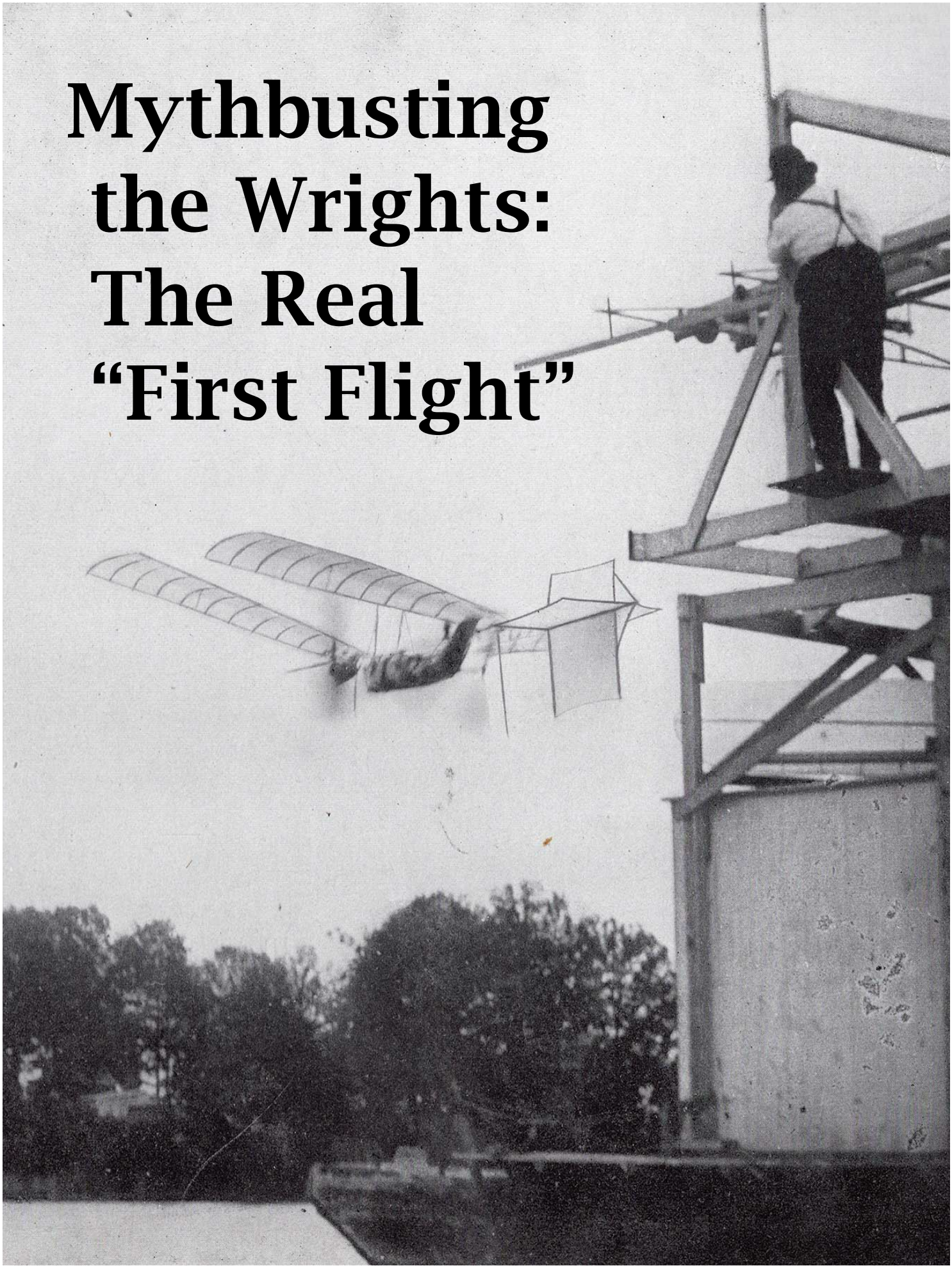
Mythbusting the Wrights: The Real "First Flight"



Mythbusting the Wrights: The Real "First Flight"

By Mike Jones

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Many airports display historic airplanes; they're a delight to pilots like you and me. SEATAC has a replica of the Voyager, Burt Rutan's amazing creation that circumnavigated the world unrefueled. A red and white Bee Gee hangs jauntily over a restaurant at LAX. There's a very special Cessna 172 poised over the baggage claim in Las Vegas (Google it), and there's a life-sized 1911 Henri Farman biplane inside Hong Kong International.

