

LETTERS TO LINCOLN ■ NIGHT RAID OVER BERLIN

AMERICAN HISTORY

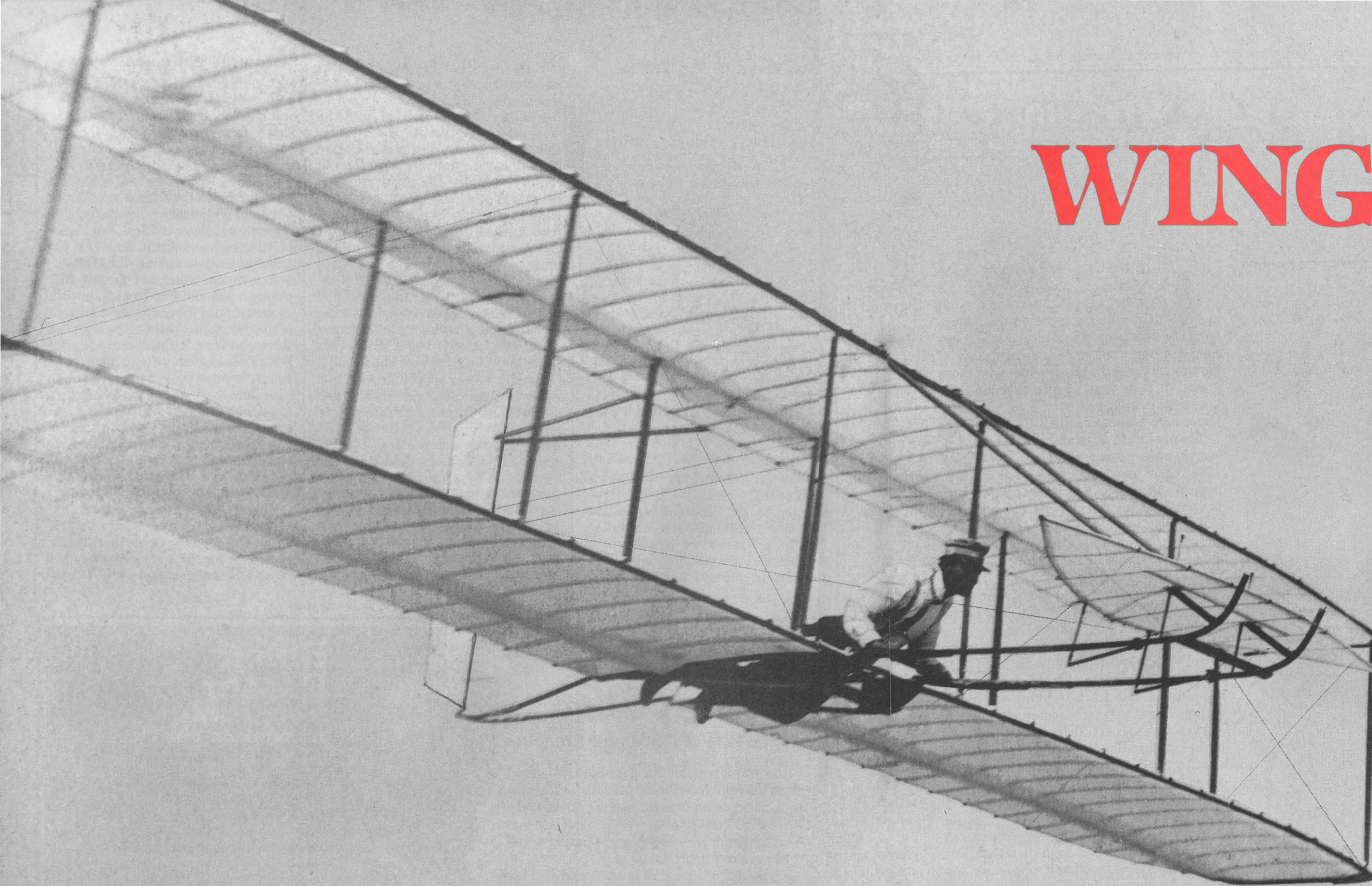
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**WRIGHT 1903 FLYER:
THE TREASURE THE
SMITHSONIAN
DIDN'T
WANT**



WINGS FOR MAN

by Doug McIntyre



The right men at the right time and place in history, Wilbur and Orville Wright applied their natural inventiveness, mechanical skills, extraordinary foresight, and great tenacity to achieve one of mankind's oldest and most nearly impossible dreams—prolonged, controlled human flight. In doing so, they radically changed their world, and ours.

A twentieth-century Icarus, Wilbur Wright soars above the sand dunes of Kitty Hawk, North Carolina during the late summer of 1902—the third year in which he and his brother Orville experimented with gliders on the windy Atlantic shore. A great improvement over the Wrights' previous craft, this one incorporated a movable vertical rudder that eliminated the uncontrolled tailspins that had plagued the inventors. With the problem of control virtually solved, the brothers were now ready to confront the final hurdle in their quest—powered flight.

In a sense, while inventing the airplane, Wilbur and Orville Wright also invented themselves. "The Wright Brothers" became a corporate entity that all but obscured the individuals.



ORVILLE WRIGHT; PHOTOGRAPH FROM BROWN BROTHERS, STERLING, PENNSYLVANIA.

On the bitter-cold morning of December 17, 1903, Wilbur Wright watched as his nervous brother Orville lay prone on the bottom wing of their first powered airplane. The two men squinted their eyes from the sting of blowing sand and the sharp winter winds that gusted at more than twenty miles an hour across the isolated section of North Carolina's Outer Banks known as the Kill Devil Hills.

The product of three and a half years of research and experimentation, the Wrights' 1903 "Flyer" weighed more than six hundred pounds and measured forty feet from wingtip to wingtip. Above Orv's head was a tank of explosive gasoline; a few inches to his right were the roaring steel engine and whirling chain-drive transmission. Behind him spun the airplane's two eight-foot blades. He was well aware that the steel bracing wires that surrounded him were sharp enough to draw blood on contact. No wonder he was nervous.

John Daniels was also nervous. As a member of the United States Life Saving Corps he was no stranger to physical danger, having often risked death to pluck shipwreck victims from the treacherous waters off the North Carolina coast. Today, however, standing behind Orville's Korona camera, he faced a different challenge. Daniels had been asked by the Wrights to photograph the first moment of human flight. He had never touched a camera in his life.

At 10:35 A.M. Orville threw the trip switch that released the Flyer from its tether. The machine gathered speed as it rolled down the "Grand Junction Railroad," the Wrights' four-dollar launching system of two-by-fours and bicycle hubs. Wilbur ran beside the machine, holding its right wingtip steady. When Orv judged the speed to be sufficient, he pulled back on the elevator control, and the world's first airplane left the ground.

