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EDITORIAL
Annual Business

With this first issue in the 22nd year of publishing the *JGCD*, I want to give special recognition to Associate Editor Steve Osder, who has served for all of these years and has now volunteered to renew his position for another three-year term. Steve has handled papers in just about all the areas in which we publish and has done an excellent job throughout. He has made many individual technical contributions in his career and I asked him to write a paper on his thoughts about fault-tolerant technology to kick off this year's volume. You will find it as the first paper in this issue. Steve, thanks a lot! It is because of the contributions from people like you that the *JGCD* has achieved its international reputation.

Also volunteering to continue for another three-year term are the following Associate Editors: K. Krishnakumar, University of Alabama, for papers in neural systems, intelligent control, structural control, and flight simulation and training; Ping Lu, Iowa State University, for papers in nonlinear control theory and applications, trajectory optimization, and guidance; I. Michael Ross, U.S. Naval Postgraduate School, as Book Review Editor; and M. Bala Subrahmanyam, Lockheed Martin Integrated Systems, for papers in guidance and control of aircraft and missiles, H_∞ control, and optimal control. Additional appointments for three-year terms as new Associate Editors are being made to the following individuals: Alain Carrier, Lockheed Martin Advanced Technology Center, for papers in control of flexible structures, vibration isolation and control, system identification, and smart actuators; Richard Colgren, Lockheed Martin Skunk Works, for papers in flight controls, handling qualities, and UAVs; Hari Hablani, Boeing Reusable Space Systems, for papers in spacecraft attitude control and determination, multibody flexible dynamics and control, precision pointing and tracking, and guidance and navigation of interceptors and interplanetary spacecraft; and Panagiotis Tsiotras, Georgia Institute of Technology, for papers in attitude dynamics and kinematics, optimal and robust control, and control of nonlinear systems for mechanical and aerospace applications. The entire editorial team is presented in the following pages.

On behalf of the AIAA, I also want to thank our retiring Associate Editors: Gary Balas of The University of Minnesota; Glenn Creamer of Spectrum Astro; Donald Ward of Texas A&M University; and Trevor Williams, of The University of Cincinnati for their selfless contributions of time and expertise to maintaining the quality of the *JGCD*. Each Associate Editor is responsible for evaluating one to two papers per month. This includes his own technical and editorial review, as well as soliciting the aid of several peer reviewers. Then, if the review is positive, the author must be given directions for revisions and the resulting revised paper must be reviewed. Ultimately, when all is done, the final accepted manuscript is sent by the Associate Editor to AIAA headquarters. These efforts by the Associate Editors need to be conducted in a timely fashion while they still pursue their own professional careers. Thanks again for all their help as they join the distinguished alumni group of former *JGCD* Associate Editors.

Each year I receive many unsolicited letters from volunteers offering to serve as Associate Editors. I appreciate those letters even though they cause me to have to make some difficult decisions on staffing. As Associate Editors retire, I need to choose a combination of new people that covers all the technical areas represented by the retiring Associate Editors, while at the same time shifting the focus of our expertise toward the areas represented by the most papers submitted. We are extremely fortunate to have many outstanding individuals volunteer, and I encourage you to consider doing so.

Another expression of thanks should go to the Institutions that support the activities of the Editorial staff. In my own case, I could not possibly perform my role as Editor-in-Chief without the support of Draper Laboratory management.

This is a peer-reviewed archive journal whose very existence depends on the willingness of experts to volunteer their time to anonymously review submitted papers. Only about 50% of the papers submitted make it through our rigorous review procedure. When a paper is published, the reader is reasonably assured of its technical quality. Thanks to all of you reviewers for your contributions; following the editorial team description is a list of reviewers for the period October 1997 through September 1998. I apologize to any reviewers whose names have been inadvertently omitted from the list.

Each year I have written about the progress made during the year toward meeting the goals 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-oriented papers, 3) to minimize the time from submission to publication, 4) to increase international involvement in the *JGCD*, and 5) to listen to and respond to everyone's concerns. Let me discuss each item.

To Maintain the Quality of the JGCD

This past year I received over 350 world-wide submissions to the *JGCD*—about two every business day. Most papers come in at a length of 30–40 pages and my job is to perform a technical and editorial review of all this and to decide which Associate Editor gets the paper, or whether to send it back to the author. With Dianne Bennett's help (thanks, Dianne), I usually process a paper within a day or two of receiving it and then I continue to monitor the progress of the paper by monthly reports from the Associate Editor. This year I continued to have the Associate Editors send me copies of the evaluations of all papers for which publication was declined. This helps me monitor the quality of the review process, as well as makes me more aware of the publishability of papers in the technical disciplines we represent. In a sense, I am fine-tuning the threshold for accepting papers into the review process. As I explained in last year's editorial, I also have very low tolerance for papers that don't follow the submission requirements inside the back cover. Therefore, authors should be aware that acceptance into the extensive review process is not automatic. By raising the threshold, we are applying our editorial resources to those papers that truly deserve our attention and acceptance into our review system.

