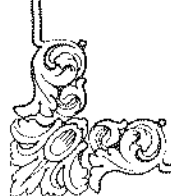


Red BaronTM

Part 2 Historical Flight Reference

Aircraft



THOSE NOT-SO-FRAGILE CRATES

"I heard the rattle of machine guns...and saw bullet holes appear as if by magic in the wings of my machine."

— William A. Bishop, Canadian ace

To look at a cutaway drawing of a World War I fighter is to see a simple, somewhat dainty skeleton, which makes it all the more surprising that they sometimes returned safely—albeit perforated with dozens of bullet holes.

Often the very simplicity of the aircraft saved them from being shot down. They were made of wood or aluminum frames, usually covered with silk or fine linen coated with a flammable varnish.

This skin provided little resistance to a bullet. An entire burst might pass harmlessly through a wing or fuselage if a spar or control cable wasn't damaged.

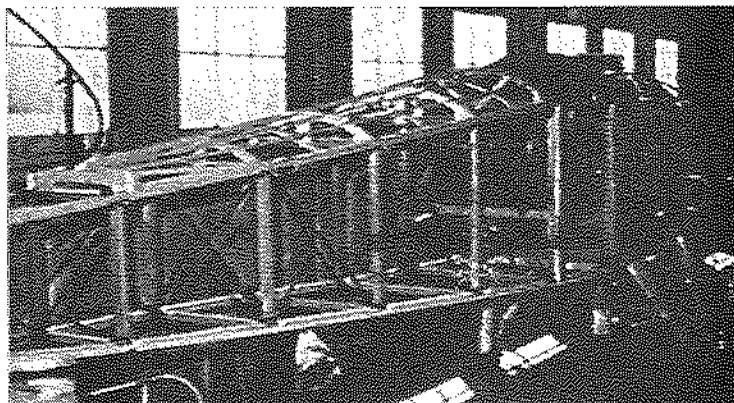
Most pilots required hundreds of rounds of ammunition to bring down an enemy aircraft. The most vulnerable areas of the early airplanes were the engine, the fuel tank and the pilot. Invariably these key targets were grouped closely together, so that the attacker's aiming point was the front half of the fuselage. Pilot Arthur

Gould Lee made a convincing case for the toughness of these "fragile" aircraft in a letter he wrote June 2, 1917. Flying at 15,000 feet just east of Ypres, he was hammering away on his jammed machine gun when his Sopwith Pup was jumped by six Albatros D.IIIs:

"I heard a loud and rapid crack-ak-ak-ak-ak-ak. I saw and smelt tracers whizzing by me, and there was a splash on the instrument board as my height indicator became a tangle of metal."

He dived away. The Germans followed, guns blazing, until his speed was so great that they broke off fearing their wings would fold.

■ The internal framework of a W.W.I. Scout. Most were made of wood, but some had steel tubing for their skeleton.



Courtesy National Air and Space Museum, Smithsonian Institution

"Then Archie woke up and let me have it. I was still only at 3000 feet, and was hit half a dozen times, as I later found."

Finally he landed at his base where his mechanics went over the Pup.

"Though 12 guns had fired at me at their leisure, my

rigger could find only 29 bullet holes—17 in the fuselage, the rest in the wings.

"At first I concluded that the bullet which had smashed the height indicator must have traveled right through me without my noticing it, but when I took off my muffler I found it had gone through that and my flying-coat collar....So I've used up two or three of my nine lives."

The Father of the Royal Air Force

By every estimate, Hugh Trenchard was an amazing man. In 1900 he went to South Africa and fought in the Boer Wars. While there, a wound in his lung paralyzed him from the waist down. Thoroughly disgusted with doctors and hospitals, he set off for Switzerland and learned to bobsled. Absolutely

reckless, his hijinks in the Alps earned him several wild crashes. Incredibly, after one such crack-up, Trenchard regained the use of his legs.

In 1912 he learned how to fly and transferred to the Royal Flying Corps at age 40. He rose through the ranks and gained com-

mand of the R.F.C. in 1915. Trenchard was a fervent believer in the cult of the offensive, as were most French and British generals. He adopted the principles of attack for the R.F.C. British pilots throughout the war invaded German airspace on routine offensive patrol. Trenchard's men always carried the war

to the enemy, and while the R.F.C. suffered near-crippling casualties, it managed to gradually wear-out the German Air Service. It was through his efforts that the Royal Flying Corps became a separate service called the Royal Air Force in 1918. (During most of the war, the air service was nothing more

than a branch of the army, like the artillery or supply branches.)

After the war, Trenchard remained the head of the Royal Air Force. Through his determination, it remained independent from the other services. He retired in the late 1920's.

THE EVOLUTION OF THE FIGHTER

The eleven years between the first powered flight at Kittyhawk, N.C., and the outbreak of the First World War witnessed a rapid development in aviation technology. In 1903 the Wright brothers were able to fly a distance of only 120 feet. Six years later a Frenchman named Louis Blériot flew across the English Channel from Calais to Dover. The first use of an airplane during war occurred in 1912, when Italy used aircraft for observation purposes during their dispute with Turkey. That same year, the airplane was used for observation and bombing during the Balkan Wars.

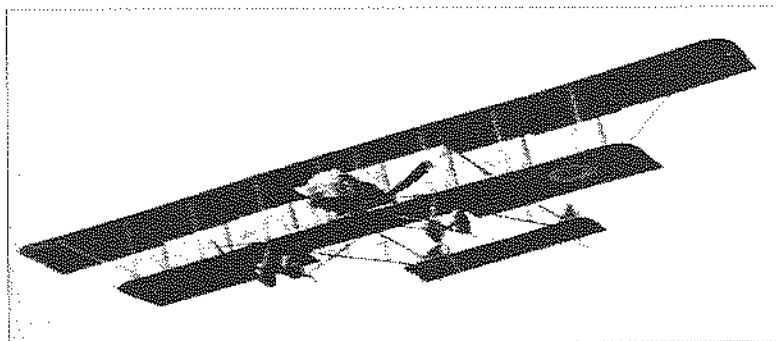
formed air units as an auxiliary to their armies. By 1910, France employed 30 aircraft. Great Britain formed the Army Air Battalion in 1911 with 5 aircraft. Germany, not wishing to be left out, began to seriously form an air service in 1912. By August of 1914, Germany had the largest air service with 232 aircraft compared to England's 113 aircraft and France's 138 aircraft.

At first the airplane was used in a reconnaissance role to scout enemy positions and troop movements. It also proved very useful for artillery spotting. Occasionally pilots dropped small hand-held bombs on troop concentrations or supply lines.

The first months of the war were marked by peaceful exchanges in the air. Opposing aircrews were known to give friendly salutes or waves as they passed each other in the air. But aircrews quickly realized that the enemy they were waving to was gathering important tactical information, endangering their comrades.

Two-seater aircraft started carrying all kinds of weapons. Some pilots actually dropped bricks on enemy aircraft. Others resorted to using revolvers or shotguns. Obviously such weapons were virtually useless in the air. Even so, some aircraft were actually downed by these methods.

■ An early French Farman used later in the war as a trainer.

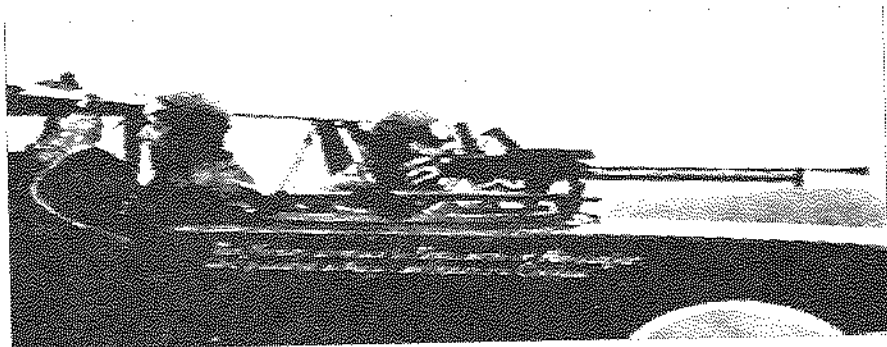


Courtesy National Air and Space Museum, Smithsonian Institution

At the beginning of the First World War the potential of the airplane in warfare was still unrealized. Prior to the outbreak of the war, the major powers of Europe

Cockpit close-up of a Bristol fighter and its Lewis gun firing rearward.

Flexible machine guns started appearing on two-seaters. The chances of downing an enemy aircraft were poor at best, partially because the field of fire was restricted and pilots had a rough time keeping their aircraft in position for good firing passes.



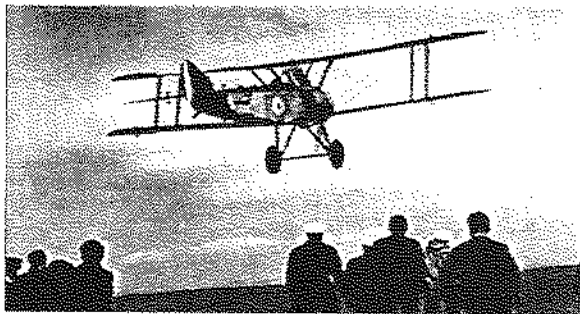
Courtesy: National Air and Space Museum, Smithsonian Institution

The only reasonable solution to the problem was to mount a forward-firing machine gun. This would allow the pilot to fly and aim the gun at the same time. The gun is aimed by aiming the aircraft. There were three gun-mounting methods to consider. The first was to fix the gun to the fuselage in such a way that the gun fired through the propeller. The second was to attach the gun to the upper wing in order to fire over the propeller. The third was to mount the gun forward of the propeller.

The first successful attack with a forward-firing gun mounted on the fuselage came in April 1915. Roland Garros shot down five German aircraft with his specially fitted Morane scout. Garros was able to fire through the propeller due to the addition of deflection

plates on his aircraft's propeller. Most of his bullets passed between the rotating blades; those that did strike the propeller simply ricocheted off the deflector plates. Garros' success created panic among the German pilots *until* his aircraft made a forced landing behind German lines, allowing the Germans access to his secret weapon. It became apparent to both sides that Garros' innovation could use some improvements.

After examining Garros' aircraft, the famous Dutch inventor Anthony Fokker developed the interrupter gear. This allowed a gun to be intermittently-timed to fire through the propeller without striking the blades. The Germans quickly employed this device on their Fokker Eindeckers. Later the English



Courtesy National Air and Space Museum, Smithsonian Institution

■ Above: A Sopwith Pup taking off from an aircraft carrier. The Pup was the first scout to achieve such a feat.

Right: The Rugged Pfalz D.III which made up about 25 percent of the German Air Service's scout strength in 1918.

introduced the D.H.2 fighter which relied on the "pusher" configuration, which placed the engine behind the pilot and his machine gun. This enabled the D.H.2 to have a forward firing gun. The French opted to mount a Lewis gun atop the upper wing of their

Nieuport scouts in order to fire over the propeller. The British did this later as well.

