alumni Award in 1995. She is also the recipient of the Faculty Achievement Award–Excellence in Research, 2000, Arizona State University. Dr. Chattopadhyay is the Principal Investigator of several research grants funded by agencies such as U.S. Army Research Office, Air Force Office of Scientific Research, NASA Langley and Ames Research Centers, and industry. She has published 86 archival journal papers and over 150 other publications (conference papers, book chapters, and NASA Technical Memoranda). Dr. Chattopadhyay is a Fellow of the American Society of Mechanical Engineers and an Associate Fellow of AIAA.



WILLIAM J. DEVENPORT is a Professor in the Department of Aerospace and Ocean Engineering at Virginia Polytechnic Institute and State University. He received his B.Sc. Degree from the University of Exeter in 1981 and his Ph.D., in Experimental and Computational Fluid Dynamics, from the University of Cambridge in 1985. His research interests include experimental studies of turbulence and turbulent flows and theoretical descriptions of turbulence, particularly as they relate to aeroacoustic problems. He has published over 60 technical papers on wing-body junction flows, wing tip vortices, blade vortex interaction, wakes, cascade flows, airfoil aerodynamics, and wind-tunnel instrumentation. His work has been supported by NASA, the Office of Naval Research, the Defense Advanced Research Projects Agency, and the National Science Foundation. He has served on the AIAA Fluid Dynamics Technical Committee and is currently a Member of the American Helicopter Society and the American Society of Mechanical Engineers and a Senior Member of AIAA.



KIRTI "KARMAN" N. GHIA is Herman Schneider Professor of Aerospace Engineering and Engineering Mechanics and a Fellow of the Graduate School. In 1969, Dr. Ghia joined the University of Cincinnati after completing his graduate education in Mechanical and Aerospace Engineering at the Illinois Institute of Technology, Chicago. His research activities are in the simulation of steady and unsteady separated viscous flows, high-incidence aerodynamics, vortex-dominated flows, nonlinear dynamics, turbomachinery flows, flow control, turbulent combustion, aeroelasticity, development of numerical methods, LES/DNS of turbulent flows, and grid generation techniques. Dr. Ghia's research work has been sponsored by the U.S. Air Force Office of Scientific Research, the Office of Naval Research, the Army Research Office, Wright Laboratory, NASA, the National Science Foundation, the Ohio Aerospace Institute, General Electric Aircraft Engine Group, and McDonnell Douglas Corporation. The American Society of Mechanical Engineers (ASME) named him the Freeman Scholar for the 1995-96 biennium and, at the University of Cincinnati, he has been the recipient of numerous research and teaching awards, including the Neil Wandamacher Award for Teaching Excellence in 1990, Rieveschl Award for Distinguished Scientific Research in 1994, and George C. Barbour Award for Excellence in Student Faculty Relations in 1999. Dr. K. Ghia has held a number of visiting positions including at USC, 1986; the Institute for Computer Applications in Science and Engineering, NASA Langley Research Center, 1985; Polytechnic Institute of New York, 1978; and Air Force Flight Dynamics Laboratories, 1976-77. He has served as Associate Technical Editor of the *Journal of Fluids Engineering*, 1981-1990; Co-Editor of the *International Computational Fluid Dynamics Journal*, 1991-1998; Chair of the Focus Group on Fluid Dynamics and Propulsive Systems for the Ohio Aerospace Institute, 1990-1995; and Director of the Institute of Computational Mechanics, 1986- and Co-Director of the Computational Fluid Dynamics Research Laboratory, 1990-present. Dr. Ghia has also served on the Fluid Mechanics Technical Committee for AIAA since 1986; ASME, 1978-present; and International Association for Mathematics and Computers in Simulation, 1988-present. He served as the Chair of the Honors and Awards Committee of the Fluids Engineering Division of ASME, 1997-2000. He has chaired many national and international symposia and meetings. He is a Fellow of ASME and Associate Fellow of AIAA. Dr. Ghia has authored or coauthored more than 200 articles or papers.



