



## Chapter

# 2

# THE ADOLESCENCE OF AIR POWER: 1904-1919

*This chapter will look at the development of air power between 1904 and 1919 when aviation was in its adolescence. Many people were very interested in and enthusiastic about flying. Most people in the United States still looked at airplanes as toys and didn't understand that they could be put to practical use.*

*Meanwhile, in Europe, air power progressed more rapidly and there was a far greater understanding that aviation could be used in lots of ways.*



## Objectives

**List** significant aviation events occurring between 1904 and 1911.

**Describe** the development of new aircraft engines.

**Recall** Louis Bleriot's aviation contributions.

**Discuss** early attempts at vertical flight.

**Discuss** the story of the world's first regularly scheduled airline service.

**Discuss** air power preparations towards World War I.

**Discuss** the military role of the airplane in World War I.

**Describe** the use of bomber and fighter aircraft in World War I.

**Identify** several World War I aces.

**Describe** the impact Billy Mitchell had on the development of air power.

## Developments in the United States

The Wright brothers' first successful powered flight went almost unnoticed throughout the world. Only one newspaper published an account of the flight and it was poorly written and misleading. The Wright brothers issued a public statement to the Associated Press on January 5, 1904. Unfortunately, this statement was either ignored or hidden deep inside the papers.

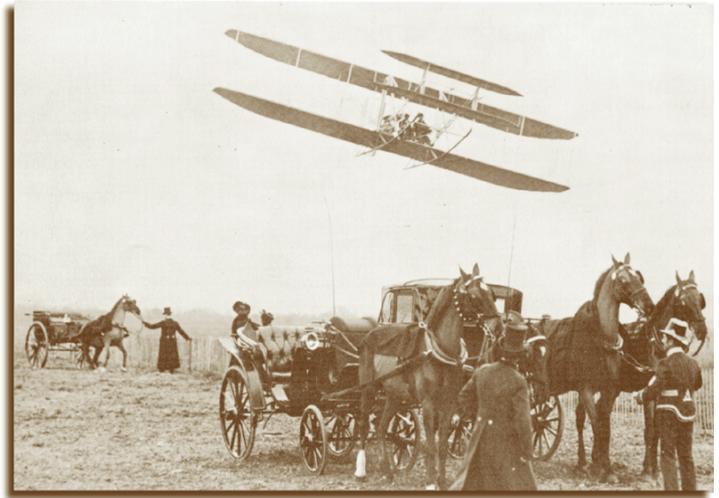
From 1904-1905, the Wright brothers continued trial flights from a pasture just outside Dayton, Ohio. They experimented and perfected their flying machines. In October 1905, they made a flight, which lasted 38 minutes and covered over 24 miles. It ended when the fuel supply was exhausted.

In 1905, the Wright brothers wrote a letter to the United States Government in Washington, D.C. They offered to build aircraft that would meet government needs. The response to their offer was unenthusiastic. After the Langley failures, the War Department did not want to be embarrassed again. When the War Department failed to accept their third offer, the Wright Brothers gave up trying to sell their invention to their own government.



When Theodore Roosevelt became President of the United States in 1904, he directed the Secretary of War to look into the possibility of testing the Wrights' new flying machines.

President Roosevelt's interest set into motion the contracting process with the War Department. With Wilbur Wright's help, the department drafted a public request for bids for an aircraft that could do seven things. It had to carry a pilot, a passenger and have fuel for a 125-mile trip. It also had to fly at least 36 mph under perfect control, and take off and land in any likely war zone without damage. Lastly, it had to be disassembled



**The Wright brothers in Pau, France, in 1909 demonstrating their airplane, which had not attracted much attention in the United States.**



**Orville Wright tests plane for Army at Fort Myer, Virginia, September 9, 1908. The flight lasted 1 hour 2 1/2 minutes.**

aircraft building company.

In September, Orville began his tests at Fort Myer, Virginia. His first flight took official Washington by storm. During the next 2 weeks, Orville completed 11 more flights. Every flight was more successful than the last.

Then tragedy struck on the thirteenth test. While conducting a test carrying Army Lieutenant Thomas Selfridge as a passenger, a propeller broke and the airplane crashed. Lieutenant Selfridge was killed. He was the first man to lose his life in a powered airplane. Orville was seriously hurt in the crash. He later recovered and completed the tests.

On August 2, 1909, the Army bought its first airplane from the Wright

for transport by wagon and be reassembled in 1 hour.

In addition, the contract called for the Wrights to train two pilots for the Army. This public request for bids was merely a "red tape" formality. The Wrights were the only people with the knowledge to build such a craft at that time, and now they were in business.

As Orville got busy building a new plane for the Army tests, Wilbur went to France. There he demonstrated the Wright brothers' flying machine for European governments and businessmen. These demonstrations resulted in Wilbur signing a \$100,000 contract to form a French



**Lieutenant Frank P. Lahm**



brothers. The price was \$25,000 plus a \$5,000 bonus because the airplane exceeded the speed requirements. This was the Army's first heavier-than-air flying machine.

In October of that year, Wilbur met the final requirements of the United States Army contract by teaching Lieutenants Frank P. Lahm and Frederic E. Humphreys how to fly.

During this same time, another aviation pioneer was entering the scene. Glenn Curtiss (who, as a teenager in Hammondsport, New York, had tuned his natural engineering talents by building gasoline engines for the motorcycles he loved to race) was beginning to catch the interest of men in other fields. In 1907, Curtiss became known as the "Fastest Man on Earth" when he set the motorcycle speed record of 136.3 mph.