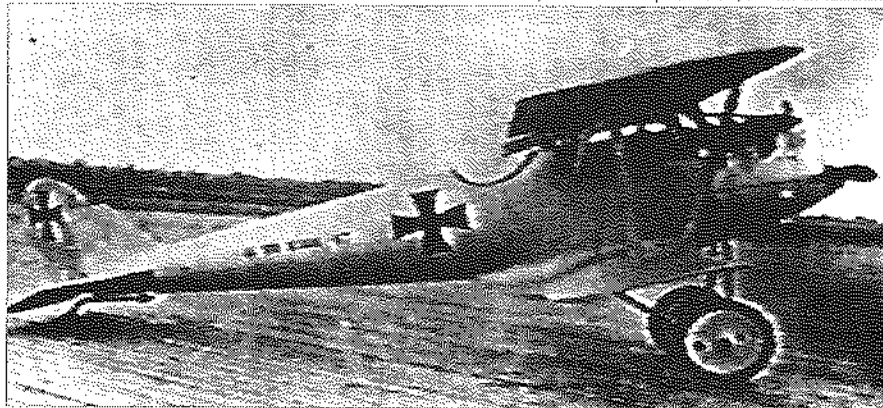
During the latter half of 1915, the Fokker Eindeckers were used with much success. This period, lasting through the early summer of 1916, is called the "Fokker Scourge" by historians. During these critical months several famous German aces began their careers, including Oswald Boelcke and Max Immelman.

Boelcke and Immelman developed the first air-combat tactics during this period. Max Immelman is generally credited with inventing the Immelman maneuver. This allowed a fighter to make successive passes at an enemy aircraft. Boelcke, on the other hand, discovered an effective means of downing an

aircraft. Boelcke would move in as close as possible to his target before firing into it, ensuring that he hit the target and conserving ammunition.

Boelcke is often called the father of air-combat tactics. He quickly formulated some basic principles which became known as *Boelcke's Dicta*. He helped

Courtesy National Air and Space Museum, Smithsonian Institution



form one of the first operational Jastas—squadrons consisting solely of fighters. Jastas patrolled an assigned area and destroyed any enemy aircraft encountered. In August 1916, the first seven Jastas were formed. Each Jasta consisted of 6 single-seat fighters, which later increased to 12 aircraft.

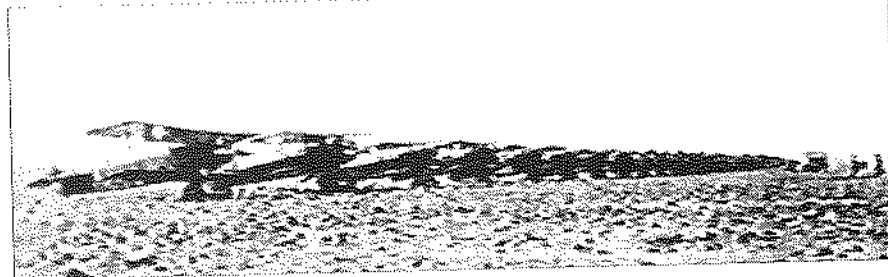
The development of German tactics and organizations continued after Boelcke's death (October 28, 1916). During the summer of 1917 the Jastas were concentrated into Jagdgeschwadern (fighter wings) consisting of three or four Jastas. The first Jagdgeschwader, J.G.1, was led by Manfred von Richthofen, the "Red Baron." At the same time the Germans were looking for better ways to gain air superiority over specific sections of the front. Having a highly developed rail network, the German staff came up with the idea of transporting fighter

squadrons by rail to areas of the front where they were most needed. In addition, von Richthofen had his squadron's planes painted with exotic schemes as a means to better identify his pilots in battle (von Richthofen's plane was red). This idea was soon adopted by other Jagdgeschwadern. Because they often travelled by rail, and because of the wild color schemes on their aircraft, J.G.1 became known as "the flying circus."

Meanwhile, the French reorganized their air service and formed the successful Escadrilles de Chasse during the battle of Verdun. Four Escadrilles later formed a group called "Les Cigognes"—the Storks. This elite unit included the famous French ace Georges Guynemer. Another famous unit, the Lafayette Escadrille, consisted of American volunteers.

The English organized their own scout squadrons in early 1916. The success of the Fokker Eindeckers led to the English realization that the two-seater aircraft would have to be escorted by scouts. At first, one or

Courtesy National Air and Space Museum, Smithsonian Institution



■ A Jasta of Fokker D.VIIs lined-up for takeoff.



Courtesy National Air and Space Museum, Smithsonian Institution

■ A pilot relaxes between missions.

two scouts would be attached to a two-seater squadron. Later pure fighter squadrons of 12 aircraft were organized to protect the two-seaters and hunt German planes.

Early in 1916 the British began to experiment with formation flying. Line Abreast, Line Astern, and Echelon were the most common formations. Of these three, Line Abreast appeared to be the best,

but as the war progressed both the Allies and Germans discovered that a "vee" formation was superior.

During the spring of 1916 the English received the D.H.2 scout, which helped end the Fokker Scourge. Later in 1916 the British introduced new types of aircraft, including the Sopwith Pup. With these new types, along with the Nieuport 17, the British gained air superiority during the Summer of 1916.

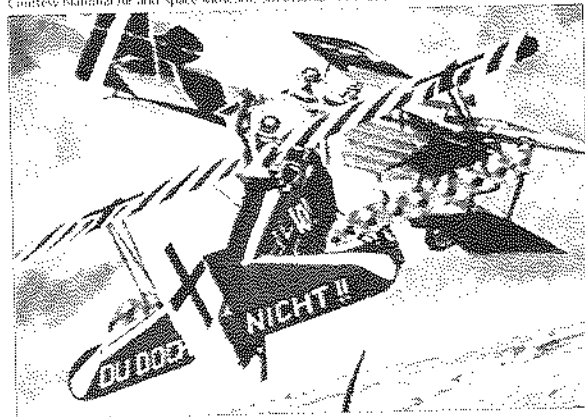
The Germans also developed new aircraft, which were superior to their Allied contemporaries. In particular, the Albatros D.III helped the Germans quickly regain air superiority, which they held until the middle of 1917. April of 1917, known as "Bloody April" to the British, was one of the greatest ordeals ever endured by the R.F.C./R.A.F. The Allied two-seater aircraft were easy prey for the Germans. Aircrew losses totaled 40 percent of the total R.F.C. strength.

New aircraft appeared on both sides during 1917. The French deployed the Spad 7 in mid 1916, which was superseded by the Spad 13 in 1917. The Spads proved extremely rugged and fast. Their only drawback was that they were less maneuverable than the German scouts. The British introduced the

S.E.5a and the Sopwith Camel. The S.E.5, like the French Spad, was a fast and durable aircraft. The Sopwith Camel proved to be very agile, especially at lower altitudes. The Germans introduced the Albatros D.III and D.V variants, as well as the new Fokker Triplane, which became a favorite of many German aces. Although slow, it possessed marvelous maneuverability. Famous aces such as Manfred von Richthofen, Werner Voss, and Ernst Udet flew the Fokker Triplane.

During 1918 the Royal Air Force (formed from the combined R.F.C and R.N.A.S. in April 1918) developed the concept of Combined Offensive

Courtesy National Air and Space Museum, Smithsonian Institution



■ Udet parachuting out of his Fokker D.VII. The German phrase on the elevators translates, "Certainly not you!"

Patrols. Two to four squadrons would fly together to perform missions. Not all of the squadrons would be of the same aircraft type. For instance, one squadron might consist of Camels, while another might consist of S.E.5s and another might be made up of Bristol F.2bs. A Combined Offensive Patrol would exploit the best qualities of each aircraft by flying them at different levels. The S.E.5s would fly at a higher altitude than the Camels, being better suited to combat at higher altitudes; the Bristol F.2bs would fly at lower altitudes. This allowed them to perform ground attack or bombing missions. The German formations faced a dilemma in attacking a Combined Offensive Patrol. If they attacked a lower squadron, the other squadron would dive upon the attacking German aircraft. This placed the Germans at a disadvantage. If the Germans attacked the higher squadron, the lower squadrons would be able to continue the mission at hand.

The German formations grew larger throughout the war. Beginning in late June 1917, they would at times fly in strengths of 40 to 50 aircraft. By the end of the war the Germans increasingly flew in Jagdgeschwader strength. When a Jagdgeschwader and a Combined Offensive Patrol met huge dogfights developed.

■ A Spandau machine gun in a Fokker D.VII.

Even though huge formations would end up dueling each other, these battles usually broke up into a series of one-on-one encounters. Duels between small units would sometimes become large dogfights as other aircraft from both sides would spot the air battle (the smoke from downed aircraft was visible for miles) and join the fray.

In May 1918, the Germans began to employ a new fighter—the Fokker D.VII. This aircraft was the best fighter of the First World War. The Fokker D.VII became the main fighter of the Germans until the end of the war.

Many new types of aircraft were still being designed when the war ended. The Germans had been developing the Fokker D.VIII, which was an extremely agile monoplane. In addition, the Germans had just introduced the Siemens-Schuckert D.IV interceptor. This particular aircraft

possessed an extremely fast rate of climb. The British produced the Sopwith Snipe to counter the Fokker D.VII. Few of this type, however, saw action



Courtesy National Air and Space Museum, Smithsonian Institution

during the final months of the war. The United States' aircraft industry began developing combat aircraft of their own design, although most were inferior to their European counterparts.

By the end of World War I, the fighter had come of age. The fundamentals of air combat had been laid down through bloody trial and error. The lessons they learned still hold true today.

AIRCRAFT ENGINES OF WWI

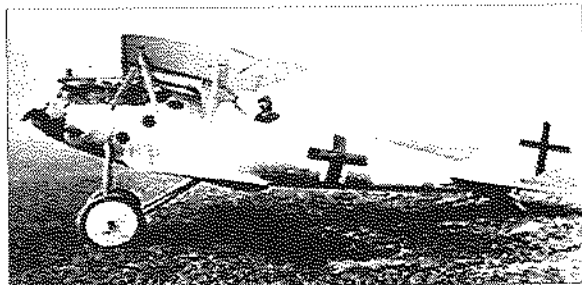
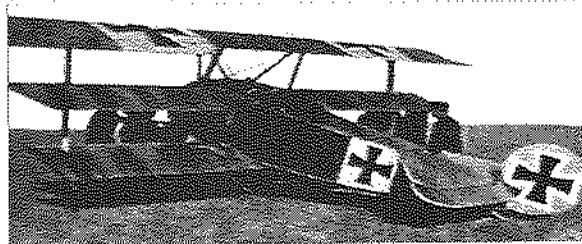
Two main types of power plants equipped the aircraft in World War One.

- Right: The Pfalz D.III used an in-line engine.
- Below: The Fokker Dr.I used a rotary engine.

The rotary engine was an air-cooled device used in many of the scout aircraft. Small and lightweight, the rotaries made excellent power plants for nimble scouts. Generally, a rotary-equipped aircraft was very maneuverable, but a little under-powered. Most air-frames with snub noses are rotary powered airplanes. Aircraft with rotary engines exhibited some strange flight characteristics. The rotary engine actually rotated with the propeller around the crankshaft. This huge spinning mass of metal creates what is known as the gyroscopic affect. An aircraft with a rotary engine will try to nose down in a right-hand turn, and will nose up in a left-hand turn.

This effect was most pronounced in the Sopwith Camel. Many novice Camel pilots would make a

Courtesy National Air and Space Museum, Smithsonian Institution



Courtesy National Air and Space Museum, Smithsonian Institution

right-hand turn once they got airborne. This would send them straight into the ground.

