JOURNAL OF AIRCRAFT
Vol. 41, No. 1, January–February 2004

Foundation–for the Next 100 Years

WE have begun publishing a series of key technology special sections to celebrate the first 100 years of powered flight. A special section on Flight Vehicle Aeroelasticity was the first, appearing in our September/October 2003 issue. It covered aeroelasticity developments from 1953–1993 and also included key articles covering ground test, unsteady aerodynamics, and computational aeroelasticity. Several more of these special sections include additional articles on Flight Vehicle Aeroelasticity, Flight Vehicle Aerodynamics, Flight Vehicle Structures, and Air Transportation. These articles not only describe aircraft technology that has transitioned to application, but also describe technologies that have, for various reasons, not transitioned. Indeed, beginning with the Wright's calculations and experiments leading to the advent of aerospace engineering, journals and reports have documented a rich history of successful applications of novel concepts. But they also document many concepts which have, at least thus far, failed to transition to application. Often a "failed concept" serves to alert future concept developers that these failures should be avoided. How often, however, does a concept fail not because of an inherent flaw, but rather because of an extraneous factor or situation? For example, two or more concepts may be in competition with only one affordable winner. Perhaps the concept failed due to a technical limitation, such as a good analysis tool, the right material, etc. How many concepts, reported within our rich foundation of 100 years of aerospace literature, are currently waiting for someone to resurrect them, perhaps adding to them yet another enabling concept to realize successful transition? We will welcome all submittals on the process and results of "lost concept recovery."

In addition, to our celebration special sections, Associate Editor Bellur Nagabhushan has arranged for an extended editorial covering several inputs from our Board of International Editors, participating in our celebration of 100 years of powered flight.

Two more special sections will appear this year. One, sponsored by the AIAA AFM Technical Committee (TC), covers the topic of Flight Vehicle System Identification, while the other deals extensively with the subject of Abrupt Wing Stall.

We welcome the addition of two new Associate Editors in the field of aircraft design, both highly recommended through our Editorial Advisory Board and the Aircraft Design TC, Brian Thompson and Gilbert Crouse. Brian Thompson prepared the following short summary of recent events in the aircraft design arena.

> Design in aircraft and gas-turbine industries has changed, in part, because the use of simulation has increased steadily to accomplish design, testing, diagnostic, analytical, manufacturing, and communication tasks. However, innovative design must be done by creative engineers with a practical understanding of physical processes, so that at a minimum computer solutions are sensibly based in reality. Laboratory work provides the feedback that drives both exploration and adaptation in the design process. Risks incurred when innovating are tempered with the pragmatism associated with testing and analyzing designs using fundamental engineering principles. The combined use of engineering analysis, laboratory investigation, initiative, and imagination remains the foundation of design in aeronautical engineering as is evident in new concepts of small supersonic aircraft, micro-aircraft, launch and refueling strategies, hypersonic transport, and endurance aircraft that have been presented over the past year. As aeronautical engineering moves forward into 2004, innovative concepts and components will continue to emerge from transdisciplinary integration of new discoveries and emerging technologies, and these contributions are invited as design papers in the *Journal of Aircraft*.

Gilbert Crouse has just joined our team and will be developing our Design Forum. The concept of a Design Forum was originated by Dan Raymer along with our Editorial Advisory Board, and endorsed by the Aircraft Design TC. Gilbert Crouse will appreciate your good ideas for reaching a target author community interested in rapid publication of their design concepts.

Associate Editor Ahmed Hassan, who handles most of our Computational Fluid Dynamics (CFD) papers, has prepared the following review of CFD events.

> In 2003, accurate prediction of the flowfields for a multitude of aerodynamic configurations remained in the forefront of the computational fluid dynamics (CFD) activities. In retrospect, with only one exception, 2003 brought a natural extension of the 2002 CFD activities. With the pervasive infusion of low-cost clusters of commodity personal computers in government laboratories, educational institutions, and industry, we saw a "wave" of new CFD tool users. For example, simulating the flow past a complete air vehicle with unprecedented geometric detail can now be accomplished in a few days by a skilled engineer having the proper training in the use of the many available commercial grid generation and flow solver tools. Within the context of an archival publication, perhaps now more then ever, we are faced with the urgency and the necessity to validate such tools to arrive at solutions that are deemed not only meaningful, but also accurate. Originality and the technical contribution to the current state-of-the-art in terms of more understanding of the inherent physics, solution algorithms, and techniques will, however, remain to form the foundation for an archival publication.

