AIAA JOURNAL
Vol. 27, No. 1, January–February 2004

Annual Business

THIS past year has been a successful one for the *Journal of Guidance, Control, and Dynamics (JGCD)*. The implementation of our Web-based manuscript submission and management system—WriteTrack—was completed in March and is fully operational. The entire editorial and review process is faster, more accurate, and less labor intensive. The editorial team thanks the AIAA Information Technology team for their cooperative help in designing and implementing the system.

We celebrated the *Centennial of Flight* by publishing a *History of Key Technologies* paper in each issue:

January–"Helicopter Control Systems: A History," R. Prouty and H. Curtiss,

March–"One Hundred Years of Aircraft Electronics," M. Kayton,

May–"Contributions to Multibody Dynamics to Space Flight: A Brief Review," A. Banerjee,

July–"Historical Review of Spacecraft Simulators," J. Swartz, M. Peck, and C. Hall,

September–"Historical Perspective on Analysis and Control of Aeroelastic Responses," V. Mukhopadhyay, and

November–"Discovery and Invention: The Newtonian Revolution in Systems Technology," R. Kalman.

We had more submissions than the above six *History of Key Technologies* papers and we will continue publishing them this year. The paper in this issue is "The Evolution, Revolution, and Challenges of Handling Qualities," by David Mitchell and eight other Davids! More history papers will be published in upcoming issues. I want to thank all the authors for their special efforts.

In past editorials I have written about the progress made during the year toward meeting the goals that I have as Editor-in-Chief. The goals are 1) to maintain the quality of the *JGCD*, 2) to increase the number of engineering applications papers, 3) to minimize the time from submission to publication, 4) to increase the international involvement in the *JGCD*, and 5) to listen to and respond to everyone's concerns. Let me briefly discuss each item.

The *JGCD* continues to attract high quality papers submitted on a worldwide basis. More than 300 papers were evaluated. However, the number of applications-oriented papers submitted still needs to be increased and I repeat the call to the community to respond with more relevant papers that can help engineers practice their profession.

The Associate Editors continue to shorten the time from submission of a paper to the time the review comments are returned to the author. Our goal is to return every paper within three months of receipt. Then it is up to the authors to make revisions as quickly as possible to speed their papers toward publication. Currently, author revision time is the single largest contributor to publication delays.

International participation in the *JGCD* has continued at previous levels. Approximately 42% of new paper submittals were from outside the United States and the acceptance rate for those papers has been about the same as for U.S. papers. Publication tends to be a bit slower, however, as more of these papers need extensive editorial work and figure revisions. Our International Advisors have been very helpful in soliciting papers. The fact that the *JGCD* is online should aid our international authors in their research and also increase our international subscription base. Currently the *JGCD* is number two in the total number of domestic and international subscriptions among the seven AIAA technical journals.

Also with this issue, I am announcing several changes to our editorial staff.

First, retiring Associate Editors are

- Victoria L. Coverstone, University of Illinois at Urbana–Champaign,
- Dale F. Enns, Honeywell Technology Center,
- Peiman Maghami, NASA Langley Research Center, and
- I. Michael Ross, Naval Postgraduate School (Book Review Editor).

I want to express my personal thanks to our retired Associate Editors and Book Review Editor for their service.

Renewed with thanks for their service as Associate Editors are

- S. N. Balakrishnan, University of Missouri–Rolla,
- Karl D. Bilimoria, NASA Ames Research Center,
- Jonathan P. How, Massachusetts Institute of Technology,
- Robert G. Melton, Pennsylvania State University,
- Vivekanand Mukhopadhyay, NASA Langley Research Center,
- Mark L. Psiaki, Cornell University, and
- Jurek Sasiadek, Carleton University.

I would like to welcome the following recently appointed Associate Editors and Book Review Editor:

- Christopher Hall, Virginia Polytechnic Institute and State University (Book Review Editor),
- Jesse Leitner, NASA Goddard Space Flight Center,
- Colin McInnes, University of Glasgow, and
- Kevin Wise, Boeing Phantom Works.

The complete list and biographical sketches of current Associate Editors are presented in the following pages.

I express my gratitude to all the reviewers who perform the peer reviews which are necessary to maintain the quality of the *JGCD*. The list of reviewers contributing between 1 October 2002 and 30 September 2003 follows the list of Associate Editors. I apologize to any reviewers whose names have been inadvertently omitted from the list.

