

## LESSON 3

# Commercial Flight, Airmail, and Helicopters

### Quick Write



Describe some of William Boeing's contributions to aviation.

### Learn About...



- early developments in commercial flight
- the use of the airplane in delivering mail
- the development and use of helicopters

Unlike most other pioneers of flight, William E. Boeing came to aviation as a businessman. He was the son of a wealthy Detroit businessman. He left Yale University in 1903 to start a timber business in the Pacific Northwest.

A few years later, Boeing saw a public exhibition of flying in Los Angeles. He became fascinated with aviation. He made his first flight in 1914. He decided he wanted to build his own planes. He thought he could build better planes than those in use at the time.

He hired his friend George Conrad Westervelt, an engineer, to design and build a twin-float seaplane. A **twin-float** is an airplane with floats for landing on or taking off from a body of water.

It was a success. Boeing launched the Boeing Airplane Company, later called Boeing Air Transport. In 1917 he sold the US Navy 50 of his Model C seaplanes for use in World War I.

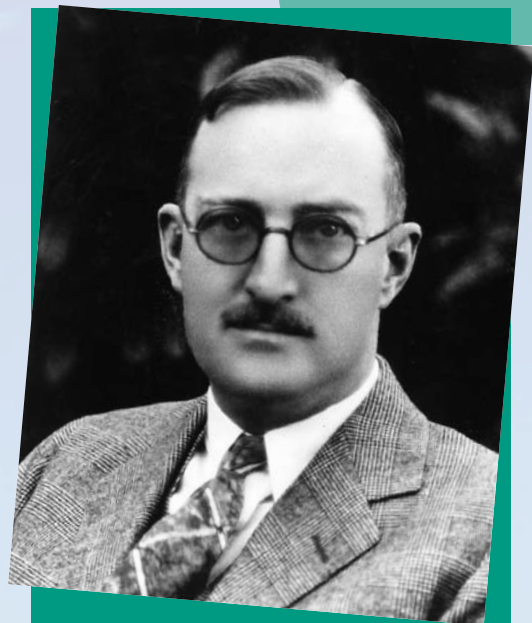
Like other airplane builders, Boeing lost his government contracts at the end of the war. He kept his business going by making furniture, cabinets, and boats.

But Boeing didn't lose interest in aircraft. Soon he built the Boeing-1, or B-1, a commercial biplane. On 3 March 1919, he and his pilot, Eddie Hubbard, opened the first international airmail route. They flew between Seattle, Washington, and Vancouver, British Columbia. A one-way trip was 140 miles.

Soon Boeing won the contract for the San Francisco–Chicago airmail route. He served the route with a Boeing 40-A mail plane. Air, not water, kept the plane's engine cool. This made the plane hundreds of pounds lighter. Boeing 40-As, he said, were designed to carry mail and people, not radiators.

In 1934 Congress made it illegal for airmail carriers and aircraft builders to be part of the same company. Boeing had to break up his firm. But his reputation was assured. In that same year, he won the Guggenheim Medal for his contributions to aviation.

William E. Boeing was a businessman who became fascinated with aviation.



**WILLIAM E. BOEING**

Courtesy of Getty Images

## Vocabulary



- twin-float
- subsidy
- incentive
- stressed skin
- retractable
- cowl
- scheduled airlines
- amendment
- tail rotor
- outrigger
- tethered flight

## Early Developments in Commercial Flight

As you read in Lesson 1 of this chapter, many aircraft companies fell on hard times when the government canceled their contracts at the end of World War I. William Boeing owned one such company. Despite the setback, he saw a future in aviation. He kept his company going. As a result, Boeing was in a good position when the government began to support aviation again.

This time, opportunity came in the form of the new airmail service. In 1925 the government decided to let private firms carry the mail. New companies sprang up to do the job. To help these firms, the government offered subsidies. A **subsidy** is government money paid to a person or company that serves the public.

After a few years, the rules changed again. The government began to support passenger service, too. New rules gave airlines an **incentive**—a motivating reward—to fly larger planes with more passenger space. The rules also encouraged the use of planes that could fly in all types of weather.

Soon Boeing Air Transport won a contract to build a two-engine aircraft for United Airlines. In 1933 Boeing rolled out the Boeing 247.

The Boeing 247 was the first all-metal airliner. Its wings were placed low on the plane's body. It had a **stressed skin**—an outer covering that can stand up to the push-and-pull forces of flight. Its landing gear was **retractable**—it folded into the aircraft. Each of its two engines had a **cowling**—a covering to protect and streamline the engine.

The B-247 could carry 10 passengers and 400 pounds of mail. It could cruise at 189 miles an hour (mph). “Same-day” service between New York and San Francisco was now possible. Modern airline service had begun.

### THE BOEING 247

With the Boeing 247, same-day service from San Francisco to New York became possible.



