How Man Learned to Fly

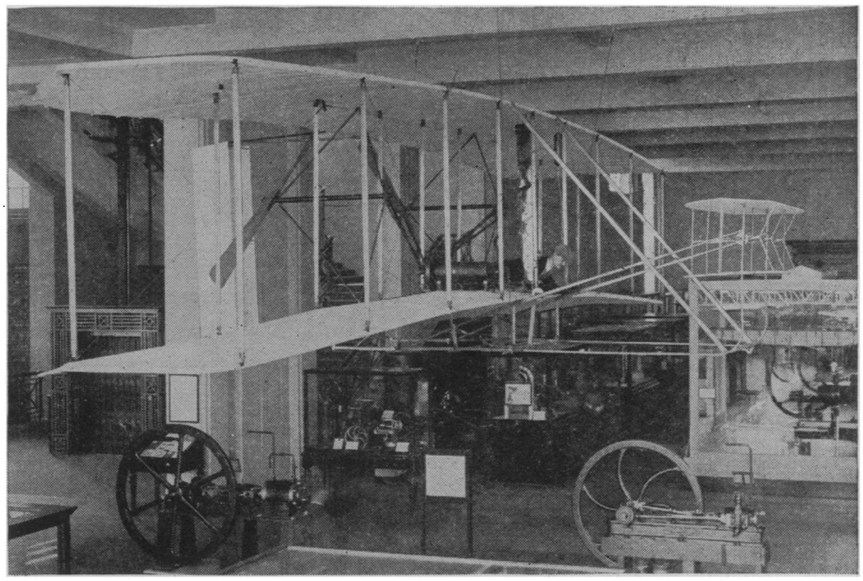
Aviation

By Edwin E. Slosson

No man in all the history of the world has had such an experience as Orville Wright. He can look up almost any time and see men flying above his Dayton home and be reminded that he and his brother were the first of all mortal men to soar into the air, twenty-five years ago. No discoverer or inventor has seen so radical a revolution of the world in such a short time. Not Columbus, for he died before he knew that he had found a new continent. Not Watt, for the steam engine did not fully reveal its power in his lifetime. Bell when he heard telephones on every hand and Edison when he could see the streets lit by his electric lamps, could come nearest to realizing the transformation of daily life effected by their inventions, but these were developed gradually under normal conditions as fast as a market could be opened for them, while aviation was forced into premature maturity by the Great War which compelled all nations to engage in the advancement of its actual application regardless of expense and danger.

The conquest of the air, completely accomplished within the present century, fulfilled one of the dearest desires of the human heart from the earliest ages. "Birds can fly so why can't I?" This mental query which led Darius Green to launch his flying machine from the barn loft had puzzled the brains of inventive minds of all periods and places. The walls of ancient Egypt and Assyria are carved with the figures of winged men. Mankind had always longed for wings, dreamed of them, prayed for them, hoped to be good enough to go to heaven where "all God's children got wings." This suppressed desire, dating back to the childhood of the race, was first realized on earth at Kill Devil Hill, Kitty Hawk, North Carolina, on December 17, 1903, when Orville Wright flew 120 feet in 12 seconds.

How the young bicycle makers of Dayton got interested in aviation and how they began their experiments may be best read in the words of the elder brother in the first account given of their first flights with gliders, the epoch-making paper read by Wilbur Wright before the Western Society of Engineers, September 18, 1901, and published in the Smithsonian Report in 1902:



THE ORIGINAL WRIGHT PLANE, as it now hangs in the Science Museum at Kensington, England

"My own active interest in aeronautical problems dates back to the death of Lilienthal in 1896. The brief notice of his death which appeared in the telegraphic news at that time aroused a passive interest which had existed from my childhood and led me to take down from the shelves of our home library a book on Animal Mechanism, by Professor Marey, which I had already read several times. From this I was led to read more modern works, and as my brother soon became equally interested with myself we soon passed from the reading to the thinking, and finally to the working stage. It seemed to us that the main reason why the problem had remained so long unsolved was that no one had been able to obtain any adequate practice. We figured that Lilienthal in five years of time had spent only about five hours in actual gliding through the air. The wonder was not that he had done so little, but that he had accomplished so much. It would not be considered at all safe for a bicycle rider to attempt to ride through a crowded city street after only five hours' practice, spread out in bits of ten seconds each over a period of five years; yet Lilienthal with this brief practice was remarkably successful in meeting the fluctuations and eddies of wind gusts. We thought that if some method could be found by which it would be possible to practice by the hour instead of by the second there would be hope of advancing the solution of a very difficult problem. It seemed feasible to do this by building a machine which would be sustained at a speed of 18 miles per hour, and then finding a locality where winds of this velocity were common."

