

Aerospace Engineering
Gant, Hook, Windes
Lesson: 4-10-2020

Learning Target:

Students will learn and understand the importance of aeronautical research to design.

Bell Work:

What are some important questions to ask when doing research?

Let's Get Started:

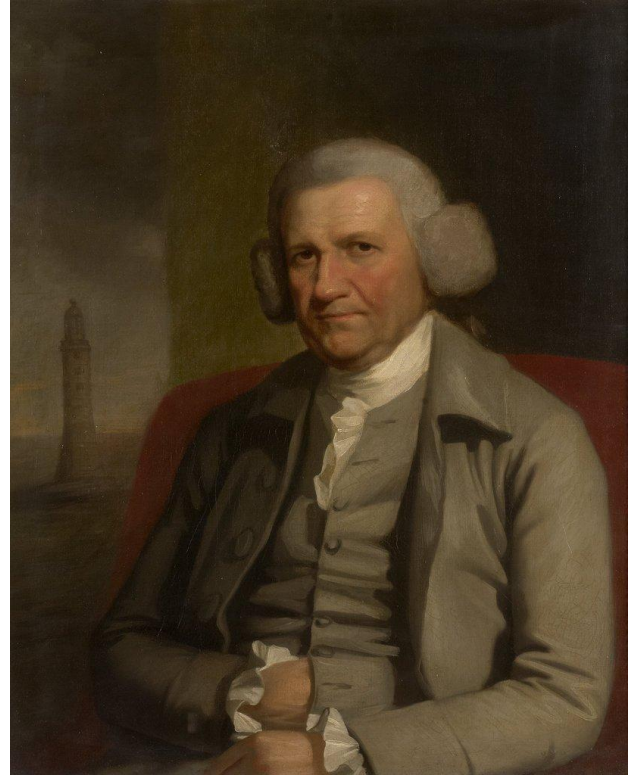
Watch Video: [A New Generation of Aeronautics Research](#)

Aeronautical Research

Since the beginning of time, humans have dreamed of flying like the birds. Failure after failure did not deter them. It would not be until the 18th century that man began to understand the principles of flight. It takes a real determination to turn dreams into realities. Heavier than air flight was discovered by people who studied the properties of flight in **new ways**. That helped them to identify what influenced the behavior of an object in flight.

John Smeaton

In 1759, a British engineer named John Smeaton published a paper that discussed the relationship between pressure and velocity for objects moving in water and air. He used a whirling arm device to measure the drag exerted on a surface by moving air. From his work Smeaton created an equation to explain his observations. His exact drag equation is not used today. But it led to other researchers making changes to it and then being used today.



George Cayley



George Cayley is considered the “Father of Aviation”. In 1799, he set the concept of the modern airplane. He understood the basic principles of flight and made working models. Cayley identified two important factors related to flight. One, that the drag vector is parallel to the flow and second that the lift vector is perpendicular to the flow. He was also the first to identify that lift is generated by low pressure on the upper surface of the wing.

Otto Lilienthal

Otto Lilienthal was a German engineer who became the first man to launch himself into the air, fly, and land safely. Unfortunately, on August 9, 1896, the glider he was in, stalled and crashed. He died the next day with a broken spine. His last words were “Sacrifices must be made.” Lilienthal had a great impact on aviation. There were several photographs that proved that a human could launch himself into the air and stay in the air a long period of time. Another important part of his research was that the principles of his experiment and the records of his research provided guidance for those that came after him.