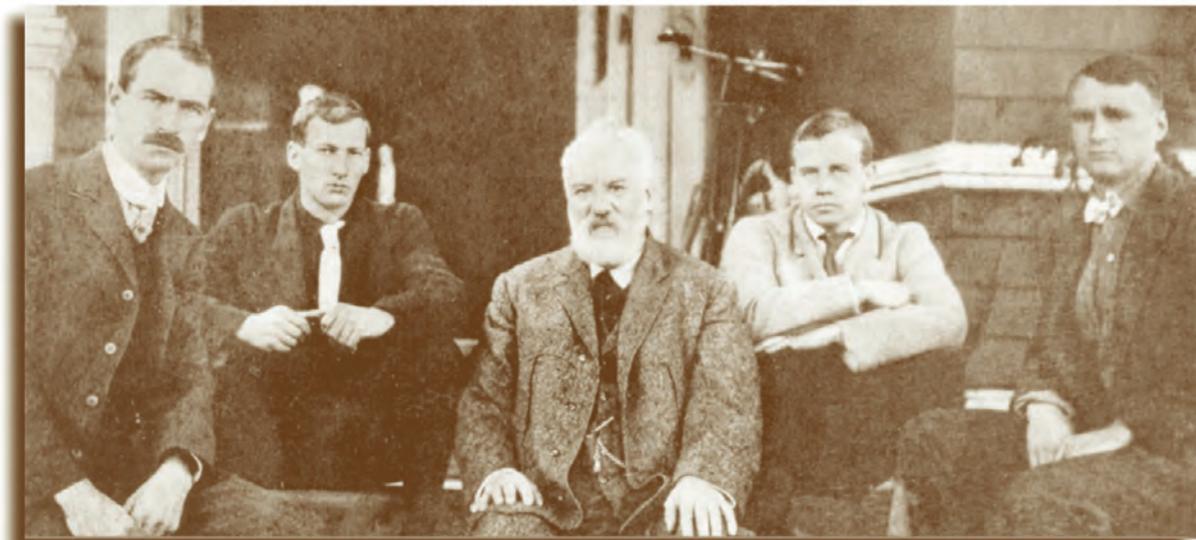
Curtiss' motorcycle engines were so light and powerful that Thomas Baldwin, a balloonist, asked Curtiss to build an engine for use on an airship. Baldwin's airship, with its Curtiss engine, became the first powered *dirigible* in the United States. Other balloonists soon followed Baldwin's lead and turned to Curtiss for engines for their ships. Another of his engines was used to power the first US Army aircraft—the *dirigible SC-1*.

It wasn't long until airplanes replaced motorcycles as Glenn Curtiss' first love, and the "fastest man on Earth" went into the business of making flying machines.

In 1907, Curtiss and Alexander Graham Bell (the inventor of the telephone) founded an organization



Glenn H. Curtiss



Glenn H. Curtiss (left), director of experiments; John A.D. McCurdy, treasurer; Alexander Graham Bell, chairman; Frederick W. Baldwin, chief engineer; and Thomas Selfridge, secretary of the Aerial Experiment Association

called the Aerial Experiment Association that designed and built several aircraft. One of them was the first American aircraft to be equipped with ailerons. Ailerons are small flaps on the wings that help control the plane.

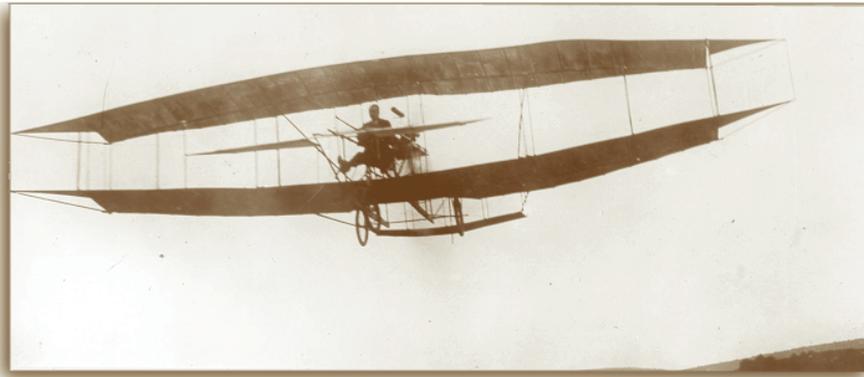
Another one of their aircraft was the first seaplane to be flown in the United States. This plane



could land and takeoff from water.

In 1908, Curtiss won the Scientific American Trophy in an aircraft called the *June Bug*. The *June Bug* made the first public flight of over one kilometer in the United States.

In 1909, at the Rheims Air Meet in France, Curtiss won the Gordon Bennett Trophy for flying the *Golden Flyer*, a plane he had just completed. He won the trophy for flying the fastest two laps around



Glenn Curtiss wins the Scientific American trophy on July 4, 1908, by flying over a measured course of one-kilometer.

In 1910, both the Wrights and Curtiss opened flying schools. The Wright brothers had delivered their airplane to the Army and trained the first two Army pilots.

In November 1910, Eugene Ely made the first flight from the deck of a ship at Hampton Roads, Virginia, in a Curtiss biplane. He later accomplished the more difficult feat of landing his aircraft on

a wooden platform on the United States naval ship *U.S.S. Pennsylvania*.

Also in 1910, former President Theodore Roosevelt took an airplane ride in St. Louis, Missouri. He became the first US President to fly.

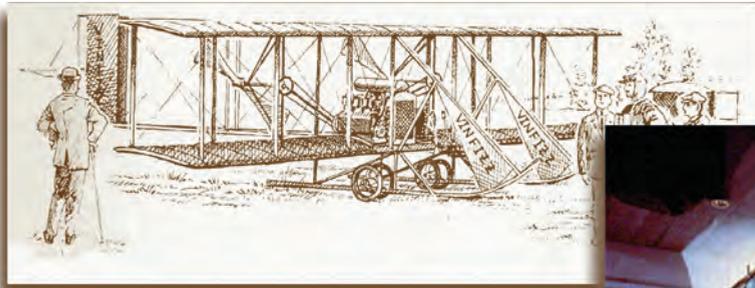
In 1911, William Randolph Hearst, publisher of the *Hearst* newspapers, offered a prize of \$50,000 for a flight across the United States completed in 30 days. Calbraith Perry Rodgers, grandnephew of Commodore Oliver H. Perry, US naval hero of the War of 1812, decided to try for the prize.

Rodgers persuaded a company that made a popular soft drink called Vin Fiz, to sponsor and help pay for the attempt. The company thought it would make great publicity value for Vin Fiz and agreed to help pay for a Wright plane. Rodgers named the plane the *Vin Fiz Flyer*. A specially trained team, with spare parts, followed him across the country.

Rodgers knew the trip would be hard, so he looked for a superior mechanic who could be relied upon to keep his plane in good repair. He asked Charles Taylor, the Wright brothers' mechanic, to take the job. The Wrights were extremely reluctant to let Taylor go, but Rodgers had offered him considerably more money than he was getting from the Wrights. Taylor was so eager to go that Orville finally agreed, but only on the condition that Taylor consider himself on loan so that he would come back to work for the Wright brothers.



The Curtiss *Golden Flyer*, powered by a 50 hp engine, won the first Gordon Bennett Cup in 1909.



Rodgers' *Vin Fiz Flyer* was built by the Wright brothers and sponsored by a soft drink company to fly across the United States. The picture at the right shows the *Vin Fiz* in the Smithsonian.

