JOURNAL OF PROPULSION AND POWER
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1996—A Mixed Year

THE fact that I am entering my second decade as Editor-in-Chief of the *Journal of Propulsion and Power* has caused me to reflect on my good fortune both to have had the opportunity to serve in this position and to have had the support of so many well-qualified Associate Editors over this period. It has also caused me to reflect on the happenings of 1996.

First of all, 1996 was marked by the passing of two giants in the propulsion arena: Sir Frank Whittle and Professor Martin Summerfield. Sir Frank invented the jet airplane engine in 1928 and received his jet-propulsion patent in 1930, when he was a flying officer only 23 years of age. He continued to make significant contributions to jet-propulsion research, both in Great Britain and in the U.S., for another half-century. Professor Summerfield's contributions to combustion and chemical propulsion spanned nearly 60 years; he worked on the rockets for JATO applications during World War II and was one of the founders of Aerojet Engineering. His 1947 paper on the "Problem of Escape from Earth by Rocket" contained the fundamental principles in the launch area. Of course, I knew him primarily as an educator and mentor who helped to shape many researchers (including me as my Ph.D. Advisor) and as a tireless editor who inspired many writers in effective, accurate communication. His contributions to AIAA were noted by Jim Harford in an Editorial in the September 1996 issue of *Aerospace America*.

1996 also was marked by some disturbing trends. For instance, the number of paper withdrawals at the 1996 Aerospace Sciences Meeting and the Joint Propulsion Conference rose dramatically, and attendance fell sharply after several years of increasing growth. In addition, the number of U.S. submittals to *JPP* continued to drop. Similar trends were noted in the Government-sponsored conferences on comparable technologies. These statistics are undoubtedly a result of cuts in the funding of research and development in propulsion-related areas. Hopefully, 1997 and the ensuing years will see a reversal of these trends.

On the brighter side, 1996 was marked by two special issues of *JPP*; the first of these, organized by Gary Bennett, featured 15 papers on all aspects of Aerospace Power, whereas the second of these featured another 15 papers on arcjets and arc heaters. The basis for the latter was the program sponsored by Mitat Birkan (AFOSR), with Roger Myers serving as the Associate Editor and obtaining additional papers to complete the scope of the issue. Such special issues help to focus the interest of readers on the varied technologies represented by the journal. Another group of papers from the International Symposium on Airbreathing Engines will appear in 1997 with the help of S. N. B. Murthy, and plans are already underway for another special issue for 1998. I continued to welcome suggestions for other topics that can serve as the basis for other issues.

Another bright spot for me was the willingness of Barry Butler, George Cox, Roger Myers, Vigor Yang, and Jim Younghans to serve another three years as Associate Editors. All have performed in an exemplary manner, and we are fortunate to have such outstanding individuals to assist in the processing of manuscripts. In Jim's case, this is especially true, since he is a Charter Member of the Editorial Board of *JPP* who also brings the able support of his wife, Marge, to all AIAA matters—thanks to both of them for all that they have done! I would also like to introduce a new Associate Editor. Hans Immich (Daimler–Benz AG) has been an active member of the Liquid Propulsion TC for some time and will be the first Associate Editor from outside of the U.S.; as such, he will be actively involved in the solicitation of papers from the European propulsion community.

An additional bright spot from 1996 was the addition of Adrian Chindgren to the masthead as the Managing Editor for *JPP*; he has moved into the job and is interacting with authors and the publisher very effectively. Of course, the continued support of Norma Brennan of the AIAA publications staff is an integral part of the entire editorial process.

Finally, I want to thank those authors who continue to provide the material needed for the *Journal of Propulsion and Power*, as well as those who played the key role of reviewers for the >200 manuscripts submitted to me during the year. Their names are listed as a partial appreciation of their service and assistance.

