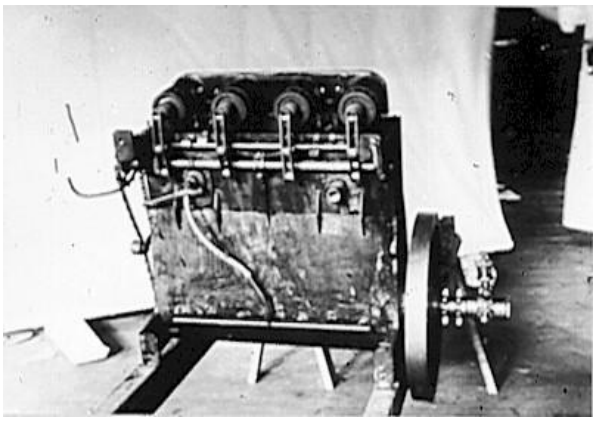
HOW POWERED FLIGHT WORKS



The Wright Brothers used a 12-horsepower engine for their first powered flight. This image depicts the actual engine. NASA tells us it had the equivalent power of "two hand-propelled lawn mower engines." Image online, courtesy NASA.

For the next two years, Will and Orville used their bike shop as an invention center. Using a bike as their first testing device, they performed airfoil experiments.

Pedaling their contraption as fast as they could was exhausting, so the brothers invented a wind tunnel into which they placed two homemade devices - one to test lift and the other to test drag. The blower fan, which was driven by an overhead belt, created winds up to 35 miles per hour.

Writing down all their observations on strips of wallpaper, they ultimately compiled their findings into a notebook. Among other important conclusions, the brothers determined the commonly accepted coefficient of lift was too high. They also found a wing produced more lift if it had the shape of a parabola.

Using the data from all their experiments, the brothers built a reworked glider in 1902. It was the first aircraft which solved the fundamental problems of flight: lift and three-axis (referred to as pitch, roll, and yaw) control. (Be sure to see NASA's animations linked in this paragraph.)

Once the brothers were able to achieve sustained and controlled flight, based on their calculations and field tests, they constructed a larger version of their 1902 glider. They called it the Flyer. Today, most folks know it as *Flyer 1* or the *Kitty Hawk*.

But *Flyer 1* would be *an airplane*, not a glider. Will and Orville needed to figure out how to use a propeller in the air. Although they looked at shipbuilding literature, it didn't help them. There was no theory of propulsion. At the time, no one truly understood a propeller is nothing more than a wing, rotating on its axis, which lifts the plane forward.

Reasoning through this fundamental tenet of self-propelled flight, the brothers were ready to build their power source. It was a 4-cylinder, 12-horsepower gas engine they built with the help of their mechanic, Charlie Taylor. (Be sure to follow the links in this paragraph to view NASA-created animations depicting how *Flyer's* engine actually worked.)

Will and Orville had been in a race to see who could develop the first heavier-than-air powered flying machine. Samuel Langley, the distinguished secretary of the Smithsonian Institute, had developed an Aerodrome. When it crashed on launch, Langley left future experiments to the Wright brothers.

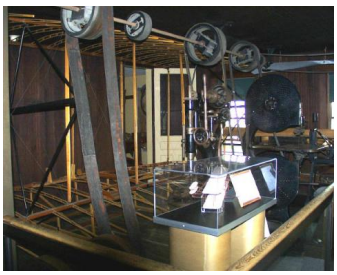
Langley wasn't the only competition the brothers faced, however. They had to press forward.

It was time for another trip to Kitty Hawk and Kill Devil Hill.

See Alignments to State and Common Core standards for this story online at:
http://www.awesomestories.com/asset/AcademicAlignment/HOW-POWERED-FLIGHT-WORKS-Fly-Boys

See Learning Tasks for this story online at:
http://www.awesomestories.com/asset/AcademicActivities/HOW-POWERED-FLIGHT-WORKS-Fly-Boys

Media Stream



Wright Brothers Bike Shop

Image online, courtesy wright-brothers.org website.

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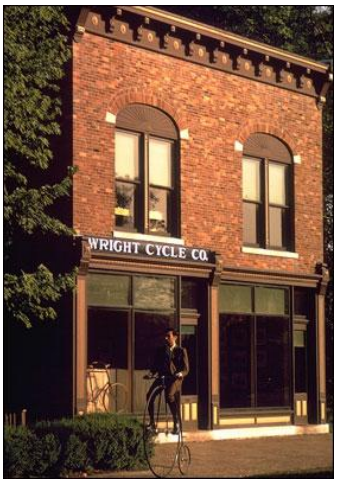

Photo of the Storefront of the Wright Brother's Bike Shop

Image online, courtesy the cliffhanger76.tripod.com website.

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Air Foil Testing

Image online, courtesy the NASA website.