The other major powerplant type was the in-line, water-cooled, automobile-style engine. These were fitted to most observation aircraft, as well as a significant number of fighters. They were more powerful than rotaries. Unfortunately, they were very heavy. Any airframe mounting one would not be as maneuverable as a rotary-powered plane. They could usually climb very well, however. One disconcerting factor the in-lines possessed was a radiator. Occasionally, if the radiator was hit, the pilot would be severely scalded as boiling water splashed on him. Later in the war this was solved by placing the radiator in a location away from the cockpit. Many in-line powered airplanes had rounded noses as their distinguishing characteristic.

THE MACHINE GUN

The invention of the machine gun precipitated the slaughter in the trenches during the First World War.

Stemming from designs of the late 1800's, the machine guns could fire at a rate of 600-1000 rounds per minute. The British and French mounted both the Vickers and Lewis guns on their aircraft, while the Germans used the Parabellum and the Spandau in theirs.

The Lewis and the Parabellum were both drum-fed guns which, under combat conditions constantly needed reloading. The early Lewis gun held only 47 rounds. Later versions could carry about a hundred, but reloading in the middle of a dogfight was a hazardous prospect at best. The Parabellum was similar to the Lewis gun except it was used almost exclusively by two-seater gunners. The name stems from the Latin

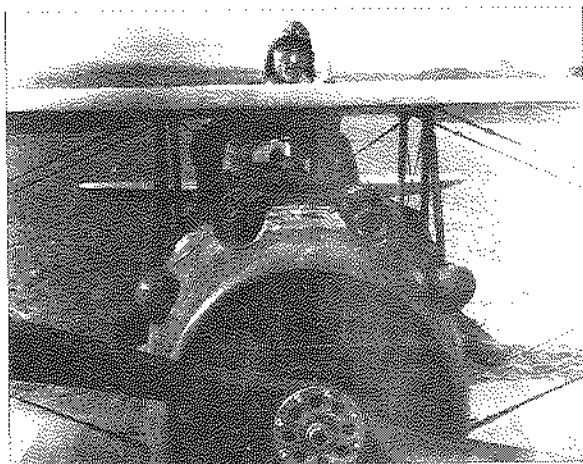
proverb, "Si vis pacem, para bellum," which means, "If you wish for peace, prepare for war."

All of the German fighters produced during the war were armed with Spandaus. Both the Vickers and the Spandau were air-cooled, belt-fed derivations of the late nineteenth-century Maxim gun. Usually fighters on both sides could carry about 500 rounds for each Vickers or Spandau they carried.

In combat several problems materialized with these guns. All of them were prone to jams of one sort or another, usually occurring when the pilots fired long bursts. Good pilots learned to snap out quick bursts, conserving ammunition and keeping their weapons from jamming. Pilots often carried small mallets to whack the guns with if they jammed.

The other major problem with the early machine guns was their inaccuracy. Even on the ground they weren't very precise weapons. In the air, this flaw was compounded by the instability of the aircraft. The aircraft vibrated, wind buffeted it about, and the pilot had nothing but a steel ring to guide his aim. All of this served to make aerial gunnery a very difficult art, which few mastered. Skilled pilots did not take any chances, and would sometimes close to within 20 yards to ensure victory. Maximum accurate

■ The business end of Eddie Rickenbacker's Spad 13.



Courtesy National Air and Space Museum, Smithsonian Institution

range was never longer than 100 yards for these weapons.

Werner Voss and Rene Fonck were arguably the best aerial shots of the war. Voss used his talent to spare the crews of his two-seater victims by aiming for the engine. This gave the Allied pilot a chance to glide to a safe landing. Fonck, on the other hand, used his marksmanship to down German planes with the lowest possible expenditure of ammunition. He was renown for scoring victories with less than 20 bullets. Most pilots, von Richthofen included, used between 100 and 500 rounds to bring down their opponents.

Flight

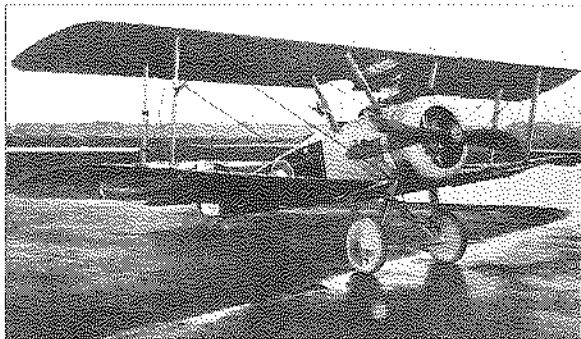


A BRIEF HISTORY OF FLIGHT

For centuries men dreamed of one day being able to fly through the sky like the birds. Many dreamers, such as Leonardo da Vinci, attempted to conquer the mysteries of flight. Da Vinci even went so far as to draw sketches of birds in flight and proposed flying machines based on these drawings. In 1783, two Frenchmen, the Montgolfier brothers, made a balloon that carried the first men in free flight. The success of the balloon led to continued development of this craft. During the American Civil War balloons were used by the Union army for observing the battlefield.

until 1903 that the first powered flight occurred. Two American brothers, Orville and Wilbur Wright, had experimented with various glider designs. In 1903 they added a gasoline-powered engine to a

■ Two legendary products of Thomas Sopwith's factory: below, the Camel; below right, the Triplane.



©Imperial War Museum, London



©Imperial War Museum, London

Meanwhile, other inventors turned their attention to gliders. In 1804 an English inventor, Sir George Cayley, invented the first glider. During the 1890's Otto Lilienthal of Germany continued to develop the glider.

During the late 1800's various inventors attempted to invent powered aircraft. The most common approach involved the application of a steam engine. But steam engines were much too heavy. It wasn't

bi-winged plane and flew 120 feet. Development continued throughout the first decade of this century. Alberto Santos-Dumont developed an aircraft patterned after a box kite and became the first person in Europe to fly. In 1907, Louis Bleriot developed the first monoplane complete with a tail for balance at the rear.

THE PHYSICS OF FLIGHT

There are four basic forces acting upon an aircraft in flight: lift, thrust, gravity and drag.

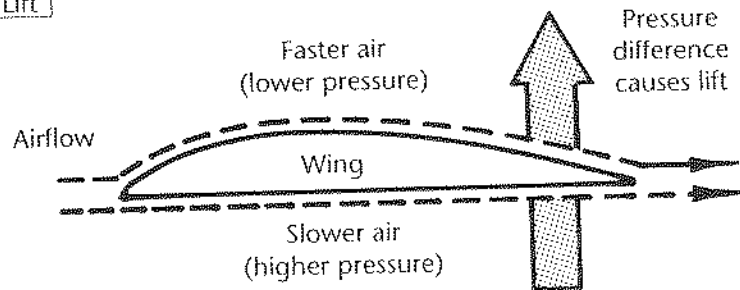
Lift is achieved through the design of the wing. As an aircraft moves, air flows over the surfaces of the wing. Wings have a special shape that forces the air to move faster over the top of the wing than on the bottom. This creates more pressure on the bottom than on the top. Known as the Bernoulli effect, this air pressure difference pushes up on the bottom of the wing, and lift is generated.

The angle at which the wing meets the airflow also affects the amount of lift generated. As this angle (known as the angle of attack) increases, more lift is created. However, if the angle of attack is too great, the air flowing above the wing will be disrupted, causing a sudden decrease in lift. This condition, a stall, occurs when the aircraft is either flying too slowly, or flying at too steep of an angle. When an aircraft stalls, the sudden loss of lift will

force it into a dive. This is especially dangerous if the aircraft is at a low altitude. The aircraft will recover from a stall when it has regained sufficient airspeed.

Increasing airspeed increases lift. The more airspeed, the greater the difference between the air pressure above the wing and below, creating more lift.

Lift

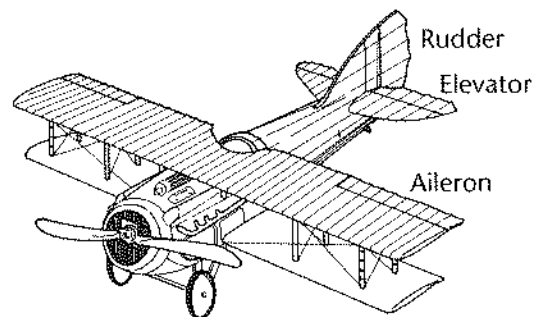


Thrust is generated by the rotation of the propeller. Propeller blades are curved in the same way as wings. However, instead of lift being generated (ie., a movement upward), thrust (a movement forward) is created. To create more thrust, increase your throttle. Generally more throttle will increase your airspeed.

Drag is the friction caused by the aircraft's surfaces moving through the air. The more streamlined an aircraft, the less drag produced.

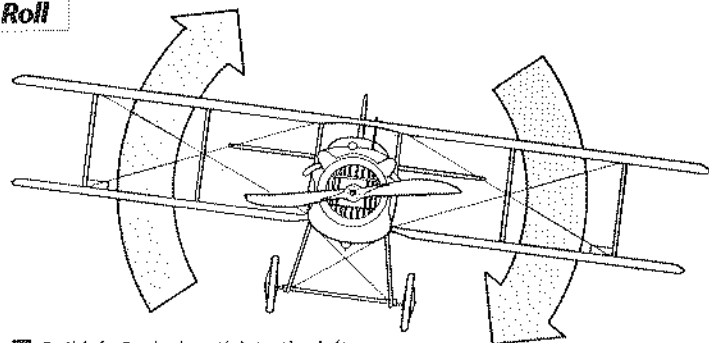
When an aircraft is in level flight at a constant airspeed, all four forces (lift, thrust, gravity, and drag) are in balance.

The control surfaces of the aircraft are used for maneuvering it. With these control surfaces, the pilot can perform three basic movements: pitch, roll and yaw.



■ Control Surfaces on an aircraft.

Roll



■ Roll left: Push the stick to the left

Pitch is the rotation of the aircraft up or down. Roll is the motion of the aircraft banking left or right. Yaw is the motion of the aircraft rotating either left or right.

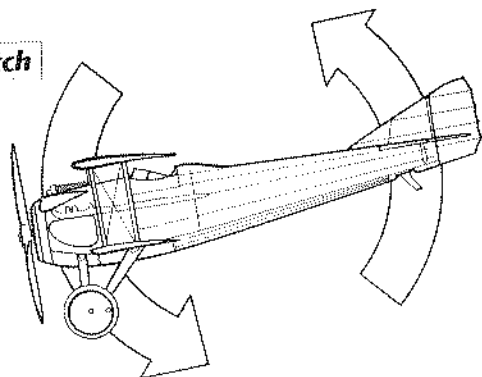
The "elevators" are located on the tail assembly, and control the aircraft's pitch. When the elevators move down, the nose will pitch down, and vice-versa.

The pilot controls the elevators with the stick. To nose the aircraft down, push forward on the stick. Pulling back on the stick will pull the nose of the aircraft up.

The rudder is located on the tail assembly. It controls the aircraft's yaw. When you move the rudder left or right, your aircraft's nose will yaw in the corresponding direction.