The five lucky witnesses—Daniels, two other members of the nearby lifesaving station, and two local residents—cheered. They had just seen a miracle!

In his excitement, Daniels was not sure if he had remembered to squeeze the bulb and trip the camera's shutter. It was not until

weeks later, back in their darkroom in Dayton, Ohio, that Wilbur and Orville saw the proof they would need to back their claim of "first to fly." The Wright Flyer was captured two feet off the ground, with Orv prone on the lower wing and Wilbur frozen in wonder for all eternity. Daniels' first photograph [see page 38] remains the most famous in the annals of invention and perhaps the most famous in American history.

"From the time we were little children, my brother Orville and myself lived together, played together, worked together, in fact, thought together." So wrote Wilbur in 1912. It was an exaggeration.

As a young boy Wilbur was much closer to his older brothers, Reuchlin and Lorin. Orville had many boyhood friends, including the African-American poet Paul Laurence Dunbar. However, Orv's favorite companion—as a child and into adulthood—was his sister Katharine.

Wilbur and Orville *did* grow to be as close as twins, but this happened over many years. In a sense, while inventing the airplane, they also invented themselves. "The Wright brothers" became a corporate entity that has obscured the individuals.

Wilbur was born in Millville, Indiana in 1867, to Milton and Susan Wright. His father, a bishop in the Church of the United Brethren in Christ, named his third son after Wilbur Fisk, a preacher he admired.

In 1871 the Bishop moved his family to Dayton, Ohio, where Orville soon was born in the upstairs bedroom at 7 Hawthorn Street. This simple two-story house would remain the family's primary residence until 1914 when Orville, the Bishop, and Katharine—born three years to the day after Orv—moved to a mansion in suburban Oakwood.

As youngsters both Wright boys earned above-average grades, but neither officially graduated from high school. Orv was the born inventor, having inherited mechanical dexterity from his mother. As a child he was fascinated by printing; over time this hobby evolved into the brothers' first career. For many years, "Wright & Wright Job Printers"



WILBUR WRIGHT; PHOTOGRAPH FROM CULVER PICTURES, NEW YORK CITY.



operated on Dayton's racially integrated west side. The young men edited and published local newspapers on an ingenious printing press they had built from scrap lumber and an old buggy top, with a tombstone serving as the press bed.

The Wrights claimed that their interest in flight began in early childhood when their father, who traveled extensively on church business, returned home with a toy "bat." This rubber-band-powered helicopter-like toy made a tremendous impact upon the boys. They played with it until it fell to pieces; rebuilt it many times; and eventually made larger versions that failed to fly as well as the smaller original. Disenchanted, they drifted off to other interests but never forgot their first taste of "flight."

As the Wrights matured, America seemed to go crazy; bicycle madness swept the nation. In the 1880s it was called "wheeling," and Americans couldn't buy bicycles fast enough. The sudden proliferation of "wheels" created a demand for good mechanics. As Wilbur and Orv's reputation for mechanical creativity spread, a second career—bicycle repairing—was virtually thrust upon them.

Orville, the more reckless and impetuous of the two, purchased a brand-new bicycle for the astounding sum of \$160. Wilbur bought a used "wheel" for \$80. The brothers' personalities were reflected in how they rode. Will preferred long quiet rides in the country, while Orv fancied himself a "scorcher" and won several medals in YMCA races.

Eventually the Wrights built and sold their own line of bicycles. This not only provided a steady, if modest, income; it also gave the Wrights basic engineering skills they would later put to use in building flying machines. That time was rapidly approaching—but first Wilbur and Orville would each have a brush with death.

In 1885, while playing shinny (an early form of ice hockey), Wilbur was struck in the mouth by an opposing player's stick. His teeth were knocked out, and he suffered severe trauma. The family became deeply concerned as Wilbur's recovery dragged on for months, then years. Wilbur withdrew into himself. He no longer went to work and rarely left the house. He complained of heart palpitations and began to speculate that he would not live long. Prior to his accident, Will had expressed an interest in attending Yale University and becoming a teacher. He now dropped his college plans, telling his father that "my health has been such that it might be time and money wasted."

During Will's convalescence, Susan Wright,

Wilbur and Orville's mother, was seriously ill with tuberculosis. Wilbur spent what little energy he had caring for his dying mother. When not by her side he was invariably buried in a book, absorbing vast stores of knowledge. He read on a variety of subjects, including the works of Robert Ingersoll, the famous agnostic. Learning was encouraged in the Wright home. The Bishop's religious principles never prohibited the brothers from examining any area of interest. "We were lucky enough," wrote Orville in 1940, "to grow up in an environment where there was always much encouragement to children to pursue intellectual interests; to investigate whatever aroused curiosity. In a different kind of environment, our curiosity might have been nipped long before it could have borne fruit."

The Wilbur Wright who emerged after his hockey accident and the death of his mother was a very different person from the rudderless Wilbur who had followed his younger brother's lead. With his health restored, Wilbur was now confident and self-assured. He had not only studied books during his convalescence; he had evaluated his own strengths and weaknesses. Will concluded that he wasn't cut out for a life in business. Science was his passion—if only he could find the proper venue in which to make his mark.

In Europe, a German engineer named Otto Lilienthal had gained international fame by experimenting with flying machines. Unlike many of the crackpots who earned ridicule and scorn, Lilienthal was a respected man whose public flights drew large crowds and numerous photographers. During his five years of gliding experiments, Lilienthal had accumulated a total of five minutes of actual flight time. As paltry as this might seem, it made him the world's most experienced aviator.

On August 9, 1896, while gliding from his man-made hill near Berlin, Lilienthal's machine was overturned by a sudden gust. His method for controlling the glider required him to shift his body to the left or right to rebalance the craft. "Weight shifting," as it was known, was both slow and dangerous. Lilienthal's glider plunged to the ground, and the crash snapped his neck. Allegedly, his final words were: "Sacrifices must be made."

Back in Dayton, meanwhile, another life-or-death struggle was in progress. Orville had contracted typhoid fever from contaminated well water. For weeks he hovered near death, slipping in and out of a coma. It was during Orv's illness that Wilbur read a newspaper obituary detailing Lilienthal's death. When Orville's fever finally broke, Wilbur,

In 1871 the Wright family—including four-year-old Wilbur—moved into a clapboard house on Hawthorn Street in Dayton, Ohio. The birthplace of Orville and his sister Katharine, this modest dwelling (opposite page, top) met the family's needs for most of the next forty-two years, and served as a refuge to Orville and Wilbur when their accomplishments brought them unwanted notoriety. The space beside the Wright Cycle Company's shop (far left) on the city's West Third Street became the laboratory and workshop (bottom) for many of the brother's aeronautical experiments. Both buildings were purchased by Henry Ford in 1936 and moved to Greenfield Village, his outdoor museum in Dearborn, Michigan, where they can be visited today.

