Was the Airplane an American Invention?

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Abstract

The airplane was not essentially an American invention; it was a World invention. One cannot attribute the invention of the airplane solely to the Wright brothers. The Wright brothers were voracious readers of a variety of articles written by or about other great names in aviation development, among them Otto Lillienthal, Octave Chanute, Sir George Cayley, and John Stringfellow. Lillienthal, Cayley, and Stringfellow were European and Chanute was born in France. Cayley's work in aeronautics, Lillienthal's gliders, Stringfellow's engine, and Chanute's coordination of aviation development literature provided a solid foundation for the historic moment in December 1903 at Kitty Hawk, North Carolina.

Keywords:aviation, invention, Wright brothers, history

Invention of the Airplane

The airplane was not essentially an American invention; it was a World invention. One cannot attribute the invention of the airplane solely to the Wright brothers. Their success at powered flight was certainly a crossroads event in the development of aviation, but it was part of an historical progression rather than a singular event.

The Kitty Hawk flight was memorable and remarkable, but it cannot be described in the context of aviation development as solely American. Multiple sources recognized that the Wright brothers were voracious readers of a variety of articles written by or about other great names in aviation development (Gibbs-Smith, 1970; Shipman, 1998; Whelan, 2000). They studied the work of Otto Lilienthal in-depth, sharing his interest in bird flight and focusing on the critical skill of learning how to fly by mastering aerodynamic principles before attacking the related challenge of generating enough power to produce lift and take off (Shipman, 1998). Otto Lilienthal was German. The Wrights maintained regular communication with Octave Chanute regarding development of a machine in which man could fly (Crouch, 2003). Chanute was born in France. He provided two major contributions to the Wright's aircraft design: the biplane and the Pratt-truss rigging method (Gibbs-Smith, 1970). The idea to use a biplane was something Chanute adopted from Sir George Cayley and John Stringfellow, who were British. Rigging was developed for bridge design by American engineers, Thomas and Caleb Pratt.

1. British Ingenuity

A number of aviation milestones were attributed to British engineers and experimenters.Some of the most notable of these contributions were made by Sir George Cayley, recognized as the Father of Aerial Navigation (Whelan, 2000). J.A.D. Ackroyd presented a series of Cayley lectures to the Royal Aeronautical Society in the early 21st Century. He attributed the first glider flight to Sir George Cayley in 1804 and the 1799 invention of the "aeroplane itself" (Ackroyd, 2002, pg. 167). Ackroydalso discussed Cayley's work with steam engine design and manufacture, invention of a heated-air engine, and construction of a gunpowder motor. These devices were not sufficiently light-weight while at the same time powerful enough to be useful for aviation purposes (Ackroyd, 2002; Whelan, 2000). However, Cayley's empirical methods led to his significant achievement in solving problems with aerodynamics, and stability and control. He originated the idea that propulsion and lift needed to be separate systems. One side of a small silver disc he engraved shows this idea (Ackroyd, 2002). He depicted air resistance as perpendicular to a flat surface, using a triangle of forces to disaggregate this resistance into lift and drag components.Prior to his work, aviation enthusiasts associated these two forces of flight together, making the ability to design an appropriate power-generating engine less and less fruitful.

Cayley experimented with a variety of gliders and models, allowing him to recognize that lift was affected by the camber of the wing, that a wing's center of pressure was not constant, and that the dihedral wing design would augment lateral stability (Whelan, 2000).

An even greater contribution by Cayley was his willingness to share his empirical findings. He provided the starting point for further investigation. Sharing his empirical findings on power generation and aerodynamics,and his designs for gliders allowed other inventors and aviation enthusiasts opportunities similar to his own.

2. German Curiosity

Otto Lilienthal also designed and constructed gliders. His designs were based on his acute observations of bird flight. Like Cayley, Lilienthal discerned that the forces acting upon a glider needed to lead to a function much like those acting on a soaring bird (Lilienthal, 1889/2001). He noticed how birds were able to capitalize on what appeared to be minimal effort to maintain flight, and he experimented with possible motors in an attempt to generate enough power to simulate the flight of birds. His study of birds also led to a deeper understanding of aerodynamics through study of birds' wings, and he developed charts of wing areas and resultant lift generated.Lilienthal's greatest successes were with glider flight. He was the first human to fly through the air (Gibbs-Smith, 1970). Lilienthal's ability to glide through the air was facilitated by his detailed examination of data in research experiments, his voracious appetite for studying the environment of flight and the reports of work by others, and his ability to translate research findings into successful modifications to his glider fleet. Both of the Wright brothers read articles about Lilienthal that sparked their interest in flight and aerodynamics.

