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Glenn Curtiss: Master of Sky and Sea

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> When we brought the machine out on the 26th day of January [1911] I felt that we ought to get some results. There were no crowds of people present and there was no announcement of what was about to happen. I had not expected to make a flight, but climbed into the aviator's seat with a feeling that the machine would surely rise into the air when I wished, but that I would only try it on the water to see how the new float acted. Lieutenant Ellyson spun the propeller and I turned the machine into the wind. It ploughed through the water deeply at first, but gathered speed and rose higher and higher in the water and skipped more and more lightly until the float barely skimmed the surface of the bay. So intent was I that I did not notice that I was approaching the shore and to avoid running aground I tilted the horizontal control and the machine seemed to leap into the air like a frightened gull. So suddenly did it rise that it took me by surprise. But I kept the machine up for perhaps half a mile, then turned and dropped lightly down on the water, turned around and headed back to the starting point. The effect of that first flight on the men who had worked, waited, and watched for it was magical. They ran up and down the beach, throwing their hats up into the air and shouting in their enthusiasm.[1]

The start of the twentieth century marked a time in the United States when frontiers were being discovered and tamed. Among these frontiers was the frontier of the skies. Wilbur and Orville Wright made their first flight in 1903, and this opened a new area for innovation and conquest as America grew more dominate as a world power. While the Wright brothers' flying machine was successful in creating the first recorded heavier than air flight, there was another American aviator whose contributions would rapidly propel the airplane into new leagues, both in the air, and on the water. Glenn Hammond Curtiss improved the airplane through his development of lightweight, powerful engines, and his contributions to naval aviation in the form of the hydroplane and flying boat.

The roots for Curtiss's aviation engine development started many years prior to the first flight of an airplane. Glenn Curtiss grew up in the town of Hammondsport, New York, and as a

[1] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 130-31.

boy, he was very bright in mathematics, but dropped out of school after eighth grade to begin working assembling cameras for the Eastman Kodak camera company in 1892.[2] After he was laid off from this job, he began working for James H. Smellie, the local druggist, who also owned a bicycle shop.[3] Curtiss increased his skill level through this work, and later opened his own bicycle shop in 1899. In addition to repairs and selling some of the most sought-after brands in his shop, he also used his mechanical knowledge to create his own brand, Hercules, which profited him very well.[4] Although Curtiss was highly successful in his work with bicycles and became somewhat of a local legend for his ability at winning bicycle races in the area, he wanted to go even faster.

In his pursuit of speed, Curtiss moved on from the bicycle to a relatively new invention at the time, the motorcycle. Curtiss began his first attempt at creating a motorcycle by ordering an engine through the mail which, upon arrival came unassembled, with no instructions, and lacking a carburetor. This did not deter him from reaching his goal, however, so he worked with his team in finding out how the motor should rightly be assembled and created his own carburetor out of a tomato can with gauze screen.[5] The finished product, which he named the Happy Hooligan, had several other tin cans soldered on for various purposes, and while it did not appear to be as refine as other machines, it did run, and was a success for Curtiss in his first step in engine development. From this first motorcycle, Curtiss embarked on a new journey in creating faster, more powerful engines for his motorcycles.

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[2] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 3-4.
[3] Louis S Casey, "Curtiss: The Hammondsport Era: 1910-1915," *Aerospace Historian* 28, no.3 (1981): 157.
[4] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 6.
[5] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 3.

The thrill of the speeds capable of being reached on a motorcycle drove Curtiss to keep improving on his engine designs. The second engine Curtiss created was made up of the largest castings he could get and weighed 190 pounds. It was powerful and could speed the motorcycle at 30 miles per hour, except for when it would explode and rip itself loose from the frame.[6] Because of this problem, Curtiss decided to build his own engines with the conviction that they be lightweight, yet still powerful. In order to test his new engines, and to gain public attention for his company, Curtiss began entering several motorcycle races. The most important of these early races happened on January 30, 1904, at Ormond Beach, Florida, where Curtiss won the 10-mile race in a time of eight minutes and 54 seconds, a time which shattered the previous record and lasted for seven years.[7] With this win, Curtiss gained national attention and received a flood of orders for his engines to be used for motorcycles and even flying machines.

The potential power of the Curtiss engine, exhibited through motorcycle racing, led to its uses in airships as well as motorcycles. Included in the orders the Curtiss factory received after the Ormond Beach race was an order from Thomas Baldwin for five two-cylinder motors. Baldwin was an airship innovator whose business was based out of San Francisco. Baldwin left San Francisco to meet with Curtiss in Hammondsport, and the two became great friends. Curtiss continued to improve his designs for Baldwin's balloons, and through this, Curtiss motors soon became known as the best motor in America for aeronautic work.[8] The success achieved through this work led Curtiss to continue his development and experimentation with new motors.