Rodgers' flight started from Sheepshead Bay, on Long Island, on September 17, 1911. The sponsoring company helped plan the route. It went roughly from New York to Chicago, Kansas City, San Antonio, El Paso, Yuma, and then Pasadena, California. The trip planned to cover more than 3,390 miles. Rodgers had some problems with the route. For example, the small 40-horsepower engine would have problems

**ROUTE OF C. P. RODGERS IN HIS VIN-FIZ** **WORLD'S RECORD FLIGHT FROM COAST to COAST**

**5¢**

**THE IDEAL DRINK**

**STATISTICS**

**ACCIDENTS**

**5¢ VIN-FIZ THE IDEAL GRAPE DRINK**

A poster distributed by the soda pop manufacturer traces Rodgers' 1911 transcontinental marathon and lists the statistics.



getting over the huge Rocky Mountains. Rodgers learned that there were only a few places where he could fly across the Rockies.

Rodgers took off from Long Island and flew day after day. Some days he had trouble making 40 mph because of head winds. Before the trip ended, he had made 68 landings—some of them severe crack-ups. His plane had to be repaired so many times that the only original parts that lasted the entire trip were the rudder and one strut.

Rodgers' actual flying distance was 4,251 miles. His longest single flight was 133 miles, and his average flying speed was just under 52 mph. After reaching Pasadena on November 5, he flew on to the ocean where he rolled his plane along the beach and wet the wheels in the Pacific. Unfortunately, he missed the prize because the trip had taken 49 days.

An automobile or a train would have made much better time. However, Rodgers made it. He made the first airplane crossing of the United States from coast to coast.

By today's standards, this flight may not sound like much of an achievement. However, in 1911, it was a remarkable feat. Rodgers' plane would not compare favorably with today's sturdy aircraft. Plus, he had no prepared landing fields, no advance weather information, no special instruments, and inadequate supplies and facilities. Calbraith Perry Rodgers was indeed a skillful and heroic pilot.

During this same time period, American women entered the field of flying. It was during the Belmont Park Aviation Meet in October 1910, that a young woman writer, Harriet Quimby, became interested in aviation. She signed up for flying lessons with an instructor named Alfred Moisant.

In August 1911, Harriet Quimby became America's first licensed female pilot. She also became a member of the Moisant International Aviators, an organization designed to advance the science of aviation.

She became a strong advocate of aviation. Believing the United States was falling behind other nations in the field of aviation, she used her writing talents to urge the country to give more attention to commercial aviation and aeronautical development.

Later, she made history again. On April 16, 1912, Harriet Quimby took off from the English Coast into a cold and foggy sky, and landed about 30 minutes later at Hardelot, France. With this flight, she became the first woman to fly solo across the English Channel.

Unfortunately, in June of 1912, she died when she was flying with a passenger at the Harvard-Boston Aviation Meet. Harriet Quimby lost control of a Bleriot monoplaner, and both she and her passenger fell to their deaths.



**Harriet Quimby became America's first licensed female pilot.**

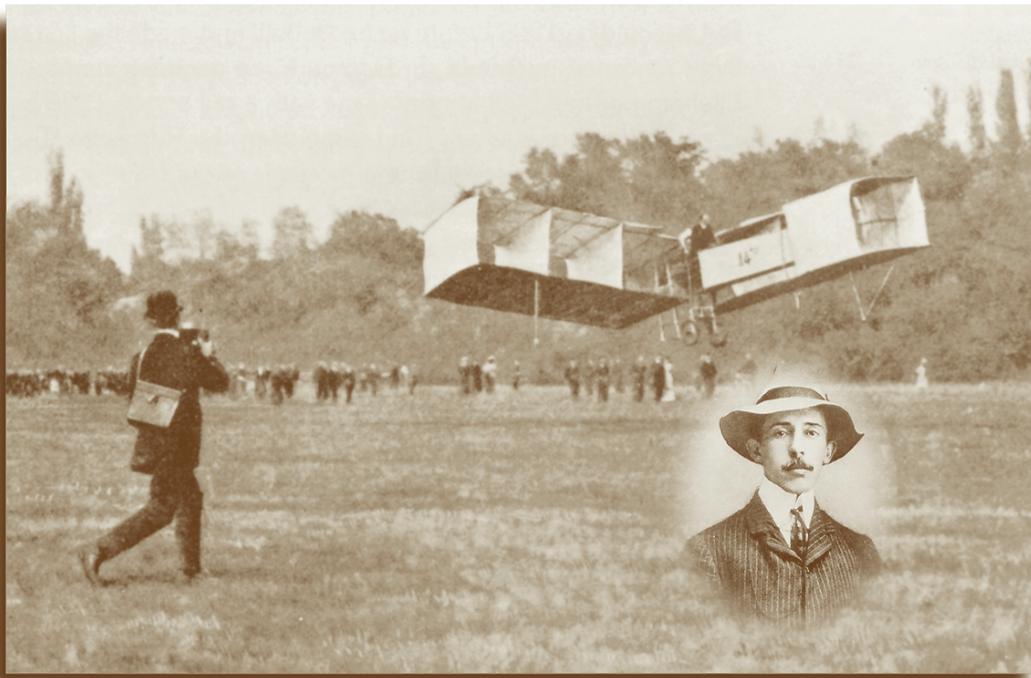


## Progress in Europe

The Wright brothers' wing-warping technique was a clumsy method to control the airplane. In Europe, a Frenchman named Robert Esnault-Pelterie built a Wright-style glider in 1904 and used ailerons to replace the wing-warping technique. Although Matthew P. W. Boulton had described the operation of ailerons in his 1868 British patent (No. 392), no one had actually built the devices to control lateral balance and control until Esnault-Pelterie's 1904 glider. His use of ailerons encouraged designers in several nations to experiment with their own aileron designs. It was Esnault-Pelterie who also built the first fully enclosed fuselage airplane.

Alberto Santos-Dumont flew the first powered airplane in Europe. His aircraft, the *14-bis* biplane, which looked like two huge box kites, was successfully flown in Paris, France, on October 23, 1906.

Two weeks later, he again flew his airplane— this time traveling 722 feet. Unlike the negative press reaction that flying was receiving in the United States, the press reported this flight favorably. As a result, all of Europe was excited by the news.