But inside the new terminal at the Stafford Regional Airport just south of Washington, DC, I found an antique quadruplane I could not identify. It was an ungainly thing, with metal ribs, fabric wings without flaps or ailerons, and guywires everywhere. In the middle of the fuselage was an odd brass contraption. Oddly, it lacked wheels for landing. What was it, I wondered, and why Stafford?

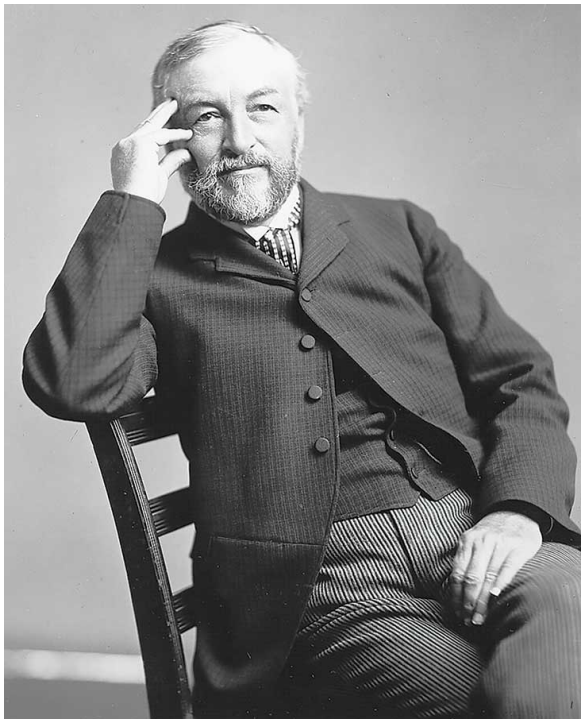
I knew it could not be a Wright Flyer because that was a biplane. Glenn Curtiss was an early innovator, but his famous "Junebug" had ailerons. Louis Blériot built his Model XI with fabric wings, but it was a monoplane.

Jim Stover, the airport director at Stafford, answered my question easily: it's Langley's Aerodrome #5.

Huh?

The Scientist-Inventor-Administrator

Most of us believe that modern aviation began on December 3, 1903 when the Wright Flyer took to the skies. That flight lasted ten seconds and started the juggernaut of innovation that became Cessna, Piper, and Beech, as well as Boeing, Lockheed, and Airbus. Easy-peasy.



Samuel Pierpont Langley (1834 —1906) was an astronomer and physicist who developed new instruments with which to study the Sun; the "Langley" is a unit of solar radiation. He innovated synchronized time-keeping across the U.S. which improved railroad safety. He built the first heavier-than-air machine which achieved sustained flight. Among his numerous honors are the Langley Gold Medal, presented by the Smithsonian Institution for outstanding scientific achievement. The both the NASA research center in Hampton, VA, and an air force base are named in his honor, along with the U.S. Navy's first aircraft carrier, the USS Langley (CV-1).

But that's not the whole story. Seven years before that freezing day, a powered, heavier-than-air machine took to the air for the first time in human history. It flew for ninety seconds. No one less auspicious than Alexander Graham Bell photographed it. The Wrights were very good, but they were not the first. The first was Samuel Pierpont Langley.

This success was not an accident. Langley was one of the preeminent scientists of his age, intellectually and professionally a peer of Edison, Darwin, Pasteur, and Curie. According to some historians, his was one of the most brilliant scientific minds of the era.

Langley was born outside of Boston in 1834. He graduated from high school but never attended college. He had three distinct personality traits which served him well: a strong mechanical aptitude, a systematic and methodical personality, and vigorous communication skills. Combining those three talents, he quickly became a rising star in astronomy.

