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### **Forever the First: The Wright Brothers**

- Prior to becoming flight experimenters, the Wrights were bicycle makers and mechanics. Bicycle technology came to their rescue more than once in the Wrights' search for a successful airplane.
- Neither of the Wright brothers graduated from high school.
- Early on, the Wrights used their knowledge of mechanics to create a wind tunnel at their bicycle factory. Inside the wind tunnel, they actually could see how air currents affected different configurations of wing structures. They were then able to design and build full-sized wings that would give their aircraft the lift and balance it needed.
- The Wrights also realized that a propeller was in fact a rotating wing.
- The Wrights performed their first experiments in long glider flights that taught them how to fly.
- The Wright Brothers named their plane *Flyer* after the most successful bicycle they had built in their workshops.
- The Wright Flyer was a marriage of bicycle technology and box-kite glider. All it needed was a source of power. That power was delivered to the propeller from a lightweight, internal-combustion, gasoline engine of the Wrights' own design.
- Empty, the Flyer was about six hundred pounds, one-third of which was attributable to the engine. Its wingspan was forty feet four inches, and it was eight feet high from the bottom of its landing skids to the top of the upper wing.
- Though flight seems simple enough today, the Wright Flyer was the product of years of experimentation, calculation, and trial and error.
- In the 1903 Flyer, the pilot flew lying down, resting on his elbows while controlling the "horizontal rudder" with his hands and warping the wings by moving his hips against a cradle. As you can imagine, this position was uncomfortable.
- The Wright brothers made four flights at Kitty Hawk on December 17, 1903. The first attempt flew 120 feet in twelve seconds; the longest lasted only 59 seconds and flew 852 feet.
- Wilbur Wright knew photographic evidence of the flight would be important. He asked John Daniels, a crewman at the Lifesaving Station at Kill Devil Hills, to take a shot of the first flight. At the moment of lift-off, Daniels forgot about the camera, but automatically squeezed the rubber shutter bulb in his excitement. This historic photograph was the only photograph he ever took.
- Just after that momentous flight, a powerful gust of wind struck the plane and began to turn it over. Wilbur, Orville, and John Daniels grabbed it, but the plane rolled over and over. Daniels held on, and was thrown head over heels inside the machine. He was not seriously injured, but was badly bruised in falling against the motor. For the rest of his life, John Daniels would boast that he had survived the world's first airplane crash.
- There are two errors in the Orville's telegram to their father informing him of the brothers' success. One is the change of the longest flight from 59 seconds to 57; the other is the misspelling of Orville's name.

- For five years, Wilbur and Orville Wright's first powered flight at Kitty Hawk, remained virtually unknown. Their 1903 flight got little attention from the press. *The Dayton Daily News* told the Wrights that 59 seconds of flight was not a new story, but 59 minutes might be worth reporting.
- The Wrights continued to work on their invention without publicity and did not fly in public until 1908.
- In 1908, the Wright brothers unveiled a plane capable of staying airborne for more than an hour.
- In 1908, Wilbur took the first woman to fly into the air. She was Mrs. Hart O. Berg, wife of the Wright brothers' Paris representative. A cord was tied around her legs to keep her skirts in place. Within weeks, the hobbled skirt became the latest fashion.

## The Inventors

### **Louis Blériot**

- Louis Blériot was a French airplane manufacturer and aviator.
- Blériot taught himself how to fly at age 30 in a plane that he designed himself. He made his first flight from Bagatelle, France in 1907.
- He initially began in business building automobile headlamps, but began experimenting with aircraft in 1900 when he built an ornithopter - a type of aircraft which used wing-flapping to achieve flight like a bird.
- Blériot formed the Blériot-Voisin Company with Gabriel Voisin, actively building airplanes from 1903-1906.
- While many inventors experimented with one type of aircraft, Blériot worked by trial and error. He first tried gliders, then box-kite biplanes, and finally with monoplanes. He developed and crashed ten airplanes before he was successful in the design of the Bleriot XI.
- Blériot became famous for being the first to fly an aircraft across the English Channel. He took off from Les Barraques, France on July 25, 1909 in his Model XI monoplane with no compass or instruments. Blériot landed in Dover, England, completing the 22-mile-long flight in 40 minutes. He won a prize of 1000 pounds sterling offered by the *London Daily Mail* for being the first to fly across the English Channel.
- Blériot built the famous SPAD Fighter Aircraft (Société Pour l'Aviation et ses Dérivés) during World War One that was flown by Allied Nations.