I would like to acknowledge our International Advisors who help us solicit high-quality papers that represent the technical efforts in their countries. They also assist authors who may have questions about the review process. I would like to thank our retired International Advisors: Richard Holdaway, Rutherford Appleton Laboratory, England; Yoshiaki Ohkami, National Space Agency, Japan; and P. T. L. Van Woerkom, Delft University of Technology, The Netherlands. I welcome new International Advisors: Jan Mulder, Delft University of Technology, The Netherlands; and Bernard Sacleux, ONERA, France.

Special acknowledgements go to the individuals serving as liaison between the *JGCD* and an AIAA Technical Committee (TC): Mark Balas, University of Colorado, with the Guidance, Navigation & Control TC; Ronald Proulx, Draper Laboratory, with the Astrodynamics TC; John Valasek, Texas A&M University, with the Atmospheric Flight Mechanics TC; and Karl Bilimoria, NASA Ames Research Center, with the Air Transportation Systems TC.

Thanks to all the editorial staff at AIAA Headquarters and to the production staff at TechBooks. These dedicated individuals work at the highest standards to produce the *JGCD*. Thanks to Lisa Gorman and Loretta Mitrano, Draper Laboratory, for making the Editor-in-Chief's office operate smoothly and efficiently all year long and to Draper Laboratory for its support of the *JGCD*.

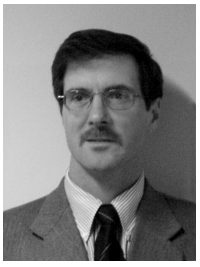
Finally, I continue to encourage communications between our readers and any member of the editorial staff. I also believe we did a good job last year in covering the span of interests of our readers and in responding quickly to communications. We can always do better and we are willing to listen, please contact me directly. My contact information is as follows:

George T. Schmidt
Editor-in-Chief, JGCD
The Charles Stark Draper Laboratory, Inc.
555 Technology Square, MS57
Cambridge, MA 02139

Editor-in-Chief

GEORGE T. SCHMIDT received his S.B. and S.M. degrees in aeronautics and astronautics from the Massachusetts Institute of Technology (MIT) in 1965 and his Sc.D. in instrumentation from MIT in 1971. Since 1965 he has worked at the Charles Stark Draper Laboratory, Cambridge, Massachusetts, where he is currently Director, Education. Prior to that he was the Leader of the Guidance and Navigation Division and Director of the Guidance Technology Center. His major technical activities have been in GN&C system design for missiles, aircraft, and manned spacecraft; Kalman filtering applications; and integration techniques for high-resolution synthetic aperture radars, satellite navigation systems, and inertial sensors. Starting in 1968 he served the NATO Research and Technology Organization (formerly AGARD) in many positions, including as a U.S. member of the Guidance and Control Panel. He is a Lecturer in Aeronautics and Astronautics at MIT. He is a Fellow of the AIAA, a Fellow of The Institute of Electrical and Electronics Engineers, a member of the Institute of Navigation, and an elected member of the Russian Federation, Academy of Navigation and Motion Control. He has received several awards including the AIAA International Cooperation Award in 2001. He is serving on the AIAA Ethics Committee. He is on the Editorial Board of the *Draper Technology Digest* and is author or contributing author of more than 70 technical papers and reports, encyclopedia articles, and textbooks. He has been Editor-in-Chief of the AIAA *Journal of Guidance, Control, and Dynamics* since 1996.

Associate Editors

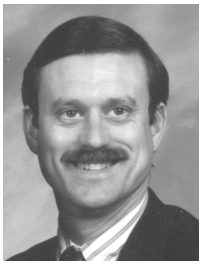


KURT S. ANDERSON, Associate Professor of the Department of Mechanical, Aerospace, and Nuclear Engineering at Rensselaer Polytechnic Institute, received his Ph.D. in applied and computational mechanics from Stanford University in 1990. After that time he worked in the areas of dynamics, structural dynamics, and controls for TRW Space and Technology in Redondo Beach, California. Dr. Anderson subsequently accepted a two-year appointment as a visiting scholar, lecturer, and research fellow at the Darmstadt Technical University of Darmstadt in Germany. He then spent a short period in the Department of Aeronautical Engineering, Applied Mechanics, and Aviation at the Ohio State University in Columbus. Since earning his Ph.D., Dr. Anderson has continued to work in the areas of computational multibody dynamics. His focus is on the development of advanced algorithms including, but not limited to, low computational order algorithms for dynamic systems simulation and control, design sensitivity analysis of dynamic systems, parallel computing applications, characterization of translating dynamic media, and numerical integration schemes. Dr. Anderson enjoys woodcarving, gourmet cooking, bike riding, hiking, horseback riding, and flyfishing.

