NASA Facts

National Aeronautics and
Space Administration

Langley Research Center
Hampton, Virginia 23681-0001

804 864-3293

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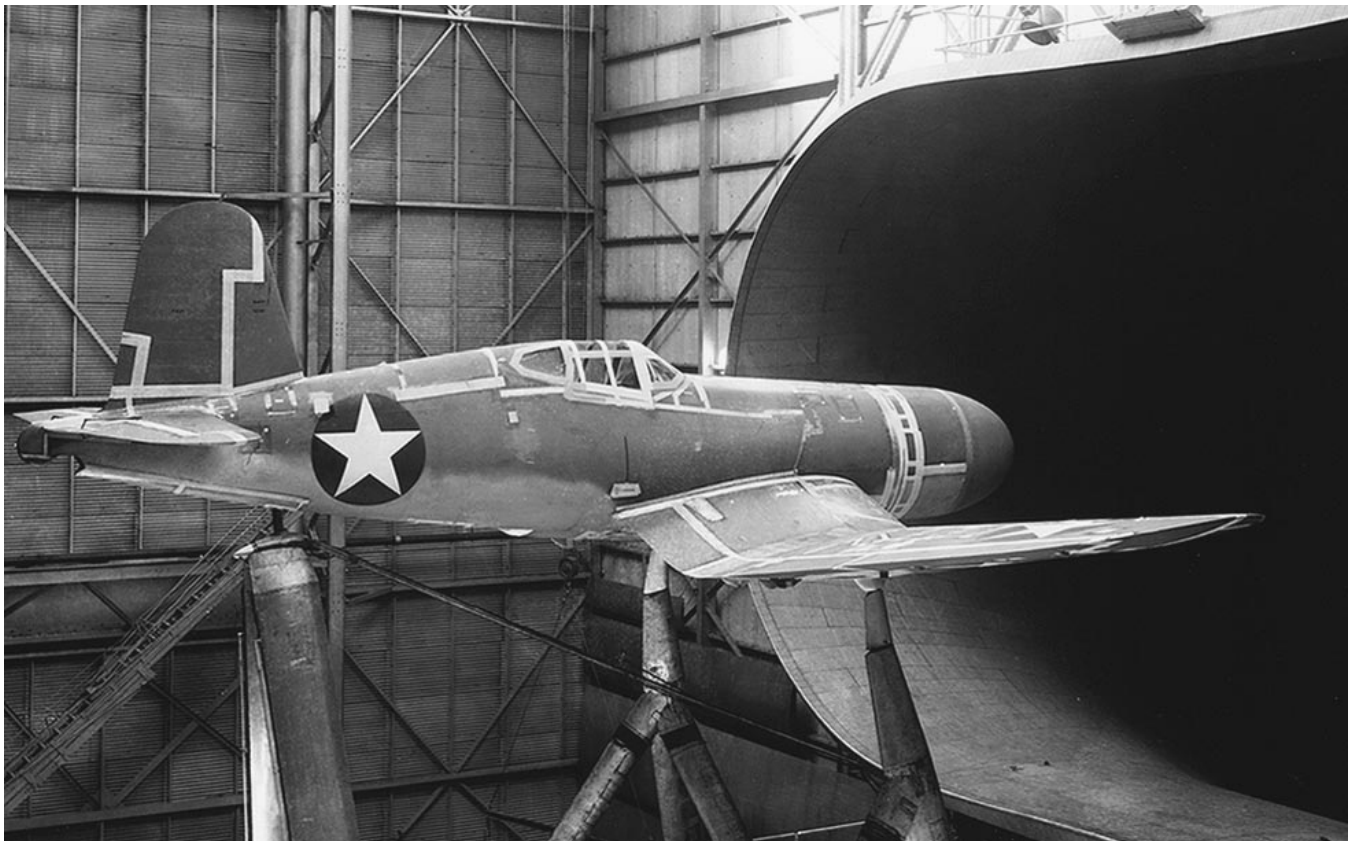
NASA Langley's 30- by 60-Foot Tunnel