PEYMAN GIVI, Professor of Mechanical and Aerospace Engineering and Director of the Computational Fluid Dynamics Laboratory at the State University of New York (SUNY) at Buffalo, received the B.E. from the Youngstown State University (Ohio) in 1980 and the Ph.D. from the Carnegie-Mellon University (Pennsylvania) in 1984. He joined the faculty of SUNY at Buffalo in 1988. Prior to that he was a Research Scientist at Flow Industries, Inc., in Kent, Washington, and had visiting appointments at the NASA Langley Research Center and the NASA Glenn Research Center. His current research interests include turbulence, combustion, computational methods, multiphase transport, magnetohydrodynamics, stochastic processes, and systems analysis and controls. He is a recipient of the Presidential Faculty Fellowship from President George Bush (1992), the Young Investigator Award of the Office of Naval Research (1990), and the Presidential Young Investigator Award of the National Science Foundation (1990). He also received the Outstanding Educator of the Year Award from SUNY at Buffalo in 1994. Givi is a Member of the editorial boards of *Progress in Energy and Combustion Science* and *Computers and Fluids*.



ISKENDER GÖKALP is Director of Research at the Centre National de la Recherche Scientifique (CNRS). He obtained his Aerospace Engineering degree from the Technical University of Istanbul in 1974 and his Ph.D. in Combustion from the University of Paris VI in 1981. He joined the Faculty of Mechanics of the University of Paris VI in 1979 as Assistant Professor and was promoted to Associate Professor in 1981. He joined the Laboratoire de Combustion et Systèmes Réactifs of the CNRS in Orléans in 1983 and was promoted to Director of Research in 1994. He is the Director of the Research Federation "Énergétique, Propulsion, Espace, Environnement-EPEE" of the CNRS and the University of Orléans, created in 1998. His current research interests include turbulent combustion, droplet and spray combustion, metal combustion, microgravity combustion, variable density turbulent flows, and supersonic combustion. He is also active in the area of historical and philosophical studies on science and technology and on interdisciplinarity. He is the Chairperson of the French Section of the Combustion Institute and the Chairperson of the Federation of the European Sections of the Combustion Institute. He is a Senior Member of the AIAA and is currently serving as a Member of the AIAA Propellants and Combustion Technical Committee. He also serves on the international board of the International Conference on Liquid Atomization and Spray Systems and on the Institute of Liquid Atomization and Spray Systems-Europe board. He is on the scientific boards of several French and European research programs. He is the Coeditor of the French journal *Combustion: Revue des Sciences et Techniques de Combustion*. He supervised more than 30 Ph.D. theses and is the author or coauthor of more than 500 articles and papers.



JAY (JAYAVANT) P. GORE, Vincent P. Reilly Professor within the School of Mechanical Engineering at Purdue University, received his B.E. (M.E.) degree from the University of Poona, India, in 1978 and his M.S. (1982) and Ph.D. (1986) degrees in Mechanical Engineering from the Pennsylvania State University. He completed a postdoctoral training program in Aerospace Engineering at the University of Michigan, Ann Arbor, prior to joining the University of Maryland in 1987. In 1991, Dr. Gore joined Purdue University as an Associate Professor and was promoted to the rank of full Professor in 1995 and to his present rank in 2000. His research interests include infrared sensing, diagnostics, and control, numerical and experimental studies of turbulent combustion, partially premixed flames, flame radiation, chemistry radiation interactions, NO_x and soot formation and emission, radiant burner flames, and sensors for pollutant control and fire detection. Dr. Gore teaches two graduate courses in combustion and two undergraduate courses in thermodynamics. He is the Chairman of the American Society of Mechanical Engineers (ASME) Committee on Heat Transfer in Fire and Combustion Systems, an Associate Fellow of the AIAA, and Chairman of the Board of Advisors of the Central States Section of the Combustion Institute. Dr. Gore is an author or coauthor of over 200 articles and papers. He received the 1987 Best Paper in ASME Heat Transfer Literature Award, a 1991 Presidential Young Investigator Award, and faculty sabbatical fellowships from the U.S. Department of Energy and the Japanese Ministry of Education in 1998. He is an Associate Editor of the ASME *Journal of Heat Transfer* and the U.S. Editor of the *Proceedings of the International Combustion Institute*, Vol. 28.