### **Igor Sikorsky**

- Igor Sikorsky was a Russian manufacturer and aviator who developed the first practical helicopter.
- Initially working on rotary-wing craft in 1909, his first efforts to develop a helicopter failed. He then turned his attention to fixed-wing aircraft, and was successful with the S-2, the second fixed-wing plane he designed and constructed.
- Sikorsky won national recognition with his fifth airplane, and received an award at the 1912 Moscow Aviation Exhibition.

- As a result of a mosquito-clogged carburetor that caused engine failure on one of his planes, Sikorsky built an aircraft with four engines called "The Grand." It was a revolutionary aircraft for its time, and featured an enclosed cabin, a lavatory, upholstered chairs, and place above the fuselage where passengers could walk about in the air.
- Sikorsky immigrated to the United States in 1919, founding the Sikorsky Aero Engineering Corporation in 1923, the forerunner of the present helicopter manufacturing giant, the Sikorsky Division of United Technologies.
- In the 1920s and 30s, Sikorsky designed and manufactured a series of large passenger-carrying aircraft known as flying boats. These flying boats were used by the Pan American Airways to open new air routes to Central and South America.
- Sikorsky's company also produced the Flying Clippers that pioneered commercial air transportation across both the Atlantic and Pacific Oceans.
- All of Sikorsky aircraft were known for easy handling and luxurious comfort.
- Thirty years after his first attempt to build a helicopter, Sikorsky finally built and successfully flew his VS-300 helicopter in 1939.
- The American military quickly picked up on the merits of the helicopter, and contracted with Sikorsky for large-scale manufacture of the R-4 helicopter in 1943.
- Over his lifetime, Sikorsky was awarded many times, including the National Medal of Science, the Wright Brothers Memorial Trophy, the U.S. Air Force Academy's Thomas D. White National Defense Award, and the Royal Aeronautical Society of England's Silver Medal. He is enshrined at both the International Aerospace and the Aviation Halls of Fame.

### **Juan de la Cierva**

- Juan de la Cierva was a Spanish civil engineer, aircraft manufacturer, and aviator.
- Cierva was interested in flight as a teenager, and experimented with gliders with his friends.
- Cierva built his first tri-motor airplane in 1918 and crashed it just one year later as a result of a stall. This caused him to experiment with ways to design stall-proof aircraft, resulting in the design and construction of the Autogiro – an aircraft that combined the capabilities of the conventional airplane and a helicopter.
- His first successful flight of the autogiro came on January 9, 1923.
- The autogiro used a propeller for forward flight and a hinged, air-powered rotor blade that could be adjusted to balance lift.
- In 1925, Cierva moved to England and founded the Cierva Autogiro Company of Great Britain.

### **The Daredevil Fliers**

#### **Barnstormers**

- After World War I, 767 American combat pilots and nine thousand more soldiers with some flight training returned to civilian life. The new aircraft industry had a surplus of airplanes priced to sell. Soon the abundance of pilots and the abundance of planes came together to make a new kind of American entertainment: barnstorming.
- The pilots called themselves barnstormers after the theater troupes that put on touring performances in barns.

- In the 1920s, pilots often flew from place to place and put on air shows. Planes were still so new, many people had never seen one. Barnstormers charged people to take a ride in an airplane.
- As the novelty wore off, barnstormers began to add stunts to their shows to draw a crowd. Eventually, groups of barnstormers got together to make a “flying circus.” They buzzed rooftops, changed planes in midair, and wing walked. As flying circuses increased in number, they challenged each other to perform the most unusual or risky aerial stunts.
- Flying circuses kept aviation in the eyes of the public and showed airplanes and flying to people all over the country who otherwise might not have known that airplanes existed. In this way, they helped commercial aviation to develop.
- Today, communities around the U.S. put on hundreds of weekend air shows every year. Air shows attract between fifteen million and eighteen million people every year, says John Cudahy of the International Council of Air Shows. He claims air shows are one of the top five spectator businesses on the North American continent.

