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THE *First* PRACTICAL AIRPLANE

Part II: The season of success

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Using all they knew from the 105 flights made with the 1904 Flyer II, the Wrights completed the Flyer III over the winter of 1904-1905, using the hardware and engine from the previous airplane. It took some time for the craft to be assembled, and poor weather hampered their start in 1905. By early summer of 1905, they were ready to resume flying at Huffman Prairie.

With revisions to the machine, which they thought would cure the pitch instability, the new craft weighed 850 pounds, including enough water and fuel to run the engine for an hour. To remedy the odd characteristic they encountered when the airplane slid sideways in a turn, they added a pair of vertical semicircular vanes between the forward rudders' twin surfaces.

They had built a new shed building closer to the Simms Station interurban trolley rail stop that ran along the road along the northwest side of Huffman Prairie. Char-

lie Taylor had been serving as their "airport manager," overseeing and participating in the construction of the 1904 and 1905 sheds, and working on the revised engine design. Still using the basic horizontal four-cylinder design they had used for the 1903 Flyer, it could now produce 16 hp and would eventually produce 20 hp during the 1905 season. At one point during testing it produced 22 hp for a short time.

By June they were ready, and on June 23, they pulled the weight up to the top of the derrick, and Orville piloted the first attempt that Friday:

Wilbur Wright's Diary F, 1905, pages 1-3:

Friday, June 23, 1905

(1.) First flight. O.W. Time 9-1/2 sec. WW. 8-3/4", C.E. T. 76 Ft. wind [at 45°]. Distance 272 ft. over ground. The left wind was struck in landing and four ribs were cracked at rear left corner. [Power insufficient. Missing explosions.] The machine was fitted with two semicircular vertical front vanes (7 sq. ft.), and was*

very hard to control. Picture.

A couple of explanations are needed at this point. Each flight was timed by the pilot, in this case Orville Wright, as well as at least one observer on the ground. For this event, Wilbur Wright timed the flight, and Charlie (C.E.T.) made an observation about the current conditions, presumably with an anemometer. It also mentions a 45 crosswind. The items in brackets denote sentence fragments added from Orville's diary. The troubles from the previous year continued to dog them, and the next day, another type of accident took place. Wilbur continued in his Diary F:

While getting ready for first start the anchor stake was pulled from the ground and the machine ran down the track with O.W. doubled over the front handle riding backwards. Fortunately no serious damage to man or machine.

It was the second time the machine's restraining stake had gotten loose, and the Flyer had been

Lead Photo: The beginning of the flying season, 1905. Orville Wright is at the controls of the Flyer III on June 23. Wilbur appears to be running alongside, while Charlie Taylor stands to the far right. On the extreme right, the weight-driven catapult derrick is visible. This is the first photograph taken by the Wrights of that apparatus. With the engine developing a misfire, the flight lasted only 9-1/2 seconds and covered 272 feet. The Flyer III was hard to control and landed heavily on the left wing, breaking four wing ribs.

pulled down the rail before one of the brothers was ready to fly. Both times Orville leapt to the front of the Flyer, and at least one time he depressed the lever for the forward rudder so the machine wouldn't rear up at the end of the rail and smash itself into the prairie.

While photos were taken that day, the control difficulties appeared to preoccupy the brothers, as no other photos appear to have been taken until September. The ninth flight of the season was at-

tempted on July 14, 1905.

Wilbur Wright's *Diary F, 1905*, pages 6-7:

Friday, July 14, 1905

Wind N.W. 6-7 miles [straight ahead]

(9.) First flight. O.W. Distance 568 ft. Time about 12 sec. Anem.—251 meters. The machine seemed to steer all right laterally, but after attaining high speed began to undulate somewhat and suddenly turned downward and struck at a considerable angle breaking front skids, front rudder, upper front spar and about a dozen ribs, and lower front spar and one upright. The machine rolled over on front edge. O.W. was thrown violently out though the broken top surface but suffered no injury at all.

In repairing machine a number of changes were made. F[ront] rudder increased to about 84 ft. and placed 12 ft. from front edge of machine. Turns upward 31° and downward 26°. Total weight about 870 lbs. Owing to very hard rain the field became flooded and delayed us several weeks.

That was it.

Both brothers had long known

that flying at speeds approaching 35 to 40 mph could be dangerous, but this accident was a close call, and they knew it. Amazingly, once again Orville came out of the accident with nothing more than bumps and bruises. They had to come up with a solution to the stability problem that had persisted since December of 1903, or the undulations they regularly encountered would prevent them from making an airplane that could be considered safe to fly.

In the 1912 disposition mentioned in part I of this story, Wilbur wrote about the risk:

"In 1905 we built another machine and resumed our experiments in the same field near Dayton, Ohio. Our particular object was to clear up the mystery which we had encountered on a few occasions during the preceding year. During all the flights we had made up to this time we had kept close to the ground, usually within ten feet of the ground, in order that, in case we met any new and mysterious phenomenon, we could make a safe landing. With only one life to spend we did not consider it advisable



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September 7, 1905. Flight 23. After suffering a nearly disastrous crash on July 17, the brothers completely redesigned the forward rudder (elevator), moving it further out in front of the machine and increasing its surface area. The changes paid off, and by this flight, they were able to control the airplane consistently. Orville made two complete circles with the Flyer III during a 2-minute, 45-second flight.