The ailerons, located on the wings, control the rolling motion of the aircraft. When the left aileron is raised or lowered, the right wing aileron moves in the opposite direction. This causes the aircraft to bank. The ailerons are controlled by the stick. To

Pitch



■ **Pitch down:** Push forward on the stick

bank to the left, move the stick to the left; to bank to the right move the stick to the right.

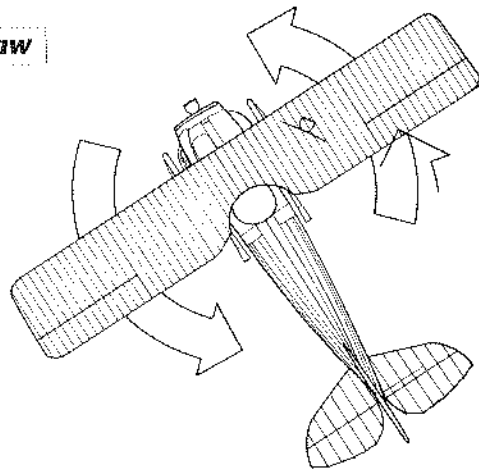
The throttle controls the rotation speed of the propeller. By increasing the throttle, the pilot increases the speed of the propeller, thereby increasing the speed of the aircraft.

The aircraft of World War One did not have flaps or brakes. Keep this in mind when you land.

Many of the WWI aircraft were equipped with rotary engines. The entire engine would spin along with the propeller. This huge spinning mass of metal caused a powerful, gyroscopic effect. This meant

that a rotary-equipped aircraft would try to nose down in a right-hand turn, and would attempt to nose up in a left-hand turn. Therefore left rudder had to be vigorously applied for both left and right-hand turns to keep the aircraft's nose level with the horizon. The Sopwith Camel had the most pronounced gyroscopic tendencies.

Yaw



■ **Yaw left:** Apply left rudder

BASIC FLIGHT SKILLS

■ An R.E.8 that has seen better days.

Climbing

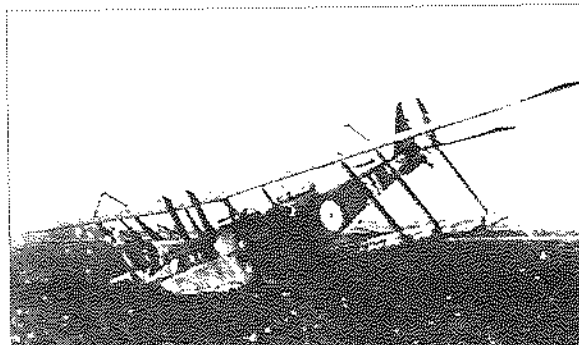
To begin climbing increase your throttle. Next, pull the nose of your aircraft up. This increases the angle of attack of your wings, increasing lift. Be careful not to bring the nose up too far or your aircraft will stall. To achieve the best climb rate use full throttle with your aircraft's nose about 20 degrees above the horizon.

Descent

To descend you either decrease the throttle or nose down into a dive. If you wish to descend without gaining more speed, decrease the throttle. Your aircraft's wings will lose lift as you slow down, causing your aircraft to gently lose altitude. Nosing down your aircraft into a dive will greatly increase the speed of your aircraft. Be careful not to descend at too steep of an angle, or your wings may break.

Turning

Bank your aircraft by using the ailerons. This will cause your aircraft to slip sideways. Since the airflow will now strike the tail on one side more than the other, the aircraft will turn. Turning is *not* accomplished with the rudder, but with the ailerons. You also need to increase the throttle, as a turn will bleed off speed. The greater the bank, the faster the turn rate. More altitude is lost during a tighter turn,



Courtesy National Air and Space Museum, Smithsonian Institution

so keep your nose above the horizon during the turn. With the standard or expert flight model selected (see pg. F-8), you have to also apply a little rudder and some back pressure (by pulling back on the stick) to maintain a good turn.

The Take-Off

The take-off procedure is performed a little differently for World War One aircraft than for modern aircraft. The aircraft of World War One were tail draggers—they were equipped with a tail skid rather than a wheel. First, apply full throttle. When the aircraft has picked up speed, push the stick forward. This will lift the tail off the ground. Be careful to avoid pushing too far forward on the stick, or you may find your propeller plowing into the ground! Now that the tail

■ A huge Allied formation buzzing an aerodrome.

is off the ground, the aircraft is more streamlined and will gain speed rapidly. When your aircraft gets up to about 40 mph, gently pull back on the stick to lift your aircraft into the air. Do not attempt to climb at too steep of an angle or your aircraft will go into a stall (with no room for recovery!).



Courtesy National Air and Space Museum, Smithsonian Institution

Landing

When you begin the landing procedure, reduce the throttle. Approach the landing field with as little speed as possible (it is best to be slightly above stall speed). As you get close to the landing area, bring the nose of the aircraft up and reduce throttle some

more. Keep the nose of your aircraft up, which allows you to come in at a lower speed. Do not try to land with your nose below the horizon. The best landing is a three-point landing—that is, when the wheels and tail skid all meet the ground simultaneously.

Recovery from a Stall

Allow your aircraft to nose down. Don't fight the stall by pulling back on the stick. When the aircraft picks up enough speed, it will recover from the stall. Pull back on the stick gently to level out.

Recovery from a Spin

A spin is a very nasty type of stall. Your aircraft will go into a spin when one wing stalls before the other. This immediately forces your aircraft to spin very rapidly. The natural instinct of a pilot is to fight the spin by applying opposite aileron. Unfortunately, this only makes the spin worse (many World War One aviators died this way). The safest way to recover is to let the stick return to the neutral position. Your aircraft will eventually stabilize itself. If you wish to come out of a spin more quickly, move the ailerons as if you were trying to roll the aircraft with the spin. But be careful—it's easy to get confused when you see the ground spinning around rapidly, and, consequently, move the stick to the wrong side!

FLIGHT MODEL SETTINGS

In Red Baron, novice pilots can experience the thrill of WWI air combat and veteran flight enthusiasts can be challenged. Also, as novice pilots progress in skill, they have the opportunity to learn more about flying. Red Baron has an option that allows you to choose the level of flight realism.

On the *realism menu*, you select the level of realism of the flight model. The settings are novice, standard and expert. Novice is the easiest to use, while expert is for experienced pilots.

On the novice setting, flying is easy. Turns are straight forward. If you bank the aircraft, it will turn. Your aircraft will lose little or no altitude, and it will not nose down.

On the standard setting, turning is modeled more realistically. You will lose more altitude in a turn than on the novice setting. In order to turn properly, you will have to apply back pressure (pulling back on the stick) to keep the aircraft turning and keep the nose above the horizon. Some rudder may be needed as well. Unlike novice, if you bank the aircraft without using back pressure or rudder, your turn will quickly degenerate into a slow, spiral dive. Landing is also more difficult.

The expert setting will test your flying abilities. Not only are turns modeled realistically, but the danger of going into a spin is also present. Your aircraft will be affected by wind gusts and turbulence. In addition, the various quirks of certain aircraft are included. For instance, the gyroscopic effect of the Sopwith Camel's rotary engine will make a simple turn a difficult, tricky maneuver. Too much stress on your aircraft's wings during a high speed dive and your wings may break!

Flight Maneuvers



FLIGHT MANEUVERS

Dive

Tape name: DIVE

In World War I, even simple maneuvers such as steep dives and climbs were considered acrobatic—not surprising since aircraft were prone to stall and many had structural flaws.

A steep dive can be used to get out of combat quickly, especially when your aircraft can dive safely at a higher speed than your pursuer's. Keep an eye on your altimeter and, if an enemy follows

you into the dive, jink your aircraft left and right with the rudder.

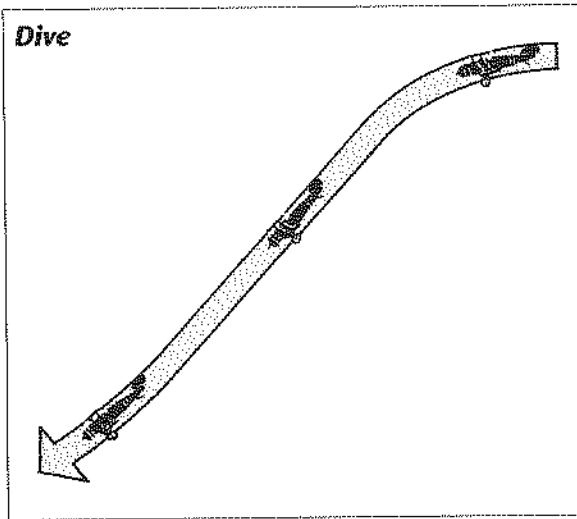
Diving is simple. Point the nose toward the ground and your crate will gain speed very quickly. Be careful because some aircraft have weak wings, and a high-speed dive may shear them off!

Zoom or Zoom-Climb

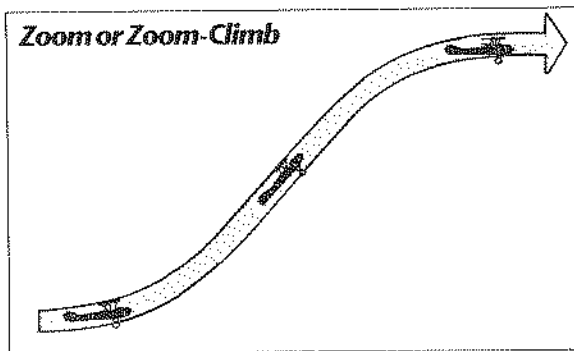
Tape name: ZOOM

A very steep climb at high speed, the zoom-climb is usually performed after a dive. Sacrificing speed for

Dive



Zoom or Zoom-Climb



higher altitude, it was used by the aviators of the Great War after they made a diving attack on an enemy aircraft to pull up beyond the reach of the enemy.

When zooming skyward, keep an eye on your airspeed. When it gets below 50 mph, level off before you stall your aircraft.

Barrel Roll

Tape name: BAR_ROLL

The barrel roll is useful for confusing an attacker on your tail.

Barrel Roll



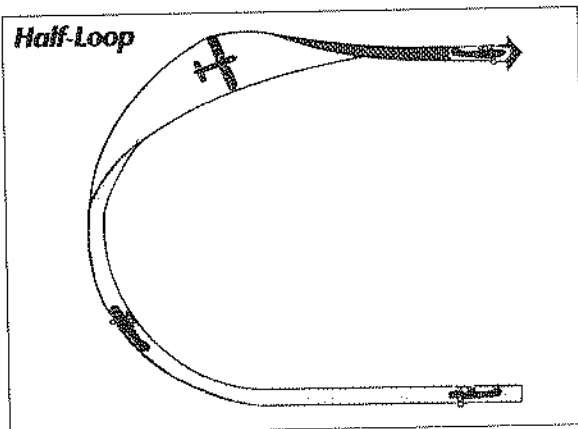
To perform a barrel roll, bank hard while pulling back on the stick slightly. Your aircraft will take a corkscrew path through the sky. Be warned—you will lose altitude.

Half-Loop

Tape name: HALFLOOP

Today this maneuver is called an Immelmann turn. However, in World War I the Immelmann turn was an entirely different maneuver (see next page).

Half-Loop



Perform a half-loop when you want to reverse direction and gain altitude. Use it when an enemy passes you going the other direction at a higher altitude.