Beginning in October 2002, we began receiving submittals to the *Journal of Aircraft* via our electronic journal administration system. Authors immediately began logging onto our site: WriteTrack.net where full upload instructions are provided. As Editor-in-Chief, I receive immediate e-mail notification and I can quickly assign the submitted paper to an Associate Editor, who is also notified immediately. An extensive reviewer database, developed with the continuing assistance of our Editorial Advisory Board, is now in place, immediately accessible by the Associate Editor who can quickly perform reviewer assignment. This new process has reduced the total time it takes to accept a paper from about six months, using the old manual process, to an average of three months. Authors, Associate Editors, and Reviewers have applauded the simplicity and are free to concentrate on the intellectual issues. We anticipate its value will continue to grow by including features such as report generation and text annotation.

Turning now to some journal business, I would like to recognize the continued dedicated service of our fine Associate Editors who appear as the "2004 Team." The quality of the published papers attests to their thoroughness and willingness to help authors bring out their best. Occasionally an Associate Editor will find that a non-U.S. author needs extra help with grammar or publication format. Dr. Nagabhushan oversees our Board of International Editors, representing 19 countries, that appears on the inside front cover. They are ready to help authors in their respective countries with any such publication difficulties.

We are fortunate to have an Editorial Advisory Board (EAB), also listed on the inside front cover. Most EAB members also serve on a Technical Committee relevant to this journal. In this way, Technical Committees have a solid link to the journal for archival publication of their best meetings papers. EAB members also stimulate ideas for special sections dealing with topics of TC interest. This past year, Dr. Joseph Lee has provided assistance in contacting other EAB members and, where no EAB member has been assigned, contacting relevant TC Chairs. As a result several new EAB members have been identified and our reviewer list has grown.

The names of the past year's reviewers through the first of October appear in this issue. I am sure you recognize many of these individuals and I certainly wish to thank them for their technical insight and willingness to assure that our published articles are accurate, timely, important to readers, and will retain

lasting value. This journal would not exist without dedicated peer reviewers.

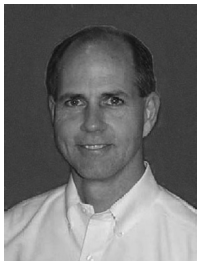
Norma Brennan ably directs the AIAA Publications staff. She efficiently oversees all journal activity along with her other publication duties. She was especially helpful this past year as we further developed the WriteTrack online paper submission procedure for the *Journal of Aircraft*. Jen Samuels is our Managing Editor. Some of the Associate Editors met Jen when she provided an Associate Editor WriteTrack training session in Reno, NV, last year. Jen has been of great help to Associate Editors and authors, demonstrating great patience and thoroughness. Jen also expertly helped develop the WriteTrack procedure. She patiently and expertly deals with all the special problems reported by editors and authors, and then she expertly engages the technical support staff in correcting the problem. However, we would not have the WriteTrack procedure at all without the technical support of John McAndrew and Sean Malone. They designed the entire procedure and then worked with the Editors-in-Chief and Associate Editors to identify remaining concerns and incorporate constructive ideas. I look forward to continuing my association with this fine professional staff.

Thomas M. Weeks
Editor-in-Chief

Editor-in-Chief

THOMAS M. WEEKS completed his degree work at Syracuse University, Department of Mechanical and Aerospace Engineering, in 1965. He entered active commissioned service that year, assigned to the Air Force Flight Dynamics Laboratory (now the Air Vehicles Directorate of the Air Force Research Laboratory) at Wright–Patterson AFB, Ohio. His initial work was in the field of electrogasdynamics at the nearly completed 50 MW wind tunnel facility. In 1968, he separated from the Air Force, but took a civil position at the same location. He worked on a variety of projects, including unsteady hypersonic heating, transonic test techniques, and sonic boom, before becoming the Manager of the External Aerodynamics Group. He served first as the Deputy and then as the Manager of the DARPA/NASA/USAF X-29 Advanced Technology Demonstrator. He served as Chief of the Wind Tunnels Branch and the Technology Strategy Branch. He served as Acting Chief Scientist and Acting Deputy Director of the Directorate. He served as Chief of the Integration and Operations Division. He retired from the Air Vehicles Directorate in August of 1998 and is currently with Universal Technology Corporation in Dayton, OH.

