Happy Birthday, Langley!

NASA's eldest celebrates its 75th anniversary

by James Schultz

Few anecdotes from the history of flight research are as unusual as the one told about German-born aerodynamicist Max Munk.

Already a respected figure in the National Advisory Committee for Aeronautics (NACA) by the time he came to work at what was then called the Langley Aeronautical Laboratory in 1926, Munk had an autocratic, brook-no-dissent management style. It didn't take long for him to alienate a talented staff, resulting in his abrupt departure after only a year. Officially, Munk is remembered at Langley for his brilliance as a theorist; unofficially, for a stubborn highhandedness that clashed with the center's collegial, egalitarian culture.

As the story goes, Munk decided while at Langley that he wanted to learn how to drive. Ignoring the able instruction offered by a wind tunnel technician on his staff, he vowed to go it alone. He drew up a map of the road between his home in Hampton, Virginia and the Langley complex, calculating the exact distance between the road's various curves and the precise amount the car would need to turn at each of those curves. Munk then hung a string from the top of the steering wheel and applied

A model of a supersonic transport plane is tested in Langley's 30 × 60 ft. wind tunnel which has been operational since 1931.

numbered pieces of tape to indicate the degree of manipulation required to negotiate each turn. By driving at a predetermined speed, and with the help of a stopwatch and the aforementioned map, he successfully and safely navigated his way to and from the office.

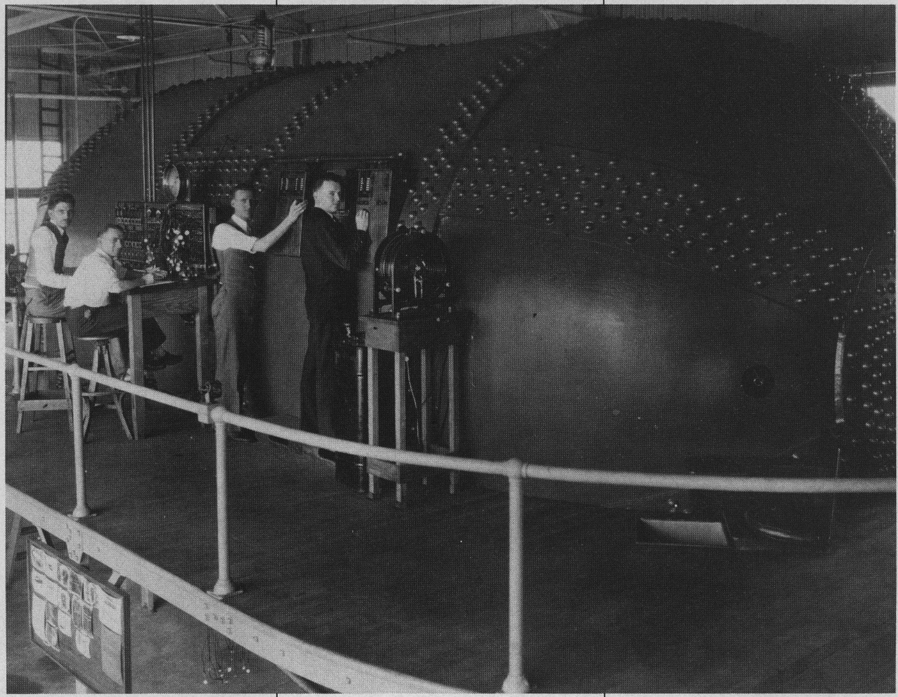
In his book, *Engineer In Charge: A History of the Langley Aeronautical Laboratory 1917-1958*, historian James Hansen calls this story "a sort of local legend, an extravagantly exaggerated one."

But there's also truth in it, he says.

"The key thing is that the folks at Langley tell such stories themselves," explains Hansen. "It's the flip side of the same coin. On one hand, the Munk story appears to be a critical one about someone losing it and going too far. But at the same time, the storytellers take pleasure in the telling: It's a mark of distinction to be that ingeniously different from everybody else."

Self-sufficient ingenuity has always been one of the Langley Research Center's great virtues. As the eldest offspring of NACA and the nation's first federally funded civilian aeronautical research facility, the center began its life making do with limited resources. But make do Langley did, sometimes in spectacular fashion.

The laboratory was responsible for developing a number of the basic devices and procedures that made the modern airplane possible. Later, as a NASA research center, it led the way in developing America's manned space program. On July 17, the men and women of Langley celebrated 75 years of preeminent achievement in the technology of flight.