### **Lincoln Beachey**

- Lincoln Beachey was one of the most popular aerial performers of his time. He was just what audiences wanted; young, handsome, and fearless.
- While most pilots donned leather helmets and flying gear, Beachey wore a stylish black suit, diamond stickpin, and oversized checkered golf cap turned backwards to keep it from flying off.
- On his first solo flight, Lincoln Beachey took a plane almost straight up, stalled it, and dropped it tail-first, smashing the craft to pieces. Beachey, however, walked away unharmed.
- From 1911 until his death in 1915, Lincoln Beachey thrilled Americans from coast to coast with death-defying stunts. He became the first American to loop the loop, as well as the first man to fly upside down. He even picked a handkerchief off the ground with his wing tip. He named his airplane the Little Looper.
- Beachey’s trademark “death dip” involved taking the plane up to 5000 feet, then hurtling downward with his hands off the controls and arms outstretched (he gripped the controls with his knees). At the last moment he would level off and skim the ground, his hands still out to his sides. He stopped the maneuver after a few pilots imitated his move and plunged to their deaths.
- Beachey had his name painted in huge letters on his top wing so that folks would know it was he flying upside down.
- Beachey drove his primitive biplane, in which he sat in the open air in front of the lower wing, over Niagara Falls into the mists and emerged still flying.
- In September of 1914, members of Congress were startled to see a biplane buzzing the Capitol. Lincoln Beachey circled the Capitol and the Washington Monument until he landed on the White House lawn. Beachey was hoping to attract attention to air defense at the outbreak of World War I.
- On March 14, 1915, Beachey made his last flight. Taking off from San Francisco Bay, he did a series of loops and then climbed to 3,500 feet. He then dove straight down. At 180 mph, he pulled sharply on the stick to regain level flight, but his wings broke away. Though he survived the crash into the bay, the daredevil was trapped inside the wreckage and drowned.

### **Bessie Coleman**

- Bessie Coleman was the first licensed black pilot in the world, male or female. Born into a poor Texas family in 1892, she did well in school. When poverty kept her from finishing college, she drifted to Chicago, where she worked as a manicurist and managed a chili parlor. Though the business made money, she was discontented, and after seeing barnstorming stunt pilots, decided to learn to fly.
- Coleman was rejected by American flight schools because of her race. She went to France to earn her pilot's license.
- In the first flight school she attended, Bessie had to walk nine miles to class every day and she barely spoke French, but in 1921, she successfully completed the course.
- Coleman was a crusader for black rights. During her career, she lost substantial sums of money because she refused any flying engagements which did not allow African Americans in the audience. She also insisted that white and black people enter the air shows through the same gate.
- Coleman dreamed of opening a flight school for black people and, in her words, "give a little coloring" to aviation.
- Coleman had difficulty buying her own plane because of her race and gender. She was finally able to put a down payment on a plane, but was not allowed to take it off the lot until she paid in full.
- Coleman was killed in 1926 when she fell out of a plane in which she was the passenger. She was not strapped in by her seat belt, and she fell to her death, breaking every bone in her body. It was later discovered that a wrench had slid into the gears and jammed the engine, causing the plane to fall.
- The loss of Bessie Coleman was felt so deeply that she was given three funerals.

### **Lillian Boyer**

- Lillian Boyer was a waitress in 1921 when two customers offered to take her up for an airplane ride. Four days later, on only her second flight, she tried climbing out on the wing of the plane. Her career as an aerial exhibitionist had begun.
- Boyer's daring stunts garnered headlines, and newspapers claimed that she produced "more thrills a minute than any other aerial artist."
- Boyer's colorful career lasted until 1929, when federal regulations on low flying and unsafe planes forced her into retirement.
- In just eight years, Boyer performed 352 shows in 41 states and Canada. She was most famous for wing walking, but she also made 143 automobile-to-plane changes and 37 parachute jumps—thirteen of which landed her (a non-swimmer) in Lake Erie.

