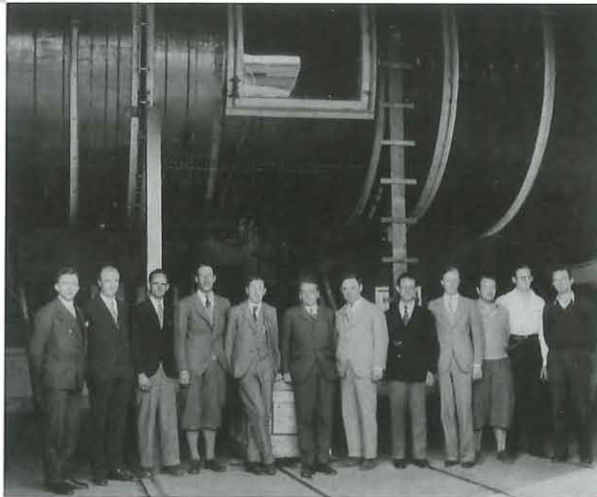


# The 10-Foot Wind Tunnel: Over and Out

Above: Flying over campus to bid farewell to the historic wind tunnel were four World War II-era planes: a T-28 trainer, a B-25 Mitchell, a C-46 Commando transport/cargo plane, and a Navy SNJ version of the AT-6 Texan.

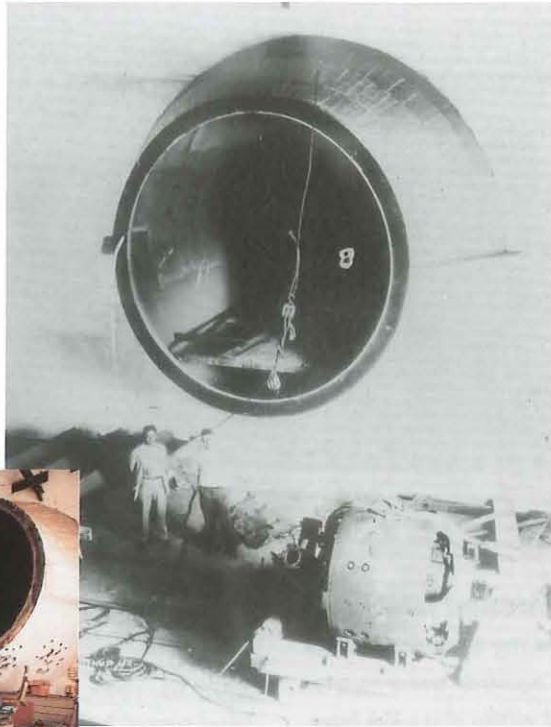


Top right: Guggenheim Aeronautical Laboratory from the south, showing the entrance (detail top left) to the wind tunnel, in 1929. Above: the wind tunnel staff in front of the newly completed test section; from left: W. Tollmien, R. Seiferth, W. Bowen, C. Millikan, H. Bateman, T. von Kármán, A. Klein, F. Wattendorf, E. Sechler, W. Oswald, F. McFadden, and F. Moyers.

GALCIT's 10-foot wind tunnel, the biggest and fastest on the West Coast when it was finished in 1929, was ceremoniously decommissioned April 30, 1997. Early in its 68-year history, the wind tunnel had helped establish Southern California as the aircraft-manufacturing capital of the country; it tested most of the warplanes that helped the Allies win World War II; and many generations of Caltech students learned hands-on aeronautics in its giant test section. But in recent years the 10-foot tunnel had begun to show its age, and the venerable facility needed to make way for a smaller, more cost-efficient model, incorporating new technology.

More than 200 wind-tunnel veterans and aviation fans attended the decommissioning, as four World War II-vintage planes buzzed the campus in salute to their birthplace. During May some tunnel components, including the huge test section, were dismantled and shipped off to rest in various museums across the country; the balances, which measured the aerodynamic forces acting on a model in the tunnel, will be displayed in the Smithsonian Institution in Washington, D.C.; the test section went off to Fantasy of Flight in Polk City, Florida; and various other pieces, as well as wind tunnel models, were parceled out to the Los Angeles County Museum of Air and Space, the Western Museum of Flight, and the Heritage of Eagles Museum. The rest was sold for scrap. The cavernous space occupying four stories inside Guggenheim Aeronautical Laboratory now stands almost empty, save for a few hundred tons of concrete that may be very hard to remove.

The wind tunnel and the building were built simultaneously, beginning in 1926 after Robert A. Millikan persuaded the Daniel Guggenheim Fund for the Promotion of Aeronautics to come up with \$300,000 (\$180,000 for building and equipment, including the wind tunnel) to build Caltech's aeronautics program from the ground up. (GALCIT is short for Graduate Aeronautical

