

Octave Chanute's Experiments with Gliders in the Indiana Dunes, 1896

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In 1896 the Indiana dune country along the southern shore of Lake Michigan was the scene of significant developments in the history of aviation, for here Octave Chanute, one of the pioneers of human flight, performed his experiments with gliders. Chanute, born in France in 1832, had already achieved a position among America's most eminent civil engineers when he became interested in aeronautics. In 1853 he worked as a surveyor on the construction of the Joliet and Bloomington portion of the Chicago and Alton Railroad, and in the years that followed he held other assignments with railroads in the Middle West. Chanute designed and supervised the building of Chicago's Union Stockyards in 1867, and he was chief engineer for the Erie Railroad from 1873 to 1883. Perhaps his greatest engineering achievement was the design and construction of the railroad bridge across the Missouri River at Kansas City which was completed in 1869. In 1889 he established his home in Chicago.¹

When almost sixty years of age, Chanute became interested in Otto Lilienthal's experiments with gliders. Lilienthal, a German, is regarded as the most important of the "modern fathers" of aviation. Chanute collected and sifted every bit of information he could find about aeronautical work done in Europe, even from the earliest times. The result was a volume, *Progress in Flying Machines*, published in 1894, which became one of the bibles of aeronautics. This work was said to have been the first reasoned analysis of aviation experiments to be published; it was symbolic of one of Chanute's chief functions in the history of flight, for he

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¹ *The Aeronautical Annual* (Boston, 1896), 56-59. Since this unsigned biography accompanies an article, "Sailing Flight," by Chanute, the information apparently came from him. Also see Marvin W. McFarland (ed.), *The Papers of Wilbur and Orville Wright: Including the Chanute-Wright Letters and Other Papers of Octave Chanute, 1899-1948* (2 vols., New York, 1953), I, 15-16n.

was the great collector and disseminator of accurate information about aviation as well as a pioneer in his own right.²

Having published his book, Chanute decided to experiment with gliders of his own design. His immediate objective was not to perfect a machine that would fly farther than any other had flown nor to excel in any of the spectacular aspects of aviation. Instead, Chanute believed that of all the problems involved in aeronautics the most important was equilibrium; for until automatic stability at all angles of flight and conditions of wind was achieved, and safety therefore secured, it would be premature to place a motor in a flying machine. Chanute was certain that lack of balance was the chief weakness of Lilienthal's machines and that the German's success was due largely to his superb physical and mental coordination. Lilienthal's death as a result of a glider accident in 1896 strengthened Chanute's opinion that the problem of equilibrium must be solved before men could fly with safety.³

While Lilienthal experimented with both monoplane and biplane gliders, the operational principles of the two were fundamentally the same. The pilot "stood in the middle of the apparatus, thrusting his arms through padded openings in the frame, so that the weight in flight rested on his elbows." Thus he sailed through the air with a portion of his body and legs hanging below the machine. He maintained balance while in flight by moving his body and swinging his legs back and forth or from side to side as the occasion required. Lilienthal made his flights from hills, one of which was artificially constructed, and from low mountains.⁴ In 1896, aware of the need for a better method of control, he installed a movable rudder on a biplane glider, the apparatus being operated by a rope fastened to a band around the pilot's head. The plan called for the machine to climb when the head was moved forward and to descend when it was moved backward. While testing this device Lilienthal apparently became

² Charles Harvard Gibbs-Smith, *A History of Flying* (New York, 1954), 207.

³ O. Chanute, "Opening Address, International Conference on Aerial Navigation (Paris)" (undated, typewritten manuscript in the Collected Papers of Octave Chanute, John G. Crerar Library, Chicago). In this paper Chanute speaks of Lilienthal in the present tense. Since the latter died in August, 1896, the meeting was no doubt held before that date.