There are a few independent measures that can be applied to archive journals. *The Scientific Citation Index* publishes several indices and the *JGCD* does exceptionally well in all categories, especially in "Total Citations" and "Impact Factor." The first index is somewhat self-explanatory. It's the total number of times papers in the *JGCD* were cited in a particular year. The second index is a measure of the frequency with which the "average article" in a journal has been cited in a particular year. These independent measurements and the fact that the *JGCD* is second in number of subscriptions to AIAA Journals, leads me to believe we are maintaining the high standards of the *JGCD*.

I also want to comment on the "looks" of the *JGCD*. On behalf of the authors and readers, I want to thank the AIAA Headquarters staff and employees at TechBooks for putting out issues that are easy to read and professionally well prepared.

To Increase the Number of Engineering Applications Papers

One goal has been to make the *JGCD* as engineering applications-oriented as practical. During the past year, we have published several outstanding applications-oriented papers, and we will also continue to ask authors of more theoretical papers to include a realistic numerical example or a detailed discussion of a possible relevant application. Our Associate Editors, International Advisors, and liaisons with AIAA technical committees will continue to solicit original engineering applications papers in their communities. The

appointments of three new Associate Editors from industry should also help in that activity. We will continue to strive to make the *JGCD* as relevant to the practicing engineer as possible while fulfilling our responsibility as an archive journal.

To Minimize the Time from Submission to Publication

The *JGCD* staff has continued to meet another goal, which is to decrease the time it takes to get a paper published. All of our Associate Editors are committed to speedy reviews. Nearly all the papers published in recent issues were submitted to us within the prior 12 months. Once a paper was sent to the AIAA for actual publication, the average time to publication was between 14 and 20 weeks for recent issues. For the typical paper, the longest delays have been in waiting for reviewer's comments and author's revisions. If those two segments of our community were to act quicker, and the authors were to follow the submission requirements inside the back cover, the publication process would move even faster.

To Increase the International Involvement in the JGCD

Another goal continues to be the improvement in geographical distribution and quality of internationally submitted papers. As a result of the efforts by our International Advisors, we have had many excellent international papers published or that are currently in the review process, and so the appointment of advisors in several countries appears to have had positive benefits for the *JGCD*, and I plan to continue to use them for the future. In many instances, the papers are the result of abstracts that had been sent to me by an International Advisor for my comments on the subject matter. Also, increasing the international distribution of the *JGCD* should help alleviate one of the main problems of an international contributor, i.e., the lack of familiarity with current research outside his country. The AIAA journals now reach 84 countries.

To Listen to and Respond to Everyone's Concerns

Finally, I continue to encourage communications between our readers and any member of the Editorial Staff. I believe we did a good job last year in covering the span of interests of our readers and responding quickly to their communications. We can do better and we are willing to listen. Don't hesitate to contact me directly. My numbers are below.

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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 of Education. His major activities have been in guidance, navigation, and control (GN&C) system design for missiles, aircraft, and manned spacecraft; Kalman filtering applications; and integration techniques for high-resolution synthetic aperture radars, global positioning systems (GPS), and inertial sensors. Since 1966 he has served the NATO Research and Technology Agency (formerly AGARD) in many positions, including as a U.S. member of the Guidance and Control Panel. He has participated in several U.S. Department of Defense committees, the most recent being the Defense Science Board Task Force on GPS and the Naval Research Advisory Committee on GPS Vulnerability. He is also a Lecturer in Aeronautics and Astronautics at MIT. He is an Associate Fellow of the AIAA, a Senior Member of The Institute of Electrical and Electronics Engineers, a member of the Institute of Navigation, and he is an elected member of the Russian Federation, Academy of Navigation and Motion Control. He is author or contributing author of more than 60 technical papers and reports, encyclopedia articles, and textbooks. He has been Editor-in-Chief of the AIAA *Journal of Guidance, Control, and Dynamics* since February 1996.

Associate Editors

S. N. BALAKRISHNAN is currently an Associate 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 bachelor's degree in aeronautics at Madras Institute of Technology, India. He received his M.S. and Ph.D. degrees 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, where he worked on Autonomous Navigation of Multiple Satellites and Multiple Target Estimation; Faculty Research Fellow, Wright Laboratory (Eglin Air Force Base, Florida), where he was involved in Integrated Missile Guidance/Autopilot Design and Automatic Target Recognition; and involvement in the Indian Space Program, where he worked on Flight Mechanics-related topics. He teaches stability and control and advanced control courses at UMR. His research activities focus on neural networks in trajectory optimization, control and design, control of time-varying systems, missile guidance and self-repairing control, and multiple target-multiple sensor problems and estimation. He has authored/coauthored about 45 journal and refereed conference papers in these areas. Dr. Balakrishnan is a Member of the AIAA Guidance, Navigation, and Control Technical Committee and an Associate Fellow of AIAA.