ERIC RAYMOND JOHNSON is a Professor in the Aerospace and Ocean Engineering Department, Virginia Polytechnic Institute and State University, Blacksburg. He earned his doctoral degree in Applied Mechanics from the University of Michigan in 1976 and has been a faculty Member at Virginia Tech since then. Prior to his doctorate, he worked in industry for four-and-one-half years on the analysis and design of servohydraulic control systems for vehicles and industrial applications. His research interests are in structures, solid mechanics, buckling and postbuckling, composite materials, and optimal design. In particular, his work has concentrated on the response and failure of composite material structures in application to flight vehicles, which includes composite stiffener crippling, failure of dropped-ply laminates, the nonlinear response of stiffened composite shells under internal pressure, and energy absorption of composite structure. Dr. Johnson has written 54 refereed technical publications. He teaches courses in thin-walled structures, elastic instability of structures, variational and energy methods, and optimal design of composite materials and structures. He is a Senior Member of the AIAA and a Member of the American Society of Mechanical Engineers.



ELI LIVNE received his B.Sc. and M.Sc. degrees (1974 and 1982, respectively) in Aeronautical Engineering from the Technion—Israel Institute of Technology. From 1975 to 1984 he served as an Engineering Officer in the Israeli Air Force, working in the areas of structural dynamics, aeroelasticity and aeroservoelasticity. He returned to academia and received his Ph.D. in Aerospace Engineering from the University of California, Los Angeles, in 1990. At the end of that year, he joined the faculty in the Department of Aeronautics and Astronautics at the University of Washington in Seattle, where he is currently an Associate Professor. Dr. Livne's research spans the disciplines of structures, structural dynamics, unsteady aerodynamics, flight mechanics, active control, and airplane design optimization, with an emphasis on design-oriented modeling techniques and the associated approximation and sensitivity computational technology necessary for carrying out large-scale design optimization of highly integrated vehicles. This work contributed to the development of efficient computational tools for truly integrated design synthesis of flexible actively controlled aerospace vehicles and to some of the first studies in integrated multidisciplinary aeroservoelastic design of such vehicles. Dr. Livne has additional interests in the areas of airplane design education and aeroelasticity of unconventional configurations. His research has been supported over the years by the U.S. Air Force Office of Scientific Research, the Office of Naval Research, NASA (Langley and Ames Research Centers), the National Science Foundation (NSF), and The Boeing Company. He is a former Member of the AIAA Multidisciplinary Design Optimization Technical Committee. He was a Member of the NASA/Boeing HSCT Aeroelastic Concept Evaluation Team and the Boeing HSCT Aeroservoelastic working group. He is a recipient of a 1987–1988 Josephine de Karman Fellowship, a UCLA School of Engineering and Applied Science 1989–1990 Outstanding Ph.D. Award, and a 1992 NSF National Young Investigator Award. He won the 1998 American Society of Mechanical Engineers (ASME)/Boeing Structures & Materials Award for the best paper given at the 1997 AIAA/ASME/ASCE/AHS/ASC 38th Structures, Structural Dynamics, and Materials Conference. He edited a special Multidisciplinary Design Optimization issue of the *Journal of Aircraft*, published in January–February 1999. He is an Associate Fellow of the AIAA and Member of ASME and the American Society for Engineering Education.