It was then a failure and a fatal accident that inspired the Wright brothers to enter aviation and so achieve their triumph. For reading of the death of Lilienthal in 1896 papers incited them to take up the task left unfinished by his death. Like Lilienthal the Dayton brothers tackled the problem from what we all can now see was the right end. They determined to learn to fly before they made their flying machine. Most inventors had adopted the opposite procedure and assumed that they must perfect their machine before they got into it. Otto Lilienthal watched the young storks learning to fly and noticed that they always faced the wind. Then he made of willow work and cotton cloth a pair of wings and a tail like those of a stork, and built up a 50-foot mound to jump off from since hills were scarce in his Pomeranian plains. He practiced with gliders until he could fly sometimes 300 yards and rise higher than his hill. After learning the (*Turn to next page*)

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art of flying by such practice the next step was to attach a motor, but before he could try this his experiments were terminated by a fall from the height of a hundred feet in a high wind. It is interesting to see that when the Germans were prohibited by the Treaty of Versailles from constructing airplanes they turned again to gliders and found it possible to stay in the air as long as daylight lasted.

The Wright boys, who were running a bicycle factory in Dayton, Ohio, sent to the Smithsonian Institution for the reports of the experiments in mechanical flight that were being made by its Secretary, Samuel P. Langley, and for such other literature as they could get on aeronautics. Getting more enthusiastic on the possibilities as they found out more about the subject they built a glider in 1900 and looked about for a locality where the wind blew and hills gave a jumping off place. On advice from the Weather Bureau at Washington they selected the coast of North Carolina at Kitty Hawk. For two seasons they tried out their gliders on the sand dunes, constantly gaining skill in the art of flying but without solving the secret of proper balance. Realizing then that the tables on which they had relied were wrong they made a wind tunnel in their shop during the winter of 1901-2 and figured new measurements for the balance and proportion of the plane with the aid of their schoolma'am sister (now Mrs. Katherine Wright Haskell of Kansas City).

The Wright brothers completed their motored glider, the first real airplane, in their bicycle shop at Dayton in September, 1903, and, by the time they got it set up at Kitty Hawk, there was time for only one day's trial. But that was enough. For on December 17, 1903, four flights were made, the two brothers taking turns in the machine. There were five witnesses and a photograph was taken in flight.

It was nearly four years before this feat was equalled by anyone else, even in France where interest in aviation was most active. Santos Dumont, on November 12, 1908, made a flight of 238 yards in 21 seconds, Henry Farman on October 26, 1907, remained in the air 56 seconds and flew nearly half a mile. But by that time the Wrights were doing 25 miles at a flight.

An historic event like this should

ORVILLE WRIGHT lives to see mankind in full flight

be given wherever possible in the words of a first hand authority, so here it is best to quote the description of the first flight as reported by Orville Wright in "Flying," December, 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 on a strange machine in a twenty-seven-mile wind, even if I knew that the machine had already been flown and was safe. After these years of experience I look with amazement on our audacity in attempting flights with a new and untried machine under such circumstances. Yet faith in our calculations and the design of this first machine, based upon our tables of air pressures, secured by months of careful laboratory work, and confidence in our system of control developed by three years of actual experience in balancing gliders in the air had convinced us that the machine was capable of lifting and maintaining itself in the air, and that, with a little practice, it could be safely flown.

"Wilbur, having used his turn in the unsuccessful attempt on the 14th, the right to the first trial now belonged to me. After running the motor a few minutes to heat it up, I released the wire that held the machine to the track, and the machine started forward into the wind. Wilbur ran at the side of the machine, holding the wing to balance it on the track. Unlike the start on the 14th, made in a calm, the machine, facing a 27-mile wind, started very slowly. Wilbur was able to stay with it till it lifted from the track after a forty-foot run. One of the Life Saving men snapped the camera for us, taking a picture just as the machine had reached the end of the track and had risen to a height of about two feet. The slow forward speed of the machine over the ground is clearly shown in the picture by Wilbur's attitude. He stayed along beside the machine without any effort.

"This flight lasted only 12 seconds, but it was nevertheless the first in the history of the world in which a machine carrying a man had raised itself by its own power into the air in full flight, had sailed forward without reduction of speed, and had finally landed at a point as high as that from which it started.

"At twenty minutes after eleven Wilbur started on the second flight. The course of this flight was much like that of the first, very much up and down. The speed over the ground was somewhat faster than that of the first flight, due to the lesser wind. The duration of the flight was less than a second longer than the first, but the distance covered was about seventy-five feet greater.

"Twenty minutes later the third flight started. This one was steadier than the first one an hour before. I was proceeding along pretty well when a sudden gust from the right lifted the machine up twelve to fifteen feet and turned it up sidewise in an alarming manner. It began a lively sidling off to the left. I warped the wings to try to recover the lateral balance and at the same time pointed the machine down to reach the ground as quickly as possible. The lateral control was more effective than I had imagined and before I reached the ground the right wing was lower than the left and struck first. The time of this flight was fifteen seconds and the distance over the ground a little over 200 feet.

"Wilbur started the fourth and last flight at just 12 o'clock. The first few hundred feet were up and down as before, but by the time three hundred feet had been covered, the machine was (*Turn to next page*)

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under much better control. The course for the next four or five hundred feet had but little undulation. However, when out about eight hundred feet the machine began pitching again, and, in one of its darts downward, struck the ground. The distance over the ground was measured and found to be 852 feet; the time of the flight 59 seconds."

