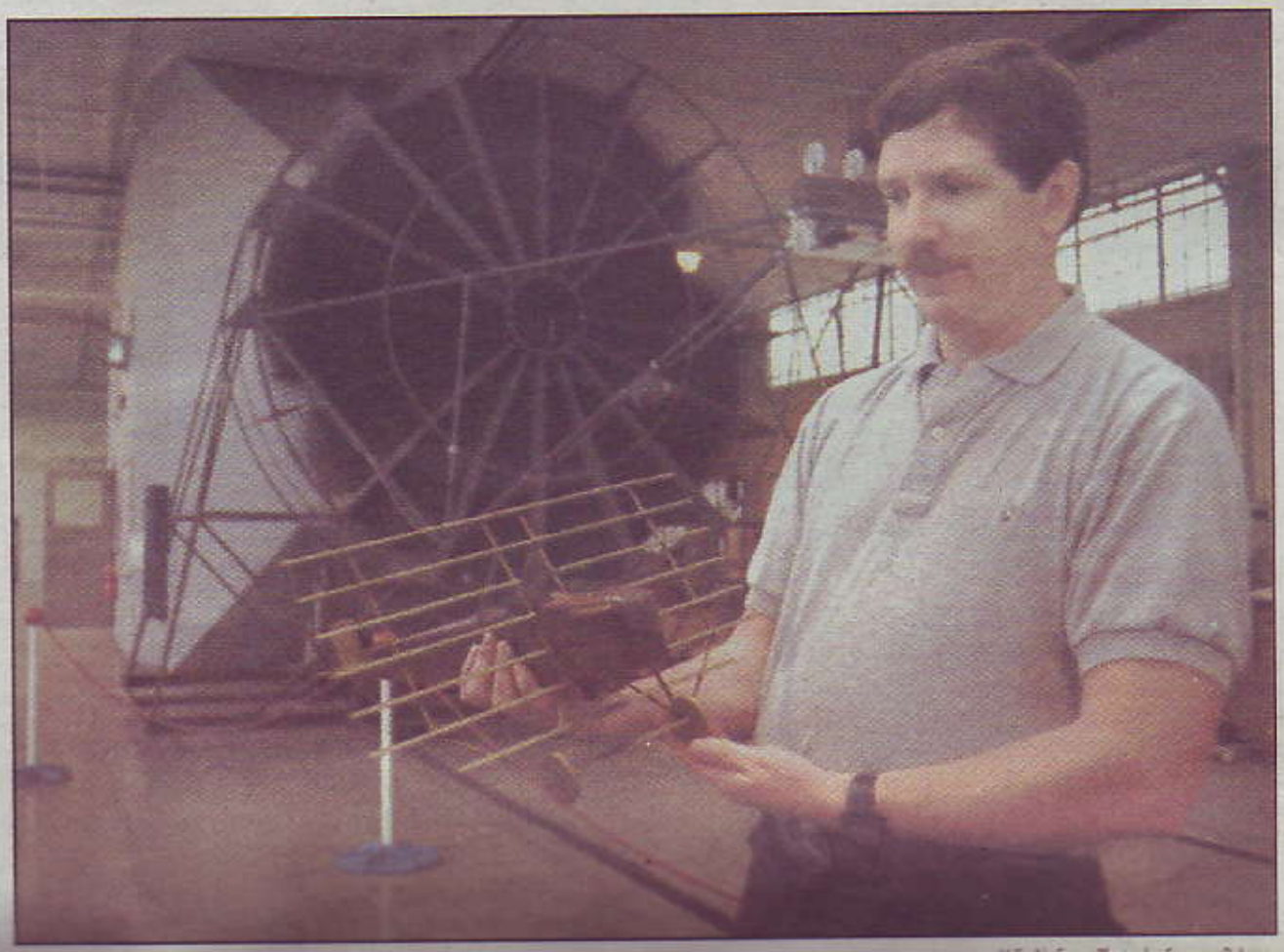
Skywrighter

Wright-Patterson Air Force Base, Ohio

Friday, March 17, 1995



U.S. Air Force Photos by Spencer P. Lane

Charles McNeely, an Air Force Institute of Technology electronics lab technician, holds a model of an early seven-wing aircraft tested in the 5-foot wind tunnel. In the background is the tunnel's air straightener.

National Historic Engineering Landmark

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By JIM ALDRIDGE
ASC HISTORY OFFICE

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What do the X-29 and the Barling Bomber have in common? The YB-35 Flying Wing and the X-24C lifting body?