The 30- by 60-Foot Tunnel, located at Langley Research Center, Hampton, Va., was NASA's oldest operating wind tunnel until its closing in October of 1995. Originally known as the Full- Scale Tunnel (FST), it was in operation for over 64 years. It was the largest wind tunnel in the world until 1945 and in 1985 was named a National Historic Landmark. Throughout the 30- by 60-Foot Tunnel's history it has been used to test everything from World War II fighters, to submarines, to the Mercury capsule to concepts for a supersonic transport.

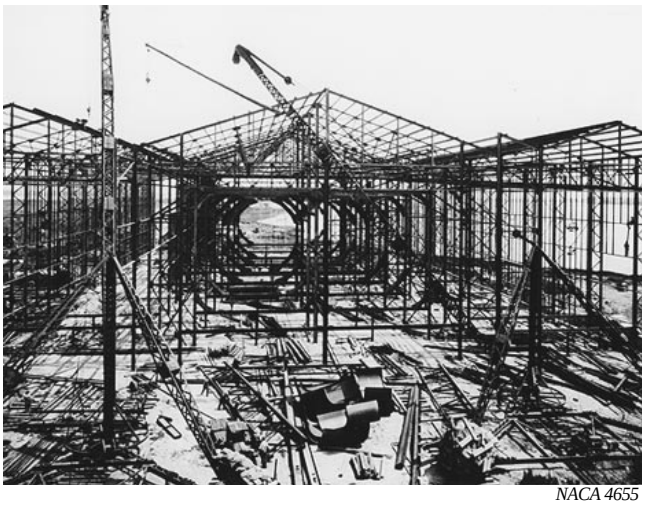


LMAL 30652

The Vought F4U-1 Corsair airplane was among many that were tested at the "30 by 60" for 'drag cleanup" during WWII.

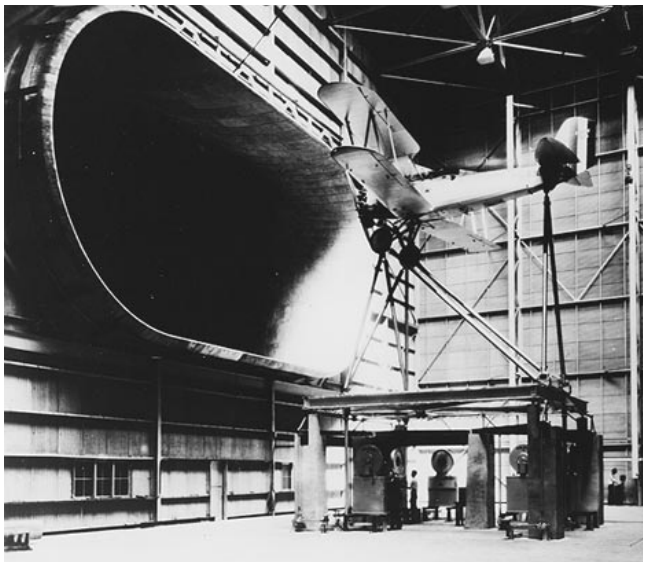
What is the 30- by 60-Foot Tunnel and How Does it Work?

The 30- by 60-Foot Tunnel is a subsonic wind tunnel originally designed for the static testing of full-scale models and actual airplanes at operational flight speeds. Such ground-based testing eliminated scale effect and provided basic information prior to and during flight testing. Contemporary studies in the tunnel often focused on stability and control characteristics and high-lift capability for both civil and military aircraft.



NACA 4655

This photograph from 1930 shows the 30- by 60-Foot Tunnel during construction. The framework is solid steel. Like many early wind tunnels, the 30- by 60-Foot Tunnel featured "inside-out" construction, with structural supports on the outside. The circular frames indicate where the two 35-foot propellers are located today.