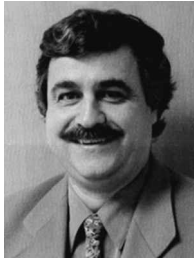
ROBERT P. LUCHT is currently the G. Paul Pepper Professor in the Department of Mechanical Engineering at Texas A&M University. He received his B.S. degree in Nuclear Engineering in 1977 and his M.S. and Ph.D. degrees in Mechanical Engineering in 1979 and 1981, all from Purdue University. After a year of postdoctoral research at Purdue University, he joined the Combustion Research Facility at Sandia National Laboratories and worked there as a Member of the technical staff and then as a Department Manager until 1992, when he became a Faculty Member at the University of Illinois. He joined the faculty at Texas A&M University in September 1998. The focus of his research is the development and application of laser diagnostic techniques for combustion systems and for nonreacting flows. Currently, his research group is developing dual-pump and high-resolution coherent anti-Stokes Raman scattering (CARS) techniques for multiparameter measurements, using planar laser-induced fluorescence (PLIF) methods for visualizing molecular mixing and studying the physics of degenerate four-wave mixing (DFWM) and polarization spectroscopy. His group is also applying CARS, DFWM, and PLIF techniques for measurements in diamond-forming flames, in spark ignition and compression ignition engines, and in a gas turbine combustion simulator. He was the program chair for the 1996 Optical Society of America (OSA) Topical Meeting on Laser Applications in Chemical and Environmental Analysis and is the General Chair for the same meeting in 1998. He is a Member of AIAA, the American Society of Mechanical Engineers, the Society of Automotive Engineers, the OSA, and the Combustion Institute. He is the author or coauthor of more than 60 archival journal articles. He is a Fellow of the OSA and an Associate Fellow of the AIAA.



ACHILLE MESSAC is an Associate Professor in the Mechanical, Aeronautical, and Nuclear Engineering Department at Rensselaer Polytechnic Institute. He received his B.S. (1981), M.S. (1982), and Ph.D. (1986) from the Department of Aeronautical and Astronautical Engineering at the Massachusetts Institute of Technology. He was a Senior Member of the Technical Staff at Draper Laboratory until 1994, where he led and participated in numerous research and development efforts. His research topics included deployment and multibody dynamics, structural optimization, and control structure integrated design, the latter of which he was a pioneer in the mid-1980s. He led such NASA efforts as the development of a large simulation for the dynamics and control of the Stabilized Payload Deployment System, a two-arm payload manipulator for the shuttle orbiter, for which he received an award. He also led the development of a large simulation to study the dynamics stability, the structural behavior, and the control properties of the space system composed of the space station (SS), the space shuttle, and the translating SS mobile transporter. In 1994, he joined the Mechanical, Industrial, and Manufacturing Engineering Department at Northeastern University as an Associate Professor, where he led the successful reform of the academic design program. He is currently leading the development of Physical Programming, a methodology that brings optimization within the easy reach of industry engineers. Physical Programming also facilitates the effective use of optimization by experts—to bring optimization to the masses. He has led winning student teams in two American Society of Mechanical Engineers (ASME) Motion Control Design Contests. He is an Associate Fellow of AIAA, a Member of ASME, the elected Chair of the AIAA Multidisciplinary Design Optimization (MDO) Technical Committee (TC), and a former Member of the AIAA Structural Dynamics TC. He is an Editorial Board Member and Associate Editor of the *Optimization and Engineering Journal* of Kluwer Academic Publishers. He served as the MDO Chair for the 38th and the 40th Aerospace Sciences Meeting and Exhibits. He is the General Chair-Elect of the 10th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization to be held in 2004. He has authored or coauthored over 80 publications. He is a Member of the honor societies Sigma Xi, Tau Beta Pi, and Sigma Gamma Tau and a Member of the Strathmore and the International Who's Who. He is a recipient of the CAREER award of the National Science Foundation.



ANTHONY N. PALAZOTTO is Professor of Aerospace Engineering, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio. He received his Ph.D. from New York University in 1968 with a specialty in the area of Solid Mechanics including a minor in Applied Mathematics. He has been involved in research and academics since that time. Dr. Palazotto's field of expertise includes nonlinear mechanics, shell analysis, mechanics of composite materials, nonlinear dynamics, and viscoplasticity. He recently worked on the problem of characterizing composite materials acting under high-velocity impact. In addition, he has carried out the analysis of reflective antennas undergoing nonlinear movement. Dr. Palazotto has received more than \$1.5 million in funding from various Air Force Directorates including the U.S. Air Force Office of Scientific Research. Dr. Palazotto has over 330 presentations and publications, 153 of which are in archival journals. He is the coauthor of a text entitled *The Nonlinear Analysis of Shell Structures* published by AIAA in 1992. He is a Fellow of the American Society of Civil Engineers and an Associate Fellow of AIAA in addition to being a Professional Engineer.



