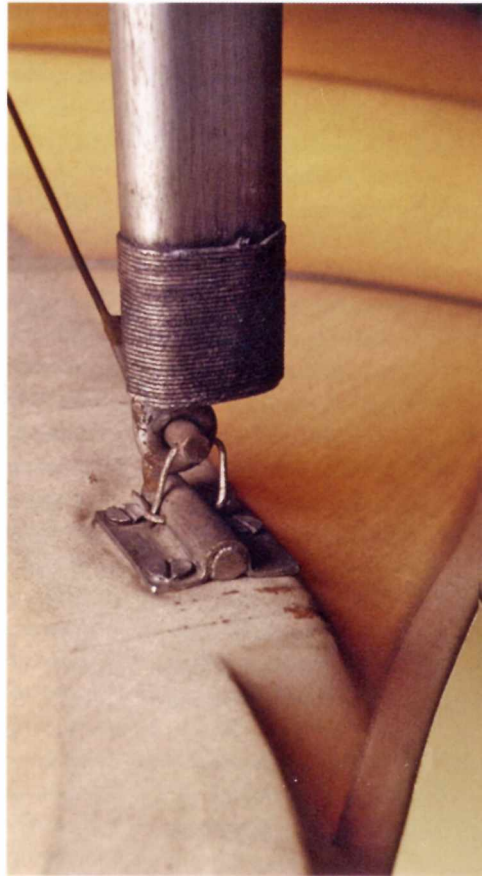
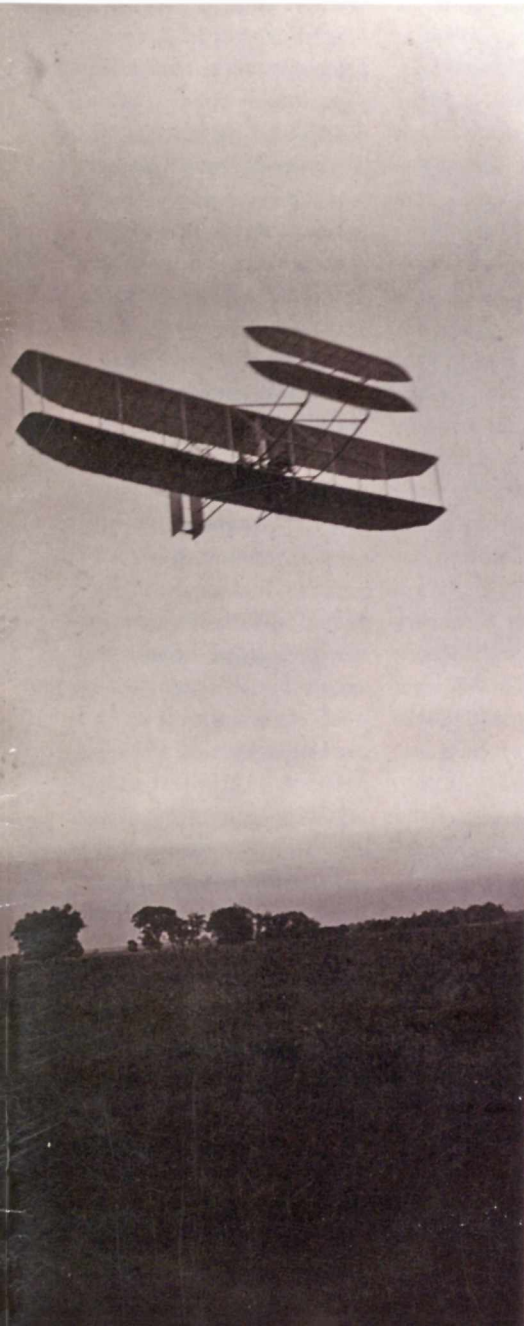


1905 Wright Flyer III

The First Practical Airplane

The 1905 Wright Flyer III is a National Historic Landmark, the first airplane in the United States to receive such a designation, and a component of the Dayton Aviation Heritage National Historical Park.



The Wright Family of Dayton: A Tradition of Stewardship

by

Tom D. Crouch

Senior Curator, National Air and Space Museum

Future generations of visitors to Wright Hall at Dayton's Carillon Park will never know what they are missing. They will still enjoy seeing the 1905 Wright Flyer III, and the camera that took the famous first flight photograph. Fine new exhibits now in the planning stages will provide them with a solid introduction to the Wright brothers and their work. What they will miss, however, is the extraordinary privilege of hearing G. Wilkinson "Wick" Wright describe the life and work of his famous relatives, while standing next to the world's first practical airplane.

Wick inherited his extraordinary sense of family responsibility, and his determination to insure that the story of Wilbur and Orville Wright was accurately known and fully appreciated, from those who came before him. Following the death of Orville Wright in 1948, members of the family had the wisdom to deposit the objects and papers documenting the work of

the Wright brothers with national institutions where they would be preserved and made available to researchers and to the public. They negotiated a final resolution of the long controversy with the Smithsonian, insuring that the world's first airplane would hang in the place of greatest honor in the world's most visited museum. They presented the letters, diaries, notebooks, photographs and other items detailing the life and work of the Wright brothers to the Library of Congress, and helped to arrange publication of the most important documents in that collection.

A quarter of a century later Wick Wright's aunt and uncle, Ivonette Wright Miller, a niece of the Wright brothers, and her husband, Harold "Scribze" Miller, who had served as an executor of Orville Wright's estate, presented a second large and rich collection of Wright papers to Wright State University on behalf of the family. Thanks to their generosity, and to the hard work of three generations of dedicated archivists, Wright State is today an internationally recognized center for the study of the Wright brothers and early flight.