Before starting a half-loop, make sure you have a lot of speed. Pull up as if you were going to loop, but begin rolling the aircraft before you reach the top of the loop. Level out when you reach the top.

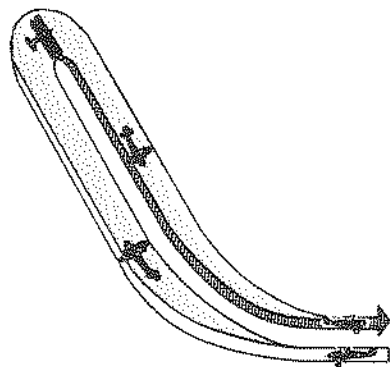
Immelmann Turn

Tape name: IMMEL

Also known as Renversement by the French pilotes de chasse, the World War I Immelmann turn was used frequently by Max Immelmann. After making a diving pass on an enemy, Immelmann zoomed up past the enemy aircraft, and before stalling used full rudder to bring his aircraft around. This put his aircraft facing down at the enemy aircraft, making another pass possible.

This is a difficult maneuver to perform properly. Pull up into a climb, apply full rudder as your speed drops, roll your aircraft and pull back slightly

Immelmann Turn



on the stick. With good timing, you will be diving back down in the opposite direction.

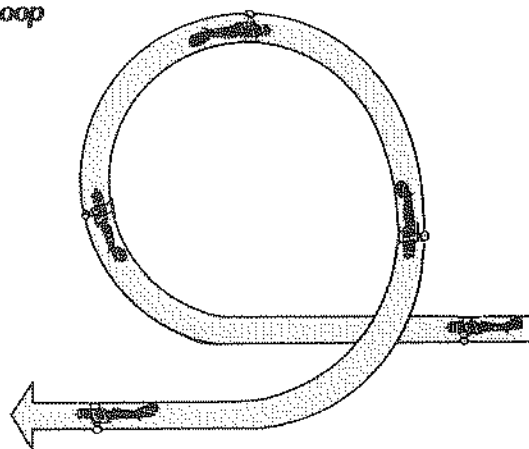
Loop

Tape name: LOOP

An impressive maneuver at an airshow, the loop is not very useful in combat. While looping, a pilot has no options until the loop is finished. In addition, you will lose a great deal of altitude.

Before starting a loop, make sure you have a lot of airspeed (generally accomplished by diving first) otherwise you'll stall halfway through the loop!

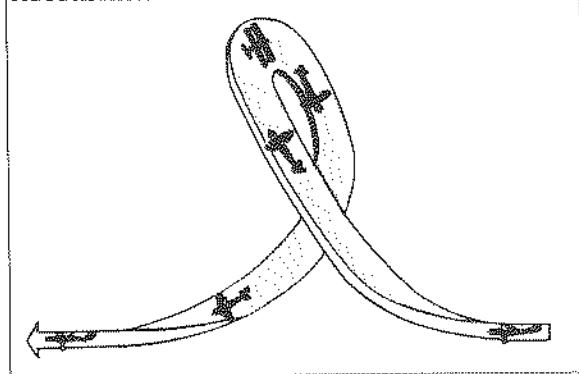
Loop



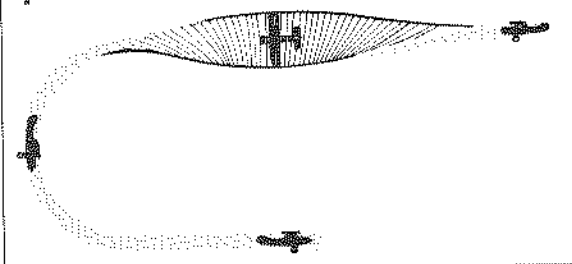
Retournment**Tape name: RETOURN**

This offensive maneuver is similar to the Immelmann. Continue to apply rudder and roll the aircraft after you have looped and come over the top. Instead of reversing direction, you'll be flying in the same direction you were going before you started climbing.

A retournment is used after a diving pass on an enemy. If the enemy continues in a straight path, not veering off to the side, a well-executed retournment will put you on the tail of your enemy.

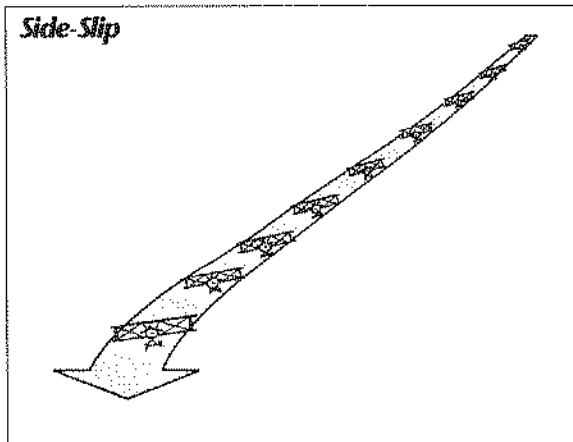
Retournment**Split-S****Tape name: SPLIT_S**

The split-s is an excellent way to escape an attacker on your tail. To perform a split-s, roll your aircraft until it's inverted, then pull back on the stick to perform the last half of a loop. When you level off, you may repeat this maneuver. Be aware that altitude is rapidly lost in this maneuver.

Split-S

Side-Slip*Tape name: SIDESLIP*

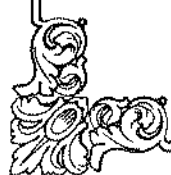
A side-slip is used to lose altitude quickly without gaining speed. To side-slip, dip one wing down and apply enough reverse rudder to keep your aircraft from turning. You may need to push forward slightly on the stick to maintain your heading.

**Slip-Turn***Tape name: SLIPTURN*

The slip-turn is a flat turn performed exclusively with the rudder. Unlike a normal banked turn, the slip-turn uses no ailerons.

Most aircraft cannot perform an effective slip-turn. However, the Fokker Triplane did not have a vertical stabilizer, and could yaw very quickly with hard rudder applied. Although the Triplane would slip during the turn, losing a great deal of speed, it could reverse direction in about half the time of other fighters performing a normal turn. To execute an effective slip-turn, don't bank your aircraft's wings.

Scout Tactics



BOELCKE'S DICTA

Boelcke's Dicta

1. Try to secure advantages before attacking. If possible, keep the sun behind you.
2. Always carry through an attack when you have started it.
3. Fire only at close range, and only when your opponent is properly in your sights.
4. Always keep your eye on your opponent, and never let yourself be deceived by ruses.
5. In any form of attack it is essential to assail your opponent from behind.
6. If your opponent dives on you, do not try to evade his onslaught, but fly to meet it.
7. When over the enemy's lines never forget your own line of retreat.
8. For the Staffel: Attack on principle in groups of four or six. When the fight breaks up into a series of single combats, take care that several do not go for one opponent.

The sky above the trenches was a deadly place to be. During Bloody April some British squadrons suffered 60 percent losses. During the more routine months of the war the attrition rate was still very high. Most novice pilots never lived long enough to call themselves veterans. Those who did survive month after month rarely showed any inclination to coach the new replacements.

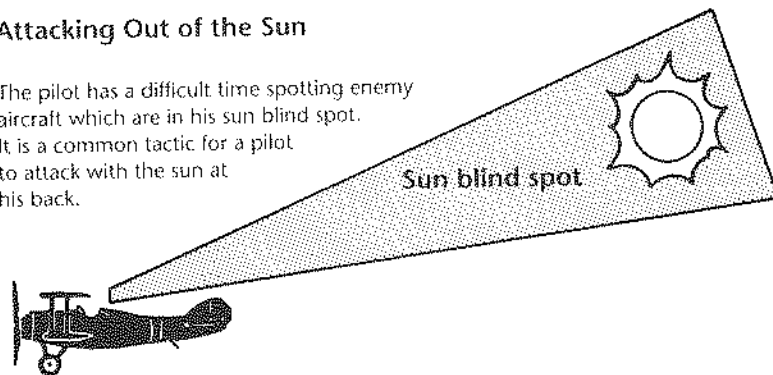
Oswald Boelcke was the exception. Boelcke possessed a rare combination of tactical brilliance and keen flying technique. Nothing escaped his eyes in the air, and as his experience grew, he began to teach his men how to survive in the air. Eventually, he put to paper his advice and circulated it among the Jagdstaffeln. His advice became known as *Boelcke's Dicta*. Its principles still form the foundation of fighter combat today.

1. Try to secure advantages before attacking. If possible, keep the sun behind you.

If you want to emulate the reckless fighting style of flamboyant pilots like Albert Ball or Lothar von Richthofen, attack before evaluating the situation. While you may score some spectacular victories, chances are you'll be flamed before the armistice.

Attacking Out of the Sun

The pilot has a difficult time spotting enemy aircraft which are in his sun blind spot. It is a common tactic for a pilot to attack with the sun at his back.



swoop down behind the target and attack before he can react. Unless you possess all three of these advantages (surprise, altitude and having the sun behind you), it is probably wise to avoid dogfighting against superior numbers.

Exercising caution, however, will increase your odds for survival. Before you attack, try to secure as many advantages as possible. Attack out of the sun, for it is every pilot's blind spot. Try to attack from a higher altitude. This way, you'll have the initiative as well as superior speed and momentum. The pilot below can only react to your moves, so you've forced him to defend himself, and not go on the attack. Surprising your foe is the best way to minimize risks to yourself. Sneak up on your opponents by staying above them and in the sun. Be patient, and when a favorable moment arises,

2. Always carry through an attack when you have started it.

Often a green pilot, in his first engagement with an enemy aircraft, will start a firing pass on an enemy aircraft only to get cold feet and try to disengage. This presents his tail to the enemy, and, more often than not, the novice is shot down. The key is to be aggressive. When you are in the air, commit to a target. Don't break off the attack until you've completed the firing run. Your aggressiveness will often frighten your opponent into making a mistake. Many a novice pilot will freeze up when an enemy is on his tail.

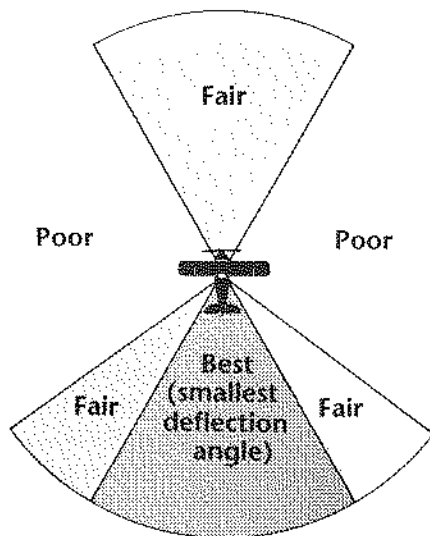
3. Fire only at close range, and only when your opponent is properly in your sights.

Machine guns from the Great War were terribly inaccurate weapons on the ground, let alone in the

air. Successful pilots closed to point-blank range before opening fire. When you find yourself in a dogfight, don't waste precious ammunition on long-range shots. Instead, choose your targets carefully, then close the range until you're within about 30 yards of your opponent. When you open fire, don't hold the trigger down too long. Snap out short, well-aimed bursts. Long bursts are likely to jam the machine guns and will waste ammunition.