S. N. BALAKRISHNAN is currently a Professor of Aerospace Engineering in the Department of Mechanical and Aerospace Engineering and Engineering Mechanics at the University of Missouri—Rolla (UMR). He received his Ph.D. in aerospace engineering at the University of Texas at Austin. Dr. Balakrishnan's professional roles include Lead Engineer, Lockheed Electronics Company, Houston, Texas, where he worked in the space shuttle program; Scientist and Fellow, Center for Space Research, University of Texas at Austin; and Faculty Research Fellow, Wright Laboratory (Eglin Air Force Base, Florida). He teaches stability and control and advanced control courses at UMR. His research activities focus on neural networks in trajectory optimization, and control, missile guidance, and multiple target-multiple sensor problems and estimation. He has authored/coauthored about 55 journal articles and refereed conference papers in these areas. Dr. Balakrishnan is a Member of the AIAA Guidance, Navigation, and Control Technical Committee, an Associate Fellow of AIAA, and Director, American Automatic Control Council.

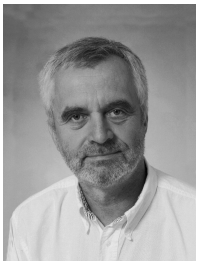
KARL D. BILIMORIA is an Aerospace Engineer at the NASA Ames Research Center, where he leads a research group on future air traffic control concepts for NASA's Airspace Systems program. Previously, he worked on advanced guidance and control concepts for supersonic civil transport aircraft under NASA's High Speed Research (HSR) program. He received his B. Tech. from the Indian Institute of Technology, Kanpur, graduating at the top of the aeronautical engineering class in 1982; he also received his M.S. and Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1984 and 1986, respectively. From 1987 to 1994, Dr. Bilimoria was on the aerospace engineering faculty at Arizona State University (ASU), where he held the positions of Assistant Professor and Research Scientist. At ASU, he taught courses on optimal control, flight dynamics/control, aircraft performance, and aircraft conceptual design; he also conducted research on aircraft trajectory optimization, optimal control of spacecraft, and flight dynamics of elastic hypersonic vehicles. He is an Associate Fellow of AIAA; a Member of the AIAA Air Transportation Systems Technical Committee (TC); a past Member of the AIAA Guidance, Navigation, and Control TC; a past Member of the AIAA Atmospheric Flight Mechanics TC; a past Member of the IFAC TC on Air Traffic Control Automation; and a Member of Sigma Gamma Tau (national aerospace honor society). Dr. Bilimoria was a finalist in the 1996 NASA Astronaut selection. He has received several NASA awards for his work, including the Exceptional Technology Achievement Medal.

ALAIN CARRIER received his Ph.D. in aeronautics and astronautics from Stanford University in 1990. Since then he has been working for the Lockheed Martin Advanced Technology Center, leading applied research and optical-precision instrumentation design, modeling, and control. He lead the development of several actively controlled electromechanical systems from concept to hardware demonstration, including actively controlled segmented optics, secondary and fast steering mirrors for astronomical telescopes, zero-G slew suspensions for space structures, active and passive vibration isolators, smart actuators, and a latch mechanism actuated by Shape Memory Alloy springs for which he owns a patent. He is the author of *Principal Gain Tracking*, a novel testing and system identification technique for high-modal-density lightly-damped structures. He currently leads the development of the pointing control system for HIRDLS (an earth observing radiometer) and the development and experimental demonstration of adaptive control techniques for vibration isolation. His research interests are in isolation, control, and passive damping of broadband and periodic mechanical vibrations for optical instruments; subarcsecond optical pointing and beam control for earth observing, laser communication, and astronomical instruments; actuators and sensors for structural control; dynamics modeling of space structures and instruments; and attitude control, stationkeeping, slews, and orbital maneuvers of spacecraft and "sciencecraft."



