activity fourteen

THE WRIGHT BROTHERS,

Their Biography, Their Aircraft and Their Workshop!

OBJECTIVE

This is an investigation into the lives of two great aviation pioneers. It is also an exercise in the hands-on construction of their Flyer and their workshop near Kitty Hawk, North Carolina.

BACKGROUND

Orville and Wilbur were members of a family of seven. They were born to Milton and Susan C.K. Wright. Their father was a bishop in the United Brethren in Christ Church. Wilbur was born in Richmond, Indiana, in 1867 and Orville, the younger of the two, was born in Dayton, Ohio in 1871. As children, the brothers were taught to be self-sufficient and a great emphasis was placed on their education. When Wilbur was eleven, and Orville was seven, their father gave them a toy "helicopter" that was equipped with counter-rotating propellers. The toy had a tremendous impact upon the boys and many historians agree this was the beginning of their interest in flight. They spent countless hours playing with the helicopter, flying kites and studying all of the flight-related literature of the times. They were especially impressed with the works of Otto Lilienthal and Octave Chanute.

After graduating from high school, Orville went into the printing business with a friend. They printed handbills, tickets and other small items. Shortly after the death of the mother in 1889, Wilbur joined the little company. Out of this partnership came the publication of a local newspaper called The West Side News. During this time, the brothers also created a bicycle business to take advantage of a nation-wide interest in cycling.

As time went on, their interest in flight became even more intense and by the end of 1898, they were ready to start construction of a glider. The brothers decided that the best design would be a biplane because of its "box kite-like" strength. They also theorized that the optimum means of maintaining equilibrium in flight was with moveable control "surfaces." They came to this conclusion by observing how seagulls and other birds were able to turn by twisting, or "warping" their wings.

The brothers also knew that a steady flow of wind was going to be necessary for testing their aircraft and they selected, after consulting with the National Weather Service, a desolate beach on the Outer Banks of North Carolina, near the town of Kitty Hawk. The sight of most of their experimentation took place on a wind-swept section of that beach known as Kill Devil Hill.

It should be emphasized to students and cadets that the brothers did not just jump in and start trying to fly. They followed a pattern, which is familiar to most students today, and it's known as the "scientific method." They first discussed their problems, and then experimented with various solutions. Data was gathered from these experiments and eventually they developed conclusions about the actual process of flight in a heavier-than-air machine. From these conclusions, they built first a controllable glider and then a powered airplane.

At first, Orville and Wilbur designed a wing based on the calculations and experiments of Octave Chanute and Otto Lilienthal. Their first glider was "kite-like" and later it was equipped with control surfaces. They found that by warping the wings, the craft would respond by banking. In July, of 1901, they tested a larger glider that had a small wing, or elevator, mounted up front. They built it so that the pilot could lie prone on the lower wing and control the warping by moving his body from side to side. To control pitch, they used a hand control that moved the small front wing up and down.

Their initial experiments in lift and control were discouraging. A break-through came when they visited Octave Chanute. After hours of discussions, they all concluded that the pressure tables the Wrights had been following were wrong. It should be noted that although they failed many times, Orville and Wilbur never gave up on the dream. Their small glider had to be re-built several times after crashing.

The encouragement of Chanute coupled with their keen interest and tenacity motivated them to continue to study and approach their problem scientifically. During the winter of 1902, they built a wind tunnel to test airfoils (wing sections) and from this study, they developed a set of new mathematical tables for lift. The 1902 glider was modified to obtain more lift and a rudder was added to the rear of the craft. When they returned to the Kitty Hawk test site, they found their calculations correct and the new glider went 622 feet.

By warping the wings, using an elevator and adding a rudder, the Brothers knew they had overcome the most difficult phase of their work; i.e., control in three axes. They now had a way to control roll, which is a movement around the longitudinal axis; they had a way to control yaw which is a movement around the vertical axis and by moving a hand-held stick, they could control pitch, which is movement around the lateral axis. With the correct airfoil for lift, they solved the secret to controlled and sustained flight…not just "hops." All they had to do was add power.

In March of 1903, the brothers applied for a flight controlled system patent. They were confident that an engine was all that was needed for sustained flight. At the time, few small engines existed and again, by sheer determination, the brothers decided to build their own powerplant. With the help of machinist, C.E. Taylor, they built a lightweight, four-cylinder engine that produced 12 horsepower! They set about designing a suitable propeller and again, everything had to be thoroughly tested.

Finally, on the 17th of December 1903, with J.T. Daniels, W.S. Dough, A.D. Ethridge, W.C. Brinkley and Johnny Moore as witnesses, Orville climbed onto the lower wing and prepared for flight. The wind was averaging 24 miles per hour and with full throttle, the craft left its rail launch "runway" and stayed in flight for 12 seconds. It went 120 feet forward and rose to an altitude of 12 feet. It was the first controlled, sustained, and powered flight in history.

The model that is featured in this activity is an exciting replica of the actual aircraft that flew on the cold December morning in 1903. The workshop shed adds drama to the "diorama". It is interesting to think that this flight was man's first step to space exploration. The Flyer only went 120 feet but as Neil Armstrong said when he stepped upon the moon for the first time, "…a giant leap for mankind!"