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"ON THE WINGS OF THE WIND"
(GLIDING)

GENERAL SCIENCE
THESIS

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Introduction

I selected thesis on "Gliding" because I am interested in the subject and I knew that by writing this composition I would clear up many doubts in my mind on the subject and in the minds of many people who are interested in the new art of motorless-flying.

I William Wegrich

dedicate this composition to all
fellows who have the nerve to start,
finish, and to fly a glider.

HISTORY OF GLIDING

Gliding history begins with legends of men who jumped from high places with mechanical wings and sailed safely to earth. Most of the stories are undoubtedly fiction but some of these unknown experimenters may have accomplished flying squirrel-like swoops on outstretched wings. The first man who is known to have studied the possibilities of heavier-than-air flight from a scientific angle was the great Italian painter and scientist, Leonardo da Vinci. He left many sketches of the details of a proposed machine, although there is no record that he ever attempted to fly.

LOUIS PIERRE MOUILLARD

This pioneer was a Frenchman who owned a farm in far-off Algeria, Africa. For thirty years, as he cultivated his fields, he studied the flight of the eagles, vultures and other soaring birds that circled in the air above his land. He made many notes and sketches. He traced the outlines of the wings of dead birds on paper and finally wrote his famous book on bird flight which he called "The Empire of the Air." Afterwards, he constructed a pair of wings fitted with a rudder which was to be steered by bicycle handlebars after the machine had been launched by running downhill into the wind. His machine was not a success and he was forced to give up his experiments because of lack of money. But his book inspired others to carry on the work.

CLEMENT ADER

Ader was well known in France as a leader in the development of the telephone, from which he had derived a fortune. After reading Mouillard's book, he made a trip to Algeria. Disguising himself as a native, he hired two Arab guides to take him into the interior of the country where he studied the flight of the great vultures of the region. By enticing them with bits of meat, he made them perform the marvelous wheeling maneuvers by which they would circle for hours and hours.

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Returning to France, at the age of forty-two, Ader constructed three monster engine-driven monoplanes resembling bats. The last of these, the "Avion," took five years to construct. It proved unmanageable. After spending \$400,000 on the three machines, Ader gave up his experiments in disappointment.

THE FOUR GREAT PIONEERS

Then came the four great pioneers of gliding; a wiry, little physics professor of California, John J. Montgomery, who flew his machines with the aid of cowboys; a retired German manufacturer, Otto Lilienthal, who built a hill to jump from; an English sailor, Percy S. Pilcher; and a world-famous builder of American bridges, Octave Chanute, who made his first flight when he was sixty-four.

JOHN J. MONTGOMERY

The first man in the world to fly in a glider was John J. Montgomery. Lilienthal is usually credited with this honor. But, in 1884, six years before the great German pioneer first tried his wings, Montgomery sailed 600 feet down a hillside at Otay, California, near the Mexican line.

John J. Montgomery was born at Yuba City, California, on February 15, 1858, the first of a pair of twins. His father, Zachary Montgomery, was at one time Assistant U.S. Attorney General. His mother, born in Ireland, had been brought to America at the age of six months, and had made the perilous ox-cart journey through the Indian country from St. Louis to California in the 1849 gold rush.

When John was about five years old, his family moved to his grandmother's farm, near Oakland, California. Here he showed his first interest in flying. He would lie on his back beside a fence and have his sisters drive his grandmother's chickens over so he could watch how they flapped their wings. His grandmother, puzzled

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by the mysterious increase in flying ability of her flock, clipped their wings and the experiments ended. Before he was old enough to build his own kites, he would tease his mother to make them for him. For hours, as a small boy, he would amuse himself by throwing pieces of tin, bent in various shapes and curves, into the air to see which would go the farthest.

In 1879, when he had completed his studies at St. Ignatius College, Santa Clara, his family had moved to San Diego. After a few months spent keeping a grocery store, during which he covered the wrapping paper with countless diagrams and calculations, he joined his family. In the hills near Otay, not many miles from the spot where Bowlus and Barstow have set their soaring records in recent years, Montgomery carried on his first gliding experiments. Back of the house, he set up a small blacksmith shop and a toolshed where he started, in 1883, the construction of his first man-carrying glider. It was patterned after the seagull. Its wings arched downward and had an area of about ninety square feet. When completed in 1884, the apparatus weighed forty pounds. Montgomery's weight was 130 pounds.

Because of the ridicule of the neighbors, Montgomery set out to test his machine on a lonely hillside at three o'clock in the morning, accompanied only by his younger brother, James P. Montgomery, now an attorney in Oakland. The machine was carried on a hayrack to the spot, three or four miles from his home. The hill had a gentle slope nearly a mile long. Shortly after sunrise, a breeze of ten or twelve miles an hour sprang up. Facing this sea breeze, Montgomery directed his brother to pull on a rope attached to the front of the glider. The machine rose beautifully in the air and sailed over the head of the brother who let go of the rope.

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A number of other successful experiments were made with the glider before an accident wrecked it. The rope was held too long and the glider crashed to earth, slightly injuring Montgomery and wrecking the machine.

During the next two years, he built two other designs. But neither attained the success of the first machine. The second glider he had built had flat wings instead of the curved ones he had correctly designed for his original machine. The third glider had the wings pivoted at the body for balancing. His lack of success discouraged the lonely experimenter. He decided too little was known about the laws governing flight. So he began at the beginning. He made thousands of experiments upon the wings of soaring birds, studying their shape, curve and the bones that braced them. From 1886, 1892, his researches were carried on whenever he could spare a moment from his other tasks, for he had taken the chair of Physics at Santa Clara College, now the University of Santa Clara, at Santa Clara, California.

By 1893, Montgomery had collected his data and planned the machine which later proved so successful. But it was not until eleven years later, 1904, that he was financially and otherwise able to build the models and full-sized machine that proved the correctness of his theories. The glider was a tandem monoplane, the wings placed behind each other. To test it, Montgomery took it to the steep San Juan Mountains where he flew it with the help of cowboys from the nearby ranches.

"In making these flights," he wrote, "I simply took the aeroplane and made a running jump. These tests were discontinued when I put my foot in a squirrel hole in landing and hurt my leg."

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The next year, 1905, he staged a spectacular exhibition of his machine by dropping it from a hot-air balloon high in the air. The glider was ridden by Daniel Maloney, known to the crowds at country fairs, where he made parachute jumps, as "Professor Lascelles." He wore brilliant silk tights. A crowd of 15,000 people gathered at Santa Clara on April 29, the date set for the flight.

Montgomery, a devout Catholic, had the balloon and glider blessed before the flight began. Then, those holding the canvas bag let go, and balloon and glider soared away. At 4000 feet, maloney cut loose. The forty-five-pound glider carrying its one hundred and fifty-pound rider dropped a few feet, then began to glide. It attained a speed at times, estimated a sixty-eight miles an hour and in the course of the flight Maloney made steep dives and sharp turns. He flew eight miles and remained aloft twenty minutes. It ended at a spot which had been decided upon before, three quarters of a mile from the place where the balloon had been released, and the pilot came down so gently that he remained upon his feet supporting the light machine with his hands.

This flight was characterized by Octave Chanute as: "The most daring feat ever attempted," and Alexander Graham Bell asserted: "All subsequent attempts in aviation must begin with the Montgomery machine."

The story of Montgomery is one of the most inspiring in the list of early pioneers in the conquest of the air. As a boy, he was lonely and misunderstood. As a man, he had to fight poverty and ridicule. He worked out his experiments thousands of miles from the nearest fellow investigator. He was able to get only the most superficial information about the work of his European contemporaries. In spite of this, he continued year after year wrestling single-handed with the problem which had baffled the trained engineers of the world. Because he worked alone and wrote little, he remained relatively unknown. Only recently have

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his great contributions to aviation begun to be recognized.

OTTO LILIENTHAL

This German pioneer is called "The Father of Gliding." His were the first public glider flights and they inspired others to build machines in many parts of the world. His favorite maxim was: "To conceive a flying machine is nothing; to construct one is little; to fly is everything."

He was born in Anklam, Pomerania, in 1848. Even as a small boy, he tells of lying in the grass watching the storks soaring over his father's house and dreaming of sailing through the blue sky. His younger, Gustav, still alive in Germany, helped him with all his early experiments. Gustav, now an old man, has spent practically all his life studying birds and still believes a wing-flapping machine can be made to fly. He keeps his experimental apparatus in a hangar at a Berlin air-field and lives near by.

The first experiment of the two brothers took the form of a pair of wings made by covering wooden frames with linen. Otto attached a frame to each arm and ran down a hillside wildly flapping the awkward pinions. Neighbor boys gathered to see the fun and jeered so loudly that the two brothers continued their experiments by moonlight.

In 1867, when Otto was about nineteen, a more elaborate wing-flapping mechanism was constructed. It strapped to his back and was operated by cords attached to his legs. It was no more successful than the wood-and linen wings. The Franco-Prussian War interrupted the experiments. After taking part in the Siege of Paris as a volunteer, Otto returned to his tests. Gustav, for a time, become engrossed in other things and Otto continued his researches alone.

For twenty years, from 1871 to 1891, from the age of twenty-three to the age of forty-three, he spent every spare moment in making tests

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and calculations. He became an eminent engineer and a manufacturer, but his purpose in earning money was to carry on his flying experiments. Later he retired and devoted all his time to his gliding.

Two years before he made his first glider, he wrote a book which gave the results of his experiments. It was called "Bird Flight as the Basis of the Flying Art." It is a landmark in the conquest of the air.