RICHARD COLGREN, Senior Staff Engineer at the Lockheed Martin Aeronautics Company in Palmdale, California, is Lead Engineer for C4ISR and UAV programs for Air Vehicle Sciences and Systems. He earned his B.S. in aeronautics and astronautics at the University of Washington and his M.S. and Ph.D. in electrical engineering systems at the University of Southern California. Previously he was Flight Control Systems Lead for RECEE and Advanced Programs, and before that IPT Lead for Specialist Support on the DarkStar UAV (Tier III-). He was also IPT Lead for the Vehicle Management System on the Uninhabited Combat Air Vehicle, and was Lead Flight Controls Engineer on the U-2S and on the Air Force Multivariable Control Theory project. He has served as Project Engineer/Principal Investigator on independent research and development projects including Technologies for Reliable Autonomous Control, development of the Lockheed flight controls workstation, and the state reduction of structural dynamic models for control systems design. Previous work includes feasibility studies and preliminary/advanced design for flight control system concepts. Work on UAV projects includes Tier IIC, Tier III-, Tier III, X-33, UCAV, micro- UAVs, the Wraith Remotely Piloted Vehicle, and other projects. Dr. Colgren is a past Chair of the Integrated Controls Subcommittee of the Lockheed Corporate Task Force. Dr. Colgren is an aeronautical engineering evaluator for the Accreditation Board for Engineering and Technology, Inc./Aeronautical. He is an Associate Fellow of the AIAA, and is a Member and past Secretary for the National Technical Committee on Guidance, Navigation, and Control.

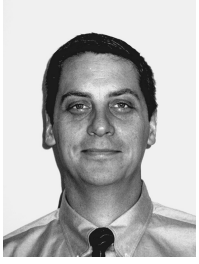
DAVID DOMAN is a Senior Aerospace Engineer with the Air Vehicles Directorate of the Air Force Research Laboratory (AFRL) at Wright–Patterson AFB in Dayton, OH. He received his B.S. in aerospace engineering (magna cum laude) from West Virginia University in 1991, his M.S. in aeronautics and astronautics from Purdue University in 1993, and his Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1998. From 1993 to 1995 he worked as a Research Aerospace Engineer in the Flying Qualities group at the USAF Wright Laboratory where he focused on control theoretical modeling of human operator dynamics. He is currently the Technical Area Lead for the Space Access and Hypersonic Vehicle Guidance and Control Group in the Control Science Center of Excellence at AFRL where he is responsible for conducting and directing research in the areas of adaptive guidance and control, online trajectory retargeting algorithms, and nonlinear control allocation. He is also responsible for an integrated adaptive guidance and control flight demonstration program. Dr. Doman has published over 20 refereed conference papers, journal articles, and technical reports, and he currently holds one U.S. patent. He was the co-recipient of the 2000 Dr. Courtland D. Perkins Award for Engineering Excellence at the Air Vehicles Directorate of AFRL. He is a Senior Member of the AIAA; a Member of the Institute of Electrical and Electronics Engineers (IEEE); an Associate Editor of the IEEE Control Systems Society's Conference Editorial Board; a Member of the AIAA Technical Committee on Guidance, Navigation, and Control; and a Member of Tau Beta Pi and Sigma Gamma Tau.



WODEK GAWRONSKI is a Principal Engineer at the Jet Propulsion Laboratory, California Institute of Technology. He received his M.S. (1968), Ph.D. (1970), and D.Sc. (1975) from the Gdansk University of Technology, Gdansk, Poland. He was a Professor at the Gdansk University of Technology (1970–1983), a Visiting Professor at the University of Hanover, Germany (1983–1986), and Senior NRC Fellow at the NASA Langley Research Center, Hampton, VA (1987–1989). His research interest is in the areas of structural dynamics, structural control, system identification, and antenna and radiotelescope pointing and control. At the Jet Propulsion Laboratory he is responsible for the advanced development of the control systems of NASA Deep Space Network antennas. He was also a consultant on control system design to several radiotelescope projects, including the NRAO 100-meter Green Bank Telescope in West Virginia, and the 50-meter Large Millimeter Wavelength Telescope in Pueblo, Mexico. He is an author of two books: *Balanced Control of Flexible Structures* (Springer 1996), and *Dynamics and Control of Structures* (Springer 1998).

HARI B. HABLANI received his B.S. (mechanical engineering) in 1972 from Government College of Engineering and Technology, Raipur, Chhattisgarh, and his M.S. in 1974 and Ph.D. in 1978 (both in aerospace engineering) from the Indian Institute of Science, Bangalore, India. He passed his M.S. with distinction and Ph.D. with P. S. Narayan Gold Medal. From 1978 to 1980, he was a Postdoctoral Fellow in the Department of Aeronautical and Astronautical Engineering, Purdue University, West LaFayette, Indiana. For the following two years, he was a NASA National Research Council Resident Associate at Johnson Space Center, Houston, Texas. Since 1982, he has been with The Boeing Company (formerly Rockwell International), Flight Sciences and Advanced Design Group, Huntington Beach, California, where he currently is a Technical Fellow. For the past three years, he has been involved with the design of guidance, navigation, and control of spacecraft rendezvous. Earlier, he was responsible for detailed design and simulation of spacecraft and interceptor dynamics, control, determination, guidance, and navigation. Dr. Hablani has received numerous awards for his contributions, including the Leonardo de Vinci (the Spirit of the Renaissance) Engineer of the Year 1991 and patent and innovation awards. He has authored numerous publications, both internal and external. For the last two years, he has been presenting Boeing-wide, a course on guidance, navigation, and control of spacecraft and interceptors. He has been an Associate Fellow of AIAA since 1994.