As the leaders of the next

generation of the Wright family, Wick Wright and his wife Marion played key roles in the organization of the Friends of the Wright State University Libraries, a group established to support the efforts of the Special Collections and Archives Department to make their priceless treasures better known and more accessible to scholars and the public. Wick also played a major role in the creation of Dayton Aviation Heritage National Historical Park, and worked to preserve the 1905 Wright airplane at Carillon Park.

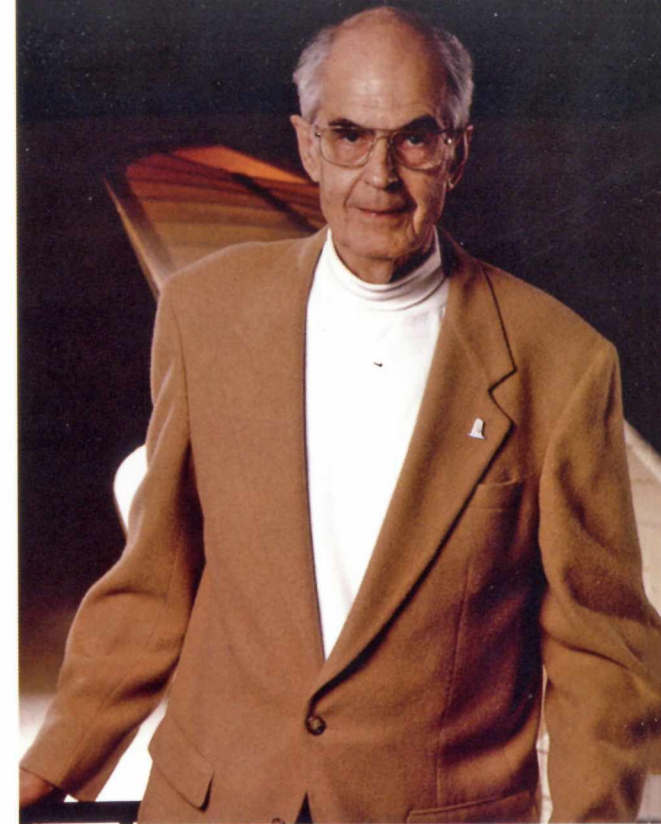
As a member of both Ohio's Inventing Flight organization and the First Flight Centennial Commission of North Carolina, no one worked harder, more effectively, or with as much enthusiasm than Wick Wright to help craft centennial programs that would be worthy of an event that shaped the history of the 20th century. He achieved all of that, and more, with dignity, grace, and confidence. Those of us who know and care about the story of the Wright brothers owe Wick Wright and the earlier generations of his family an enormous debt of gratitude for their generosity, commitment, and wise stewardship. Our thanks to them all.

The Wright Method of Control

The key to the Wright brothers' solution of the problem of flight lay in their recognition that the airplane must be controlled around three axes and their invention of a system that accomplished this. The two most obvious of these dimensions are movement of the nose to left and right (known as "yaw") and up and down ("pitch"). What they added to previous understanding was the necessity to control also the movement of the wings up and down ("roll").

Movement in the first two dimensions was managed by the Wrights with rudder and elevator respectively. Movement in the third dimension, rotation around the axis of the fuselage, was controlled by "wing warping," i.e., twisting of the left and right wing tips in opposite directions. This twisting increased the lift on one wing and decreased it on the other, raising the first and lowering the second.

The Wrights' second control contribution was the discovery that in order for a pilot to make a controlled turn to the right, for example, he must warp the wings to achieve a roll to the right and simulta-



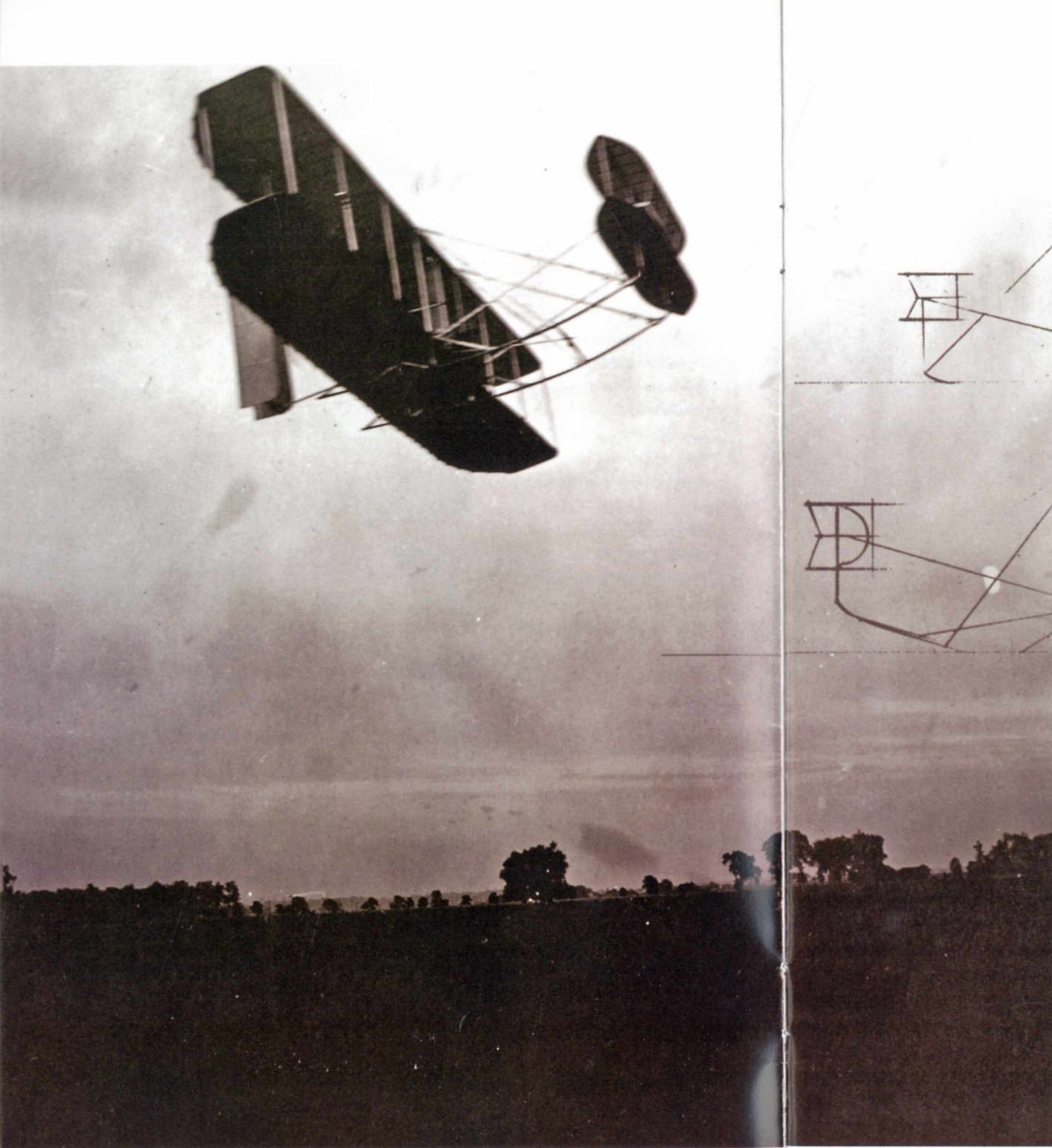
*This publication is dedicated to
Wilkinson "Wick" Wright, great-nephew of
Wilbur and Orville Wright.*