All these aircraft and many others are products of one of Wright Field's most venerable and durable facilities – the 5-foot wind tunnel. It is in recognition of this facility's many contributions to aeronautical development that the American Society of Mechanical Engineers will enroll the 5-foot wind tunnel as a National Historic Mechanical Engineering Landmark on Wednesday.

Models of early aircraft tested in the 5-foot wind tunnel sit on storage shelves in Bldg. 19.

The 5-foot wind tunnel is the oldest operational wind tunnel in the world today. It was built in 1921-1922 for use by McCook Field's Engineering Division. At the time, McCook had only a small 14-inch tunnel, built in 1918, for use during World War I. All work requiring a larger facility had to be contracted out at great inconvenience and expense.

McCook Field engineer E.N. Fales had originally recommended an 8-foot tunnel. However, no building at McCook was large enough to accommodate a tunnel of this size – "THIS FIELD IS SMALL," declared a sign over McCook's main hangar doors. Fales scaled back the tunnel's design to 5 feet.

McCook's wood shops, under the direction of R. J. Myers, built the tunnel – as often happened in those days – without detailed design drawings or specifications. The tunnel included a test section in which a scale model of an air vehicle or vehicle component – such as an airfoil – was placed to test its aerodynamic characteristics.

This was accomplished by passing a controlled airstream, generated by large fans at one end of

See Wind tunnel, Page 3

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12 – The senior master sergeant selection list was released Tuesday; 24 from Wright-Patt are selected.

33 – When it comes to the American Red Cross, these volunteers really know how to give their hearts.

Wind Tunnel

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the tunnel, over the model. Researchers, by applying a variety of calculations, could then derive the model's lift and drag coefficients.

The completed tunnel measured 96 feet in length and 5 feet in diameter at the throat. Four Sprague dynamometers (left over from Liberty engine production) powered two 12-foot counterrotating fans arranged in tandem, mounted at one end of the tunnel downstream of the airflow. An air flow straightener located at the tunnel's intake bell was mounted on rails so that it could be moved to place models in the test section.

U.S. Air Force Illustration

This illustration shows a cross-section of the 5-foot wind tunnel in its hangar at McCook Field.

When completed, the 5-foot wind tunnel could generate winds up to 260 miles per hour and was rated the most efficient tunnel in the world at that time. Fales estimated that tests performed in the tunnel amounted to only 1 percent of the total cost of developing and testing a new air vehicle. Models of proposed new aircraft were routinely tested in the tunnel before constructing a flight test prototype. If a model design failed to demonstrate sufficient efficiency in the tunnel, the design would be modified or scrapped.

McCook's engineers put the tunnel to immediate use testing all variety of aircraft and their components. One early test series in which tunnel operators took considerable pride was that of the XNBL-1 Barling bomber. Named for its designer, Englishman Walter J. Barling Jr., the bomber sported a two and a half wing design and six engines. McCook's model shop fabricated a 1/70th scale model of the aircraft, complete with movable rudders, elevators, and ailerons. The tests, conducted in late 1922, proved indispensable in ascertaining the Barling's degree of stability, together with lift and resistance.

In addition to airplanes, McCook engineers also used the 5-foot wind tunnel to determine the most efficient shape for dirigibles and to develop special accessories for aircraft, including regulating windmills for radio generators, compensating gunsights and air deflectors for open cockpits.

In October 1927 the Air Corps moved its engineering operations across town from McCook to newly opened Wright Field. The 5-foot wind tunnel was disassembled in February 1928 and transported to Wright Field where, in February 1929, the tunnel was reassembled in Bldg. 19, which had been constructed specifically to house it.

During the 1930s Wright Field's Materiel Division tested models of almost every aircraft procured by the Air Corps in the 5-foot wind tunnel. The Division's Experimental Engineering Section also conducted significant research into a type of aircraft instability called "flutter."

Wright Field's Aircraft Laboratory operated the 5-foot wind tunnel during World War II and into the 1950s, performing aerodynamic tests of new aircraft and missile systems. In 1958, the Aircraft Laboratory turned operation of the tunnel over to the Air Force Institute of Technology.

Under AFIT's direction the 5-foot wind tunnel has supported both student thesis projects and continuing research by the Air Force, other government agencies and industry. Aircraft benefitting from the 5-foot wind tunnel include the F-15, the EC-135 ARIA and the X-29. The tunnel also has been used to determine the aerodynamics of skyscraper designs, soap box derby models and bicycle wheels for use by the U.S. Olympic team.

Bicycle wheels? Wilbur and Orville Wright would surely have smiled at this. It was, after all, Dayton's two most famous bicycle makers who used a homemade wind tunnel almost a century ago to acquire critical aerodynamic data for their invention of the world's first successful airplane.