ARUN K. BANERJEE is a Consulting Scientist in the Advanced Technology Center of Lockheed Martin Missiles and Space Company. His major work has been in multibody elastodynamics. He received the Engineer of the Year award in 1990 from AIAA, San Francisco Chapter, for a general theory of motion-induced stiffness of structures and was invited by the European Space Agency in 1992 to give a state-of-the-art lecture in multibody dynamics. Previously, he worked for Martin Marietta on tethered satellite dynamics and control, and for Northrop on the dynamics of shuttle booster recovery. His degrees include a B.S. from Calcutta University, M.S. from Stanford University, and Ph.D. degrees from the Indian Institute of Technology, Kharagpur (where he taught for five years), and the University of Florida. His publications include over 30 journal articles, with a broad interest in dynamics and in vibration control. Dr. Banerjee is an Associate Fellow of AIAA.

HAIM BARUH is an Associate Professor in the Department of Mechanical and Aerospace Engineering at Rutgers University. He received his B.S. degree in mechanical engineering in 1976 from Bogaziçi University in Istanbul, Turkey, and his M.S. and Ph.D. degrees in engineering mechanics in 1978 and 1981, respectively, from Virginia Polytechnic Institute and State University. Prior to joining Rutgers in 1983, he worked as a Visiting Assistant Professor at Virginia Polytechnic Institute and State University. His research interests include modeling of control of flexible spacecraft and robots, parameter identification, control of systems described by constrained coordinates, smart structures, detection of structural damage, and aircraft structural analysis. He is author of the textbook *Analytical Dynamics.* He is a Member of AIAA and Sigma Xi, and he currently serves as Education Officer in the AIAA Princeton Section.

ROBERT H. BISHOP holds the Myron L. Begeman Fellowship in engineering in the Department of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin. He received his B.S. and M.S. degrees in aerospace engineering from Texas A&M University and his Ph.D. in electrical and computer engineering from Rice University. Dr. Bishop spent ten years as a practicing engineer with the Charles Stark Draper Laboratory, including six years as an on-site resident at NASA Johnson Space Center. He was twice a Faculty Fellow of the NASA Jet Propulsion Laboratory and a Welliver Fellow of The Boeing Company. His current research focuses on various aspects of spacecraft and missile design and includes nonlinear attitude control and momentum management of spacecraft, adaptive estimation using mixture-of-expert shierarchies with application to interplanetary navigation, and development of GN&C systems for autonomous planetary precision landing for future manned missions. The author or coauthor of a number of books, Dr. Bishop has served on the AIAA Guidance, Navigation, and Control Technical Committee and currently serves on the AAS Spaceflight Mechanics Technical Committee. He is an Associate Fellow of AIAA and is active in AAS, IEEE, and ASEE.

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 the Principal Gain Tracking, a novel testing and system identification technique for high-modal-densitylightly-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."

EUGENE M. CLIFF was awarded the B.S. degree by Clarkson University in 1965 and the Ph.D. by the University of Arizona in 1970. He served on the faculty at Arizona for two years and moved to Virginia Polytechnic Institute and State University in 1971. Currently, he is the Reynolds Metals Professor in the Aerospace and Ocean Engineering Department. His research interests center on optimal control and optimization with applications to trajectory shaping, optimal design, and control of distributed parameter systems. He is an Associate Fellow of AIAA.

RICHARD D. COLGREN is the Lead for Flight Controls on Reconnaissance and Advanced Programs at the Lockheed Martin Skunk Works in Palmdale, California. He earned his B.S.A.A. at the University of Washington, and his M.S.E.E. and Ph.D. in Electrical Engineering–Systems at the University of Southern California. He is IPT Lead for Specialist Support on the DarkStar or Tier III- Uninhabited Air Vehicle (UAV) and is IPT Lead for the Vehicle Management System for the Lockheed Martin Uninhabited Combat Air Vehicle. Previously, he was Lead Flight Controls Engineer on the U-2S and on the Air Force Multivariable Control Theory project. He has served as Project Engineer on independent research and development projects, including development of the Lockheed flight controls workstation, and on the state reduction of structural dynamic models for control systems design. Previous work includes feasibility studies and preliminary/advanced design flight control system concepts such as the Crew Return Vehicle and HL-20 mini shuttle, Rockwell/Lockheed A-X proposal, F-22, F-117A, B-2, F-20, and other classified projects. Work on UAV projects includes the Micro Air Vehicle, Tier II^{+}, Tier III-, Tier III, and the Wraith Remotely Piloted Vehicle. Dr. Colgren is a past chairman of the Integrated Controls Subcommittee of the Lockheed Corporate Task Force. He previously worked for the Northrop Advanced Systems Division and the Northrop Aircraft Company. Dr. Colgren is an Associate Fellow of AIAA. He is a Past Secretary and is currently a Member of the AIAA Guidance, Navigation, and Control Technical Committee. He was the AIAA Review Chairman for the 1992 American Control Conference and was the co-chair for the 1998 conference. He also was the Program Chairman of the 1996 AIAA Guidance, Navigation, and Control Conference. Dr. Colgren is an ABET/EAC (Accreditation Board for Engineering and Technology, Inc.) aeronautical engineering evaluator. He is an Adjunct Professor in Electrical Engineering at the University of Southern California. He is a past Associate Editor for the *Journal for Theoretical and Computational Graphics* and for *Workstation News*.

