

With a Little Help from Some Friends

THE continued growth of the stature of the *Journal of Propulsion and Power* in the face of shrinking support for research in the fields covered by *JPP* has been achieved only through the assistance of numerous individuals. Many of those are the authors who have entrusted the results of research to *JPP*; the Associate Editors and I gratefully acknowledge that trust.

There are numerous other groups and individuals who have played an important part in the growth of *JPP*. First of all are the several Technical Committees of the Propulsion & Energy Group of AIAA; they have provided many of the Associate Editors and reviewers without whom the archival review process could not exist. In addition, they have suggested topics for special issues or areas where papers should be sought. I hope that these TCs will continue to feel a real sense of ownership of *JPP*. The recently published (September–October 1998) issue covering all aspects of space propulsion has received high praise from many readers; this issue could not have been assembled without the able leadership of Vigor Yang. Supporting Vigor in this effort were several individuals who must be recognized here; the continuing support given by Mary Newby is remarkable, and there were others from Penn State, such as Bill Anderson, who provided valuable assistance behind the scene. At the same time, the symposium that provided the majority of the manuscripts was organized by a group from the People's Republic of China, led by Guoqiu Liu, who followed the vision of Xinmin Ren, a founder of Chinese space propulsion. The issue also includes an outstanding group of nine manuscripts on all aspects of electric propulsion for upper-stage and onboard propulsion, assembled with the help of Rod Burton, Eddie Choueiri, Manuel Martinez-Sanchez, and Roger Myers; these manuscripts provide a benchmark for a description of the several concepts covered.

Preparation of several special issues to be published in 1999 is under way by several others who must be recognized here. A group of nearly 20 papers on the application of aerospace technologies to the generation of terrestrial energy, to be published in the March–April issue, resulted from the efforts of that TC, led by the imaginative Ashwani Gupta with the able assistance of Dilip Ballal and Dave Lilley. Another group of 25-plus papers discussing several solutions for the propulsion of microsatellites, i.e., spacecraft with a mass less than 100 kg and requiring a power less than 100 W, is currently being assembled by Mike Micci, with Andrew Ketsdever as Guest Associate Editor, for publication in the Fall of 1999. The concept of another special issue, this one to honor the memory of my editorial mentor, Martin Summerfield, was advanced by two long-time friends, Bob Brown and Luigi DeLuca, both of whom have already made numerous contributions to AIAA publications as Editors of Progress Series books and journals. More than 20 manuscripts from associates and former students of Prof. Summerfield are nearing completion of the review process, with Bob and Luigi serving as the Associate Editors. Finally, the matchless Vigor Yang, with continuing help from Mary Newby, is assembling another symposium, this one on solid propellants; the nearly 40 manuscripts from that symposium will constitute the July–August issue. Another long-time friend, Tom Brill, is also assisting in this process, as is a PRC team led by Changrong Jin from the Chinese Society of Ordnance and Huanxing Hu, Director of the Modern Chemistry Institute. This issue will pro-

vide an update of the technology described by the issue on solid-propellant ballistics, which appeared in July–August 1995, also with the active efforts of Vigor Yang! A thread common to all of these is the involvement and dedication of individuals other than those whose names appear on the masthead—hence the title of this Editorial, since I have had the pleasure of knowing many of them for some time. I wish to publicly thank all of them for their efforts and to note that all of these issues will have significant—at least six countries in each—international participation.

The role of Associate Editor is a difficult one, as anyone involved in the process is aware. Three who have provided exemplary service are stepping down: Rod Burton, Ann Karagozian, and Ian Waitz. All three have managed to accomplish their roles well while maintaining positions as teachers and researchers, and I thank them all. I am glad that Rod has agreed to return in 2000 to begin another millennium as an AE. Able replacements for these three have been provided by the relevant Technical Committees, with Greg Spanjers handling electric propulsion, Dave Riggins covering high-speed propulsion, and Rodney Bowersox dealing with mixing and turbomachinery. All three have served as reviewers and have been published in *JPP*; I look forward to working with them. I am even more pleased to announce that three current Associate Editors, Ashwani Gupta, Carl Pian, and Frank Rose, have agreed to serve another term; they have been valuable members of the team, and their continuing service means that the “Power” in *JPP* will continue its growing role in the next three years. I also wish to express my gratitude to the other Associate Editors who are continuing their service.

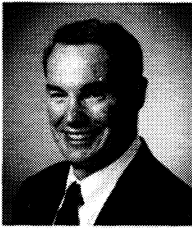
In the midst of these pleasant announcements, I must announce the loss of Adrian Chindgren, who has provided valuable support to us as Managing Editor; he has left AIAA to move into another profession, and we all wish him well. Adrian has been a joy for me to work with and has eased the editorial efforts of all the AEs for nearly three years. I am pleased that Mary Ellen Lanham, who has been supporting the *AIAA Journal*, has taken over as Managing Editor for *JPP* in a very smooth transition. I am even more pleased that Norma Brennan continues as Director of Publications, since she has provided support, counsel, and friendship to me as an editor for more than 20 years.