Courtesy of the EAA/Jim Koepnick



### THE C-47

The government ordered 10,000 of these planes during World War II.

Courtesy of the EAA/Jim Koepnick

Transcontinental and Western Airlines (TWA) signed a contract with Douglas Aircraft of Santa Monica, California, to build an even bigger plane.

The result was the Douglas Commercial-2, or DC-2. It came out in May 1934. It cruised at 192 mph. It could carry 14 passengers and several thousand pounds of mail up to 900 miles.

Meanwhile, a third airline—American Airways—was flying foreign-built aircraft. American was also losing money. It asked Douglas Aircraft to improve on the DC-2. The result was the DC-3. The DC-3 could carry 24 passengers, or 5,000 pounds of cargo, a distance of 1,200 miles.

American Airways rolled out the first DC-3 in June 1936. It became one of the most successful planes ever built. By 1938 it was carrying 95 percent of all commercial traffic in the United States. A year later, 90 percent of all commercial traffic worldwide was flying the DC-3.

Later, during World War II, Douglas developed a military version of the DC-3—the C-47. Douglas built some 10,000 of these planes for the Army Air Force. The C-47's official name was the *Skytrain*. But pilots called it the *Gooney Bird*. ("Gooney bird" is another name for albatross, a large sea bird. Albatrosses are superb fliers. They can fly long distances without tiring.) Some C-47s are still in use.

## The First Airlines

By the late 1920s, Charles Lindbergh's vision of civil aviation was taking form. Within a year of his 1927 flight, the number of licensed pilots in the country grew from 1,500 to 11,000. The number of licensed planes also rose sharply. Building and flying airplanes became the country's most profitable business. By 1929 there were 44 **scheduled airlines**. These are *airlines that have flights that depart and arrive at set times*.

Competing for passengers, the airlines worked with aircraft companies to build them better and better planes. Shortly after United introduced the B-247, a second airline got into the act.





#### THE PAN AMERICAN CLIPPERS

The Pan American Clippers were named for the swift sailing ships of the 19th century. Their crews wore naval-style uniforms and bore naval ranks.

Courtesy of the National Air and Space Museum, Smithsonian Institute (SI Neg. No. 89-1216)

Another important advance was Pan American Airways' seaplane Clippers. The Clippers came to represent a way of traveling in style and luxury. But they also marked a major step forward in aircraft development.

Pan Am started out in 1927. It flew the first airmail route between Key West, Florida, and Havana, Cuba. In time the route extended down the Atlantic coast of South America.

Pan Am pilots soon found themselves flying over water more often than over land. And in remote areas, seaplane bases were easier to build than land airports for ordinary airplanes.

So Pan Am decided that the kind of "bigger and better" plane it needed was an advanced seaplane. The company hired Igor Sikorsky. (He later won fame for helicopter design, as you'll soon read.) Sikorsky designed a four-engine "flying boat"—the S-40. It could fly 125 mph and carry 40 passengers. Pan Am used the S-42, a successor to the S-40, for survey flights to find routes across the Pacific.

Other airplane makers got into the flying-boat business. In 1934 Pan Am received a larger boat, the Martin 130, built by the Glenn L. Martin Company. The airline called it the *China Clipper*. On 29 November 1935, the *China Clipper* completed the first airmail flight between San Francisco and Manila, in the Philippines. By 1937 the route went all the way to Hong Kong. By that time, Pan Am was flying a round trip across the Pacific every seven days.

Regular passenger and airmail service across the Atlantic began on 20 May 1939 with the Boeing 314. Many considered this the "ultimate flying boat."

There were only about two dozen seaplane Clippers. But they defined an era in air travel. They had an excellent safety record during their six and a half years in service. Pan Am used the name "Clipper" for other aircraft until the company went out of business in 1991. The name of its famous aircraft lives on because some other companies have adopted it.

The era of passenger-carrying seaplanes was short. During World War II, aircraft design made great strides. Four-engine land planes improved. New runways appeared around the world. As a result, seaplanes lost their competitive edge. They gave way to new types of land-based aircraft.

## The Use of the Airplane in Delivering Mail

As you have read, the need to deliver mail by air led to many changes in aviation. During the 1920s and 1930s, Congress passed several laws on civil aviation. The first was the Air Mail Act of 1925, also known as the Kelly Act. It let private airlines carry mail. The Air Commerce Act of 1926 provided the first safety regulation for pilots and aircraft.

In 1930 Postmaster General Arthur F. Brown got Congress to pass the McNary-Watres Act. This act was an **amendment**—a *revision or change*—to the Air Mail Act of 1925. The McNary-Watres Act led to United's contract to build the B-247 and other aircraft. Such contracts played an important role in air service across the seas as well. The seaplanes Pan Am needed to fly the mail over water led to regular passenger service across the Atlantic and Pacific oceans. The act also encouraged airlines to fly bigger planes that held more passengers.

