



Smithsonian

The Wright Brothers



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The Fight for Flight

Orville and Wilbur Wright were brothers. From an early age, they liked to experiment. They wanted to build a flying **machine**. Both had worked on printing presses and motors. They also owned a bicycle shop. With the same tools they used to fix the bikes in their shop, the brothers built a **glider**. It used wind to rise off the ground, just like a kite!

The Wright brothers spent years improving the design of the glider. Their goal was to build a machine that would lift a person into the sky. For years, many people dreamed of manned flight. But nobody had ever done it. The Wright brothers were sure that they could be the ones to finally make the dream a reality.

There would be many problems along the way. Countless hours would be spent studying and testing their plans. It would take a lot of hard work if they wanted to become the fathers of flight.



Orville Wright (right) works at the bicycle shop with his friend Edwin H. Sines (left).



Wilbur and
Orville Wright

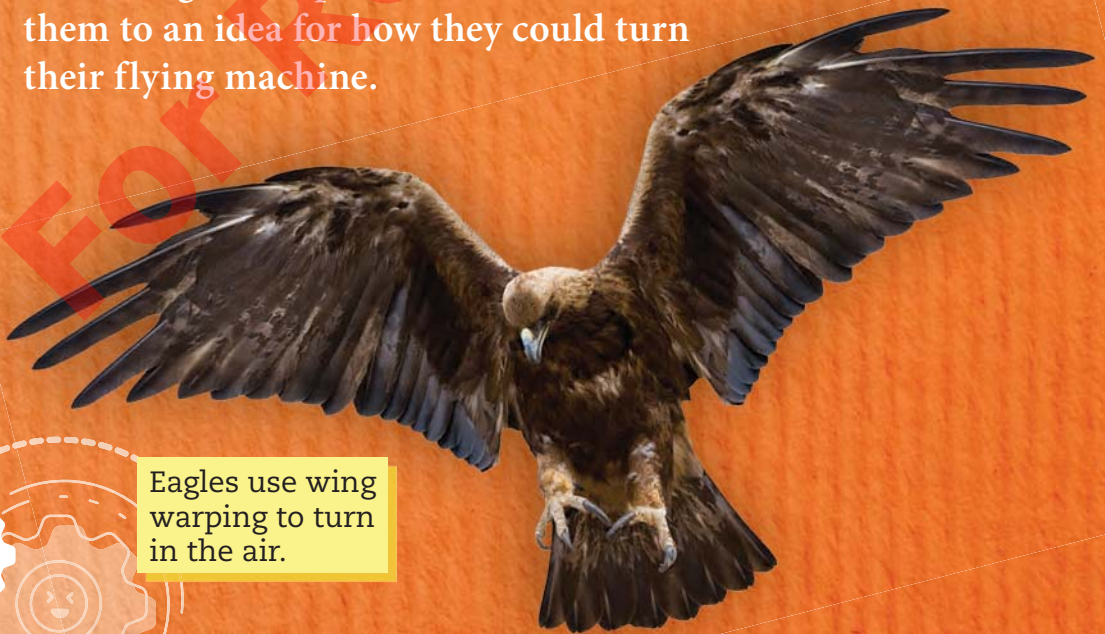
Creating a Flying Machine

The Wright brothers were inventors. They took what they knew and applied it to new ideas. They knew how bicycles worked. This helped them plan the design of their glider.

Just like Riding a Bike

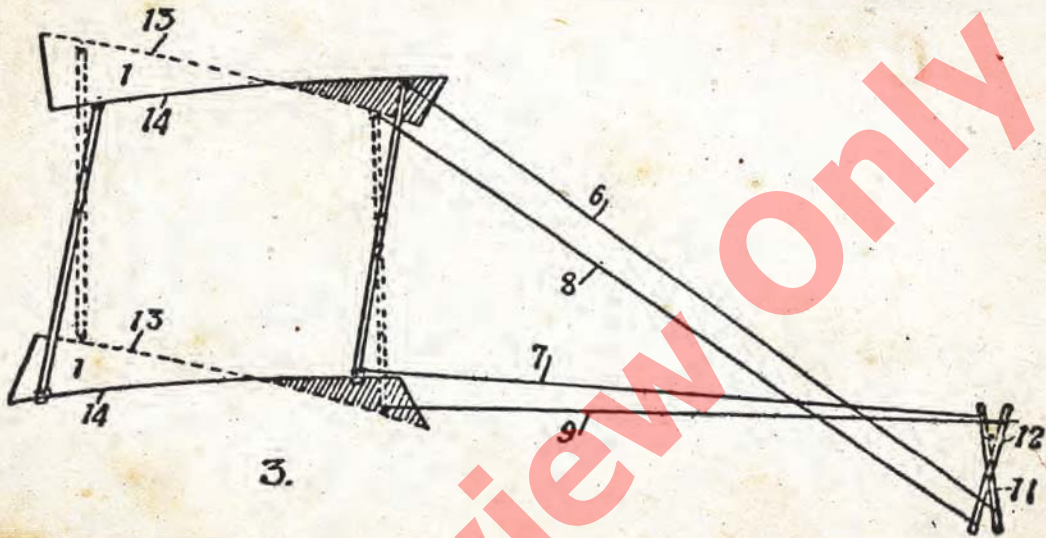
Riding a bike is similar to flying an airplane. Both need balance and control. Both machines need a strong frame built out of light materials. The materials need to be wind resistant and have an aerodynamic shape. This helps with stability.

