

## A dream of flight: The triumph of ingenuity and persistence and the scientific method

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In 1993, I conducted an archaeological geophysics survey to locate the site of the Wright brothers' 1910 hangar at the Huffman Prairie Flying Field, Dayton, Ohio, U.S. The 1910 hangar housed the Wright School of Aviation and Exhibition Co. Incredibly, the locations of the 1910 hangar and a smaller 1905 hangar are not known exactly. In spite of the tremendous historical significance of the 1910 hangar, it was mistakenly destroyed in the buildup to World War II. A replica of the 1905 hangar was built in the approximate location in 1990. The purpose of the archaeological investigation was to locate the exact site of the 1910 hangar, prior to constructing a replica for the 2003 centenary celebration of the first powered flight, and to document any surviving buried evidence of the Wright brothers' occupation of the site. It was during the background investigations associated with the work that I became fascinated with what the brothers had accomplished.

In 2001, I visited the Wright Brothers National Memorial in Kitty Hawk, North Carolina, U.S. It was there on 17 December 1903, after 4 1/2 years of study and meticulous experimentation, that Wilbur and Orville Wright achieved their goal of powered flight in a heavier-than-air craft. As I viewed the monument marking the 120-ft extent of man's first powered flight, I was reminded of the words of Neil Armstrong as he set foot on the moon only 66 years later, "That's one small step for man, one giant leap for mankind."

Later, I stood before the large Memorial Pylon on top of Kill Devil Hill and marveled at the accomplishments of the two brothers. They didn't graduate from high school or attend college, but they possessed a wealth of curiosity, persistence, and ingenuity, and they profoundly impacted the course of human history.

The Wright brothers had the mindset, vision, and approach of great scientists and engineers; however, they had no formal training in the sciences. They achieved one of mankind's most cherished dreams by systematic and persistent experimentation and testing. Unlike those who employ modern research,



Figure 1. Geophysical surveys at the Wright Brothers' Huffman Prairie Flying Field—Flying Field Walking Tour Flag No. 6 in left background (Butler and Simms, *Geoarchaeology*, 1994).



Figure 2. Man's first powered flight, Kitty Hawk, North Carolina, 17 December 1903, 10:35 A.M. (National Park Service).

development, and invention, the Wright brothers did not have or seek any external funding. They called no press conferences to announce grandiose ideas and plans. They prepared no proposals to government or private funding agencies. In fact, the Wright brothers refused an offer of financial support for their work from Octave Chanute (1832-1910), a long-time encouraging friend and adviser. Chanute had experimented with gliders and authored a history of flying machines; he clearly saw great potential in the work of the Wright brothers. Wilbur Wright explained that outside financial support might turn a dream into an obsession and cause their bicycle business to suffer. It was only after the brothers had achieved powered flight and made improvements that they had their flying machine patented and moved to commercialize flight.

The approach used by the Wright brothers to accomplish the first powered flight contrasts markedly with current charlatans and hucksters of technology. In the book *Voodoo Science* (Oxford University Press, 2000), Robert Park

identifies the terms pathological science, junk science, pseudoscience, and fraudulent science and uses the term voodoo science to cover them all (you will have to read the book to understand Park's distinctions). Park states that the line between foolishness and fraud is thin, and that what may indeed start out as honest error or misunderstanding tends to progress almost imperceptibly from self-delusion to fraud. A common modus operandi of practitioners of voodoo science is to bypass the time required for systematic study, shun the scientific peer review process, and announce "breakthroughs" at press conferences.

Sadly, the geoscience profession has suffered its share of voodoo science. From the many, persistent, black-box electromagnetic techniques, sometimes requiring the operator to enter the "alpha state" to perceive subtle signal variations, to faked fossil finds, to highly embellished natural resource prospect reports, geoscientists are frequently faced with debunking false or misleading claims and with restoring damaged public and client perceptions of the profession.

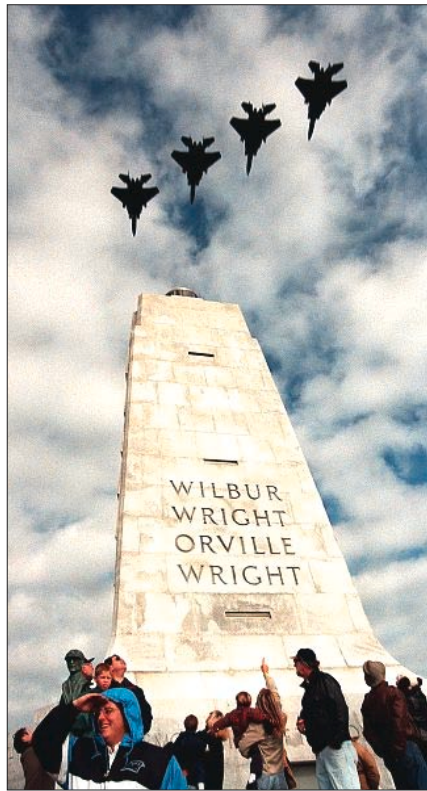
A fairly recent example involved a 1970s vintage radar system design that was developed with government funding and touted as a major breakthrough in ground penetrating radar (GPR) capability. The radar system reportedly could "see through sea water" to image objects on the seafloor and could produce almost photographic-quality images of geologic features or buried objects. The radar system was developed by an apparently legitimate scientist/engineer, albeit without any prior experience with GPR or geoscience and apparently without knowledge of the state of the art in GPR technology. Somewhere along the way, it had to become apparent to the developer and the government agency that the system was not a major breakthrough; however, it is hard to discreetly back away from an effort involving a significant investment of scarce research and development funds and personal and professional reputations.

Did scientists and the public view the Wright brothers with suspicion? Were there efforts to debunk the work of the



**Figure 3.** View of first powered flight takeoff monument from the 120 ft landing marker, the 60 ft high Memorial Pylon is in the background on Kill Devil Hill (National Park Service).

Wright brothers? Was the expression, "If God had intended for mankind to fly, we would have been born with wings," applied to the efforts of the brothers? Certainly! But Wilbur and Orville Wright were not hucksters or charlatans, and they certainly couldn't be accused of wasting public funds. They also couldn't be accused of ignorance of the state of the art and scientific literature. From the selection of Kitty Hawk with its favorable wind conditions to the careful laboratory experimentation, design improvements, and numerous field trials to the establishment of the world's first flying school at Huffman Prairie, the Wright brothers exhibited the attributes and skills of the world's great scientific investigators and innovators throughout history. They also carefully



**Figure 4.** Supersonic jets fly over the pylon as part of the 1998 rededication of the Wright Brothers Memorial. Former U.S. President George Bush and astronaut Buzz Aldrin spoke at the ceremony. Aldrin noted, "History will remember the inhabitants of the time as the people who went from Kitty Hawk to the moon in 66 years!"

documented all their laboratory and field experiments as proof of legitimacy and for posterity. However, the visual confirmation of man breaking the "confines of gravity" was all the proof needed to launch the age of flight.

In 1953, an overflight of the Memorial Pylon by a squadron of subsonic jets celebrated the golden anniversary of the first powered flight. In 2003, it will be possible to view the Memorial Pylon and the Huffman Prairie Flying Field with its replicas of the flight hangars by imagery acquired from satellites or the International Space Station. As the centenary of powered flight approaches, numerous conferences and other forms of commemoration will be held. As scientists, we should celebrate the triumph of personal integrity and the scientific method. We should revel in the profound results of a dream carried to fruition by ingenuity and persistence. **TLE**

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