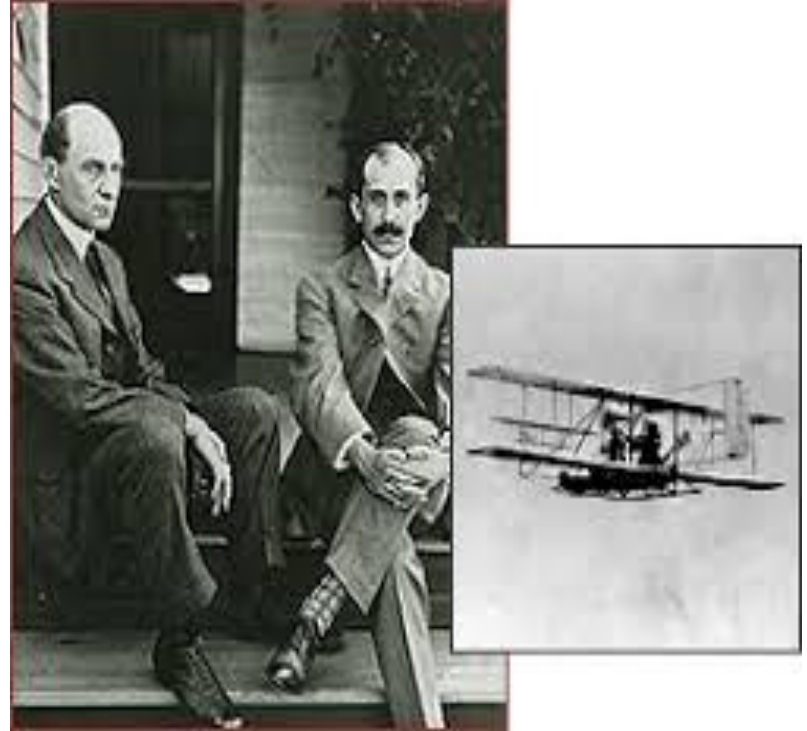
Samuel Pierpont Langley



Samuel Langley is considered one of the most unlucky researchers in the history of flight. In 1896, one of his heavier-than-air machines, Aerodrome no. 6, was the first to achieve sustained unmanned flight. It flew 4,200 feet flying at about 30 mph over the Potomac River in Washington, D.C. Because of this, he received a government contract to build a heavier-than-air machine with a pilot on it. The Great Aerodrome was launched by catapult from a houseboat. It had to go from a dead stop to 60 mph in only 70 feet. The launch created more stress than the wood and fabric could handle and the front wing was damaged. During the second launch the rear wing and tail came off during the launch. Charles Manley, the pilot, almost drowned before he was rescued from the wreck in the ice-covered Potomac. After this, Langley did not attempt any more flights.

Orville and Wilbur Wright

On December 17, 1903, the Wright Brothers changed the world forever. On that day at Kitty Hawk, North Carolina, they flew the first engine powered, plane that achieve controlled, sustained flight with a pilot aboard. They did flight experiments with kites and gliders for several years before this flight. The Wright Brothers built a wind tunnel and tested models of their plane in their bicycle shop. The data that they collected related to drag and lift was more accurate than any before. This helped them to design and build wings and propellers that were more efficient than anything else at that time. After the first tests at Kitty Hawk, the they continued to work on their design for two more years. By 1905, they had an plane that could maneuver in the air at the pilot's command until it ran out of gas.



These pioneers in aeronautical research are the ones that paved the way for the of future flight with all of their research. There seems to always be a demand for planes to fly faster, farther, and higher all the time. Because of this, the U.S. has created several research centers. From March 1915 until October 1, 1958, the National Advisory Committee for Aeronautics (NACA) carried out much of the cutting edge research in aeronautics in the U.S. NACA created four aeronautical research centers that became a part of NASA on October 1, 1958.

- Langley Research Center in Langley, Virginia
- Ames Research Center in Moffett Field, California
- Glenn Research Center in Cleveland, Ohio
- Dryden Flight Research Center at Edwards AFB, California

Research is extremely important to productivity and competitiveness. From new types of aircrafts to robotics, biomedical engineering and sustainable energy, it helps fill in the gaps in knowledge and helps develop new products.

Aeronautical Research Understanding:

1. How has aeronautical research changed over the years?
2. Who invented the first heavier than air aircraft?
3. Who became the first man to launch himself into the air, fly, and land safely?
4. Where was the first heavier than air aircraft flown at?
5. Where was the first heavier than air aircraft built at?
6. Who was the first to achieve sustained unmanned flight?