



*Clark B. Millikan*

# Clark Blanchard Millikan

## 1903-1966

By Ernest E. Sechler

Clark Blanchard Millikan was born in Chicago on August 23, 1903, and died on January 2, 1966. His birth occurred almost simultaneously with the decision of the Wright brothers that their airplane was ready to fly under its own power. These brothers shipped their frail craft from Dayton to Kitty Hawk in September of that year. Whether or not this coincidence was important can never be known, but it is a fact that, in his early impressionable years, Clark was surrounded by the publicity attendant on the rapid development of this new means of transportation.

Being the son of Robert Andrews Millikan, at that time Professor of Physics at the University of Chicago, any latent interest in new advances in science and technology was sure to develop. According to his own memory, Clark was only eight or nine years old when he first decided to make his life's career in some area associated with aeronautics. During this eight- or nine-year period, many startling firsts in aviation were accomplished, beginning with the Wright brothers' first flight in December 1903. All of these events would surely have been discussed at the home of a university professor, and it is little wonder that one of his sons saw glamorous possibilities in aeronautics as a future career.

Clark attended the University of Chicago elementary and high schools, and, during this time, he continued his interest in aeronautics by building model airplanes. It is unfortunate that none of these exist today, for it would be fascinating to compare them with

the complex machines that he was concerned with in the last years of his life. While in elementary and high school, Clark found an outlet for his intense physical energy in athletics.

After spending a year divided between the University of California (Berkeley) and Throop Institute of Technology (now the California Institute of Technology), he entered Yale as a freshman in the fall of 1920. Although Clark specialized in physics and mathematics at Yale, it is obvious that the impact of the airplane on the world conflict between 1917 and 1919 must have left a strong impression on his mind. At that time very few schools had courses in aeronautics, although Jerome Hunsaker was detailed (from the Navy) to the Massachusetts Institute of Technology in 1913 to develop courses in aerodynamics.

By the end of his undergraduate years, Clark had firmly established the pattern of his future life. Its major facets consisted of solid strength in the fundamentals of mathematics and physics, an intense interest in all phases of aeronautics, a love of music both as a participant and as a spectator, and a physical energy that he enjoyed expending out of doors in some form of athletic activity. Binding all this together was an outgoing personality that won him many friends from all walks of life. Alive, vibrant, dynamic, and friendly were the adjectives that described Clark Millikan to those who knew him best.

He entered graduate school at Caltech in the fall of 1924 and continued to specialize in mathematics and physics. Although there were no formal courses in aeronautics at that time, Professor Harry Bateman, the distinguished mathematician and physicist, had a strong interest in theoretical aerodynamics. It was under Professor Bateman that Clark produced his doctoral dissertation, "The Steady Motion of Viscous Incompressible Fluids." He received his Doctor of Philosophy degree in 1928. His interest in all phases of aeronautics remained high, which was evidenced by the fact that he and two colleagues, Arthur L. Klein and Albert Merrill, designed, built, and flew a revolutionary new type of biplane in which control was established by moving the complete biplane wing assembly. The placement of the two wings was such as to develop a built-in stability, and this airplane, fondly named the "Dill Pickle," could be flown hands off, an unusually daring feat in those days.

Throughout the 1920's there was an ever-growing aviation activity in Southern California. Small firms were springing up from Burbank to San Diego, and, since Caltech was one of the leading engineering schools in Southern California, it was natural that there should be an early and continuous contact between this new and exciting industry and the staff and students of Caltech. Donald Douglas, Sr., and his chief engineer Arthur Raymond; "Dutch" Kindleberger, who went from Douglas to North American; "Kelly" Johnson from Lockheed; and Jack Northrop were all friends of Caltech and soon became close personal friends of Clark Millikan. Through them he saw how aircraft were built and flown so as to round out his theoretical knowledge of the subject.

Another movement of importance was taking place during this period that had its influence in his life. In 1925 Daniel Guggenheim donated \$500,000 toward the development of a school of aeronautics at New York University. At about the same time the Daniel Guggenheim Foundation for the Promotion of Aeronautics was established. From this Foundation, Caltech was granted funds in 1928 to establish the Daniel Guggenheim Graduate School of Aeronautics and to build the Guggenheim Aeronautical Laboratory. The Fund also arranged for a visit of Dr. Theodore von Kármán to the United States from Aachen so he could participate in the plans for the laboratory. Although the contribution of von Kármán was great, it was actually Clark Millikan and Arthur Klein who did the detail design work on the laboratory and its primary occupant, a ten-foot diameter working section Gottingen-type closed-return wind tunnel.

