World War I Aircraft

Presented by the

Education Division National Museum of the United States Air Force

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OF THE UNITED STATES AIR FORCE



SPAD VII

The famed American volunteers of the French Lafayette Escadrille were flying the SPAD VII in February 1918 at the time they transferred to the U.S. Army Air Service, becoming the 103rd Aero Squadron. Several other U.S. units also used the SPAD VII, although most American Expeditionary Force (AEF) fighter squadrons were equipped with a slightly improved version, the SPAD XIII, by the time the war ended in November 1918.

The SPAD VII made its initial flight in July 1916. It showed such promise that it was put into production at once, and by the latter part of that year it appeared on the Front in both French and British squadrons. The airplane was an immediate success, primarily because its structural ruggedness permitted it to dive at high speeds without disintegrating. About 189 of the slightly more than 5,000 SPAD VIIs built went to the AEF.

The airplane on display was obtained from the Museum of Science and Industry, Chicago, III., and restored by the 1st Fighter Wing, Selfridge Air Force Base, Mich., 1962-1966.

TECHNICAL NOTES:

Armament: One Vickers .303-cal. machine guns Engine: Hispano-Suiza 8-Aa of 180 hp Maximum speed: 127 mph Ceiling: 17,500 ft. Span: 25 ft. 8 in. Length: 20 ft. 3 in. Height: 7 ft. Weight: 1,550 lbs. maximum



CURTISS JN-4D JENNY

The Curtiss Jenny became America's most famous World War I training airplane. Generally used for primary flight training, some Jennies were equipped with machine guns and bomb racks for advanced training.

The JN series began by combining the best features of the Curtiss "J" and "N" models. A 1915 version, the JN-3, supported Pershing's Punitive Expedition into Mexico in 1916, but the aircraft proved unsuitable for field operations. Curtiss improved the JN-3 and redesignated in the JN-4.

With America's entry into WWI on April 6, 1917, the Signal Corps ordered large quantities of JN-4s, and by the time production was terminated after the Armistice, more than 6,000 had been delivered, the majority of them JN-4Ds.

After WWI, the Army sold hundreds of surplus JN-4s to civilians. The airplane soon became the mainstay of the "barnstormers" of the 1920s, and many Jennies continued flying into the 1930s.

The JN-4D on display was obtained from Robert Pfeil of Taylor, Texas, in 1956.

TECHNICAL NOTES:

Engine: Curtiss OX-5 of 90 hp Maximum speed: 75 mph Ceiling: 11,000 ft. Span: 43 ft. 7 in. Length: 27 ft. 4 in. Height: 9 ft. 10 in. Weight: 1,430 lbs.



STANDARD J-1

The Standard Aircraft Co. J-1 was a two-seat primary trainer used by the U.S. Army Air Service to supplement the JN-4 Jenny. Similar in appearance to the JN-4, the J-1 was more difficult to fly and never gained the popularity of the legendary Jenny.

Standard developed the J-1 from the earlier Sloan and Standard H-series aircraft designed by Charles Healey Day. Four companies -- Standard, Dayton-Wright, Fisher Body and Wright-Martin -- built 1,601 J-1s. The government cancelled about 2,700 more J-1s on order after the signed of the Armistice in November 1918.

Museum personnel completed a two-year restoration of the aircraft on display in 1981.

TECHNICAL NOTES:

Engine: Curtiss OXX-6 of 100 hp (Hall-Scott engines were most commonly used, but some were equipped with Curtiss or Hispana-Suiza engines) Maximum speed: 72 mph Range: 235 miles Ceiling: 5,800 ft. Span: 43 ft. 10 in. Length: 26 ft. 7 in. Height: 10 ft. 10 in. Weight: 2,100 lbs. loaded

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THOMAS-MORSE SCOUT

The Thomas-Morse Scout became the favorite single-seat training airplane for U.S. pilots during World War I. The Scout first appeared with an order for 100 S4Bs in the summer of 1917. The U.S. Army Air Service later purchased nearly 500 of a slightly modified version, the S4C. Dubbed the "Tommy" by its pilots, the plane had a long and varied career.