NACA 5553

On May 27, 1931, the National Advisory Committee for Aeronautics (NACA) dedicated its new "Full Scale" wind tunnel. The Navy Vought O3U-1 was the first complete aircraft to be tested.

The overall tunnel is 434 feet long and 222 feet wide, with a maximum height of 97 feet. The actual test section is an open-jet 30 feet high, 60 feet wide and 56 feet long. Two four-bladed wood (originally cast aluminum alloy) propellers, each 35.5 feet in diameter and powered by a 4,000-horsepower motor, produce the air stream. During normal operation, the two motors use approximately 3 megawatts of electricity. The tunnel is a closed-loop design, with two return passages that allow for continuous air flow at speeds ranging from 25 to 120 mph.

History

In early 1928, Dr. Joseph S. Ames, chairman of the National Advisory Committee for Aeronautics (NACA, NASA's predecessor), wrote the U. S. Director of the Budget explaining the need for a full-scale wind tunnel. Smith J. DeFrance, who had previously worked with Langley's variable density tunnel (VDT), was chosen to lead the planning for such a full-scale tunnel. After convincing Congress that the 30- by 60-Foot Tunnel would be worth its cost of almost a million dollars, the NACA asked for a two-year appropriation of $900,000 to construct the tunnel. This request was granted on Feb. 29, 1929.

Because the 30- by 60-Foot Tunnel was designed and built during the Depression, DeFrance's team was able to take advantage of cheap materials and a large pool of unemployed engineers. Before constructing the tunnel, DeFrance's team first built a 20-percent scaled model to study the air flow, as the tunnel was to be the first with an elliptic throat (the throat is the smallest cross section of a wind tunnel – in this case the throat is elliptically shaped and at the entrance to the test section) and with two propellers mounted side by side.

In February 1930, a contract was signed with the J.A. Jones Construction Company and construction of the actual tunnel began. The completed 30- by 60-Foot Tunnel was dedicated on May 27, 1931, during the Sixth Annual Aircraft Engineering Conference. DeFrance's team had not even spent all appropriated funds and returned the excess money to the Treasury

L 89-07075

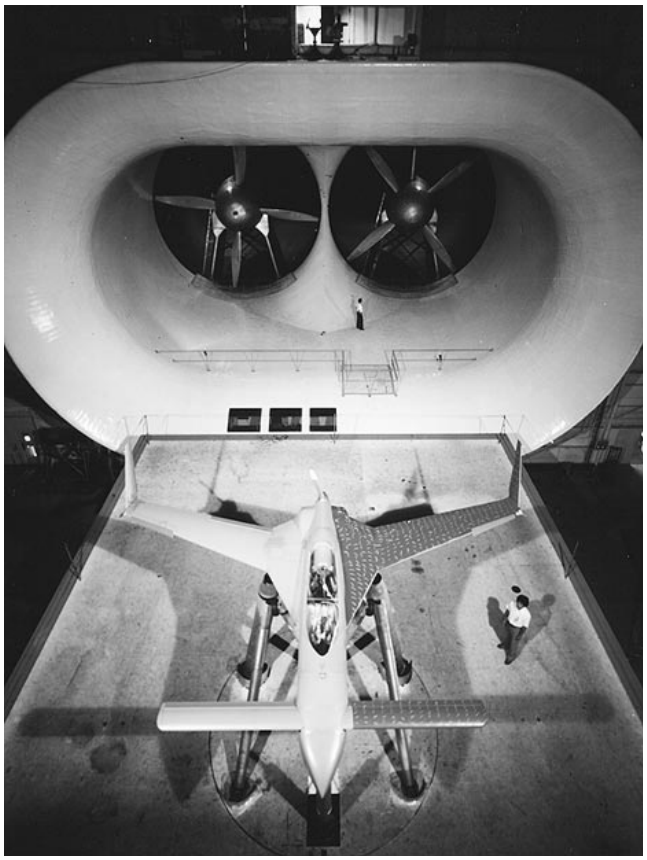
This large white building houses the 30- by 60-Foot Tunnel. It is located in the original, East Area of NASA Langley Research Center. Built in the early 1930s, the continuous air flow test facility occupies the whole building. The power station in the foreground supplies energy for two 4000-horsepower motors that run the tunnel's huge propellers.