The Wright brothers began putting their ideas about how to achieve powered flight to the test on the windswept sand dunes of Kitty Hawk, North Carolina in September 1900. Their first experiments with the 1900 glider (opposite page, top) proved unsatisfying because the craft's small size did not provide enough lift. The brothers returned in 1901 with a glider larger than any previously launched (center photo), but encountered control problems. Once home, the brothers discovered that the calculations they had been using were in error. The 1902 glider (bottom) that incorporated their corrections proved successful; the next step toward their goal would be the addition of an engine.

his childhood interest in flight re-awakened, filled his ears with talk of flying machines. Wilbur had found his venue, but the dynamics of the brothers' relationship had changed. From now on Wilbur would lead, not follow.

What happened over the next five years is one of the great American tales, a story so archetypal as to almost define Yankee ingenuity and rugged individualism. It began with a letter.

On May 30, 1899, Wilbur picked up a pen and a sheet of Wright Cycle Company stationery and wrote to Samuel Langley, a well-known flying-machine inventor and secretary of the Smithsonian Institution. He requested copies of the museum's publications on aeronautics as well as a list of other writings on the subject.

Wilbur's letter remains the most important letter the Smithsonian has ever received: "I have been interested in the problem of mechanical and human flight ever since as a boy I constructed a number of bats [helicopters] of various sizes after the style of Cayley's and Pénau's machines," he wrote. "My observations since have only convinced me more firmly that human flight is possible and practicable. It is only a question of knowledge and skill just as in all acrobatic feats. Birds are the most perfectly trained gymnasts in the world . . . and it may be that man will never equal them . . . [but] I believe that simple flight at least is possible to man. . . . I wish to avail myself of all that is already known and then, if possible, add my mite to help the future worker who will attain final success."

This remarkable letter is significant on three counts. First, it reflects how much research Wilbur had already done. In addition to studying birds, he was familiar with the work of early European experimenters. Secondly, it is clear he did not think that he would invent the airplane; rather some "future worker" would "attain final success." Finally, and most significantly, he made no mention of Orville. This letter, and most of the hundreds of others that Wilbur penned between 1899 and 1902, are written in the first-person singular. Wilbur's famous quotation about how he and Orv "thought together" was apparently not a sentiment he held from the start.

In response to Wilbur's request, the Smithsonian sent him pamphlets on human flight, including some by the late Lilienthal. Also recommended was Octave Chanute's book, *Progress in Flying Machines*. On May 13, 1900, Wilbur wrote to Chanute: "For some years now I have been afflicted with the belief that flight is possible to man. My

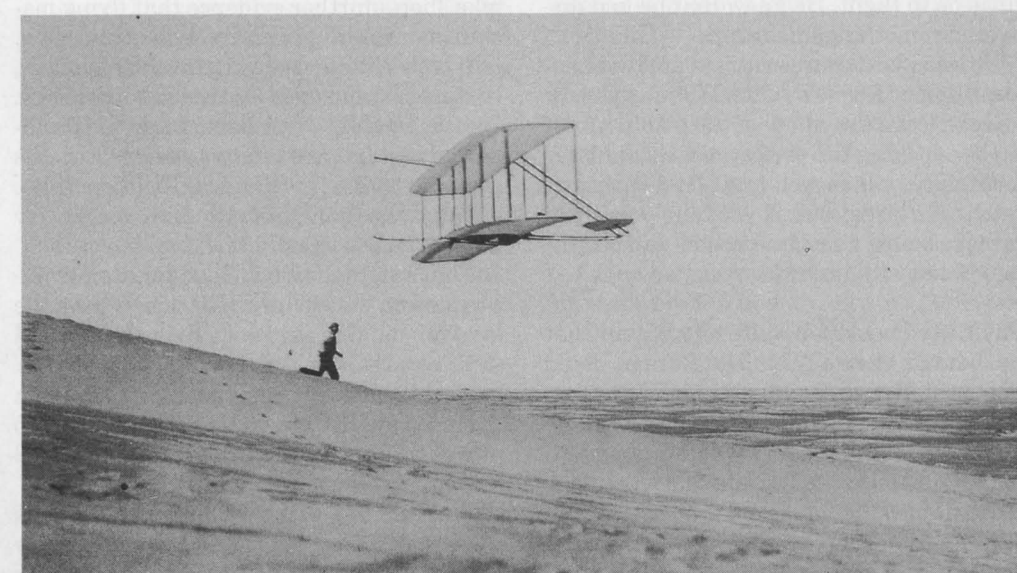
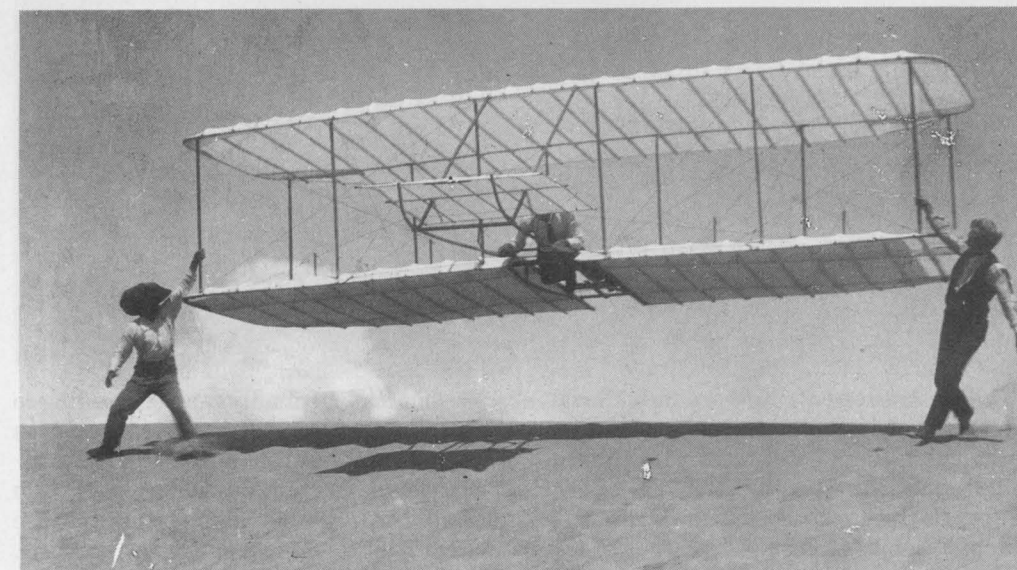
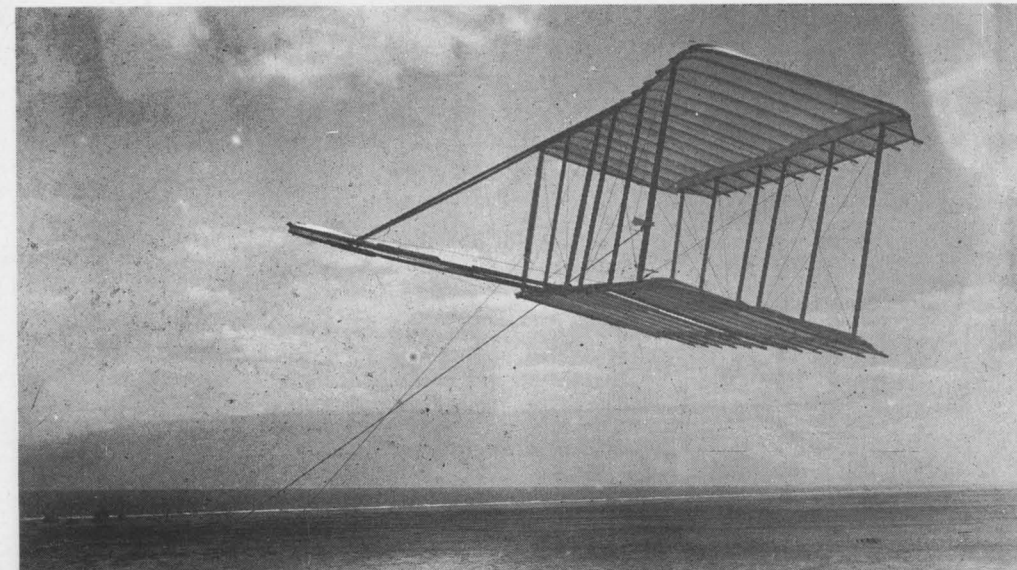
disease has increased in severity and I feel that it will soon cost me an increased amount of money if not my life. . . . It is possible to fly without motors, but not without knowledge and skill. This I conceive to be fortunate, for man, by reason of his greater intellect, can more reasonably hope to equal birds in knowledge, than to equal nature in the perfection of her machinery."