His first glider was built in 1891, and it was made of peeled willow rods and cotton cloth. The 100 feet of fabric in the wings was covered with wax to make it airtight. Lillienthal hung from arm-rests and maintained equilibrium by swinging his legs toward the high wing when a side-gust tipped the glider. In his methodical way, Lillienthal tried out his apparatus first in his garden by launching himself into the air from a springboard. He would pace off twenty-six feet, turn and run toward the board which would throw him into the air and allow him to glide for several yards.

When he commenced to take-off from hills in the neighborhood of Berlin, he encountered trouble. Once, in balancing his machine, he threw his weight too far back and was unable to pull himself up again. "I was thrown about like a sheet of paper when it is caught by the wind," he said. "At first I saw only blue sky, and then I saw only green grass, and I thought it was all over with me." A sprained left hand was the only painful result of the accident.

The strongest winds that Lillienthal Practiced in were of an estimated velocity of fifteen or sixteen miles an hour. He explained: "By running, I obtained an additional velocity of seven miles an hour. Under these circumstances, the first part of my flight is almost horizontal, and the alighting is always a gentle one."

Even while hopping off small hills near Berlin, he achieved some re-

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markable flights. "Almost every Sunday and sometimes on week days," he wrote, "I went out to practice on the hill between Gross Krautz and Werder. A mechanic, Herr Hugo Eulitz, the maker of my apparatus, went with me and each practiced alternately while the other rested. Thus we obtained dexterity in gliding down on the air and in landing at the foot of the hill with out mishap. Herr Kassner, of the Meteorological Institute, was so kind as to photograph me in the air, and thus enable me to exhibit how I sailed right over the head of the miller of Derwitz (in whose barn I stored my apparatus), and of his extemed poo~~le~~ dog."

In the summer of 1893, he built a circular "hangar" at the top of a long slope near Steglitz. The shed, in which he stored his apparatus, was provided with a sod roof to give Lilienthal a firm footing in making the run by which he sailed down the slope. The arrangement gave him a starting point of thirty-three feet high. When a former professor heard of this shed, he wrote that there was no harm in his amusing himself with his flying experiments but that he "should, for heaven's sake, spend no money for such things!"

After the shed was ready, Lilienthal waited for favorable winds. The hill sloped to the southwest, west and northwest. The wind blew from the east and the north almost every day for three months and the experimenter abandoned his shed and moved to the Rhinow Hills, near Rathenow. Out of the surrounding flat fields, this range of hills rises to a height of 200 feet with free slopes on all sides covered only with grass and heather. The inclination of the slopes varies from ten to twenty degrees. The elevations were far higher than any Lilienthal had tried before.

"When I unfolded my flying outfit for the first time on these slopes," he said, "a somewhat anxious feeling came over me when I said to myself:

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'From up here you are now to sail down into the land spread out deep before you.' But the first few careful leaps soon gave me back a feeling of security, as the soaring flight began here far more gently than from my flying tower. The wind did not 'rear up' here as it did in front of the tower, where I always felt a sudden upward blast from the wind in passing the edge, which often threatened to be dangerous."

This gliding place was some distance from his home so that he could not spend as much time with his machines as he desired. In 1894, an opportunity arose to obtain an ideal hill almost in his own backyard. A canal was being cut near Berlin and Lilienthal bought the dirt which was excavated and built a great conical mound in the middle of a level field at Lichterfeld. In the top he dug a cave where he stored his gliders. This hill was fifty feet high and gave him an ideal practice ground.

Before this he had introduced an innovation in his machines, constructing them so they would fold up; The ribs were arranged radially so the wings could be folded up like a fan. This saved space in the crowded underground storeroom.

"When you fall vertically in this apparatus," Lilienthal wrote about this machine, "it acts as a parachute. The air strikes vertically from below and presses uniformly on all parts of the surface. It is possible to get into this position in flying if the aviator uses up, in gliding upward, all the momentum acquired in flying downward. I have often been obliged thus to pass over some obstacles, a tree, a crowd of people or the photographer who was getting a view of me from the front. It is easy to rise in this way, but the apparatus comes to a stand at the summit, and if it cannot be promptly slanted down behind, it will be tilted toward the front in falling."

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In the five years between 1891 and 1896, Lilienthal made 2,000 successful flights, the longest from 600 to 1000 feet and lasting from a few seconds to more than a minute. His total time in the air for those five years was about five hours. He sometimes made his glides at a remarkable angle of ten to one. In later years he averaged 300 feet on his hops. The maximum speed he attained in the air was estimated at twenty-two miles an hour.

In 1895, he gave up monoplane gliders, with which he had experimented exclusively before, and built a biplane machine. This proved more stable and had a better gliding angle. "Six or seven meters velocity of wind," he said, "suffice to enable the sailing surface of eighteen square meters to carry me almost horizontally against the wind from the top of my hill without any starting jump. If the wind is stronger, I allow myself to be simply lifted from the point of the hill and sail slowly toward the wind. The direction of the flight has, in strong winds, a strong upward tendency. I often reach positions in the air which are much higher than my starting point. At the climax of such a line of flight, I sometimes come to a standstill for a time, so that I am able to speak with the gentlemen who wish to photograph me, regarding the best position for the photographing." Thus, it was Lilienthal who made the first soaring flights of history.

The biplane which he constructed had a supporting surface of 172 square feet and weighed fifty-three pounds. Lilienthal weighed 170 pounds.

. After the success of his biplane in 1896, Lilienthal decided he had advanced far enough to install an engine. He built a two and one-half-horsepower motor weighing ninety pounds. It was to use carbon-dioxide gas, the same gas that puts the fizz in modern ice cream sodas. He planned to carry enough of it in a tank for a four-minute flight. The throttle was to be a hand-operated valve on the tank. The motor was to propel the

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glider by flapping hinged tips on the main wings.

The motor and a new glider was ready for trial when Lilienthal decided to practice the new form of control which he had devised for his motored plane. The elevator was operated by a rope fastened to a band around the pilot's head. When he moved his head forward, the machine climbed; when he moved it backward the machine descended.

When he took off, the wind was gusty. At fifty feet in the air, the glider stalled. Lilienthal apparently was confused by the unfamiliar control system and the machine plunged to the ground like a stone. When he was removed from the wreckage, his spine was broken and he died the next day. His carbon-dioxide plane was neglected and later disappeared.

"Man must serve an apprenticeship to the birds," was one of Lilienthal's familiar sayings. For thirty-five years, from the time he was thirteen until he died at the age of forty-eight, he served such an apprenticeship, establishing many of the principles of flight which aided those who followed.

PERCY S. PILCHER

One day, about a year before Lilienthal's death, a slender twenty-nine-year-old English engineer named Percy Pilcher visited him. Pilcher had enlisted in the British navy before he was nineteen. After his period of service as a sailor had expired, he became an engineer and a lecturer at the University of Glasgow. From the time he was fifteen years old, his passion was flying.

In 1895, he constructed a glider, "The Bat." It closely resembled Lilienthal's monoplane. Before he tried his machine, he decided to visit the "Father of Gliding" in Germany. While there, he made several flights in the old experimenter's biplane machine. On his return, he launched himself in his own glider from the top of a high hill at Cardross on the Clyde River. But the flight of the Machine was as erratic as that of its namesake.

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Pilcher reduced the dihedral angle of the wings and tried again. This time the light glider, carrying its hundred-and-forty-five-pound operator, made a flight that lasted twenty seconds.

With this crude plane, Pilcher made the first towed glider flight in history. He hitched it to a team of horses. They were driven at a gallop across a field into the wind and the glider soared upward like a kite. At a height of twenty feet, Pilcher cut loose and sailed to earth. His flight lasted a full sixty seconds.

"The Bat" was not stable enough to suit the experimenter, so he built a second machine, "The Beetle." It had larger wings and weighed eighty pounds, twice as much as the first craft. The weight was too great and the craft was never a success. The following year, 1896, "The Gull" appeared. It weighed only fifty-five pounds and had huge wings with 300 square feet lifting surface. Pilcher had gone to the opposite extreme. The wings of this machine were too lightly loaded. Only in the calmest weather could it be managed; in winds, it was too large and unwieldy.

Undiscouraged, Pilcher set to work upon his fourth machine, "The Hawk". As in former gliders, "The Hawk" had wing ribs of bamboo and the pilot hung from arm-rests in an opening in the center of the apparatus. During the summer of 1896, he flew this machine with great success. Long glides were achieved and the operator could easily maintain balance by swinging his legs slightly from side to side. In one trip, the machine flew 800 feet across a valley when given a start by being towed at eleven miles an hour by boys running at the end of a rope. With the success of this machine, Pilcher began to plan the installation of a motor and propeller.

In 1898, he designed and constructed a glider having three wings one above the other. In it, a four-horsepower engine was to be fitted in

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front of the operator. By means of a shaft passing overhead it was to turn a propeller behind the wings. Like the ill-fated Lilienthal, Pilcher completed his motored ship but never had an opportunity to take it into the air. He had promised to give an exhibition with the motored ship but a misty rain was falling and he decided to make the flight in "The Hawk" instead of in the untried new machine.

A pair of horses were tied to the glider. At the signal they were started in a gallop across the muddy field. In spite of the rain, "The Hawk" rose quickly into the air. However, just as it left the ground, the rope snapped. Pilcher decided to try again and set out on his last flight.

The three-year-old glider climbed quickly to thirty feet and leveled off. It was flying on an even keel when a tail bracing wire broke. The tail collapsed, "The Hawk" plunged straight downward; and when Pilcher was lifted from the wreckage, he was unconscious. The doctors who made a first examination thought that he would recover, but two days later, on October 2, 1899, he died without having regained consciousness, and his triplane with its motor and propeller were never tested. Pilcher was thirty-four years old at the time of the accident.