CHRISTOPHER D. HALL is a Professor of Aerospace and Ocean Engineering at Virginia Polytechnic Institute and State University. Before joining Virginia Tech in 1997, he taught for five years in the Department of Aeronautics and Astronautics at the Air Force Institute of Technology. He received a B.S. in aerospace engineering from Auburn University (1984), an M.S. in systems engineering at the Air Force Institute of Technology (1988), and a Ph.D. in theoretical and applied mechanics from Cornell University (1992). His research interests include spacecraft dynamics and control, space systems design, and nonlinear oscillations. He is a member of the Phi Kappa Phi, Sigma Gamma Tau, and Tau Beta Pi Honorary Societies, and the recipient of a Tau Beta Pi Outstanding Professor Award in 1993, the Colonel Charles A. Stone Leadership Award in 1996, the Ralph R. Teetor Educational Award in 1997, and the Dean's Award for Excellence in Teaching in 2001. He is an Associate Fellow of AIAA, is a past Associate Editor of this journal, and is currently Chair of the AIAA Astrodynamics Technical Committee.



JONATHAN P. HOW is currently an Associate Professor in the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology (MIT). He received a B.S. in engineering science (aerospace option) from the University of Toronto in 1987 and his S.M. and Ph.D. in aeronautics and astronautics from MIT in 1990 and 1993, respectively. He then studied for two years at MIT as a Postdoctoral Associate in charge of the design and analysis of robust controllers for the Middeck Active Control Experiment, which flew onboard the Space Shuttle Endeavor in March 1995. Prior to joining MIT in 2000, he worked for five years as an Assistant Professor in the Department of Aeronautics and Astronautics at Stanford University. His current research focuses on 1) various aspects of spacecraft navigation, control, and autonomy, including GPS sensing for formation-flying vehicles; 2) optimal coordination and trajectory design for teams of cooperating UAVs; and 3) theoretical analysis and synthesis of robust, hybrid, and adaptive controllers. He is a Senior Member of the AIAA and is active in the Institute of Electrical and Electronics Engineers and the Institute of Navigation.

JESSE LEITNER holds a Ph.D. in aerospace engineering from Georgia Institute of Technology in the area of flight mechanics and control, an M.S. in aerospace engineering from Georgia Institute of Technology, and a B.S. in aerospace engineering from the University of Texas at Austin. He is currently a Guidance, Navigation, and Control (GN&C) Systems Engineer and he serves as NASA Goddard's Lead Engineer for Distributed Space Systems. In this role he is responsible for the end-to-end technology program supporting Goddard's Earth Science and Space Science multiple spacecraft missions. He is also the Lead Analyst for formation flying guidance, navigation, and control work. Dr. Leitner serves as an interface between engineers and scientist principal investigators for distributed spacecraft missions at Goddard and he also acts as an interface in this area to the Department of Defense and other government agencies with interests in distributed space systems. Prior to joining NASA Goddard at the beginning of 2000, he was a Group Leader for Space Flight Dynamics and Control at the Air Force Research Laboratory, Space Vehicles Directorate, in Albuquerque. His research interests are in spacecraft guidance, navigation, and control and formation flying; applications of nonlinear and adaptive control; and dynamics and control of large optical systems. He serves on the AIAA GN&C Technical Committee, he has just finished his term as the AIAA Director on the American Automatic Control Council, and he was the Technical Program Chair for the 2002 AIAA GN&C Conference. He is an Associate Fellow of AIAA.

PING LU, Professor of Aerospace Engineering at Iowa State University, received his B.S. from the Beijing Institute of Aeronautics and Astronautics, China, in 1982 and his M.S.E. and Ph.D. in aerospace engineering from the University of Michigan in 1984 and 1988, respectively. He worked as a Postdoctoral Fellow from 1988 to 1989 at the University of Michigan. Since 1990 he has been with Iowa State University. His research interests include aerospace guidance, nonlinear control theory and applications, and trajectory optimization. He is an Associate Fellow of AIAA and was a Member of the AIAA Technical Committee on Guidance, Navigation, and Control (1994–2000).