He started at the Harvard Observatory. Then he jumped to the U.S. Naval Academy to add some luster to the small observatory there. His breakthrough appointment was as the professor of astronomy at the University of Pittsburgh, which also made him the director of the prestigious Allegheny Observatory. There he invented the bolometer, a sensitive electrical instrument which measures tiny variations in the radiation from stars, and conducted precise observations of the sun. Some of his elegant solar etchings were used in textbooks into the Space Age.

In Pittsburgh his administrative skills began to eclipse his scientific prowess. The Observatory was chronically underfunded and could not afford the research Langley envisioned. To provide steady funding he invented and monetized the “Allegheny Time System.”

Allegheny Time

By the close of the Civil War, rail travel had proven itself as fast, convenient, safe, and affordable. Railroads rely on schedules. Unhappily, in those days every village set their own clocks. Since nobody (except astronomers) knew the actual time with any precision, local clocks were merely guesstimates. As railroads expanded, this ambiguity threatened the operation, reputation, and prosperity of the railroads.

Langley developed a service which published the accurate time twice a day by telegraph to every subscribing railroad station in the United States and Canada. This allowed the railroads to synchronize their operations over vast distances. In a few years his Alleghany Time System became the forerunner of the time zone system we use today, and the revenues revitalized his Observatory.

In short order, Langley became a celebrity. Due to his voluminous writings he was known around the globe. He was always in the newspapers. He was particularly gifted as a popularizer of science, a 19th century Carl Sagan,

explaining complex topics in ways that an educated layman could understand. His books sold well, making his fame grow ever brighter.

Meanwhile, back in Washington, DC, the Smithsonian Institution was in a pickle. The Smithsonian had been founded in 1846 after a British chap bequeathed the United States about $220 million (in today's dollars) in gold coins. The Smithsonian started with aspirational goals — "an establishment for the increase and diffusion of knowledge among men" — which proved expensive. Not unexpectedly, after a few decades funds grew tight and the nascent organization floundered. It needed a re-boot. It needed glamour. It needed a celebrity-scientist like Samuel Pierpont Langley.

Aviation as we know it today "...got its start when Langley proved, *against all odds*, that heavier-than-air mechanical flight was possible."

— Phil Hornung

But Langley had a secret passion: artificial flight. He wrote, "I well remember how, as a child lying in a New England pasture, I watched a hawk soaring far up in the blue, sailing without any motion of its wings… [In mature life…] I asked myself whether the problem of artificial flight was as hopeless and absurd as it was then thought to be… It seemed the first thing to do was discard the old rules and commence new experiments; not to build a flying machine, but to find the principles upon which one could be built." Langley would become the first researcher to apply the scientific method to the problems of flight.

Langley was lured away to the Smithsonian 1887 by their promise he could continue his aviation experiments. In very short order Langley is raising money, sending scientific expeditions across the globe, corresponding with brilliant scientists, and developing the principles of aviation. Talk about multi-tasking!

Which brings us back to Stafford and an exuberant octogenarian named Phil Hornung and his son, Chris.

Roadside Reading

Phil Hornung was a Catholic priest who gave up the cloth and enjoyed a 31-year career as a school psychologist in the Washington, DC area. Back in the 1980s, Hornung was elected to the Stafford County Board of Supervisors. He served for eight years, including the years when the county was deciding if, when, and where to build a local airport.

This photo, taken by none other than by Alexander Graham Bell, shows the aerodrome in flight on May 6, 1986.

In 2016, because of his work on the airport, the Stafford Historical Society requested a presentation on the history of aviation in Stafford County.

"While I was researching that, I happened to see a historical marker on the side of the road," he explained. "It said a guy named Langley had flown his airplane over the Potomac River in 1896. That was a surprise, so I dug into it."

Hornung learned the historical marker was correct; Langley's "aerodromes" flew in Stafford County. Recognizing an opportunity to burnish Stafford's aeronautical

reputation, he persuaded local enthusiasts to transform their new airport terminal into a mini-museum honoring Langley's accomplishments.