OCTAVE CHANUTE

Montgomery, Lilienthal and Pilcher were all boys when they began their gliding experiments. Chanute, however, a man of more than sixty, and had lived a life filled with honors and brilliant achievements when he began his experiments.

He was born in Paris, France, in 1832. When he was six years old he was brought by his parents to America. In New York, he received his education. He was a civil engineer. Later, he built the first bridge across the Missouri River, and was entrusted with laying out the Chicago

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stockyards. The city of Chanute, Kansas, was named in his honor. At the time of his glider tests he was a friendly, pink-cheeked, white-goateed little man with a kindly twinkle in his eyes. He never lost his boyish enthusiasm for new adventures, and gliding to him was always a sport as well as a serious study.

In 1891, he began to write a series of articles on gliders in "The Railroad and Engineering Journal," published in New York City. These later collected into the famous book, "Progress in Flying Machines."

Five years later, in 1896, Chanute began actual flying. He was assisted by A. M. Herring, an American who helped Lilienthal in Germany. The first machine they constructed was a Lilienthal-type monoplane, in which they made about 100 glides down the sandy slopes of the wild dunes near Miller, Indiana. Chanute decided the monoplane was too difficult to manage and turned to biplanes after testing several multiple-winged gliders with the supporting surfaces arranged one above the other. With one of these "Venetian blind" planes, having five separate wings, 300 successful glides were made. Most of these flights were made by Herring and another assistant, William Avery. But Chanute, although sixty-four years old, took his turn in the air. Because he had no longer the quickness of youth, he sought some mechanical means for balancing the machines in flight so squirrel-like acrobatics would be unnecessary. He designed wings that swung horizontally to change the center of pressure, but they were not successful.

The following year he set up a camp in the isolated sandhills with half a dozen assistants. Five machines were constructed and tested. When the men were not working on the gliders or flying them, they spent hours watching the hawks, eagles and gulls of the wild region through field glasses, comparing notes on what they saw.

Of the five planes constructed that summer, most were discarded as too

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clumsy. The best was the famous Chanute "double decker". His experiences with bridges enabled him to devise the simple form of wire bracing between wings which was used in all early motored biplanes. This glider proved more stable than the others. It was not necessary to swing the body from side to side so frequently in the air. Almost 800 glides were made in it without an accident.

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As a result of his experiments, Chanute took out a patent upon a swinging wingtip designed to preserve lateral stability. His main idea was to achieve stability and control. He made no attempt to apply a motor to his glider.

When the wright brothers were carrying on their experiments, he aided them with advice and made a visit to their lonely camp at Kitty Hawk in 1903, only a few days before they accomplished the first airpland flight of history, a flight which he had helped make possible.

After Chanute's death, near the beginning of the World War, his original midels and plans were left to the Chicago Academy of Science, where they are now on exhibition.

WILBUR AND ORVILLE WRIGHT

When the news of Lillienthal's death was published in American papers, two young men in Dayton, Ohio, Wilbur and Orville Wright, read the accounts over and over again. Years before, a toy helicopter, which their father had brought them when returning from a visit, had first aroused their interest in aviation. The reports of the work of the German gliding pioneer stirred this interest anew and they set out on their "Apprenticeship to the birds."

Along the Miami River, near their home, they spent hours watching hawks and buzzards soaring overhead, trying to discover the secret of their flight. Then they began planning a glider along the general lines of Chanute "two-decker." However, they decided that maintaining balance by swinging the body from side to side was too unreliable. They realized that a completely controllable machine would never come until some method of balancing the wings mechanically had been found. This they set out to do.

One day, a coustomer came into the bicycle store which the brothers kept in Dayton, asking for an inner tube. After it was delivered, Wilbur stood

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talking to the purchaser with the cover of the pasteboard box in his hand. Unconsciously he twisted it as he talked. Noticing what he was doing, he was struck with the idea that by similarly twisting, or warping, the wings of their glider, lateral balance could be preserved. The idea was tried out in a large model, flown as a kite. By pulling strings on the ground the young inventors were able to warp the wings of the model and prove that their idea was sound.

The following year, 1900, they built a man-carrying glider embodying the idea of warping wings. to try out their machine, they sought a place with steady winds, and long slopes free from rocks and vegetation. They wrote to the Weather Bureau at Washington, D. C., and were told that just the place they sought could be found at the Kitty Hawk sand dunes on the sea-coast of North Carolina. In this wild region, about thirty miles from Elizabeth City, North Carolina, they pitched a camp and assembled the sateen-covered wings of their glider.

Riding the steady winds that went in from the sea, the machine, carrying the operator stretched out flat on the lower wing, made a number of glides. When the brothers returned to Dayton they had been in the air a total of about two minutes. While the behavior of the glider in the air was erratic, pitching and bucking, they had proved that it could be balanced mechanically and this was a great advance.

During the next two years, Wilbur and Orville Wright made nearly a thousand glides. Some were more than 600 feet long and in a number their motorless machine bucked winds as high as thirty-six miles an hour, hovering over one spot without making any descent. On several glides, the machine remained in the air more than a minute.

Sometimes at their camp a gale blew in from the sea with such force that even the birds sought shelter, and the Wrights had to keep their frail-winged machine securely housed in the rough shed they had constructed. Orville

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Wright, in an article in "Flying" in 1913, relates how a storm came in suddenly, blowing thirty or forty miles an hour. "It increased during the night, and the next day was blowing over seventyfive miles an hour. In order to save the tarpaper roof, we decided it would be necessary to get out in the wind and nail down more securely certain parts that were expecially exposed. When I ascended the ladder and reached the edge of the roof, the wind caught under my large coat, blew it up around my head and bound my arms till I was perfectly helpless. Wilbur came to my assistance and held down my coat while I stried to drive the nails. But the wind was so strong I could not guide the hammer and succeeded in striking my fingers as often as the nails."

Life at the camp of these two young glider flyers who were feeling their way tword the motored plane and the conquest of the air, is pictured by Orville's entries in a diary which he kept at the time, such as: "Friday, August 29, 1902. Kitchen fixed up and sixteen foot well driven. "Monday, Sept. 1. Raised building; made beds to last half a year. "Saturday, September 6. Put beds at ceiling. Watched eagles soaring. "Monday, September 8, Began work on glider after shooing away native razor-back pigs and ending careers of two mice, one with a gun."

Octave Chanute who had encouraged the Brothers in their experiments, visited their camp in 1902, and returned again in 1903. A.M. Herring, his assistant who had been with Lilienthal, came with him and told the young inventors tales of their hero and his flights from the Lichterfeld mound.

At home in Dayton, between summer trips to Kitty Hawk, Wilbur and Orville spent their spare time rigging up a crude wind tunnel and making tests on 200 tiny wings, investigating the lift of different shapes and curves. They placed them at all angles and tried them in tandem and in multiple combinations as well as singly, building up air tables which helped them later. Each glider they built was better than the one before, requiring less move-

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ment of the controls to maintain a level keel. When they returned to Dayton at the end of the 1902 visit to Kitty Hawk, they were ready to begin work upon the motor-driven plane in which Orville skimmed over the North Carolina sands in the first successful airplane flight of history on December 17, 1903.

RECENT HISTORY

In 1911, Orville Wright took his English friend, Alec Ogilvie, back to the Kitty Hawk dunes to fly a new glider upon which he wished to make some tests. In a forty-five-mile-an-hour gale, he hovered above Kill Devil Hill for nine minutes and forty-five seconds, setting a world's record that stood for ten years and an American record that stood for seventeen years.

In May, Ferdinand Schulz sailed along the dunes of the Galtic seacoast at Rossitten, traveling nearly four miles parallel to the coast.

In the fourth Rhoen contest, more than 100 ships were entered. On his "Konsul" soaring ship, Botsch set a new distance record by flying nearly twelve miles cross-country from the Wasserkuppe. During the same year, a soaring contest was held in Austria and another at Cherbourg, France, where one six-hour flight by Barbot in his "Dewoitine" Monoplane. About this time the French soaring plane builders began putting light engines in their craft and became less interested in gliding as a sport. Consequently, most of the advance from 1923 on was made in Germany.

In a sea-flying contest held at Rossitten in 1924, Ferdinand Schulz won first place by a flight of eight hours and forty-two minutes. He used the same crude machine the technical committee had rejected at the 1922 Rhoen meet.

In 1925, a new star, Massuax, of Belgium, advanced the soaring endurance record to ten hours and twenty-nine minutes at Vauville, France. His long flight was made on July 26. A few months later, on October 2, Schulz recaptured the record by a twelve hour and six minute soaring journey at Krim,

HISTORY OF GLIDING

Russia. At this same meet, the youthful Johannes Nehring, flew the "Konsul" more than fifteen miles, setting a new long distance record.

The outstanding flight of 1926 was made by Max Kegel. Flying a ship that he had made, from the Wasserkuppe, in a thunderstorm, and sailed thirty-five miles to a new cross-country record.

During the latter months of 1929, Bowlus made a number of very successful flights of duration of Point Loma. He quickly advanced the American record to more than nine hours. And Jack Barstow flew his Bowlus sailplane over Point Loma for fifteen hours and brought the duration record back to the United States.