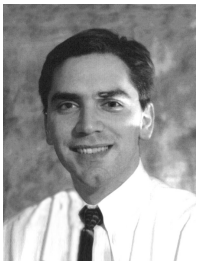
Associate Editors



THOMAS W. AUGUSTINE is the Airframe Integration Technology Thrust Leader within The Boeing Company –Phantom Works–Survivability Design and Integration Group. He received his B.S. in aeronautical and astronautical engineering from Purdue University in 1982 and his M.S. in engineering management from Washington University in St. Louis in 1991. Mr. Augustine joined McDonnell Douglas in 1982 as a Structural Analysis Engineer and worked on numerous production and developmental aircraft programs. Since 1990, he has worked in the research and development of affordable, survivable, signature reduction technology. He is a Senior Member of the American Institute of Aeronautics and Astronautics and a Member of the National Defense Industrial Association and the Tri-Service Low Observables Supportability Working Group.

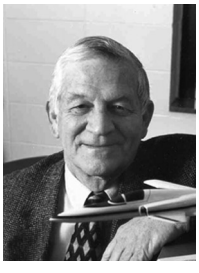
NDAONA CHOKANI is a Professor in the Mechanical Engineering and Materials Science Department at Duke University. He received his B.A. (honors) in engineering science from Oxford University in 1984 and Ph.D. in engineering from Cambridge University in 1988. Dr. Chokani served on the faculty at North Carolina State University from 1988 to 2003. His current research interests include experimental fluid dynamics (specifically the transition of laminar-to-turbulent flows), instrumentation, and digital signal processing techniques. His work has been supported by the Air Force Office of Scientific Research, the Air Force Research Laboratory, NASA, and the National Science Foundation. Dr. Chokani has several international scientific collaborations with research groups in France, Germany, Russia, and Switzerland. He serves as a member of the AIAA Aerodynamics Measurement Technology Technical Committee, the AIAA Thermophysics Technical Committee, and the AIAA Transition Working Group. He is an Associate Fellow of the AIAA.

INDERJIT CHOPRA is an Alfred Gessow Rotorcraft Professor in Aerospace Engineering and Director of the Alfred Gessow Rotorcraft Center at the University of Maryland. He was the Minta-Martin Research Professor from 1996 to 2000. He received his B.S. in engineering from Punjab Engineering College, Chandigarh, India, in 1965; his M.E. from Indian Institute of Science, Bangalore, India, in 1968; and a Sc.D. from the Massachusetts Institute of Technology (MIT) in 1977. He worked at the National Aeronautical Laboratory in Bangalore from 1966 to 1974. His research there included aeroelastic analysis and wind-tunnel testing of scaled models of airplanes and launch vehicles. At MIT, he worked on dynamic analysis of wind turbines. In 1977, he joined NASA Ames/Stanford University Joint Institute of Aeronautics and Acoustics, where he worked for four- and-a-half years on the development of aeroelastic analysis of advanced rotor systems and testing of full-scale helicopters in the NASA Ames wind tunnel. In 1981, he joined the University of Maryland (UM). He has been working on problems associated with aeromechanics of helicopter and smart structures. His graduate advising resulted in 30 Ph.D. and 58 M.S. degrees. An author of over 125 archival papers, Dr. Chopra has been an Associate Editor of the *Journal of the American Helicopter Society* (1987–91) and *Journal of Intelligent Materials and Systems* (1977–cont.). Also, he has been a Member of the Editorial Advisory Boards of three journals: *Vertica* (1987–91), *Smart Materials and Structures* (1994–cont.), and *SADHANA* (1991–95). He was awarded the 2001 American Society of Mechanical Engineers Adaptive Structures and Material Systems Prize, the 1996 AIAA/ASME Best Paper Award, and the 1992 UM's Distinguished Research Professor. He is a Member of the Army Science Board and a Fellow of AIAA, the American Helicopter Society, and the Aeronautical Society of India.