Hornung's son, Chris, described their strategy as a pro-active community outreach. "There was a degree of indifference about the new airport," he said. "If you weren't a pilot there just wasn't enough activity out there to make a difference to the community."

That would change with an aerodrome in the terminal. The two Hornungs and their co-conspirators envisioned educational programs, career days, and public events built around this snippet of history. They raised $300,000 and began searching for somebody to build their replica. Chris Hornung eventually found a company in Dallas with just the right skills: Kip Aero.

The life-size reproduction of the Aerodrome #5 hangs from the ceiling of the new Stafford, VA airport terminal (KRMN). Lankenau explained, "We make things exactly the way they were done, the same way they did it, using the same tools. And it's functional. A replica would be a non-flying version or not use the same technology. A replica looks like it should to a non-expert, from twenty feet away. This is a reproduction."

Airplanes and Steam Engines

Kip Aero is owned by Kip Lankenau, an aviation historian, a pilot, a mechanic, and a visionary. His main business is the service, restoration, and parts manufacturing for both vintage automobiles and vintage aircraft.

"We recently built a Sopwith Strutter from the original factory drawings. We ship parts to a guy building a Sopwith Camel in Pennsylvania. We've got aircraft being assembled in New Zealand, and we ship stuff to Europe all the time," Lankenau said. "Anybody who's operating an early aircraft will call us for parts, consult on operations, or ask how to maintain their aircraft. That's what we do here; it's a living, working museum."

Lankenau was excited to receive Hornung's inquiry. "I was already familiar with Langley and his work in early aviation," he said. But to build a Langley aerodrome? "It was an opportunity to recreate history."

They began researching Langley and his airplane. They found Langley was a prodigious and systematic experimenter. He developed aeronautical principles, pioneered construction techniques, and developed the infrastructure to support his aerodromes. He invented a 34-foot diameter whirling arm which created enough "airspeed" to test aerodynamic shapes. He invented measurements for lift and drag. He proved dihedral wings were stable. He kept copious notes. "Everything that Langley ever wrote or walked across or sat upon has been preserved by the Smithsonian," laughed Lankenau.

Part of that is the nature of a museum; to throw something away simply isn't in their genes. But even more, Langley is the person who formed the Smithsonian into the institution it is today. He took the Smithsonian from being a disparate cluster of collections people had donated into one of the premier scientific and educational institutions of the world.

"The Smithsonian is Langley, and Langley is the Smithsonian," Lankenau said. "Even today, he's an overwhelming presence there."

As one might expect, the Smithsonian itself was extremely helpful. They shared items they had cataloged but had never made available for research. In one day alone, they provided 5,400 new Langley artifacts for Lankenau to review. "They had no idea what they were burping up," he laughed.

Kip Lankenau, "mentor in chief" at Kip Aero, inspects the final assembly of the boiler used on the aerodrome.

"I had to look at every single artifact and figure out if it was applicable," Lankenau recalls. "We were sifting through all this minutia, like a needle in the haystack. But we needed 100 needles and there were a thousand haystacks."

They were aided by a Langley #5 that hangs in the Smithsonian. But the Smithsonian's model is not configured as it was when it first flew. The machine had been modified and improved over several years. "The Aerodrome #5 on display was repaired and restored many times," Lankenau confided. "We even were able to identify some damage documented in earlier notes."

More helpful was another Aerodrome #5 which had been assembled for the 1915 World's Fair in San Francisco. It had been in storage at the Smithsonian for a century.

"When I matched the documentation, I realized it was assembled from spare parts," Lankenau added. "It probably served as a static model, maybe

testing the angle of incidence or whatever. It was more original and more helpful than the Aerodrome on display."

Decyphering Mysteries

Lankenau's team quickly realized that Langley's letters, notes, and drawings were only the starting point for the mystery they needed to unravel. "There's more left unsaid than what was said," Lankenau added somberly. He estimates they spent seven hours researching for every hour they spent building the reproduction. "Basically we were detectives trying to figure out what Langley had done 125 years ago," Lankenau concluded.