**The first successful powered flight in Europe was made by Alberto Santos-Dumont in the *14-bis* biplane on October 23, 1906.**

In 1907, Louis Bleriot, built and flew the world's first powered monoplane. Then in 1909, two major events attracted worldwide attention to aviation. The first was the flight across the English Channel by Bleriot in his *Bleriot XI*, and the second was the first international air meet held in Rheims, France.

Bleriot, a man of great determination, built 11 planes before getting one that was good enough to make the trip across the English Channel. While testing his planes, he had almost 50 crashes, but he refused to give up.



For his flight across the English Channel, he took off from the coast of France, near Calais. Unfortunately, he had no compass for the 25-mile trip, and 10 minutes after his takeoff, he was lost. All he could see was sky and water—not a landmark in sight.

When he finally saw the cliffs of Dover in the distance, he noticed that his engine was running hot. As Bleriot listened to the roar of his overheated engine, he searched the water below him hoping to find a ship that would be close enough to pick him up if he had to ditch before he could reach the coast of England.

He saw no ship, but he saw a small storm and flew into a rain shower. The rain cooled the overheated engine. Thirty-seven minutes after taking off in France, Bleriot landed not far from the spot that had been the starting point for the balloon crossing of the English Channel by Jeffries and Blanchard 124 years earlier. Word of his historic flight soon spread throughout Europe and the United States, and he became quite famous.



Louis Bleriot, the *Bleriot XI* builder, is pictured just prior to his flight across the English Channel.



The *Bleriot XI* was the world's first monoplane.

Less than a month later, the first international air meet was held in Rheims, France, August 22-28, 1909. Thirty-six planes competed in the contest. During the week of the meet, several of the planes crashed, but luckily no one was killed or seriously injured. Many of these pilots broke several records. One was an endurance record, set by Henri Farman, who stayed in the air 3 hours 4 minutes 56 seconds. Meanwhile, Bleriot made the best time for a single lap—47.8 mph.

Another aviation accomplishment during this time was the development of the first multiengine aircraft.

There are two reasons for building aircraft with more than one engine. One is to increase the aircraft's power, and the second is to improve reliability and safety. Two engines can provide more



power than one, and if one engine fails in flight, there is another to provide power until a safe landing can be made.

During the early days of aviation, both of these reasons were justified. The engines did not supply that much power for their relative weight and often stopped while the aircraft was in flight.

In 1911, the Short brothers of England were granted patents for the world's first multiengine aircraft. It had two engines and three propellers, and was called the *Triple Twin*. The two engines were mounted in tandem, one in front of the cockpit and one behind. The front engine drove two propellers attached to the wings. The rear engine drove a single pusher propeller.

The first four-engine aircraft was built and flown by the great Russian designer and pilot, Igor Sikorsky, on May 13, 1913. This aircraft was a giant of its time. It had a wingspan of 92 feet. Four 100-horsepower engines powered the aircraft, and because of its large size, its landing gear had 16 wheels.

**Igor Sikorsky designed and flew the first 4-engine aircraft named *LeGrand*. This painting of *LeGrand* once hung in the Canadian National Aviation Museum.**



Other innovations included a fully enclosed cockpit. It protected the pilot from the weather. It also had a passenger cabin with portholes for windows. The *LeGrand*, as this aircraft was called, was an imaginative forerunner of the modern airliner.

Another important development in aircraft engines also occurred during this time period. Early aircraft engines were manufactured out of steel, cast iron, and brass and were water-cooled. This resulted in engines that were very heavy. They generally weighed about 10 pounds for every horsepower they produced. These large heavy engines not only reduced performance, but also required a heavy structure to support the weight of the engine.

In an effort to overcome this problem, in 1907, two French brothers, Laurent and Gustav Seguin, developed an engine they called the *Gnome*. The *Gnome* was an air-cooled engine with the cylinders arranged in a radial (round) fashion. The cylinders had cooling fins that helped bleed the heat into the



surrounding air.

The Seguins realized they had to have some way to circulate the air around the cylinders even while the aircraft was sitting still. They accomplished this by fastening the crankshaft solidly to the airframe, and allowing the engine and the attached propeller to spin around the fixed crankshaft. This is exactly the opposite of modern radial engines where the engine is fixed and the propeller is attached to the rotating crankshaft. Because of this unique method of operation, these engines were called rotary engines.

Rotary engines, like the *Gnome* and the later *Le Rhone*, were an instant success and weighed only about 3 pounds for each horsepower produced. It was later discovered that it was not necessary to rotate the cylinders to achieve cooling, but many World War I aircraft, such as the Sopwith *Pup* and Sopwith *Camel* were powered by rotary engines.

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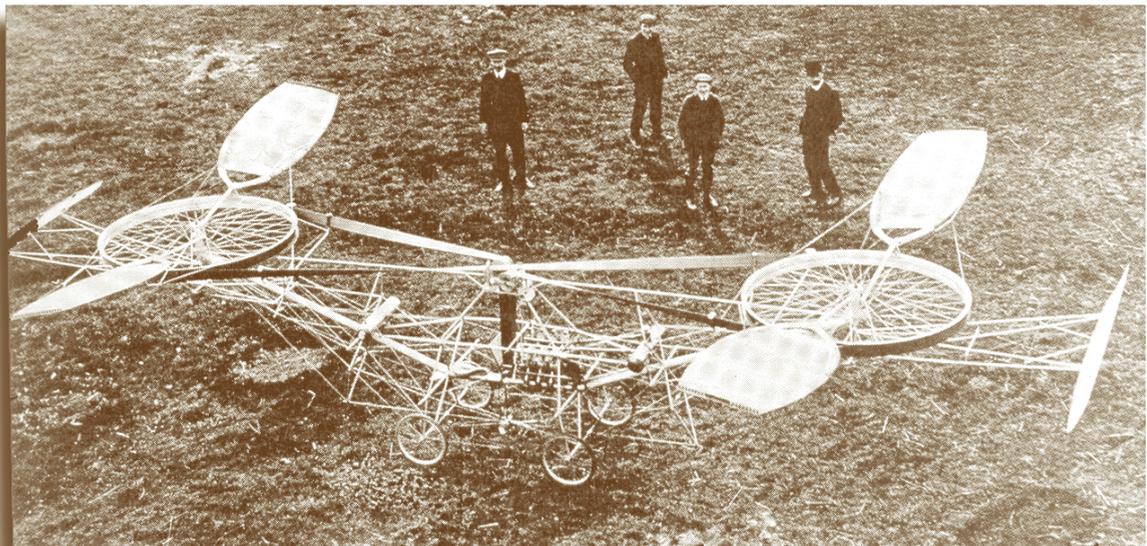
## Moving Up - Flying Vertical

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While the balloon and airplane pioneers were building their “flying machines,” others were experimenting in another area of flight. These pioneers dreamed of being able to takeoff and land vertically. Their experiments would lead to the modern-day helicopter.

