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Langley Reseach Center

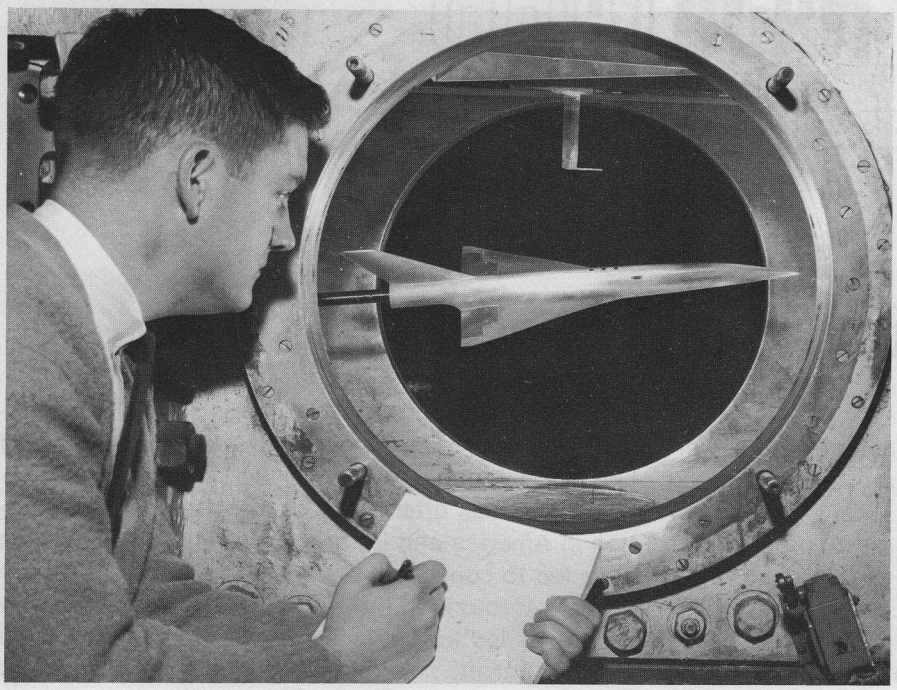
HAMPTON, VIRGINIA

Langley Research Center, the senior field establishment of the National Aeronautics and Space Administration, was founded in 1917. During the half-century since, the Center has been a focal point of our nation's research into the problems of flight and has contributed extensively to the search for practical solutions.

In Langley's more than 50 years of service to the Nation, the speed of airplanes has increased from less than 100 miles an hour to more than 4,000 miles an hour, and the epoch of the exploration of space has begun.

Langley has often been called the cradle of aviation in America and its developments in aeronautics have led to consistent advances in civil and military aviation throughout the world. In fact, the technology which has led to the development of most all United States aircraft, and indeed, a noteworthy share of America's spacecraft as well, has its origins at this Center. It was the first and, until 1940, the only

Aerial view showing the major facilities of the Langley Research Center of the National Aeronautics and Space Administration, Hampton, Virginia.



Aeronautical studies carried out in wind tunnels at Langley Research Center, on a hypersonic (the next higher speed range beyond supersonic) transport concept. A blended-body-wing model of a hypersonic cruise configured transport is being examined in Langley's 20-inch Hypersonic Tunnel. It is being evaluated under rigidly controlled conditions closely simulating real flight.

national laboratory for aeronautical research.

Named in honor of a pioneering American scientist, Samuel Pierpont Langley, the research center occupies 770 acres of Atlantic Coast waterfront land in Hampton, Virginia. Professor Langley, a brilliant scientist of the late 19th and early 20th centuries, is credited with the first practical demonstration of unmanned mechanical flight. While Secretary of the Smithsonian Institution in Washington, D.C., he built and flew a powered model aircraft on May 6, 1896.

From the beginning, research at Langley was conducted systematically, in ground facilities — notably wind tunnels — and in flight. Airplanes of World War I vintage were the earliest flight research tools. The first Langley wind tunnel, with a test section five feet in diameter, began operating in 1920, but within a decade it was joined by a variety of new, highly specialized tunnels which represented several innovations in research equipment design.

Early Langley contributions included: the systematic development of airfoil shapes; full scale research on propellers; the famous NACA cowling in 1929; the precise engineering definition of airplane handling qualities; research on engine cooling; the development of superchargers; refinements for airfoils with various kinds of flaps.

During the Wold War II period, Langley furnished personnel and research techniques to found other research establishments, now important parts of the National Aeronautics and Space Administration. They include the Ames Research Center, Moffett Field, California; the Lewis Research Center, Cleveland, Ohio; the Flight Research Center, Edwards, California; and Wallops Station, Wallops Island, Virginia.

All comprised the nucleus around which NASA was formed on October 1, 1958, and all continue to provide essential research to meet the national goals in space and aeronautics.