HARI B. HABLANI received his B.S. (Mechanical Engineering) in 1972 from Government College of Engineering and Technology, Raipur, Madhya Pradesh, and his M.S. in 1974 and Ph.D. in 1978 (both in Aeronautical Engineering) from the Indian Institute of Science, Bangalore, India. He passed his M.S. with distinction and his Ph.D. with the P.S. Narayan Gold Medal. During 1978–80, he was a postdoctoral fellow in the Department of Aeronautical and Astronautical Engineering, Purdue University, West Lafayette, Indiana, and for the subsequent two years he was a NASA National Research Council Resident Associate at Johnson Space Center, Houston, Texas. Since 1982, he has been with Boeing (formerly Rockwell International) Reusable Space Systems, Downey, California, where currently, he is a Principal Engineering Specialist in the Flight Controls Group. In the past 16 years, he has been involved with detailed design and simulation of various aspects of attitude control, determination, and guidance of over a dozen spacecraft, satellites, and interceptors. Dr. Hablani has received numerous awards for his contributions, including the Leonardo da Vinci (the Spirit of the Renaissance) Engineer of the Year 1991 award and patent and innovation awards. He has published 25 internal technical reports and 30 technical papers in his field. His interests are varied and include spacecraft attitude control and determination, multibody flexible dynamics and control, precision pointing and tracking, and guidance and navigation of exoatmospheric interceptors and interplanetary spacecraft. He is an Associate Fellow of AIAA.

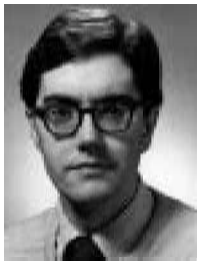
CHRISTOPHER D. HALL is an Assistant Professor of Aerospace and Ocean Engineering at Virginia Polytechnic Institute and State University. Before assuming his present position in 1997, he taught for five years in the Department of Aeronautics and Astronautics at the Air Force Institute of Technology. He earned his B.S. in aerospace engineering from Auburn University (1984), his M.S. in systems engineering at the Air Force Institute of Technology (1988), and his Ph.D. in theoretical and applied mechanics from Cornell University (1992). His research interests include spacecraft attitude 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, and the Ralph R. Teetor Educational Award in 1997. He is an Associate Fellow of AIAA and is currently serving on the AIAA Astrodynamics Technical Committee, as well as its subcommittee on education.

GARY L. HARTMANN is a Principal Research Fellow in the Control and Navigation Department of Honeywell's Technology Center in Minneapolis, Minnesota. He received a M.S. in electrical engineering from Iowa State University (1967) and has completed his Ph.D. course work in control sciences at the University of Minnesota. Since joining Honeywell in 1968, he has served as an individual contributor and managed R&D programs. His major activities have been the design of flight control laws with modern control techniques for a variety of developmental and production aircraft, development of avionics architectures for flight critical applications, and design of Kalman filters. His current interests include aided navigation systems, modeling and design of flight and propulsion control systems, and flight management systems architectures that provide new CNS/ATM functions. Mr. Hartmann is a Member of IEEE and a Senior Member of AIAA.

FELIX R. HOOTS received his B.S. in physics (1969) and his M.S. in mathematics (1971) from Tennessee Technological University and his Ph.D. in mathematics (1976) from Auburn University. He began his professional career in civil service as a mathematician for the 14th Aerospace Force headquartered in Colorado Springs, Colorado. His research there involved development of analytical models for satellite orbit prediction with atmospheric drag, ground site visibility, and satellite close approach prediction. In 1986 he joined GRCI and now serves as Chief Scientist of the Decision Technologies Division. Dr. Hoots has published papers in the leading technical journals, has reviewed numerous papers for these journals, and has taught both short courses and full semester courses in Astrodynamics, Engineering Mathematics, and Partial Differential Equations for the University of Colorado. He is an Associate Fellow of AIAA, has served on its Astrodynamics Technical Committee, and has served as General Chairman for the annual Astrodynamics Conference. He is a member of the American Astronautical Society (and currently serves on its Space Flight Mechanics Technical Committee), Kappa Mu Epsilon (Mathematics Honor Society), and Phi Kappa Phi (Scholastic Honor Society).