Testing

The 30- by 60-Foot Tunnel has provided design information on many military, commercial and general aviation configurations. Its many contributions include fundamental aerodynamic testing of full-scale aircraft during the 1930s; drag reduction or "clean up" studies of full-scale military aircraft during World War II; testing of the Albacore, the fastest submarine in the world in 1950; testing of the nation's first spacecraft, the Mercury capsule; testing of full-scale general aviation aircraft; free-flight testing of models of significant vertical takeoff and landing aircraft; and testing of lifting body, supersonic transport and present-day military aircraft configurations.

L 59-336

NASA technician checks the Mercury capsule prior to testing in the 30- by 60-Foot Tunnel in 1959. The Mercury program got its start at Langley shortly after NASA was established in October of 1958.



L 81-07333

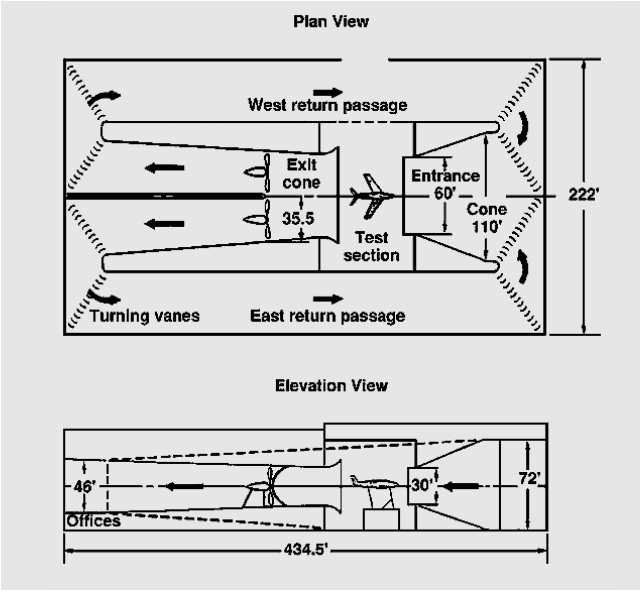
This unusual canard (tail-first) configuration underwent tests in 1981 aimed at increased flight safety for light planes. The plane is an all-composite light plane called the "VariEze."

L 87-08104A

A dynamically scaled model of a McDonnell Douglas modified F-18 Hornet is shown during a free-flight test. The model is powered by compressed air through the attached cable. Researchers used this test to evaluate thrust vectoring, a promising new concept for enhanced maneuverability for military aircraft.

Over the years the interior of the tunnel has been modified several times to adapt to changing needs. In the 1960s and 1970s, the tunnel underwent renovation and was equipped for free-flight dynamic model testing. In recent years, the tunnel has been extensively used for such free-flight testing, a technique unique to the facility. Free-flight testing involves flying remotely piloted 10- to 20-percent scaled models in the tunnel air-stream. Such testing allows researchers to assess flight characteristics and evaluate control options without risking an airplane or pilots' lives.

The 30- by 60-Foot Tunnel will be officially closed Oct. 27. NASA Langley is a federal custodian of historic properties, in conformance with the provisions of the National Historic Preservation Act.



This plan view depicts the air flow through the 30- by 60-Foot Tunnel. Air is drawn through the test section by two 4,000 horsepower electric motors driving two 35.5 ft. propellers. The air flow is divided beyond the exit cone and is circulated through two return passages.

L 75-00734

This large model is an early design for a supersonic transport plane tested for low speed characteristics in the 30- by 60 in the mid 1970s.