

## Dedication to William R. Sears

**T**HIS issue of the *AIAA Journal* is dedicated to Professor William R. Sears on the occasion of his 75th birthday. It is particularly fitting to do so, since he was the Editor-in-Chief of the *Journal of the Aerospace Sciences* of the Institute of Aeronautical Sciences up until its merger to form the present AIAA. Of particular importance is the fact that he has become the dean of American aeronautics through his leadership in theoretical research, teaching, and applications to practical aeronautics. To refresh our collective memories, Professor Telonis has kindly written a brief biography of Professor Sears. Throughout the rest of this year, the *AIAA Journal* will be publishing papers dedicated to him.

We all have our favorite memories and stories to swap about Bill. So I would like to share mine with you because of

its pertinence to *Journal* operations. I submitted my first paper, on melting ablation, on June 6, 1957, to the *Journal of Aerospace Sciences*; it was published in January 1958, in only seven months including the review process. Since I have become your Editor-in-Chief, my most fervent desire has been to reestablish that as the norm for our review and acceptance procedures. This can only be accomplished if all, not just a few, of our reviewers return the manuscripts in less than four weeks. In any event, Bill, happy 75th birthday and the best of success in your future endeavors!

George W. Sutton  
Ph.D., P.E.  
Editor-in-Chief

## Professor William R. Sears—A Short Biography

**B**ILL Sears was born and raised in Minneapolis. During his high school years, he set out to become an aeronautical engineer and pursued his goal with determination and great success. At the age of 21 he earned his Bachelor's of Aeronautical Engineering degree from the University of Minnesota and headed west to pursue graduate studies at Caltech. The environment there was stimulating and exciting intellectually and socially. He found there, among others, Clark B. Millikan and A. L. Klein, but he was struck by the personalities and warmth of Theodore von Kármán and Mabel Rhodes. He worked diligently for the first and married the second. These two individuals in their own way have greatly influenced his entire life and career.

Bill became an instructor in 1939, an assistant professor in 1940, and for four years at Caltech taught courses in aerodynamics, wind-tunnel methods, vector analysis, and propellers. During that time, he developed the skills that enabled him to become a superb teacher who gave carefully prepared lectures, models of clarity and organization. Just as his teaching career began at Caltech, so did his research and publication career. His first paper was an experimental investigation of ground effects in the GALT wind tunnel, presented at the Sixth Annual Meeting of the Institute of the Aeronautical Sciences in January 1938, and published in the Institute's journal in May 1938.

Bill Sears' Ph.D. work on unsteady airfoil theory resulted in five papers that are still the standard references on the topic. In one of these papers, he discussed the sinusoidal gust case, with the famous spiral Sears function that has been expanded upon by other researchers as late as in the 1980's.

From 1941 to 1946, Bill worked for Northrop as the Chief of Aerodynamics and Flight Testing. He and a number of bright former Caltech students worked on the P61 series (Black Widow) and the Northrop experimental flying-wing aircraft. The jet-propelled version of this design proved to be a beautifully maneuverable, stable, high-performance airplane, but its performance went beyond its structural limits. During the Northrop years, Bill did not have many chances to continue his scholarly work. Nevertheless, at the end of his tenure at Northrop he published one of his famous papers on projectiles of minimum wave drag in which he calculated for given volume and length, and for given caliber and length, such well-known shapes as the Sears-Haack bodies. His five years in industry rounded out Bill's professional experience and gave him a solid grounding in the practical problems facing the aircraft industry. Since then, he has maintained an active interest in the problems of the aircraft (later aerospace) industry, through extensive consulting, government advisory work, and contact with former colleagues and students, many of

whom have had distinguished industrial careers. He also has kept a hands-on practice on the theory he taught. Since 1940 when he got his pilot's license, Bill has not stopped flying and by today has logged over 7500 hours.

But he had always hoped to return to a university, and among the academic invitations that came at the end of the war was the exciting prospect of becoming the Director of the new Graduate School of Aeronautical Engineering proposed by Cornell University. It must have been exciting, because Mabel and Bill didn't even know where Ithaca was. They were heartbroken at leaving their beloved California, but they found Ithaca and moved there in the summer of 1946. Bill quickly gathered a faculty that included John Wild, a former Caltech and Northrop colleague, Arthur Kantrowitz from NACA-Langley, and Y. H. Kuo, a colleague and former student of von Kármán. He also hired a secretary named Alice (Toni) Anthony, who has turned out to be the most permanent, and in many ways the most important, member of the Cornell Aero School staff. The school could not really run without her.