Shot Selection—Best Areas to Attack From

The higher the deflection angle, the harder the shot. The best shot is from directly behind the target. The worst is from either side of it.



4. Always keep your eye on your opponent, and never let yourself be deceived by ruses.

Occasionally, a pilot who is outmatched will feign death by going into a seemingly uncontrolled spin. At treetop level, the pilot will pull-up, level off and head for home.

5. In any form of attack it is essential to assail your opponent from behind.

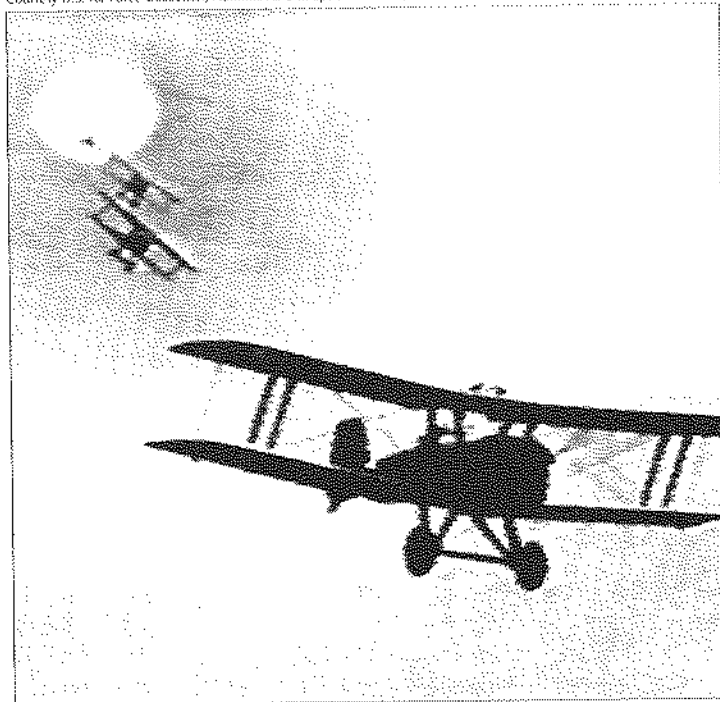
The art of deflection shooting was so difficult to master during the Great War, that many pilots didn't even bother to try. A few of the great aces, most notably Mannock and Fonck, successfully made deflection shots in combat.

■ Hundreds of aviators were flamed when they neglected their tail. "Beware of the Hun in the sun" was a common expression.

A deflection shot is made when the target aircraft is flying in a different direction than the attacker. To make a deflection shot, the attacker must lead the target since the target is not flying along the path of the bullets. For example, say you are traveling north

and your target is in front of you heading west. This is a 90 degree deflection shot, since the target is perpendicular to you. This is the most difficult shot to make. Deflection requires leading the target; how much to lead depends on the speed of the target and the angle of the shot. A 90 degree deflection shot demands a great deal of leading.

Courtesy U.S. Air Force Collection, National Air and Space Museum, Smithsonian Institution

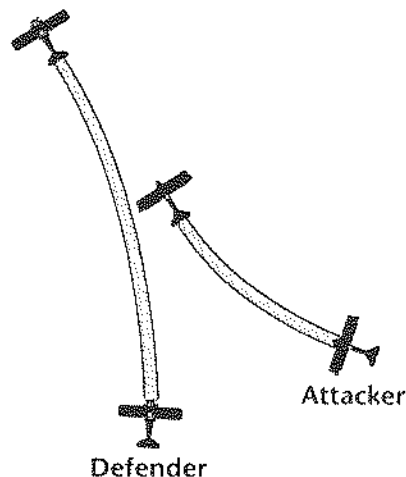


If you do try a deflection shot, put the cross hairs well forward of the nose of the target plane. Squeeze off a short burst, and watch the tracers. Then adjust your aim accordingly. *If* you have time that is. Chances are, you'll have already passed the target. Rather than trying to adjust your aim for the speed of the enemy, the deflection angle of the shot, and the distance to the enemy, most pilots fired from a position where there was no deflection. This meant attacking head-on or from the rear. Attacking head-on has many disadvantages. First, because of the closure rate, you don't have much time to aim and shoot. Also, your target will probably be shooting at you too, while you're making your pass. Finally, you run the risk of a collision if one of you does not swerve.

Attacking from the rear is much better. Often your target won't see you. If you are stalking a single-seat scout, attacking from the rear denies him the ability to shoot at you. Furthermore, there is no deflection angle from a stern shot, which greatly increases your chance of scoring a hit.

Turning Away from an Attacker

The defender has chosen to go with his natural instinct—to turn away from the attacker. The end result is that the attacker ends up on the tail of the defender with a relatively easy shot.

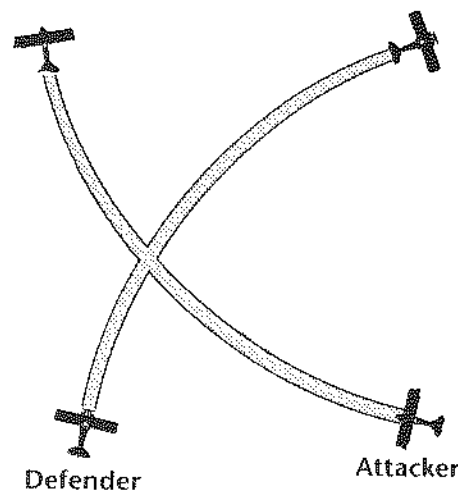


6. If your opponent dives on you, do not try to evade his onslaught, but fly to meet it.

Don't break away from an attack. If you do, you'll give your opponent a choice target and a chance to get on your tail if you do. For example, if you spot a Fokker making a pass at you from behind and to the right, don't break left to avoid him. While the natural instinct is to turn away from him, this only exposes your tail.

Turning Toward an Attacker

In this situation the defender has correctly chosen to turn toward his attacker. Although he will pass through the line of fire of the attacker, it will only be for an instant. The attacker will not be able to follow the defender through his turn.



Instead, turn hard to your right. Even though you will cross his line of fire, it will only be for a brief moment. By turning toward him, you cut inside his turn and he won't be able to follow you.

If a Fokker dives on you from the rear, don't try to dive straight down to get away. That gives him a clear stern shot. Instead, break left or right and turn toward him.

If your aircraft is sturdier than the enemy's, you may try diving to get away. In other cases, however, it's best not to dive away as this only gives the enemy a clear stern shot.

7. When over the enemy's lines never forget your own line of retreat.

Always make sure you can run for home when you need to. Many pilots found themselves cut off from their lines with a damaged plane and had to land in enemy territory. Make sure you know where you are and where the front is.

8. For the Staffel: Attack on principle in groups of four or six. When the fight breaks up into a series of single combats, take care that several do not go for one opponent.

To retain the advantage in combat, it is essential to attack every enemy aircraft if the odds are even. If three Eindeckers bounce three Nieuports the odds are even, right? This is true *only* if each Eindecker

engages a different Nieuport. This way, all three Nieuport pilots are forced to defend themselves with evasive flying. However, if all of the Eindeckers attack a single Nieuport, it leaves the other two Nieuports free to attack the Eindeckers.

SPECIALIZED ATTACK TACTICS

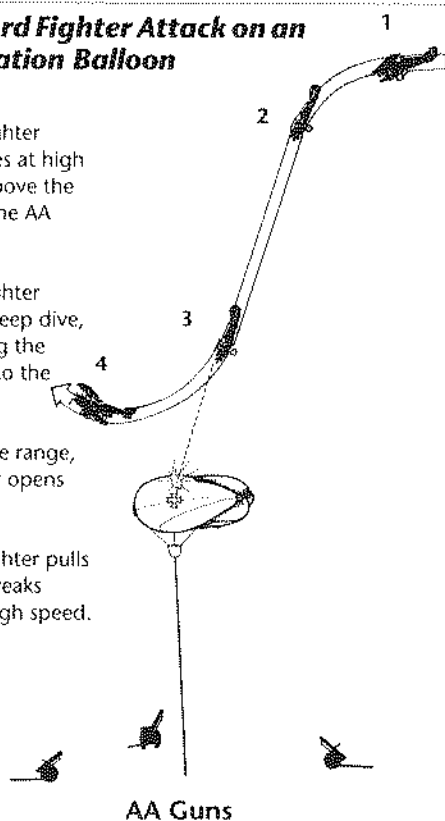
Standard Fighter Attack on an Observation Balloon

1—The fighter approaches at high altitude above the range of the AA guns.

2—The fighter enters a steep dive, minimizing the exposure to the AA guns.

3—At close range, the fighter opens fire.

4—The fighter pulls up, and breaks away at high speed.



Two-seater aircraft

Attacking two-seaters was difficult. The best strategy was to stay in the two-seater's blind spot at all times. This is behind and underneath the two-seater (see illustration). The rear-gunner's field of fire is interrupted by the tail and the fuselage, so he can't shoot at someone in this region. Albert Ball dove under his victims, and then pulled up sharply to spray the belly of his target. This tactic required extreme precision, but, if executed properly, shielded the scout pilot from the rear-gunner's machine guns. If the two-seater has no forward-firing machine gun, a descending head-on

attack can also be very successful.

Observation balloons

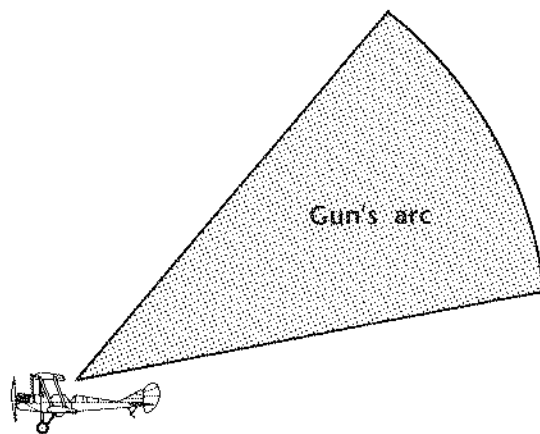
Although observation balloons were very vulnerable to air attack, most were heavily guarded by rings of anti-aircraft guns deployed on the ground. As in scout fighting, surprise was essential to flaming a balloon. Usually, attacking aviators dove steeply, shot at the gas-bag, and flew out of range as quickly as possible. This minimized exposure to ground fire. Some of the more daring pilots switched their engines off just before they began their dives, so that the Archie gunners could neither see nor hear their planes.

Zeppelins

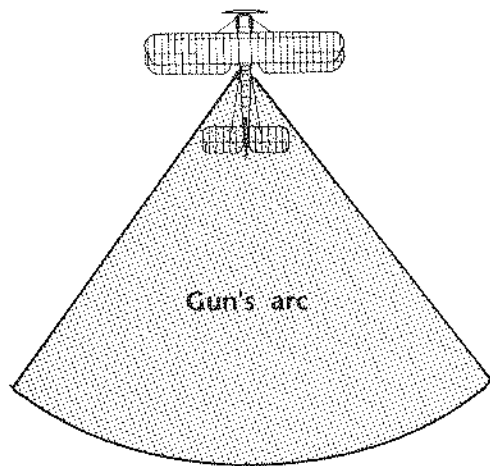
Only a few Zeppelins were actually shot down by Allied fighters. The best tactic was to fly behind the zeppelin and attack it from the rear. This shields the plane from the German gunners and their machine guns positioned above and below.