⁴ Lewin B. Barringer, *Flight Without Power: The Art of Gliding and Soaring* (New York, 1940), 2.

confused by the unfamiliar controls and was killed when the glider plunged fifty feet to the ground.⁵

In contrast to Lilienthal, Chanute's objective was to discover better means of control than that of shifting the weight of the pilot and also to obtain some measure of automatic stability. He sought to achieve these ends with the use of adjustable surfaces and parts which could be controlled with a minimum of effort on the part of the pilot. Because of the success of his efforts, Chanute must be given credit for the development of the first reasonably stable flying machine.⁶

Chanute selected Miller Beach, in what is now the northeastern part of Gary, for his experiments because the high sand dunes there were reasonably devoid of vegetation and because of the frequent north and northwest winds, which were best for glider flights in that area. Moreover, the soft sand assured maximum safety for the operators of the machines. Chanute also hoped, but mistakenly, that at Miller he would escape the attention of the newspapers and curiosity seekers. His party, which arrived in Miller on June 22, 1896, consisted of Augustus M. Herring, a pupil of Lilienthal who had been associated with Samuel P. Langley at the Smithsonian Institution; Paul Butusov, a young Russian aeronautical enthusiast; William Avery, a carpenter; and James Ricketts, a young Chicago physician.⁷ A camp was established northeast of what is now the Lake Street bridge over the Grand Calumet River.

The engineer's desire to keep his experiments a secret from the public was blasted immediately. According to Chanute, "As soon as we left the train at Miller with our suspicious baggage, we soon had more visitors than was altogether pleasant in preliminary experiments."⁸ Within a short time several Chicago, Boston, and New York newspapers

⁵ Cecil Leonard Brown, *The Conquest of the Air: An Historical Survey* (London, 1927), 65-66; Edwin Way Teale, *The Book of Gliders* (New York, 1930), 31.

⁶ *Scientific American*, Supplement No. 1826, LXX (December 31, 1910), 427.

⁷ Octave Chanute's Diary, 1896, in McFarland, *Papers of Wilbur and Orville Wright*, I, 641n. Chanute, conscious of the possibility of injuries to his glider pilots, insisted on having a physician in his party. Ricketts also served as the camp cook. See *Scientific American*, CV (September 23, 1911), 275. In this publication Ricketts was referred to as "Howard" and not "James."

⁸ O. Chanute, "Recent Experiments in Gliding Flight," *The Aeronautical Annual* (Boston, 1897), 33.

had reporters on the scene. A representative of the *Westchester Tribune*, Chesterton, Indiana, who arrived at the camp site while the tents were being erected, described Chanute as a little man with gray hair and a "French style" beard. On being told that the Chesterton visitor was a newspaper man, Chanute said:

I did not come here seeking notoriety. We have a machine that is an improvement on the one made in Berlin [Lilienthal's] which we are going to test but do not expect these tests to be successful. We want nothing said of our work or that we are here, because we do not want to be classed with the army of aerial cranks that have been and are exciting the country. We want nothing said in the newspapers and we want no visitors.⁹

Nevertheless, some of the residents of the Dunes area did regard Chanute as a crank, and fantastic stories were told in later years about the "Crazy Old Man of the Sand Dunes." His first wings, some of the natives insisted, were thatched with chicken feathers. A famous naturalist, when spending his boyhood summers in the sand hills, was impressed by the stories of the "lonely old man" and of his efforts to fly.¹⁰

The Miller Beach site was ideal for Chanute's experiments, for the dunes in that area were about seventy feet high. Adjacent to the camp was a long dune which bordered the Grand Calumet River for some distance. A few hundred feet to the north was another dune which ran east and west; beyond it to the north was a wide, level beach extending to the edge of Lake Michigan.¹¹ Since Chanute was too old to pilot the machines, he left the testing to Herring and occasionally to other members of the party. The operators, who were suspended from the wing of the Lilienthal monoplane glider and from beneath the lower wing of Chanute's multiple-winged machine, would make running starts of several steps and launch themselves into the wind from the top of the dune. About a hundred glides, the longest being 116 feet, were made with the Lilienthal machine. Chanute found the Ger-

⁹ *Westchester Tribune* (Chesterton, Indiana), June 27, 1896.

¹⁰ Edwin Way Teale, *Dune Boy: The Early Days of a Naturalist* (New York, 1943), 118-119.