Another change in the masthead results from the retirement in 1998 of most of the members of the Editorial Advisory Board from full-time employment. I wish to thank them for their leadership and support since the Board was established. As I write this editorial, I am working with the volunteers on all the Technical Committees of the P&E Group and the Publications Committee to establish a new Advisory Board, which will include some of the current members who have agreed to continue providing their assistance during their retirement.

Finally, I also wish to acknowledge those who have served as the reviewers without whom the archival process cannot function. Their names are listed in this issue, but this does not adequately express the appreciation owed them for their assistance.

R. H. Woodward Waesche
Editor-in-Chief

Editor-in-Chief



R. H. WOODWARD WAESCHE is Principal 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 AIAA and has contributed an article on Spectroscopy to the *Dictionary of Science and Technology*, among numerous technical publications. He is also on the Editorial Advisory Board for the *Encyclopedia of Physical Science and Technology*, with responsibility for articles on propellants and propulsion.

Associate Editors



C. THOMAS AVEDISIAN is a Professor in the Sibley School of Mechanical and Aerospace Engineering at Cornell University. His current research interests include droplet and spray combustion, particulate emissions and control during combustion of fuel droplets, impingement of droplets and fluid jets, fabrication and analysis of composite materials, and rapid evaporation of liquids. He was previously a member of the technical staff at AT&T Bell Laboratories (Holmdel, New Jersey), a Visiting Scientist at the National Institute of Standards and Technology (Gaithersburg, Maryland), and a Visiting Professor at Brown University. He is the recipient of three Best Paper Awards from AIAA for research on droplets and sprays, and a Gallery of Fluid Motion Prize from the American Physical Society. He received his B.S. (1972) from Tufts University, his S.M. (1974) from Massachusetts Institute of Technology, and his M.A. (1977) and Ph.D. (1980) degrees from Princeton University. He has been at Cornell since 1980. He is a fellow of the American Society of Mechanical Engineering and was the chair of the ASME Heat Transfer Visualization Committee (1993–1997). He is a member of the Combustion Institute and is an Associate Fellow of AIAA where he is a member of the AIAA Terrestrial Energy Committee.



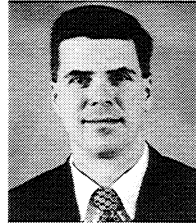
RODNEY D. W. BOWERSOX, Assistant Professor in the Department of Aerospace Engineering and Mechanics at the University of Alabama, received his Ph.D., M.S., and B.S. in Aerospace Engineering from Virginia Polytechnic Institute and State University in 1992, 1990, and 1988, respectively. Prior to joining faculty at the University of Alabama in 1997, he was on the faculty at the U.S. Air Force Institute of Technology, Department of Aeronautics and Astronautics (1992–1997). His research and teaching activities are in the areas of theoretical, experimental, and computational fluid mechanics as related to high-speed aerodynamics and propulsion. Dr. Bowersox received the USAF Col. Charles A. Stone Leadership Award (1995) and five Air Force Scientific Achievement Awards (1996–1997). Dr. Bowersox is a Senior Member of the AIAA and is currently serving a second term on the Airbreathing Propulsion Technical Committee.



P. BARRY BUTLER, Professor of Mechanical Engineering and Associate Dean for Academic Programs at the University of Iowa, received his B.S. and M.S. degrees in Aeronautical and Astronautical Engineering from the University of Illinois at Urbana-Champaign and his 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 and is an Associate Fellow. 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.



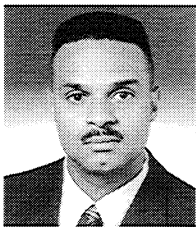
GEORGE B. COX, JR. is a Project Engineer at Pratt & Whitney/Government Engines & Space Propulsion in West Palm Beach, Florida. He graduated in 1966 from The Johns Hopkins University with a Bachelor of Engineering Science degree, and was awarded a Master of Mechanical Engineering degree in 1968 from North 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 the 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 J. DORNEY is an Associate Professor of Mechanical Engineering at Virginia Commonwealth University. He received his B.S. and M.S. degrees in Aeronautical and Astronautical Engineering from the University of Illinois at Urbana-Champaign and his Ph.D. in Aerospace Engineering from Pennsylvania State University. His current research interests include unsteady flows in turbomachinery, aerodynamics, and computational fluid dynamics. Before joining the faculty at VCU in 1998, Dr. Dorney worked as an Associate Research Engineer at the United Technologies Research Center (1988–1993), as an Assistant Professor of Mechanical and Aeronautical Engineering at Western Michigan University (1993–1996), as a Project Engineer at Pratt and Whitney (1996–1997), and as an Assistant Professor at GMI Engineering & Management Institute. Dr. Dorney's research has led to two Best Paper Awards, a NASA Space Act Award, 20 journal papers, and more than 45 conference papers.