Tommies flew at practically every pursuit flying school in the United States during 1918. After the war ended, the Air Service sold them as surplus to civilian flying schools, sportsman pilots and ex-Army fliers. Some were still being used in the mid-1930s for WWI aviation movies filmed in Hollywood.

The Tommy on display was donated to the museum in March 1965 by Capt. R.W. Duff, Miami, Fla., and restored by Aero Mechanics High School, Detroit, Mich.

TECHNICAL NOTES:

Armament: One .30-cal Marlin machine gun Engine: LeRhone C-9 rotary of 80 hp Maximum speed: 95 mph Range: 250 miles Ceiling: 16,000 ft. Span: 26 ft. 6 in. Length: 19 ft. 10 in. Height: 8 ft. 1 in. Weight: 1,330 lbs.



AVRO 504K

In July 1913, the British A.V. Roe (Avro) Co. tested its first model 504 aircraft, and numerous variants followed -- based upon the type of engine installed. The 504K version had adapters, which allowed the installation of several different types of rotary engines. This aircraft had an undistinguished combat career, but it proved to be an excellent trainer.

After America entered World War I, it took many months to build the training facilities needed by the U.S. Army Air Service. Meanwhile, many American student pilots went overseas for flight training. Those sent to Great Britain learned on the Avro 504K trainer before advancing to combat aircraft. The U.S. Army Air Service eventually established its main training center at Issoudun, France, and in July 1918, the American Expeditionary Force (AEF) commanders ordered 52 Avro 504K aircraft for teaching aerobatics at Issoudun. After the war, the Army Air Service brought a few Avro 504K aircraft back to the United States, and they remained in training service for a few years.

Using original parts, the Royal Canadian Air Force's Aircraft Maintenance & Development Unit built the aircraft on display in 1966-1967 with a 110-hp Le Rhone J rotary engine. It arrived at the National Museum of the U.S. Air Force in May 2003, and it is painted to represent one of the 52 Avro 504K aerobatic trainers used at the AEF No. 3 Instruction Center, Issoudun, France, in 1918.

TECHNICAL NOTES: Maximum speed: 95 mph Ceiling: 13,000 ft. Weight: 1,830 lbs.



NIEUPORT 28

The French-built Nieuport 28 became the first fighter airplane flown in combat by pilots of the American Expeditionary Force (AEF) in World War I. On April 14, 1918, resulted in two victories when Lts. Alan Winslow and Douglas Campbell of the 94th Aero Squadron each downed an enemy aircraft -- the first victories by an AEF unit.

The lightly built Nieuport 28 developed a reputation for shedding its upper wing fabric in a dive, and by the spring of 1918, many considered the Nieuport 28 obsolete. Even so, American pilots maintained a favorable ratio of victories to losses with it. Many American aces of WWI, including 26-victory ace Capt. Eddie Rickenbacker, flew the Nieuport at one time or another in their careers. The less maneuverable, but faster and sturdier, SPAD XIII began replacing the Nieuport 28 in March 1918.

This reproduction was rebuilt by museum personnel. It contains wood and hardware from an original Nieuport 28. The aircraft is painted and marked to represent a Nieuport of the 95th Aero Squadron, Third Flight, as it appeared in July 1918. It was placed on display in May 1994.

TECHNICAL NOTES:

Armament: Two Vickers .303-cal. machine guns Engine: Gnome 9-N rotary of 160 hp Maximum speed: 122 mph Range: 180 miles Ceiling: 17,000 ft. Span: 26 ft. 3 in. Length: 24 ft. 4 in. Height: 8 ft. Weight: 1,625 lbs. loaded

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SOPWITH F-1 CAMEL

The British Sopwith Camel F-1 shot down more enemy aircraft than any other World War I fighter. It was highly maneuverable and very difficult to defeat in a dogfight. Because of its tricky handling characteristics, however, more men lost their lives while learning to fly it than died while using it in combat.