For years, the Wright brothers studied how things fly. They researched birds and wings. They looked at the shapes, sizes, and angles that allow birds to fly. One thing they noticed was how birds warped, or twisted, their wings to help them turn in the air. This led them to an idea for how they could turn their flying machine.



Eagles use wing warping to turn in the air.

This sketch by Wilbur shows the side view of the 1899 Wright Kite.



ENGINEERING

Wing Warping

Wing warping is one way to control an airplane. It is a system of cables that twist the edge of the wings in opposite directions. This allows a plane to turn by leaning more to the right or left. The Wright brothers found that this was an easy way to maneuver planes. Wing warping is similar to flying a paper airplane. If the tips of the wing are curled back, it glides and turns.

Building the Glider

Before the Wright brothers built a glider, they tested wing warping on a kite. This was not an ordinary kite. The Wright Kite was shaped like a box and was 2 meters (6 feet) long. It also had large wings on each side that could twist and turn. The brothers' goal was to see whether changing the shape and angle of the wings would help steer a plane. They were right! The Wright Kite was balanced and controlled. Orville and Wilbur were ready to start building a glider.

The first glider was a larger version of the Wright Kite. The brothers mainly focused on the shape and size of the wings. Through their research, they knew that the wings had to be slightly curved in the front and straighter in the back. They also found that the wings had to be very large for balance.

1900 Wright Glider



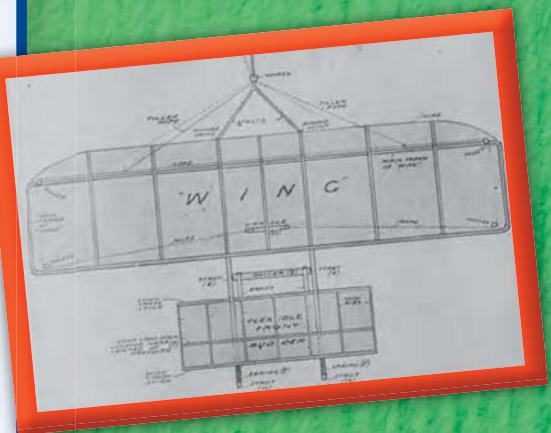
illustration of Wilbur
flying the Wright Kite



ARTS

Sketches

Before they built anything, the Wright brothers looked at other designs for gliders. They used them to learn what worked and did not work in the past. They also made their own sketches. Sketching is a good way to look at something before building it. Drawings let people see possible problems and change their ideas before they build.





STEAM CHALLENGE

Define the Problem

Wilbur and Orville Wright changed their design many times before the first manned flight in 1903. They experimented with many parts of their gliders and flyers. Your challenge is to put one of their ideas to the test. Can you design a glider to transport cargo?



Constraints: You may only use paper and tape to build your glider.



Criteria: The glider must transport cargo (10 paperclips) a distance of 4 meters.



Research and Brainstorm



How did Wilbur and Orville Wright experiment with adding weight to their gliders and flyers? What did they find? Where could a glider hold extra weight?

Design and Build



Plan the design of your glider. You may find and use folding instructions online and adjust the design or create your own from scratch. Where will you add the paperclips to the glider? How will you secure the paperclips? Build the glider and add the cargo.



Test and Improve

Test the glider twice, and write down the longest distance the glider flies. How can you improve the glider? Will you move the cargo? Modify your design, and try again.



Reflect and Share

Could you use a different material to make the gliders? What other parts of the paper gliders could be changed? Could you add more cargo to your glider?