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[6] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 22.
[7] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 31.
[8] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 30.

The Curtiss philosophy of building powerful, lightweight engines had proven very successful in flight. However, Curtiss did not let this lessen his desire for greatness, and he began to construct an even larger motor, one that would be faster than anything the world had ever seen. This new engine was an air cooled V8, which produced up to forty-horsepower, and weighed over 200 pounds. In order to test this new motor, Curtiss had a custom-built motorcycle frame for the motor and took it to Ormond Beach, Florida. Here, in January 1907, Curtiss covered the one-mile course in a time of 26.4 seconds and set a world record of 136.36 miles per hour.[9] This achievement made Curtiss the fastest man in the world, for no motorcycle, automobile, airplane, or train had ever gone that fast before. Thus, the new Curtiss engine had proven itself worthy as capable for powering all types of new aeronautical experiments.

Among the thousands who had taken interest in Curtiss and his motors, was the famed inventor Alexander Graham Bell. Bell had purchased one of Curtiss's motors for his own experiments in 1905, and in 1907, he invited Curtiss to join himself and John Alexander Douglas McCurdy and Frederick W. Baldwin, both Canadian engineers, in Baddeck, Nova Scotia for a series of flying experiments.[10] From the pooling together of these great minds came several theories on how to better the current state of aviation. Also, during his time with Bell, it was suggested by Mrs. Bell that a group be formed to learn more about the mechanics of flight, and so Aerial Experiment Association, or AEA, was formed, with Curtiss being chosen as the director of experiments.[11] During its lifetime, this organization was able to accomplish many

[9] Larry M Rineck, "Glenn H. Curtiss: An Early American Innovator in Aviation and Motorcycle Engines," *SAE Transactions* 103, (1994): 929-30.
[10] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 21.
[11] Louis S Casey, "Curtiss: The Hammondsport Era: 1910-1915," *Aerospace Historian* 28, no.3 (1981): 157.

feats, thanks to the use of Curtiss engines in its machines. However, the greatest test for Curtiss's engines was yet to come.

The race for the Gordon Bennett Aviation Cup at Rheims, France in August 1909 tested Curtiss and his engines on a stage against some of the greatest flyers from around the world. By this point, Curtiss had experienced many successes with flights with the AEA. However, by now, the AEA was disbanded, after only lasting two years, and Curtiss had started his aircraft company, Herring-Curtiss, with the help of wealthy aviation enthusiast Augustus Herring.[12] Curtiss was chosen by the Aero Club of America to represent the United States in the meet, and Curtiss planned to do so with a new motor design.[13] This new engine was a fifty-horsepower V8, which was built in secret. However, upon arriving at the meet, Curtiss found that Louis Blériot, the famed French aviator, who was favored to win the contest, had changed his motor to an eighty-horsepower V8 after information leaked out about the engine Curtiss was using.[14] On August 28, Curtiss made his attempt, finishing the course in a time of 15 minutes and 50 seconds. This time made Curtiss the winner of the Gordon Bennett Cup, and he was congratulated by several of the Americans present among the crowd of 150,000, including former president Theodore Roosevelt, who declared his performance "bully."[15] The victory at Rheims proved to the world that Glenn Curtiss and his engines were the best of the best. The engine used in this flight was later improved and sold as the Curtiss OX, which was one of the

[12] The Herring-Curtiss name only lasted one year, since Herring left in 1910 and it was renamed the Curtiss Aeroplane Company. This merged with the Wright brothers' company in 1929 to form the Curtiss-Wright Corporation; David McCullough, *The Wright Brothers* (New York: Simon & Schuster, 2015), 239-49.
[13] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 174.
[14] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 67.
[15] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 65.

most popular airplane engines during the 1910s and was later used to power some of his flying boat models.[16] Curtiss continued his racing career as an aviator and entered several races both domestically and abroad, both for the recognition, and the prize money, which helped him grow his business.

The race from Albany to New York on May 29, 1910, proved to be one of the most difficult races Curtiss entered, and through it, gave him a new vision for aircraft development. The course went along the Hudson River starting in Albany and ending in New York. While people had flown long distances over water before, as in the case of Blériot, who had recently flown across the English Channel, Curtiss saw this as a much more difficult flight, for the total distance was 152 miles and there were several hills and cliffs which would prevent any chance of a safe emergency landing. In addition, these cliffs created erratic wind currents that would have a great affect on a small plane.[17] Curtiss took all of these risks into consideration, and carefully mapped out his flight in advance and studied the wind currents and any possible landing spots.