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The 41st flight, the second of two flights on September 29, 1905. After the Wrights' warm-up flight of one circle in the morning, Torrance Huffman, the owner of the prairie the Wrights had borrowed for their flying experiments in 1904 and 1905, was present for this flight, which lasted an astounding 14 circles of the field, traveling 19,570 meters in 19 minutes, 55 seconds, according to Wilbur's stopwatch time of Orville's flight. The Flyer III averaged 36 miles per hour. Wilbur took 12 photographs of the flight, which lasted until Orville ran the Flyer III's gas tank dry.

to attempt to explore mysteries at such great height from the ground that a fall would put an end to our investigations and leave the mystery unsolved."

Even while keeping close to the ground and rarely exceeding 20 feet in altitude, accidents were happening on a regular basis to both O.W. and W.W., as they referred to each other in their pocket notebook diaries. If they flew any higher, accidents such as Orville's on the 14th of July would most likely be fatal.

A major revision was made to the layout of the Flyer III's design during the rebuild of the machine. The forward rudder was increased from just over 52 square feet in surface area to 84 square feet, and it was moved from 7.32 feet to 11.7 feet in front of the wings. The greater surface area and added moment arm meant the added ballast weight could be removed.

They resumed flying on Thursday, August 24. Three flights were made, and the changes to the Flyer proved to be on target. The Flyer had become

more controllable. One other aspect of the flights proved to be noteworthy enough that Wilbur felt it needed to be mentioned. At the end of his diary entry for that day, he jotted down, "Nothing broken in any of these three flights." That was a big change from their previous experiences.

Soon the flights started lasting over a half a minute on a regular basis, and as the brothers became accustomed to the aircraft's handling, without having to concentrate on overcoming the pitch instability, flights like the ones made on Wednesday, September 6, 1905, were obtained:

(20.) 1st trial. O.W. 620 meters [in] 40-1/5 sec. W. W. 37 sec. C. E. T. 37-4/5 sec. Distance over ground. 1,688 [ft.]

(21.) 2nd trial. O.W. [Speed through air] 16.5 [meters per sec], 4,730 meters [in] 4' 54 sec. W. W. 4' 46-1/2 sec. C. E. T. 4' 47-2/5". "Four rounds of field, and landed at starting point.

The pitch instability problem seemed to be fixed; they no longer

had to endure the ever-increasing undulations that would end in an abrupt landing, which often meant repairs, some major, would have to be made. Their confidence in solving the riddle began to relax them as well. In one entry concerning a flight on Wednesday, August 30, 1905, by Orville, Wilbur wrote that the flight was "A very comical performance." Orville's landing resulted in breaking the ends of four wing ribs.

There was one more problem that kept them from making even longer flights. Their accidents were not restricted to the problems with pitch stability. A curious loss of speed and a subsequent "arrival" in the hummock-filled pasture was still happening with annoying frequency.

Wilbur wrote in his 1912 disposition:

"The machine had reached the ground, in the peculiar cases I have mentioned, too soon for us to determine whether the trouble was due to slowness of the correction or whether it was due to a change of conditions, which would have increased in intensity, if it had continued, until the machine would have been entirely overturned and quite beyond the control of the operator. Consequently, it was necessary, or at least advisable, to discover the exact cause of the phenomenon before attempting any high flights. For a long time we were unable to determine the peculiar conditions under which this trouble was to be expected. But as time passed, we began to note that it usually occurred when we were turning a rather short circle. We, therefore, made short circles sometimes for the purpose of investigating and noting the exact conduct of the machine from the time the trouble began until the landing was made."

Time after time, the vexing "peculiar cases" occurred during 1905, as they had in 1904. Wilbur continued:

"At one time we thought it might be due to the fact that the machine, in circling, did not face exactly in the direction of the line of motion. To test this point we disconnected the rudder wire from the warping wire and operated the rudder by an entirely separate



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Another of the 12 photographs taken of flight 41 shows Orville flying 60 feet over Huffman Prairie. Compared to the 1904 machine, one can clearly see how far forward the Wrights placed the elevator after the July 17 crash.

INTERESTING WRIGHT WEBSITES:

www.wrightexperience.com

www.first-to-fly.com

Plenty of Wright materials here, including a nice collection of photographs of all 19 aircraft produced by the Wrights and their company. Also included is a delightful interview and caricatures of the Wrights by Kate Carew, a well-known journalist and artist working at that time for the *New York World*.

www.rootcandles.com

In addition to their current business, a short summary of the A.I. Root company history is maintained on this site, and it includes full excerpts of the January 1 and January 15, 1905, articles written by Amos Root about his experiences at Huffman Prairie the previous year.

www.libraries.wright.edu/special/wright_brothers/

The Online Archives of Wright State University. There is an extensive collection of Wright materials within the library's collection, which was donated to the university by the Wright family in 1975.