WINFRED A. FOSTER, JR. is a Professor in the Department of Aerospace Engineering at Auburn University. He received his B.S.A.E. (1967), M.S. (1969) and Ph.D. (1974) from Auburn University. He has been a member of the Aerospace Engineering faculty since 1974. His research has been primarily in the area of solid rocket motor performance prediction and finite element structural analysis. He has published over 60 technical documents and made numerous presentations in these and related areas. He is currently a member of the AIAA Solid Rocket Technical Committee and serves as the Chair of the History Subcommittee.



ALEC D. GALLIMORE is an Associate Professor of Aerospace Engineering and of Applied Physics at the University of Michigan where he directs the Plasmadynamics and Electric Propulsion Laboratory. He received his B.S. in Aeronautical Engineering from the Rensselaer Polytechnic Institute in 1986, and his M.A. and Ph.D. in Aerospace Engineering from Princeton University in 1988 and 1992, respectively. His primary research interests include electric propulsion, plasma diagnostics, space plasma simulation, and electrode physics. He has experience with a wide array of electric propulsion technologies, including MPD thrusters, arcjets, ion engines, and Hall thrusters, and has implemented a variety of probe, microwave, and optical plasma diagnostics. The author of more than 50 scientific articles on electric propulsion and plasma physics, Professor Gallimore was the recipient of the University of Michigan Class of '38E Prize for teaching, service, and research in 1996, and received teaching awards in 1994 and 1996 from Sigma Gamma Tau. In 1994 he was awarded the Crystal Image Award for Technical Achievement by the National Technical Association for science educator of the year. He has served on the Defense Science Study Group and is a member of the AIAA Electric Propulsion Technical Committee. Professor Gallimore is an Associate Fellow of AIAA.



ASHWANI GUPTA is a 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 co-editor 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 his D.Sc. from Sheffield University in 1986 for international recognition and published high-quality original research. Dr. Gupta is Chair of the AIAA Terrestrial Energy Technical Committee and was previously Chair of the AIAA 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 propulsion business unit of the Space Infrastructure Division of Daimler-Benz Aerospace. He is responsible for new technology developments in the field of rocket propulsion. He is presently program manager of the German research and technology program for reusable, high-performance cryogenic rocket engines, which is a joint technology program with the German Aerospace Research Center 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 25 journal articles and conference papers.



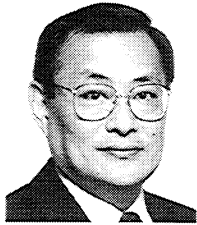
JAN L. LEPICOVSKY is a Senior Project Manager and Head of the Turbomachinery Analysis Section at NYMA Inc., an on-site contractor at the NASA Lewis Research Center (LeRC) in Cleveland, Ohio. He has 30 years of experience in fluid dynamics and turbomachinery experimental research. He received his Ph.D. and M.S. degrees from the Czech Technical University in Prague, Czech Republic. He worked as a researcher and the Thermodynamic Lab leader at the Propulsion Division of the Aeronautical Research and Test Institute in Prague until 1979. He was in charge of development testing on components of a small turboprop engine. After his move to the U.S., he worked as a scientist in the Aeroacoustic group of the Lockheed-Georgia Company in Marietta, Georgia, from 1980–1988. His major involvement there was with experimental research of mixing enhancement of free jets and propeller flows. In 1988 he worked for Textron-Lycoming in Stratford, Connecticut, where he was responsible for experimental studies in turbine cooling. Since 1989 he has been associated with the Propulsion Division at NASA LeRC. His major engagement is application of nonintrusive measurement techniques to fan and turbine experimental research. His expertise involves laser velocimetry, pressure and temperature sensitive paints, and thin-film thermocouples. He has authored more than 40 technical papers. He is an Associate Fellow of AIAA and a member of the AIAA Ground Testing Technical Committee. He served as an Associate Editor of the *AIAA Journal* and on several AIAA Technical Committees. He is a member of the ASME.



MICHAEL M. MICCI is a Professor of Aerospace Engineering and is associated with the Propulsion Engineering Research Center at the Pennsylvania State University. He received his B.S. and M.S. in Aeronautical and Astronautical Engineering from the University of Illinois at Urbana-Champaign, and his 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, the 1990–1991 academic year on sabbatical leave at ONERA, Palaiseau, France, and the 1997–1998 academic year on sabbatical leave as an NRC Senior Associate at the U.S. Air Force Research Laboratory, Edwards AFB. He is an Associate Fellow of AIAA and a member of the AIAA Liquid Propulsion Technical Committee.