CHRISTOPHE PIERRE is Professor of Mechanical Engineering at the University of Michigan, Ann Arbor, where he also holds the position of Associate Dean in the Rackham School of Graduate Studies. He received the Engineer Diploma in Aerospace Engineering from the Ecole Centrale de Paris, France, in 1982, the M.S. from Princeton University in 1984, and the Ph.D. from Duke University in 1985. He joined the faculty of the Department of Mechanical Engineering at the University of Michigan in 1985, where he was promoted to the rank of Professor in 1997. His research interests include structural dynamics, vibrations, and nonlinear dynamics, and he has done extensive work on mode localization in disordered periodic structures. He currently works in the areas of reduced-order modeling of complex structures, component mode synthesis, midfrequency dynamics, nonlinear modal analysis, and dry friction damped systems, with application to turbomachinery bladed disks and automotive body structures. He serves as Associate Editor for the *Journal of Vibration and Acoustics* and belongs to the Advisory Board of *Nonlinear Dynamics* and to the Editorial Board of *Applied Mechanics Reviews*. He is a Fellow of the American Society of Mechanical Engineers and a Senior Member of AIAA. Dr. Pierre has published more than 80 journal articles and a large number of conference papers and has given numerous invited lectures internationally.



ALLEN PLOTKIN is Professor of Aerospace Engineering and Engineering Mechanics at San Diego State University, where he has been a faculty Member since 1985. He received B.S. and M.S. degrees from Columbia University and a Ph.D. from the Division of Engineering Mechanics at Stanford University in 1968. From 1968 to 1985 he was a faculty Member in the Department of Aerospace Engineering of the University of Maryland, where he was promoted to the rank of Professor in 1977. During 1975–1976 he was a Visiting Associate in Engineering Science at the California Institute of Technology. His research interests are aerodynamics, hydrodynamics, and basic incompressible fluid mechanics. The research has emphasized the blending of analytical and computational techniques for the solution of a wide variety of flow problems, including fluid jets, airfoil and hydrofoil theory, ground effect, separation, and vortex modeling. He served two terms as a Member of the AIAA Fluid Dynamics Technical Committee. He is an American Society of Mechanical Engineers Fellow and an AIAA Associate Fellow and a Member of the Society of Naval Architects and Marine Engineers and the American Society for Engineering Education. He is the coauthor (with J. Katz) of *Low-Speed Aerodynamics: From Wing Theory to Panel Methods*, published in 1991 in the McGraw-Hill Series in Aeronautical and Aerospace Engineering, and the author of approximately 40 journal articles. A second edition of *Low Speed Aerodynamics*, published by Cambridge University Press, will be available in 2001. He has been an Associate Editor of the *AIAA Journal* since 1986.



SUNIL SAIGAL, Professor of Civil and Environmental Engineering at Carnegie-Mellon University, received his B.S. in Civil Engineering in 1978 from Punjab Engineering College, M.S. in Structural Engineering in 1980 from the Indian Institute of Science, and Ph.D. in Aeronautics and Astronautics in 1985 from Purdue University. Before joining Carnegie-Mellon University in 1989, he served on the faculty of Mechanical Engineering at Worcester Polytechnic Institute (1986–1989). He served as the Director, Mechanics and Materials Program, at the National Science Foundation from 1996 to 1998; has held summer assignments at Hibbitt, Karlsson, and Sorensen, Inc. (1987), NASA Lewis Research Center (1990 and 1991), and Oak Ridge National Laboratory (1993); and spent a year (1992) as a visiting engineer at Mercedes Benz A.G. in Stuttgart, Germany. His primary research interest lies in the area of computational solid and structural mechanics. He has contributed to developments in finite elements, boundary elements, and the element-free Galerkin methods with applications in shape optimization, inverse problems, mechanics of materials, and probabilistic analysis. Dr. Saigal is an Associate Fellow of AIAA and has served on the AIAA Technical Committee for Structures since 1992. He is the recipient of the 1987 Worcester Engineering Society Admiral Ralph Earle Medal, the 1988 Society of Automotive Engineers Ralph R. Teetor Educational Award, the 1990 National Science Foundation Presidential Young Investigator Award, the 1990 Carnegie Mellon University George Tallman Ladd Research Award, the 1994 American Society of Civil Engineers (ASCE) Pittsburgh Section Professor of the Year Award, and the 1996 Carnegie Mellon University Richard Teare Award for excellence in teaching. He has served as the Associate Editor for Computational Mechanics for the *ASCE Journal of Engineering Mechanics* and is on the Advisory Editorial Boards for the *International Journal for Numerical Methods in Engineering*, *International Journal for Computational Civil and Structural Engineering*, and *Engineering with Computers*. Dr. Saigal is author and coauthor of more than 85 journal articles.