3. French-American Contribution

Wilbur and Orville Wright were greatly encouraged in their aviation endeavors by Octave Chanute. Chanute published a seminal collection of work done by others regarding experimentation in aviation (Rodriguez, 2000). He also designed, constructed, and tested gliders himself. His approach was similar to Lilienthal: he developed the most aerodynamic glider and then worked to add a propulsion system. Chanute and a team of assistants found success in flying a glider fashioned after Lilienthal's model and later with a biplane glider. The biplane was designed with a rigid bracing system modeled after the Pratt bridge truss (Gibbs-Smith, 1970; Rodriguez, 2000). This model was a precursor to the structure the Wright brothers used for their flyer.

Chanute's glider experiments provided a basis for future aviators through his successes and his failures. He focused a tremendous amount of his experimentation to developing what he called, "automatic equilibrium" (Gibbs-Smith, 1970). This goal phenomenon of equilibrium was essentially an inherent stability in the aircraft design; unfortunately Chanute never realized this dream. However, he did succeed in serving as an information conduit for all things aviation. He reported progress in the quest for powered flight to inventors and experimenters on both sides of the Atlantic, which may have played a role in the successful modification of the biplane glider to accommodate a pilot and a propulsion system.

4. The First Manned, Powered, Controlled Flight

There were certainly a host of additional aviation pioneers upon whose shoulders the Wright brothers were able to climb – assimilating research, modifying designs and testing them in a wind tunnel or in real time, and developing a greater understanding of the principles of aerodynamics. They studied the work of previous inventors and engineers from around the world, both to gain insight into the principles of aviation and aerodynamics and to avoid the pratfalls of those who had already experimented and failed. They tested designs such as Chanute's rigging to create automatic stability, and Lilienthal's equations for wing area and camber (Gibbs-Smith, 1970). The Wright brothers recognized that control of an airborne glider was paramount to building a powered aircraft. Wilbur Wright said, "when once a machine is under proper control under all conditions, the motor problem will be quickly solved" (Gibbs-Smith, 1970, pg. 116). The airplane that flew on December 17, 1903 was the Wright's resultant design – a controllable biplane, powered by a light-weight engine,that could support the weight of a pilot. Those meager 120 feet in just 12 seconds were easily as significant in the early 1900s as Neil Armstrong's first boot print on the Moon in the late 1960s. When Armstrong stepped down onto the lunar surface he did not say, "…one giant leap for America." The lunar landing, like the Kitty Hawk flight almost 66 years earlier, was a technological milestone for all mankind.

References

Ackroyd, J.A.D. (2002). Sir George Cayley, the father of aeronautics, part 1. The invention of the aeroplane. Notes and records of the Royal Society of London, 56(2), pp. 167-181. Retrieved from http://www.jstor.org/stable/3557665

Crouch, T.D. (2003). Wings: A history of aviation from kites to the space age. New York: W.W. Norton & Company.

Gibbs-Smith, C.H. (1970). Aviation: An historical survey from its origins to the end of the second world war. London: NMSI Trading Ltd.

Lilienthal, O. (1889). Birdflight as the basis of aviation.(Isenthal, A.W., Trans.). (Reprinted by M.A. Markowski, 2001, Hummelstown, PA: Markowski International Publishers)

Rodriguez, C. (2000). Developments before the Wright brothers. In T. Brady (Ed.), The American aviation experience (pp. 13-47). Carbondale and Edwardsville: Southern Illinois University Press.

Shipman, P. (1998). Taking wing: Archaeopteryx and the evolution of bird flight.New York: Simon & Schuster.

Whelan, P.A. (2000). Orville and Wilbur Wright. In T. Brady (Ed.), The American aviation experience (pp. 48-66). Carbondale and Edwardsville: Southern Illinois University Press.