March 9, 1922-December 9, 1999

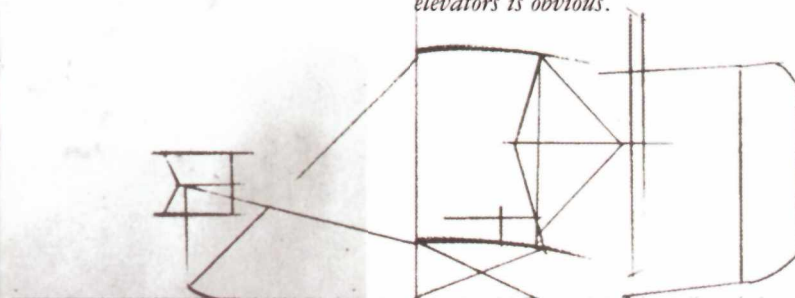
neously turn the rudder to the right. This coordinated turn approach prevented the plane from either slipping to the inside or skidding to the outside of a turn.

The promise of this revolutionary idea, thoroughly demonstrated in about 1000 flights by the Wrights in their 1902 glider, was fulfilled on December 17, 1903, at Kitty Hawk, North Carolina, with "the first free, controlled, and

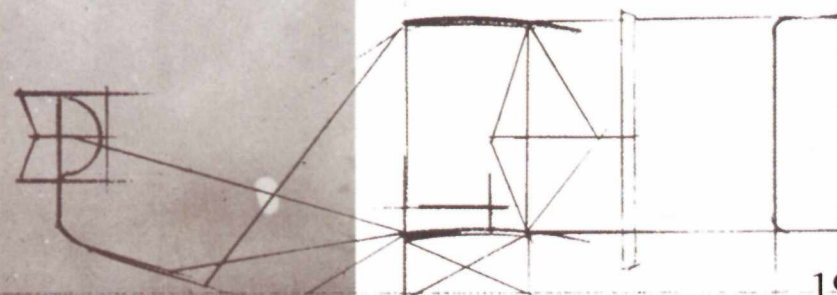
sustained flight in a power-driven, heavier-than-air machine." But the four flights made on that single day in Wright Flyer I convinced the brothers that there were still significant problems to be solved in controlling the aircraft. This was accomplished with the 1905 Wright Flyer III, culminating with Wilbur Wright's flight on October 5, of over 24 miles in 38 minutes, 3 seconds.



Left: Orville Wright at the controls of Wright Flyer III over Huffman Prairie on September 29, 1905. This flight lasted 19 minutes, 56 seconds and covered 12 miles. The extension of the connecting frame to the forward-located elevators is obvious.



