MEDALIST FOR 2007

For outstanding contributions to aerospace engineering in aeroelasticity, unsteady aerodynamics and flight mechanics, and for exceptional leadership of engineering organizations including service to the U.S. Department of Defense

ALEXANDER H. FLAX

Born in Brooklyn, Alexander H. Flax received his early education there and attended New York University, where he received a B.S. in aeronautical engineering in 1940. Flax began his professional career in 1940 as a stress analyst with the Curtiss-Wright Corporation, where within two years he became chief of the flutter and vibration group working primarily on structural and dynamics problems and on methods for design analysis and testing.

With the advent of electric strain gages, new opportunities arose to validate analytical methods, many of which were just emerging as replacements for the more empirical and judgmental methods of the past. Flax was very active in developing and applying these new approaches to the many aircraft types under development at Curtiss-Wright, includeing the 0-52--a high-wing, strut-braced observation aircraft and last of a line and an era; the P-40 fighter--the most advanced fighter available in quantity at the outbreak of World War II; the XP-60 and XP-62--experimental fighter aircraft never produced in quantity; the SB2C-1--a Navy dive bomber that entered service in 1943; and the C-46--a military transport aircraft extensively used to "fly the hump" in the China-Burma-lndia theater. Flax's work on these aircraft included stress analysis, flutter and vibration analysis, and advanced flight loads analysis.

In 1944 he moved to the Piasecki Helicopter Corporation (which later became the Vertol Division of The Boeing Company) as Head of Aerodynamics, Structures, and Weights-a position that in some larger companies was occupied by the chief technical engineer. At Piasecki, Flax was one of a small group of engineers who developed the world's first twin-rotor, tandem helicopter (known as the Navy XHRP-1 or, more informally, as "The Dogship"). Helicopter technology was then its infancy even for single-rotor machines, and the additional complication of tandem rotors required starting from scratch on many questions of design, analysis, and testing. Nevertheless, Piasecki won two major design competitions--the HUP-1 for the Navy and HU-16 for the Army/Air Force. Descendents of the twin-tandem HUP-1 are still in service as the CH-46 and CH-47 transport helicopters which were used in the Persian Gulf conflict.

In 1946 Flax joined the Cornell Aeronautical Laboratory (now known as CALSPAN) as assistant head of the Aeromechanics Department. Continuing to do research on helicopter rotor structures, he and his colleagues built and flew what may have been the world's first flight-worthy and flight-demonstrated fiberglass composite rotor blades. It was perhaps twenty years after this work that composite fiber blades appeared in operational helicopters.

Soon after joining the Cornell Aeronautical Laboratory, Flax branched out into supersonic vehicle research, including supersonic aerodynamics, flight control, and ramjet propulsion. His research in wing theory and wing-body interferences in this period was widely recognized. He conceived of the perforated-wall wind tunnel, one of two wind-tunnel designs currently in use for testing at transonic flows exceeding Mach 1. He was also one of the inventors of the wave superheater for generating "clean" airflows of several-second duration at temperatures previously attained only in rocket exhaust flows.

During his final years at Cornell Aeronautical Laboratory, as Vice President and Technical Director, Flax exercised managerial and technical guidance over a wide variety of projects, many not particularly aeronautical. These included early work on neural network computers, automotive crash safety, and doppler radars for weather sensing. He received a Ph.D. in physics from the University of Buffalo in 1958.

Flax served as Chief Scientist of the U.S. Air Force from 1959 to 1961 and in 1963 was appointed Assistant Secretary of the Air Force for research and development. From that position he championed advanced aircraft engine development as an essential element of progress in both military and civilian aeronautics. In the 1960s he emphasized the Light-weight Engine Gas Generator Program and the Advanced Turbine Engine Gas Generator Program, work that reached fruition in the 1970s with the engines that went into the F-15 and F16 fighter aircraft and the new generation of high-bypass engines for military and civil large, long-range transports.

Another area of special attention was materials, especially the then newly emerging field of high-strength, highstiffness, lightweight fiber composites. This work began with boron fibers in the early 1960s and quickly expanded to include graphite fibers and Kevlar finding particular application in helicopters and vertical take-off aircraft, in some of which more than 40 percent of the structural weight may be in fiber composites other areas of research emphasized during Flax's service with the Air Force included the development of precision-guided weapons and the corresponding aircraft targeting systems and their sensors.

As a result of these research thrusts, laser and electro-optical guided bombs were quickly developed. Optical, infrared, and high-resolution radar sensor systems were vigorously pursued, and on-board computer capabilities were added as standard equipment or modular additions to all future fighter-attack aircraft. The result of all of these initiatives and their further exploitation became apparent in the Persian Gulf conflict.

Military space systems also fell within Flax's responsibilities in the Air Force. During his tenure the Defense Support Program, a satellite-borne infrared sensor for ballistic missile launch detection, which is still operational, reached full engineering development status, and the Titan III launch vehicle family reached operational flight status. Early versions of defense communications satellites including OSCS-1, TACSATCOM, and several Lincoln Experimental Satellites were developed and

flown. The conceptual groundwork and applications studies for the Global Positioning System, now reaching full operational status, were laid down at that time.

In March 1969, Flax joined the Institute for Defense Analyses as Vice President of

Research and later that year became President; he retired in 1983. While at IDA, Flax oversaw activities supporting the Office of the Secretary of Defense and the Joint Chiefs of Staff in developing analytical and computer models for evaluation of strategic nuclear and conventional forces. Also the then-greatly increased Defense Department emphasis on operational test and evaluation called for IDA to develop many innovations in operational test methodology and instrumentation for air combat and air-ground combat in such projects as AIMVAL-ACEVAL. Other major areas of emphasis were assisting in coordinating, evaluating, and guiding technology base programs, such as those in long-wave infrared sensors, materials, and propulsion.

Flax was elected to the National Academy of Engineering in 1967 and served as the Academy's home secretary. He was a member of the Governing Board of the National Research Council, the Air Force Scientific Advisory Board, the Defense Intelligence Agency Scientific Advisory Committee, a senior consultant to the Defense Science Board, and a U.S. national delegate to the NATO Advisory Group on aerospace research and development. Flax also served on advisory bodies on engineering programs at Princeton and Stanford universities. He has delivered the Wright Brothers Lecture of the American Institute of Aeronautics and Astronautics (AIAA) and the Wilbur and Orville Wright Memorial Lecture of the British Royal Aeronautical Society.

Flax received many accolades for his work, including the Lawrence Sperry Award of the Institute of Aeronautical Sciences (now AIAA), the Air Force Exceptional Civilian Service Medal, the Defense Intelligence Agency Exceptional Civilian Service Medal, the Department of Defense Distinguished Public Service Award, the NASA Distinguished Service Medal, and the Von Karman Medal of the NATO Advisory Group for Aerospace Research and Development. He was also a recipient of the General Thomas D. White Air Force Space Trophy.