### Lighting the Way for the Mail

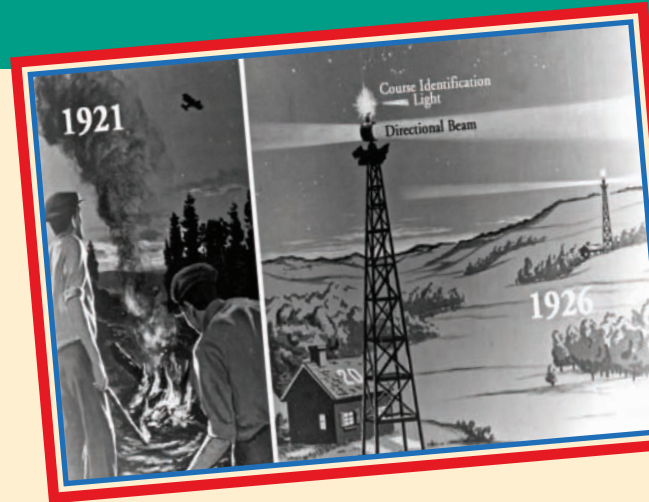
The first airmail pilots in the 1920s had a tough job. They flew in rebuilt warplanes with open cockpits. They flew through rain, fog, and high winds. They had no radios, weather stations, instruments, or beacons.

One of the most important early airmail routes went between New York and Chicago. These planes flew over the Allegheny Mountains. The route was so dangerous that pilots called it "the graveyard run."

What's more, the airmail service wasn't holding its own against the railroads. The trains, after all, rolled on day and night. To meet the competition, postal authorities introduced night flights.

At first, Post Office staff, farmers, and other people built bonfires to light the pilots' way at night. Then came electric beacons. These were powerful rotating lights mounted on 50-foot towers. Towers were built every 10 to 15 miles along a cross-country route. Emergency landing fields were built about every 30 miles. Lights for landing and navigation were soon added to planes as another safety feature.

The government launched regular airmail service on 1 July 1924. At that time, the United States had the world's first regular night service on a lighted airway. The route ran between New York City and the West Coast. From this "trunk" airway, branch lines grew all over the country. This was a major advance in aviation.



#### BONFIRES AND ELECTRIC BEACONS

During the early days of airmail service, bonfires lit the way for pilots. Electric beacons soon replaced the bonfires.

The Air Mail Act of 1934 made air carriers responsible to three federal agencies. The Post Office Department awarded airmail contracts and set routes. The Bureau of Air Commerce, within the Department of Commerce, was in charge of operating airways. It also regulated the licensing of planes and pilots. And the Interstate Commerce Commission's Bureau of Air Mail set the rates for payments to mail carriers.

Through the Air Mail Act of 1938, Congress created the Civil Aeronautics Authority. This law moved civil aviation responsibility from the Commerce Department. It increased government control over the airline industry. It limited competition between airlines and protected the routes of established carriers.

## The Development and Use of Helicopters

The Wright brothers get most of the credit for developing the airplane. Developing the helicopter was another story. It involved several inventors in different countries and even in different centuries.

As you read earlier, Leonardo da Vinci (1452–1519) designed a rotary flying machine. In 1842 W. H. Phillips built a model of a steam-powered helicopter. But many improvements were needed to create a practical helicopter.

Rotary flight is different from fixed-wing flight. The early inventors didn't understand the forces facing the helicopter. They didn't know how to design devices to address these forces.

Some inventors who experimented with helicopters early in the 20th century gave up on them for a time. But 9 January 1923 marked another milestone flight. On that day, a Spanish Army pilot made the first successful flight in an autogiro. Juan de la Cierva of Spain built this aircraft. It looked like an airplane but had an overhead rotor instead of wings. An engine and a propeller made the autogiro move.

But Cierva's machine had serious drawbacks. For example, it couldn't move in all directions. So during the 1930s, Cierva and other designers in Spain, France, and Germany continued to experiment.

Frenchman Louis Bréguet was one experimenter. He'd turned away from helicopters, despite some early success. But by the early 1930s, he was thinking about them again. He established the Syndicate for Gyroplane Studies and hired a young engineer named René Dorand.

Bréguet didn't want to get people's hopes up too soon. He named his new aircraft the *Gyroplane-Laboratoire*. Using the French word for *laboratory*, he thought, would let people understand that the helicopter was experimental. His was another attempt to solve the problems of stability and control.

## The Problem of Control

The early experimenters struggled with how to control the helicopter in flight. As you read in Chapter 2, Lesson 2, their challenge was to find a way to overcome the torque of the rotor blade.

A helicopter gets lift from its rotor's spinning blades. But when the rotor turns, the rest of the machine tends to spin in the opposite direction.