The Camel first went into action in June 1917 with 70 Squadron, Royal Flying Corps, and 4 Squadron, Royal Naval Air Service. Two U.S. Army Air Service squadrons, the 17th and 148th, flew the Camel in combat while assigned to British forces during the summer and fall of 1918. Such famous U.S. pilots as George Vaughn (America's second-ranking Air Service ace to survive the war), Elliot White Springs, Errol Zistel and Larry Callahan were members of the 17th and 148th. A third U.S. unit, the 185th Aero Squadron, used the Camel as a night fighter on the American Front during the last month of the war.

Although 5,490 Camels were produced, very few remain in existence today. USAF personnel built the Camel on display from the original WWI factory drawings, completing it in 1974. The aircraft is painted and marked as the Camel flown by Lt. George A. Vaughn Jr., 17th Aero Squadron.

TECHNICAL NOTES:

Armament: Two Vickers .303-cal. machine guns Engine: Clerget rotary of 130 hp Maximum speed: 112 mph Range: 300 miles Ceiling: 19,000 ft. Span: 28 ft. Length: 18 ft. 9 in. Height: 8 ft. 6 in. Weight: 1,482 lbs. maximum



FOKKER DR. I

Few aircraft have received the attention given the Fokker Dr. I triplane. Often linked with the career of World War I's highest scoring ace, Germany's Rittmeister Manfred von Richthofen (the "Red Baron"), the nimble Dr. I earned a reputation as one of the best dogfighters of the war.

The German air force ordered the Fokker Dr. I in the summer of 1917, after the earlier success of the British Sopwith triplane. The first Dr. Is appeared over the Western Front in August 1917. Pilots were impressed with its agility, and several scored victories with the highly maneuverable triplane. Von Richthofen score 19 of his last 21 victories were achieved while he was flying the Dr. I. By May 1918, however, the Dr. I was being replaced by the newer and faster Fokker D. VII.

Although Fokker built a total of 320 Dr. Is, none have survived. This reproduction is painted to represent the aircraft flown by Lt. Arthur Rahn in April 1918 when he served with Jagdstaffel 19. Lt. Rahn is credited with six confirmed victories. The aircraft was placed on display in April 1994.

TECHNICAL NOTES:

Armament: Two 7.92mm Spandau LMG 08/15 machine guns Engine: Oberursel Ur II of 110 hp or LeRhone of 110 hp Maximum speed: 103 mph Range: 185 miles Ceiling: 19,685 ft. Span: 23 ft. 7 in. Length: 18 ft. 11 in. Height: 9 ft. 8 in. Weight: 891 lbs. empty; 1,291 lbs. loaded



CAQUOT TYPE R OBSERVATION BALLOON

Tethered balloons allowed World War I observers to see as far as 40 miles behind enemy lines to spot troop movements, chart trench systems and direct artillery fire. The observation balloon most used by Americans was named for its designer, French engineer Lt. Albert Caquot. The hydrogen-filled balloon could lift two passengers in its basket, along with charting and communications equipment, plus the weight of its mooring cable, to a height of about 4,000 feet in good weather. Normal operations were between 1,000 and 4,000 feet. During WWI, American balloon observers directed artillery fire at targets such as troop concentrations and supply dumps. They noted more than 1,000 enemy airplane sightings, 1,000 instances of military traffic on railroads and roads and 400 artillery batteries.

Caquot balloons were manufactured in great numbers in WWI; nearly 1,000 were made in the United States in 1918-1919. During World War II, the British produced Caquots once again, but in limited numbers. Manufactured in 1944, the balloon displayed at the museum is believed to be the only survivor. The British used it for parachute testing and noncombat aerial observation and photography until 1960. The British Ministry of Defense, Royal Aircraft Establishment, presented the Caquot to the museum after it was located with the aid of American and British WWI balloon veterans in 1975. Assisted by the Goodyear Aerospace Corp. of Akron, Ohio, which had produced these balloons during WWI, museum personnel mended and sealed the balloon fabric and prepared it for inflation. It was placed on display in May 1979.

TECHNICAL NOTES:

Gas capacity: 32,200 cu. ft. Length: 92 ft. Diameter: 32 ft.



