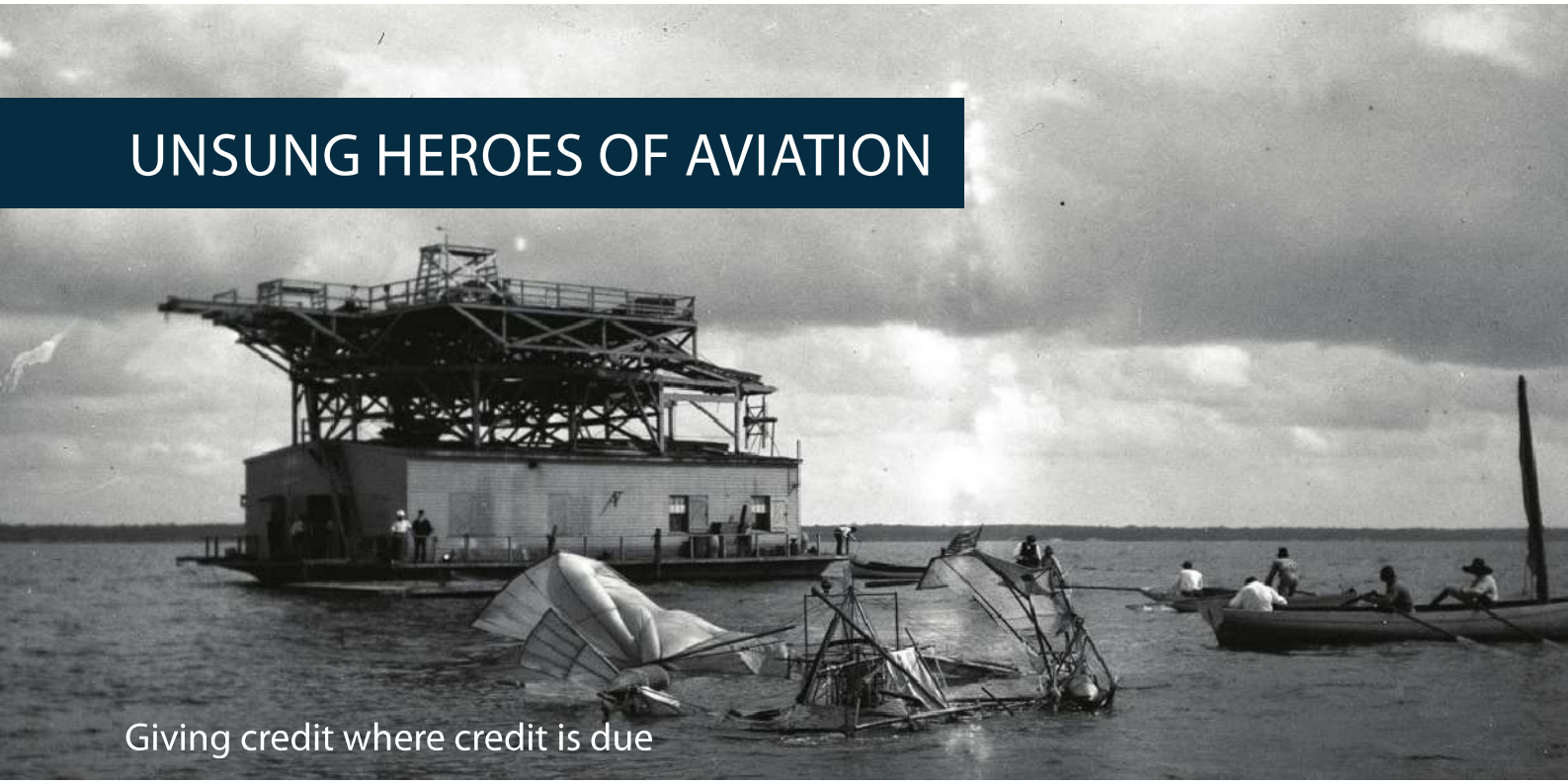
UNSUNG HEROES OF AVIATION



Giving credit where credit is due

Charles Lindbergh, the Wright brothers, Amelia Earhart and Howard Hughes are all well-known figures, even outside the small world of aerospace engineers. They are legends and many a movie or documentary covers their achievements. Yet there is a group of unsung heroes, worthy of more praise by the general public. Time to look at two examples of true aviation pioneers that didn't make it into the average history book.

TEXT **Benjamin Broekhuizen, Student Aerospace Engineering, Editor Leonardo Times**

SIR GEORGE CAYLEY

Probably one of the most important unsung heroes is the British scientist Sir George Cayley, born in 1773 near Scarborough. Sometimes nicknamed 'the Father of Aviation', this gentleman scientist remains largely unknown to the general public, yet his influence on aviation is immense. He was one of the first to lay a scientific framework for aeronautical engineering and pioneered the use of the engineering concepts of 'weight', 'lift', 'drag' and 'thrust' and described how these concepts were related.