MICHAEL B. MCFARLAND, Senior Systems Engineer with Raytheon Electronic Systems, is involved in a variety of research and development activities related to advanced missile guidance and control algorithms. He received his B.S. in aerospace engineering with high honors from the University of Florida in 1991, and his M.S. and Ph.D. in aerospace engineering from the Georgia Institute of Technology in 1992 and 1997, respectively. From 1991 to 1999, he was a Research Aerospace Engineer with the Air Force Research Laboratory Munitions Directorate at Eglin Air Force Base. Some of his previous research efforts focused on genetic algorithms, hybrid numerical/analytical methods for optimal aeroassisted orbit transfer vehicle guidance, robust nonlinear missile autopilot architectures, missile guidance laws, adaptive nonlinear control using artificial neural networks, and optimal path planning. His current research interests include guidance and control of hypersonic missiles, applications of adaptive and nonlinear control theory, and artificial neural networks. He is a Senior Member of AIAA, Member of the AIAA Missile Systems Technical Committee, Member of the Institute of Electrical and Electronics Engineers, and Life Member of Tau Beta Pi.

COLIN MCINNES is Professor of Space Systems Engineering at the Department of Aerospace Engineering, University of Glasgow. He obtained a B.S. in physics and astronomy and a Ph.D. in astrodynamics from the University of Glasgow in 1988 and 1991, respectively. He was then appointed as a Lecturer in the Department of Aerospace Engineering in October 1991 and was subsequently Reader (1996) and Professor (1999). During this time he has been a Visiting Researcher at the Central Design Bureau for Unique Instrumentation, Moscow, and the Institute of Space and Astronautical Science, Tokyo. His research interests center on highly non-Keplerian orbits for solar sails, solar sail mission analysis and design, autonomous spacecraft control, and space robotics. Recent contributions include studies of high-energy sample return missions using solar sails for the European Space Agency and mission applications of non-Keplerian orbits for NOAA and the Lockheed-Martin Corporation. He teaches spacecraft dynamics and control and contributes to a Masters program in Space Mission Analysis and Design. He is a Fellow of the Royal Aeronautical Society, the Institute of Physics, and the Royal Society of Edinburgh, and he was elected a Fellow of the Royal Academy of Engineering in July 2003.

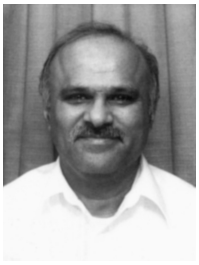
ROBERT G. MELTON is a Professor of Aerospace Engineering at the Pennsylvania State University. He received his B.S. in physics (cum laude) from Wake Forest University in 1976, and his M.S. in physics (1979) and Ph.D. in engineering physics (1982) from the University of Virginia. His research includes work in celestial mechanics, non-Keplerian astrodynamics, trajectory optimization, optimum station-keeping for space-based interferometry, and satellite attitude dynamics and control. An Associate Fellow of AIAA, he has served on its Astrodynamics Technical Committee and on the *Journal of Guidance, Control, and Dynamic's* Applications Advisory Board. He is a member of Sigma Pi Sigma (Physics Honor Society) and a Fellow of the American Astronautical Society, in which he has served as Chair of the Space Flight Mechanics Technical Committee, and Vice President-Technical; and in which he is currently Vice President-Publications.

VIVEK MUKHOPADHYAY received his S.M. and Sc.D. degrees in aeronautics and astronautics from Massachusetts Institute of Technology in 1970 and 1972. He was awarded the President of India Gold Medal and B.Tech. degree at the Indian Institute of Technology in 1968. He is presently a Senior Research Engineer at NASA Langley Research Center, Aerospace Systems Concepts and Analysis Division. His prior positions include Assistant Professor, Indian Institute of Technology; Research Specialist, Planning Research Corporation; Adjunct Associate Professor, George Washington University, Joint Institute for Advancement of Flight Sciences; and Senior Research Engineer, Aeroelasticity Branch and Systems Analysis Branch at NASA Langley. He is an Associate Fellow of AIAA, and a recipient of the prestigious NASA Floyd Thompson Fellowship. He has 35 years of research and teaching experience in the areas of applied optimal control, aeroservoelasticity, and structural dynamics and has many publications in archival journals. He was a contributing author to the Academic Press series *Advances in controls and Dynamics*, AIAA History of Key Technologies series, and "Benchmark Active Control Technology" special publications. His research interests are in the areas of robust control, active flutter suppression, multidisciplinary analysis, and optimization of advanced aerospace concepts. He has made key contributions to many NASA Langley projects including Drone for Aeroelastic and Structural Testing, Active Flexible Wing Flutter suppression, Benchmark Active Control Technology, Joined Wing Concept, Advanced Vehicle Systems Technology Programs, and Blended Wing Body vehicle design and optimization.