We have already mentioned the three basic problems of flight in Chapter 1. Later on you will study how lift is produced and sustained in heavier-than-air crafts. Here we will simply say that in heavier-than-air crafts, the lift is produced by the wing. Also, in order to sustain lift, the wing must continuously move through the air.

In a fixed-wing aircraft, the forward motion of the aircraft causes the wing to move through the air and produce lift. For helicopters, there is another method of moving the wing through the air. The large rotor (propeller) on top of a helicopter is made up of a number of blades. Each of these rotor blades is just like a wing. As the rotor whirls, the blades move through the air causing lift. Helicopters are called rotary-wing aircraft because of the way that the wings (blades) rotate.



Paul Cornu's Helicopter



Many aviation pioneers already mentioned, such as Roger Bacon, Leonardo da Vinci, and George Cayley, experimented with helicopters. None of them, however, went any further than building and flying models. But it was these models that validated the rotary-wing concept.

In 1842, W. H. Phillips built and successfully flew a model helicopter powered by steam jets at the rotor tips. The first helicopter to lift a man into the air was flown in 1907. This machine was built and flown by a Frenchman named Louis Breguet. Although it lifted him, it was held steady by four assistants.

In that same year, another Frenchman, Paul Cornu, also “flew” a helicopter. In 1909, a father and son—Emile and Henry Berliner— became the first Americans to build and fly a helicopter.

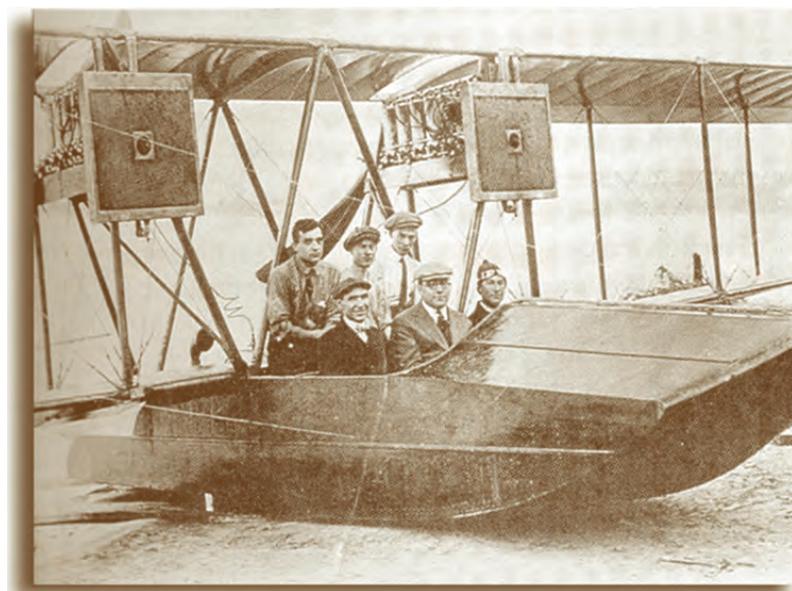
All of these early experimenters were plagued by problems of controlling the helicopter while in flight. The major control problem to be overcome was counteracting the torque of the rotor blade. When the rotor of a helicopter is turning, the rest of the machine tends to spin in the opposite direction.

One way to overcome the torque is to have two rotors that rotate in opposite directions. Another is to provide a small propeller at the end of a long tail boom (tail rotor), which provides thrust to counteract the torque of the main rotor. This problem of control would continue to haunt the designers for more than 30 years before being solved.

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## Commercial Flying - The Beginning

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The first regularly scheduled airline flew the *Benoist XIV* flying boat.

On January 1, 1914, the world’s first regularly scheduled airline service using heavier-than-air craft was started in the United States. This airline was called the “St. Petersburg - Tampa Airboat Line.” It was flown by Tony Janus in a twin-engine *Benoist XIV* flying boat, which carried two passengers. The 22-mile flight across Tampa Bay cost \$5 and took about 20 minutes. The airline flew the route twice a day for about 5 months and carried a total of 1,200 passengers.

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## Preparing for War

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By 1912, all the major modern countries of the world had formed a military flying service. In the United States, it was present in name only. While other nations of the world made advances in military aviation, almost no progress was made in the United States.



The US Army had purchased a single Wright biplane in 1908, and for 3 years, this one airplane was the entire “Air Force.” Then, in 1911, Congress appropriated funds to purchase five more airplanes. By the end of 1913, there were 19 aircraft and 29 pilots in the US Army.

In 1914, when World War I started in Europe, Germany had about 200 aircraft in its Air Force. Britain and France possessed about 450. More importantly, they also had the industry needed to make more aircraft.

The United States did not enter World War I until 1917. Even with 3 years to prepare, the United States still did not have a single combat-worthy aircraft when it entered the war. To make the situation even worse, Curtiss Aircraft was the only company in the United States that could be considered an aviation industry.

In 1917, Congress appropriated \$64 million for construction of aircraft—boasting that we would “darken the skies over Europe with US aircraft.” Congress promised that 263 American squadrons equipped with 22,625 aircraft would be in action by June 1918. However, when the war ended in November 1918, there were only 45 American squadrons in action, and they were all flying British and French aircraft. Not a single American-designed combat aircraft saw action in World War I.

The United States wound up building some British-designed *DH-4* aircraft that saw some action from September 1918 until the end of the war in November.

This was the first example of the shortsightedness of the United States Congress with regard to aviation. Unfortunately, this mistake would be repeated over and over again. What Congress overlooked was that the United States did not possess the engineers to design the aircraft, the industry to build them or the instructors and planes with which to train the pilots. Without these resources, there would be no strong US aviation industry.



The Wright Brothers' Military Flyer Known as *Signal Corps No. 1*

## World War I

### *Military Role of the Airplane*

Throughout the history of aviation, the greatest progress in flight has been made during times when either war or the threat of war was present. When the war started in 1914, the average airplane had a speed of 70 to 80 mph and could not go higher than about 10,000 feet. By the time World War I ended, the speed of aircraft had increased to 140 to 150 mph, and they could operate up to about 24,000 feet.