The engineering skills and expertise of Langley and other NACA research laboratories were wholly devoted during World War II to making U.S. military airplanes superior in every respect. Langley wind tunnels worked around the clock to add to fighter plane speeds by reducing drag. Critical design problems of engine cooling and cowling were also tackled and solved.

The emphasis on speed brought aeronautics to the threshold of supersonic flight, and led to a joint NASA-military program to build and fly airplanes specifically intended to produce research information. One of these — the Bell X-1 — first accomplished supersonic flight in 1947.

Langley also led the way in developing the slotted wall wind tunnel for transonic research, and with it came the "area rule" aircraft design concept for reducing transonic drag.

The supersonic transport program which the United States is now pursuing had many of its origins in a concentrated Langley research effort to develop

and refine the aeronautical technology needed to make such aircraft efficient and versatile. The variable sweep principles used in the SST design were devised and patented by Langley scientists, and the wind tunnels and other facilities at the Center have contributed many hours of research to ensure success for the project.

Today, Langley's aeronautical research includes investigations of current and future concepts for hypersonic flight vehicles and their propulsion systems; supersonic aircraft of advanced design; helicopters and VTOL-STOL aircraft—subjects of experimentation at Langley since the late 1940's—leading to the development of a vehicle combining vertical or short take-off and landing capability with the good performance and handling qualities of a conventional airplane in cruising flight; and the improvement of subsonic aircraft with particular reference to the operating problems of transports.

Timely research at Langley made it possible for NASA to undertake plans for manned space flight in Project Mercury, the Nation's first manned space flight effort, only a few days after the founding of the agency in 1958. Personnel drawn from the Langley Research Center formed the Space Task Group which managed the Mercury program and later established the NASA Manned Spacecraft Center at Houston, Texas.

Research at Langley contributed similarly to the successful Gemini program, and is continuing to support Project Apollo. For example, the simulation capabilities developed at Langley made possible the early (1962) selection of the lunar orbit rendezvous mode to be used for the Apollo mission. Other simulation studies prepared for the successful demonstration of rendezvous and docking in space, as exemplified by the Gemini program.

Continuing studies in reduced gravity simulation are preparing for the development of improved techniques for extra-vehicular activity — including

Since the inception of the Apollo program engineers and scientists have been studying what effect the moon's low gravitational field — about one-sixth that of earth's — might have on an astronaut's ability to walk, run, and perform other tasks. A simulation technique (Reduced Gravity Simulator) developed by the Langley Research Center, is used to simulate lunar gravity. The test subject in a pressure suit is supported in the simulator by a system of slings, cables, and a trolley which is accelerated by and moves along with the subject as he walks, jumps, or runs. The facility is operated in studies of a variety of factors such as fatigue limit of the subject, energy expenditure and speed of locomotion as affected by lunar soil properties and surface slope.

the use of backpacks and one-man propulsion systems — and for lunar landing and lunar surface exploration by astronauts.

Other research in support of Apollo includes experiments in such areas as dynamics; stability and control; navigation and guidance; earth reentry and landing.

To assist in defining meaningful national goals for future activities in space, Langley has conducted extensive studies of manned orbiting research laboratories. The Center is also continuing research on wingless lifting body configurations and, in another area, assessing the feasibility of using a large telescope in orbit for astronomical observations not possible through the earth's atmosphere.

Langley Research Center also contributes heavily to NASA's unmanned spacecraft program. A Langley scientist conceived the inflatable satellite technology which led to the orbiting of the long-lived Echo I in 1960. From the Echo beginnings have come a series of smaller inflatable satellites from which we have learned much about our earth's atmosphere, and the PAGEOS satellite, almost a duplicate of Echo, which is being used in a long term very accurate geodetic survey of the entire earth.

The highly successful Lunar Orbiter program managed by Langley produced five successful photographic flights within a single year and returned to earth with highly detailed knowledge of the entire moon.

The Scout launch vehicle, the only all-solid fuel rocket with orbital capacity used in the United States space program, was developed and is managed by Langley.

There are many other examples to illustrate the variety of work performed by Langley personnel.

Some of these include the study of the problems of reentry heating in the earth's atmosphere upon return of a vehicle from a planetary mission; meteoroid measurements leading to the development of protective techniques; vacuum effects in space; development of radiation resistant plastics and other materials; investigation of decelerator devices which may be used in planetary explorations of the future; the development of instrumentation techniques which are required by operations in the space environment; experiments in electric propulsion and solar physics; and radio attenuation measurements to improve space communications.

Langley's principal aims are to engage in basic and applied research to advance aerospace flight; to generate new and advanced concepts for future NASA programs; to advise and provide research assistance to other NASA organizations and government agencies; to search for and identify potential industrial applications evolved in the course of research; to plan, develop and operate necessary facilities; and to prepare for appropriate dissemination of scientific and technical information resulting from research activities.

The staff at Langley numbers about 4,000 — of whom about a third are engineers and scientists. At their disposal is a carefully integrated grouping of research facilities, an invaluable national resource dedicated to keeping America strong in the air and in space.

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