STEPHEN OSDER is currently an Independent Consultant in guidance, controls, and avionics systems design. He retired from McDonnell Douglas Helicopter Systems, where he was a Corporate Fellow. He has a B.S. in electrical engineering from the City College of New York and an M.S. in electrical engineering from Johns Hopkins University. He joined McDonnell Douglas in 1985 as Chief Scientist for Controls and Avionics and was responsible for advanced development in rotorcraft flight control, fire control, navigation, and related avionics. He spent many years at Sperry Flight Systems (now Honeywell), where he was Director of Research and Development. His contributions have been in guidance and control systems for transports, fighters, bombers, helicopters, missiles, re-entry vehicles, spacecraft, and UAVs. He has published many papers on fly-by-wire systems, fault tolerant computer technology, avionics architectures, and guidance and navigation, and he holds 21 patents in related areas. He is an Associate Fellow of AIAA and a Member of the Institute of Electrical and Electronics Engineers and the American Helicopter Society, and he has been Associate Editor of the *Journal of Guidance, Control, and Dynamics* since the journal's inception.

MARK L. PSIAKI is an Associate Professor in the Sibley School of Mechanical and Aerospace Engineering at Cornell University in Ithaca, New York. He received a B.A. in physics in 1979 and a M.S. and Ph.D. in mechanical and aerospace engineering in 1984 and 1987, all from Princeton University. He worked at the RCA Space Center in East Windsor, NJ, on the TIROS program from 1979 to 1982. He has worked at Cornell continuously since 1986 except for two sabbaticals, one from 1994 to 1995 and one in 2001. In both instances he was a Lady Davis fellow in the Aerospace Faculty at the Technion in Haifa, Israel. His principal research interests are in the areas of estimation and filtering, GPS receivers and applications, spacecraft attitude and orbit determination, and spacecraft attitude dynamics and control. He received the best paper awards for the 1997 AIAA Guidance, Navigation, and Control conference and for the 1998 and 2002 AIAA/AAS Astrodynamics Specialist conferences. He also has received teaching and advising awards from Cornell. He is an Associate Fellow of the AIAA and served on its Guidance, Navigation, and Control Technical Committee from 1992 to 1995.

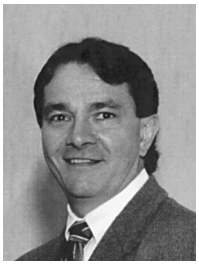
JUREK Z. SASIADEK is a Professor of aerospace engineering in the Department of Mechanical and Aerospace Engineering at Carleton University, Ottawa, Ontario, Canada. He received his M.S. (1972), Ph.D. (1975), and D.Sc. from the Technical University of Wroclaw, Wroclaw, Poland. His research interests focus in two main areas. The first is robotics, especially space robotics and unmanned autonomous vehicles (UAVs). The second area involves guidance, navigation, and control, especially spacecraft and aircraft control and nonlinear control. In 1989–1991 Dr. Sasiadek was with the Canadian Space Agency in Ottawa, and in 1985–1987 he was a Technical Director for Alberta Research Council, Calgary, Alberta. He has authored or coauthored more than 180 journal and refereed conference papers. Professor Sasiadek is a member of the AIAA Guidance, Navigation, and Control Technical Committee. An Associate Fellow of AIAA, he was a Program Chair of the 1994 AIAA Guidance, Navigation, and Control Conference in Scottsdale, Arizona. In August 2001, he was General Chair of the 2001 AIAA Guidance, Navigation, and Control Conference in Montreal, Quebec. Currently, he is Chair of an IFAC Robotics Technical Committee. Also, he is a Chair of Joint Robotics and Control Systems Societies Chapter in Ottawa.



M. BALA SUBRAHMANYAM was born in the state of Andhra Pradesh, India, in 1949. He received his B.S. (1970) in electrical engineering from the Regional Engineering College, Warangal, India, and his M.S. (1972) and Ph.D. (1975) in electrical engineering from the University of Iowa, Iowa City, Iowa. Dr. Subrahmanyam has held faculty positions with Texas A&M University, Kingsville, Texas, and the University of Missouri-Columbia, Columbia, Missouri. He was also with the Naval Air Warfare Center, Patuxent River, Maryland, working in the area of research and development of flight control systems of advanced naval aircraft. Currently he is with the Lockheed Martin Advanced Technology Center in Palo Alto, CA, working on the Advanced EHF and Airborne Laser programs. He is also an Adjunct Professor with the Florida Institute of Technology. Dr. Subrahmanyam's research interests include the areas of guidance and control problems of aircraft and missiles, H 1 control, and optimal control. He has published over 30 journal articles in these areas. In addition, he has written the books *Optimal Control with a Worst Case Performance Criterion and Applications* (Springer-Verlag, 1990) and *Finite Horizon H 1 and Related Control Problems* (Birkhauser, 1995). He is an Associate Fellow of the AIAA.