The variable-density tunnel team in 1929.

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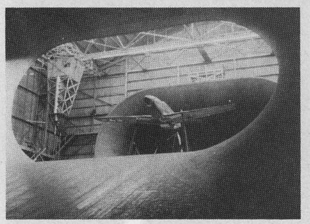


P-51 Mustang in the full-scale tunnel, 1943.

"We've done almost any mission one can think of, from aeronautics to astronautics," says Paul F. Holloway, the current center director. "And we've done it as active partners with industry. One of Langley's major achievements was the establishment of an infrastructure for what came to be known as the aerospace community. That's probably our greatest legacy."

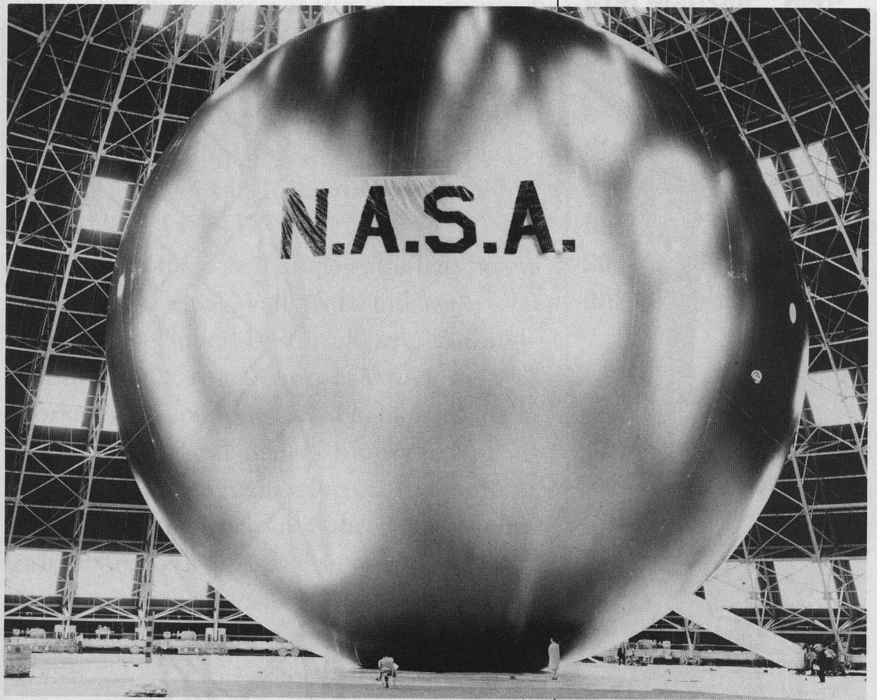
The Young and the Restless

If there was one thing that characterized the laboratory in the early years, it was the youthful enthusiasm of its staff. Most of the young men who came to work at Langley (until World War II, virtually all the research engineers were male) were from northern or midwestern states. Of those, many had grown up in or near large urban areas. To local farmers and fisherfolk, clannish and distrustful of outsiders, Langley seemed less a government facility than a Yankee enclave—and a suspiciously exuberant one at that.

But as time passed, familiarity bred contentment: The locals grew fond of the young engineers who rented rooms in nearby boardinghouses, organized social and athletic functions, and courted young ladies from the surrounding area.

Relatively little was known about airplane flight in the 1920s, so the Langley engineers set out to learn as much as possible. Because aerodynamic theory sometimes lagged behind practical application, the learning was often in the doing.

"Hired fresh out of school with a minimum knowledge of aerodynamics and little

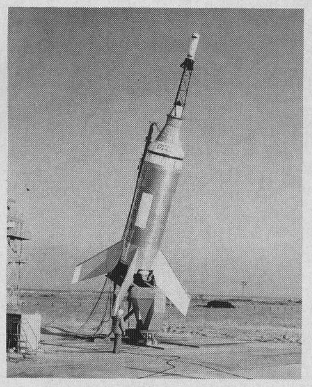


practical experience of any kind, the majority of these early Langley researchers learned nearly everything on the job," writes Hansen. "Because they were so young, they had not learned that a lot of things could not be done, so they went ahead and did them."

