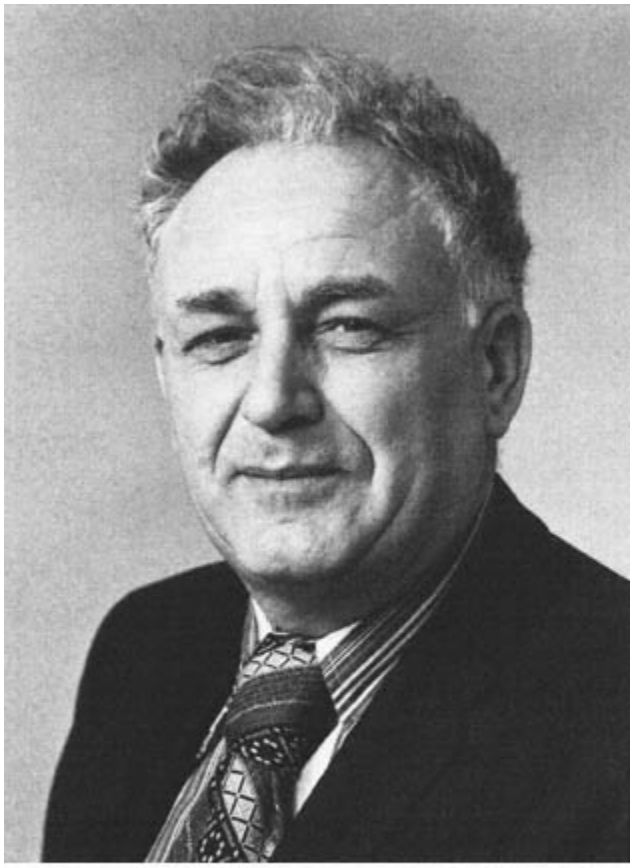

Lester Lees

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1920–1986

By Frank E. Marble

Lester Lees, authority on the subjects of supersonic and hypersonic aerodynamics, a highly respected teacher, and one who played a pivotal technological role in the creation of the United States ballistic missile defense system, died November 10, 1986, from complications attending Parkinson's disease. His death came only two days after the celebration of his sixty-sixth birthday. Lester Lees was a member of the faculty at the California Institute of Technology from 1953 until the time of his death.

Lester thoroughly enjoyed his life; he enjoyed his family; he enjoyed his work, his students, good food and wine, and a good argument! He pursued everything with zest, enthusiasm, and humor. He had an unusual ability to identify the key elements of new technological issues and possessed an immense reservoir of energy with which to pursue them. This uncompromising drive led him to grow from his aeronautical background to make vital contributions to the fields of transportation, energy production and management, and environmental protection.

Born in New York City on November 8, 1920, Lester Lees entered the prestigious Stuyvesant High School in September 1933 and was admitted as a freshman to the Massachusetts Institute of Technology (MIT) three years later, at the age of fifteen. He emerged in 1941 with a B.S. and an M.S. in aeronautical engineering, having pursued additional advanced work in mathematics and physics. An appointment as research assistant

during his last year at MIT gave him his initial experience with research and culminated in his master's thesis, "The Influence of Static Pressure Gradients upon the Turbulent Boundary Layer." That he should pursue such a difficult and highly competitive area of research at this stage of his scientific development proved an accurate indicator for the course of his career!

With the United States entry into the war imminent in 1941, Lester Lees joined the U.S. Air Force's Air Materiel Command at Wright Field, Dayton, Ohio, as an aeronautical engineer. While at MIT, Lester met Constance L. Morton, a student at Simmons College, School of Library Science. They were married in Dayton on August 30, 1941. Connie, a strong, intelligent, and gracious person, became and remained a principal factor in Lester's career.

It was at Wright Field that Lester met Theodore von Kármán, whose personal magnetism drew Lester to the California Institute of Technology in the fall of 1942. There he served as an instructor in mathematics and a research fellow in aeronautics; collaborated with von Kármán on the design of a supersonic wind tunnel; and continued, closely with the distinguished theoretician H. S. Tsien, research in supersonic gasdynamics.

As the war gradually enveloped most scientific personnel, Lester was taken into the Army Air Corps Enlisted Reserve and joined the Langley Memorial Aeronautical Laboratory of the National Advisory Committee for Aeronautics. Langley was an active and stimulating research center where many of Lester's young colleagues were also destined to join the leaders of the postwar aeronautical research establishment.

During this period, the original theory of laminar instability was transformed from highly suspect to firm reality by the classic experiments of G. B. Schubauer. Almost simultaneously, Lester Lees, together with Professor C. C. Lin, extended this theory to the new regime of supersonic flows, beginning a field of investigation that to the present time has remained active for supersonic and hypersonic flows.