GILBERT L. CROUSE, JR. is the Founder and President of DaVinci Technologies, Incorporated, which performs aircraft configuration design and develops aircraft design-oriented software tools. Dr. Crouse received his Ph.D. and M.S. in aerospace engineering from the University of Maryland and his B.S. in physics from Wheaton College. His specific areas of expertise and interest include configuration design, fixed-wing and rotary-wing aerodynamics, and computational analysis. Prior to forming DaVinci Technologies, Dr. Crouse was with BBN Technologies for six years and was appointed to Division Scientist by the President of BBN Technologies in 1999. He is a Senior Member of the AIAA, a member of the Aircraft Design Technical Committee, and a Member of the American Helicopter Society.

ROBERT E. DUFFY is currently President of RED Associates, a research, development, and consulting firm. A former member of the faculty of the Department of Mechanical Engineering, Aeronautical Engineering, and Mechanics at Rensselaer Polytechnic Institute, he was the Chairman of the aeronautical engineering academic program. He is the author of over 65 published papers and research reports in the areas of applied aerodynamics, flight mechanics, and experimental fluid dynamics. Dr. Duffy has served as a consultant to numerous governmental agencies, industrial concerns, and individuals. He is a past Member of the Atmospheric Flight Mechanics Technical Committee and is an Associate Fellow of AIAA.

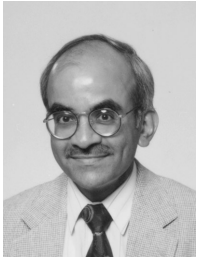


FRANKLIN E. EASTEP is an Emeritus Professor of Aerospace Engineering at the University of Dayton. He received a B.S. in aeronautical engineering from Ohio State University in 1958, an M.S. in aeronautics from Air Force Institute of Technology in 1963, and a Ph.D. in aeronautics and astronautics from Stanford University in 1968. Dr. Eastep has been teaching and conducting research within the technical areas of structural dynamics, aeroelasticity, and unsteady aerodynamics since 1968. During that period, he has been the principal for 18 doctoral candidates and over 45 masters students. He served on active duty with the U.S. Air Force for 20 years, retiring in 1978. Dr. Eastep is a member of the American Academy of Mechanics and is a Fellow of AIAA. He is presently an NRC Senior Research Associate with the Air Force Research Laboratory at Wright–Patterson AFB.

AHMED A. HASSAN is currently a Boeing Technical Fellow at the Boeing Company in Mesa, Arizona. His area of expertise is computational fluid dynamics (CFD). Dr. Hassan received his B.S. and M.S. from the University of Cairo in 1974 and 1976 respectively. He then received his Ph.D. from the University of Arizona in 1981. He was on the faculty of Arizona State University from 1981 to 1987 as an Assistant Professor. He joined the Boeing Company (then McDonnell Douglas Helicopter Company) in 1987, where he conducted research related to the application/development of CFD design and analysis tools to rotorcraft problems. He is the company representative on the corporate-wide CFD working group, an Associate Fellow of AIAA (1981 to the present), and a member of the American Helicopter Society (1987 to the present). He is currently serving as Associate Editor for the AIAA *Journal of Aircraft* in the area of CFD. Dr. Hassan has published more than 30 archival studies and presented more than 60 papers at national and international conferences. He holds six patents and has four additional patents pending with the U.S. Patent and Trademark Office. His work has focused on modeling the aerodynamics of rotor blade-vortex interactions and investigating novel flow control techniques for rotorcraft applications.

