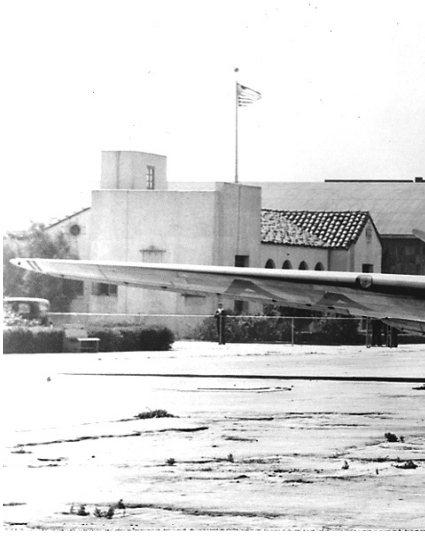
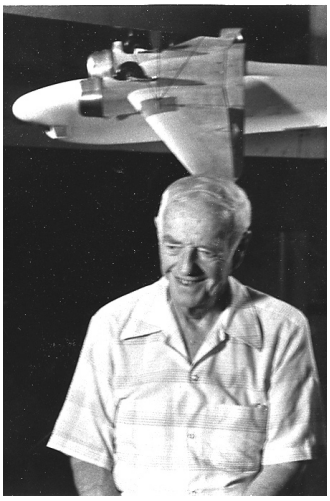


## The Passing of a Man and His Era



**William Bailey Oswald and the original DC-3 test model, shown here in Caltech's 10-foot wind tunnel, both starred in the PBS *Nova* show commemorating the plane's 50th anniversary in 1985.**

William Bailey Oswald, PhD '32, who died on July 30, 1998, at the age of 92, was one of the outstanding figures of American aviation in the "heroic era" of its development, the roughly 30-year span during which commercial aviation reached maturity. He earned one of the very first PhDs in aeronautics awarded by the California Institute of Technology and was an outstanding representative of the type of modern aeronautical engineering that was the hope and aim of the new school of aeronautics led by Theodore von Kármán.

The year 1926 is remarkable in the history of aviation in the United States because in this year the Daniel Guggenheim Fund for the Promotion of Aeronautics was established with the aim of stimulating advanced training and research in the field. Robert A. Millikan recognized the importance of aviation for the U.S., in particular for California, and was able to obtain a grant of $300,000 to establish the Guggenheim Aeronautical Laboratory at Caltech (GALCIT). With surprising insight he chose von Kámán to lead the new school. Of the first three graduate students who completed their PhD degrees in the new school, one was destined to become a major player in the rapid expansion of aviation: William Bailey Oswald, known to practically everybody in or around aviation as "Ozzie."

A 10-foot wind tunnel, one of the most advanced facilities of its time, was designed and constructed as the major research facility of the new school. The GALCIT wind tunnel started operating in 1928 and, under the guidance of Clark B. Millikan, rapidly became a most important link between academia and industry. Practically every airplane designed in this country during the following quarter century was tested in this facility. Ozzie was one of the first who used the tunnel in cooperation with the Douglas Company. By a strange quirk of fate, Ozzie's first appearance at Caltech coincided with the birth of the tunnel; his last visit to the campus was occasioned by its decommissioning in 1997.

Ozzie came to Caltech in 1928 with a degree in physics from UCLA and was awarded his aeronautics PhD degree four years later with a surprisingly theoretical thesis: "The transverse force distribution on elliptical and nearly elliptical bodies moving in an arbitrary potential flow." The study was aimed at the motion of airships but consisted essentially of a rather complicated application of three dimensional potential theory. Ozzie's fame, however, originated with an NACA (National Advisory Committee for Aeronautics) report published in the same year: "General formula and charts for the calculation of airplane performance." For many years this report was the bible of aeronautical engineers faced with performance predictions. A. E. Raymond, chief engineer and later vice president of the Douglas Company, who at the time taught aircraft design at Caltech, had suggested the subject to Ozzie and in addition had hired him for the summer to work at the Douglas Company. It didn't take much longer before Ozzie was chief aerodynamicist at Douglas Santa Monica, and the summer extended to his full professional life.