PASQUALE M. SFORZA joined the University of Florida's Graduate Engineering & Research Center as Director and Professor of Aerospace Engineering in 1998. He received a B.Ae.E. in 1961 and an M.S. and a Ph.D. in Astronautics in 1962 and 1965, respectively, from Polytechnic Institute of Brooklyn. He was appointed to the faculty of Polytechnic in 1965 and served there until 1998. He was promoted to Professor in 1977 and served as Head of Mechanical and Aerospace Engineering from 1983 to 1986 and as Head of Aerospace Engineering from 1987 to 1995. He is an Associate Fellow of AIAA and served as Editor-in-Chief of the *AIAA Student Journal* (1969–1970), AIAA National Lecturer in Wind Engineering (1976), Associate Editor of the *AIAA Journal* (1980–1983), and Book Review Editor of the *AIAA Journal* since 1983. His research in turbulent jet mixing, vortex aerodynamics, and energy transfer led to three patents and over 100 articles and papers. He received the Technology Achievement Award from the AIAA Long Island Section in 1977 and an Outstanding Paper award from AIAA in 1992. He is a Member of the Editorial Board of the *Journal of Applied Fire Science* and was a Member of the Advisory Board of the New York State Legislative Commission on Science and Technology (1978–1984). He is active in consulting for industry and government agencies through Flowpower, Inc., a consulting firm he founded in 1978.



KUNIGAL N. SHIVAKUMAR is a Research Professor and Director (Interim) of the Center for Composite Materials Research at North Carolina A&T State University. He received a B.E. (1972) in Civil Engineering from Bangalore University and an M.E. (1974) in Civil Engineering and a Ph.D. (1979) in Aerospace Engineering from the Indian Institute of Science (IISc). Immediately after completing his Ph.D., he joined NASA Langley Research Center as National Research Council Research Associate. He worked at NASA for two years and joined Old Dominion University as a Research Assistant Professor (1982) and was promoted to Research Associate Professor (1983). In 1985 he joined Analytical Services and Materials, Inc. (AS&M), Hampton, Virginia, as a Senior Scientist and Group Leader. In 1991 he joined North Carolina A&T State University as a Research Professor and a Coordinator for Structures and Controls Group of the Mars Mission Research Center. During the past 25 years Shivakumar has been researching polymer-based composite materials (manufacturing, testing, and analysis), structural analysis methods, and fracture of metals and composites. He has developed a number of innovative processing technologies, test methods, analysis methods, and software codes for composite materials. He has about 135 peer-reviewed publications, one patent, and many copyrighted softwares. Shivakumar is a recipient of four special achievement awards from NASA, two certificates of recognition from AIAA, and one award each from AS&M, IISc, and Bangalore University. In addition, he has been cited in *Who's Who of the South and Southwest of America*, *Science and Engineering of America*, *Finance and Industry*, *World, American Men and Women of Science*, and *Plastics and Polymers*. Shivakumar has been an active Member of AIAA for more than 17 years. He served AIAA as a Member of the Structures and Materials technical committees (TC), Vice Chair of the Materials TC, General Chair of the 37th Structures, Structural Dynamics, and Materials (SDM) conference, Chair of the Long Range Planning committee, Member of the SDM planning committee, and delegate for congressional visit. Currently he is an Associate Fellow of AIAA.