There have been very few revolutions in military affairs. It is rare when a new weapon or a new way of thinking completely changes the way wars are fought. The airplane was one of those few weapon systems that changed warfare, but it took a while to do it. In World War I, the real revolution



in military affairs took place with the advent of the tank and the machine gun. These weapons changed the way wars were fought.

Large armies that tried to destroy the enemies' weakest link by either out maneuvering them or destroying them head-on typically fought wars. These large armies would face off in large open battlefields. The advent of the machine gun and later the tank changed the way wars were fought.

Armies could no longer line up and merely fight it out. They had to dig in. So the airplane also changed the way wars were fought. When the enemy started to dig in, an airplane could fly overhead and use its mastery of the air and space domain to gain a new and previously unknown advantage.

The airplane was first used in the same role as balloons had been in earlier wars. They were used for observation. This role required aircraft that were slow and stable. The pilot or observer could study and photograph activity on the ground. Aircraft, such as the British *BE-2* and *Avro 504*, the French *Morane* and *Farman*, and the German *Taube* and *Albatros*, were excellent for this type of mission.



The German *Fokker D-7* of World War I (EAA)

These airplanes usually carried no guns. If an allied observer met an enemy aircraft, the pilots would salute each other with a respect for each other's skill and mastery of the sky.

As war progressed, there were a few bombing attempts. Bomber aircraft were observation aircraft with the pilot or an observer carrying small bombs on his lap. These bombs were released by hand with very poor accuracy.



The German *Albatros D-II* had a plywood fuselage and two machine guns. (EAA)

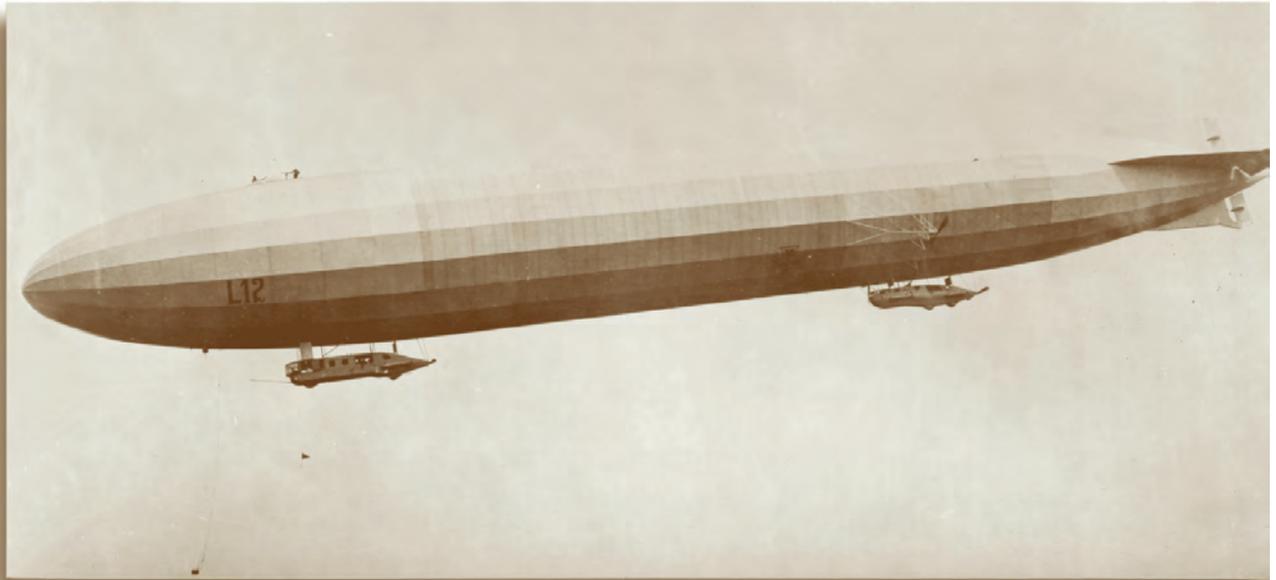
During the war, the first long-range strategic bombing raid was made by three British *Avro 504*s against the German *Zeppelin* storage sheds at Lake Constance in southern Germany. There was little damage done, but the raid did cause the Germans to form their first bombing squadron.

By 1915, the Germans were raiding behind allied lines in France, and later began bombing London using both dirigibles and airplanes.



## Europe in World War I

At the beginning of World War I, the German Army had 20 large *dirigibles*, 9 built by Zeppelin and 11 by other German manufacturers. During the war an additional 88 *Zeppelins* were produced. Germany's plans were to use these airships as strategic bombers against French and English cities. On August 9, 1915, they made their first raids over London.



Early German Airship

The raids were very accurate with their bombing, but because the airships were filled with highly flammable hydrogen, the slightest damage caused them to burst into flames. Because of their vulnerability to anti-aircraft fire from the ground and the air, they began flying only at night.

By 1916, it was clear that a replacement was necessary, and it came in the form of a large twin-engine bomber called the *Gotha IV*. Beginning in April 1917, these bombers dropped tons of bombs on English cities and factories.

Although these raids caused considerable damage and many deaths, the most important impact was that the English had to recall some of their fighter squadrons from France to protect the homeland.

Another outcome of the German air raids was the formation of the Independent Bombing Force within the British Royal Flying Corps. This was the first and only Allied flying force during World War I that was not under the command of an infantry trained general officer.

This same organization went on to later become the Royal Air Force (RAF) that we know today. It was created independent of and equal to the British Army and Navy.

By the time the war ended, strategic bombing (bombing enemy territory) had grown from a few observation planes with the pilots dropping small handheld bombs to large, specially designed bombers capable of carrying up to 6,000 pounds of bombs.



## Fighter Development

As more and more bombing raids took place, it became clear that control of the air was needed. Fighter or pursuit aircraft were needed to drive off the bombers.

At first, the armament of these “fighters” consisted of the pilot shooting at the enemy with a pistol or rifle. In 1915, a French pilot, Roland Garros, mounted an automatic rifle on his aircraft so he could fire forward through the propeller. To keep from shooting off his own propeller, the rear of the prop was armored with steel plates to deflect the bullets.

As primitive as this device was, it was quite effective because, for the first time, the pilot could aim his guns by flying directly at the enemy.

April 1915, Garros was shot down behind the German lines, and his aircraft was captured. After examining his armored propeller, the Germans gave a Dutch airplane designer, Anthony Fokker, the task of improving this device.

Fokker designed an interrupting gear which connected a machine gun to the aircraft engine and prevented the gun from firing when a propeller blade was lined up with the gun’s muzzle. This allowed the machine gun to be fired through the spinning propeller. For nearly a year, this invention gave the Germans almost total control of the air.