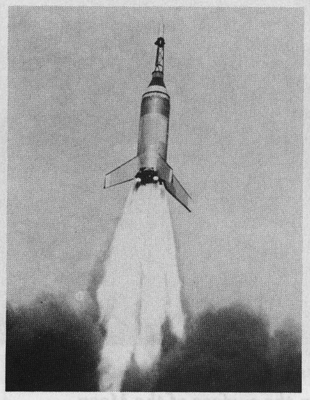
What the government engineers did, in close cooperation with the emerging aircraft industry, was essentially to reinvent the airplane. In 1928 Langley devised the nation's first streamlined engine cowling, a heralded advance that boosted aircraft speeds 16 percent simply by reducing drag. By the 1930s an aeronautics design revolution was well underway: The awkward, wire-braced, fabric-covered wooden flying machines of previous decades yielded to sleek metal craft that were faster and stronger. Planes like the DC-3 became the first of a new generation of aircraft that incorporated technology based on NACA's state-of-the-art aeronautical research.

Along with improved airplanes came efforts to design and build better wind tunnels and related research tools and labs. Starting with the Variable Density Tunnel in 1922, Langley's wind tunnel complex grew ever more sophisticated. One of the most notable achievements was the development by the late 1940s of a slotted-throat tunnel,

Suspended from the ceiling of a hangar, this 100-foot-diameter Echo satellite was test-inflated with forty thousand pounds of air while on Earth; in orbit, it only required a few pounds of gas to keep it inflated.



The Little Joe launch vehicle being prepared for a test launch from Wallops Island in 1960.



which eliminated the "choking" problems that had so bedeviled researchers attempting to unravel the mysteries of the transonic flight regime. Improvements accelerated in succeeding decades. By the mid-1980s, the center's National Transonic Facility was up and running, and by the early '90s the 8-foot high temperature tunnel was being readied to accommodate large-scale hydrogen-fueled scramjet engine testing.

For several generations of motivated engineers, there were few better places to work than Langley. A position at the NACA laboratory in Hampton wasn't a mere job. For many it was a way of life. Even at lunch, equations would be scribbled, erased and rescribbled on marble countertops. Langley was the kind of place an impassioned aeronautical researcher could call home.

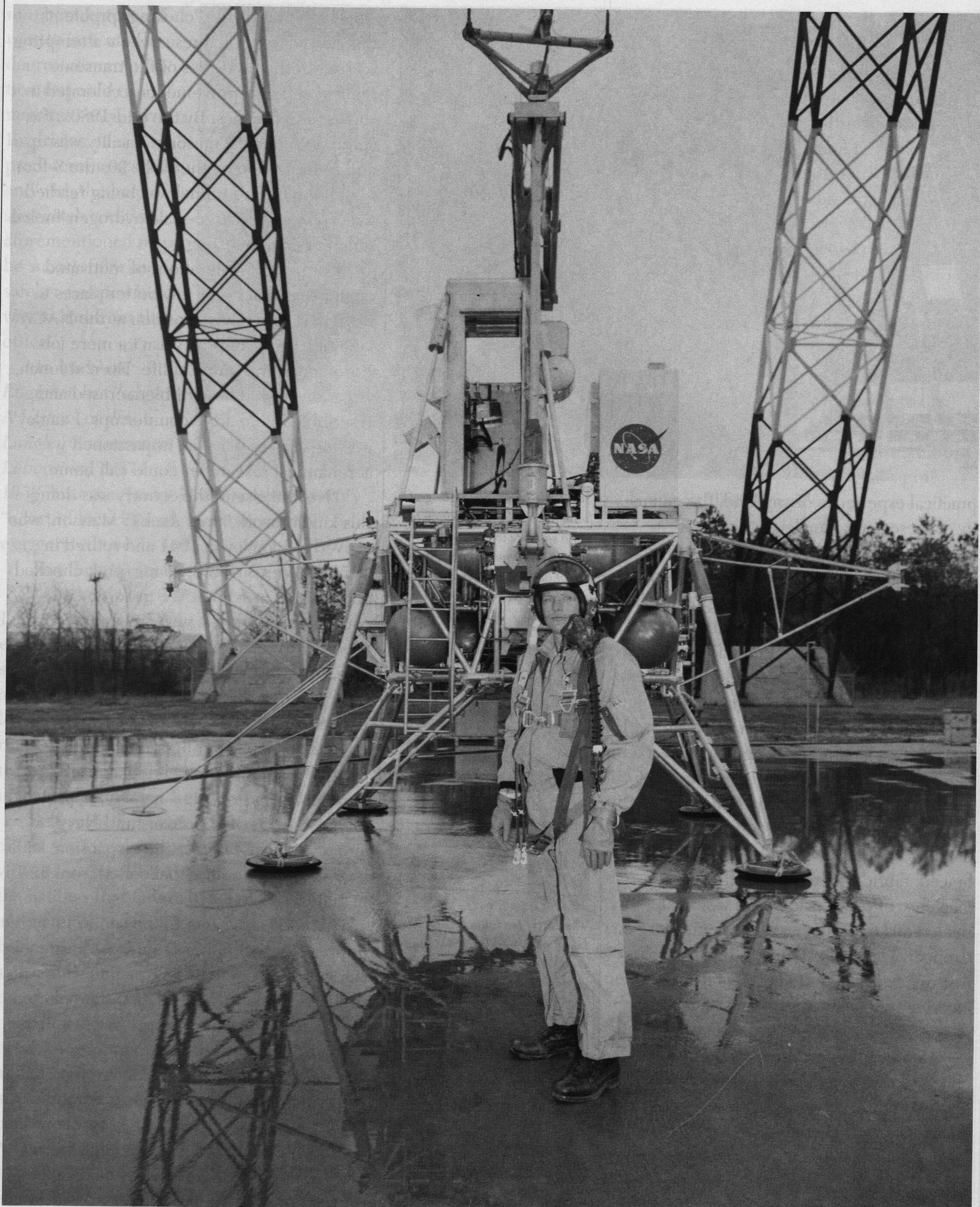
"No one else in the country was doing this kind of work," says Axel T. Mattson, who arrived at Langley in 1941 and retired in 1974. "Here you were, young, pink-cheeked and just out of school. We took [on-site] courses taught by the world's leading experts. It was so exciting it was unbelievable."