MARTIN SICHEL, Professor Emeritus of Aerospace Engineering at the University of Michigan, received the B.M.E. and M.M.E from the Rensselaer Polytechnic Institute in 1950 and 1951 in Mechanical Engineering and the Ph.D. in Aeronautical Engineering from Princeton University in 1961. From 1951 to 1956 he worked as a development engineer for the General Electric Co. and for the Army Chemical Center while in the U.S. Army. He joined the faculty of the Department of Aerospace Engineering at the University of Michigan in 1961 and was promoted to the rank of Professor in 1968. His current research interests include the numerical simulation and modeling of gaseous, dust, and spray detonation phenomena; the group combustion of sprays; combustion and explosion of dust air mixtures; and supersonic combustion. He has been the principal or coprincipal advisor for over 35 doctoral students from 1961 to the present. He has been a Member of the AIAA Air Breathing Propulsion and Propellants and Combustion committees. He has been a Member of the Program Committees for the 21st–27th Symposium (International) on Combustion and the 13th–16th International Colloquium on the Dynamics of Explosions and Reactive Systems. He is currently an Associate Editor of the *AIAA Journal*. He is a Fellow of AIAA and the American Association for the Advancement of Science. He is the recipient of the Cybulski Medal from the Polish Academy of Sciences for research in combustion (1995) and of the A.K. Oppenheim Prize (1995) at the International Colloquium on the Dynamics of Explosions and Reactive Systems. Dr. Sichel is the author or coauthor of more than 100 articles and papers.



RONALD M. C. SO, Chair Professor and Head, Department of Mechanical Engineering, the Hong Kong Polytechnic University (PolyU), Hung Hom, Kowloon, Hong Kong, received the B.S. (Hons) from the University of Hong Kong in 1962; the M.Eng. from McGill University, Montreal, Quebec, Canada, in 1966; and the M.A. and Ph.D. in Aerospace and Mechanical Sciences from Princeton University, Princeton, New Jersey, in 1968 and 1971, respectively. He joined Union Camp Corporation, Princeton, New Jersey, in 1970, working on pulp and paper research. Shortly thereafter, he joined Rutgers University, New Brunswick, New Jersey, first as a Postdoctoral Fellow and then as a Research Assistant Professor in 1972 to work on problems related to atmospheric dispersion and pollution. He left Rutgers to join the General Electric Research and Development (GE R&D) Center, Schenectady, New York, in 1976 to work on research and development in the areas of propulsion and power generation. In 1981, he left GE R&D to become an Associate Professor in the Department of Mechanical and Aerospace Engineering, Arizona State University (ASU), Tempe. The following year he was promoted to Professor and remained there until 1996, when he took a two-year leave of absence to head the Mechanical Engineering Department at PolyU. In 1998, he resigned from ASU to become the Head at PolyU. His research led to the Dugald Clerk Prize, Institution of Mechanical Engineers, London, in 1991 for his contributions made to combustion in IC engines, the Lewis F. Moody Award of the American Society of Mechanical Engineers (ASME) for contributions in the area of computational fluid dynamics, and the Doctor of Science (D.Sc.) by the University of Hong Kong for original contributions in fluid dynamics and heat transfer. The current research interests of Dr. So include turbulence modeling, flow-induced vibrations, buoyant and nonbuoyant turbulent flows, and turbulent heat transfer modeling. Dr. So is a Fellow of ASME, the Institution of Mechanical Engineers, and the Hong Kong Institute of Engineers and an Associate Fellow of AIAA. He is an Associate Editor of *AIAA Journal* (1993–1995, 1998–2001), an Advisory Editor of the *International Journal of Mechanical Sciences* (1997–2002) and the *International Journal of Heat and Fluid Flow* (1994–2000), a Special Editor of *Combustion Science and Technology* (1988), and an Editor of ASME Special Publications (1984, 1986). Dr. So is the author or coauthor of more than 220 articles and papers.