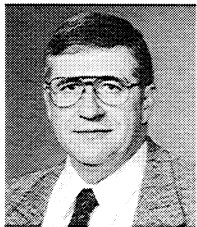
ROGER M. MYERS is the Director of Electric Propulsion at Primex Aerospace, leading flight system development and production efforts in arcjet, Hall current, and pulsed plasma thrusters. He received his B.S. in Aerospace Engineering from the University of Michigan and his Ph.D. in Mechanical and Aerospace Engineering from Princeton University. He joined the NASA Lewis Research Center Group of Sverdrup Technology in 1988 and became supervisor of the Space Propulsion Technology Section in 1989. He continued to serve in this capacity with Nyma, Inc., becoming Deputy Director of Aerospace Technology in early 1996, and left Nyma for Primex Aerospace later that year. He has worked on a wide range of propulsion technologies, spacecraft integration assessments, and missions/systems analyses. The propulsion systems include solid propellant pulsed plasma thrusters, pulsed and steady-state magnetoplasmadynamic thrusters, arcjets, ion thrusters, Hall current thrusters, and small chemical rockets. The spacecraft integration assessments and mission analyses have included a wide range spacecraft and missions, most recently focusing on small satellite applications and large commercial communications satellites. He has authored over 60 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 faculty of the Diagnostic Instrumentation and Analysis Laboratory at the Mississippi State University. Previously, he was on the research staff at Molten Metals Technologies, involved in research and development of plasma torches and remediation technologies for hazardous waste treatment. At Textron Defense Systems' Everett Laboratory (formerly the Avco Everett Research Laboratory), Dr. Pian was the Director of Commercial MHD Component Development. He was also the manager of the MHD Integrated Topping Cycle Program, 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 generator and systems. Dr. Pian is a Senior Member of AIAA and previously served on both the AIAA Plasmadynamics and Lasers and the AIAA 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.



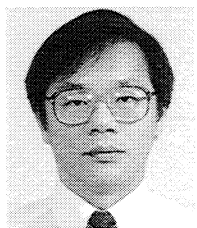
DAVID W. RIGGINS, Associate Professor of Aerospace Engineering at the University of Missouri-Rolla, received his Ph.D. in Aerospace Engineering from Virginia Polytechnic and State University in 1988. He has been a member of the faculty of the University of Missouri-Rolla since 1990; prior to 1990 he worked for both industry and the U.S. Department of Defense. His primary research interests include scramjet propulsion, jet engine analysis, hypersonics, computational fluid dynamics, high-speed fuel-air mixing and combustion, and flow losses and irreversibilities. He is a Senior Member of AIAA and is a member of the Air-Breathing Propulsion Technical Committee. Other activities include participation in JANNAF committees and workshops. He is the author of more than 50 conference publications and 10 journal papers.



M. FRANK ROSE is the Deputy Director of the Space Sciences Laboratory at the NASA Marshall Space Flight Center. 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 his Ph.D. in Solid State Science from Pennsylvania State University in 1966 and his B.A. in Physics from the University of Virginia in 1961. He is an Associate Fellow of AIAA, fellow of the IEEE, and a member of Sigma Xi.



GREGORY G. SPANJERS is Group Leader for the Electric Propulsion Laboratory at the U.S. Air Force Research Laboratory (AFRL), Edwards AFB. He received the degrees of B.S. in Physics and B.S. in Mathematics from the University of Minnesota in 1986. He received his M.S. degree in 1990 and his Ph.D. in 1992, from the University of Washington, performing plasma physics research for magnetic fusion. He became a Faculty Research Assistant at the Aeronautics and Astronautics Department of the University of Washington and initiated a program developing high-speed, free-flying plasma probes. From 1993–1995 he was with HY-Tech Research Corporation, Radford, Virginia, performing basic research on plasma radiation sources, plasma propulsion, advanced plasma diagnostics, and high-speed shutters. He joined the AFRL Electric Propulsion Laboratory as Principle Scientist in 1995, becoming Group Leader in 1998. His present research interests include pulsed plasma thrusters, Hall thrusters, micropropulsion devices, plasma diagnostics, and flight diagnostics. He is the author of over 50 journal and conference papers, has 2 patents pending for advanced electric propulsion thrusters, and is a member of the AIAA Electric Propulsion Technical Committee.



VIGOR YANG received his B.S.M.E. from National Tsing Hua University in Taiwan in 1976 and his 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. YOUNGMANS 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 his 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.