¹¹ Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual* (1897), 32; George A. Brennan, *The Wonders of the Dunes* (Indianapolis, 1923), 141.

man's glider dangerous and hard to handle, so tests with it were discontinued.¹²

The Chanute glider, the wings of which were arranged to swerve fore and aft to adjust the center of lift, was a fantastic machine with five tiers of wings on each side of the center structure. It had two small wings like rudders in the rear. Although its longest flight was only eighty-two feet, this "Venetian blind" affair was flown at least three hundred times without the slightest injury to the pilots.¹³ Chanute, who was concerned with principles of construction that would achieve balance for the machine and safety for the operators, was satisfied with its performance. The members of the party, all of whom were no doubt familiar with Lilienthal's book, *Bird Flight as the Basis of Aviation*, also spent hours watching the hawks, eagles, and gulls of the area, comparing notes on what they saw.¹⁴ In 1897 Chanute stated that he had learned more from the experiments at Miller than he had discovered during many years study of aeronautical principles and experiments with models.¹⁵

The initial experiments at Miller Beach were terminated on July 4, 1896, and the machines were returned to Chicago. Chanute, Herring, and Butusov spent the next few weeks supervising the construction of new gliders which incorporated the principles learned during the tests.

Chanute returned to the Indiana dunes on August 20, 1896, but not to Miller where the public had interfered with his work. Instead, the party came on the sailing vessel, "Scorpion," to Dune Park several miles east of Miller, where a site was selected in an unsettled area about two miles from the station of Dune Park, now Wilson, on the Lake Shore and Michigan Southern Railroad. The only road through the woods, swamps, and dunes was so indistinct that visitors frequently lost their way when they sought to reach the camp. But Chanute's hopes for privacy were again shattered when

¹² Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual* (1897), 36.

¹³ *Ibid.*

¹⁴ Teale, *Book of Gliders*, 24, 36. Lilienthal's study of bird flight was published in Berlin in 1889 as *Der Vogelflug als Grundlage der Fliegekunst*. An English translation of its second edition, *Bird Flight as a Basis of Aviation* (n.p., 1911) was published.

¹⁵ Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual* (1897), 37.

a storm wrecked the camp and much of the equipment on the night of his arrival. Replacements were sent by railroad to the Dune Park station, thereby attracting the attention of the public and the newspapers.¹⁶ The *Westchester Tribune* gleefully remarked that Chanute had discovered he could not get away from newspapermen.¹⁷

Chanute tested three types of machines at Dune Park: his original multiple-winged affair, a glider with three wings, and a monoplane invented by Butusov. The design of the three-winged machine was Chanute's, except for an automatic device perfected by Herring which was intended to secure stability.¹⁸ All the machines were constructed at Chanute's expense. Since Butusov's glider was too heavy for the operator to take off from a flying start, a slanting trestle was erected. Its runways were greased with tallow and two men pulled the machine into the wind. The glider never flew more than 75 feet and was soon abandoned as unsatisfactory.¹⁹ The greatest distance achieved by the multiple-winged type was 188 feet in 7.8 seconds with Avery as the operator.²⁰

The first trials of the three-winged machine showed that the lower surface was too close to the ground. It was removed and the glider became a biplane.²¹ This machine was unusually successful; numerous flights of from 199 to 359 feet were made without any serious injury to the pilots. One flight of 359 feet was made by Herring at a maximum height of 62 feet in 14 seconds, or something more than 17 miles an hour.²² Glides were made in winds of as much as thirty miles an hour velocity, something which Lilienthal was reported to

¹⁶ *Ibid.*, 40-41.

¹⁷ *Westchester Tribune*, August 26, 1896.

¹⁸ Octave Chanute, "The Evolution of the 'Two-Surface' Flying Machine," *Aeronautics*, III (October, 1908), 28-29.

¹⁹ Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual* (1897), 42.

²⁰ Octave Chanute's Diary, 1896, McFarland, *Papers of Wilbur and Orville Wright*, I, 648.

²¹ Chanute, "The Evolution of the 'Two-Surface' Flying Machine," *Aeronautics*, III (October, 1908), 28.

²² Octave Chanute's Diary, 1896, in McFarland, *Papers of Wilbur and Orville Wright*, I, 649. Teale, *Book of Gliders*, 37, reports that the gliders at Dune Park achieved a maximum speed of 52 miles an hour; and Barringer, *Flight Without Power*, 3, states that Herring reported a flight of 927 feet in 48 seconds. No verification of such unusual performances was found in Chanute's writings.

have said would surely bring disaster to any pilot.²³ Such confidence was acquired in the biplane that all in the party were permitted to fly it. Chanute believed that any young man could become expert in the use of the machine within a week.²⁴ He did not, however, consider his biplane sufficiently stable or airworthy to justify the attempt to fit it with an engine and make motor-driven flights.²⁵ At the termination of the tests, Chanute estimated the costs of the experiments at Miller and Dune Park at \$14,000, all of which he paid personally.²⁶