NOTED GLIDER PILOTS

William Hawley Bowlus

"Hawley"

Bowlus was born at Ohio, Illinois, on May 8, 1896. He spent his early boyhood in the Middle West. When he was thirteen, his parents moved to California. The next year, 1910, he saw Curtiss, Latham, Paulhan, and other pioneer birdmen fly at the Los Angeles Aviation meet, one of the first held in America. From then on, his chief interest has been flying.

In the fall of the same year he won a prize at a kite meet in Los Angeles, and then began the construction of his first glider on his father's chicken ranch near San Fernando. The machine was a monoplane "hang" glider. It was wrecked after a 250-foot hop in 1911. But it flew.

His next glider was a biplane, almost exactly the same size and design as the one the Wright brothers had used at Kitty Hawk. It flew splendidly, with Bowlus lying prone upon the lower wing and operating the front elevator and the rear rudder by means of controls. Several flights of 1,000 feet were accomplished in 1912.

During the time he was attending high school, he spent his evenings working on new gliders and building models to try out original ideas. At the time he was attending high school in San Fernando. He made a collection of stuffed soaring birds to study the shapes and curves of their wings. Several buzzards and hawks were preserved in the exact attitude of flight, with their wings outstretched. Bowlus experimented by launching them from hillsides in calm air in attempts to make them soar. One of his stuffed buzzards, with a wingspread of several feet, sailed for a considerable distance down the slope before losing its balance.

Another experiment which Bowlus made about this time was a towed flight, with the glider hitched to "Old Cap," his father's racehorse.

NOTED GLIDER PILOTS

The motorless biplane, of the "hang" variety, was tied tightly to the back of a two-wheeled sulky with a long rope. When everything was ready the driver in the sulky clucked and "Old Cap" started to walk, then broke into a run.. Bowlus, coming behind, holding up the glider lengthened his stride until he was making hops like a jack-rabbit. Just as he tilted up the forward edge of the glider and the machine reared into the air, "Old Cap" looked around over his shoulder. Seeing the huge white wings behind him, he made a wild jump. The rope broke, Bowlus let go, the glider slid backward and hitting the ground folded up in a heap.

When America entered the World War, Bowlus enlisted as a mechanic in the Army Air Service. He spent fourteen and a half months in the United States, England and France. In each place he continued his glider experiments, gaining permission to use odds and ends in constructing motorless machines during his spare time. He built one glider in France and two in England.

For two and a half years after the war he was Chief Flight Test Inspector at McCook Field(now Wright Field), Dayton, Ohio. He had to inspect all the planes twice a day, sometimes going over 150 machines morning and afternoon. While there, he built two more gliders.

In the fall of 1922 he returned to San Fernando, worked as an automobile mechanic, experimented with hundreds of model gliders and with a number of full-sized experimental machines. Two years later, he became "the first and only employee" of the Ryan Flying S School at San Diego, starting on a salary of twenty-one dollars a week. With the owner of the company he designed a "parasol" monoplane for mail-carrying. It was this plane, known as the Ryan M-1 that attracted the attention of Charles A. Lindbergh when he was "pushing mail" to Chicago and planning to fly the Atlantic.

HISTORY OF GLIDING

The Ryan M-1 was the direct ancestor of "The Spirit of St. Louis," the most famous modern plane in the world.

Bowlus was holding the position of plant superintendent at the Ryan factory when the famous telegram arrived: "CAN YOU BUILD A PLANE TO CROSS ATLANTIC STOP SINGLE ENGINE STOP SINGLE PILOT STOP QUOTE PRICE." It was signed by the then unknown air-mail pilot Charles A. Lindbergh. As a result, "The Spirit of St. Louis" was built, Bowlus and the other members of the organization working day and night to complete the craft within the specified sixty days. Bowlus was in charge of the actual building of the machine and several of the original features of the plane were his own ideas.

He remained with the Ryan company until 1929 before joining the Airtech Flying School, the only school operating at Lindbergh Field, San Diego. While still with Ryan, he began the construction of his first soaring ship, the sixteenth motorless machine he had built. This famous "Number Sixteen" was constructed in his back yard, his wife making the paper ribs which were used in the experimental wings. The machine was finished in January, 1929. But it was not until nine months later that it made its first soaring flight. It would glide and glide but it wouldn't soar. Three times it was wrecked and rebuilt. In spite of these long months of failure and ridicule he kept working away, altering the design, strengthening parts, seeking to improve his craft. Then, in October, 1929, he soared for fourteen minutes, breaking Orville Wright's nine-minute record, made eighteen years before, for the first time on an American-built machine.

Only a few days later, on Saturday, October 19, 1929, he swung over Point Loma on a motorless flight of one hour and twenty-one minutes. From then on, he advanced the American endurance record in quick steps to nine hours, five minutes and twenty-seven-seconds. During this great flight in February, 1930--only four months after his first fourteen-minute success he suffered for nearly five hours from severe cramps in his legs.

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At times they became so bad that he had to remove his feet from the rudder bar to stretch his legs while he steered by reaching down and grasping the rudder wire with his hand. On this flight he ascended to an unofficial American altitude record of more than 1,500 feet above his starting point. When his chief instructor, Jack Barstow, remained aloft for fifteen hours and twelve minutes, flying through the night of April 29, 1930, it brought the unofficial world's record to the Bowlus machine.

Besides having 136 hours of soaring time, Bowlus is a transport pilot having more than 2,300 hours of flying time in motored ships. He learned to fly an airplane with only one hour and ten minutes of instruction. This was due to his training in flying gliders.

While studying birds, he has taken hundreds of reels of motion pictures of feathered flyers which he studies by running them slowly through the projector. Bowlus at one time operated a motion picture projector in a theater in Los Angeles. While there, he operated the machine during the first public presentation of the famous film, "The Birth of a Nation"

On an expedition into the mountains near Levec, California, in the spring of 1930, with Colonel and Mrs. Lindbergh, he taught them the art of soaring. He has established a school at Point Loma, and other schools using his machines and method of instruction have been organized in other parts of the country. He is president of the Bowlus Sailplane Co., of San Diego, California. The Bowlus soaring ships are manufactured in the same factory--a former fish cannery--which served as the Ryan factory when "The Spirit of St. Louis" was under construction.

Charles A. Lindbergh

"Slim"

The career of Colonel Lindbergh is too familiar to need repeating here. Practically everyone knows that he was born at Little Falls, Minnesota, on February 4, 1902; learned to fly in Lincoln, Nebraska; recieved training

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AT THE ARMY flying schools at Brooks and Kelly fields; bought a second hand "jenny biplane"; barnstormed at country fairs; flew airmail; and then, in the most dramatic thirty-three-hour flight of history, spanned the Atlantic from New York to Paris.

His first glider flight was made in the summer of 1929 when he flew for nearly a mile across Lambert Field, St. Louis, in a Primary machine towed behind an automobile. On January 19, 1930 he made his first sailplane flight in a Bowlus sailplane at Point Loma, remaining up half an hour, and soaring 500 feet above the ocean, winning his first-class glider pilot's license, the ninth issued in the United States.

A few weeks later, he accompanied Bowlus on an expedition to Lebec, among the Tehachapi Mountains, where they established a camp and made a number of soaring flights along the western slopes. On one of these, made on February 6, 1930, Lindbergh flew fifteen miles, passed over Lebec Lake, circled several times, and drifted down to a landing in a bean field about four miles away in a straight-line distance from the starting point. So enthusiastic was Lindbergh over motorless flying that he has ordered a soaring craft built for him at the Bowlus factory.

John Carlton Barstow

"Jack"

Jack Barstow was the first pilot in the world to fly a motor-less craft for fifteen hours. He was born at Midland, Michigan, December 19, 1906. He enrolled at the Airtech Flying School at San Diego, California, in the spring of 1929 and in June passed the tests for a private pilot's license. Shortly after he had learned to fly motored planes he joined the Bowlus school, instructing students on the primary glider. On November 3, 1929, he won his third-class glider pilot's license. On December 1, 1929, he qualified for his second-class license number eight. On the same flight he soared above his starting point more than five minutes, qualifying

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HIM for his first class glider pilot's license. In April 29, 30, Barstow took off over point loma and circled for fifteen hours, he broke Bowlus's record of nine-hours and yelled down that he was going after the world's record of 14 hours forty three minutes. Because he had taken nothing to eat and no extra clothing, he suffered considerable fatigue, but he kept on until 9:57 A.M. the next morning. He was awarded the \$2,500 prize offered by Edward S. Evans, Honorary President of the National Glider Association, for the first flight of ten hours made by an American.

Ferdinand Schulz

Ferdinand Schulz was born in Westpreussen, in eastern Germany, near the Russian border. He was a self-made pilot, building his own soarer and teaching himself to fly while teaching school in Germany. Schulz on the eighteenth of May 1924 by flying for more than eight hours he broke the world's record. The noted designer, Hoffman, built for him a beautiful streamlined ship in which on May 3, 1927, he made his world's record flight of fourteen hours and seven minutes. Carrying a passenger in the "Goethen," he flew for nine hours and twenty-one minutes over the same Rossitten dunes, setting a record still unbroken. It was Schulz's fourteen-hour record, more than anything else, that aroused the world to the realization of the amazing progress in motorless flying which had been made in the years that followed the war.

Ralph S. Barnaby

Lieutenant Barnaby is the only licensed glider pilot in the U.S. Navy. He was born at Meadville, Pennsylvania, on January 21, 1911. He attended the A.M. A. C. school at Cape Cod, to take instruction in soaring. Under official observation, he made a flight of eight miles down the rugged coast of Massachusetts and landed at his starting place. His most famous exploit was accomplished on January 31, 1930, when he was cut loose from bottom of the Dirigible "LosAngeles", at 3,000 feet and spiraled down to a safe

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landing on the flying field at lakehurst, New Jersey.