K. KRISHNAKUMAR is an Associate Professor of Aerospace Engineering and the Director of the Intelligent Control Laboratory at the University of Alabama, Tuscaloosa. Dr. KrishnaKumar is currently responsible for teaching and coordinating courses in Intelligent Control, Flight Dynamics and Control, Optimal Control, and Spacecraft Dynamics and Control. His research interests include immunized artificial neural systems, intelligent control methods and their application to aircraft and spacecraft control, structural control, flight simulation, and training. He has organized several tutorial workshops and short courses on Evolutionary Algorithms, Fuzzy Logic, and Neural Networks and their applications. He is the Chairman of the AIAA Artificial Intelligence Technical Committee and a Member of the SAE Information Sciences Technologies Committee and the *Journal of Aircraft* editorial board. Dr. KrishnaKumar is an Associate Fellow of AIAA and a member of IEEE, INS, and IFSA.

PING LU is presently an Associate Professor of Aerospace Engineering and Engineering Mechanics at Iowa State University. He received his Bachelor's degree from the Beijing Institute of Aeronautics and Astronautics, China, in 1982, and his M.S.E. and Ph.D. degrees in aerospace engineering from the University of Michigan in 1984 and 1988, respectively. He worked as a Postdoctoral Research Fellow from 1988 to 1989 at the University of Michigan. Since 1990, he has been with Iowa State University. His research interests include guidance, nonlinear control theory and applications, and trajectory optimization. He is an Associate Fellow of AIAA and currently a member of the AIAA Technical Committee on Guidance, Navigation, and Control.



ROBERT G. MELTON received his B.S. in physics 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. He joined the Aerospace Engineering Department of the Pennsylvania State University as Assistant Professor in 1981 and became Associate Professor in 1987. His research has involved attitude control of multibody spacecraft, optimal detumbling of space stations, dynamics of gyro-controlled spacecraft via conjugate momentum methods, control of flexible space structures using embedded fiber optic sensors, error analysis for finite burn ascent trajectories, perturbation analysis of low-thrust orbital transfers, and the dynamics and control of large articulated spacecraft in low Earth orbit. An Associate Fellow of AIAA, he has served on its Astrodynamics Technical Committee and on the *Journal of Guidance, Control, and Dynamics* Applications Advisory Board. He is a member of the American Astronautical Society (where he currently chairs the Space Flight Mechanics Technical Committee) and Sigma Pi Sigma (Physics Honor Society).

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STEPHEN OSDER is currently an independent consultant in guidance, controls, and avionics systems design, having retired from McDonnell Douglas Helicopter Systems, where he was a Corporate Fellow. He has a B.E.E. 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 16 patents in related areas. He is an Associate Fellow of AIAA and a member of IEEE and AHS, and he has been Associate Editor of the *Journal of Guidance, Control, and Dynamics* since the *Journal*'s inception.

I. MICHAEL ROSS obtained his doctorate in Aerospace Engineering in 1990 from Pennsylvania State University and thereafter joined the U.S. Naval Postgraduate School (NPS) as an Adjunct Professor in the Department of Aeronautics and Astronautics. Currently, he holds a joint appointment with NPS' Space Systems Academic Group as an Associate Professor. At NPS, Dr. Ross teaches courses in spacecraft dynamics and space systems engineering. His current research interests are in computational optimal control, the applications of singular optimal control theory to spacecraft trajectory design and the deflection of near-Earth-objects. His research contribution include advancing the energy-sink theory for the stability of dual-spin spacecraft and the optimization of aeroassisted maneuvers. He has been the Project Lead on PANSAT, a small communications satellite built at NPS, currently in low-Earth-orbit. He has served on the AIAA Astrodynamics Technical Committee and the AIAA Mechanics and Control of Flight Award Committee. He has also participated in organizing several AAS/AIAA conferences. He is a member of the AAS Spaceflight Mechanics Technical Committee, a Senior Member of AIAA, and a Member of SIAM and Sigma Xi.

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.Sc. (1972), Ph.D. (1975), and D.Sc. degrees 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 (UAV). 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/coauthored over 100 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.