Into Space

World War II brought changes to Langley, as basic research took a back seat to more pressing projects—namely, improving the prototypes of U.S. Army and Navy aircraft. Because of wartime expansion, staff levels at the laboratory ballooned from 524 in 1939 to 3,220 by 1945.

Women also came to the center in unprecedented numbers, and one entire job category—"computers," or people who produced slide rule calculations and plotted data curves—became an exclusively female domain. This was not lost upon some of the laboratory's most dedicated male engineers, who quite literally married their computers.

By 1940, two NACA "daughter" centers had been established— Ames in California and Lewis in Ohio—and some of Langley's most accomplished personnel went west to staff these new facilities. Meanwhile, by



Not long after this photo was taken in front of Langley's Lunar Research Facility, astronaut Neil Armstrong became the first human to step upon the surface of the Moon.

war's end the center was turning its research energies toward the problem of breaking the so-called sound barrier. Langley researchers and test pilots played a major role in the effort that resulted in Captain Charles E. "Chuck" Yeager's historic supersonic flight on October 14, 1947.

During the war, Langley also had begun rocket research at Wallops Island, on Virginia's secluded Eastern Shore. Throughout the 1940s, researchers at Wallops worked with sounding rockets in an attempt to understand and analyze transonic and supersonic aerodynamic forces. By the time the Soviet satellite Sputnik broadcast its first orbital beeps to an astonished world in 1957, Langley's rocketeers already were prepared to pick up the gauntlet thrown down by the USSR.