PANAGIOTIS TSIOTRAS received his engineering diploma in mechanical engineering from the National Technical University, Athens, Greece (1986), his M.S. in aerospace engineering from Virginia Polytechnic Institute and State University (1987), and his Ph.D. in aeronautics and astronautics from Purdue University (1993). He also holds an M.S. in mathematics from Purdue University (1992). During 1989 he worked at the Interdisciplinary Center for Applied Mathematics at Virginia Polytechnic Institute and State University and from 1993 to 1994 he was a Postdoctoral Fellow at Purdue. From 1994 to 1998 he was an Assistant Professor in the Department of Mechanical, Aerospace, and Nuclear Engineering at the University of Virginia. Currently, Dr. Tsiotras is an Associate Professor in the School of Aerospace Engineering at Georgia Institute of Technology. His research interests include attitude dynamics and kinematics, optimal and robust control, and control of nonlinear systems emphasizing mechanical and aerospace applications. He is a recipient of the National Science Foundation Career Award and the Sigma Xi Award for Excellence in Research. He is an Associate Fellow of AIAA and a Member of the Institute for Electrical and Electronics Engineers, the American Society of Mechanical Engineers, and the American Society for Engineering Education, as well as a Member of the Phi Kappa Phi, Tau Beta Pi, and Sigma Gamma Tau honor societies.

DAVID VALLADO is currently a Principal Engineer at Raytheon Command, Control, Communication, and Information Systems in Denver, Colorado. He is also the author of the textbook, *Fundamentals of Astrodynamics and Applications* (McGraw–Hill, 1997; 2nd ed., Microcosm, 2001). He has been recognized in Who's Who in America (2001) and as a 1998 Outstanding Young Men of America. He attended the U.S. Air Force Academy and majored in astronautical engineering, receiving his B.S. in 1980. He earned his M.S. in systems management from the University of Southern California in 1982. He then attended the Air Force Institute of Technology, where he earned his M.S. in astronautical engineering in 1984. He completed over 20 years of military service, and retired as a Lieutenant Colonel in 2000. His Air Force assignments included serving as a Project Officer for the Stage I of the PEACEKEEPER missile, performing ballistic missile analysis for the Strategic Air Command Staff at the 544th Strategic Intelligence Wing, teaching as an Instructor in the Department of Astrodynamics at the U.S. Air Force Academy, and several research scientist activities at the Air Force Research Laboratory for orbital dynamics applications. His last assignment was in the Aerospace Analysis directorate at U.S. Space Command in Colorado Springs where he performed analytical studies to improve space surveillance. He is currently Secretary of the American Astronautical Society Technical Committee, and Chair of the AIAA Committee on Standards, which is working on recommended practices for astrodynamics.



KEVIN A. WISE is a Senior Technical Fellow in the Boeing Phantom Works, and currently is the Deputy Vehicle Management System Lead Engineer on the X-45 Joint-Unmanned Combat Air System program. He received his B.S., M.S., and Ph.D. degrees in mechanical engineering from the University of Illinois in 1980, 1982, and 1987, respectively. Since joining Boeing (then McDonnell Douglas) in 1982, Dr. Wise has been actively involved in the application of modern estimation and control methodologies in guidance, navigation, and flight control problems for jet aircraft and missiles. He has designed flight control systems for fighter aircraft, missiles, munitions, ejections seats, and unmanned air vehicles. His most recent accomplishment includes the GNC for the aerodynamically unstable X-45A Unmanned Combat Air Vehicle. His research interests include aircraft and missile dynamics and control, robust adaptive control of linear and nonlinear systems, and robustness theory for parametric and dynamic uncertainties. He has authored more than 50 technical arcticles, and teaches graduate level control theory at Washington University in St. Louis, Southern Illinois University at Edwardsville, and at the University of Missouri–Rolla graduate extension and UMSL. Dr. Wise is an Associate Fellow of the AIAA, a Senior Member of the IEEE, and is a Fellow of the St. Louis Academy of Sciences.