References:

A number of published sources were consulted to compile these articles, chief among them:

The Bishops Boys, A Life of Wilbur and Orville Wright, by Tom Crouch

The Papers of Wilbur and Orville Wright, including the Chanute-Wright Letters, Volume 1, 1899-1905, edited by Marvin W. McFarland, Aeronautics Division of the Library of Congress

Kill Devil Hill, Discovering the Secret of the Wright Brothers, by Harry Combs, with Martin Caidin

The Wright Brothers, by Fred C. Kelly

You can see the original Wright Flyer III on display at the Wright Brothers Aviation Center at Carillon Historical Park in Dayton, Ohio. Log onto www.carillonpark.org for park hours and other information.

handle. The trouble, however, continued as before. A flight...was made on the 28th of September, 1905, with the rudder wires entirely disconnected from the warping wires. When it was noticed that the machine was tilting up and sliding toward the tree, the operator **turned the machine down in front** (emphasis ours—VA Ed.) and found that the apparatus then responded promptly to the lateral control. The remedy was found to consist in the more skillful operation of the machine and not in a different construction. The trouble was really due to the fact that in circling, the machine has to carry the load resulting from centrifugal force, in addition to its own weight, since the actual pressure that the air must sustain is that due to the resultant of the two forces. The machine in question had but a slight surplus of power above what was required for straight flight, and as the additional load, caused by circling, increased rapidly as the circle became smaller, a limit was finally reached beyond which the machine was no longer able to maintain sufficient speed to sustain itself in the air. And as the lifting effect of the inner wing, owing to its reduced speed, counterbalanced a large part of the increased lift resulting from the greater angle of incidence on that wing, the response to lateral control was so slow that the machine sank to the ground, usually before it had been brought back to the level again. . . .When we had discovered the real nature of the trouble, and knew that it could always be remedied by tilting the machine forward a little, so that its flying speed would be restored, we felt that we were ready to place flying machines on the market."

The brothers clearly understood the nature of wing loading and how the additional load of turning flight was affecting their airplane. They knew that maintaining forward speed was essential, and by doing so they avoided the slide to the inside of the turn they had been fighting. With the problem solved, higher flights of 40 to 60 feet in altitude were commonplace. By the beginning of October, they were flying the Flyer III at will, and flight times started being



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The last photographed flight of 1905. Wednesday, October 4, 1905, 4:32 p.m. The brothers' sister, Katharine, as well as their father, Milton, were present along with nine others (including Charlie Taylor) when Orville flew for 33 minutes, 17 seconds on Wilbur's stopwatch, covering nearly 21 miles. Now they were confronted with new mechanical difficulties. As their flight times increased, they began to experience overheated bearings. By this flight, they'd added an oiler to the rear bearing on the axle under the chains, but not on the front bearing. You guessed it, the flight ended as the front bearing overheated. Orville shut down the engine while in flight and glided 400 feet to land in front of the storage shed. His record for flight endurance would stand for exactly one day—on October 5, 1905, Wilbur would keep the Flyer III in the air for 30 laps of the field, flying 38 minutes, 3-1/5 seconds, according to Orville. The slightly more than 24-mile flight would stand as the record until they resumed their flights in 1908.

measured in half-hour increments, instead of half a minute.

The weather hadn't helped them much either. In a letter to Octave Chanute, dated October 18, 1905, Wilbur wrote: "The wet weather of this year has very much interfered with our practice by keeping the ground so wet and soft that we have been entirely prevented from operating many days when the sky was clear. The labor of moving the machine on wheels has been greatly increased, and the over-ex-

ertion produces quick exhaustion, so that only a few flights can be made at a time. The wet grounds did not permit us to resume experiments till the last week of September, but the next two weeks were so fine that we did more flying than in all our previous flights of three years put together. On the 26th we passed the ten-mile mark for the first time with a flight of 17,961 meters in 18 min. and 9 sec. The exhaustion of the gasoline supply ended the flight."

For a week, it seemed that every

time they mounted the Flyer on the rail and launched it, the pilot set a new record. The only limiting factors were the gasoline supply and the new problem of overheating bearings. The engine and chain drive transmission were running so long that the transmission bearings would run out of lubricant, so they added oil cups to them. The same thing happened occasionally to the front engine bearing. The airplane could be flown almost whenever it pleased them, and on the 5th of October, Wilbur flew the Flyer for the second to the last time that year. He remained aloft for 30 laps over Huffman Prairie, flying 38,956 meters (24.2 miles) in just over 38 minutes. The weather that fall was still unsettled, and the last flight of the 1905 season, on Monday, October 16, lasted only a bit more than a minute. Delays prevented Wilbur from flying until a 5 p.m. launch, "too late for extended flight," according to his diary entry. It would be over two years before either brother would take to the air again—on May 6, 1908, in Kitty Hawk, North Carolina. They took the 1905 Flyer III to their old camp on the Outer Banks to knock the rust off of their flying skills before their first major public flight demonstrations in the United States and France.

By the fall of 1905, they knew they had a practical airplane. Now all they had to do was sell it. It would prove to be as great a challenge as either of them would ever face.

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