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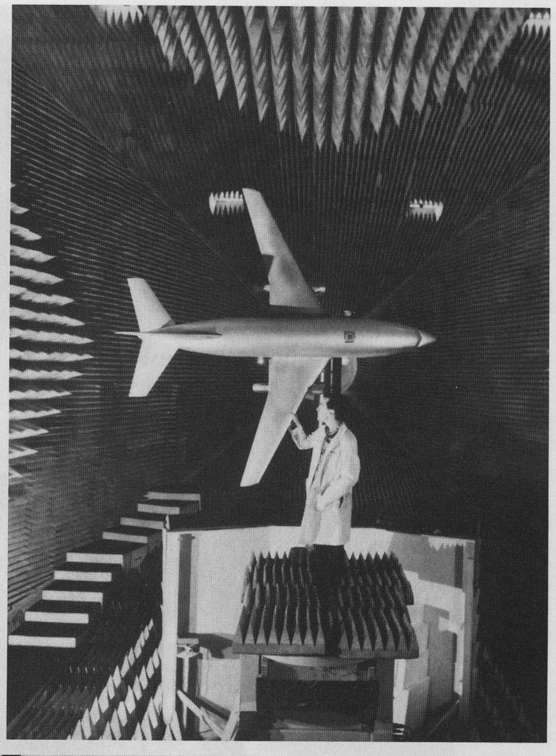
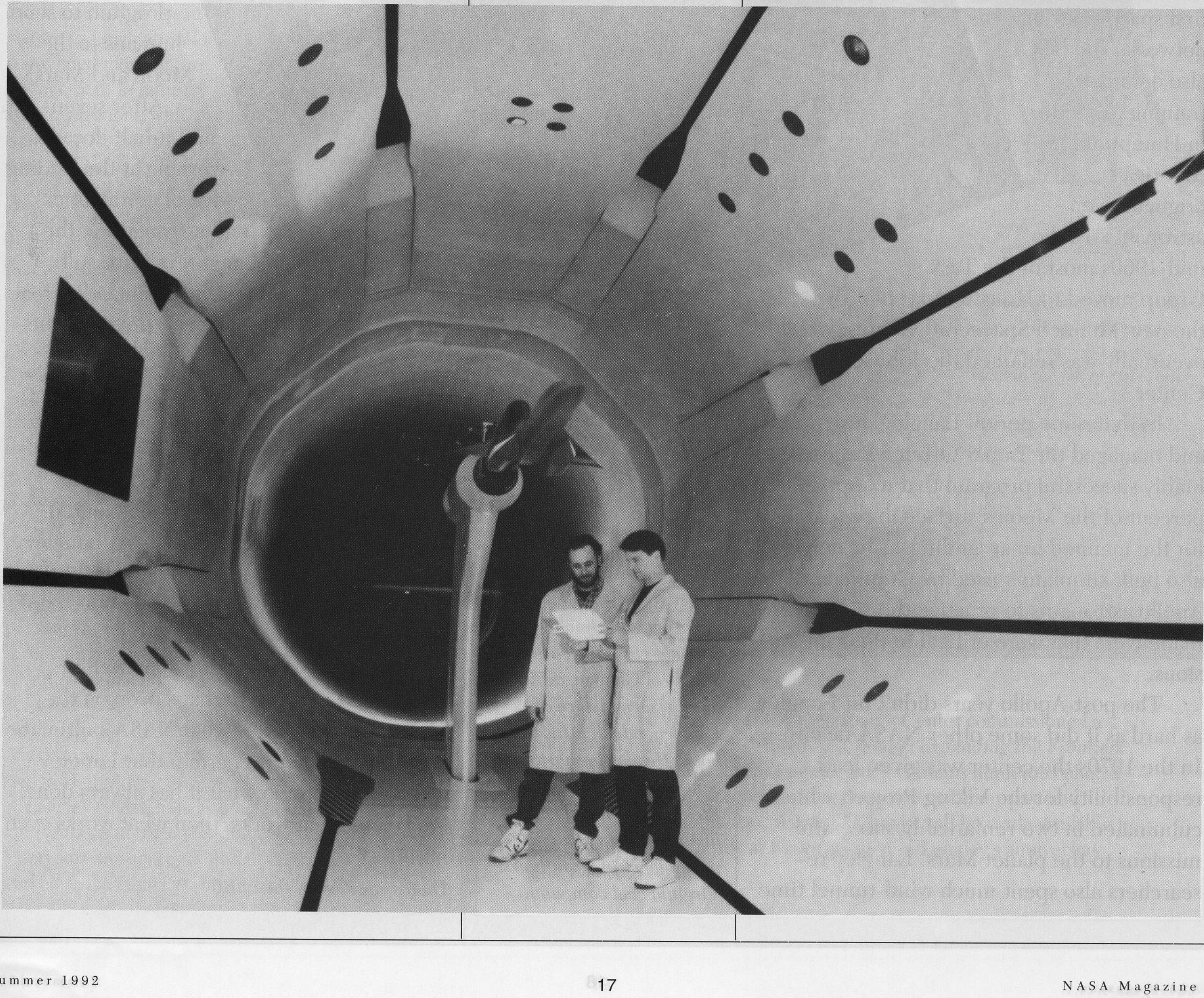


▶ *A model of a Boeing 737 is used to collect data in the Low Frequency Antenna Test Facility.*