■ On these aircraft, the gunner was seated in front of the pilot. His gun, however, fired to the rear over the head of the pilot. This resulted in a very limited arc. These aircraft did not mount a forward-firing gun.

Firing Arcs for Two-seater Aircraft with a Front-seat Gunner
(Includes the B.E.2c and Aviatik C.I.)



Side view

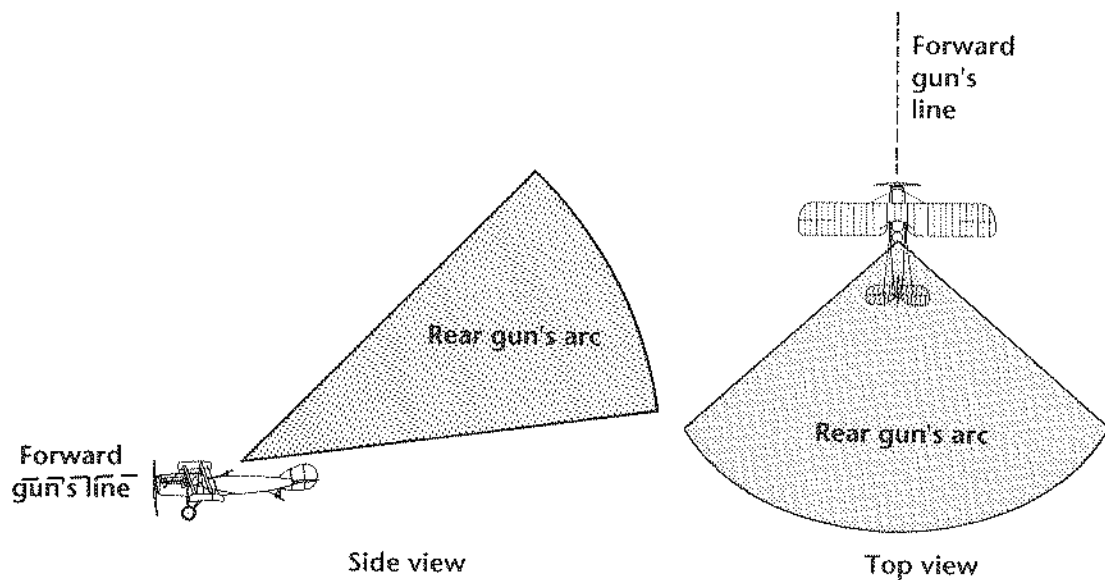


Top view

■ On these aircraft, the rear gun was mounted on a swivel, whereas the forward-firing gun was fixed. The standard attack tactic against two-seaters was to approach from its blind spot—from behind and below the two-seater.

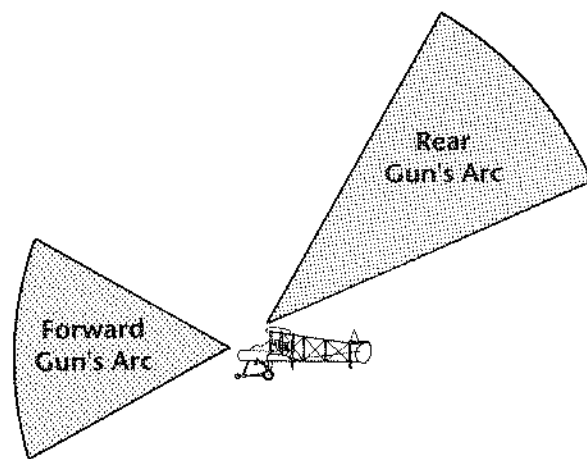
Firing Arcs for Standard Two-seater Aircraft

(Includes the R.E.8, Bristol Fighter, D.H.4, Roland C.II, Rumpler C.IV, and Junkers J.I.)

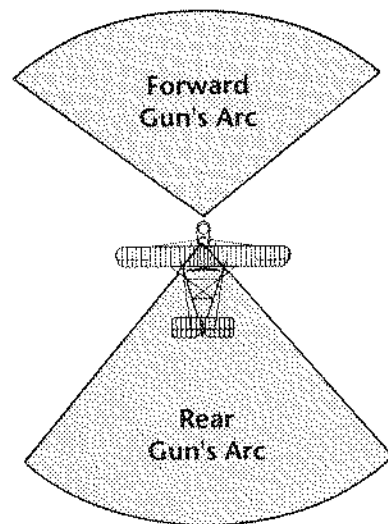


■ The F.E.2b has a unique gun configuration. The gunner can operate two separate machine guns. Both are mounted on a swivel. The rear gun has a limited arc, as its line of fire must clear the top wing of the F.E.2b. This results in a large vulnerable area directly behind the aircraft.

Firing Arcs for the F.E.2b



Side view

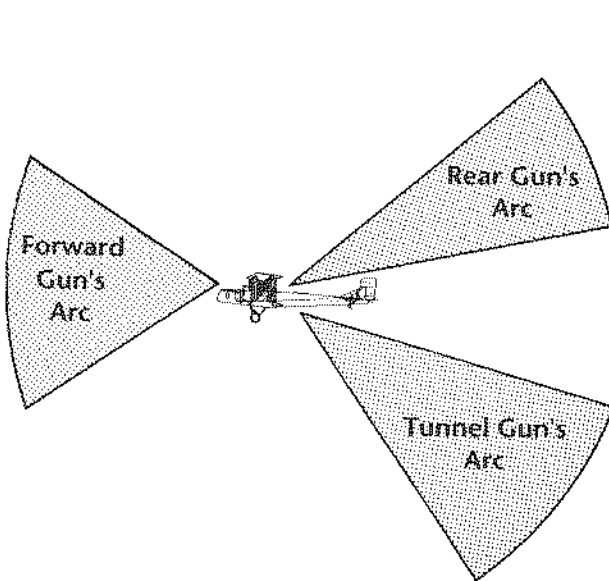


Top view

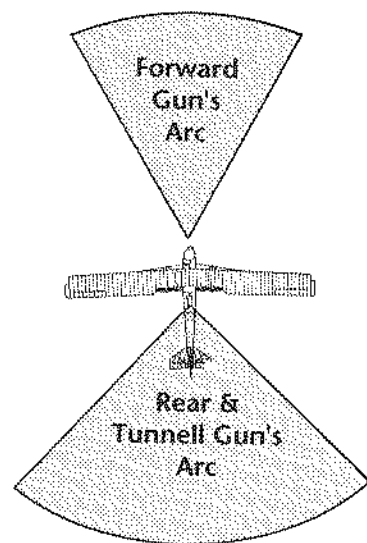
■ These large bombers were bristling with machine guns. They carried three separate gunners. The forward and rear guns were mounted on a swivel. They also included a "tunnel gun" which fired through a hole in the fuselage out the rear of the bomber. This gun removed the usual blind spot that existed on two-seater aircraft. The Handley Page was more heavily armed than the Gotha, as it mounted dual guns on each gun swivel.

Firing Arcs for Heavy Bombers

(Includes the Gotha G.IV and Handley Page 0/100 and 0/400)



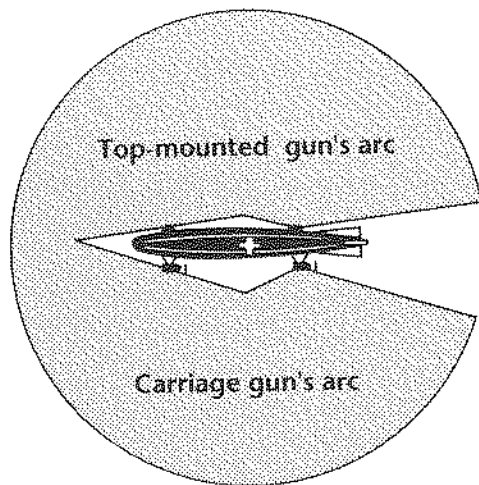
Side View



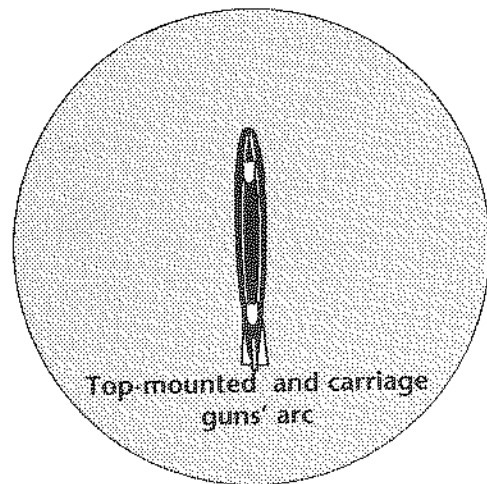
Top View

■ The Zeppelins were heavily armed with machine guns. There were guns mounted in each carriage and guns mounted on the top of the Zeppelin. These guns could effectively cover all regions of the sky except directly behind or directly to the side of the Zeppelin.

Firing Arcs for Zeppelins



Side View



Bottom View

Aircraft Specifications

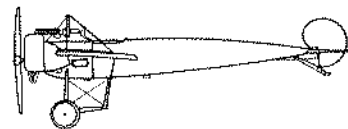
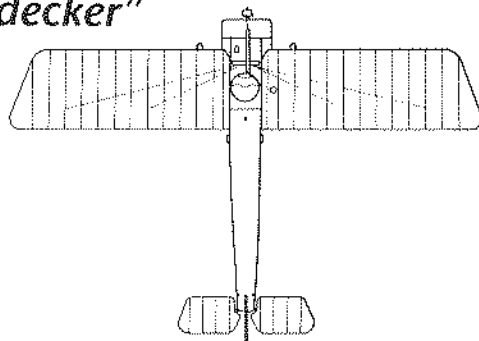
Note: Figures for total built are approximate. The introduction date given for each aircraft indicates when it was deployed in substantial quantities to the front.



GERMAN AIRCRAFT SCOUTS

Fokker E.III "Eindecker"

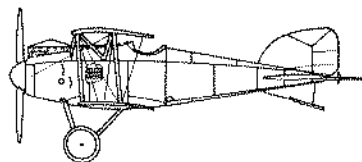
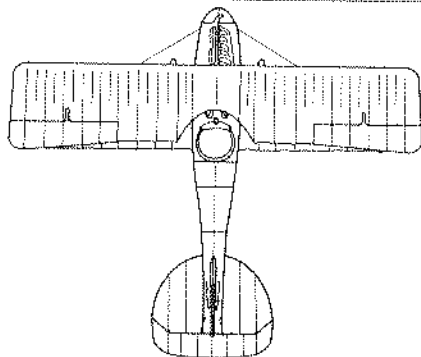
Length: 23 ft. 11 in.
Wingspan: 31 ft.
Engine: 100 hp Oberursel rotary
Armament: 1 Spandau
Climb rate: 28 min. to 9,840 ft.
Ceiling: 11,500 ft.
Max. speed: 88 mph
Total built: 150
Introduction date: August 1915



The Eindecker, which simply means "monoplane", revolutionized the air war in August of 1915, as it was the first plane to be armed with a synchronized machine gun. The Eindecker suffered from being both underpowered and difficult to fly. It had no ailerons, but used the wing-warping system invented by the Wright Brothers to control it in flight. The Eindecker was the perpetrator of the "Fokker Scourge" of 1915-16. By mid 1916 however, the Eindecker found itself hopelessly outclassed by the latest generation of Allied fighters. By the end of the year, almost all of the Fokker E.IIIs had been withdrawn from the front.