The language of Wilbur's preamble to Chanute is not only beautiful, it is revealing. It indicates that he had dismissed motors as a detail, not the key to flight. This was a point missed by many of his contemporaries, most notably Dr. Langley, who spent years and thousands of tax dollars developing state-of-the-art engines.

What the letter tells us about Wilbur's state of mind is even more significant. Wilbur Wright was a young man who foresaw early death. When viewed through this prism, perhaps his subsequent condescending treatment of Orville was actually brotherly love, not selfishness. Wilbur would not allow Orv to fly until 1902. Since Wilbur did not believe he had long to live anyway, it made sense for him to risk his neck on their imperfect flying machines, sparing his brother. At the very least, his premonitions of death may have given urgency to his work.

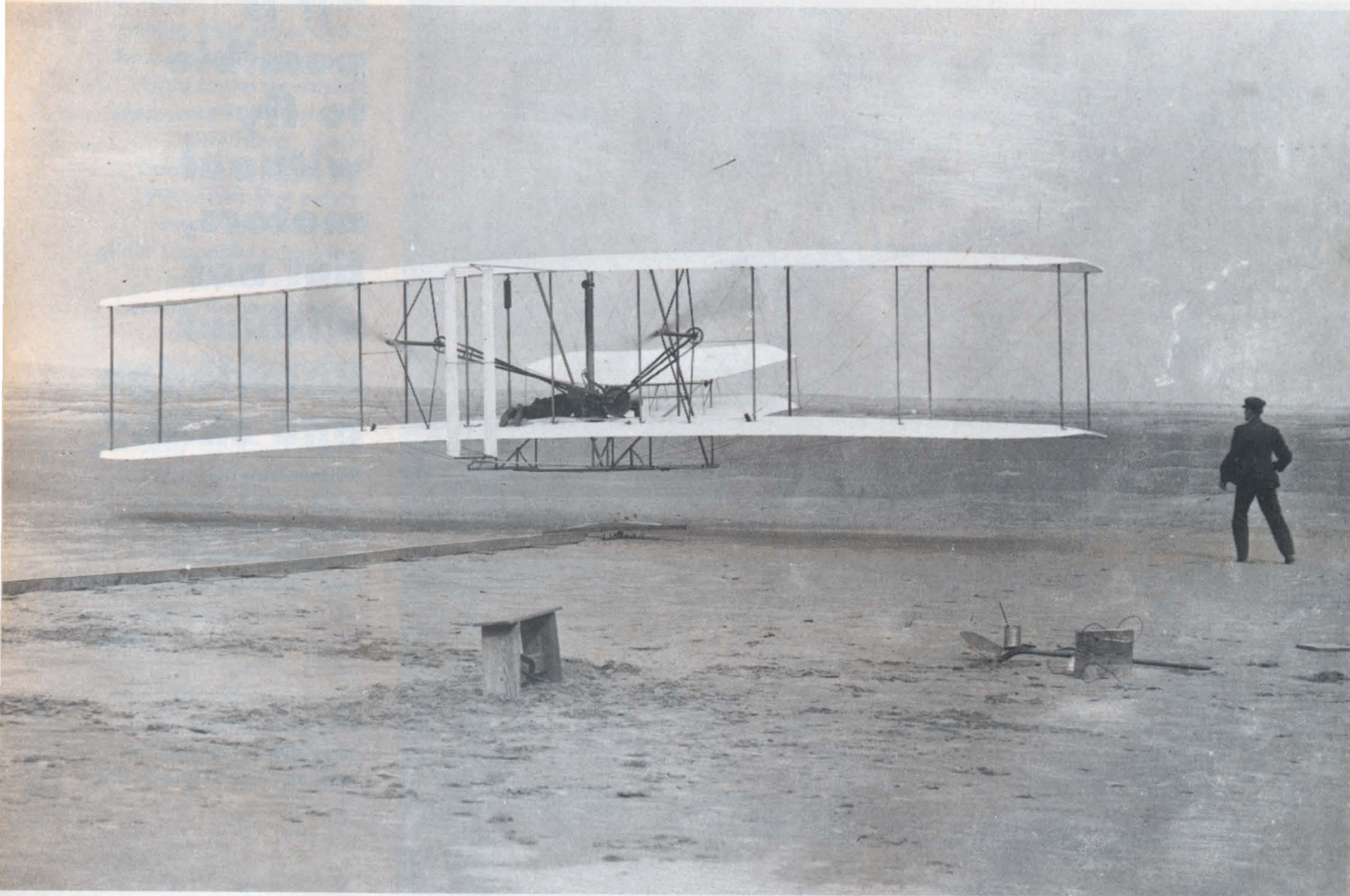
Wilbur concluded that the first major necessity in achieving human flight was the development of a control system. His years in the bicycle business had taught him that it was possible to ride a machine that is inherently unstable. The rider achieves balance by making tiny adjustments as he moves over an ever-changing terrain. So too, thought Wilbur, must an airplane pilot adjust his machine to maintain balance and control in the rapidly changing environment of the sky. What good are powerful engines and wings that lift if you have no control in flight? As obvious as this point seems today, virtually all of the Wright's rivals—including Alexander Graham Bell, Sir Hiram Maxim, John Montgomery, and Albert Santos-Dumont—put their chief efforts into designing wings and/or engines. Most viewed control as a detail rather than as essential for flight.