Two technicians review the test schedule for a model in the 16-ft. transonic wind tunnel. ▼

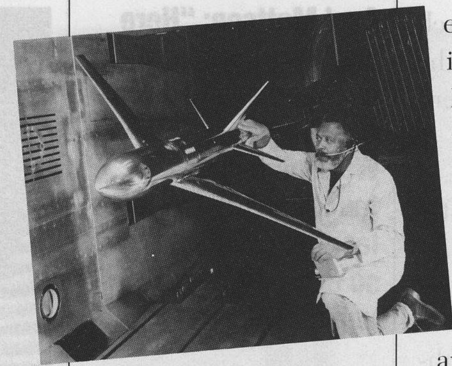


With the space race now underway, aeronautical engineers had a new frontier to challenge them. By the end of 1958, NACA had ceased to exist, replaced by the successor agency known as NASA. So it was that Langley became a Research Center and the de facto leader of the U.S. manned space program.

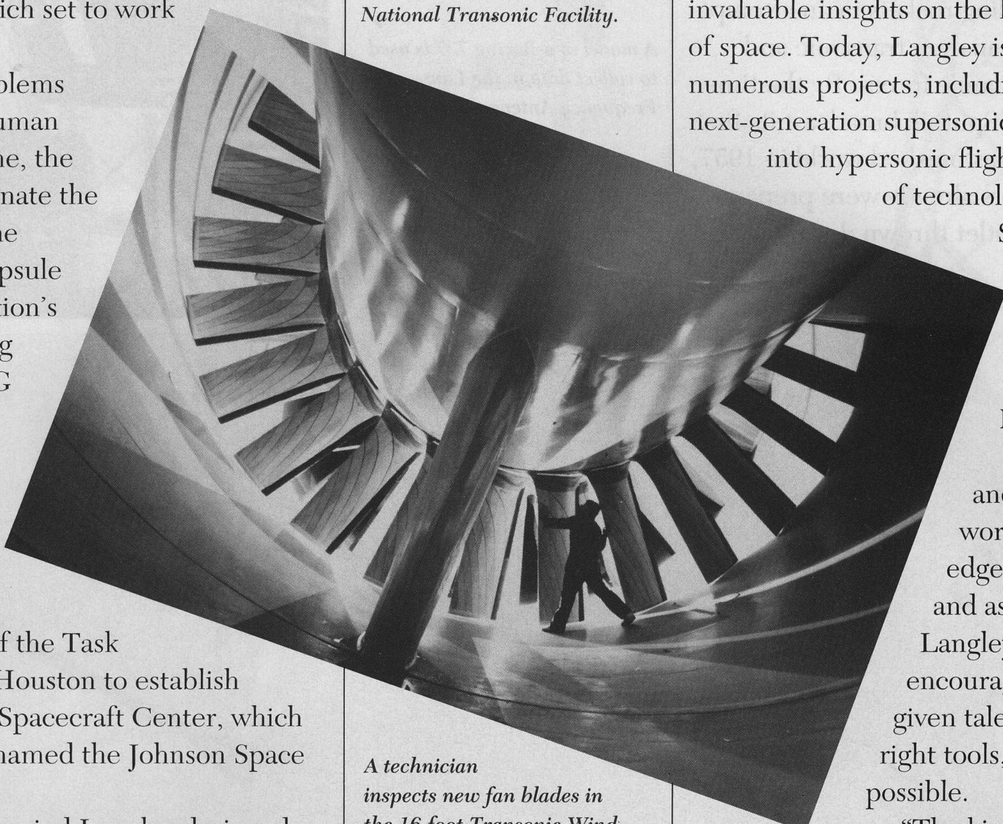
A group of veteran center researchers was organized into the Space Task Group (STG), which set to work to define and solve the problems associated with human spaceflight. In time, the group would originate the first designs for the Mercury space capsule and set up the nation's first space tracking network. The STG also organized a training program in Hampton for America's original seven astronauts. In the mid-1960s most of the Task Group moved to Houston to establish the new Manned Spacecraft Center, which eventually was renamed the Johnson Space Center.

In that same period Langley designed and managed the Lunar Orbiter Project, a highly successful program that mapped 99 percent of the Moon's surface in preparation for the manned lunar landings. The center also built simulators used by Gemini and Apollo astronauts to practice the spacecraft maneuvers that were critical to their missions.