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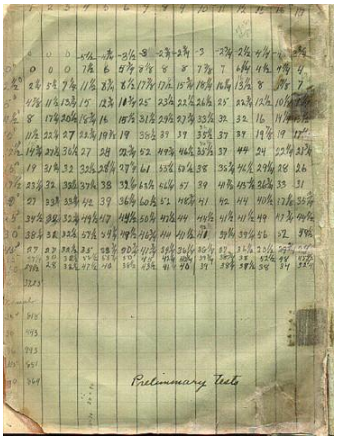

Page From Wright Brother's Notebook

Image online, courtesy wright-brothers.org website.

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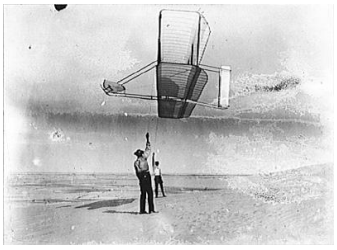

Wright Brother's Reworked Glider

Image online, courtesy wright-brothers.org website.

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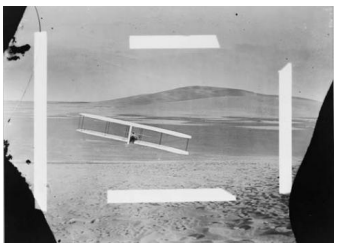

Flying the Glider

Image online, courtesy the wright-brothers.org website.

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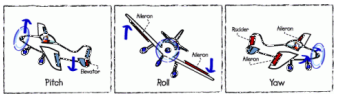

Detail of the Three Axis of Aircraft

Image online, courtesy NASA website.
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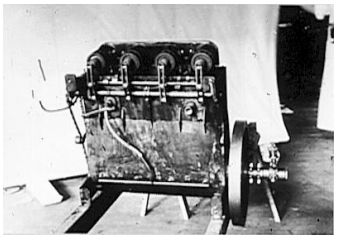

Engine for Flyer I

Image online, courtesy the U.S. Library of Congress.
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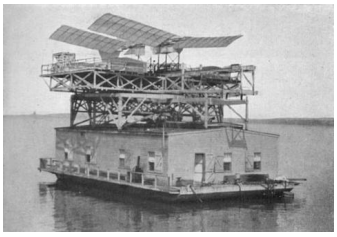

Langley's Aerodrome

Image online, courtesy wright-brothers.org website.
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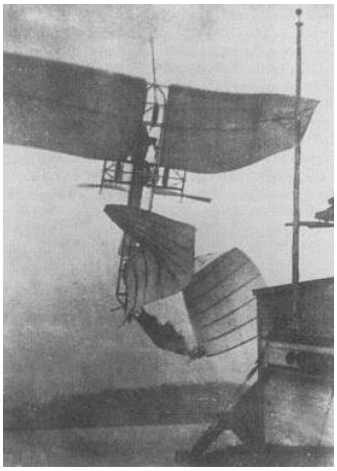

Langley's Aerodrome - Photo of the Crash

Image online, courtesy wright-brothers.org website.
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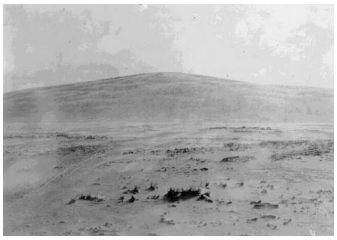

Photo of Kill Devil Hill

Image online, courtesy wright-brothers.org website.
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Photo: Flyer I

Image online, courtesy wright-brothers.org website.
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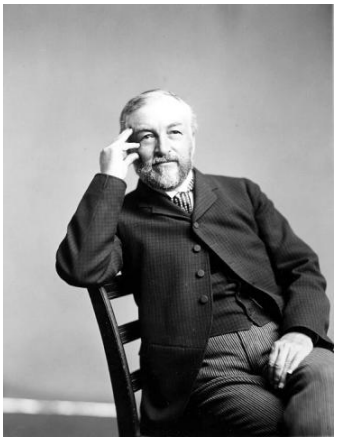

Samuel Langley

Image online, courtesy the Smithsonian Institution website.
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View of Kitty Hawk Area

Image online, courtesy the 456fis.org website.
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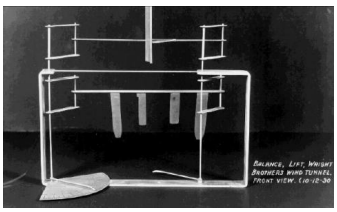

Wind Tunnel Tests - For Lift and Balance

Image online, courtesy wright-brothers.org website.
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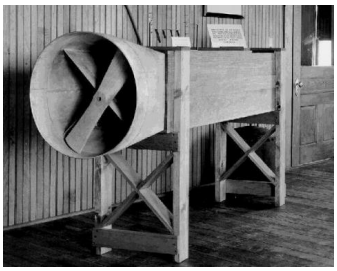

Wright Brother's Wind Tunnel

Image online, courtesy the wright-brothers.org website.
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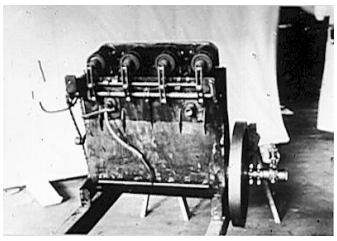

HOW POWERED FLIGHT WORKS

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