In 1899 Wilbur built a small kite to test a method of control that he called "wing warping." Modern airplanes still incorporate this breakthrough discovery in the form of ailerons. When the tip of one wing is turned up, the tip of the opposite wing turns down. The resulting change in air pressure over the wing surfaces causes the machine to roll in the opposite direction from the down-turned wingtip.



"It is possible to fly without motors, but not without knowledge and skill."

Wilbur Wright



In one of the most remarkable images ever to show history in the making, Life Saving corpsman John Daniels' December 17, 1903 photograph captures the Wright Flyer, with Orville standing alongside, just after it lifted off on man's first successful heavier-than-air flight. Heading into a brisk wind, the aircraft remained aloft for twelve seconds and landed about 120 feet from the takeoff point. The Flyer made just three more flights—the longest spanning 852 feet—before being wrecked when winds caught and cartwheeled it down the beach.

Wilbur discovered wing warping while fiddling with a bicycle tire inner-tube box. In a spectacular example of creative visualization, he saw the top and bottom surfaces of the box as the upper and lower wings of a biplane. When twisting the box, the corners flared; one up, one down. This is what birds' wings do in flight. He knew that he had discovered something important.

With his kite tests a success and with encouragement from Chanute, Wilbur was now ready to leave the safety of the bike shop: "If you are looking for perfect safety," he later wrote, "you will do well to sit on a fence and watch the birds; but if you really wish to learn, you must mount a machine and become acquainted with its tricks by actual trial."

Why Kitty Hawk? Chanute told Wilbur that the United States Weather Bureau could provide a list of locations offering strong winds and soft sand upon which to land. As chance would have it, a U.S. Life Saving Station located near the lyrically named village of Kitty Hawk doubled as a weather bureau outpost. Wilbur's letter of inquiry was passed along to Kitty Hawk postmaster Bill Tate,

who sent Will a friendly reply. According to Tate, the *only* thing Kitty Hawk had was strong winds and soft sand.

On September 6, 1900 Wilbur left Dayton to make the five-hundred-mile journey to the Outer Banks islands of North Carolina. Orville elected to stay behind and run the bike shop—further evidence that flying machines were still primarily Wilbur's passion.

It took Wilbur six days, traveling by train, horse, boat, and on foot to reach Kitty Hawk. Orville, unable to resist sharing in his brother's adventure, arrived two weeks later. His companionship, mechanical skills, and the supplies he brought with him made Orv more than welcome.

The Wrights' arrival made quite an impression on the villagers. Extremely poor, the local inhabitants eked out a living fishing and farming the poor, sandy soil. The Wrights' modest incomes made them wealthy men amongst the Kitty Hawkers. Their ability to pay cash for fresh eggs disrupted the local barter economy.

Will and Orv were the big attractions in town for reasons other than economics; they were spectacular oddballs! In their bowler

hats, jackets and ties, they could be seen running up and down the beach, flying their big glider as a kite. The locals were divided: some were fascinated by the brothers; others were convinced the visitors were dabbling with the Devil. The "Bankers'" mindset is best summed up in a popular expression of the day: "If God had meant for man to fly, he would have given us wings."

Wilbur and Orville's first flying season ran from September 13 through October 23, 1900. It could be more accurately described as a "kiting season," since they attempted only one manned flight.

Wilbur, who had used Lilienthal's tables of air pressure when designing his machine, had expected it to be capable of flights of up to 300 meters. However, the glider generated only about half the projected lift—reducing the earthbound Wrights to flying their glider as a tethered kite, loaded with seventy-five pounds of chain.

In 1901 the Wrights returned to Kitty Hawk, arriving on July 10. They hoped to get in hours of practice, thanks to the additional lift generated by their new and vastly larger machine. The 1901 glider had lifting surfaces totaling 315 square feet—the largest machine anyone had ever attempted to fly. However, it too failed to produce enough lift.

Frustration in the air was only one of the problems the brothers faced that summer. Their tent and shed provided little shelter from the horrendous storms and gale-force winds that rolled in from the ocean. But even the hardships of inclement weather paled alongside the suffering inflicted by swarms of bloodthirsty mosquitoes. Orville, describing their ordeal in a letter to his sister Katharine, complained that "it was the most miserable existence I have ever passed through. The agonies of typhoid fever with its attending starvation are as nothing in comparison. . . . The sand and grass and trees and hills and everything were crawling with [mosquitoes]. They chewed us clean through our underwear and socks. . . . Misery! Misery!"

On August 22 the Wrights packed up their equipment and left for home. On the train to Dayton, a disillusioned Wilbur told Orv that "not within a thousand years would man ever fly."

Back in Dayton, the Wrights threw themselves into their neglected bike business, pushing talk of flying machines to the back burner. Then, Wilbur received a timely invitation. Octave Chanute wanted him to speak to the Western Society of Engineers in Chicago. "Nagged" into accepting by Katharine, Will was forced to re-examine the work that

he and Orville had done up to that point. While drafting the speech, Will and Orv became convinced that their lift problem was the result of errors in Lilienthal's air pressure tables and not in their construction techniques. They determined to prove Lilienthal wrong, and resolved to never again rely on data they did not develop themselves. This marked a milestone in the brothers' career: no longer simply engineers, they were becoming theoretical scientists.

Orville described the months of November and December 1901 as the happiest of the brothers' lives. "Wilbur and I" he said, "could hardly wait for the morning to come. To get at something that interested us. *That's happiness!*"

In their bicycle-shop-turned-laboratory, the brothers constructed a small wind tunnel powered by the same gas engine that ran the shop's machinery. Inside the tunnel they placed two ingenious devices called "balances"—one to measure lift; the other, drag.