SAHJENDRA N. SINGH received the B.Sc. in electrical engineering (1965) from the Patna University, India, the M.E. in applied electronics and servomechanism (1968) from the Indian Institute of Science, Bangalore, and the Ph.D. in electrical engineering (1972) from the Johns Hopkins University, Baltimore, Maryland. He is currently a Professor of Electrical Engineering at the University of Nevada, Las Vegas. Prior to joining the University of Nevada, Las Vegas, in 1986, he worked at the Indian Space Research Organization, Trivandrum, and at the NASA Langley Research Center, Hampton, Virginia. Dr. Singh did research as an ONR Distinguished Faculty Fellow at the U.S. Naval Air Warfare Center, Warminster, Pennsylvania, the U.S. Naval Air Warfare Center, Patuxent River, Maryland, and the U.S. Naval Undersea Warfare Center, Newport, Rhode Island, in the areas of control of aircraft and turbulence control, and also as an AFOSR Faculty Fellow at Edwards Air Force Base, California. He has 25 years of teaching and research experience in the areas of nonlinear system and control theory, differential games, gyrodynamics, aircraft and spacecraft control, large space structures, and control of elastic robotics systems. He has published more than 90 journal papers in these areas. He is a senior member of IEEE and an Associate Fellow of AIAA.

M. BALA SUBRAHMANYAM was born in the state of Andhra Pradesh, India, in 1949. He received the B.S. (1970) degree in Electrical Engineering from the Regional Engineering College, Warangal, India, and the M.S. (1972) and Ph.D. (1975) degrees in Electrical Engineering from the University of Iowa, Iowa City, Iowa. Dr. Subrahmanyam has held faculty positions at 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 Lockheed Martin in Orlando, Florida, working on the flight control system of the Joint Air-to-Surface Standoff Missile. 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_∞ control, and optimal control. He has published over 30 journal papers 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_∞ and Related Control Problems* (Birkhäuser :1995). He is an Associate Fellow of AIAA.

PANAGIOTIS TSIOTRAS received his Engineering Diploma in Mechanical Engineering from the National Technical University, Athens, Greece (1986), his M.Sc. 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.Sc. degree in Mathematics from Purdue (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 NSF Career Award and the Sigma Xi Award for Excellence in Research. He is a Senior Member of AIAA and a Member of IEEE, ASME, and ASEE, as well as a Member of the Phi Kappa Phi, Tau Beta Pi, and Sigma Gamma Tau honor societies.

Reviewers for October 1, 1997–September 30, 1998

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Adams, N.
Adams, W.
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Agrawal, S
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Anderson, M.
Anderson, T.
Anthony, T.
Araujo, A.
Ardema, M.
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Zarchan, P.
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Zhou, K.
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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 method[1] 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.

Ethical Standards for Publication of Aeronautics and Astronautics Research

Preface

The American Institute of Aeronautics and Astronautics (AIAA) serves the engineering and scientific aerospace communities and society at large in several ways, including the publication of journals that present the results of scientific and engineering research. The Editor-in-Chief of a journal of the AIAA has the responsibility to maintain the AIAA ethical standards for reviewing and accepting papers submitted to that journal. These ethical standards derive from the AIAA definition of the scope of the journal and from the community perception of standards of quality for scientific and engineering work and its presentation. The following ethical standards reflect the conviction that the observance of high ethical standards is so vital to the whole engineering and scientific enterprise that a definition of those standards should be brought to the attention of all concerned.

Ethical Standards

A. Obligations of Editors-in-Chief and Associate Editors*

1. The Editor-in-Chief has complete responsibility and authority to accept a submitted paper for publication or to reject it. The Editor-in-Chief may delegate this responsibility to Associate Editors, who may confer with reviewers for an evaluation to use in making this decision.
2. The Editor will give unbiased and impartial consideration to all manuscripts offered for publication, judging each on its scientific and engineering merits without regard to race, gender, religious belief, ethnic origin, citizenship, or political philosophy of the author(s).
3. The Editor should process manuscripts promptly.
4. The Editor and the editorial staff will not disclose any information about a manuscript under consideration or its disposition to anyone other than those from whom professional advice is sought. The names of reviewers will not be released without the reviewers' permission.
5. The Editor will respect the intellectual independence of authors.
6. Editorial responsibility and authority for any manuscript authored by an Editor-in-Chief and submitted to the journal must be delegated to some other qualified person, such as an Associate Editor of that journal. When it is an Associate Editor participating in the debate, the Editor-in-Chief should either assume the responsibility or delegate it to another Associate Editor. Editors should avoid situations of real or perceived conflicts of interest. If an Editor chooses to participate in an ongoing scientific debate within the journal, the Editor should arrange for some other qualified person to take editorial responsibility.
7. Unpublished information, arguments, or interpretations disclosed in a submitted manuscript must not be used in the research of an Editor-in-Chief, Associate Editor, or reviewer except with the consent of the author.
8. If an Editor is presented with convincing evidence that the main substance or conclusions of a paper published in the journal are erroneous, the Editor must facilitate publication of an appropriate paper or technical comment pointing out the error and, if possible, correcting it.