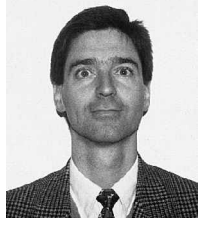
R. H. Woodward Waesche
Editor-in-Chief

Editor-in-Chief

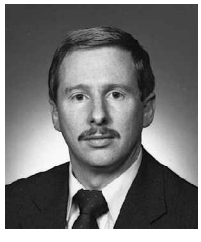
R. H. WOODWARD WAESCHE is a Senior Scientist at Science Applications International Corporation (SAIC) and received his B.A. in Physics from Williams College in 1952, his M.A. in 1962, and his Ph.D. in Aerospace and Mechanical Sciences from Princeton University in 1965. Before joining SAIC in 1993, he served in the U.S. Army, and held senior positions at Rohm & Haas Company (1954–1966), United Technologies Research Center (1966–1981), and Atlantic Research Corporation (1981–1992). His research interests center on propulsion-related combustion, especially on unsteady combustion in solid-propellant rockets and its suppression by additives. He has also performed extensive research on combustor flowfields; his most recent publications, one of which won the Solid Rockets Best Paper Award (1990), dealt with flow in the Space Shuttle Booster. Dr. Waesche chaired the AIAA Propellants & Combustion Technical Committee (1975–1977) and was Director-Technical of the AIAA Propulsion & Energy Group. He is a long-time member (since 1978) of the Technical Activities Committee, and a member of the AIAA Finance Committee. Dr. Waesche is listed in *Who's Who in the World*. He served as Editor-in-Chief of the *Journal of Spacecraft and Rockets* from 1980 to 1986, when he assumed the post of Editor-in-Chief of this journal. Dr. Waesche is a Fellow of the AIAA, and has contributed an article on Spectroscopy to the *Dictionary of Science and Technology*, among numerous technical publications.

Associate Editors

RODNEY L. BURTON received his Ph.D. in the area of Electric Propulsion from Princeton University in 1966. He has been a faculty member at the University of Illinois at Urbana-Champaign, in the Department of Aeronautical and Astronautical Engineering, since 1989. His primary research interests are electric rocket propulsion, high pressure combustion, high velocity guns, and high energy arc discharges, and he advises the thesis research of graduate and undergraduate student students in these areas. He was General Chairman of the AIAA International Electric Propulsion Conference in 1990. From 1981–1989 he was with G.T.-Devices, Inc., Alexandria, Virginia, performing basic research on electrothermal arc discharges and electromagnetic railguns. From 1979–1981 he was with the Plasma Propulsion Laboratory, Princeton University, where he measured the performance of the "benchmark" MPD thruster. He is the author of 100 journal articles and reports.

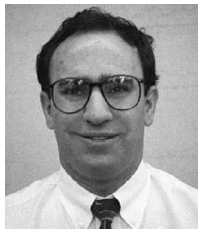


PATRICK BARRY BUTLER is Professor of Mechanical Engineering at the University of Iowa and received B.S. and M.S. degrees in Aeronautical and Astronautical Engineering from the University of Illinois at Urbana-Champaign and a Ph.D. in Mechanical Engineering from the same university. Dr. Butler is active in a number of aerospace-related instructional and research activities at the University of Iowa, where he also serves as campus coordinator of the Iowa Space Grant Consortium. His current research interests include multi-phase reactive flows, shock initiation of energetic materials, and combustion of solid propellants and pyrotechnics. Dr. Butler has worked as a visiting research Fellow for the U.S. Navy and Sandia National Laboratories where he conducted research in the area of solid propellant and energetic materials modeling. In addition to his editorial duties with the AIAA *Journal of Propulsion and Power*, Dr. Butler is a member of the AIAA Technical Committee on Propellants and Combustion. In 1991 he was awarded the Society of Automotive Engineers' Ralph R. Teetor Educational Award from the Aerospace Division, and the American Society of Mechanical Engineers' Outstanding Professor Award from the student chapter at the University of Iowa. Dr. Butler is an Associate Fellow of AIAA.