As crude as they appeared, these balances—cobbled by Orville from bicycle spokes and hacksaw blades—were remarkable instruments; exact mechanical analogues to the mathematical formulas for calculating lift and drag. They worked brilliantly, producing new tables of air pressure whose precision has been confirmed by modern computers. The 1902 Wright glider would be the first flying machine based on accurate data and designed by modern scientific methods.

The Wrights' lab work was important in one more significant respect: it marked Wilbur's acceptance of Orville as a full and equal partner. "My machine" no longer appeared in Wilbur's letters. From this point on it would be "our machine."

The third flying season ran from August 28 through October 28, 1902. With the lift problem behind them, both brothers rolled up flight time. Quickly, Wilbur and Orville became the world's most experienced aeronauts. The new machine functioned perfectly—except for one perplexing and potentially fatal flaw. For no apparent reason, the glider would, sporadically, fall from the sky in a "tail spin."

One night Orville drank a pot of coffee and then found himself unable to sleep. As he tossed in his bunk, it struck him that the tailspin problem could be eliminated by making the tail a movable rudder, rather than a fixed surface. This was the final piece of the puzzle. The Wrights now had a glider with a system that effectively controlled all three axes: the elevator for "pitch," wing

"After running the engine and propellers a few minutes to get them in working order, I got on the machine at 10:35 for the first trial. . . . On slipping the rope the machine lifted from the track just as it was entering on the fourth rail."

Orville Wright's diary entry for December 17, 1903

warping for "roll," and a movable rudder for "yaw." Three-axis control is the key to flight. The discovery of this principle and the development of a system for achieving it are the Wrights' greatest contributions to aircraft technology. Everything that flies, from a hang glider to the Space Shuttle, still incorporates these epoch-making innovations.

Wilbur and Orville now had a practical glider. During the fall of 1902 they made more than seven hundred flights (375 in one week alone), with their longest glide covering 622.5 feet in twenty-six seconds. It was time to add an engine and propellers.

Back in Dayton, Wilbur and Orville soon discovered that obtaining an engine powerful enough to lift their machine, yet light enough to be carried aloft, wasn't going to be easy. Most of the big-name engine makers

couldn't produce a motor light enough, and those who could refused to sell one to the Wrights for fear of being associated with flying machines.

With significant help from Charlie Taylor, a Dayton machinist the brothers had hired to run the bike shop in their absence, they built their own lightweight internal combustion engine producing twelve horsepower. The crankshaft was turned by hand on their lathe from a nineteen-pound bar of steel; only the aluminum crankcase was made outside the bike shop, cast by a local foundry from a mold provided by the Wrights.

Having solved one problem, the Wrights now ran into a stone wall—propellers. They had envisioned that this would be the easiest part of their work, anticipating a trip to the library to obtain ship propeller data, and then applying that knowledge to design "air-screws." The brothers were astonished to discover that no such data existed on ship propellers; all had been made on a trial-and-error basis. While it is desirable for a ship's propeller to be efficient, it is not essential. An airplane, however, will not leave the ground with an inefficient prop.

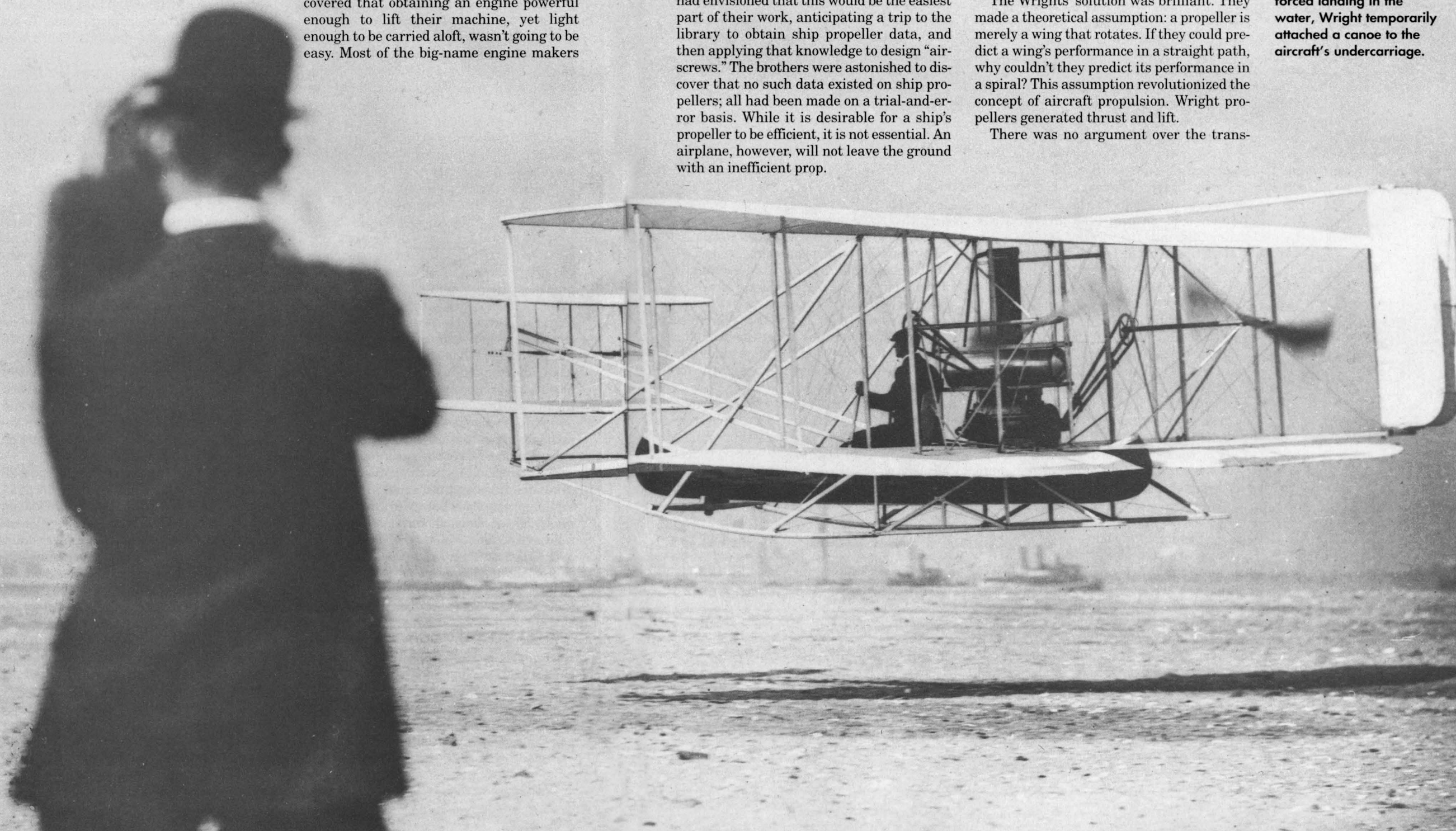
The "Great Propeller Debate" has passed down into Wright family lore. During an interview, ninety-seven-year-old Ivonette Wright-Miller, Wilbur and Orville's niece (and the last person alive who flew with them as a passenger), recalled that her uncles argued "so long and loud they would end up converted to the other's side, only to have the argument start up again, with each brother arguing the other's original position. 'Tis so! 'Tis not!'"