### **The Explorers:**

#### **Admiral Richard E. Byrd**

- U.S. Navy Lieutenant-Commander Richard E. Byrd was the first person to fly over both the North and South Poles.
- In 1900, at the age of twelve, Byrd traveled around the world with a family friend.
- As a boy, Byrd tried to "toughen" himself by shunning warm clothing, even in the winter.

- The first flights over the Poles meant flying in cold, unheated aircraft which was anything but comfortable. In the event of an emergency landing, there was absolutely nobody to help the crew.
- Byrd and his pilot Floyd Bennett took off for the North Pole from the Norwegian island of Spitzbergen on May 9, 1925. Spitzbergen was about 745 miles from the North Pole.

The flight created international acclaim, making Byrd a hero.

- Byrd was the navigator on the flight to the North Pole. He used a sun compass, winddrift measure, and bubble sextant as navigational tools.
- The sixteen-hour flight went as planned, except for an oil leak.
- There was no heat in the plane, so temperatures inside the cabin could have easily reached -50° F while flying through the Arctic sky.
- Some people disputed that Byrd could have reached the North Pole in the time frame he claimed. Nevertheless, Congress awarded him the Congressional Medal of Honor for the feat.
- Byrd planned to be the first to cross the Atlantic Ocean, but he was injured in a plane crash. By the time he healed, Lindbergh had made the historic first solo flight across the Atlantic.
- Byrd embarked on his first expedition to Antarctica in September of 1928. He returned in 1930. The temperature at his base camp, “Little America” averaged -38° F.
- In 1929, Byrd flew over the South Pole, where mountains reach up to 9,186 feet, making the flight a difficult one.
- Byrd used the Ford Tri-motor, or “Tin Goose,” for his South Pole flight. His Tri-motor was so heavy that supplies were thrown out to lighten the aircraft. The plane managed to climb over the mountains with just nineteen feet to spare. One of Byrd’s sponsors for his Arctic flight was Edsel Ford, son of Henry Ford. Byrd named his aircraft the Josephine Ford after Edsel’s daughter.
- The plane was 42 feet 2 inches long with a wing spread of 64 feet 4 inches. Its speed was 122 mph.
- In 1933, Byrd led a second expedition to Antarctica. In March of the next year, he began a nearly fatal winter stay at the Bolling Advance Base, from which he was rescued in August. The expedition departed Antarctica in February of 1935.
- Byrd made three more trips to Antarctica (in 1939, 1946, and 1955).
- Byrd was awarded the Medal of Freedom in 1957.

### **The Record Breakers**

- Between the World Wars, the world speed record went from 170 mph in 1920 to 469 mph in 1939.

### **Glenn Curtiss**

- Glenn Curtiss was one of the greatest American aviation pioneers. He produced the world’s first practical seaplanes (used extensively in the early days of aviation because of the lack of landing strips). His company manufactured the most popular biplane of the 1920s, the Jenny, and aircraft and engines from his companies flew in both World Wars.