ANTHONY M. WAAS, Professor of Aerospace Engineering and Director, Composite Structures Laboratory at the University of Michigan, received his B.Sc. with first-class honors from Imperial College, University of London, United Kingdom, in 1982, and the M.S. in 1983 and Ph.D. in 1988 with a minor in Applied Mathematics from the California Institute of Technology, all in Aeronautics. He joined the faculty of the Department of Aerospace Engineering at the University of Michigan in 1988, where he was promoted to the rank of Associate Professor in 1994 and Professor in 2000. His current research interests include mechanics of composite structures and composite materials, structural stability, optical methods for experimental stress analysis, biomechanics, and smart materials and structures. Dr. Waas has served as a Member of the AIAA Structures Technical Committee (1991–1994, 1997–2001), the American Society of Mechanical Engineers (ASME) Technical Committee on Instability of Solids and Structures (1995–2001), the ASME Technical Committee on Experimental Mechanics (1996–2000), and the ASME Structures and Materials Committee (1998–2002). He is a recipient of the Royal Aeronautical Society Prize of Imperial College (1982), the William Balhaus Prize in Aeronautics at the California Institute of Technology (1988), a Rackham Faculty Fellowship (1990), the University of Michigan Aerospace Department Teaching Award (1995), the Society of Automotive Engineers Ralph Teetor Award (1995), the American Academy of Mechanics Junior Award for Research (1997), and a University of Michigan Aerospace Department Research Award (1998). He is a Fellow of ASME and an Associate Fellow of AIAA, the American Society for Composites, and the American Academy of Mechanics. He is an Associate Editor of the *Journal of Composites: B* and has served on the Editorial Advisory Board of the *AIAA Journal of Aircraft*. He is author or coauthor of more than 60 articles and papers.

Editorial Policy Statement on Numerical Accuracy and Experimental Uncertainty

The purpose of this statement is to reiterate the desire to have high-quality investigations with properly documented results published in the AIAA journals, and to clarify acceptable standards for presentation of numerical and experimental results. Recently there has been considerable concern with the quality of published numerical solutions. Also the practice of including error bars on experimental results is often lacking. In response to these problems, a succinct policy statement on these items is as follows:

The AIAA journals will not accept for publication any paper reporting (1) numerical solutions of an engineering problem that fails adequately to address accuracy of the computed results or (2) experimental results unless the accuracy of the data is adequately presented.

The implementation of this policy will be at the discretion of the Editors and Associate Editors of the journals.

The accuracy of the computed results is concerned with how well the specified governing equations in the paper have been solved numerically. The appropriateness of the governing equations for modeling the physical phenomena and comparison with experimental data is not part of this evaluation. Accuracy of the numerical results can be judged from grid refinement studies, variation of numerical parameters that influence the results, comparison with exact solutions, and any other technique the author selects. The validity of the accuracy estimation will be judged by the reviewers of the paper. An estimate of accuracy of the numerical results must be presented when comparisons with other numerical and experimental results are given,

and when new results of the author will likely become data for future comparisons. Since accuracy of various computed results obtained from a numerical solution can vary significantly, the accuracy of the result being used must be stated. Accuracy of results from a validated code must still be established to show that proper input parameters have been used with the code.

Estimates of experimental uncertainty are required for all plotted or tabulated data obtained by authors. If data from other workers are used, they require no uncertainty. Unless otherwise stated and properly referenced, it is assumed that the uncertainty of authors' output data is estimated by the small-sample method¹ with assumed odds 20:1. All reported data must show uncertainty estimates if used in text or tables; for example, $T = 642 \pm 8$ K. All figures reporting new data should contain uncertainty estimates either on the figure with error bars in both coordinate directions or in the caption; for example, uncertainty in $T = \pm 8$ K at 20:1 odds. Investigations with limited data should present tabulated results in the paper while extensive data should be available elsewhere in tabulated form for use by other workers.

Finally, the accepted documentation procedures for a technical investigation must be used. For computational papers, the author must provide an adequate description of the numerical solution procedure, if not documented elsewhere. In addition, the complete governing equations must be specified with sufficient detail along with the input parameters to the code so that a reader could reproduce the results of the paper. For papers concerned with experimental test, thorough documentation of the experimental conditions, instrumentation, and data reduction techniques is required.

¹ Kline, S. J., and McClintock, F. A., "Describing Uncertainties in Simple-Sample Experiments," *Mechanical Engineering*, Jan. 1953, pp. 3–8.