One way to overcome torque is to have two rotors that move in opposite directions. Another way is to use a **tail rotor**, *a small propeller at the end of a long tail boom*. The small propeller's thrust offsets the main rotor's torque.

The first helicopter a pilot could completely control was the Focke-Achgelis (FA-61). A German, Dr. Heinrich Focke, built it in 1937. Its two rotors were mounted side by side on outriggers from the fuselage. An **outrigger** *is a frame extending laterally beyond the main structure of an aircraft*. It stabilizes the structure.

The world's first female helicopter pilot, Hanna Reitsch, demonstrated the FA-61 in 1938. She flew it inside a stadium in Berlin, Germany. She was able to hover and make 360-degree turns. She could fly backward, forward, and sideways.

The first practical helicopter, however, was Igor Sikorsky's VS-300. It was equipped with one main rotor and a tail rotor. It made its first vertical takeoffs and landings in September 1939. The helicopter could carry a useful load and perform work. The pilot could control it well. The early experiments were **tethered flight**, *or flights in which the aircraft was tied to the ground by cables*. The helicopter's first free flight was 13 May 1940. Its top speed was 50 mph. It weighed 1,150 pounds.

Sikorsky worked hard to overcome problems with vibration and control. At first, his helicopter flew "like a bucking bronco," according to an Army project officer. Nevertheless, all later Sikorsky helicopters have been refinements of the VS-300. From this small aircraft, the helicopter has developed into the workhorse of the skies.

### **THE VS-300**, Sikorsky's first successful helicopter

Courtesy of Bettmann/Corbis





## Military and Civilian Use of Helicopters

The military first used helicopters in World War II. But the helicopter came into its own during the Korean and Vietnam Wars. In both wars the US military used it to carry the wounded and rescue downed pilots. It was well suited for the jungle warfare of Vietnam. There, the military used helicopters to place ground troops in battle areas and to outmaneuver enemy ground forces. Since that time, helicopters have been an important part of US military tactics.

In civilian life, helicopters are crucial to search-and-rescue work. The US Coast Guard relies on them to save fishermen and sailors in distress at sea. In the floods after Hurricane Katrina that hit the Gulf Coast in 2005, the Coast Guard and other agencies used helicopters to rescue more than 30,000 people.

Helicopters are used for medical transport, civilian police work, and to broadcast news and highway-traffic reports. Helicopters also play important roles in other sectors, such as the construction, timber, and offshore oil industries.

## Flight Paths

### Igor Sikorsky and the First Practical Helicopter

A Russian who moved to France before settling in the United States, Igor Sikorsky (1889–1972) is best known as the man who developed the first practical helicopter. But that wasn't Sikorsky's first claim to fame. He'd already made two other contributions to aviation.

A mosquito—yes, an insect—led to Sikorsky's first breakthrough. While a young flyer in the Russian Army, he produced a plane—the S-6A—that won the highest award in the Moscow air show. But on a later flight, a mosquito got caught in the fuel line, causing the engine to fail. Sikorsky had to make an emergency landing. That experience gave him the idea for an aircraft with more than one engine. This led him to build and fly the first successful four-engine aircraft, *Le Grand* (See Chapter 2, Lesson 2).

Sikorsky left his native country in 1918, after the Russian Revolution. In France, he won a contract to build a bomber for the Allies. But World War I ended soon after that. His bomber was not needed.

Sikorsky arrived in New York City in 1919. Unable to find a job in aviation, he lectured for a while. Then some friends and students who knew of his work in aviation pooled their funds to launch him in business. He formed the Sikorsky Aero Engineering Corporation.

Within a few years Sikorsky made his second major achievement. As you read earlier, he designed a flying boat for mail service.

But Sikorsky still cherished a lifelong dream: to build a helicopter. When Igor was a child in Kiev, Ukraine (then part of Russia), his mother told him about Leonardo da Vinci's helicopter designs. He became fascinated by the idea of rotary-wing flight. People told him it was an impossible dream. Some of his own staff called it "Igor's nightmare."

In 1940 he achieved his dream. Today, the name Sikorsky stands for excellence in helicopters.

**CHECKPOINTS**

## Lesson 3 Review

Using complete sentences, answer the following questions on a sheet of paper.

1. What development saved hundreds of pounds on Boeing's 40-A mail plane?
2. How successful was the DC-3?
3. Why did Pan American Airways need a new type of advanced seaplane?
4. What brought the era of the Pan Am Clippers to an end?
5. Why did manufacturers start building planes with more passenger space after 1930?
6. In the early days of airmail service, what prompted postal authorities to add night flights?
7. How did Igor Sikorsky solve the problem of control with his helicopter?
8. How are helicopters used today in civilian life?
9. A mosquito led to which important development in aviation?

### Applying Your Learning

10. Describe how competition among airlines and among manufacturers led to new developments in aircraft.