Orville described the complexity of their dilemma: "With the machine moving forward, the air flying backward, the propellers turning sidewise, and nothing standing still, it seemed impossible to trace the various simultaneous reactions."

The Wrights' solution was brilliant. They made a theoretical assumption: a propeller is merely a wing that rotates. If they could predict a wing's performance in a straight path, why couldn't they predict its performance in a spiral? This assumption revolutionized the concept of aircraft propulsion. Wright propellers generated thrust and lift.

There was no argument over the trans-

A worthy real-life counterpart to the fictional heroes Tom Swift and Frank Merriwell, Wilbur Wright skims above Governors Island in New York harbor during a 1909 series of demonstrations that included a twenty-mile round-trip flight up the Hudson River to Grant's Tomb and back, providing millions of New Yorkers with their first glimpse of an airplane. To insure buoyancy in the event of a forced landing in the water, Wright temporarily attached a canoe to the aircraft's undercarriage.



Reaching for the sky that he and his brother Orville sought successfully to conquer, Wilbur Wright (inset, opposite) holds aloft an anemometer while preparing for a flight demonstration in Pau, France in 1909. Today, with their long-contested claim of "first to fly" finally secure, the remarkable brothers who ushered in the age of flight are memorialized not only at the Wright Brothers National Memorial at Kitty Hawk (including the Big Kill Devil Hill monument pictured in the color photograph) and the Smithsonian and other museums, but also by every one of the tens of thousands of aircraft that daily serve mankind.

mission system. Drawing on their bike-building experience, Wilbur and Orville used chains and sprockets to spin their props. They now had everything they needed. It was time to fly.

The Wrights' fourth and most momentous flying season saw them back at Kitty Hawk from September 25 through December 19, 1903. Plagued by a myriad of mechanical and weather delays, the brothers finally had their first powered airplane ready for takeoff on the morning of December 14.

Wilbur won the coin toss for the first shot at human flight. However, a "pilot error" on his part resulted in a crash seconds after liftoff. Although the plane had left the ground, the brothers considered this a "hop," not a "flight."

It took several days to make repairs. During this delay, the weather turned bitter cold, and winter set in. The Wrights feared that they might not get to fly at all in 1903.

On the morning of December 17, the winds were gusting above thirty miles an hour. Despite the grave risks involved in flying an untested machine in air this turbulent, the brothers, for once in their lives, literally threw caution to the wind.

This time, Orville would go first. His first effort produced a twelve-second flight of approximately 120 feet. This is the historic flight immortalized in Daniel's photograph. Wilbur went next, flying 175 feet. Then Orville made his second attempt, this time reaching the 200-foot mark. The shortness of these flights had nothing to do with machine failure. Wilbur and Orville simply lacked experience controlling the heavy 1903 Flyer. If anything, it responded too well, with the slightest movement of the elevator control causing the machine to dart toward earth.

Wilbur later would write to Chanute, declaring that "those who understand the real significance of the conditions under which we worked will be surprised rather at the length than the shortness of the flights made with an unfamiliar machine after less than one minute's practice."

Orville added in 1913: "With all the knowledge and skill acquired in thousands of flights in the last ten years, I would hardly think today of making my first flight in a strange machine in a twenty-seven mile wind. . . . I look on with amazement upon our audacity in attempting flights with a new and untried machine under such circumstances."

On the fourth flight of the day, Wilbur flew for fifty-nine seconds, spanning a distance of 852 feet. Elated, the brothers made plans to

fly the four miles from their camp at Kill Devil Hills to Kitty Hawk village. In an instant their plans were dashed. A huge gust flipped the machine over and cartwheeled it down the beach. The 1903 Flyer was reduced to a jumble of broken spars and ribs. It never flew again. It didn't have to.

The Wrights' famous flight of December 17, 1903 is usually where history drops their story, but it is actually just the second-act curtain in an exciting three-act drama.

Upon arriving home, the Wrights discovered that the newspapers did not believe their story, or misunderstood what they had accomplished. This consequence proved to be both a blessing and a curse for the brothers. The blessing was that it protected their technology while their patents worked their way through the bureaucracy. The curse was that it made it hard for the Wrights to market the machine and for many years deprived them of the glory that should have been theirs.

In 1904 and 1905 the Wrights flew from a cow pasture eight miles north of Dayton. It was at Huffman Prairie, now part of Wright-Patterson Air Force Base, that the brothers perfected their machine and taught themselves how to fly. The first circles and figure eights made by an airplane were flown above Torrance Huffman's field. Word eventually leaked out of the experiments after the Wrights were seen by passengers on a trolley car. With a record flight of twenty-four miles in thirty-eight minutes under the belts, the Wrights stopped flying for more than two years while they tried to find a buyer for their machine.

The U.S. government had been burned by flying machines in the past (investing \$50,000 in Dr. Langley's failure, for example), and the Wrights' offer to provide a practical airplane was rejected out of hand. Insulted by their own country's "snub," Wilbur and Orville then traveled to England, France, and Germany in hopes of making a deal.

Their mission was complicated by unforeseeable obstacles. A sale in France was blocked by a lapse in judgement by their old friend Octave Chanute.

The brothers' relationship with Chanute had soured over time, with Chanute accusing the Wrights of being too secretive. In March 1903, Chanute had traveled to Paris to speak at an Aéro-Club banquet. During his lecture he not only implied that the Wrights were his students; he also let stand the impression that their work had been financed by him. To make matters worse, he

Continued on page 66



WINGS FOR MAN *continued from page 42*

showed slides of the Wrights' gliders and told the French about wing warping. The rebirth of European interest in heavier-than-air flight can be traced directly to Chanute.

Fortunately for Wilbur and Orville, Chanute's understanding of wing warping was limited, so his talk didn't give away the store. However, he created the impression that it was just a matter of time before French aviators would have airplanes of their own, so why should France spend money on an American machine?