The Kip Aero team made dozens of spars and ribs for the four wings and the tail, then carefully hand-stitched China silk on to the fragile structure.

The most challenging aspect of their research was that all of Langley's assistants documented their work differently. They kept daily logs, down to the smallest tasks, so the volume of material was enormous. But their cursive handwriting was hard to read. Different assistants had varying degrees of knowledge and experience. Even their vocabularies differed; the language has changed since the 1890s.

The wings were a challenge. Langley had already developed the airfoil shape from his twirling arm machine, so Lankenau knew the wing profile. But the ribs were impossibly thin: about 30 inches long but only 2mm wide (two millimeters is less than half the width of a pencil). The team had to shape them

without breaking. “In the first batch [of ribs] we were having about 7% success rate. Eventually we achieved about a 90% success.”

The wing spars are “U” shaped and tapered. “We had to hand-pick the same kind of clear white pine, with the correct grain, and then figure out how to rout out the “U” and taper it,” Lankenau explained.

Improving the rigidity of the aircraft became the next dilemma for Langley. It had to be ultra-light, so they stabilized the frame with guywires both above and below the fuselage. “Those guywires kept the wing from deforming, but they got in the way of wheels beneath the aerodrome,” acknowledged Lankenau. That complex trade-off explains the decisions to launch the aerodrome from a catapult and to land in the river.

The aerodrome completely assembled, showing the engine and the exhaust. Notice how the engine components are integrated into the fuselage itself; this is a common characteristic of steam engines.

The fabric-covered propellers on display at the Smithsonian are incorrect. Lankenau created more accurate propellers, laminated from eighteen strips of pine only 4mm thick. “They look more like a ship’s propeller or like a fan, not the long skinny props used today,” Lankenau pointed out.

Langley and his assistants also didn’t repeat every detail when they documented a task. A great example of this confusing brevity was the silk used for the wings.

"The wings are covered in silk, so throughout all of their notes they would call it silk, silk, silk," Lankenau elaborated. "It wasn't until we were deep into the project we found the first time Langley ever referenced silk. That one time he specifically called it 'China silk.'"

China silk is a less expensive fabric that's woven on a hand-powered loom rather than the steam-powered loom. It also is unbleached and not calendared. These traits mean that, unlike better grades of silk, the China silk will shrink, stretching tightly over the wing ribs. The reference to China silk was a critical factoid.

"Who would know that?" Lankenau asked. "Maybe a textiles expert, but nobody at the Air and Space Museum."

The Age of Steam

Perfecting the steam engine was the hardest part of Langley's project. Although it seems old-fashioned today, steam was the pinnacle of technology in the 1890's. Langley tried other motors, including compressed air, rubber bands, carbonic acid, and gasoline engines. He returned to steam because it was more advanced and reliable.

Coincidentally, steam engines are one of Lankenau's hobbies. Lankenau realized the Aerodrome's engine was a tiny version of a state-of-the-art naval engine so new in the 1890s the Navy hadn't yet put it into production. At its heart, it is a single cylinder, double action, non-condensing steam engine.

The process starts with a reservoir of compressed air. The air blows into a reservoir of liquid gasoline which pushes the gasoline into an evaporator coil. There it warms into vapors which feed two Bunsen burners. Those shoot flames into a boiler at 1700˚F and the water quickly turns into steam. The steam expands into the cylinder of the engine, driving the propellers. The whole

mechanism weighs just a couple of pounds, and the framework of the aerodrome itself supports the engine.

It works beautifully. “Within about 30 seconds the fuel turns to vapor,” Lankenau noted. “The steam comes up within a minute. Once you get to 150 PSI the propellers are released.” There’s enough fuel for 90 seconds of flight.

This Aerodrome on display at the Stafford airport in Virginia.

Lankenau is impressed with Langley’s miniature engineering. “Remember, you’re looking at brass and copper structures that are less than half a millimeter thick. There’s no safety margin here!” he said with a laugh. But in the € fuel and water than in the engine itself,” he told me. “The original aerodrome came out to be 26.2 pounds, and our reproduction is less than two ounces off from Langley’s original.”