RONALD A. HESS received the B.S., M.S., and Ph.D. degrees in aerospace engineering from the University of Cincinnati. After completing his doctoral degree, he joined the faculty of the Department of Aeronautics at the U.S. Naval Postgraduate School in Monterey, California. In 1976 he joined the staff of the Flight Systems Research Division at NASA Ames Research Center. In 1982, he joined the faculty at the University of California, Davis, where he is currently a Professor in the Department of Mechanical and Aeronautical Engineering. His research interests lie in the areas of automatic and manual control and in human/machine systems. He is an Associate Fellow of AIAA, and a Senior Member of IEEE. In 2000, he was a recipient of the AIAA Mechanics and Control of Flight Award. He is also an Associate Editor of the *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, and the British *Journal of Aerospace Engineering.*

KENNETH J. HOLT retired from McDonnell Douglas Corporation in 1990. He had been involved in flight test operations and marketing. He received his B.S. from Hampton University in Virginia and his M.B.A. from the University of Missouri, St. Louis. He served 20 years in the U.S. Air Force and retired as a Lieutenant Colonel and a Command Pilot. His background is in fighters. He has flown the F-86, F-100, F-4, F-15, and F-18, and he spent tours in the Air Training Command and Strategic Air Command. He joined McDonnell in 1973. There, he flew production test flights and was the company's interface with the military and Federal Aviation Administration for test flights. He developed much of the flight test operating procedure for the F-18 and AV8B, and was the McDonnell flight operations consultant to the Government Aircraft Factory F-18 facility at Avalon, Australia. He retired from active flying in 1984. Mr. Holt served as Chair of the Aircraft Operations Technical Committee from 1985 to 1987. He is a Senior Member of AIAA.

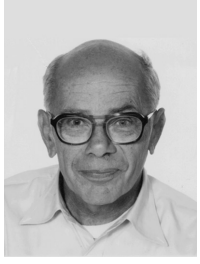


MAHENDRA C. JOSHI is a Manager in the Noise and Emissions group at Boeing Commercial Airplanes in Seattle, Washington. Prior to this assignment, he was responsible for acoustics and propulsion technologies in the Phantom Works organization of McDonnell Douglas in Long Beach, California. Dr. Joshi has more than 20 years of experience in the development of acoustic technology for air and space vehicles. This includes prediction and control of engine and airframe noise sources, sonic loads, and transmission of noise inside vehicles. He was selected as MDC Technical Fellow in 1993. He conducted rotorcraft noise research at Bell Helicopter Textron in Fort Worth, Texas, for four years and was a Postdoctoral Research Associate at NASA Langley Research Center for two years. He is an Associate Fellow of AIAA and was a Member of the Aeroacoustics Technical Committee. He received his Ph.D in Aerospace/Mechanical Engineering from the University of Tennessee Space Institute in 1977.

BELLUR L. NAGABHUSHAN is a Professor of Aerospace Engineering at Saint Louis University. He received his B. Tech. in aeronautical engineering from the Indian Institute of Technology, Madras, India, in 1971, and his M.S. and Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1973 and 1977. After completing his graduate studies, he joined the Defense Systems Division of Goodyear Aerospace Corporation in Akron, Ohio, where he evolved advanced V/STOL airship and hybrid rotorcraft configurations and investigated their flying qualities. Subsequently, he conceived and demonstrated smart dispensing concepts for tactical weapons and also served on projects related to aircraft flight simulator development. In 1987 he joined the Bendix/King Avionics Division of Allied Signal Aerospace Company in Fort Lauderdale, Florida, as a Senior Staff Engineer, and was involved in the development of a digital FBW system for aircraft flight control. Dr. Nagabhushan has broad research interests that include all types of flight vehicles and associated flight mechanics and control technologies. He has authored over 75 technical papers and articles in archival journals, holds several patents, and has received numerous awards for technical and scholarly achievements. He is a Fellow of the Aeronautical Society of India, an Associate Fellow of AIAA, and serves on the Lighter-Than-Air Systems Technical Committee of AIAA. In addition to being an Associate Editor of this journal, Dr. Nagabhushan is also Chair of its International Board of Editors.