- Like the Wrights, Glenn Curtiss had been a bicycle mechanic. Later he became involved with motorcycles and was well known as a record-setting motorcycle racer and as an inventor of powerful, lightweight engines.
- After his offer to sell his engines to the Wrights was turned down, Curtiss teamed up with Alexander Graham Bell to form the Aerial Experiment Association (AEA).
- On July 4, 1908, the AEA's plane June Bug catapulted Curtiss into the world's spotlight. At a time when the Wright brothers had never flown at a public event, Curtiss captured the prize offered by the Scientific American and the New York Aero Club for one simple feat: to fly on schedule, on a given date and from a specified location, for a distance of more than one kilometer.
- Wind and rain delayed the June Bug for hours. At 7:00 pm Curtiss flew but fell short of the one kilometer goal. Half an hour later, he tried again—with yellow wings flapping, smoke pouring from the 40-horsepower Curtiss engine, hands clenching the steering mechanism.
- At a height of about twenty feet, the June Bug flew for more than a mile. The world knew for the first time that the airplane had actually been invented.
- Just six years after the Wrights proved powered flight was possible, the world's first air race was held in Reims, France. At the first international air race, on August 22, 1909, Glenn Curtiss turned in the fastest two-lap time and won the first James Gordon Bennett Trophy and a \$5000 prize. He won by banking his turns when he approached a pylon when other pilots slowed down to take the turns.
- Glenn Curtiss became one of the Wrights' competitors in manufacturing airplanes and became involved in lengthy and bitter patent battles with them that lasted until the outbreak of World War I.
- Curtiss and the AEA created tricycle landing gear (the Wrights had used skids) and ailerons, flaps on the wings that control rolling or banking. These features are still employed on airplanes today.
- While many inventors, including the Wrights, were secretive for patent protection, Curtiss rarely bothered enforcing his own numerous patents. In his mind, freely exchanging ideas led to rapid advances in technology, which resulted in benefits for everyone. Despite his feud with the Wright brothers, Curtiss did more than any other person to advance the design of the airplane and the business of aviation.
- Curtiss became the dominant manufacturer of large water-cooled aircraft engines up to the mid-1930s. His company led the way in lightweight engines and essentially cornered the liquid-cooled engine business with the military.
- Glenn Curtiss was the first to make a flight in public in the U.S., the first to build a commercially sold airplane, the first to fly from one American city to another, and the first to secure a pilot's license in this country.

### **Jimmy Doolittle**

- During World War I, Jimmy Doolittle publicized the fledgling Army Air Corps with his hair-raising stunt-flying escapades, entering every air show he could get into and setting speed records that captured the imaginations of millions.
- Doolittle earned one of the first doctorates in aeronautics, but his piloting feats overshadowed his academic accomplishments.
- Doolittle was a pilot of exceptional skill. In 1922, he was the first pilot to cross the U.S. in less than 24 hours. In 1925, he won the Schneider Trophy (where small

- seaplanes competed) and in 1932, Doolittle won the Thompson Trophy (won for speed at the National Air Races in the U.S.) with a speed of 252.6 mph.
- In 1931, in the first transcontinental race, James Doolittle won the first Bendix Trophy by crossing the U.S. in just over eleven hours.
  - During World War II, Jimmy Doolittle assembled and trained the famous Tokyo Raiders and planned and carried out a surprise attack against Japan that helped change the tide of the war in the Pacific. The raid was immortalized in the film *Thirty Seconds Over Tokyo*.
  - Jimmy Doolittle became a general and was in charge of the U.S. Eighth Air Force, which carried out the strategic bombing over Germany during the 1944 D-Day invasion.
  - Doolittle pioneered instrument flight and worked to develop 100-octane aviation fuel.

### **Charles Lindbergh**

- Lindbergh was actually the 79th person to cross the Atlantic in a plane. His flight was historic, however, because he was the first person to fly non-stop and solo across the Atlantic.
- Lindbergh started his career in aviation as an airplane mechanic, wing walker, parachute jumper, and barnstormer.
- Lindbergh racked up flight hours as an airmail pilot. Many daring young pilots flew the mail routes in aging planes left over from World War I. The planes were nicknamed “flying coffins” because so many pilots died in them.
- In 1927, Charles Lindbergh won \$25,000 for being the first pilot to fly nonstop and solo across the Atlantic Ocean between New York and Paris.
- Lindbergh made the 3600-mile flight in 33 ½ hours. His plane, *The Spirit of St. Louis*, had no radio, instruments, or even a parachute. He was guided only by a compass and the stars.
- Lindbergh designed the plane himself. In order to carry extra fuel, Lindbergh had to put a gas tank directly in front of the pilot’s line of vision. To see forward, Lindbergh had to look through a homemade periscope from a side window.
- Lindbergh became a celebrity all over the world as soon as he landed. A crowd of about 50,000 people greeted him at the airfield in France. On June 11, 1927, President Calvin Coolidge presented Lindbergh with the Distinguished Flying Cross. Two days later, four million people came to see him in a New York parade.
- Lindbergh’s flight demonstrated the dramatic improvements that aircraft had made in performance and reliability, and his charm and enthusiasm captured the imagination of the world. He single-handedly changed the public’s perception of aviation as an unsafe “stunt” and ushered in a new era of transportation.