1903 Flyer



1905 Flyer

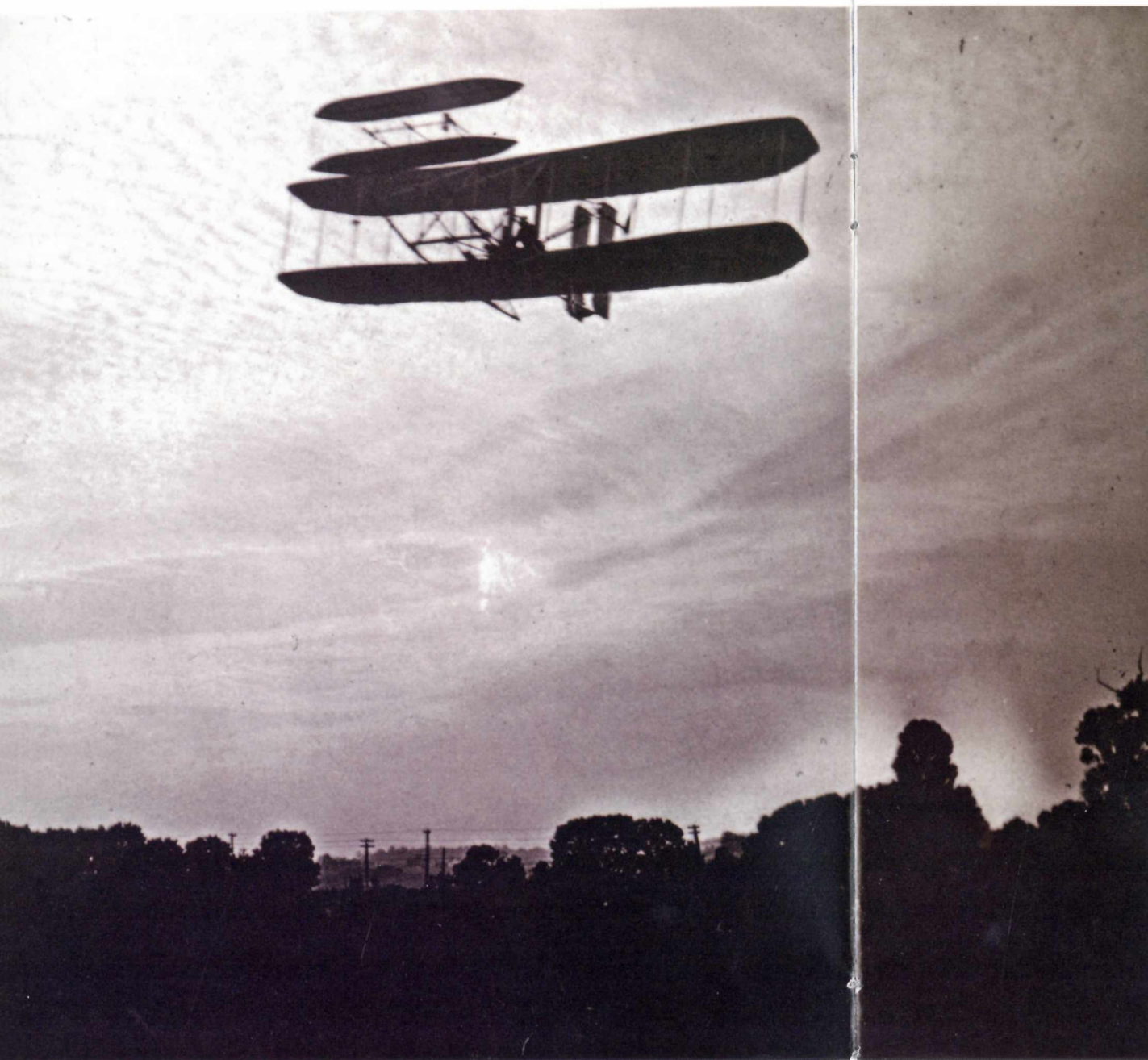
The Significance of the 1905 Wright Flyer III

by
Peter L. Jakab

Curator, Aeronautics
Division, National Air and
Space Museum

In the year 1905, at an isolated cow pasture eight miles east of Dayton, Ohio, the world changed. As the hot, sweltering afternoons of summer drifted into the cool, crisp mornings of fall that year, nearby residents and local farmers tending their fields were witnessing

with regularity a scene that would become a defining characteristic of twentieth-century life: the sight and sound of an airplane flying overhead. Throughout September, a noisy, frail-looking, wood-and-fabric machine frequently circled the hundred-acre meadow known locally as Huffman Prairie. Small groups of family and friends of the birdmen began turning up to see them fly. For weeks after observing an especially spectacular flight of nearly 40 minutes, on October 5, a three - year - old Dayton



Above: Another view of the historic September 29 flight over Huffman Prairie. Note the flat rigging of the wing surfaces. This was a change from the downward sloping wingform of the 1903 Wright Flyer.

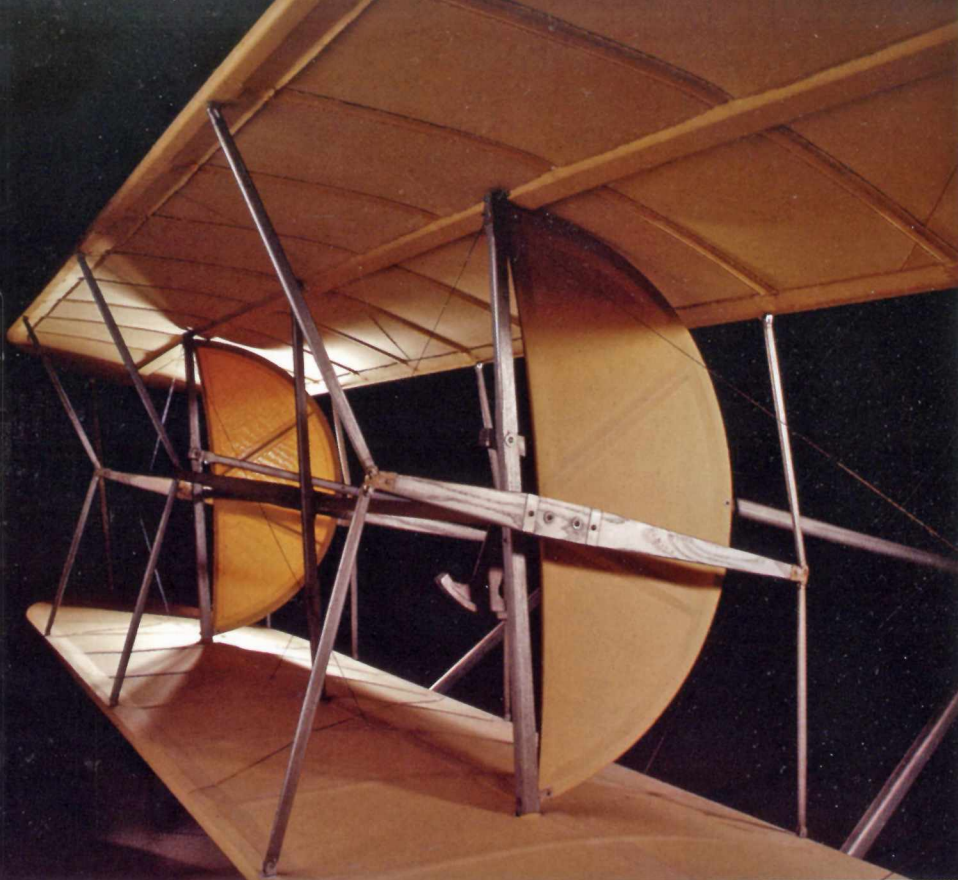
boy named Charley Billman raced through his parents' house, arms outstretched, mimicking the sound of the engine. Like the craft that so enthused him, young Charley's playful imitation would also become a ubiquitous feature of the twentieth century. Indeed, the age of the airplane had arrived.