The Wright brothers were so enraptured with the action of flying that they neglected their business and sold their Iowa farm in order to spend their summers in trying out and smashing up machines and their winters in trying to figure out why they did not work and in designing better ones. Meanwhile they were gaining confidence and competency in the art of aviation. They set up a shed in a field eight miles out of Dayton and here on September 20, 1904, Wilbur Wright completed a circular flight. In 1905 they were able to rise over fifty feet in the air and to stay up over half an hour.

Such flights were unprecedented anywhere in the world, but they aroused little interest in the farmers who watched them from the fields about Dayton or the newspaper men who were invited to witness them. The public, fooled so often by false alarms, had become skeptical and editors were scary of any flying stories. Even as late as 1908, as Mark Sullivan tells us, the *Cleveland Leader* refused to pay telegraph tolls on a dispatch telling of the amazing flights at Kitty Hawk and the editor sent back a sharp message to "cut out the wildcat stuff."

During the five years when the Wrights were perfecting their airplane and practicing the art of aviation hundreds of persons had seen them in the air about Dayton or Kitty Hawk at one time or another, yet on the whole America and France declined to believe that flying was an accomplished fact. The Wrights did not attempt to conceal their experiments, but they avoided publicity and refused, on account of pending patents, to give out detailed descriptions or allow their airplanes to be photographed.

But by 1908 they were ready for a public demonstration of what they had been doing and this was made in a way to convince the most skeptical on both sides of the Atlantic simultaneously. For this purpose

WILBUR WRIGHT pioneered; passed on

the two brothers, hitherto inseparable, parted company and in September, 1908, Orville Wright at Fort Myer, Va., met the rigorous requirements of the U. S. Army Signal Corps, and Wilbur Wright at Le Mans, France, won the Michelin prize of $4,000 and a trophy valued at $2,500.

The Army specifications for a heavier-than-air machine were that it must be capable of remaining in the air for one hour, of making 36 miles an hour against and with the wind, and of carrying a passenger and fuel for 125 miles. On September 12 Orville Wright made a record flight of one hour and 14 1/3 minutes. A speed of 40 miles an hour was made and passengers carried on several flights. But on September 17 a breaking propeller blade threw the machine to the ground, causing the death of Lieut. Selfridge and serious injury to Mr. Wright. This was the first airplane bought by any government in the world.

In France Wilbur Wright on September 21 made a continuous flight of one hour and 31 minutes and before the end of the year had extended this time to more than two hours and covered a distance of more than ninety miles. The French were so captivated by his success that a syndicate purchased the patent rights and engaged him to train aviators at Pau.

New Yorkers had their first chance to become convinced with their own eyes that flying was a possibility during the Hudson-Fulton celebration, when Wilbur Wright flew from Governor's Island to Grant's Tomb and back. This made the Hudson the scene of three epoch-making events in the history of transportation. The "Half-Moon" sailed up the river in 1609; the "Clermont" steamed up it in 1807; and the Wright airplane flew up it in 1909.

On December 5, 1908, Alexander Graham Bell wrote to Secretary Walcott of the Smithsonian Institution: "The Wright brothers are being deservedly honored in Europe. Can not America do anything for them? Why should not the Smithsonian Institution give a Langley medal to encourage aviation?"

At this instigation the Smithsonian Institution established the Langley medal and awarded it for the first time to Wilbur and Orville Wright "for advancing the science of aerodromics in the application to aviation by their successful investigations and demonstrations of the practicality of mechanical flight by man."

The secret of the success of the Wright brothers lay in their peculiar combination of venturesomeness and caution. They were willing to risk their own lives day after day in trying out uncontrollable gliders and capricious airplanes, but they opposed stunt flying from the start. The French were inclined to sneer at Wilbur Wright because he would not attempt flying unless his machine and the weather were just right to suit him, and then he went no further than the specified distance to meet the conditions of the competition. At the Hudson-Fulton celebration he waited patiently at Governor's Island regardless of the growing impatience and incredulity of the crowds on the banks of the Hudson, then, late in the day when the wind fell, he slipped up the river so quietly and quickly that many of them failed to see him. The two brothers so congenial in disposition and complementary in talents formed an ideal firm for the pioneer enterprise. In 1912 this historic partnership was dissolved by the death of Wilbur from typhoid.

Competition Aids Invention

General Science

ARTHUR D. LITTLE, in *The Handwriting on the Wall* (Little, Brown).

Our industries are entering upon a long period of super-competition, the duration of which will in large measure be determined by conditions in Europe or our own relations to them. As foreign markets are restricted, competition at home will be intensified. As the pressure increases, our manufacturers will be forced to rely more and more generally upon the scientific method for the control of materials and processes and to support intensive research as the basis for industrial development. We may hope to see the stupendous wastes which accompany our present operations minimized, and resources, now neglected, utilized to great advantage. Such abundant metals as beryllium, hafnium, calcium, and magnesium will be utilized. Our wastes in cereal straw will be turned to account. The lumberman will be brought to realize that he is leaving behind or burning up greater values than he markets. Pure iron, bright as silver and little subject to corrosion, will be available for a thousand uses.

Science News-Letter, December 8, 1928