The post-Apollo years didn't hit Langley as hard as it did some other NASA facilities. In the 1970s the center was given lead responsibility for the Viking Project, which culminated in two remarkably successful missions to the planet Mars. Langley researchers also spent much wind-tunnel time evaluating Space Shuttle designs, resulting in significant design improvements.



Inspecting a transport model between test runs in Langley's National Transonic Facility.



A technician inspects new fan blades in the 16-foot Transonic Wind Tunnel.

James Schultz is a freelance writer who specializes in science and technology writing. He is the author of Winds of Change, *a 75th anniversary history of Langley, which is his third book. He also has written a contemporary history of Richmond, Virginia and a history of the rise to prominence of a southwest Virginia coal company.*

By the 1980s, the center's Atmospheric Sciences Division was receiving international recognition for its innovative research, while on the space side, Langley scientists saw one of their prized creations, the Long Duration Exposure Facility (LDEF), launched and retrieved from orbit by the Space Shuttle. LDEF data continue to yield invaluable insights on the harsh environment of space. Today, Langley is hard at work on numerous projects, including studies of a next-generation supersonic aircraft, research into hypersonic flight and evaluation of technologies for the Space Exploration Initiative, a long-term program to send humans to the Moon and Mars.

After seven-and-a-half decades working at the leading edge of aeronautics and astronautics, the Langley culture still encourages the belief that, given talent, time and the right tools, anything is possible.

"The kinds of projects Langley has gone after have involved firsts like the Lunar Orbiter and Viking. That kind of success was unprecedented," says center director Holloway. "At Langley there still is a can-do attitude. Over the years the arguments haven't been over if we could do it; they were over how to do it."

The next NASA center may well be established in orbit, perhaps even on the Moon. But no matter what NASA's ultimate destination, it seems certain that Langley will continue to do what it has always done: figure out what works, then what works even better. •

Photos courtesy of the LaRC

The People Factory

A group from the U.S. Army Corps of Engineers surveys the future site of Langley Field in the fall of 1916, after considering 15 sites throughout Virginia and six other states.

Although Langley's many milestones in basic and applied astronautical research are likely to take center stage during this year's 75th birthday celebration, the center's most significant contribution to astronautics has little to do with machines or inventions.

"We talk an awful lot about technical accomplishments, and Langley certainly has had—and continues to have—its fair share of those," says center director Paul F. Holloway. "But Langley played a major role in another area that doesn't receive as much attention. It provided many of the leaders, both in industry and government, who went on to create this country's aeronautic and aerospace infrastructure."

Holloway points out that all of the early senior staff at other NACA centers came from Langley, and that people from Langley played a major role in getting the early space program going. "In my opinion," he says, "our biggest resource has always been a terrific group of people."

Many Langley "graduates" have gone on to distinguished careers in both the private and public sectors. Fred Weick, for example, led the Langley team that developed the nation's first streamlined engine cowling, and proposed the incorporation of the tricycle landing gear onto commercial aircraft. The "swept-wing" theories of Robert T. Jones proved invaluable to designers working on later-generation sub- and supersonic aircraft, while another Langley veteran, Richard T. Whitcomb, originated the Area Rule, a new concept in the shaping of high-speed aircraft, and invented the so-called supercritical (referring to any speed beyond the critical Mach number) airfoil to delay the drag rise that accompanies transonic airflows. Now retired, Whitcomb still lives in Hampton.

Langley researchers also made important contributions in the concerted national effort to get Americans into space. H. Julian "Harvey" Allen, who worked at the center through the late 1930s, eventually became chief of high-speed research at NACA Ames, where he devised a heat-dissipating blunt-body shape later incorporated into the design of space capsules.

Perhaps Langley's biggest contribution to the human conquest of space, however, was the 36-person Space Task Group (STG). Led by Robert R. Gilruth, the group included such pioneers as Maxime A. Faget, Caldwell C. Johnson and Christopher C. Kraft, Jr.. Although it later moved to Houston, the STG was the nucleus around which the entire U.S. manned space program condensed.

And it all began at Langley. •

For its 75th birthday the Langley Research Center commissioned a condensed history entitled *Winds of Change: Expanding the Frontiers of Flight*. This 140-page, coffee-table book contains numerous photos along with text that incorporates the comments of many past and present Langley employees. *Winds of Change* will be made available to the general public in July at the conclusion of Langley's anniversary observances. —*Editor*