HALBERSTADT CL IV

Introduced into combat during the last great German offensive of World War I, the CL IV supported German troops by attacking Allied ground positions. Equipped with both fixed and flexible machine guns, hand-dropped grenades and small bombs, the CL IV proved very effective in this role, but it lacked the armor necessary for protection against ground fire.

The CL IV became a hunted target of Allied pursuit squadrons, but it gave a very good account of itself in dogfights. A versatile machine, the CL IV also performed as an interceptor against Allied night bombing raids and served as a night bomber against troop concentrations and airfields near the front lines.

The museum acquired the Halberstadt CL IV on display in 1984. Badly deteriorated at the time, its restoration was a joint international cooperative venture by the Museum fur Verkehr und Technik in Berlin, Germany, the Smithsonian Institution's National Air and Space Museum and the National Museum of the United States Air Force. It is marked as the CL IV of the squadron leader of the Schlachtstaffel 21, which is known to have engaged elements of the U.S. Army's 94th and 95th Aero Squadrons in mid-July 1918 during the Chateau Thierry battle.

TECHNICAL NOTES:

Armament: One or two fixed 9mm Spandau machine guns and one flexible Parabellum 9mm machine gun; anti-personnel grenades; and four or five 22-lb. bombs Engine: Mercedes D III 6-cylinder in-line, water-cooled engine of 160 hp Maximum speed: 112 mph Range: 300 miles Ceiling: 21,000 ft. Span: 35 ft. 2 7/8 in. Length: 21 ft. 5 1/2 in. Height: 8 ft. 9 1/8 in. Weight: 2,350 lbs. loaded



SPAD XIII

In 1916 a new generation of German fighters threatened to win air superiority over the Western Front. The French aircraft company, Société pour l'Aviation et ses Dérives (SPAD), responded by developing a replacement for its highly successful SPAD VII. Essentially a larger version of the SPAD VII with a more powerful V-8 Hispano-Suiza engine, the prototype SPAD XIII C.1 ["C" designating Chasseur (fighter) and "1" indicating one aircrew] first flew in March 1917.

With its 220-hp engine, the SPAD XIII reached a top speed of 135 mph -- about 10 mph faster than the new German fighters. It carried two .303-cal. Vickers machine guns mounted above the engine. Each gun had 400 rounds of ammunition, and the pilot could fire the guns separately or together. Technical problems hampered production until late 1917, but nine different companies built a total of 8,472 SPAD XIIIs by the time production ceased in 1919.

Since the United States entered World War I without a combat-ready fighter of its own, the U.S. Army Air Service obtained fighters built by the Allies. After the Nieuport 28 proved unsuitable, the Air Service adopted the SPAD XIII as its primary fighter. By the war's end, the Air Service had accepted 893 SPAD XIIIs from the French, and these aircraft equipped 15 of the 16 American fighter squadrons. Today, Americans are most familiar with the SPAD XIII because many of our aces -- like Rickenbacker and Luke -- flew them during WWI.

Built in October 1918 by the Kellner et ses Fils piano works outside of Paris, the museum's SPAD XIII (S/N 16594) did not see combat. Shipped to the United States with 434 other SPAD XIIIs after the Armistice, this aircraft went to San Diego, Calif., and a smaller, 150-hp Wright-Hispano engine replaced its Hispano-Suiza engine. The museum staff restored this SPAD XIII to its original configuration, including a 220-hp Hispano-Suiza engine. It is painted in the markings of America's highest scoring ace of WWI with 26 victories, Capt. Edward V. Rickenbacker of the 94th Pursuit Squadron.

TECHNICAL NOTES:

Wingspan: 26 ft. 11 in. Length: 20 ft. 8 in. Height: 7 ft. 11 in. Weight: 1,815 lbs. (gross)



FOKKER D. VII

First appearing entering combat in May 1918, the Fokker D. VII quickly showed its superior performance over Allied fighters. With its high rate of climb, higher ceiling and excellent handling characteristics, German pilots scored a remarkable 565 victories over Allied aircraft during the month of August alone.