The pilots breaking the bucolic calm of Huffman Prairie in 1905 were of course Wilbur and Orville Wright. The brothers made their historic breakthrough flights at Kitty Hawk, North Carolina, on December 17, 1903, with their first powered airplane, but it was the final phase of their experimental work in 1904 and 1905 that brought their invention to practicality.

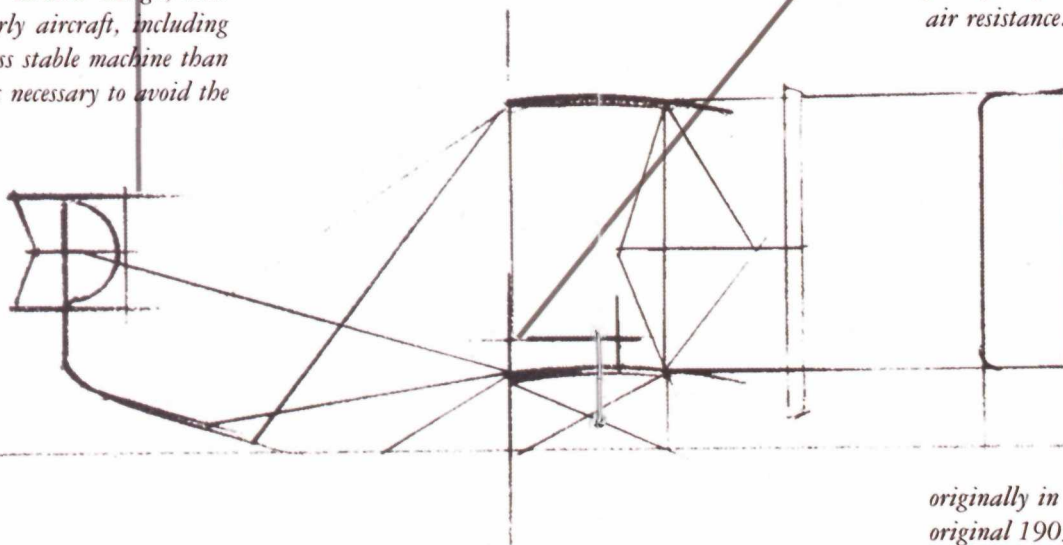
As had been their practice with their earlier gliders and the 1903 machine, the Wrights' powered airplanes of 1904 and 1905 reflected the brothers' single, evolving biplane/canard design. The chief remaining problem with the 1903 airplane was pitch instability—i.e., the controls were extremely sensitive in climb and descent. To cure the condition, the Wrights added seventy pounds of ballast to the front of their new 1904 airplane to move the center of gravity forward. With

only slight improvement, the brothers took more radical steps with their 1905 design by enlarging the elevator surface and moving it 4 1/2 feet further forward of the wings. These changes transformed their experimental craft into a true airplane. They could now fly with reasonable control and consistency, maneuver effectively under the full and sure command of the pilot, stay aloft as long as the fuel supply lasted, and land safely to fly again. The Wright airplane remained tricky to fly, but by any definition the brothers now possessed a practical flying machine.