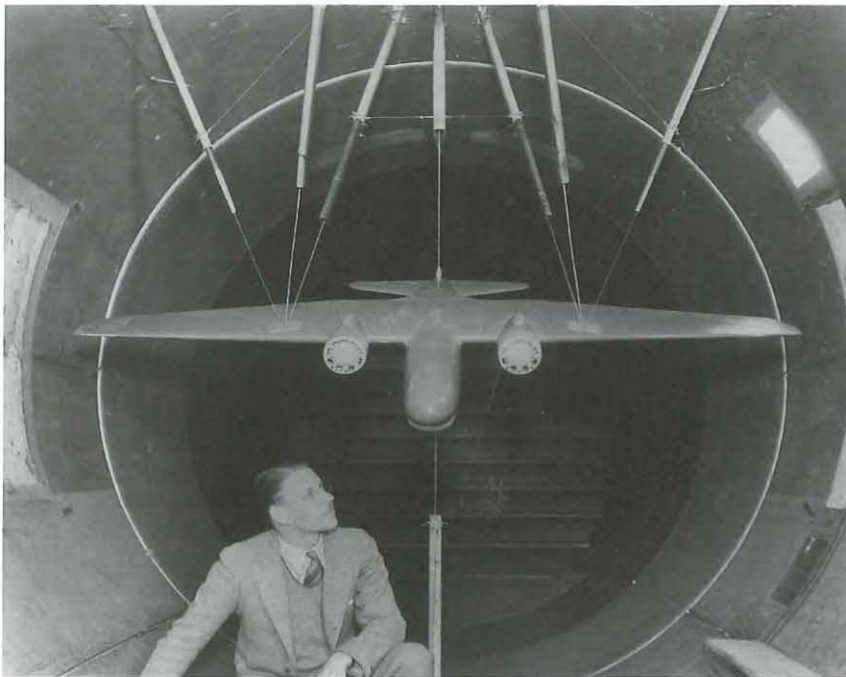


At left is one of the two concrete entrance cones, which neck down the air flow from a 20-foot diameter into the 10-foot test section, as it was installed in 1929. Unfortunately, they were built so solidly that they have created a massive removal problem in 1997. They're still there (far left).

Laboratories of the California Institute of Technology, but originally the G stood for Guggenheim.) Millikan also lured Theodore von Kármán, probably the most distinguished aeronautics professor in the world, from Germany to Southern California to lead the new program. He remained director of GALCIT until 1949, and was followed by Clark Millikan (1949–66), Hans Liepmann (1972–85), and the current director, Hans Hornung. Although von Kármán didn't settle here permanently until 1930, he helped design the wind tunnel while on an exploratory lecturing expedition in 1926.

It occupied most of the core of the new building—a space 46 feet tall, 100 feet long, and 25 feet wide. Powered by an electric 750-horsepower World War I submarine motor, its propellers created wind velocities of up to 200 mph. And yes, the propeller blades *have* on very rare occasions been flung loose. Jerry Landry, the current manager of the wind tunnel, remembers such an occasion in 1962 when the hub failed, “allowing various pieces of hub and blades to seek new resting places.” The result registered as a small earthquake on the Seismological Lab's instruments.

From the beginning, the wind tunnel was expected to do double duty as a teaching and research facility—including commercial research. Northrop's six-passenger Alpha in December 1930 was the first airplane tested—of more than 1,100 commercial tests. Besides Northrop, numerous other aircraft companies used the tunnel during the thirties, including Boeing, Lockheed, Hughes, and Douglas. The Douglas DC-1, -2, and -3 (and eventually all of them up to the DC-10) were



Above: Clark Millikan with a model of the DC-3 in 1935. The planes were suspended upside down for testing in the wind tunnel; the balances that weighed the aerodynamic loads are above. Right: (from left) the first aircraft tested in the tunnel, the Northrop Alpha (1930); an early version of the B-17 (1935); and the P-38 (1937).



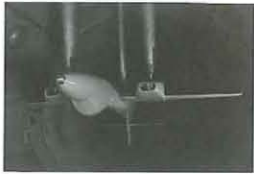
Left: The General Motors Stingray coupe was tested in the wind tunnel in 1959 (it came on the market in 1963).



tested here, but it was during World War II that the 10-foot wind tunnel performed its most valuable service.

From 1930 on, students were employed on a part-time basis to man the wind tunnel (and gain practical experience), but during the war, the staff expanded to as many as 60 (in addition to military personnel in aeronautics training), as the tunnel was kept running for three shifts a day, seven days a week, to help develop military aircraft. Most of the warplanes that played such a crucial role in the Allied victory spent a portion of their infancy as models at Caltech—from the P-38 Lightning and the P-51 Mustang to the B-17 and B-29. In 1941 the original wire rigging was replaced by a suspension system of rods and links, which allowed for quicker model changes—and solved the problem of planes flying loose from the wires and crashing at the end of the tunnel. (The original work section, made of two-inch redwood, was also replaced at this time by one made of steel and wood paneling.) The suspension system survived till 1987, when it succumbed to the Whittier Narrows earthquake, putting the 10-foot tunnel out of the aircraft business.

But there was still a steady diet of structures and surface vehicles to keep the wind tunnel busy—antennas, oil-drilling platforms, airport towers, stadiums, street lighting, supertankers, as well as human subjects such as bicyclists, skiers, an Olympic luge rider, and current director Hornung demonstrating the wind speed of Hurricane Hugo for *Nightline*. And of course automobiles—from land-speed record holders (*E&S*, January 1982 and No. 1, 1997) to more common vehicles. General Motors tested its early Corvette here in 1953, and more recently the wind tunnel has hosted the likes of the new EV-1 and its predecessors—the Impact and the solar Sunraycer (*E&S*, Winter 1988). The last test—of a portable helicopter hangar—was conducted in February 1997. Then a bit of history was carted off to the museums. □ —JD



Above: (top) the Spruce Goose (1944), inverted, that is, right side up; (bottom) an early jet aircraft, the Curtiss-Wright XP-87 (1947). The more substantial suspension system replaced the wire rigging (opposite page) in 1941.



Top: Some of the wind tunnel's old timers take a last look inside the test section during the day-long decommissioning ceremonies in April.

Bottom: Hoisted out of Guggenheim by crane, the 1941-vintage test section, diffuser, and a portion of the contraction await transportation to Florida's Fantasy of Flight.