In 1799, a century before the Wright brothers, Cayley designed an aircraft with a fixed main wing, a fuselage, a tail for horizontal and vertical control and an early propulsion system of turning vanes, in essence a precursor to the modern propeller. This basic design would influence aviation pioneers for the next century and is a clear ancestor of modern aircraft. However, Cayley was not able to produce this powered aircraft due to the lack of reliable lightweight engines.

Cayley was inspired by birds twisting their wings during flight and thought that cambered wing surfaces would allow fixed-wing aircraft to fly. He then proceeded to perform a series of tests using a whirling arm as a substitute for modern wind tunnel testing. As the name suggests, a whirling arm can be used to accelerate a surface through the air, allowing the scientist to study its performance. He was therefore the first to scientifically research different aerofoils.

His attention then turned to building gliders. The glider model he designed in 1804 is generally considered the first real aircraft ever designed and features a fixed wing, set at an angle of incidence of six degrees, and a moveable cruciform tail. By using ballast, Cayley was able to shift the centre of gravity of his glider to ensure stable flight.

The gliders allowed him to investigate the performance of cambered wings. He came to realize that an area of low pressure is formed above the wing and noted the movement of the centre of pressure. Furthermore, he experimented with stability, discovering how to achieve longitudinal stability and roll stability and used a rudder for further controlling the aircraft. He also discovered the notion of streamlining, greatly aiding his aeronautical endeavours.

In 1849, one of his first full-scale gliders was able to carry a ten-year-old over a short distance. The boy, a son of one of Cayley's servants, thus became the first person to fly an aeroplane. A triplane glider design set another first in 1853 when it carried Cayley's coachman over a distance of 275 metres, making the coachman the first adult to fly an aeroplane.

Throughout his career, Cayley made enormous contributions to aeronautics and provided solutions to the basic problems of flight. Cayley correctly predicted that sustained, i.e. powered and controlled, flight would not be possible until a suitable lightweight engine was available. The people that would first achieve this, the Wright brothers, later acknowledged his breakthroughs as fundamental to their attempts at powered flight.

SAMUEL PIERPONT LANGLEY

Samuel Pierpont Langley was born near Boston, Massachusetts in the year 1834. He was an astronomer and physicist and became the Secretary of the Smithsonian Institute in 1887, where he founded the Smithsonian Astrophysical Laboratory.

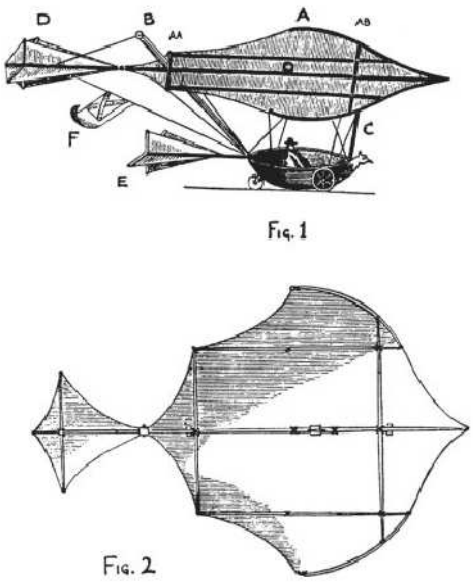


Figure 1. The Cayley 'Governable Parachute' (1852)