This wind tunnel, which had for that time the very high velocity of 200 miles per hour was operated, calibrated, and turned into a highly efficient research tool largely by the efforts of Clark Millikan, "Maj." Klein, and a handful of graduate students in this embryo Aeronautics Department at Caltech. It was during this period that the acronym *GALCIT* (standing for the Guggenheim Aeronautical Laboratory of the California Institute of Technology) was coined, and ever since the words *GALCIT* and Clark Millikan have been synonymous.

*GALCIT* was under the directorship of von Kármán from 1930 until 1949, and during that time Clark was in charge of the applied

aerodynamics phases of the Laboratory's activities and supervised all of the testing and research carried out in the wind tunnel. Since this was the only available large wind tunnel in Southern California, the local, and sometimes some distant, aircraft companies found it an ideal piece of test equipment for developing new aircraft designs.

Through these contacts he had a very significant influence on the early development of many of the important airplanes of the 1930's and 1940's. Concurrent with this activity, he was also an excellent teacher and he rose from Assistant Professor in 1928 to Associate Professor in 1934 and to full Professor in 1940. He always prepared his lectures meticulously, and, because his classes knew he performed many experiments in aerodynamics himself and was thoroughly acquainted with all the new developments in the field, they knew they were getting the latest and the best information.

Unlike many people in the engineering and scientific world who join societies but take no part in them, Clark Millikan was not only a member of many scientific and technical organizations but was usually an "active" member in the truest sense of the word. He served as an officer, on executive councils and advisory boards, and his advice and participation were not only solicited but were given generously. In this manner, his influence extended far beyond the confines of his already broad academic activity at Caltech.

With all of these outside activities, his colleagues were constantly amazed at the impact that he could continue to have on Caltech and the Jet Propulsion Laboratory. He authored approximately forty technical papers, as well as the first volume of the GALCIT Aeronautical Series of Textbooks. His was entitled *Aerodynamics of the Airplane* and was an outgrowth of a course he taught to his graduate students.

He was Director of the Southern California Cooperative Wind Tunnel during its first fifteen years of existence (1945-60) and contributed greatly to its success. This was a joint venture financed by five Southern California aircraft companies and managed and operated by Caltech. It was one of the first large supersonic wind tunnels and was known throughout the world for its efficiency,

flexibility, and accuracy. It contributed greatly to the development of postwar commercial and military aircraft, and a large part of this contribution came about because of the intense interest of its Director in every phase of the operation and in the aerodynamic phenomena being studied.

His contributions to the military strength of the United States were great. With his wide knowledge of the entire aeronautics field and his personal friendship with so many of its leaders, his services and advice were constantly being sought-and, what is more, were generously given-by the armed services. Although his later activity in the field of missiles and spacecraft were largely connected with the Air Force through his activity as a member of its Scientific Advisory Board (from 1952 until his death), he also had contact with other services. He was a lieutenant commander (USNR) in 1942-46; served on the Naval Research Advisory Committee in 1947-50; was a member of the Defense Science Board of the Department of Defense in 1957-62; and was Chairman of the Guided Missile Committee of the Research and Development. Board of the Pentagon. He was influential in Army circles through his membership on the Army Ballistic Research Laboratory's Scientific Advisory Committee.

Clark Millikan never knew how to spare himself and, even when ill, continued a work load that would have been impossible for many men in good health. This refusal to stop may have hastened his passing, but he just could not live in any other way. If he had a major fault this was it, but it was far overshadowed by his contributions to aeronautics and to society. He worked under a double handicap in that he was the son of the great physicist Robert Millikan and he taught in the school that his father had made famous. But his achievements and contributions and his place in the annals of aeronautics were his alone and were accomplished by a work and play program that set new records for what could be accomplished in a given time. From the first 120-foot flight of the Wright brothers to men in orbit and interplanetary probes is a distance that few minds can even completely grasp, but Clark Millikan not only understood this development but contributed to nearly every step along the way.