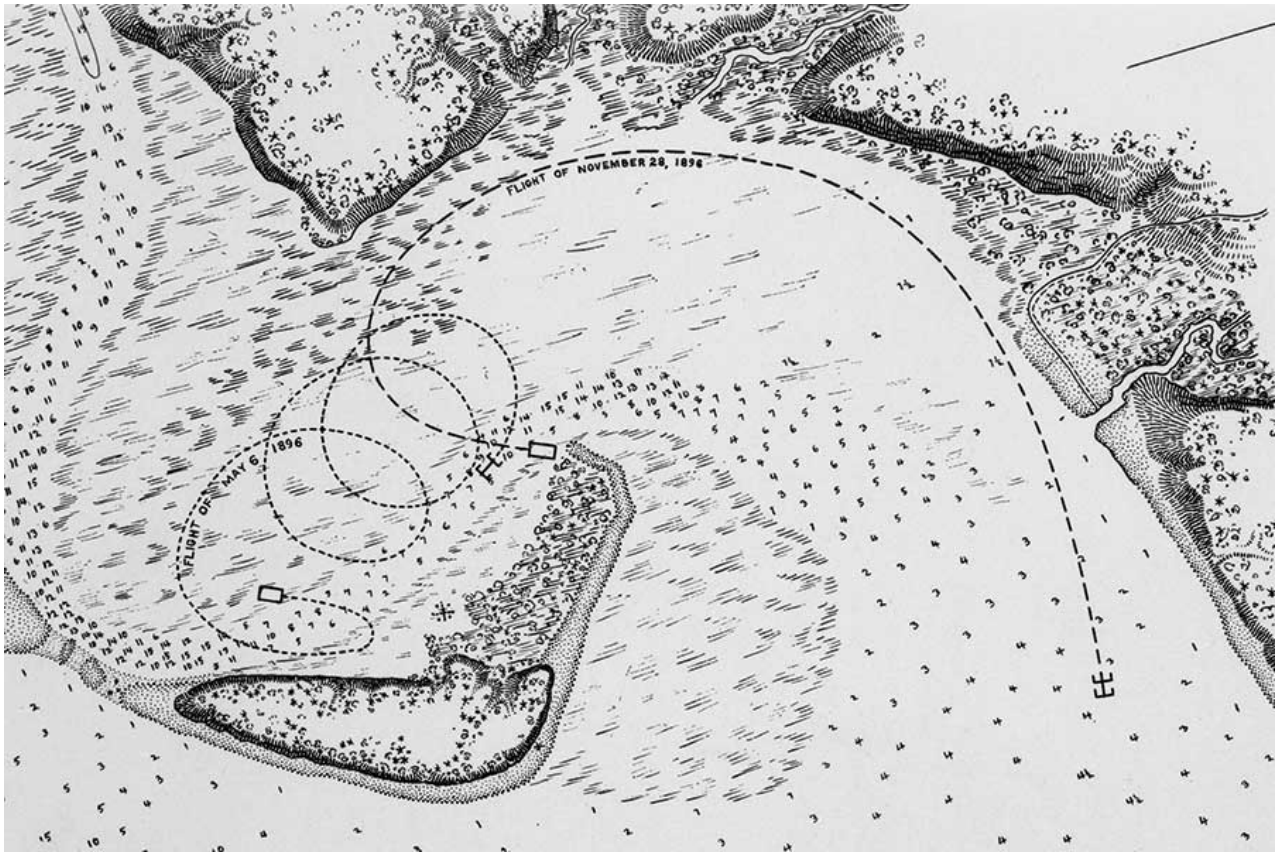
Phil Hornung remains amazed with both Lankenau and Langley. “The steam engine? That thing is like a Swiss watch. It’s a piece of jewelry.”