Designed by Reinhold Platz, the prototype of the D. VII flew in a competition against other new fighter aircraft in early 1918. After Baron Manfred von Richthofen, the famous Red Baron, flew the prototype and enthusiastically recommended it, the D. VII was chosen for production. To achieve higher production rates, Fokker, the Albatross company and the Allgemeine Elektrizitats Gesellschaft (AEG) all built the D. VII. By war's end in November 1918, these three companies had built more than 1,700 aircraft.

The reproduction aircraft on display is painted to represent the Fokker D. VII of Lt. Rudolph Stark, a squadron leader of Jasta (Fighter Squadron) 35b in October 1918. It was placed on exhibit in May 1996.

TECHNICAL NOTES:

Armament: Two 7.92 Spandau machine guns Engine: Mercedes 160 hp or BMW 185 hp Maximum speed: 120 mph (Mercedes engine); 124 mph (BMW engine) Ceiling: 18,000 ft. (Mercedes engine); 21,000 ft. (BMW engine) Span: 29 ft. 3.5 in. Length: 22 ft. 11.5 in. Height: 9 ft. 2.5 in. Weight: 1,540 lbs. empty; 1,939 lbs. loaded



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Kettering Aerial Torpedo "Bug"



KETTERING AERIAL TORPEDO "BUG"

In 1917 Charles F. Kettering of Dayton, Ohio, invented the unmanned Kettering Aerial Torpedo, nicknamed the "Bug." Launched from a four-wheeled dolly that ran down a portable track, the Bug's system of internal pre-set pneumatic and electrical controls stabilized and guided it toward a target. After a predetermined length of time, a control closed an electrical circuit, which shut off the engine. Then, the wings were released, causing the Bug to plunge to earth -- where its 180 pounds of explosive detonated on impact.

The Dayton-Wright Airplane Co. built fewer than 50 Bugs before the Armistice, and the Bug never saw combat. After the war, the U.S. Army Air Service conducted additional tests, but the scarcity of funds in the 1920s halted further development. Museum personnel built this full-size reproduction of the Bug, and it went on display in 1964.

TECHNICAL NOTES:

Armament: 180 lbs. of high explosive Engine: One De Palma 4-cylinder of 40 hp Maximum speed: 120 mph Range: 75 miles Span: 14 ft. 11 1/2 in. Length: 12 ft. 6 in. Height: 4 ft. 8 in. Weight: 530 lbs. loaded



CAPRONI CA. 36

During World War I, Italian aeronautical engineer Gianni Caproni developed a series of multi-engine heavy bombers that played a key role in the Allied strategic bombing campaign. His bombers were produced not only in Italy, but also in France, Great Britain and the United States.

In late 1914 Caproni designed the Ca. 31, powered by three Gnome rotary engines. The following year, Caproni produced a new version, the Ca. 32. Very similar to the Ca. 31, it had three FIAT 100-hp water-cooled in-line engines. Three months after Italy's entry into WWI, the first Ca. 32s attacked an Austrian air base at Aisovizza, and by the end of the year, regular raids were being mounted against other Austrian targets.

Caproni continued to refine his successful design with the introduction of the Isotta-Fraschini powered Ca. 33. Toward the end of the war the definitive version, the Ca. 36, went into production. Changes from the Ca. 33 were small but included five-section wings that made disassembly and surface transportation easy. Ca. 36s remained in Italian Air Force service as late as 1929.

Restored by museum specialists, the museum obtained the Ca. 36 on display from the Museo Aeronautica Caproni di Taliedo in Italy in 1987.

TECHNICAL NOTES:

Armament: Two Revelli 6.5mm machine guns and 1,764 lbs. of bombs Engine: Three Isotta-Fraschini V.4B 150-hp water-cooled, 6-cylinder Maximum speed: 87 mph Range: 372 miles Ceiling: 14,765 ft. Span: 74 ft. 7 in. Length: 36 ft. 3 in. Height: 12 ft. 7 in. Weight (loaded): 8,820 lbs. Fuel capacity: 166 gallons Oil capacity: 13 gallons Crew: Four

De Havilland DH-4



DE HAVILLAND DH-4

The DH-4 was an ever-present element of the U.S. Army Air Service both during and following World War I. When the United States entered WWI in April 1917, the Aviation Section of the Signal Corps only had 132 aircraft, all obsolete. Modeled from a combat tested British De Havilland design, the DH-4 was the only U.S. built aircraft to see combat during WWI. With inadequate funding to buy new aircraft, the newly created U.S. Army Air Service continued to use the DH-4 in a number of roles during the lean years following the war. By the time it was finally retired from service in 1932, the DH-4 had been developed into over 60 variants.

