Wilbur, Orville and the Genius of Wing-Warping

By Dennis Payton Knight

There were pioneers before them experimenting in attempts to conquer the skies, mostly falling clumsily from a few feet the air, if even getting off the ground. They included, most famously, Samuel Langley of the Smithsonian Institution, who flew an unmanned steam-powered fixed-wing model airplane in 1896.

But it was Wilbur and Orville Wright, a pair of bicycle mechanics from Dayton, Ohio, who, on December 17th, 1903, made the first controlled, sustained flight of a powered heavier-than-air flying machine. They succeeded because they, uniquely, understood flight could not be possible without controls to keep the aircraft lateral, allowing it to lift, turn, glide and land.

Wilbur, the elder brother, and Orville were likable young men, modest, good neighbors, good citizens, and brilliant, even though neither quite finished high school. They had admiring logistical support from their sister Katharine, and guidance from their father, Bishop Milton Wright, who oversaw a good share of the country as a Christian church leader.

It was Wilbur who observed that birds change the angle of the ends of their wings to make their bodies roll right or left. The brothers thought this would be a good way for a flying machine to bank or lean into a turn like a bird, much like a person riding a bicycle, with which they were thoroughly familiar. Experimenting with ways to achieve that, it was Wilbur idly manipulating a long inner-tube box at the bicycle shop that led them to discover wing-warping, or twisting the trailing edges of the wings in opposite directions.

They invented a three-axis system which enabled the pilot to steer effectively and maintain flight equilibrium. It was their first patent, and it was awarded not for the invention of an airplane, but rather that of a system of aerodynamic control that manipulated a flying machine's surfaces. It was an elegant solution to what the brothers called "the flying problem," that remains a key principal of flight even today.

To prove their theories, the brothers experimented in relative secrecy, first with a hand-made wind tunnel at their bicycle shop in Dayton, then with gliders at Kitty Hawk, on the wind-swept outer banks of North Carolina. They tested and proved their theories, and taught themselves to fly, before adding a light engine of their own design to turn their glider into the first self-powered flying machine.

There is much more to the story of the Wright Brothers, and, if you are interested, I highly recommend David McCullough's book, *The Wright Brothers*, Simon & Schuster, 2015.

Of the brothers, Wilbur was the deeper intellect in the abstract of taking mankind airborne, whereas Orville was the practical, functional mechanical engineer. But these are generalizations in both cases, because it was the Wright Brothers together who wove observation and theory cohesively into a machine that has evolved into the incredible variety of aircraft, from crop-dusters to supersonic fighters, and jumbo aircraft jetting passengers in hours around the world.