The biplane glider as developed by Chanute was his greatest achievement in the field of aeronautics. This machine, which later became famous as the "Chanute type," was the model upon which the first successful powered airplanes were built. While Chanute did not invent the biplane, he was the first to apply the principles of the modern truss bridge to glider construction.²⁷ In describing the wings of the machine Chanute said:

Being a builder of bridges, I trussed these surfaces together in order to obtain strength and stiffness. The surfaces were connected by a girder composed of vertical posts and diagonal ties [wires], specifically known as a "Pratt truss."²⁸

The wings, which were straight and slightly cambered to diminish the pressure of wind gusts, were referred to by

²³ Chelsea Fraser, *The Story of Aircraft* (New York, 1933), 291.

²⁴ Octave Chanute, "Some American Experiments," *The Aeronautical Annual*, (Boston, January, 1898), 9. According to Chanute, accidents were so rare at Dune Park that Dr. Ricketts could only exhibit his talents as a cook. See Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual*, (1897), 41.

²⁵ Brown, *Conquest of the Air*, 72. Chanute's opinion that the biplane was not as yet sufficiently stable to permit motor-driven flights was justified in October, 1898, when Herring failed in his efforts to do so. Herring's experiments, which were witnessed by Chanute, took place at St. Joseph, Michigan. See McFarland, *Papers of Wilbur and Orville Wright*, I, 651n.

²⁶ Octave Chanute, "Development and Future of Flying Machines," *The City Club Bulletin* (Chicago), II, No. 15 (1898), 192, in *The Collected Papers of Octave Chanute*, John G. Crerar Library, Chicago. Herring conducted experiments, partly at Chanute's expense, with a biplane glider at Dune Park in September, 1897. These experiments were erroneously referred to as "Chanute glides of 1897." See McFarland, *Papers of Wilbur and Orville Wright*, I, 651n.

²⁷ Wilbur Wright, "Some Aeronautical Experiments," Address delivered before the Western Society of Engineers, Chicago, September 18, 1901, in McFarland, *Papers of Wilbur and Orville Wright*, I, 102.

²⁸ Chanute, "The Evolution of the 'Two-Surface' Flying Machine," *Aeronautics*, III (October, 1908), 29.

Chanute in another instance as "aerocurves."²⁹ The vertical and horizontal tail or rudder, an invention of Herring's, was held in place by a spring which permitted it to move upward or downward from its normal position, thus modifying the action of the wind gusts upon it and thereby achieving longitudinal stability.³⁰ Otherwise, the pilot, who was suspended beneath the lower wing, controlled the glider by throwing his legs to the left or to the right as the occasion demanded. The machine was light but very strong; weighing only 23 pounds, it carried a maximum weight of 178 pounds.³¹ This was the glider upon which the Wright brothers based the design of their machines and later of the first motor-driven airplane.³²

Chanute stands out most prominently as the man who directly encouraged the Wright brothers and provided them with a practical example of biplane construction. In May, 1900, Wilbur Wright, who was acquainted with Chanute's writings and accomplishments, wrote him the first of numerous letters exchanged by the two during the next ten years. The Chanute-Wright correspondence is said to be

unquestionably among the most important, not to say fascinating, chapters in all of aeronautical literature and certainly of aeronautical history. It is seldom that mankind's epochal

²⁹ Chanute, "Some American Experiments," *Aeronautical Annual* (1898), 10.

³⁰ Wilbur Wright, "Some Aeronautical Experiments," McFarland, *Papers of Wilbur and Orville Wright*, I, 103. For several years a controversy occurred between Chanute and Herring in regard to the "Chanute type" of glider. Herring and his friends insisted that Chanute was not giving Herring sufficient credit for his part in the development of the machine. Although Chanute in his diary refers to the biplane tested at Dune Park as the "Herring machine," he also speaks of it in the same document as the glider Herring "called his own." On several occasions Chanute gave Herring full credit for the "automatic regulator" which operated the rudder. At one point of the controversy, Chanute declared that he "did not claim to have made any invention at all, but simply designs to study automatic stability." For details of this affair see Octave Chanute's Diary, 1896, McFarland, *Papers of Wilbur and Orville Wright*, I, 648-652; Octave Chanute to James Means, September 29, 1897, and Octave Chanute to Matthias C. Arnot, March 24, 1901, *ibid.*, I, 650-652; Chanute, "Recent Experiments in Gliding Flight," *Aeronautical Annual* (1897), 39; Chanute, "Some American Experiments," *Aeronautical Annual* (January, 1898), 10; Chanute, "The Evolution of the 'Two-Surface' Flying Machine," *Aeronautics*, III (October, 1908), 28-29.

