The Wright brothers' invention process

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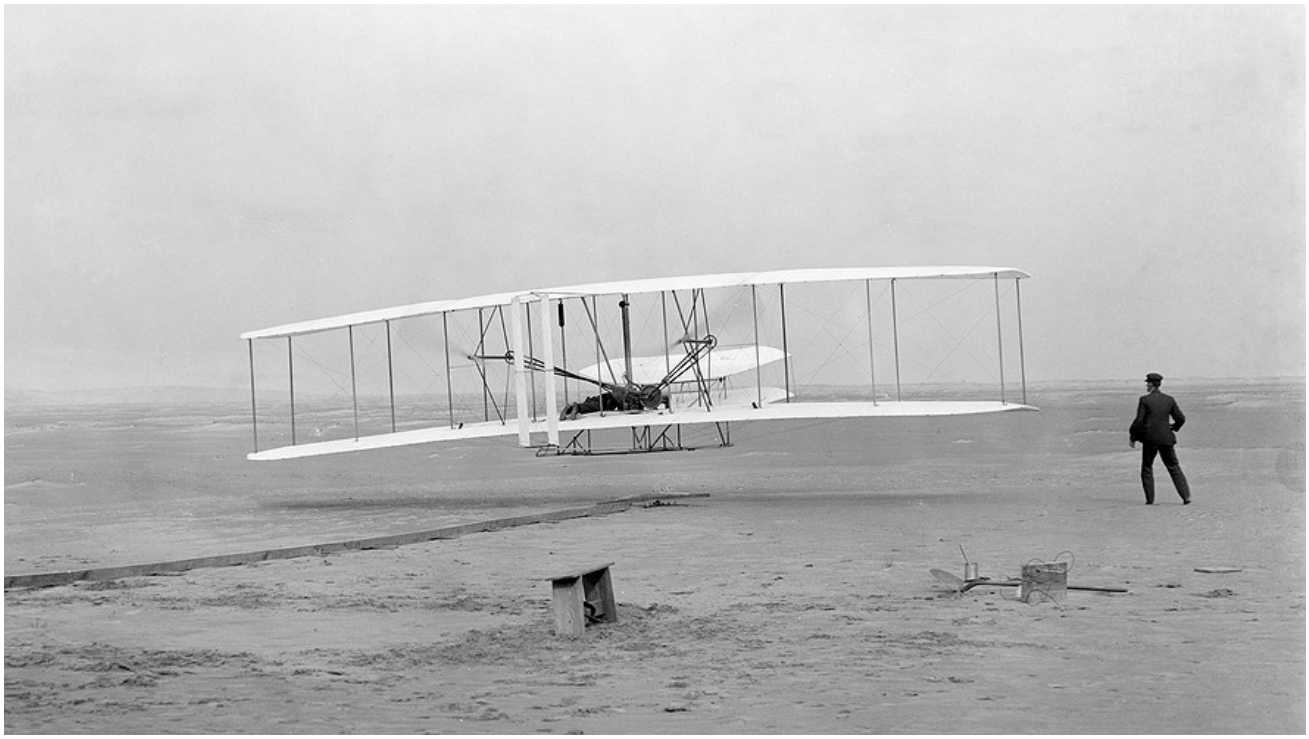


TOP: On December 17, 1903, two brothers from Dayton, Ohio, named Wilbur and Orville Wright, were successful in flying an airplane they built. This first powered aircraft flew for 12 seconds above the sand dunes of Kitty Hawk, North Carolina. Orville is at the controls of the "Wright Flyer" as Wilbur looks on. Photo: John T. Daniels/AP. BOTTOM: The forces at play with the "Wright Flyer." Image: NASA

The Wright brothers, Orville and Wilbur, invented the world's first working airplane. Before they started building their invention, they did some important studying. They studied what other inventors and scientists had done before them. They wanted to learn everything that was known about building and flying airplanes. They wrote to museums, read science papers and spoke with engineers. From their studies, they knew the hardest part of building an airplane would be figuring out how to control the plane in flight. However, they had some ideas for how to solve this problem.

Developing Flight Control Systems

The Wright brothers tested their ideas for flight control between 1900 and 1902. At this time, airplanes were not powered by an engine. Instead they just glided through the air like kites. The Wright brothers used kite flights to try out their ideas. Like an airplane, a kite is heavier than air. It relies on the motion of the wind to lift itself.

The brothers chose Kitty Hawk, North Carolina as the place for the early flight experiments. In this area, strong winds are always blowing in from the sea. Kitty Hawk's sand dunes are also perfect for soft landings when a plane goes down.

Testing The Theories

The early kite and glider experiments were far from perfect. In late 1901, Orville and Wilbur began to doubt their designs. So they built a wind tunnel, a large tube with moving air inside. They developed new ways to test their models in the wind tunnel.

They tested more than 200 different wings, trying many wing shapes to improve their gliders. Their successful 1902 plane was based on these tests. Its wings were long and thin, which helped the glider cut through air more easily. The length of the plane from one wing tip to the other was 32 feet.

Developing Test Pilot Skills

The Wright brothers were airplane designers and test engineers. They were also the first pilots of a powered plane. They developed their piloting skills by making more than 1,000 flights. At the time of their first powered flight, Orville and Wilbur were the most experienced pilots in the world. From 1903 to 1905, they continued to improve their piloting skills on a series of powered planes.