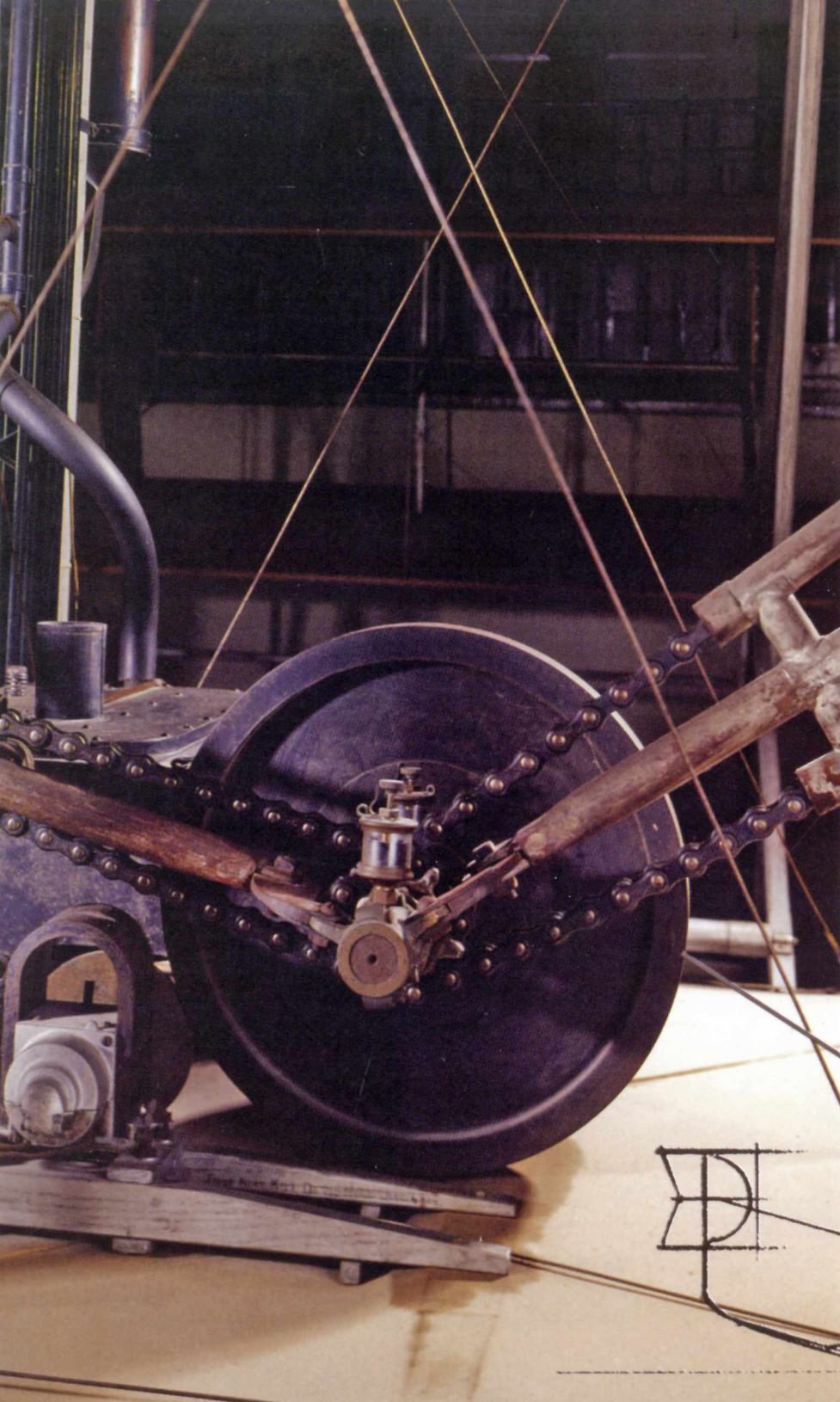
As monumental as the first brief flights in 1903 were, the 1905 Wright Flyer III was the true culmination of their six years of hard work, meticulous engineering, and many moments of both frustration and exhilaration. With it Wilbur and Orville had taken the final steps into a new era, inaugurating the aerial age. The 1905 airplane was the crowning achievement of the Wrights' pursuit of powered flight. They were now ready to share the fruits of their genius with the world.



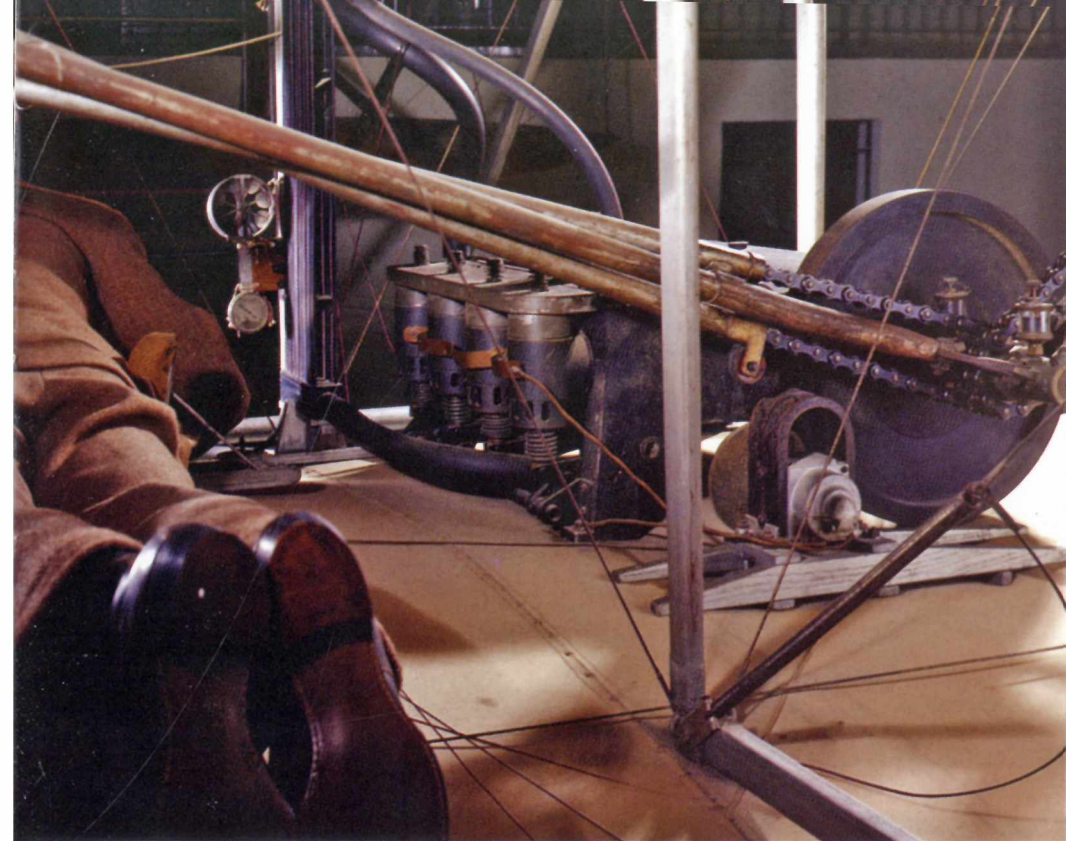
Above: Detail of the forward elevator assembly. The Wright brothers made a conscious decision to use a "canard" design, with the elevators in front, in all of their early aircraft, including Flyer III. Although this resulted in a less stable machine than locating them in the rear, they felt it was necessary to avoid the sudden pitch down in a stall that they recognized as the cause of the death of the German flying pioneer Otto Lilienthal and others. The horizontal elevators on Flyer III were larger than on the previous Flyers, and placed farther out in front in order to improve longitudinal stability in the "pitch" axis. Located between the horizontal elevator surfaces were two fixed vertical vanes intended to counteract a tendency to veer left to right.