³¹ Barringer, *Flight Without Power*, 3; *Scientific American*, Supplement No. 1826, LXX (December 31, 1910), 427.

³² The most important improvement made by the Wright brothers in the Chanute glider was the elimination of its vertical and horizontal rudder in the rear and the placing of a "horizontal rudder" in front of the machine. This innovation proved useful in securing fore and aft balance. See Brown, *Conquest of the Air*, 94-95.

achievements on the history-making and history-changing scale of practical aerial flight have ever been recorded, discussed, and elucidated with such clarity, candor, and simple charm as are found in the Wright-Chanute letters. . . . These precious documents are instinct with the scientific intelligence and philosophic spirit out of which flight was born.³³

Wilbur Wright, in his first letter to Chanute, revealed his ideas and ambitions in regard to flying and also sought advice about the best locations for winter experiments with gliders.³⁴ A short time later he asked Chanute where spruce could be obtained and what type of varnish was best for use in constructing gliders.³⁵ In May, 1901, Wright invited Chanute to visit him and his brother, Orville, at their camp at Kitty Hawk, North Carolina.³⁶ Chanute accepted, returning in 1902 and 1903 to witness their experiments. The Chanute-Wright letters are filled with highly technical discussion and information about aeronautics. Throughout the correspondence one sees Chanute's encouragement of the brothers in their efforts to solve the problem of heavier-than-air flying machines.

In January, 1911, about a month after Chanute's death, Wilbur Wright paid tribute to his friend and also reminded the world that important aeronautical achievements had been made in the Indiana dunes when he wrote:

Mr. Chanute was one of six very remarkable men who in the last decade of the 19th century raised studies relating to flying to a point never before attained. Lilienthal, Chanute, Langley, Maxim, Ader, and Hargrave formed by far the strongest group of workers in the field that the world has seen. Lilienthal and Chanute were peculiarly missionaries of the cause, and by their writings gave their experimental work an influence on the progress of the art not equalled by the others. Mr. Chanute's book, *Progress in Flying Machines*, was one of the greatest contributions ever made to the advancement of the art. His Dune Park experiments, in combination with the clear manner in which they were presented to the public,

³³ Marvin D. McFarland and Arthur G. Renstrom, "The Papers of Wilbur and Orville Wright," *The Library of Congress Quarterly Journal of Current Acquisitions* (August, 1950), quoted in McFarland, *Papers of Wilbur and Orville Wright*, I, x.

³⁴ Wilbur Wright to Octave Chanute, May 13, 1900, McFarland, *Papers of Wilbur and Orville Wright*, I, 18-19.

³⁵ Wilbur Wright to Octave Chanute, August 10, 1900, *ibid.*, I, 22.

³⁶ Wilbur Wright to Octave Chanute, May 12, 1901, *ibid.*, I, 54.

constituted another very important contribution, and finally his encouragement of workers in all countries vastly influenced the trend of events accompanying the birth of the art. From all of these causes I think I was fully justified in saying that if he had not lived the history of human flight would have been quite different from what it has been.³⁷

Today, a small plaque northwest of the Lake Street bridge over the Grand Calumet River in Miller marks the site of Chanute's initial efforts to conquer the skies over the Indiana dunes.

³⁷ Wilbur Wright to Charles S. Strobel, January 27, 1911, *ibid.*, II, 1018-1019. Also see Wilbur Wright, "The Death of Octave Chanute," *Aeronautics*; VIII (January, 1911), 4. Samuel Pierpont Langley (1834-1896), for some years head of the Smithsonian Institution, experimented with steam-powered and gasoline-driven airplanes; Sir Hiram Stevens Maxim (1840-1916), American-born English citizen and inventor of the Maxim machine gun, also conducted experiments with steam-driven flying machines; Clement Ader (1841-1925), French engineer, worked with gliders and attempted to perfect a steam-powered airplane; Lawrence Hargrave (1850-1915) invented box kites which provided the foundation for the development of the power airplane in Europe. See Gibbs-Smith, *History of Flying*, 193, 198, 199, 209.