Richard Atwater

"Dick"

Atwater was born at Perth, West Australia, on November 5, 1900. He was a member of the Royal Flying Force during the World War. As Chief Instructor and Test pilot for the American Motorless Aviation Corporation and an instructor at the Cape Cod School, he has made 300 flights on many types of gliders. At Port Washington, Long Island, he flew a hydro-glider for eight minutes and forty-five seconds, towed behind a motor boat. At the Bayside Glider Meet, in May 1930 he divided honors with W.H. Bowlus, winning the prizes in four events. He holds a transport airplane pilot's license,.

Frank Monroe Hawks

Before Frank Hawks began making towed glider flights, he had been an army aviator, had flown in Mexico carrying payrolls of oil companies by air, and had won honors in the National Air Tour of 1927. At the National Air Races, at Cleveland, Ohio, Hawks rode a glider towed behind an airplane Pontiac, Michigan, to Cleveland, and cut loose so high in the air the land was made in twenty minutes. In the spring of 1930 he made the first trans-continental glider flight of history, flying the Franklin "Eaglet."

Mrs. Charles A. Lindbergh

Mrs Lindbergh was the first woman in the United States to win a soaring license. On January 29, 1930, she took off from Soledad Mountains, near San Diego, California, and soared for more than six minutes in a Bowlus sailplane. She is a charter member of the "Anne Lindbergh Flyers," a girls glider club at San Diego. She also holds a private pilot's license as an operator of motored planes.

MILESTONES IN GLIDER HISTORY

1884. John J. Montgomery. Otay, California. Own construction glider. Duration unknown.
1891. Otto Lilienthal. Rhinow Hills. Germany. Own construction glider. Approximately one minute.
1895. Percy Pilcher. Cardross. Great Britain. Own construction, "The Bat". 20 seconds.
1896. Octave Chanute. Miller, Indiana. United States. Own construction. Duration unknown.
1900. October. Wright Brothers. Kitty Hawk. United States. Own construction. Duration unknown.
1902. August. Wright Brothers. Kitty Hawk. Own construction. 26 seconds.
1903. January. Wright Brothers. Kitty Hawk. Own construction. 1 minute, 12 seconds.
1911. October 24. Orville Wright. Kitty Hawk. Own construction. 9 minutes 45 seconds.
1912. October. Hans Gutermuth. Germany. Wasserkuppe. "Darmstadt." 1 minute; 12 seconds.
1921. August 30. Klemperer. Germany. Wasserkuppe. "Blue Mouse" 1 minute.
1921. September. Martens. Germany. Wasserkuppe. "Vampyr." 15 minutes, 40 seconds.
1921. September 13. Harth. Germany. Heidelberg-Rhoen. Own construction. 21 minutes, 30 seconds.
1922. August 18. Martens. Germany. Wasserkuppe. "Vampyr" 1 hour, 6 minutes.
1922. August 19. Hentzen. Germany. Wasserkuppe. "Vampyr" 2 hours
1922. August 24. Hentzen. Germany. Wasserkuppe. "Vampyr" 3 hours 6 minutes.

MILESTONES IN GLIDER HISTORY

1922. September 22, Maneyrol. France. Itford Hill, England.
"peyret-tandem." 3 hours, 21 minutes.
1923. January. Thoret. France. Vauville, France. "hanriot."
7 hours, 3 minutes.
- 1923 January. Maneyrol. France. Vauville, France. "Peyret."
8 hours, 50 minutes, 50 seconds.
1923. January.31, Barbot. France. Vauville. "Dewoitine."
8 hours, 36 minutes, 56 seconds.
1924. May 18. Ferdinand Schulz. Germany. Rossitten. Own construction. 8 hours, 42 minutes.
1925. July 26. Massaur. Belgium. Vauville, France. "Poneclet-Vivette." 10 hours, 29 minutes.
1925. October 2. Schulz. Germany. Krim, Russia. "Moritz." 12 hours, 6 minutes.
1927. May 3. Schulz. Germany. Rossitten. "Westpreussen." 14 hours. 7 minutes.
1928. July 29. Peter Hesselbach. Germany. Cape Cod, Massachusetts, "Darmstadt." 4 hours, 5 minutes.
1929. October 20. Fowlus. America. Point Loma. Own construction. 1 hour, 21 minutes nine-and-four-fifths-seconds.
1929. December 10. Bowlus. America. Point Loma. Own construction. 2 hours, forty-seven minutes, 13 one-half-seconds.
1929. October 19-20. Herman Dinort. Germany. Rossitten. Own construction. 14 hours, 43 minutes, 25 seconds.
1930. January 13. Fowlus. America. Point Loma. Own construction. 6 hours, 19 minutes, 3 seconds.
1930. April 29-30. Jack Barstow. America. Point Loma. Bowlus sailplane. 15 hours, 12 minutes.

GLIDER WORDS AND WHAT THEY MEAN

Aileron: A flap hinged at the end of the wing to keep lateral stability.

Air speed: The speed of the glider through the air.

Air speed indicator: An instrument registering the speed that the a glider goes through the air.

Altitude: Height of the glider.

Angle of descent of glider: The gliding angle.

Angle of attack: The angle of thrust that the wing is put in the air.

Aspect ratio: The proportion of the wing to the length and width.

Anemometer: An instrument that tells the speed of the wing.

Bank: To raise the wing when you turn.

Belt, safety,: The belt across the seat holding the pilot in.

Biplane: A glider with two wings, one above the other.

Cabane: A framework above the wings supporting the wires on top of the wing and the fuselage. (fuselage)

Camber: The curvature of the top and bottom of the wing.

Cantilever wing: A wing internally braced, no wires on the outside.

Casein glue: A waterproof glue used in making gliders.

Ceiling: The height that the glider rises.

Center of gravity: The center of weight of the glider.

Center of pressure: All the parts of the wing that has any thing to do with the lifting of the glider. Center of lift.

Chord: The distance from the leading edge of the wing to the trailing edge of the wing.

Cloud flying: Making use of the upcurrents that are always around clouds

Cockpit: The open space where the pilot sits while operating the glider.

Compression Rib: A flat rib placed in the wing for the purpose of bracing. It is place between the front and rear spar.

Control surfaces: The Ailerons, rudder, elevators.

GLIDER WORDS AND WHAT THEY MEAN

Crack-up: To damage the glider in any way shape or form while flying or landing.

Crossed controls: To work the Ailerons, rudder, elevators the wrong way.

Cross wind: A wind blowing sidewise to the line of flight.

Curve: The shape of the ribs.

Cumulus clouds: Clouds which are very white and are heaped up very high. Many upcurrents are found beneath these kind of clouds.

Dihedral: The lateral shape of the wing. Wing tips higher than the center.

Dive: To let the nose of the glider go below the horizon.

Downcurrents: Cold air that is heavier than hot air and falls to the ground.

Dope: A preparation that is put on the wings to make them tight and weather-proof.

Duralumin: An aluminum that is very strong and light that is used in the construction of a glider.

Dynamic soaring: Rising above the starting point not due to the upcurrents but to the speed of the wind.

Entering or Leading edge: The front edge of the wing.

Elevator: A hinged surface connected to the rear of the glider to control the up-and-down motion of a glider.

Factor of safety: The number of times that the load on the glider can be increased till the glider will break.

Fabric: The cloth used to cover the wings and elevators, rudder of a glider.

Fin: A fixed vertical plane in front of the rudder to increase the stability of a glider.

GLIDER WORDS AND WHAT THEY MEAN

Flippers: Sometimes called by people that don't know what the elevators of a glider is.

Flying speed: The speed of the glider through the air and still stay up.

Fuselage: The body of an airplane. The part supporting the wing and elevators.

Gap: The distance between the top and bottom on the wings in a biplane.

Glide: To maintain speed by "Coasting downhill" on the air.

Glider: A form of motor-less aircraft.

Gliding angle: The flattest glide that a glider can fly at and still remain in the air under complete control.

Ground speed: The speed of the glider in relation to the ground.

Gussets: Small triangular braces such as used to make the ribs of a glider.

Hang-glider: A machine that is operated by swinging the legs to maintain balance.

Hanger: A shed or building in which the glider is kept.

Head-wind: A wind that is met head-on.

Hitching to a cloud: Circling below a cumulus cloud, and keeping in the up-current of the air which is formed by the cloud.

Hop: A short glide, or flight.

Hot air-soaring: Soaring by making use of the hot-air-up-currents.

Hydroglider: A glider that is equipped with floats for landing and for taking off of water.

Incidence, angle of,: The angle that the chord of a wing makes with the direction of motion relative to the air.

Landing speed: The speed at which a glider touches the earth in a normal glide or landing.

GLIDER WORDS AND WHAT THEY MEAN

Lattice girder: A wing spar with cross-pieces.

Leading edge: The front edge of the wing. Sometimes called the entering edge.

Length: The distance from the nose of the glider to the tip of the tail.

Loading, wing: The weight of the glider fully loaded, divided by the area of the supporting surface.

Log book: A book kept by a pilot in which he makes notes of each flight that he takes.

Longerons: The fore-and-aft members of the glider fuselage.

Longitudinal balance: The balance of fore-and-aft.

Monoplane: A glider that has but one wing.

M.P.H. : Miles per hour.

Nacelle: An enclosed body, usually shorter than a fuselage and not supporting the tail members. A streamlining around the pilot.

Nose: The front part of a glider.

Nose dive: To lower the nose below the line of the horizon and go down very steeply.