The combination of a highly theoretical work, his thesis, and a very practical and down-to-earth report, NACA Rep. 408, completed in the same year, demonstrates the new trend in aeronautics of the time: in the design of a flying machine one cannot compensate for ignorance with safety factors. Even a safety factor of two

**The first DC-3 (a DST—Douglas Sleeper Transport) appears about to run over a Northrop Gamma pursuit plane at Mines Field (now LAX) in 1936. The American Airlines flagship crashed at Chicago's Midway Airport in 1942.**

will keep any design from getting off the ground. The designer has to be able to predict forces as well as the structural response very accurately indeed, and this requires a deep understanding of the physics, supplemented by a keen awareness of the limitation of theory and the corresponding need for empirical corrections. Even the advent of the modern computer has not much altered these requirements. When, some years later, the speed of aircraft started to approach or surpass the speed of sound, the need for a grounding in the basic physics and mathematics became even more obvious.

Ozzie's professional life spans the time in which commercial aviation developed from an adventure to routine and the speed range of aircraft progressed from low subsonic to transonic and supersonic speed. Probably the most spectacular success of the early Douglas team, in which Ozzie became a prominent member, was the legendary DC-3, an airplane that put commercial flying on the map and, as a byproduct, demonstrated the importance of a solid grounding in the basic science of aeronautics, competent wind-tunnel and flight testing, and the interaction between industry—Douglas—and academia—GALCIT. This cooperation, which involved not only aerodynamics but the structural dynamics of thin shells as well, is a classic example of the mutual beneficial interaction between an upcoming industrial corporation full of plans for new products and an academic research and educational team full of enthusiasm and new ideas. Of course, the number of design engineers at Douglas and the number of faculty members at GALCIT were at the time of the same order. The increase in speed, size, and sophistication of aircraft led obviously to an ever-increasing divergence in the number of professionals within the industry and academia. Similarly the necessary test facilities became too large and expensive to incorporate within academia. The rather short-lived Co-op wind tunnel owned by five cooperating aircraft industries and operated by Caltech required for its operation up to 30,000 kilowatts, some 40 times more than the GALCIT 10-foot tunnel. The interplay between academia and industry is certainly as important as ever, but necessarily and regrettably has to take a different shape than the easy intimacy in Ozzie's era.

Today transatlantic flights in aircraft with two engines has become routine, but the DC-1, prototype for the DC-3, had to demonstrate a flight, including take off and landing, with only one engine before the airlines accepted the configuration (three engines were usual). Once the two-engine plane was accepted, it completely dominated commercial flying until the end of WWII. During the war the DC-3 became the C-47, the flying jeep, and during the early Cold War made the Berlin Airlift possible. In many parts of the world the DC-3 still serves today, and short-hop airlines even in this country occasionally employ reconditioned DC-3s. No other commercial plane has approached this success.

With Ozzie as chief of aerodynamics, the Douglas commercial series went on through the propeller-driven DC-4 and DC-6 to the jet-propelled DC-8. Each one adopted an essentially new design feature: the DC-4, the nose wheel; the DC-6, pressurization; and the DC-8, turbo-jet propulsion. Ozzie's hopes and expectations for an American supersonic, commercial plane unfortunately did not materialize during his time.

Ozzie is survived by his wife, Lucia, and any account of Ozzie's life would be incomplete without a few words about her. Indeed Lucia, known to all Douglas team members as the genial hostess for their famous yearly party, already appears in the early days of the DC-3: as part of the Douglas team, Ozzie participated in a sales trip to TWA in Kansas City. He apparently directed and delayed the return car trip to California by insisting that every day he had to be in a preprogrammed city where a letter from his fiancée was waiting for him in General Delivery. Sixty-three years later Lucia brought Ozzie in a wheel chair to GALCIT for his last visit.

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