Besides teaching several courses in fluid mechanics and wing theory and one orientation seminar on airplanes for the non-aero entering students, Bill continued his research, often collaborating with his students. The early Cornell years had several main themes. One was three-dimensional boundary layers in which he pointed out the "Independence Principle" for the boundary layers on yawed infinite wings, almost simultaneously with R. T. Jones. He also pointed out the distinction between "boundary sheets" and "boundary regions," which has helped organize the field of three-dimensional boundary layers ever since. A second theme was wing theory. This ran the gamut from Prandtl's lifting-line theory to the famous paper on slender-body theory, from incompressible flow to supersonic flow. A third theme dealt with internal flow in turbomachinery. His papers dealt with problems related to rotating stall and nonsteady interactions between blade rows and blade wakes. The latter subject, which was a further extension of Bill's Ph.D. research, turned out later to be pertinent to the important problem of turbomachinery noise.

At the beginning of his second decade at Cornell, Bill was editor of the *Journal of Aeronautical* (later *Aerospace*) *Sciences* (1955 – 1963), among many other service positions in his profession. In his personal work, he became caught up in the enthusiasm for study of the effects of magnetic fields on the flow of conducting fluids, variously known as Magnetohydrodynamics, Magnetofluidynamics, Magnetoaerodynamics, etc. After writing two sections of the monumental Princeton Series on High Speed Aerodynamics and Jet Propulsion, he turned to MHD and produced, from 1958 to 1966, a torrent of

papers in the area. This spate of activity was interrupted only by two articles that were essentially recollections of his teacher, Theodore von Kármán, who had died in 1963.

During this period Bill decided that after 17 years with its original Director, the Aero School needed a new head and he needed a new assignment. He was by now John L. Given Professor of Engineering, and in 1963 he became the first Director of the Center of Applied Mathematics at Cornell, a unit he had been active in instituting. After four years as Director of the Center, he decided it was off to a good start, and he returned to the Graduate School of (now) Aerospace Engineering as a faculty member, but not Director.

There are two main subjects that have occupied Bill's attention since 1967. The first is aerodynamic noise, both sonic booms and noise in the subsonic flow associated with helicopters and turbomachines. Cornell has an active center of sonic-boom research, and Bill's interest in subsonic noise was a natural outgrowth of his early work on airfoils in nonsteady flow. A review of this field was presented as the 1968 von Kármán Lecture to the American Institute of Aeronautics and Astronautics. His active interest in this area continues. The second subject, unsteady boundary layers and their separation, somehow seems to be a natural complement to the nonsteady inviscid flows that interested him at the beginning of his career.

In 1974 Bill Sears accepted an offer from the University of Arizona and returned west. He continued his activities in teaching and research but also devoted much of his time and energy to an idea about how to attack and solve perennial problems of wind-tunnel testing. This idea, which involved marrying the tunnel to a high-speed computer, has become known in publications as the "adaptive-wall wind tunnel."

Bill Sears has received many honors and recognitions; among them we could mention the 76th Lanchester Lecture of

the Royal Aeronautical Society (1973), the von Kármán lecture in Israel (1976), the Gardner Lecture at M.I.T (1987), and the Guggenheim Lecture at the ICAS (1988). Moreover, he was honored with the Prandtl Ring of the German Aeronautical Society. Bill was elected as an honorary fellow of the AIAA, and he is a member of the National Academy of Engineering, the American Academy of Arts and Sciences, and the National Academy of Engineering of Mexico.

Looking back on Bill Sears' professional life, one can only be impressed by his achievements. Teaching, research, editing, industrial consulting, government service, international lecturing: it seems like he has to be several people to do it all. Yet he always has time for the personal relationships that are the spice of life. His friends and admirers among his colleagues and former students around the world can be counted by the hundreds. His warmth and humor show through all his activities. He considers his major contribution to be his role as a teacher who has influenced directly the lives of a few hundred students, mostly at Cornell. They all feel deep appreciation and affection for Bill and Mabel Sears. With the help of Bill's colleagues, the Cornell Aero School has maintained for many years a tradition of scholarship that goes back to von Kármán. The body of students that Bill has helped educate forms a remarkably impressive group of engineers and scientists.

Demetri P. Telionis  
Professor, Department of Engineering  
Science and Mechanics  
Virginia Polytechnic Institute  
and State University

### Notice to Subscribers

We apologize that this issue was mailed to you late. As you may know, AIAA recently relocated its headquarters staff from New York, N.Y. to Washington, D.C., and this has caused some unavoidable disruption of staff operations. We will be able to make up some of the lost time each month and should be back to our normal schedule, with larger issues, in just a few months. In the meanwhile, we appreciate your patience.