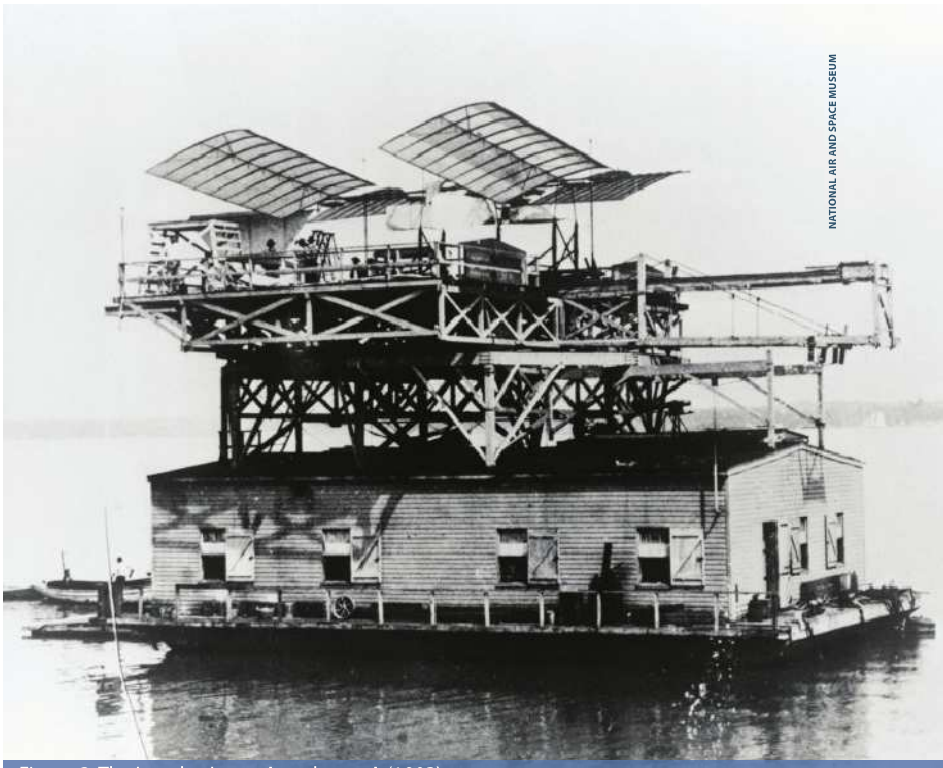


Figure 2. The Langley Large Aerodrome A (1903)

Apart from his contributions to astrophysics, especially solar physics, he also invented and used the bolometer, an instrument that can measure electromagnetic radiation. Using the bolometer, he attempted to measure the surface temperature of the Moon and later measured the interference of infrared radiation by carbon dioxide in Earth's atmosphere. These interference measurements were later used in 1896 to compute a climate change scenario.

In addition to these contributions to science, he was also quite the aviation pioneer. In 1887 he started his first aerodynamics experiments using a whirling table, much like Cayley did with the whirling arm. Later that year he experimented with rubber band powered model aircraft, which was a common starting point for aviation pioneers, again like Cayley. He called these models 'aerodromes'. One of the more bizarre – at least from a present-day viewpoint – experiments was carried out in 1889, when Langley started testing different species of stuffed birds on a whirling table. He keenly observed that birds generally do not fly quite as well once they have died.

From 1891 onwards, he started experimenting with larger, steam powered 'aerodromes'. He tried to optimize the steam engine used in these unmanned models over the different design iterations, which lead to Aerodrome No. 4, which was readied for testing and launch. The launch would take place on a special platform atop a houseboat in the Potomac river at the end of 1893. This resulted in a string of failure after failure, mostly due to excessive flexing of the wing. At the end of a long testing campaign, No. 4 finally made a small hop of roughly forty metres in October 1894. A later model, No. 5, managed a hop of only thirty metres and Langley decided to put the project on hold in 1895. He cancelled his earlier plans of developing these models into a manned Aerodrome.

In 1897 he ended his aeronautical research, announcing this decision in a popular magazine detailing the amount of effort he had put in. He then returned to astronomy to specialize in solar astronomy and focussed on his work as Secretary of the Smithsonian. It is unknown who or what persuaded him, but in 1898 he decided to ask a grant from the US Army in order to fund further research into a manned Aerodrome. He explained his plans and stressed the fact that he would do this in his own time with no charge to either the Smithsonian or the federal government, apart from the $50,000 he was requesting from the Army to cover research and construction costs for the next two years. Given that the Spanish-American War had just broken out, the Army decided to grant the $50,000.

This began a new phase of aeronautic experimentation by Langley and in June 1899 his Aerodrome No. 6 was able to perform a circling flight of 550 metres and No. 5 was able to fly 760 metres. He then produced a quarter-sized model of the manned Aerodrome, which performed flights of 50 to 100 metres in June 1900. The next three years were spent perfecting the design, which lead to the quarter-sized model performing a flight of 300 metres in August 1903. This paved the way for the final step: the Langley Large Aerodrome A, the full-scale manned version.

Charles Manly, who had reworked the engine for the Aerodrome A into a 40 kW engine that was ahead of its time, was selected to pilot the Aerodrome A for its first flight, which was planned for October 1903. This first attempt was a complete failure, the nose-heavy aerodrome flew straight into the Potomac river after leaving the launch platform. Another test was planned for December 8, 1903 after rebuilding the heavily damaged Aerodrome A. Manly was to pilot the craft once more.

This second test was even more catastrophic than the first. Instead of nose-diving, the Aerodrome now flew up in a vertical position, before falling down in the Potomac once again. The cause of this crash was suspected to be the tail getting caught in the launching device and breaking off. The newspapers ran with the failed expensive experiments and criticized the Army funding for the project. Additional funding for Langley seemed out of the question and the press attention added insult to injury. Langley put an end to his aviation career.

Only nine days later, on December 17, two brothers running a bicycle company did what Langley and Manly could not. Two brothers, without even a high school diploma, built and flew an aircraft worth less than $1000 and achieved what an esteemed scientist and $50,000 of Army grants had aspired to: controlled powered flight.

References

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