On the morning of May 29, 1910, Curtiss set off. At the same time, there was also a train which was going from Albany to New York on rail and carried Mrs. Curtiss. Curtiss suffered no troubles for the first part of the trip and refueled halfway at Poughkeepsie. During the second half, things went smoothly as well, until he reached West Point, where the winds became extremely rough and continued as he went through Storm King and Dunderberg, where his plane dropped and almost touched the water.[18] The danger did not last long however, and Curtiss finished the course in two hours and forty six minutes, finishing ahead of the train that had left

[16] E. H. Sherbondy, "Aviation Engine Development," *SAE Transactions* 12, no.2 (1917): 295.
[17] Sherwood Harris, *The First to Fly: Aviation's Pioneer Days* (New York: Simon & Schuster, 1970), 168.
[18] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 101-2.

with him.[19] Upon his arrival, Curtiss received the 10,000 dollar prize for the competition as well as the Scientific American Trophy for the third year in a row. In addition to these prizes, he also received a message from President Taft which read,

> I am intensely interested in what Mr. Curtiss has done. It seems that the wonders of aviation will never cease. I would hesitate to say that the performance of Mr. Curtiss is an epoch because tomorrow we may hear that some man has flown from New York to St. Louis. Mr. Wright told me at the time the ten-mile flight from Fort Myer was made that the chief difficulty was in flying over unknown territory. Mr. Curtiss seems to have surmounted this, and I am glad he has. His Flight will linger long in our memories.[20]

The flight from Albany to New York was a great achievement for Curtiss and a true test of his aviation development. This experience in flying over the water led him to look for new ways to improve the airplane that would make it better suited for this type of travel.

One of the main organizations who took notice of Curtiss's over water flight was the United States Navy. The navy had been increasingly interested in the possibilities for airplanes to be used as scouts for ships, but there had not been any way that such an operation would be possible with the current state of the airplane at the time. Curtiss was also interested in this opportunity, and wrote to the secretary of the navy on November 29, 1910 in which he stated the advantages of airplanes to military branches, and also offered to train navy pilots at no expense.[21] Earlier that month, Eugene Ely had taken off from a wooden platform built on the deck of the scout cruiser, *Birmingham*, using a Curtiss biplane.[22] Although he did touch the water with his wheels and slightly damage

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[19] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 85.
[20] Jay Henry Mowbray, *Conquest of the Air* (Philadelphia: National Pub. Co., 1910), 184.
[21] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 309.
[22] Roy A Grossnick and William J Armstrong, *United States Naval Aviation: 1910-1995* (Washington, D.C.: Naval Historical Society, 1997), 3.

the propeller, this flight did prove that there was a possible use for airplanes in the navy. After this, came the question of if an airplane would be able to land on a ship. To test this, the armored cruiser *Pennsylvania*, had a wooden deck built on it, similar to what had been done with *Birmingham*. One of the main issues faced, with a landing, was how to slow the aircraft down in the limited space. This was accomplished by a series of ropes and sandbags creating the first "arresting gear" ever installed on a ship.[23] The test took place on January 18, 1911, with aviator Eugene Ely performing the task. The landing was successful and there were no problems during the course of it. After it was over, Curtiss described it as, "probably one of the greatest feats in accurate landing ever performed by an aviator."[24] These two accomplishments were very influential in showing the uses for airplanes in naval operations and built a relationship that would only grow between Curtiss and the navy.

Glenn Curtiss then continued his experiments with naval uses for aviation. The Albany to New York flight had shown how useful it would be for an airplane to be able to take off and land on the water, however, no attempts at this had ever succeeded. Previously, when he was experimenting with the AEA, he had attempted such a flight using pontoons strapped to the bottom of an experimental airplane, however, the trials never met success, as the airplane was never able to take off. In order to attempt this challenge, Curtiss moved from Hammondsport, New York to North Island in San Diego Bay, where he believed he could work in private and have a more suitable location for his

[23] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 310.
[24] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 121.

experiments.[25] In the month of January 1911, there were several attempts made, and each ended with new modifications being made to make flight possible. Then, on January 26, 1911, success finally came, as the plane was able to take off and fly close to the ocean without any problems. Adjustments continued to be made, and a new pontoon made of thin spruce was fitted for the flight on January 21, in which the airplane flew several hundred feet above the water.[26] This would become the navy's first airplane and was designated A-1.[27] The lessons learned from his many experiments with aircraft design enabled Curtiss to reach this milestone in aviation history. The first successful flight of a hydroplane marked new grounds for the airplane in its uses by both civilian, and military organizations.