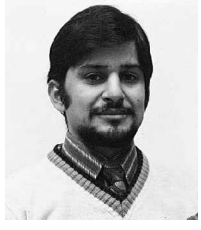


WILLIAM W. COPENHAVER is currently director of the Compressor Aero Research Lab within the Wright Laboratory, Aero Propulsion and Power Directorate, Turbine Engine Division. He is responsible for identifying and directing compressor component basic and applied research to meet Air Force air breathing engine development requirements. Air Force research under his direction is related to the development of physics-based models that accurately represent the loss, blockage, and stability of advanced transonic fans and compressors. The models developed in the Lab are used in an advanced design system to explore innovative component designs. Prior to his current position, Dr. Copenhaver was assigned to the Air Force, Compressor Research Facility (CRF), Test Group and Data Acquisition Group. While in the test and data groups, he was responsible for the planning, development, and preparation of full scale compressor component test programs. Dr. Copenhaver holds an M.S. degree from Virginia Tech, and a Ph.D. in Mechanical Engineering from Iowa State University. He is an Associate Fellow of AIAA and a member of ASME serving on the International Gas Turbine Institute Turbomachinery Committee.

GEORGE B. COX JR. is a Project Engineer at Pratt & Whitney/Government Engines & Space Propulsion in West Palm Beach, Florida. He graduated in 1966 from The Johns Hopkins University with a Bachelor of Engineering Science degree, and was awarded a Master of Mechanical Engineering degree in 1968 from North Carolina State University. He has worked for 26 years at Pratt & Whitney in combustion and fluid dynamics, including rocket engine, gas dynamic and chemical laser, and gas turbine engine component design and development. His most recent activity includes analytical and CFD modeling for the Space Shuttle Engine Study program, direction of CFD support for National Aerospace Plane effort at Pratt & Whitney, and combustion and aerodynamic support for the Alternate Turbopump Development Program. Mr. Cox has 12 publications on gas turbine and rocket engine design systems, component design and development, and modeling. He also has three patents awarded, and one pending, in the fields of gas turbine, gas dynamic laser, and rocket combustion.



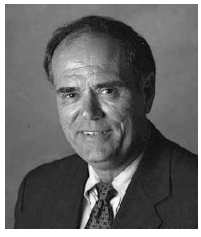
DANIEL B. FANT is the research manager for the Advanced Gas Turbine Systems Research (AGTSR) program at the South Carolina Energy R&D Center, Clemson University. The AGTSR program is a nationwide, industry-university research consortium dedicated to advancing stationary gas turbine engine design for the next generation of land-based power generation systems. The AGTSR consortium is sponsored by the U.S. Department of Energy. Dan retired from the U.S. Air Force on 1 October 1994, after 15 years of service, and during his career he served in various engineering capacities: as project officer for advanced space transportation concepts at the Space Division in Los Angeles, CA; laboratory research associate at MIT-Draper Laboratory in Cambridge, MA; assistant professor of aerospace engineering at the Air Force Institute of Technology in Wright Patterson AFB, Dayton, OH; and in his last assignment, at Bolling AFB in Washington, D.C. as program manager of basic research in turbomachinery flows and high angle-of-attack unsteady aerodynamics. He received his B.S. in Mechanical Engineering from the University of Connecticut, his M.S. in Aeronautical Engineering from the Air Force Institute of Technology, and his Ph.D. from Iowa State University in Mechanical Engineering. Dan is also a licensed professional engineer in the State of Ohio.