The Great War

During WWI, the Air Service used the DH-4 primarily for day bombing, observation and artillery spotting. The first Americanbuilt DH-4 arrived in France in May 1918, and the 135th Aero Squadron flew the first DH-4 combat mission in early August. By war's end, 1,213 DH-4s had been delivered to France.

Unfortunately, the early DH-4s had drawbacks, including the fuel system. The pressurized gas tank had a tendency to explode and a rubber fuel line under the exhaust manifold caused some fires. This led to the title "The Flaming Coffin," even though only eight of the 33 DH-4s lost in combat by the United States burned as they fell. Furthermore, the location of the gas tank between the pilot and observer limited communication and could crush the pilot in an accident.

Perhaps the most notable mission flown in the DH-4 was the brave attempt by 1Lt. Harold Goettler and 2Lt. Erwin Bleckley of the 50th Aero Squadron to find and assist the famed "Lost Battalion" on Oct. 6, 1918. During a resupply mission to this surrounded unit, their DH-4 was shot down. Both men were posthumously awarded the Medal of Honor.

DH-4 Production

Of the three U.S. companies that built the DH-4 during WWI, the largest producer was the Dayton-Wright Co. of Dayton, Ohio. The Air Service ordered over 12,000 DH-4s, but a number of problems kept initial production figures low and construction quality poor. The many changes involved in converting the design to American production standards, along with the use of the American Liberty 12-cylinder engine rather than the Rolls Royce engine of the British model, contributed to early production delays.

As the months of 1918 passed, however, quantity and quality improved considerably. By the end of the war, Dayton-Wright delivered 3,106 DH-4s, while the Fisher Body Division of General Motors built 1,600 and the Standard Aircraft Corp. added another 140, bringing the total to 4,846. The remaining 7,500 DH-4s still on order were cancelled.



EBERHART SE-5E

When the United States entered World War I, plans called for American manufacturers to mass produce aircraft already in use by the Allies. One of the fighters chosen was the British S.E.5A, designed by the Royal Aircraft Factory. The prototype S.E.5 first flew in December 1916, and deliveries of an improved version, the S.E.5A, started in March 1917. Noted for its strength, stability and speed, the S.E.5A rivaled the Sopwith Camel as the most successful British fighter of WWI.

For its pilots already in Europe, the American Expeditionary Force bought 38 S.E.5A aircraft from Great Britain, and in the United States, the government placed orders with the Curtiss Aeroplane and Motors Corp. The Armistice halted production after Curtiss had completed only one S.E.5A, but 56 more were constructed from components shipped from Great Britain. In 1922 the Eberhart Steel Products Co. received a contract to rebuild 50 of the Army Air Service's S.E.5A aircraft using 180-hp Wright-Hispano "E" engines. The Army Air Service used these aircraft, redesignated the SE-5E, for advanced training.

The museum acquired the SE-5E through a donation by the estate of Lt. Col. William C. Lambert, USAF Ret. A WWI ace with 21.5 victories, Lambert flew the S.E.5A as an American member of the Royal Flying Corps and the Royal Air Force. The Air Force Museum Foundation also helped buy the aircraft. It is painted to represent an SE-5E of the 18th Headquarters Squadron, Bolling Field, Washington, D.C., in 1925.

TECHNICAL NOTES:

Armament: None Engine: Wright-Hispano "E" of 180 hp Maximum speed: 122 mph Range: 225 miles Ceiling: 17,000 ft. Span: 26 ft. 9 in. Length: 20 ft. 11 in. Height: 9 ft. 6 in. Weight: 2,100 lbs.

Eberhart SE-5E Cockpit



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More Resources

Additional Teacher Resources are available online at http://www.nationalmuseum.af.mil/education/educators/index.asp