After the success of the hydroplane, Curtiss then worked with the navy to develop uses for it with the current fleet. While it is easy to see the advantages an airplane would offer in terms of scouting, there were no modern aircraft carriers or other means to store such a technology. Curtiss reached a rather simple solution to the problem; the airplane could land and taxi close to the side of the ship, which could then lower a crane and pick up the plane and store it on board.[28] The test took place in San Diego Harbor on February 17, and *Pennsylvania* successfully hoisted the airplane on board and then off again.[29] This advancement in naval aviation proved one more way that the airplane could be of

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[25] Glenn Curtiss and Augustus Post, *The Curtiss Aviation Book* (New York: Frederick A Stokes Company, 1912), 125-6.
[26] George E A Hallett, "Glenn H Curtiss' First Off-Water Flight," *Aerospace Historian* 13, no.4 (1966): 166.
[27] Roy A Grossnick and William J Armstrong, *United States Naval Aviation: 1910-1995* (Washington, D.C.: Naval Historical Society, 1997), 4-5.
[28] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 113-4.
[29] Roy A Grossnick and William J Armstrong, *United States Naval Aviation: 1910-1995* (Washington, D.C.: Naval Historical Society, 1997), 3.

use for the navy, and the practice of using hydroplanes for scouting with this method continued for several years.

Following the successful use and adoption of the hydroplane, the navy looked to Curtiss for ways that it could be improved. In a meeting between Curtiss and the navy in September 1911, the navy asked for a hydroplane that had an enclosure for the pilot and instruments and was able to carry a passenger.[30] In order to fulfill these demands, Curtiss proposed his idea of the flying boat. The flying boat, Curtiss believed, would have all the advantages of a hydroplane, such as a plethora of landing grounds, and the advantages of a boat, such as seaworthiness and protection for the pilot.[31] The first test of the flying boat took place on January 10, 1912, proved to be a failure. The problem was finding a way to separate the hull from the water. It was not until a separation, or "jog," was added that would break the water away from the hull that they finally reached success.[32] Once this was done, the flying boat worked very well, and was even able to carry two passengers in tests the following week.[33] Following these tests, the flying boat was sent overseas to do many demonstrations in Europe and became the first American aircraft sold in the Middle East.[34]The flying boat was one of Curtiss's greatest contributions to naval aviation, and proved itself in its performance across the world.

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[30] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 136.
[31] Glenn Curtiss, "Flying-Boat Races," *Scientific American* 107, no.21 (November 1912): 438.
[32] C.R. Roseberry, *Glenn Curtiss: Pioneer of Flight* (Garden City, New York: Doubleday and Company inc., 1972), 324.
[33] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 144.
[34] Gary Leiser, "John D. Cooper and His Demonstration of a Curtiss Flying Boat in Istanbul, 1914: The First American Aircraft Sold to Turkey" *Turkish Historical Review* 8, no.1 (2017): 37-8.

Curtiss's flying boat continued to grow its legacy as an important naval piece for several years and became the first airplane to fly across the Atlantic Ocean. By 1917, the growing threat of German U-boats made the navy look to Curtiss's flying boats as a possible answer.[35] The Navy Curtiss NC flying boat had begun initial production and was ready for testing. The tests took place at Rockaway on Jamaica Bay in New York.[36] After the flyboat passed these tests, the navy decided it was ready for its greatest challenge, a transatlantic flight, although by this time, the war was already over. On May 8, 1919, the operation began, as three NC flying boats, designated NC-1, NC-3, and NC-4, left Rockaway, New York for Halifax, Nova Scotia to begin the first leg of the journey.[37] NC-1 and NC-3 arrived without incident, but NC-4 suffered engine failure along the way, forcing it to stop for repairs. On the sixteenth, the three left for the twenty hour flight to Azores. Poor weather caused only NC-4 to reach its destination, as the other two lost course, and their crews were rescued by nearby freighters and naval ships.[38] NC-4 remained at Azores three days until the storm cleared before attempting the final leg to Portugal. On May 27, NC-4 reached Lisbon, Portugal, and became the first transatlantic flight. The success of the NC flying boat in the first transatlantic flight demonstrated how Curtiss answered the navy's demands and challenged the odds in his design and knowledge for naval aviation.

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[35] J. C. Hunsaker, "Progress in Naval Aircraft," *SAE Transactions* 14, no. 2 (1919): 240.
[36] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 192.
[37] It should also be noted that there was a fourth flying boat, designated NC-2, but it was salvaged for parts for NC-1 and was put out of commission; Roy A Grossnick and William J Armstrong, *United States Naval Aviation: 1910-1995* (Washington, D.C.: Naval Historical Society, 1997), 39.
[38] William F Trimble, *Hero of the Air: Glenn Curtiss and the Birth of Naval Aviation* (Annapolis, MD: Naval Institute Press, 2010), 195-6.

Glenn Curtiss's work in aviation development in the early twentieth century should be held in high regard. His early life working with bicycles and motorcycles helped him create powerful, lightweight motors that would later be used for aviation. His interest in naval aviation also was of major use to the navy with his invention of the hydroplane and flying boat. For these reasons, Glenn Hammond Curtiss should be recognized as a premier American aviator, whose efforts propelled the airplane into new domains.

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