ASHWANI GUPTA is Professor of Mechanical Engineering at the University of Maryland. His academic experience includes six years as member of the research staff at MIT in the Energy Laboratory and Department of Chemical Engineering, three years as senior research associate and independent research worker at Sheffield University in the Department of Chemical Engineering and Fuel Technology, and thirteen years at the University of Maryland. He spent four months in Japan as a consultant to several companies. Presently he serves as an international consultant on a major project sponsored by the Japanese Government. He is the author of over 150 publications in the areas of combustion, swirl flows, diagnostics, fuel sprays, hazardous waste thermal destruction, pollution, and alternative fuels. He has coauthored two books and edited seven books. Presently he is coeditor of the Energy and Environmental Series of books published by CRC Press. He has been the recipient of the Energy System Award of AIAA and four best paper awards from AIAA and ASME. Dr. Gupta received his Ph.D. from Sheffield University in 1973. He was awarded a D.Sc. from Sheffield University in 1986 for international recognition and published high quality original research. Dr. Gupta is chairman of the Terrestrial Energy Technical Committee of AIAA and was previously chairman of the Propellant and Combustion Technical Committee. Dr. Gupta is a Fellow of AIAA and the Institute of Energy (England, UK) and a member of ASME, SAE, ASEE and the Combustion Institute.

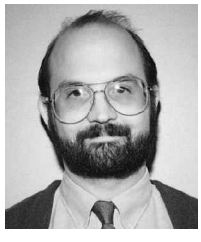
HANS IMMICH is currently manager of new rocket propulsion programs and technologies at the space propulsion business unit of the Space Infrastructure Division of Daimler–Benz Aerospace. He is responsible for new technology developments in the field of rocket and air breathing propulsion. He is presently program manager of a German technology program on advanced technologies for reusable, high performance cryogenic rocket engines, which is a joint technology program with the German Aerospace Research Establishment DLR. Before joining Daimler–Benz Aerospace in 1985 he was with Asea Brown Boveri Company, Baden, Switzerland, from 1979–1985. There he was responsible for fluid mechanical development of large steam turbines and for development of combustion chambers for large gas turbines. Dr. Immich received his Ph.D. in the area of fluid mechanics from the Technical University in Munich in 1979. In addition, he received the "habilitation" (lectureship qualification) in 1986 in fluid mechanics from the Technical University in Munich. Dr. Immich is a member of the AIAA Technical Committee of Liquid Propulsion. He is the author of 17 journal articles and conference papers.

ANN R. KARAGOZIAN received her B.S. in Engineering from UCLA in 1978 and her Ph.D. in Mechanical Engineering from the California Institute of Technology in 1982. She has been a faculty member at UCLA since then, and is currently a Professor in the Department of Mechanical and Aerospace Engineering. Her research interests lie in the fluid mechanics of combustion systems, with current emphasis on numerical simulation and experimental interrogation of acoustically driven reacting flows and high speed combustion systems. Recent research activities have applications to NOx emissions reduction for the High Speed Civil Transport and Advanced Subsonic Transport aircraft, fuel-air mixing enhancement for hypersonic aircraft, and hazardous waste incineration for land-based as well as shipboard waste treatment. Professor Karagozian is currently a member of the NASA Aeronautics Advisory Committee and of the Naval Studies Board's Technology for Future Naval Forces Study. She has been a member of the Defense Science Study Group, the NASA Federal Lab Review Task Force, and on technical panels for the U.S. Environmental Protection Agency, the Department of Energy, the Aeronautics and Space Engineering Board, and the National Science Foundation. She is an Associate Fellow of the AIAA and in 1987 was the recipient of the TRW-UCLA Excellence in Teaching Award.