The Real First Flight

According to observers, including Alexander Graham Bell, the successful flight was on May 6, 1896. Aerodrome #5 made two flights that day, one of 2,300 feet and a second of 3,300 feet, after being catapulted from a boat. This success was astonishing because (according to Lankenau) there had been at least eighty previous failures.

Thomas Edison would not have been surprised. Edison said, “Genius is one percent inspiration and 99% perspiration.” That jives with Woody Allen’s perceptive comment that “80% of success is just showing up.” If Langley had gone home after fifty or sixty tries, he never would have made it to the finish line.

The moment of success astounded them all. “They waited until there was enough power and the propellers were spinning, then released the spring on

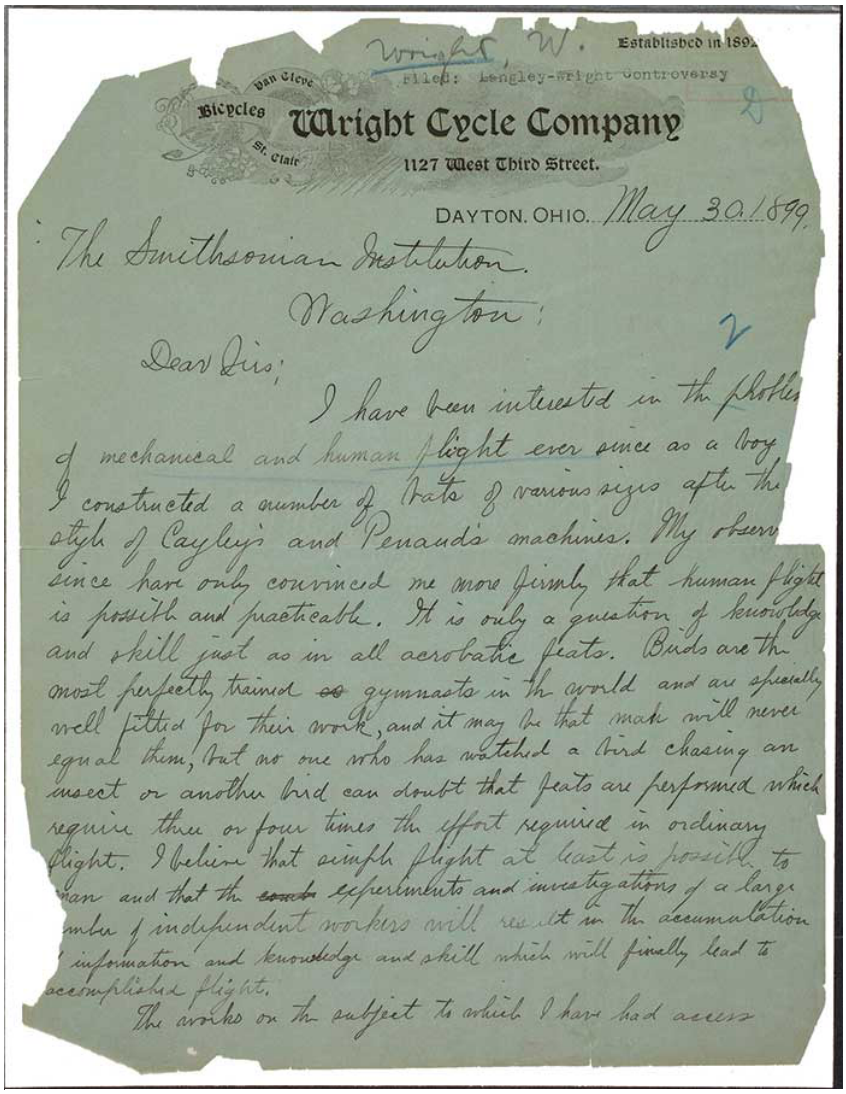


the catapult,” Phil Hornung recalls, reading from the reports. “The thing took off; dropped a little, and flew. Unlike all the other previous tests, it didn’t hit the water. It just flew and everybody was dumbfounded.”