Nose heavy: A condition in which the nose of the glider tends to let the nose drop in natural flight.

Overall length: The distance from the nose to the tail.

Pancake, to: To level out too soon and lose flying speed and drop heavily to the ground.

Pitot tube: Consists of two tubes, one open to the air and the other protected which are connected to the air-speed-indicator.

Plane, main: The main wing of a glider.

Plywood: Wood strengthened by two or more layers glued cross-grained together.

Plywood leading edge. The entering edge of the wing covered with plywood to give it greater strength.

GLIDER WORDS AND WHAT THEY MEAN

Pontoons: Floats.

Profile: The thickness and curve of a wing when seen from a end view.

Rabbit landing: A landing when the glider hops along the ground several times after touching the ground.

P.T.G. : Preliminary training glider.

Ribs: The members used in a wing to give it lift.

Ring, the: The metal ring that attaches on to the hook before taking off

Rudder: The vertical controlling surface which steers the glider from left or right.

Rudder post : The upright member to which the rudder is hinged.

Rudder bar: The foot bar that operates the rudder.

Sailplane: A glider that flies by taking advantage of the up-currents.

Settling draft: A powerful downcurrent on the lee side of a hill.

Shock cord: The rubber rope which is used in launching the glider.

Sideslip: A sliding movement when you bank too high.

Skidding: Sliding sidewise when turning. Due to not banking steep enough.

Skid, the: The runner upon which the glider slides on when landing and taking off.

Sinking rate: The number of feet a second that a glider drops below the starting point.

Smoke bomb: A bomb filled with smoke and exploded to tell the direction of the wind.

Soaring: A sustained flight above the starting point.

Soaring plane: A glider capable of sustained free flight without self-propulsion.

Sock: A wind-cone to tell the direction of the wind.

Span: The number of feet from tip to tip of the wing.

Spar, main, front, rear: The main members on which the wing is built.

GLIDER WORDS AND WHAT THEY MEAN

Spiral: A steeply banked, continuous turn in the glide.

Spot landing: A landing made at a selected spot.

Stabilizer: The "tail plane." A fixed surface on the rear of the glider to lessen the pitching motion.

Stall: To lose flying speed.

Stalling speed: The speed at which the support of the wings become heavier than the weight of the glider.

Static soaring: Soaring on upcurrents of air.

Stick, the: The up-right stick between the pilots legs by which he controls, the glider.

Streamlined: Shaped so as to form as little resistance as possible.

Struts: Vertical members uniting spars in the upper and lower wings.

"S" Turns: A series of right-and-left handed turns.

S.T.G. : A secondary training glider.

Tail wind: A wind blowing the same way that the glider is flying.

Tapering wings: The wings of a glider that is wider in the center than at the tips.

Terrain: The ground over which you glide.

Thermic upcurrents: Rising air currents formed by the sun's rays radiated from the earth.

Thermic soaring: Soaring by the use of thermic up-currents.

Trailing edge: The rear edge of the wing.

"Three Birds, The: The pin awarded to first-class glider pilots in Germany.

"Three Stars" The: The first class glider insignia of the N.G.A.

Turnbuckle: A fitting used to adjust the tension of a wire.

Up-currents: A draft of hot-air that is rising.

Warping wings: The wings of a glider that can be twisted to maintain lateral balance.

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GLIDER WORDS AND WHAT THEY MEAN

- Weight loaded: The weight of the glider with the pilot and equipment.
- Weight empty: The weight of the glider without the weight of the pilot.
- Wing: The main supporting surface of the glider.
- Wing area: The area of the supporting of only the wing.
- Wing heavy: A condition of the glider when the left or right wing tends to drop.
- Wing loading: The weight of a glider, fully loaded, divided by the area of the supporting surfaces. The area used in computing the wing loading should include the ailerons but not the stabilizer or the elevator.
- Wing-low landing: A landing that is made with one of the wings low.
- Wing skid: A skid placed at the tip of the wing to prevent any damage if the tip comes into contact with the ground.
- Wing-tip: The extreme end of either the left or right wing.
- Yaw, to: To turn flatly from side to side.

" A FLIGHT IN A GLIDER."

The instructor yells, "your hop", you instantly drop anything that you are doing and rush over to where the crate is standing. You climb in the rear seat, and snap on a wide belt which is called the "Safty Belt", it is to keep you from leaving the crate if it hits a bump that would otherwise throw you out. It is also used to keep you in the crate if it piles up. The instructor turns around in his seat and asks you if everything is O.K. you say O.K., he turns arund and waves to the driver of the tow-car. As the shock-cord on the hook of the glider tightens up the instructor yells back "For H--l's Sakes don't freeze that stick. The glider is slowly moving, bumping and skidding along the ground, it gains speed you notice the stick come back toward you and the ground departs for places unknown. After a little while the stick slides up to neutral and the glider stops climbing and levels out. Far below, you can see the up-turned faces of the occupants of the tow-car, they wave and the pilot waves also. The wing drops, you instantly shift your weight over to the oppoisite side of the seat the stick moves with you, a long flipper on the rear of the wing near the end called the a-lerion moves down the wind striking this resisting surface raises up as if an invisible hand pulled it up, then you shift your weight back to the center of balance. You look far off and see some cars going along a road, How small they look! The nose of the glider drops the wing goes down, you wonder if the pilot is ever going to level that wing out. Slowly the wing comes up, you see the ground coming up at you the stick comes back, the ground levels out, you are skimming a half a foot or-so off the ground closer and closer comes the ground, the stick comes back toward you, everything becomes quiet the swishing of the wires dies out the crate stalls a little a gentle bump is felt, the wires from the fuselage to the bottomm of the wing, called the flying wires, they are

" A FLIGHT IN A GLIDER"

to brace the wings in flying and to brace the fuselage in a side landing, start cutting the weeds as you skid through them, the stick goes all the way forward to keep the crate on the ground if it hits a bump the crate finally skids to a stop, the wing drops, and the instructor pulls a weed out of the ground and starts chewing it, he then turns around and says how do you like to be a little bird, and you reply "Keen". The tow-car pulls up in front of the glider and stops. You help them lift the crate on the trailer, hop in the back seat, grab the wing. The tow-car starts up the hill for another flight, while you tell everybody what a keen hop you just had.

"LOG OF MY GLIDER FLIGHTS AT REDONDO BEACH, CALIFORNIA"

August 3, 1930.

Had two hops in the Pacific Glider Clubs two seater. Flew the crate a little after the take-off but mostly followed the motions of the "Ins," Ed Rosenaw, and mostly went up for the ride and to get the feel of the air.

Flight duration: 40-48 seconds.

August 10, 1930.

Had one hop with "Ins" Costello. Before the flight he said for me to take care of the lateral part of the glider and he would take care of the up and down part. After the take-off he yelled back for me to take the stick. I flew the crate until the landing until he said O.K. and I let the stick go and settled my self to enjoy the landing, for when you are trying to struggle the crate around up there you havent time to enjoy yourself you are too busy keeping the crate in flying position.

Flight duration: 40 seconds.

August 14, 1930.

Had four hops with "Ed" had the stick on the take-off and held it in the landing.

Flight duration on four hops were: 38, 45, 40, 35.

August 17, 1930.

Had two flights with "Ins" Johnny Kelder and flew the crate fair. He complemented me on keeping the crate in a steep glide so I would have plenty of control of the crate.

Flight duration: 30, 38.

August 24, 1930.

Had one hop with Johnny, and had the front seat for the first

"LOG OF MY GLIDER FLIGHTS AT REDONDO BEACH, CALIFORNIA"

time. Because in that rear seat you don't know half the time what you are doing. It is sure different in the front seat when the nose rises you sure can tell it quick, but in the back seat you could hardly notice it. Had control of rudder for the first time as the rudder is only connected to the pilot in the front seat. The rear pilot has no rudder bar, only braces to put your feet on. Note: Our glider is almost ready to cover.

Flight duration: 40 seconds.

August 30, 1930.

Had hop with Johnnie Kelder, made first bank, also sat in rear seat because it was so rough. Was complemented on the landing. Our glider wing recieved the first coat of dope. Flight duration: 30 to 40 seconds.

November 11, 1930.

Had three hops in our glider., they were mostly ground-skids. But gave us good practice on the rudder.

November 14, 1930.

Recieved license for "Glider". No change to be made. Flew itt twice with Ed Rosenaw at the controls. Exceedingly high wind glider took off at 7 to 9 miles an hour.

Sunday November 16, 1930.

Had 9 hops went up about 2 feet and went half way down the hill. 27 hops for today in all. Ted 9 Bill 9 Bud 9.

Thanksgiving. November 27, 1930.

Had twelve hops in glider. Went off about five feet, there

"LOG OF MY GLIDER FLIGHTS AT REDONDO BEACH, CALIFORNIA"

WAS no wind at all.

36 hops in all today. Ted 12 Bill 12 Bud 12.

Saturday November 29, 1930.

Had five hops, went up about ten feet. Made some pretty good landings but stretched the balance wire.

Total number of hops today is 15. 5 apiece.

"Notre Dame defeated "Army 7 to 6.

Used Charlie Boyington's Sterns Knight.

December 13, 1930.

Had five flights in glider today. Nothing of interest to report.

December 1930.

Had five hops in crate. On last hop went over to "Pacific's" launching place and took off. Had about 40 feet of altitude. Went straight down the hill and followed the curve of the hill. Ed was coming up with his crate and was in the center of the road that I was supposed to fly over and land. Saw that I didnt have enough altitude to bank and go over him so I kicked the rudder to the right and banked to the right. Landed O.K. but didnt stop skidding on the ground, went through a foot or two single strand wire fence and the tip of the wing hit a pole and caved in the leading edge and broke the front spar so will have to make a new section. Will take us about two weeks to make a new section and will be flying as soon as we get it made if it isnt too rainy.