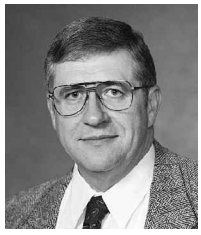
LAWRENCE A. KENNEDY is currently Dean, College of Engineering, and Professor of Mechanical Engineering at the University of Illinois at Chicago. Prior to joining UIC, he was the Ralph W. Kurtz Distinguished Professor of Mechanical Engineering at Ohio State University. At OSU he served as Chairman of Mechanical Engineering for the period 1983–1993. He also served as Acting Director of the Center for Automotive Research and is a Professor at the Ohio Aerospace Institute at NASA Lewis Research Center. Prior to joining Ohio State he was on the faculty of the State University of New York at Buffalo. He has been a Visiting Professor at Princeton University, the University of Michigan, the von Karman Institute of Fluid Dynamics, and the University of California/San Diego. Professor Kennedy received his Ph.D. and M.S. degrees from Northwestern University in 1964 and 1962, respectively, and his B.S. degree in 1960 from the University of Detroit. His technical interests include the broad areas of combustion, fluid mechanics, and heat transfer. Professor Kennedy is a Fellow of ASME, an Associate Fellow of AIAA and a member of the Combustion Institute, SAE, APS, and ASEE. He is a registered Professional Engineer in New York. He has been a NATO Senior Fellow in Science, a U.S. Consultant to AGARD, NSF Senior Science Fellow, and a Goebel Visiting Professor at Michigan. In 1993 he received the Ralph Coats Roe Award.

MICHAEL M. MICCI is an Associate Professor of Aerospace Engineering and is associated with the Propulsion Engineering Research Center at the Pennsylvania State University. He received a B.S. and M.S. in Aeronautical and Astronautical Engineering from the University of Illinois at Urbana—Champaign, and a Ph.D. in Mechanical and Aerospace Engineering from Princeton University. He joined the faculty at Penn State in 1981, where he teaches and conducts research in rocket propulsion. He spent 1987 as a Visiting Scientist at the Air Force Office of Scientific Research and the 1990–1991 academic year on sabbatical leave at ONERA, Palaiseau, France. He is a member of the AIAA Liquid Propulsion Technical Committee.

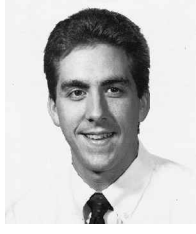


ROGER M. MYERS received his B.S. in Aerospace Engineering from the University of Michigan and his Ph.D. in Mechanical and Aerospace Engineering from Princeton University while working in the Electric Propulsion Laboratory. He joined the NASA Lewis Research Center Group of Sverdrup Technology in 1988 and transitioned to NYMA, Inc. at the same location in 1994. He became supervisor of the Space Propulsion Technology Section in 1989, Deputy Director of Aerospace Technology in 1996, and recently joined Olin Aerospace as Director of Electric Propulsion. He has worked on a wide range of propulsion systems including solid propellant pulsed plasma thrusters, pulsed and steady-state magnetoplasmadynamic thrusters, low power arcjets, electrostatic ion thrusters, Russian Hall thrusters, and small chemical rockets. The mission studies have included a range of both Earth-space and planetary missions, most recently focusing on small satellite applications. His research has also included the development of plasma diagnostics for thruster and spacecraft integration studies and fundamental research on electrode physics in plasma discharges. He has authored over 50 publications and is a member of the AIAA Electric Propulsion Technical Committee.

CARLSON C. P. PIAN received his B.S., M.S., and Ph.D. degrees from the University of Michigan in Aerospace Engineering. He did post-doctoral work in the field of MHD power conversion at the Eindhoven Technical University in The Netherlands. Dr. Pian is currently on the research staff at Molten Metals Technologies, involved in research and development of plasma torches and remediation technologies for hazardous waste treatment. Previously, Dr. Pian was on the faculty of the Diagnostic Instrumentation and Analysis Laboratory at the Mississippi State University. At Textron Defense System's Everett Laboratory (formerly the Avco Everett Research Laboratory), Dr. Pian was the Director of Commercial MHD Component Development. He was also the manager of MHD Integrated Topping Cycle Program, was responsible for the technical direction and administration of the program, including research and development, and the design and fabrication of MHD power generators. Dr. Pian was also involved in system design studies and analyses of MHD power conversion experiments and worked on analytical modeling of flows in gas turbine combustors. Prior to joining Avco, Dr. Pian was a research engineer at NASA Lewis Research Center where he was engaged in research and analysis relevant to MHD power generators and systems. Dr. Pian is a Senior Member of AIAA and previously served on both the Plasmadynamics and Lasers and the Terrestrial Energy Systems Technical Committees. He was also a member of the Board of Directors of the Symposium on the Engineering Aspects of MHD. Dr. Pian has authored or co-authored over 60 technical papers related to MHD power conversion and space plasma.