The Allies tried mounting their machine guns on top of the wing to fire over the propeller. This was not successful because it slowed the aircraft due to the increased drag.

In April 1916, a German aircraft equipped with this interrupting gear was captured and the Allies soon copied it. This was the start of the great “dog fight” era of air battles.

As aircraft engaged more and more in dog fighting, it became obvious that the fighter aircraft needed to be light, fast and very maneuverable. Some of the famous fighters developed during World War I included the Sopwith *Camel* and the *SE-5A* by the British, the *Spad VII* and *Nieuport 28* by the French and the German *Fokker Dr-I* and *D-VII*.

One of the greatest technical accomplishments of World War I occurred too late to affect the outcome of the war. In May 1918, the German designer, Hugo Junkers, built the world’s first all-metal, low-wing monoplane fighter called the *Junkers D1*. Only 45 were manufactured before the war ended. Few people realized they were seeing the fighter of the future.



The Sopwith *Triplane* could “turn on a dime.” (EAA)



## ***Fighter Aces***

As aerial combat increased, the French developed a method of recognizing pilots who shot down many enemy aircraft. They coined the term “ace” for a pilot who shot down five enemy aircraft. This same number was adopted by the British and Americans. The Germans, however, required 10 enemy aircraft be downed before recognizing the pilot as an ace.

The term “ace of aces” was a designation given to the pilot from each nation with the most “kills.” Included as ace of aces during World War I were Edward V. Rickenbacker, American (26 victories); René Fonck, French (75 victories); Edward Mannock, British (73 victories); and Baron Manfred von Richthofen, German (80 victories).



French “ace,” René Fonck, shot down 75 enemy aircraft during WWI.



Captain “Eddie” Rickenbacker, America’s Ace of Aces

## ***The United States in World War I***

World War I began in Europe in 1914, but the United States did not enter the war until 1917. Quite a few American pilots did not wait for their own country to declare war. Instead, they found ways to get into the flying services of other nations already engaged in combat. Most nations had some legal



difficulties in accepting the services of these American “foreigners,” but France did not. The famous French Foreign Legion was willing and able to accept volunteers from other nations.

When the war broke out, seven wealthy young Americans living in Paris volunteered to fly for France. These Americans worked as a group and named themselves the Lafayette Escadrille, in honor of the French nobleman who lent his services to the Americans during the Revolutionary War.

By March 1917, the month before the United States formally entered World War I, only one of the original members of the Lafayette Escadrille was still living. By the time the war ended, 40 of the gallant Americans responsible for the Escadrille’s fighting fame had given their lives for the French and Allied cause. Six of these Americans achieved “ace” status while flying for the French Air Service.

At first, the Lafayette Escadrille was viewed by the French largely as a propaganda device for winning American support for the war effort. The brave Americans, however, proved their value as fighting men. Before their unit was incorporated into the United States Army Air Service in February 1918, the Escadrille scored 199 confirmed victories.

One of the most widely known and most popular of the American flyers was Raoul Lufberry, a native Frenchman who had become an American citizen. He was one of several American citizens serving with the French Air Service who later joined the all-American Lafayette Escadrille.

Lufberry scored 17 victories during the war. He always advised his pilots to stay with their planes, even if they began to burn, which was one of the most dangerous possibilities. In those days, the fabric-

covered aircraft burned very easily. On May 19, 1918, however, he ignored his own advice and paid the full price. Lufberry’s aircraft was hit by enemy bullets and began to burn. Two hundred feet above the ground, he jumped, apparently aiming at a nearby stream. Instead, he landed on a picket fence and was killed.

Eddie Rickenbacker, a former racing car driver, learned from Lufberry the value of watching the sky all around for enemy planes. He also learned that a flight patrol leader’s main duty is to take care of his men.

The American 94th and 95th Squadrons were flying unarmed planes. When the French authorities learned that the Americans were flying unarmed aircraft, they quickly supplied them with machine guns.

The Americans began shooting down German airplanes, and Rickenbacker quickly accumulated five victories. After his fourth victory, Rickenbacker was named Commander of the 94th Squadron. He equipped his men with parachutes, solved a troublesome problem of jamming guns, and then kept his squadron atop the list of effectiveness against the enemy.

His 26 kills came in only 5 months of flying. Rickenbacker mastered aerial combat tactics just as he had mastered automobile driving tactics on dirt tracks and, later,



**Raoul Lufberry, was a French-born, American citizen who flew with the Lafayette Escadrille.**



on the speedway at Indianapolis.

Rickenbacker was the only living American airman to receive the Congressional Medal of Honor during World War I. Three other Americans received the medal posthumously. Lieutenants Harold Goettler and Erwin Bleckley were awarded the medal for their heroic action of October 6, 1918. In action that cost them their lives, Goettler and Bleckley helped an American battalion trapped behind enemy lines. The other airman who posthumously received the Medal of Honor was Frank Luke.

If Rickenbacker and Lufberry knew the value of discipline and planning, Frank Luke was their opposite. Luke has been described as “an undisciplined, carefree maverick, . . . absolutely impervious to any squadron regulations.” However, he was extremely confident of his abilities. He accomplished one of the most amazing feats of the war by destroying 15 enemy balloons and 3 planes within 17 days. German planes and their anti-aircraft guns heavily guarded the balloons. These balloons were regarded by pilots as the most dangerous and difficult targets of all.

Luke was a loner. After one last spree in which he downed

three balloons and two planes on the same raid, he did not return to his base. Luke had been wounded and went off by himself. He ran into enemy soldiers and strafed and killed six Germans on the ground, and wounded an equal number.

He then landed his plane and went to a stream to get a drink of water. He was discovered by a German foot patrol. He drew his revolver to defend himself, but was killed by the soldiers.

Many aviators earned fame through combat in World War I. One man who was very influential in aviation in that war, and who made a giant contribution to aviation tactics later, was not a famous fighter pilot at all, but a student of air power and its use. His name was Billy Mitchell.

Mitchell, son of a United States senator, grew up in Milwaukee, Wisconsin. One of his boyhood friends was Douglas MacArthur who, during World War II and the Korean War, won worldwide fame for outstanding service in the United States Army. By applying his considerable intelligence and abilities, Mitchell started breaking records at an early age.

