

## Aircraft Technology: A Few Good Drivers

I hope you have examined our key technology special sections that celebrate our first 100 years of controlled powered flight. Each of these special sections feature a future-look article that attempts to forecast where that aircraft technology component (e.g. aircraft structures) appears to be heading. Please check those articles for excellent ideas to drive your own aircraft technology investment strategy. Additionally, recent events including the publication of the 9/11 Commission Report, will also drive future aircraft technology investment. This report makes numerous recommendations for our consideration concerning border security, aviation security including, as Associate Editor Ken Holt points out, reducing the vulnerability of aircraft, civil aviation reform, intelligence gathering, and military response—all within a comprehensive and integrated set of recommendations to achieve the elimination of global terrorism. They point out that major vulnerabilities still exist in general aviation security including inadequate screening and assess controls. New and expanded roles for UAVs will emerge to help secure our borders and with GPS, play an expanding role in intelligence gathering. Biometrics applications are recommended to address entry/exit screening.

Another driver recently highlighted in *Aerospace America*, Oct. 2004, is the military transport market. There it is noted that the most intriguing possibility for military transport market growth, to respond to ever increasing demands for lift, is technology. Tilt-rotor technology, blended wing-body design, lighter-than-air, and stealth applications are some of the areas that could stimulate the market. The DOD is currently undergoing transformation from the cold war paradigm to one driven by current events. Aircraft technology to address this transformation will certainly include heavy dependence on UAV capability. Currently hundreds of UAVs are in use by the DOD overseas.

Yet another driver for aircraft technology investment was briefed last March to the NASA Institute for Advance Concepts. On their web site, one finds a briefing by the Air Force Research Labs Munitions Directorate on the subject of aerospace propulsion and power with positrons (antimatter). Such a revolutionary energy source could lead to long loiter, 24/7 surveillance and other military missions. Single stage-to-orbit aircraft are also envisioned employing a turbo-ramjet-rocket exo-atmospheric engine.

The two recently accomplished flights of SpaceShipOne within a 14 day span earned the ten million dollar Ansari-X prize. Certainly this feat will inspire and drive many to follow in the development of a new generation of aerospace craft.

Of course I hope you will be driven to submit your excellent papers on advancing aircraft technology to this journal.

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 email 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 (EAB), is now in place, immediately accessible by the associate editor who can

quickly make his 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 about three months on average. Authors, associate editors and reviewers have applauded the simplicity and are freed up to concentrate on the intellectual issues.

Turning now to some journal business, I would like to recognize the continued dedicated service of our fine associate editors who appear as the “2005 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-US author needs extra help with publication format or grammar. 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, also listed on the inside front cover. Most EAB members also serve on a technical committee (TC) relevant to this journal. In this way, these technical committees have a solid link to the journal for archival publication of their best meetings papers. EAB members help identify reviewers and also stimulate ideas for special sections or survey papers 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 has been especially helpful this past year as we further developed the WriteTrack online paper submission procedure for the *Journal of Aircraft*. Luke McCabe became our managing editor in January 2004. Some of the associate editors of most of our journals met Luke when he and Jen Samuels provided an associate editor WriteTrack training session in Reno last year. Luke has been of great help to associate editors and authors, demonstrating great patience and thoroughness. Luke expertly helps with the development of the WriteTrack procedure. He patiently and expertly deals with all the special problems reported by editors and authors and then 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 Mr. John McAndrew and Sean Malone. They designed and built the entire procedure and then worked with editors 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 structure 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.



**INDERJIT CHOPRA** is the Alfred Gessow Professor in Aerospace Engineering and Director of Alfred Gessow Rotorcraft Center at the University of Maryland. He received his B.S. in aero engineering from Punjab Engineering College, Chandigarh (India) in 1965; his M.E. from Indian Institute of Science, Bangalore in 1968; and his Sc.D. from MIT in 1977. He worked at the National Aerospace Laboratory, Bangalore from 1966 to 1974. His research there included wind-tunnel testing of scaled aeroelastic 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. In 1981, he joined the University of Maryland. He has been working on problems associated with aeromechanics of helicopter, smart structures and micro air vehicles. His graduate advising resulted in 34 Ph.D. and 60 M.S. degrees. An author of over 150 archival papers, Dr. Chopra has been Associate Editor of *Journal of the American Helicopter Society* (1987-91) and *Journal of Intelligent Materials and Systems* (1977-cont.). He was the recipient of 2002 AIAA Structures, Structural Dynamics and Materials Award, 2002 AHS Grover Bell Award, 2001 ASME Adaptive Structures and Material Systems Prize, 2002 A. J. Clark School of Engineering Faculty Outstanding Research Award, 2004 SPIE Smart Structures & Materials Lifetime Achievement Award. He has been a member of the Army Science Board (1997-2002). He is a Fellow of AIAA, ASME, AHS, NIA and 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.



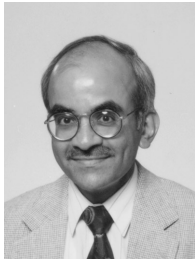
**AHMED A. HASSAN** is currently a Boeing Technical Fellow at the Boeing Company in Mesa, Arizona. His area of expertise is computational fluid dynamics (CFD). Dr. Hassan received his B.S. and M.S. from the University of Cairo in 1974 and 1976 respectively. He then received his Ph.D. from the University 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.



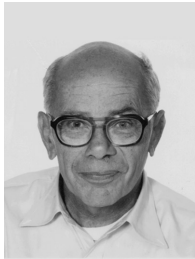
**BELLUR L. NAGABHUSHAN** is a Professor of Aerospace Engineering at Saint Louis University. He received his B. Tech. in aeronautical engineering from the Indian Institute of Technology, Madras, India, in 1971, and his M.S. and Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State 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** holds 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 and a Ph.D. from Imperial College of Science and Technology in 1984. He has been at a licensed professional engineering since 1986 in Ontario and Connecticut. Dr. Thompson is a seasoned engineering designer with experience on advanced medical, automotive, aircraft, rocket-engine, and instrumentation concepts. He has industrial experience at Bell Northern Research, Scientific Research Associates, and Boeing and held previous academic appointments at Imperial College, the University of Waterloo, and RPI. His research places emphasis on studio pedagogy, trailing-edge flows, vehicular design, and emerging technologies. He was the Chief Engineer of the Aircraft Studio at RPI which produced the world's largest student-engineered aircraft. Thompson has engineering experience in a wide range of applications including commercial aircraft, high-speed snow plowing, hybrid electric automobiles, axial turbomachinery, centrifugal pumps, heat exchangers, telephony heat transfer, gas and steam turbines, and pulmonary ventilation. He has authored over 160 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.



**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.