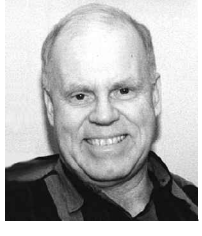


M. FRANK ROSE is Director of the Space Power Institute and Professor of Electrical Engineering at Auburn University, Auburn, Alabama. He holds 16 patents and is the author of 140 technical papers on various aspects of advanced power systems, space environmental effects, hypervelocity impact phenomena, energy storage, advanced composites, and energy conversion technology. He received a Ph.D. in Solid State Science from the Pennsylvania State University in 1966 and a B.A. in Physics from the University of Virginia in 1961. He is an Associate Fellow of the AIAA, Fellow of the IEEE, and a member of Sigma Xi.



IAN A. WAITZ is Assistant Professor of Aeronautics and Astronautics at Massachusetts Institute of Technology, where he is Director of the MIT Aero-Environmental Research Laboratory and Associate Director of the MIT Gas Turbine Laboratory. His principal fields of interest include propulsion, fluid-mechanical mixing, reacting flows, aeroacoustics, and in particular, aspects of the above that relate to environmental issues associated with aircraft design and operation. Professor Waitz currently directs a variety of experimental and computational research in these areas including studies of streamwise-vorticity-enhanced mixing, mixer-ejector design, jet noise reduction, mixing technology for low-emissions combustors, wake management strategies for fan noise reduction, pollutant chemistry in turbine and nozzle flows, combustion processes for microgas turbine engines, and vortical flows in compressor endwall flowfields. Professor Waitz received a Ph.D. in Aeronautics from the California Institute of Technology in 1991, an M.S. in Aeronautics from George Washington University's Joint Institute for Advancement of Flight Sciences at NASA Langley Research Center in 1988, and a B.S. in Aerospace Engineering from Pennsylvania State University in 1986.

VIGOR YANG received his B.S.M.E. from National Tsing Hua University in Taiwan in 1976 and Ph.D. from the California Institute of Technology in 1984. Following one year as a Research Fellow in Jet Propulsion at Caltech, he joined the faculty at the Pennsylvania State University in 1985. He is currently a Professor of Mechanical Engineering and serves as a consultant to several industrial and government laboratories. His research mainly involves combustion instabilities in propulsion systems, high-pressure droplet/spray combustion, rocket interior ballistics, and combustion of energetic materials. He has organized several international meetings and workshops devoted to various combustion aspects of liquid and solid propellants in rocket engines. He was the recipient of the Penn State Engineering Society Outstanding Teaching and Research Awards in 1989 and 1992, respectively. Professor Yang is an Associate Fellow of AIAA.



JAMES L. YOUNGHANS is Manager of Advanced System Design and Analysis at General Electric Aircraft Engines and is located in Evendale, Ohio. He received his B.S. and M.S. from the University of Cincinnati and an M.B.A. from Xavier University. He joined the technical staff at General Electric in 1963 and has held positions of increasing responsibility in Turbine Heat Transfer, Installation Aerodynamics, Low Observables, and System Design. He is a member of the AIAA Air Breathing Propulsion Technical Committee and the ASME Aircraft Engine Committee.

Reviewers for the *Journal of Propulsion and Power*—1996

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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. In the main, 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 preparation 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 Publications Committee of AIAA on August 16, 1989, and are endorsed by the Editors-in-Chief. With minor changes, these standards are adapted 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, reproduced 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 as to whether the paper merits publication in an archive journal. 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 which 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 so informed. 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. At that time, authors will be told for which issue their papers are tentatively scheduled. 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.