Above: Pilot position, controls and engine. Flyer III retained the prone pilot position of the earlier designs, intended to minimize frontal air resistance. As in those earlier aircraft, control of the wing warp was exercised through hip movement left and right of a small cradle in which the pilot lay and of the elevators by movement of a lever in the pilot's left hand. The second major change in the 1905 Flyer (after the improved elevator design) was the decoupling of the warp and rudder operation. Previously, the sliding cradle moved both in a predetermined manner. In Flyer III, however, the operator was given separate control of the rudder through the use of a lever by his right hand. The engine was the second one used by the Wrights, originally in Flyer II in 1904. It was an improved version of their original 1903 engine which, by 1905, was delivering approximately 21 horsepower, or almost twice that available at Kitty Hawk.

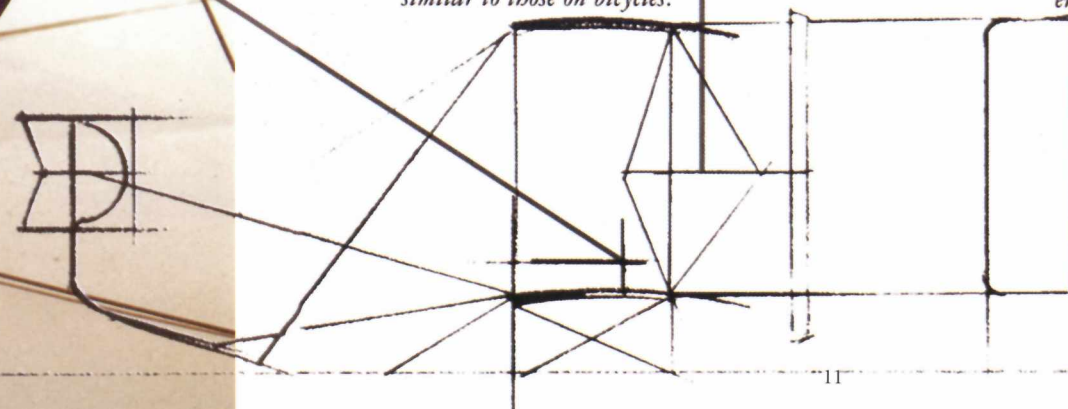


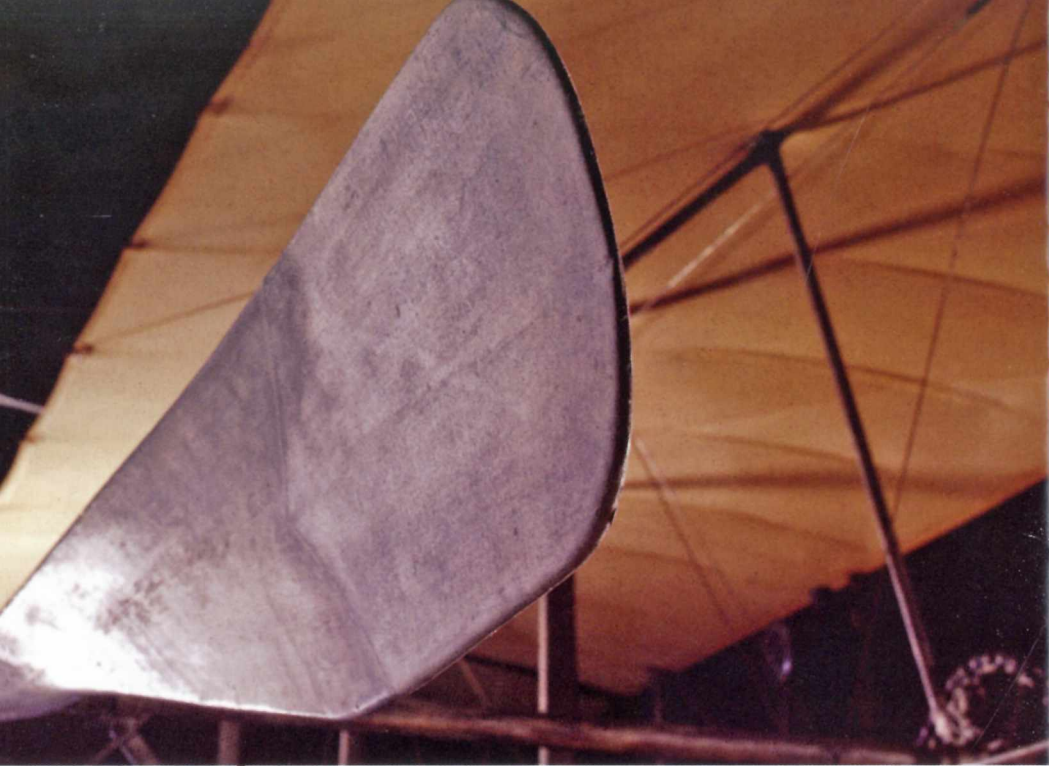
Left: Engine and propeller drive assembly. The large flywheel at the rear of the engine was intended to reduce the vibration that caused a whipping motion in the chains. Power was transmitted from the engine's crankshaft by means of sprockets and chains, similar to those on bicycles.



The chains were enclosed in 1-inch diameter steel tubes to prevent injury in case of breaking. The drip oiler was added above to provide lubrication for the chains and drive sprockets.