The brothers knew that nobody else understood the true nature of the flying problem. Still, by 1906 a few brave souls had coaxed machines into the air. These "flights" prompted the Wrights' rivals, and the press, to dismiss Orv and Will as frauds. One Paris newspaper ran this banner headline over a story on the brothers: "Flyers or Liars?"

Why Wilbur and Orville didn't simply make a demonstration flight has never been easy to explain. They had become paranoid that a rival would see their machine and steal its secrets, making it impossible for them to recoup their investment. (Their patent attorney had preached secrecy.) However, the primary reason may have been emotional. The Wrights simply couldn't let go of their "baby." Bishop Wright publicly boasted that his three youngest children never left the "paternal roof." Wilbur and Orville appear to have inherited their father's possessiveness.

Finally, in 1908 everything changed. A consortium of French businessmen agreed to purchase a Wright machine. At almost the same time, the U.S. government accepted a new bid from the brothers to supply the Signal Corps with an airplane. After a quick trip to Kitty Hawk to brush up on their rusty flying skills, the brothers split up to meet the deadlines on their contracts.

In France, in Wilbur's words, "princes and millionaires are as thick as thieves." Huge crowds came out to watch him fly. He astonished the Europeans with the grace of his machine and his skill as its pilot, making flights of more than two hours in length. There was no longer any doubt that

the Wrights' claim of "first to fly" was true. The same newspapers that had called them "liars" now hailed them as "*Les Premiers Hommes-oiseaux!*"—first among the "bird men!"

Orville went to Fort Myer, Virginia, where he flew before large crowds, including President Taft, senators, and congressmen. It was while he was there that Orville suffered the only serious accident of his career. During a flight with Lieutenant Thomas Selfridge as his passenger, a propeller cracked, cutting a bracing wire. The machine crashed, breaking Orv's leg and killing Selfridge. Still, the American public had seen enough to know that the "air age" had arrived.

Back home, the brothers were honored with parades, medals, and trips to the White House. Everywhere they went, huge throngs gathered to see them, speak with them, touch them. Wilbur and Orville were repelled by the hysteria, just as another famous American aviator would be a generation later. The fuss and hoopla was anathema to the pathologically shy Wrights. Orville categorically refused to speak in public, and Wilbur once declined a request for a speech by quipping, "I know of only one bird that talks, the parrot, and they don't fly very high."

Soon after their world triumph, the Wrights found themselves embroiled in messy patent infringement suits—usually initiated by them. The ugliest and most celebrated involved rival aviator Glenn Curtiss. The Wrights won every case but in the process lost the war. To protect their claims of priority in court, the brothers could not make significant changes in their aircraft designs; a big change could be interpreted by the airplane-ignorant courts as an admission by the inventors that their original designs were flawed. So, while they were frozen in 1908 technology, Curtiss and others were free to innovate. Quickly, Wright airplanes became obsolete.

The psychological and physical demands of testifying in court and giving endless depositions destroyed Wilbur's health. In 1912 he contracted typhoid fever, the same illness that Orville had battled in 1896. On May 30, Wilbur

died at the family home in Dayton. His premonition of early death had come true. He was only forty-five years old.

When Wilbur died, his place in history was anything but assured. To this day, rumors persist about "flights" made by other aviators prior to December 17, 1903. In Brazil, Santos-Dumont is still hailed as the "father of flight." Books have appeared over the years claiming credit for Connecticut's Gustav Whitehead. Frenchman Gabriel Voisin went to his grave debunking the Wrights. Tourists in California can visit a monument to John Montgomery, a glider pilot of dubious achievement, who died in 1911 in a craft that Wilbur had warned him was a death trap.

Ironically, the greatest threat to the Wrights' place in history turned out to be the Smithsonian Institution. In conjunction with Curtiss, the Smithsonian credited its beloved secretary, the late Dr. Langley, with inventing the airplane [see "Odyssey of the Flyer" on pages 44-47]. Correcting this gross distortion became Orville's obsession, and ultimately resulted in his sending the 1903 Flyer into exile in England, where it remained until 1948.

Finally, however, Orville's protracted battle with Curtiss and the Smithsonian culminated in a final triumph: the establishment of the Wrights' priority as conquerors of the sky. Whatever doubts serious scholars may have harbored were finally put to rest with publication of *The Papers of Wilbur and Orville Wright* in 1953.

Orv spent the years after Wilbur's death in a laboratory originally intended for both brothers. He tinkered with whatever caught his fancy (spending months on an automatic record changer, for example). He produced no major inventions of his own.

Until his death of from heart attack in 1948, Orville was, literally, a living legend. So quietly had he lived that when his obituary appeared in newspapers most people outside of Dayton were surprised to learn that he had still been alive.

What the Wrights might have accomplished had Wilbur not died so young

is one of the great "what ifs?" Wilbur himself shed some light on the vicissitudes of invention in a 1906 letter to Chanute: "If the wheels of time could be turned back . . . it is not at all probable that we would do again what we have done. . . . It was due to a peculiar combination of circumstances which might never occur again."

More so than Thomas Edison, Robert Fulton, or Samuel Morse, the Wrights can claim total credit for the invention that brought them lasting fame. Lifelong diarists, prolific letter writers, and amateur photographers of considerable skill, Wilbur and Orville left a paper trail that documents each step in their systematic program of aeronautical research. They invented more than wings of strength, a lightweight engine, and efficient propellers.

They also perfected three-axis control—pitch, yaw, and roll, the three dimensions of flight. They tested their theories in the air, teaching not only themselves how to fly, but the rest of us as well. From humble beginnings, these two bachelor bicycle makers built everything themselves. They paid for their work from their own earnings, risked their lives repeatedly on imperfect gliders, and triumphed with no desire for glory, only a just demand for what was rightfully theirs. It is as much the quality of their character as the brilliance of their work that earns Wilbur and Orville Wright lasting fame in the pantheon of American heroes.

Perhaps the most eloquent testament to their achievement is one simple line from Orville's diary, dated June 7, 1903: "Isn't it astonishing that all

these secrets have been preserved for so many years just so that we could discover them!" ★

Los Angeles writer Doug McIntyre is author of Ride the Wind, a screen biography of the Wrights, as well as numerous television comedies, including Married . . . With Children, WKRP in Cincinnati, and Full House.

Suggested additional reading: The authoritative biography of the Wright brothers is *The Bishop's Boys* by Tom Crouch (W. W. Norton, 1989). An illustrated work fascinating to both young people and adults is *The Wright Brothers: How They Invented the Airplane* by Russell Freedman (Holiday House, 1991). Other pictorial volumes of interest include *Kitty Hawk and Beyond* by Ronald R. Geibert and Patrick B. Nolan (Wright State University Press, 1990), and *How We Invented the Airplane* by Orville Wright (Dover, 1988).