To-date I have had forty hops in our glider. Also 11 in "Pacific's" two seater.

William B. Wegrich

"Log of My Glider Flights"
Redondo Beach, Calif,

Sunday March 1, 1931.

Put new section on and flew the crate. 12 hops on top of the hill and 3 hops over the hump. Boy it sure is fun. The sand fleas are about driving me crazy. It bet it is 100 in the shade. We took two bunches of pictures of the crate on the ground and while flying hope they turn out good. Pacific went over to Ascot Racing field to fly and there was just 2 crates on the hill, Holly-woods and ours. 15 hops in all for today.

8 for Ted, 7 for Bill.

Jack and Bill Brawders went with us and were the ground crew.

Sunday March 8, 1931.

Had 8 hops in crate went over the hump once and had a keen hop, had plenty of altitude on all hops and it sure is keen. Frank Meers took a couple of pictures and then Dick Debuca took 2 more I sure hope they turn out good.

16 hops in all for today.

8 for Bill, 8 for Ted.

March 14, 1931.

Had four hops in glider for today. Went over the hump and all the way down once and on the other hops were up on top of the hill. The wind was blowing direct in the face of the crate and we sure took off what I mean. The duration of the hop was about a minute and a half. Bud flew for the first time since the crackup and done pretty good. Later in the afternoon the wind changed and was blowing straight across the hill and it was too dangerous to fly so we quit.

12 hops for today.

Ted 4, Bill 4, Bud 4

"LOG"

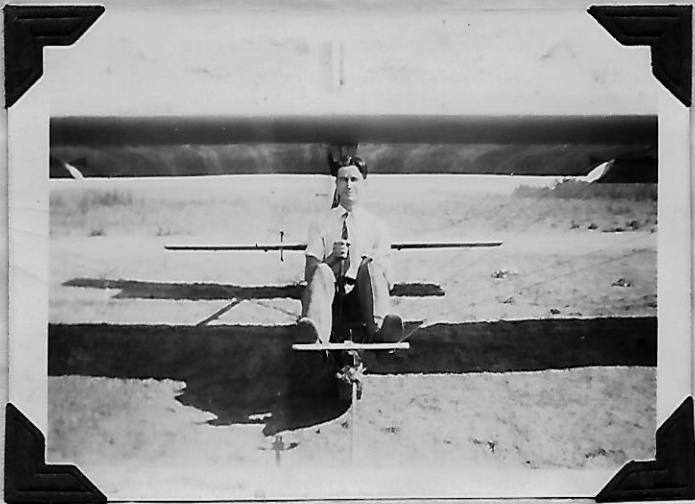
Sunday March 15, 1931.

Had five hops in the crate. Started flying at three oclock. Had a pretty strong side wind to fly with but otherwise it was O.K. All the hops were all the way down the hill. Tom and Blanche came down to see us fly so we done the best we could.

15 hops in all for the crate today.

Ted 5, Bill 5, Bud 5.

"OUR GLIDER"



Pilot "Ted Wegrich"



Pilot "William Wegrich"



Pilot "Jack Flanagan"

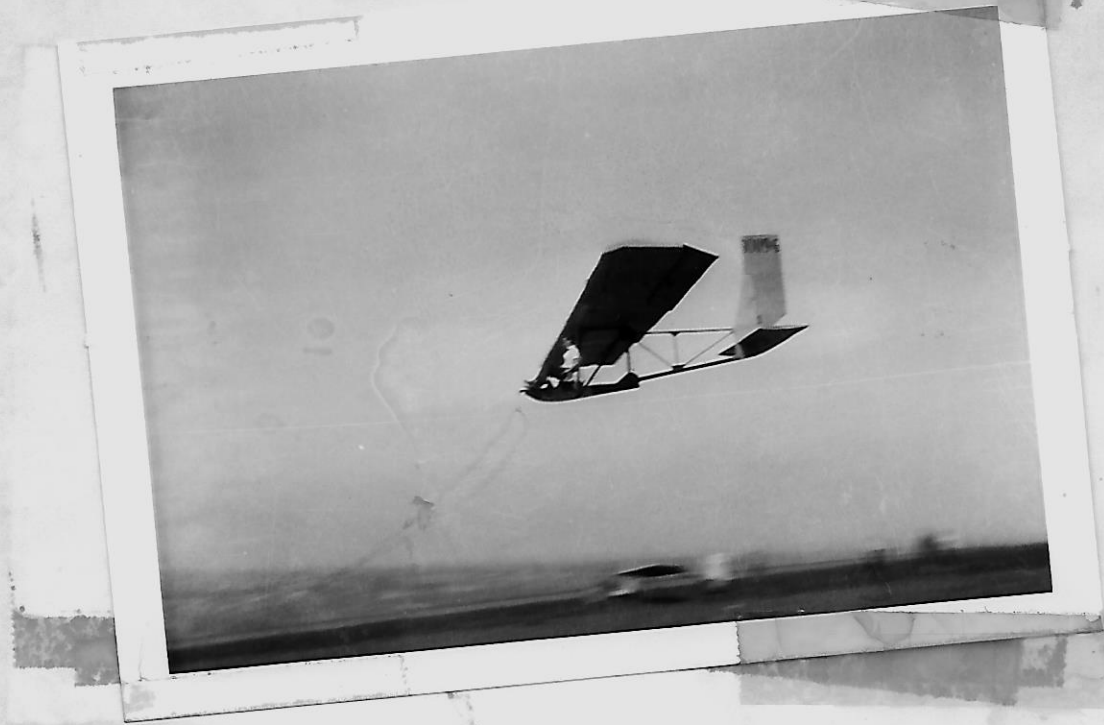
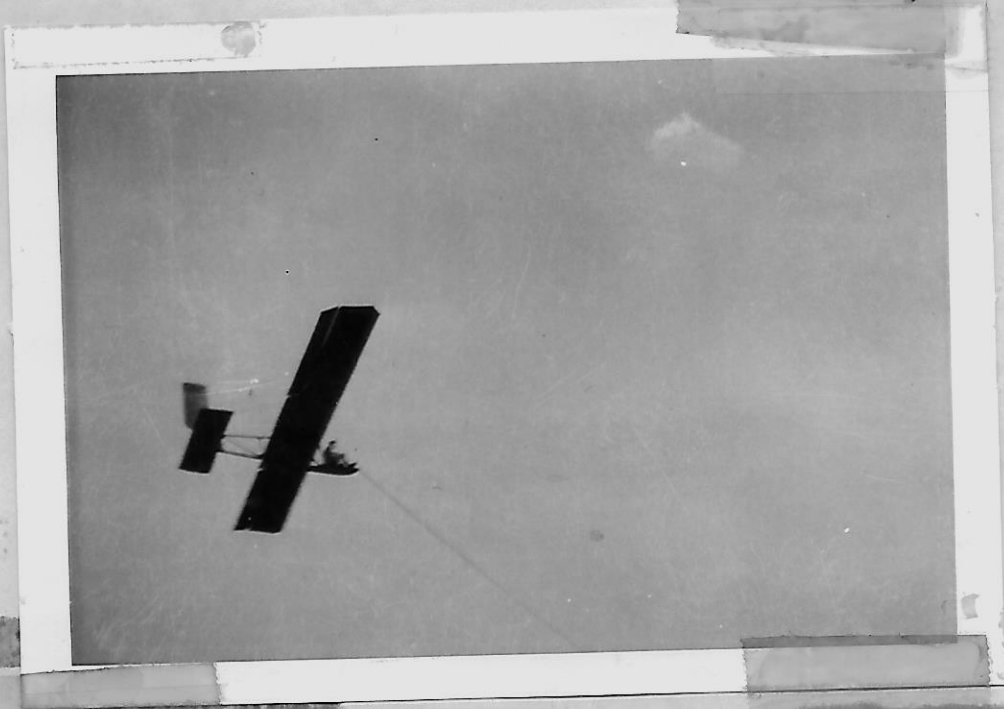


"BILL" FLYING OLD
G-10119 AT PACIFIC
PALISADES, CALIFORNIA
IN 1930

Form AB-8		UNITED STATES OF AMERICA DEPARTMENT OF COMMERCE AERONAUTICS BRANCH		License No. G-10119	
GLIDER LICENSE					
- NONE -					
Maximum Passengers Authorized Less Crew				Model WEGRICH	
<p>THIS CERTIFIES, That the aircraft described in the margin, licensed and registered as follows:</p> <p>TED WEGRICH WILLIAM WEGRICH & JACK FLANAGAN 7010 HAAS AVE LOS ANGELES CALIFORNIA</p> <p>is a civil aircraft of the United States of America, conforms to the air-worthiness requirements of the Department of Commerce, and assigned the license number indicated above. Unless sooner suspended or revoked this license expires DECEMBER 1 1931</p>				1 PLM	
				Aircraft Serial No. 1	
				Eng. Type NONE	
				Useful Load Land - -	
				" " Sea - -	
				Pay load Land - -	
				" " Sea - -	
				Gross Weight Land - -	
				" " Sea - -	
				Group 3	
<i>Charles M. Young</i> Assistant Secretary of Commerce for Aeronautics					
Sold to _____		Sold by _____		Date of Sale _____	
<p>Note: All provisions of the Air Commerce Regulations are made a part of the terms hereof as though written herein</p> <p>4-30 THIS LICENSE MUST BE PROMINENTLY DISPLAYED IN THE AIRCRAFT. (OVER)</p>					