B. Obligations of Authors

1. An author's central obligation is to present a concise, accurate account of the research performed as well as an objective discussion of its significance.
2. A paper should contain sufficient detail and reference to public sources of information such that the author's peers could repeat the work.
3. An author should cite those publications that have been influential in determining the nature of the reported work and that will guide the reader quickly to the earlier work that is essential for understanding the present investigation. Information obtained privately, as in conversation, correspondence, or discussion with third parties, should not be used or reported in the author's work without explicit permission from the investigator with whom the information originated. Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, should be treated similarly.
4. Fragmentation of research papers should be avoided. A scientist who has done extensive work on a system or group of related systems should organize publication so that each paper gives a complete account of a particular aspect of the general study.
5. It is inappropriate for an author to submit manuscripts describing essentially the same research to more than one journal of primary publication.
6. An accurate, nontrivial criticism of the content of a published paper is justified; however, in no case is personal criticism considered to be appropriate.
7. To protect the integrity of authorship, only persons who have significantly contributed to the research and paper presentation should be listed as authors. The corresponding author attests to the fact that any others named as authors have seen the final version of the paper and have agreed to its submission for publication. Deceased persons who meet the criterion for co-authorship should be included, with a footnote reporting date of death. No fictitious name should be listed as an author or co-author. The author who submits a manuscript for publication accepts the responsibility of having included as co-authors all persons appropriate and none inappropriate.
8. It is inappropriate to submit manuscripts with an obvious marketing orientation.

C. Obligations of Reviewers of Manuscripts

1. Inasmuch as the reviewing of manuscripts is an essential step in the publication process, every publishing engineer and scientist has an obligation to do a fair share of reviewing. On the average, an author should expect to review twice as many papers as an author writes.
2. A chosen reviewer who feels inadequately qualified or lacks the time to judge the research reported in a manuscript should return it *promptly* to the Editor.
3. A reviewer of a manuscript should judge the quality of the manuscript objectively and respect the intellectual independence of the authors. In no case is personal criticism appropriate.
4. A reviewer should be sensitive even to the appearance of a conflict of interest. If in doubt, the reviewer should return the manuscript promptly without review, advising the Editor of the conflict of interest or bias.
5. A reviewer should not evaluate a manuscript authored or coauthored by a person with whom the reviewer has a personal or professional connection if the relationship would bias judgment of the manuscript.
6. A reviewer should treat a manuscript sent for review as a confidential document. Its contents, as well as the reviewers' recommendations, should neither be shown to nor discussed with others except, in special cases, to persons from whom specific advice may be sought; in that event, the identities of those consulted should be disclosed to the Editor.
7. A reviewer should explain and support judgments adequately so that Editors and authors may understand the basis of the comments. Any statement that an observation, derivation, or argument had been previously reported should be accompanied by the relevant citation.
8. A reviewer should be alert to failure of authors to cite relevant work by other scientists. A reviewer should call to the Editor's attention any substantial similarity between the manuscript under consideration and any published paper or any manuscript submitted concurrently to another journal.
9. A reviewer should not use or disclose unpublished information, arguments, or interpretations contained in a manuscript under consideration, except with the consent of the author.

D. Obligations of Engineers and Scientists Making Statements to Society at Large

1. A scientist or engineer publishing in the popular literature has the same basic obligation to be accurate in reporting observations and to be unbiased in interpreting them as when publishing in a technical journal.
2. A scientist or engineer should strive to keep public writing, remarks, and interviews as accurate as possible.
3. A scientist or engineer should not proclaim a discovery to the public unless the support for it is of strength sufficient to warrant publication in the technical literature. An account of the work and results that support a public pronouncement should be submitted as quickly as possible for publication in a technical journal.

Acknowledgments

The ethical standards embodied in this document were adopted by the AIAA Publications Committee on 16 August 1989 and are endorsed by the Editors-in-Chief. With minor changes, these standards are adopted from those published by the American Geophysical Union and are used with their permission.

*Throughout this document, the term "Editor," when used alone, applies to *both* Editor-in-Chief and Associate Editor. When one or the other bears the specific responsibility, the full title is used.

AIAA Manuscript Review Process

This description of AIAA manuscript review procedures is given so that authors, reviewers, and readers will better understand the paper selection and publication process. The first step in manuscript evaluation is an examination by the Editor-in-Chief of papers submitted to the journal. The Editor-in-Chief first tests the manuscript for the several criteria of subject scope, archival editorial style, apparent technical validity, topical importance, timeliness, relationship to prior publication, conciseness, appropriate references, and length. Precise requirements are given on the inside back cover of each journal issue.

Formal Review

If it passes these first tests, the paper is sent to that journal's Associate Editor with the most direct knowledge of the subject matter and of expert reviewers in the field. The Associate Editor then evaluates the paper according to the same criteria and, in most cases, has the paper sent to two or more reviewers in the field for confidential review. The review report form (reprinted here) is designed both to encourage the reviewer's objectivity and to ensure the thoroughness of his or her evaluation.