### **Louise Thaden**

- Louise Thaden received her pilot’s license after just five hours and fifteen minutes in the air.
- Thaden broke the women’s altitude record by flying to 20,260 feet in 1928, using a homemade oxygen mask. She nearly passed out before catching herself at 16,000 feet.
- In 1929, Thaden set an endurance record of more than twenty-two hours aloft. She described the challenge of staying awake as “torture.”

- Later that year, Thaden set a new speed record of 156 mph. No woman had ever held three flight records simultaneously.
- In 1929, Thaden won the first All-Women's Air Derby, flying from Santa Monica to Cleveland. She was the first woman to win a national air race, beating such famous fliers as Amelia Earhart and Blanche Noyes.
- The world was astonished when Louise Thaden won the coveted Bendix Trophy in 1936. She captured the prize in a small stock biplane rather than a souped-up racer or a large twin-engined machine made for such transcontinental hauls. She achieved a top speed of 210 mph. Thaden's cup victory also set a new east-to-west record of 14 hours, 54 minutes.
- Thaden retired from full-time competition in 1938 to devote more time to her family.

## **The Entrepreneurs**

- The first systematic use of commercial aircraft was for airmail, which began in 1918. It took the mail thirty hours to get from the Atlantic coast to the Pacific coast, as opposed to three days by train. Airlines remained dependent on transporting mail to make a profit until the early 1930s.
- Commercial flight took off immediately after World War I, even though passenger flights were cold, unsafe, and extremely expensive.
- Commercial flight entrepreneurs opposed reckless barnstorming because they wanted to showcase aviation as a reliable and safe method of transportation.
- A flat grass field for takeoff and landing, plus some hangars and a customs shed, was all most airports ran in the 1920s. Tickets were often sold beside the airplane itself.
- During the 1920s, planes designed purely as airliners took to the air, including the Ford Tri-motor, which first flew in 1926. Nicknamed the "Tin Goose" for its corrugated metal construction, the Ford was tough and reliable, though very noisy to fly in.
- The Tin Goose was used by all the major American airlines. TWA used the plane for the first U.S. coast-to-coast service, a trip that took thirty-six hours. Passengers spent the night in Kansas City and continued the journey the following day. Today, you can fly from New York to Los Angeles in six hours.
- Until the 1930s, most passenger aircraft were biplanes, with two pairs of wings and a wooden or metal framework covered with fabric, or sometimes plywood. Many had an open cockpit, situated in front of an enclosed—but unpressurized—cabin that carried a maximum of ten people. The passengers usually sat in wicker chairs that were not bolted to the floor, so the journey was usually a bumpy one.
- On long-distance flights, passengers were often freezing in the morning and sweltering at noon. They had to think carefully about what clothes to wear on the flight.
- Vibration and noise from the big piston engines shook the cabins. On long routes, airliners often landed for the night, and crew and passengers slept in hotels.
- In the early years of commercial flight, airliners flew much lower than modern jets. With their big wings, they bumped around in turbulence, and air sickness was common among passengers.
- There were strict weight limits in the early days of passenger aviation. Every passenger had to be weighed to make sure that the plane was not overloaded.
- By 1930, four robust air carriers emerged: United, TWA, American, and Eastern. Each airline had an established transcontinental route: American in the south, TWA in

the central region, United on the northern route, and Eastern in the east. The Big Four accounted for ninety percent of airline services nationwide.

- In 1930, Boeing Aircraft and Transport Company, later part of United Airlines, introduced the world's first stewardesses. At first they were trained nurses and worked in white uniforms. They cleaned the airplane, carried baggage on board, made sure seats were fastened to the floor, helped to refuel the airplane, and handed out airsickness pills.
- Pressurized cabins were first used commercially in 1939.