"OUR GLIDER"





Bill Wegrich flying C-10119
at Pacific Palisades, California
March of 1932



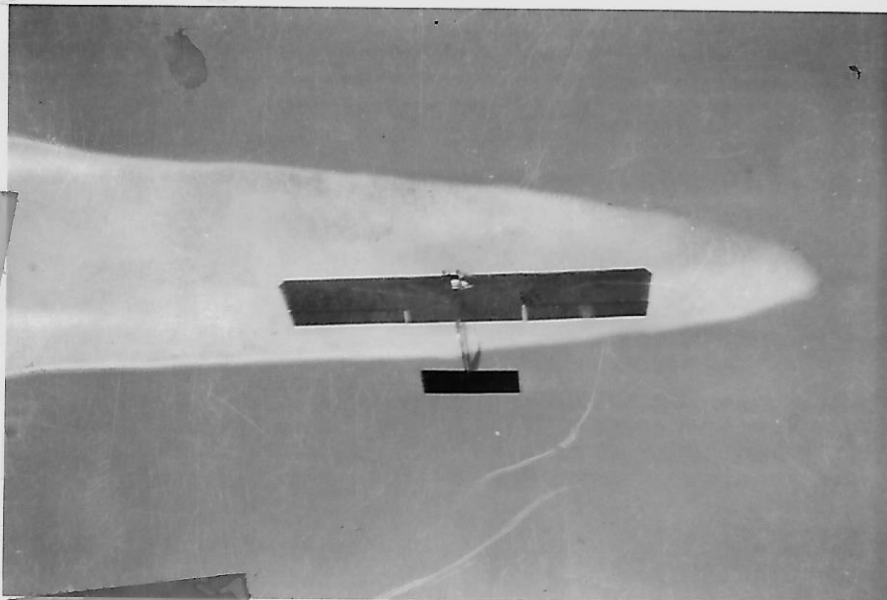
Bill Wegrich
March-1930



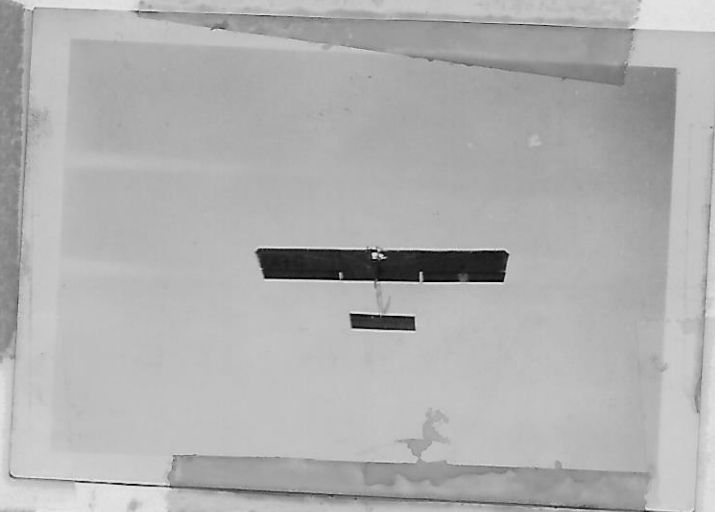
This is the ocean







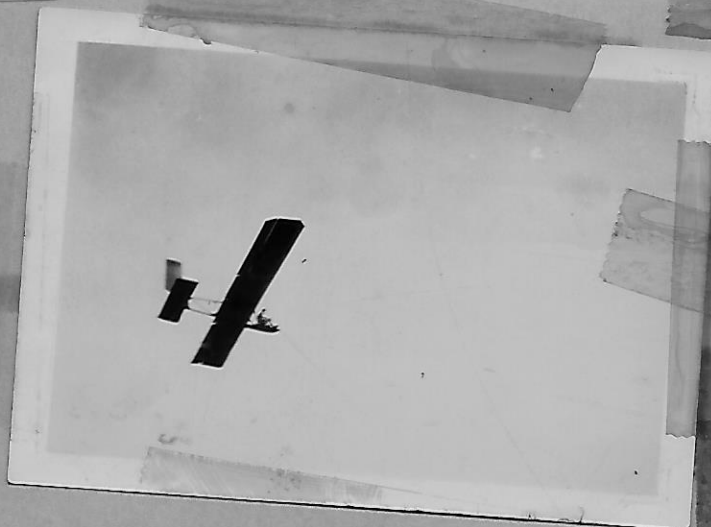




Glider Hill at Redondo Beach California
in the year of 1930.



"Old 10-G-119 Glider.... The 19thth Glider
licensed in the State of California".....
Jim Witts holding wing tip 10119



Phil Megrich in glider at Redondo Beach
California in 1930. Jim Witts at right
side of picture, under the wing.....



9-1960

Glider being towed for take-
off by 1923 Dodge tow-car....
Glider sled also showed in
in good style.....



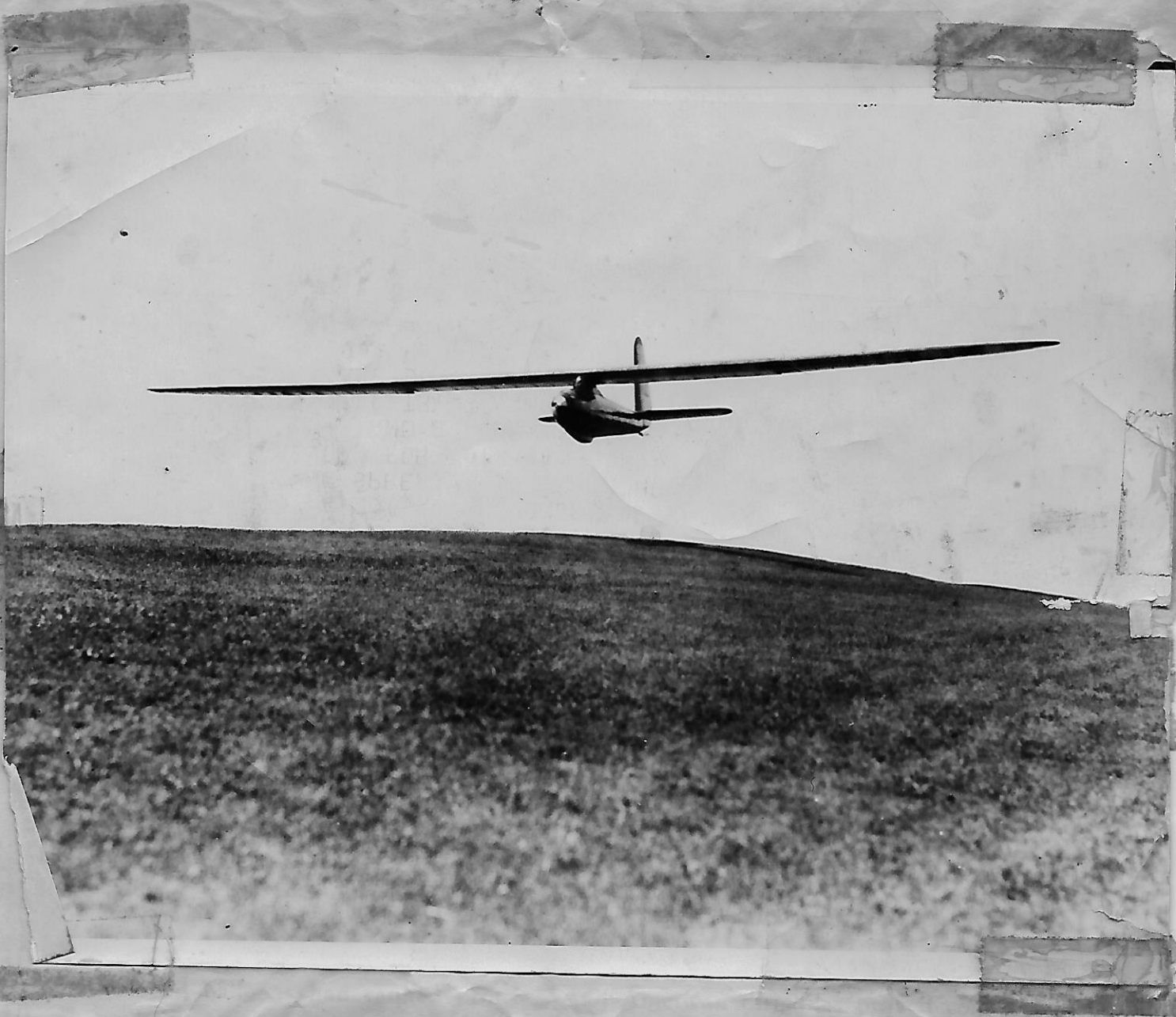




BILL FLYING THE SECONDARY GLIDER,
REDONDO BEACH, CALIFORNIA
1932. BRINGS BACK A LOT OF
PLEASANT MEMORIES —

Pacific Palisades Glider Hill 1930





"Darnstat" Sailplane Going Off The Wasserkuppe Mountains

"Germany"

Bibliography

I spent forty-five minutes in Hyde Park Library collecting my material, fifteen hours typing, typing the material. In all I spent approximately sixteen hours on this composition.

Book of Gliders----- Teal.

A.B.C. of Sail-flying--- Author unknown.

The Power Glider----- September 1930, number.

Some of the things I had already known.

Total number of words: 14,000

Conclusion

To The Reader: I hope this effort of mine
Will give you as much enjoyment reading of
this composition as I had in writing it.