Considerable significance is attached to the review reports. Each reviewer is asked to judge the technical validity of the manuscript and the extent of its advance beyond work previously published. The reviewer is asked also for advice concerning the specific merits and/or deficiencies of the manuscript. However, the decision to publish, to require major revision before publication, or to reject for reasons cited lies first with the Associate Editor and ultimately with the Editor-in-Chief.

It takes a minimum of several months (at least three) after receipt of the manuscript to accomplish the evaluation and review steps discussed above.

Revision or Rebuttal

The next step is up to the author. If the paper has been rejected or if extensive revisions have been requested that the author believes are incorrect or unwarranted, he or she is entitled to submit a point-by-point rebuttal to the Editor's statement of reasons and the reviewers' comments. The rebuttal then is analyzed by the Editors, and a final decision is made, although there may be a need for an additional review cycle. Authors who revise their papers must make an effort to do so within the stated time period.

A reviewer who feels strongly that a particular paper should not be published may choose to write his or her criticism as a Technical Comment. The author then will be allowed to write a closing response for publication in the same issue as the Comment.

Formal acceptance will not occur until the author has complied with all of the revision requests (if any) made by the Associate Editor and has prepared the paper in AIAA archival style. (Or the Associate Editor may accept the author's rebuttal, as described above.)

Acceptance and Publication

When a paper is formally accepted, it will be scheduled for publication in a forthcoming issue, and the author will be informed of the tentative date. Depending upon the number of papers awaiting publication and projected size of issues, this may require that papers be scheduled several issues ahead. When feasible, papers will be published in the order of their original receipt.

Galley proofs will be sent to authors for correction and release approximately two months prior to publication. In order to allow for late or nonreturn of galleys by authors and to provide the flexibility to meet issue-length and topic-mix constraints, issues will be overscheduled by about 25%. Thus, there will always be a certain number of papers held over for the next issue. All authors and co-authors receive a complimentary copy of the issue in which their papers appear.

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Confidential Review Report
AIAA Journals

Guidelines for Review Comments

Length
Note on reverse if reduction in length is required. Concise presentation is important in any case. Please indicate what material can be deleted, shortened, or covered by a readily available reference.

Title
Precise and informative. Twelve words or fewer (preferably six to eight); no acronyms or abbreviations.

Authors
Listed authors should be limited to those who have made significant contributions to the paper.

Abstract
Proper and *specific summary* of objectives, contents, major results, and conclusions; 100 to 200 words.

Nomenclature
List of characters or symbols used throughout the paper, and their definitions. Acronyms should not be included in this list, and nomenclature definitions should not be repeated in the text.

Introduction
Adequate discussion of need and purpose of the work and its relation to prior work.

Content
Adequate justification and definition of assumptions, inputs, references, test conditions, etc., so that information presented is useful.

Figures
Readily understandable and useful as data or for design. Please point out unnecessary figures, especially photographs, as well as any errors or deficiencies. When color illustrations are provided, determine if the use of color is essential to the interpretation of the data.

References
Adequate (see *Introduction* and *Content*) and accurate; must be obtainable by the reader.

Journal Scopes
AIAA Journal: Aerodynamics, the aerospace environment, lasers and plasmas, fluid mechanics and reacting flows, and structural mechanics and materials.

Journal of Aircraft: Applied aircraft systems, design, operations, flight mechanics, flight and ground test, flight safety, computer applications, systems integration, aerodynamics, structures, and structural dynamics.

Journal of Guidance, Control, and Dynamics: Dynamics, stability, guidance, control, navigation, optimization, electronics, and information processing, including applications of recent research to practical engineering problems.

Journal of Propulsion and Power: Airbreathing, electric, and advanced propulsion, solid and liquid rockets, combustion, fuels and propellants, power generation and conversion for aerospace vehicles, and terrestrial energy devices and systems.

Journal of Spacecraft and Rockets: Spacecraft and tactical and strategic missile systems, including subsystem design and application, mission design and analysis, developments in space sciences, and applications of space technology to other fields.

Journal of Thermophysics and Heat Transfer: Properties and mechanisms involved in thermal energy transfer and storage in gases, liquids, and solids, including conductive, convective, and radiative modes alone or in combination.

Numerical Accuracy and Experimental Uncertainty
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.

Confidential Report Policy

Do not sign the Report, because it is the policy of the Institute to maintain the anonymity of the reviewer unless there is a specific reason for making the reviewer known to the author.

Please return the original Review Report, signed letter, and manuscript to the Associate Editor (large manuscript envelope enclosed).

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American Institute of Aeronautics and Astronautics

E1

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The Editors particularly desire your specific comments on technical content, overall value, relevancy, accuracy of computed results or experimental data, and revisions needed for conciseness, clarity, and/or completeness. Guidelines are given on the reverse side. Please start your comments here and add sheets as necessary.

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*Would you be willing to review the revised manuscript if the technical editor feels it is necessary? ☐ YES ☐ NO

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