The aerodrome made three wide, lazy loops over the Potomac River, arcing across the sky for ninety seconds. That duration was ten times longer than any previous experiment with a heavier-than-air flying machine. Finally the boiler ran out of fuel, the steam engine stopped, and the aerodrome gently plopped

into the Potomac. After the plane landed, they fished it out, dried the wings, and flew it again that afternoon.

Phil Hornung burbles with pride at Langley's accomplishment. "All the flying that exists today got its start when Langley proved, against all odds, that heavier-than-air mechanical flight was possible. It took him twelve years. But he's the one who demonstrated mechanical flight first."



Wright, W. Established in 189
Filed: Langley-Wright Controversy
Van Cleve
Bicycles
Wright Cycle Company
St. Clair
1127 West Third Street.
DAYTON, OHIO. May 30 1899.

The Smithsonian Institution.
Washington;

Dear Sirs;

I have been interested in the problem of mechanical and human flight ever since as a boy I constructed a number of kites of various sizes after the style of Cayley's and Penaud's machines. My observations since have only convinced me more firmly that human flight is possible and practicable. It is only a question of knowledge and skill just as in all acrobatic feats. Birds are the most perfectly trained ~~as~~ gymnasts in the world and are specially well fitted for their work, and it may be that man will never equal them, but no one who has watched a bird chasing an insect or another bird can doubt that feats are performed which require three or four times the effort required in ordinary flight. I believe that simple flight at least is possible to man and that the ~~comb~~ experiments and investigations of a large number of independent workers will result in the accumulation of information and knowledge and skill which will finally lead to accomplished flight.

The works on the subject to which I have had access

Langley was a prolific correspondent and freely shared his findings with anyone who asked. In 1898, Wilbur Wright wrote this two-page note to Langley asking for guidance. In the next five years the Wright Brothers would build on Langley's work with the first manned heavier-than-air flight.

Langley never made a successful machine that would carry a person; that honor goes justifiably to the Wright brothers. But they, and dozens of other experimenters, relied on Langley's findings. He published his results and corresponded often, freely sharing his results. A letter on display at the Smithsonian confirms the Wrights benefited from the guidance Langley offered.

In short, hanging above the Stafford Regional Airport passenger lounge is the most accurate reproduction of Aerodrome #5 that exists in the world today. Its

presence is a tribute to one determined scientist who, truly against all odds, took the first steps to solve the mystery of flight.

"I'm going on 86 years old," Hornung said, as he summarized his feelings for the whole project. "To see that Aerodrome is energizing to me. Langley was a dreamer. That guy only had in high school education. Look what he was able to accomplish. Now we want to use his Aerodrome to inspire today's kids with aviation."

Aerodrome #5 Specifications

Aircraft Type	Quadruplane ("four wings")	
Overall length	13 ft.	4 m
Wingspan	13 ft.	4 m
Height	4 ft 3 in.	1.3 meters
Empty Weight	23.6 lbs	10.6 kg
Loaded Weight	26.2 lbs	11.7 kg
Fuel & Consumables:	2.6 lbs	1.2 kg
Useful Load:	0 lbs.	0 kg
Wing area	68.9 sq. ft.	6.4 sq m
Wing loading	3.78 lbs /sq. ft.	1.84 kg/sq m
Airspeed	23 mph	37 kph

Engine:	Hand-made, single cylinder, double acting steam engine. 33mm bore x 70mm stroke, turning two geared 39 in./1m white pine counter-rotating propellers @ 500 rpm
Horsepower:	Approximately 1¼ bhp @ 150 psi pressure, producing 650 rpm
Range:	Approximately 90 seconds (Three minutes total fuel on board. It took 30 seconds to achieve full fuel vaporization and then 60 more seconds to achieve required steam pressure for launch.)

About the Author

Dr. Mike Jones is an entrepreneur who uses his business expertise to help G.A. airports across the country improve their governance and operations, speeding them on their way to more revenues, grants, and community support. He also helps protect them from avaricious developers and reverse the damage caused by ineffectual politicians. He's been writing for this magazine for nearly a decade, flown 800 Young Eagle missions, and put 4,000 hours in his logbook. He's always accessible at PilotMike2012@gmail.com.