Above: Engine installation, from the rear. The chain connecting the left propeller hub with the crankshaft was crossed in order to produce a counter rotation. Having the propellers turn in opposite directions neutralized the torque they produced, another of the brothers' many clever ideas. Attached to the front strut is an anemometer used to measure air flow, and thus distance flown.





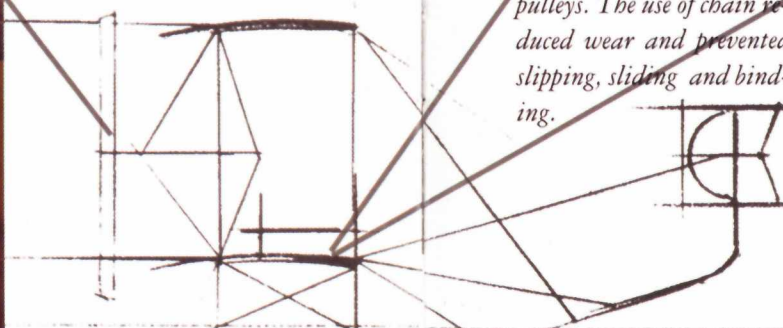
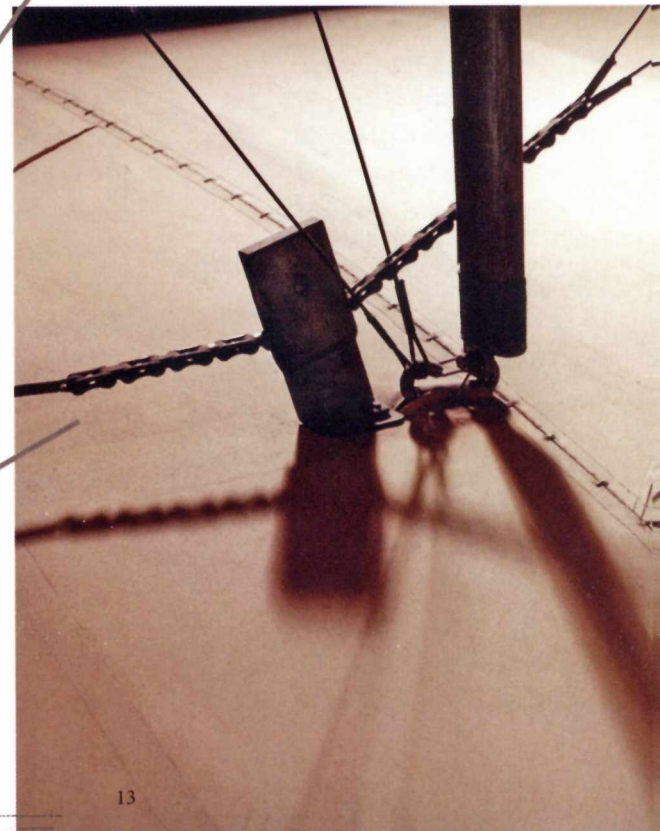
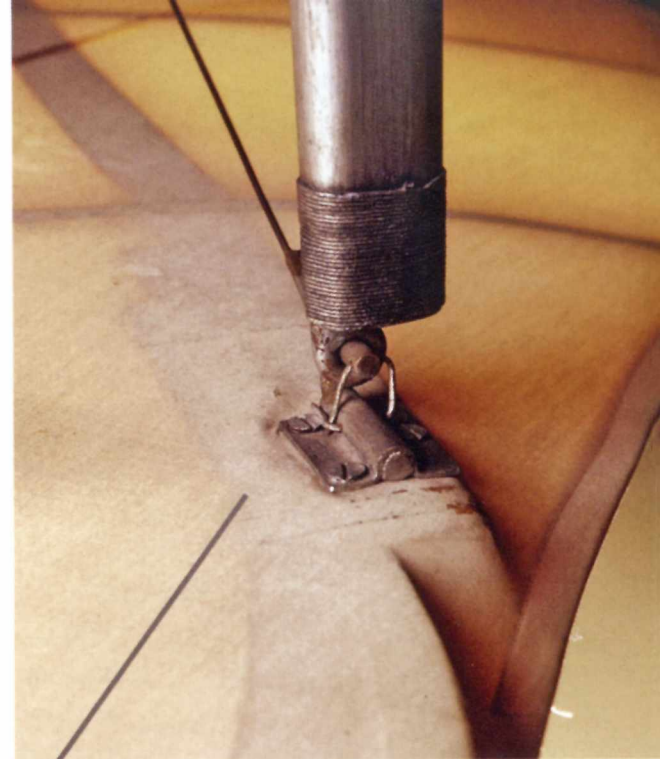
*Above: **Propeller blade.** The 1905 "bent end" propellers were much improved over the essentially flat ones used in 1903 and '04. As size and speed increased, the Wright brothers found that they were not getting the performance their calculations promised and determined it was due to distortion, or twisting, of the propeller blades under the*

pressures encountered in flight. They solved this by giving the ends of the blades a slight backward sweep.

*Below left: **Propeller hub from the rear.** The propellers were attached to the shaft with a large nut and bolt on the rear and by screws to a metal plate secured to the shaft in the front.*

*Above right: **Strut and spar linkage.** Critical to the Wright brothers' wing warping system of control was pulling the ends of the struts to cause the twisting of the wing surfaces. In order to facilitate this twisting of the structural members, the struts were hinged and safety wired to the wing spars.*

*Below right: **Warping wire and pulley.** Sections of the wing warping cable which led from the hip cradle to the tops of the outer rear struts were replaced by lengths of light bicycle chain where they passed through pulleys. The use of chain reduced wear and prevented slipping, sliding and binding.*



Acknowledgements

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