As the war ended, Lester accepted an assistant professorship in aeronautical engineering at Princeton and for the next five

years directed its supersonic and hypersonic research. It is important to note that events of this period interrupted Lester's orderly progress through the doctorate and, given his stature in aeronautical research, he found no compelling reason to divert himself toward that end. The few indignities he suffered as a consequence received appropriate responses.

The Princeton colleague who exerted the deepest and most lasting influence was Luigi Crocco, a splendid, creative scientist and a gentleman of great personal warmth. Together they developed a vitally important theory of dissipative gas flows, the spirit of which would play an essential role in Lester's future. Toward the end of the Princeton period, David Grayson Leeswas born. David grew to share the intellectual attributes of his mother and father and maintained a warm and understanding relationship with Lester throughout his life.

In 1953 the hypersonic wind tunnel in Caltech's Guggenheim Laboratory was nearing completion, and that summer Lester was persuaded by Clark Millikan to return to Caltech as a member of the faculty and to assume responsibility for directing hypersonic research. The next seventeen years saw Lester develop, through his energy and personal commitment, a sequence of outstanding research accomplishments and a following of intensely devoted students. These students were an integral part of Lester's and Connie's life; essentially they were his extended family. They were always welcome at the Lees home, where they would be well fed by Connie; their parties were legendary!

At Caltech Lester continued his important work on hypersonic viscous flows initiated at Princeton in collaboration with his student Ronald Probstein, particularly the leading-edge shock-boundary layer interaction problem. He also expanded his activities into the field of rarified gas dynamics related to very high-altitude flight. At this time the hypersonic technology community began to realize the advantages of a blunt-nosed body in reducing heat transfer during atmospheric reentry. Lester's work on chemically reacting turbulent boundary layers placed him in a unique position to deal with the nose ablation issue. As consultant to the Space Technology Laboratories (later Thompson-Ramo-Woolridge (TRW)), he guided the military

research and development of the successful reentry body design. This activity had, of course, a strong influence on the direction of his academic research program with regard to both hypersonic flow about blunt slender bodies and the stability of laminar boundary layers in very high-speed flow. It was during this period of his career that one of his students, Dr. Toshi Kubota, became his close faculty associate and lifelong collaborator, sharing with Lester the duties of teaching and supervising students in hypersonic research.

In the early 1960s the technology issues centered on ballistic missile defense and, in particular, on the question of discrimination between heavy bodies and decoys as they entered the earth's atmosphere. Through an exhaustive effort, carried out in collaboration with Dr. Leslie Hromas of TRW, Lees showed that the characteristics of the trail left behind as the objects reentered the atmosphere differed significantly between heavy bodies and decoys. It transpired that the bodies' viscous boundary layer had a significant effect upon the wake structure, and the joint work with Luigi Crocco, mentioned earlier, became relevant. Again, the fundamental aspects of this problem became the motivation for his academic program.

Lester Lees always took an active interest in government and politics, and in the late 1960s it seemed natural that he should become involved with environmental issues. When President Harold Brown formed Caltech's Environmental Quality Laboratory in 1971, he persuaded Lester to become its first director. Under his stimulating guidance, this became a flourishing and prolific organization, and because Lester was not one to minimize the unpopular facts concerning sources of pollution, it also produced its share of controversy. Time, however, has proven Lester correct, and as a consequence, his influence on environmental legislation has been very significant. This time also marked the creation of Caltech's Department of Environmental Engineering, and Lester became professor of environmental engineering and aeronautics. He remained in the position of director of the laboratory until 1974 when, feeling the laboratory to be firmly established, he stepped down from that position. Although he remained intensely active in environmental, ener

gy, and transportation problems, he gradually returned to aeronautical and aerospace research and moved his office back to the Graduate Aeronautical Laboratories. He resumed teaching and research supervision in aeronautics, but his declining health gradually undermined the energy that characterized his technological activity.

Lester Lees was a fellow of the American Institute of Aeronautics and Astronautics and was elected to the American Academy of Arts and Sciences in 1964 and the National Academy of Engineering in 1971. He was a member of the National Aeronautics and Space Administration (NASA) Lunar and Planetary Missions Advisory Board. He served for several years on the President's Scientific Advisory Board as a member of the Space Vehicle Panel, the Space Technology Panel, and the combined Space Science and Space Technology panels.

Lester Lees was devoted to the practice and teaching of sound cutting-edge technology rooted in scientific fundamentals. In this he must be considered one of the most successful of his generation.