He was the youngest student ever to enter George Washington University when he enrolled in 1895. He became a second lieutenant



Many German pilots saw the French Nieuport 17 when they looked over their shoulders in air combat. (EAA)



Air Force General, Billy Mitchell, got his start in air combat during WWI.



in the Wisconsin Volunteers at age 18 and was promoted to first lieutenant a year later. By 1903, at the age of 23, he had become the youngest captain in the Army.

In 1909, he completed the Army Staff College and was a distinguished graduate. When he was 32 years old, he was ordered to Washington to serve on the War Department's general staff. Once again, he was the youngest officer ever given this assignment.

Mitchell's interest in aviation started after the beginning of World War I in 1914. He spent much of his time on the general staff in Washington urging for a separate and independent air service. On his own time, he studied flying at the Curtiss Company's School at Newport News, Virginia. He became a pilot at the age of 36. In those days, 36 was considered quite old for flying.

As the war progressed in Europe, Mitchell steadily climbed in rank and responsibilities, finally becoming Chief of the Air Service for the American forces in Europe. He did his best to get first-rate aircraft and mechanics for American pilots.

As a trained pilot himself, he tested British and French planes before he would accept them for his fliers. He rejected the Sopwith *Camel* because its rotary engine gave the plane a tendency to whip into a right-hand spin, and his pilots were not sufficiently experienced to control it. Later, United States pilots flew *Camels*.

Mitchell studied air power enthusiastically and met the leading theorists personally. From his friend, General Hugh Trenchard, Commander of the British Royal Flying Corps, Mitchell learned to think of the airplane as an offensive weapon, best used in giant fleets of bombers striking against the enemy's homeland.

**PREMISE 1**  
"Air superiority over the battlefield must be completely assured."

**PREMISE 2**  
" Air power may then be employed offensively against the enemy's ground troops."

**PREMISE 3**  
"Finally, aerial bombardment may be directed against the enemy's supplies, railroads, communications and airdromes."

"The airplane is first and foremost an offensive weapon."

Mitchell's Air Power Theory



Mitchell held the title of Chief of the Air Service, but control of the air wing was still totally in the hands of the Army. Mitchell saw aviation as a military effort to help the ground forces. He did not think that this could best be achieved by being subservient to them.

Most ground officers, however, thought of the Air Service as an auxiliary to the land troops. Airplanes were thought to be useful for keeping an eye on enemy infantry movements, and for keeping enemy airplanes away from friendly troops. Army officers of that time, of course, had been trained for ground warfare. So, it was often difficult to make a case for a strong and independent air service.

Billy Mitchell slowly gained favor with certain folks, but his outspokenness made him some enemies, too. He thought the air service should be separate from the Army so that it could “command the sky.” Once his airplanes had command of the sky, they could be used offensively against the enemy’s troops.

His influence was great on the American flying squadrons, some of whose members were to rise to later prominence. Those men carried Mitchell’s teachings forward and made a great impact on the conduct of air warfare in World War II.

In September 1918, Mitchell commanded the first mass use of aircraft for bombing attacks on enemy supply routes and for supporting the ground troops. This attack involved nearly 1500 allied airplanes and was important in deciding the outcome of the war. However, it was not until after the war that Mitchell was able to demonstrate the effectiveness of the air weapon against naval vessels. Although Mitchell was forced to sacrifice his military career for his beliefs, he unquestionably had a large influence on aviation’s golden age.

Because World War I was fought in Europe, the American public was isolated from the actual battlefield. Except for the American troops serving in Europe, Americans were unaware of the increasing importance of air power during World War I. Therefore, when the war ended, the United States was the only nation involved in the war that had not learned the most important lesson taught by World War I—*If you control the air, you cannot be beaten; if you lose the air, you cannot win.*



### Key Terms and Concepts

- early pioneers of flight
- Signal Corps Aeronautical Division
- Aerial Experiment Association
- aviation development in the United States
- aviation development in Europe
- development of helicopters
- development of commercial aviation
- military role of the airplane in WWI
- fighter aircraft development during the WWI era
- legacy of Billy Mitchell



## ? Test Your Knowledge ?

### SELECT THE CORRECT ANSWER

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1. **(Robert Esnault-Pelterie / Matthew P.W. Boulton)** built a Wright-style glider in 1904 and used ailerons to replace the wing-warping technique.
2. **(Henri Farman / Alberto Santos-Dumont)** flew the first powered aircraft in Europe.
3. Louis Bleriot was the first person to fly across the **(English Channel / Atlantic Ocean)**.
4. The first international air meet was held at **(Kitty Hawk, NC / Rheims, France)**.
5. The first four engine aircraft was built and flown by **(Igor Sikorsky / Louis Bleriot)**.
6. One problem with early aircraft engines was that they were too **(heavy / light)**.

### MATCHING

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- |  |                              |
|--|------------------------------|
| 7. French "ace of aces."                     | a. <b>Anthony Fokker</b>     |
| 8. Former race car driver.                   | b. <b>Edward Mannoek</b>     |
| 9. Dutch airplane designer.                  | c. <b>Raoul Lufberry</b>     |
| 10. British "ace of aces."                   | d. <b>Eddie Rickenbacker</b> |
| 11. Commanded first mass-air bombing attack. | e. <b>René Fonck</b>         |
| 12. Member of the Lafayette Escadrille.      | f. <b>Billy Mitchell</b>     |

### TRUE OR FALSE

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13. The War Department was enthusiastic with the Wright brothers' offer to build airplanes for the government.
14. Before Glenn Curtiss became interested in aviation, he was a motorcycle racer.
15. Eugene Ely made the first flight from the deck of a ship.
16. Calbraith Perry Rodgers was the first person to fly nonstop across the United States.
17. The first woman to fly solo across the English Channel was Mathilde Moisant.
18. Helicopters are called rotary-wing aircraft because the wings (blades) rotate.
19. The first helicopter to lift a man into the air was built and flown by Henry Berliner.
20. The Soviet Union began regularly scheduled airline service on January 1, 1914.
21. By 1914, the United States had the most powerful flying service in the world.
22. The United States produced several American-designed combat aircraft during World War I.
23. At the beginning of World War I, the airplane was used primarily for observation.
24. The first bombing raids carried out by the Germans in World War I were done with the Gotha IV.



25. *In World War I, fighter aircraft were used to drive off attacking bombers.*
26. *Eddie Rickenbacker was America's "ace of aces" in World War I.*
27. *The Lafayette Escadrille was composed of France's greatest aces.*
28. *A lesson learned in World War I was — If you control the air, you can not be beaten; if you lose the air, you cannot win.*