THOMAS W. STRGANAC is an Associate Professor of Aerospace Engineering at Texas A&M University. He received his B.S. in aerospace engineering from North Carolina State University in 1977, his M.S. in aerospace engineering from Texas A&M University in 1980, and his Ph.D. in engineering mechanics from Virginia Polytechnic Institute and State University in 1987. In 1975 he joined the staff at NASA's Wallops Flight Center where he served as an Engineer in NASA's Sounding Rocket Program Branch and the Lighter-Than-Air Program Office. In 1982 he transferred to NASA's Langley Research Center where he served as a Research Engineer until 1989. In 1989 he accepted an appointment on the faculty at Texas A&M University. His research interests focus on fluid-structure interaction, structural dynamics, nonlinear mechanics, material/system identification, and aeroelastic phenomena. He has organized and presented internationally short courses on Advanced Flight Tests (with Donald T. Ward) and Aeroelasticity, and he is the coauthor of the text titled *Introduction to Flight Test Engineering*. He has served on the Lighter-Than-Air Systems Technical Committee (TC), the Balloon Systems and Technology TC, and the Structural Dynamics TC. He is an Associate Fellow of the AIAA and a registered professional engineer.

BRIAN E. THOMPSON is a Professor and the NSERC-GM of Canada Chair of Engineering Design and Innovation at The University of Western Ontario. He received his B.A.Sc. (mechanical engineering) from the University of Waterloo in 1979, a Ph.D. from Imperial College of Science and Technology at the University of London in 1984, and was licensed as a professional engineering in 1986 in Ontario and Connecticut. Dr. Thompson is a seasoned engineering designer with experience on advanced automotive, aircraft, and rocket-engine concepts with industrial experience as Supervisor of Experimental Gas Dynamics at Scientific Research Associates between 1986–90 where he was Principal Investigator of contract research on the Space Shuttle Main Engines and Solid-Rocket Motors, turbomachinery, commercial aircraft, gas turbines, pulmonary ventilators, and flow-diagnostic instrumentation. In 1990, he was appointed Group Leader of Advanced Design at Boeing Canada Limited and was responsible for engineering and research of regional-transport commercial aircraft. He held academic appointments at Imperial College in 1983–84, at the University of Waterloo in 1984–88, at Rensselaer Polytechnic Institute from 1991–2001, and at the University of Western Ontario since 2001. Thompson's research contributions have placed emphasis on engineering-design pedagogy, on trailing-edge flows, on vehicular-scale flows, and on the necessary flow-diagnostic instrumentation and CFD tools to investigate flow phenomena. In the Aircraft Studio at Rensselaer Polytechnic Institute, he was Chief Engineer of the RP-3 aircraft, which is one of the world's largest student-engineered aircraft. He has engineering experience in a wide range of applications that include commercial aircraft, high-speed snow plowing, hybrid electric automobiles, axial turbomachinery, centrifugal pumps, heat exchangers, telephony heat transfer, municipal solid waste recovery, ceramic recuperators, gas-turbine blade cooling, turbopumps, and pulmonary ventilation. He has authored over 120 publications and technical reports, is a patent holder, and has presented invited lectures and short courses on aerodynamics, engineering studios, and aircraft design in the U.S., Europe, Canada, and the U.K. Based on his specialized expertise in experimental and computational fluid mechanics, aerodynamics, convective heat transfer, and vehicular design, he has consulted for industry and government agencies in the paper, turbomachinery, engineering-design, education, sports-engineering, aircraft and waste-recovery industries, and for the Internal Revenue Service. Thompson is currently leading pedagogical research that explores how to teach engineers to be innovative. Studio pedagogy, a cognitive schema developed to utilize intuition and initiative, is being applied to teach engineering design with creative processes in which the principles of engineering science are rigorously applied. Emphasis in the studio is placed on innovation with emerging technologies, leadership, and teamwork.



MURRAY TOBAK is a Senior Staff Scientist at NASA Ames Research Center. He has degrees from the University of California and Stanford University, and has been a Research Scientist at NACA–NASA Ames Research Center since 1948. He has specialized in theoretical studies of fluid and flight dynamics of high-speed aircraft and missiles. His studies have been aimed at identifying problems in nonlinear dynamics, flow stability, 3D separated flow, and vortex phenomena requiring basic research and new analytical and experimental tools for their solution. He is an AIAA Associate Fellow and has received NASA's Exceptional Service Award.