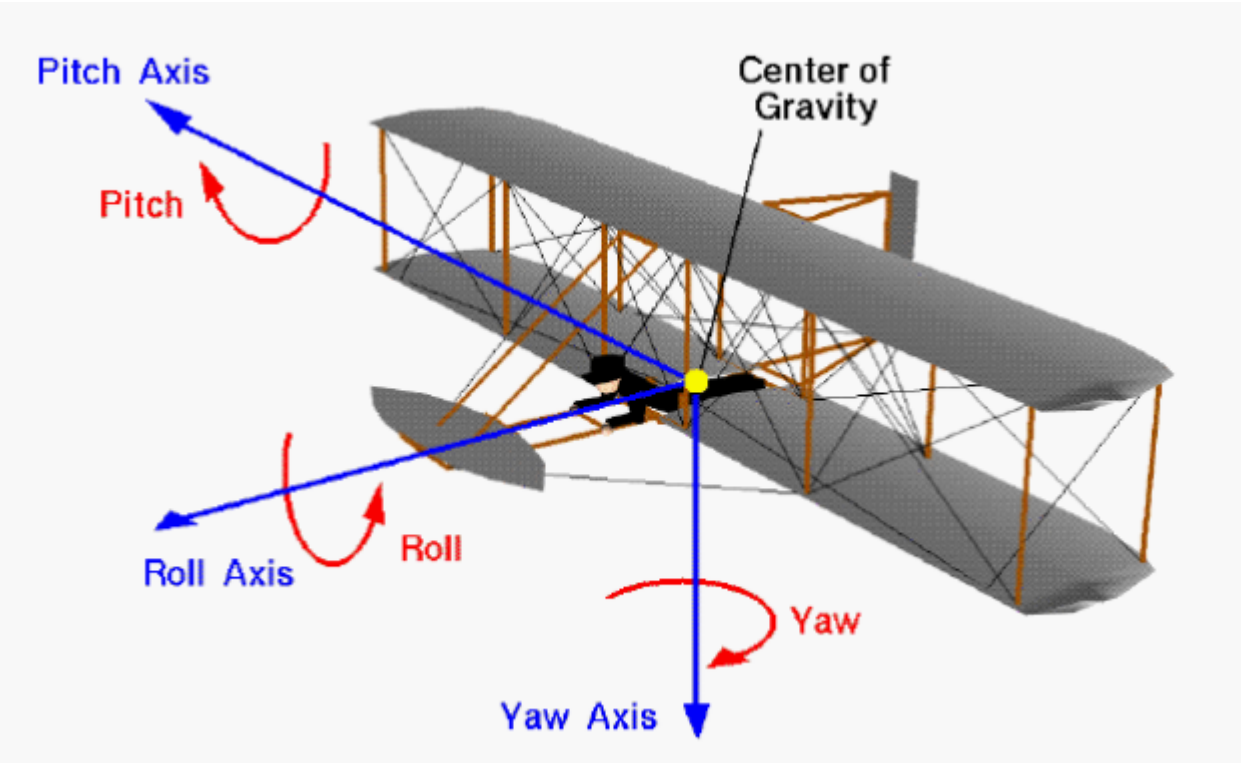
Developing Propulsion Systems

The Wright brothers were the first to pilot a vehicle that was both heavier than air and self-powered. This required two other pieces of technology. First, the plane needed a lightweight motor. Second, it needed propellers to push the plane through the air.

The brothers based their engine design on an early automobile engine. They improved the engine over time, making it much stronger. The thin, high-speed propellers they designed were based on wind tunnel tests. They were unlike any other propellers being made at that time.

The First Flight

The Wright brothers were the first to fly an airplane. Their historic first flight took place on Dec. 17, 1903. One of their main discoveries was how to control their vehicle. From the early glider flights, the Wrights understood that the plane would need a rudder. Placed at the rear of the aircraft, the rudder could control side-to-side motion.



The brothers also added wing warping, which means twisting the tips of the wings. The effect of warping is to control how much the air under the wings pulls the plane upwards.

Flight Development

The four flights of 1903 were only an early chapter in the story of flight. The longest flight lasted less than a minute.

The brothers continued to improve their machine, building a series of new planes between 1903 and 1905. They moved their flight testing from Kitty Hawk to their hometown of Dayton, Ohio. Then they flew their new planes at Huffman's Field on the edge of town. With a new, more powerful plane, they were able to stay in the air for up to a half hour. They could even fly figure eights and take passengers up for a ride. The age of the airplane had arrived.

Pushing The Envelope

After the success of the first airplane, the Orville and Wilbur continued to be involved in the science of flight. Orville was one of the original members of the National Advisory Council on Aeronautics (NACA). This is the parent company of NASA, the U.S. space agency.

Quiz

1 What effect did studying past inventors and scientists have on the Wright brothers?

(A) It made them realize that it was not possible to flight a plane that was heavier than air.

(B) It made them realize that figuring out how to control the plane would be the hardest part.

(C) It made them realize that wind tunnels were needed to carry out the flight experiments.

(D) It made them realize that they would need to try many different wing shapes for gliders.

2 According to the article, what changed after the Wright brothers moved their flight testing from Kitty Hawk to Dayton, Ohio?

(A) The brothers experimented with different wings for powered planes.

(B) The brothers were able to build a wind tunnel to test wing shapes.

(C) The brothers became interested in working on the science of flight.

(D) The brothers designed more powerful planes that could fly longer.

3 Look at the photograph at the top of the article and read the caption under it.

Use the caption and the article to select the statement below that BEST explains what is happening in the photograph.

(A) The brothers are studying the work and flights of other scientists in order to learn more about airplanes.

(B) The brothers are using a wind tunnel to test different wing shapes and improve their piloting skills.

(C) They brothers are testing their first powerful plane at an airfield, which was near their hometown in Dayton, Ohio.

(D) The brothers are flying an airplane they built in Kitty Hawk, which they chose for its strong winds and sand dunes.

4 Look at the diagram near the bottom of the article. Why is this diagram included with the article?

(A) to show the speed of the airplane

(B) to label the changes to the airplane

(C) to show the design of the airplane

(D) to label the parts of the airplane