Albatros D.II

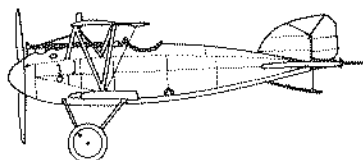
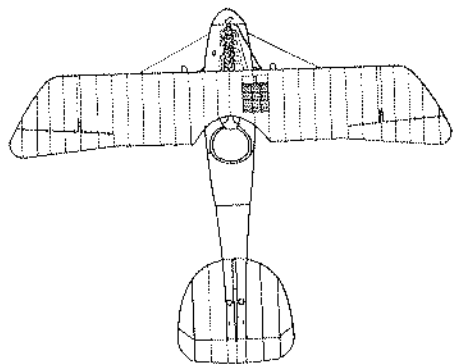
Length: 24 ft. 3 in.
Wingspan: 27 ft. 10 in.
Engine: 150 hp in-line
Armament: 2 Spandau
Climb rate: 6 min. to 3,280 ft.
Ceiling: 17,000 ft.
Max. speed: 109 mph
Total built: 275
Introduction date: September 1916



The first in one of the war's most successful design series, the Albatros D.II re-established parity in the air in late 1916. Fast, maneuverable and heavily armed with twin Spandau machine guns, the D.II served as Germany's primary scout plane until the arrival of the Albatros D.III in early 1917. Oswald Boelcke, Manfred von Richthofen, and Werner Voss all flew the D.II at some point in their careers.

Albatros D.III

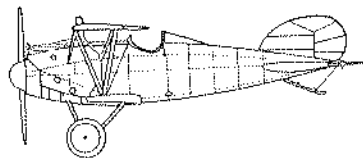
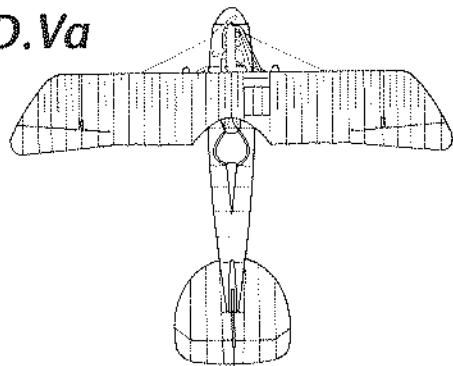
Length: 24 ft.
Wingspan: 29 ft. 8 in.
Engine: 160 hp in-line
Armament: 2 Spandau
Climb rate: 4 min. to 3,280 ft.
Ceiling: 18,000 ft.
Max. speed: 109 mph
Total built: 1,350
Introduction date: February 1917



The D.III was a major improvement on the D.II as it was much more agile. It first arrived at the Front in February and March 1917. Its performance was so superior to its Allied contemporaries that it swept them from the skies for the next several months, culminating in "Bloody April." Fast, well-armed and highly maneuverable, the Albatros was an excellent dogfighting machine. It could turn inside nearly every Allied fighter except the Sopwith Pup. However, steep dives would often tear the lower wings off.

Albatros D.V and D.Va

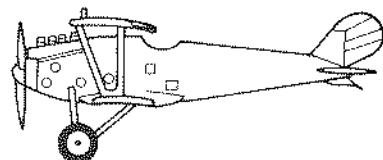
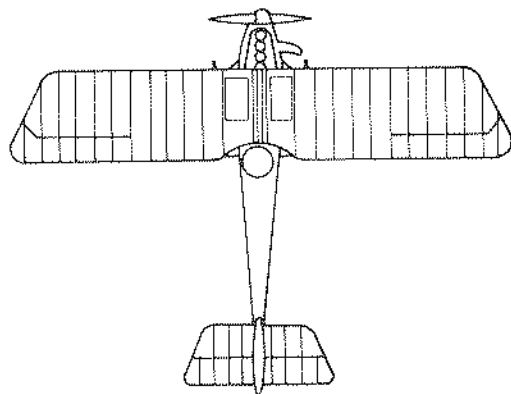
Length: 24 ft.
Wingspan: 29 ft. 9 in.
Engine: 200 hp in-line
Armament: 2 Spandau
Climb rate: 4 min. to 3,280 ft.
Ceiling: 20,000 ft.
Max. speed: 116 mph
Total built: 1,660
Introduction date: June 1917



This was the replacement for the Albatros D.III. It appeared in large numbers during the summer of 1917. Most German pilots were disappointed with it since it was not a major improvement on the Albatros D.III. In fact, the D.V was heavier and could not climb as fast as its predecessor. In combat, the Camels, Spads and S.E.5s all demonstrated their superiority over the D.V. Despite its mediocre performance, this aircraft served until the Armistice in many German units. While it wasn't an outstanding aircraft, it was very easy to fly. This was a definite advantage at a time when German pilots were coming out of training schools with less and less flight time.

Pfalz D.III

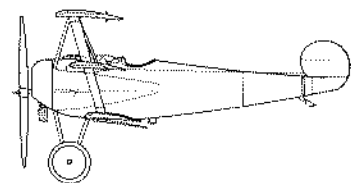
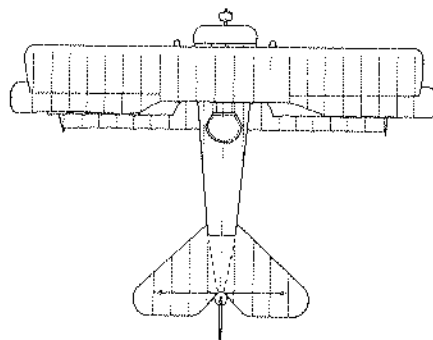
Length: 22 ft. 10 in.
Wingspan: 30 ft. 10 in.
Engine: 160 hp in-line
Armament: 2 Spandau
Climb rate: 7 min. to 6,562 ft.
Ceiling: 17,000 ft.
Max. speed: 102 mph
Total built: 600
Introduction date: July 1917



The Pfalz D. III was used by nearly a quarter of the German Air Service, yet it never gained the recognition it deserved. It was fast, sturdy, and durable — much more so than the Albatros D.III. It could not turn as tightly as the Albatros D.III or D.V. The Pfalz supplied most of the Bavarian Jagdstaffeln at one point or another from summer 1917 until mid 1918. Aces such as Werner Voss and Rudolf Berthold preferred this aircraft over the Albatros D.V since it could dive faster and was more rugged.

Fokker Dr.I "Triplane"

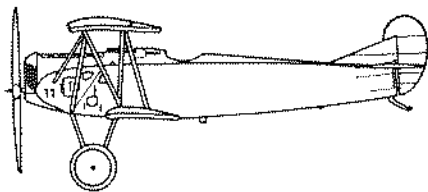
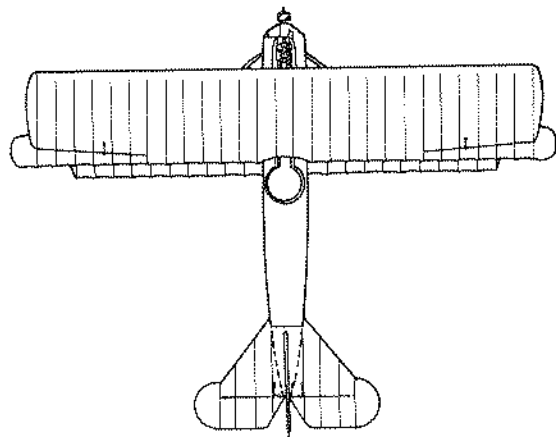
Length: 18 ft. 11 in.
Wingspan: 23 ft. 7 in.
Engine: 110 hp Oberursel rotary
Armament: 2 Spandau
Climb rate: 3 min. to 3,280 ft.
Ceiling: 20,000 ft.
Max. speed: 103 mph
Total built: 320
Introduction date: August 1917



Inspired by the Sopwith Triplane, the Dr.I was very effective in the swirling dogfights of late 1917 and early 1918. Stubby and slow, the Triplane had so much wing area that it could out-turn and out-climb all Allied aircraft. It did not, however, possess great speed or structural integrity, so the Dr.I pilots could not out-dive or out-run their opponents. Though it was incredibly maneuverable, it proved to be very difficult to fly. Only the top aviators and the best Jastas received the Triplanes until spring of 1918 when they were allocated to some of the lesser units. A total of just over 300 were built. Its large rudder and lack of a vertical stabilizer allowed it to make tight turns without banking the wings, a maneuver called a slip-turn.

Fokker D.VII

Length: 23 ft.
Wingspan: 29 ft. 10 in.
Engine: 185 hp in-line
Armament: 2 Spandau
Climb rate: 4 min. to 3,280 ft.
Ceiling: 22,900 ft.
Max. speed: 114 mph
Total built: 1,000
Introduction date: May 1918

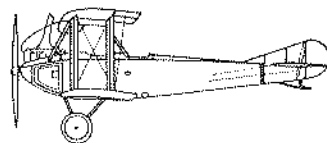
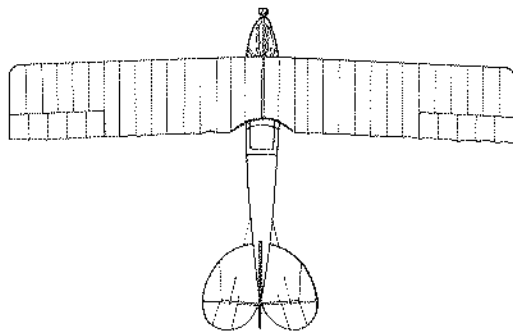


Without a doubt, this was the best scout of the war. It was an easy aircraft to fly, yet it was quick and rugged. A pilot could dive a D.VII without fear of losing a wing. Its high compression BMW and Mercedes engines gave it unrivaled high-altitude capabilities. Fokker pilots routinely stood their D.VIIs on their tails and climbed vertically in combat. For short periods, the Fokkers could maintain this attitude and fire the twin Spandaus without fear of stalling. It served in dozens of Jagdstaffeln by the end of the war after first arriving at the Front in April 1918. The Fokker D.VII was so respected by the Allies that they specifically demanded the destruction of all of them in the Treaty of Versailles.

GERMAN RECONNAISSANCE AND BOMBER AIRCRAFT

Aviatik C.I

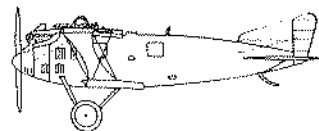
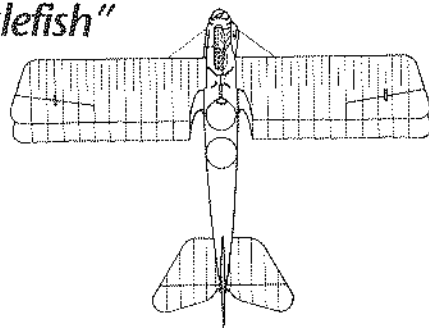
Length: 26 ft.
Wingspan: 41 ft.
Engine: 160 hp in-line
Armament: 1 Parabellum
Climb rate: 12 min. to 3,280 ft.
Ceiling: 11,480 ft.
Max. speed: 89 mph
Total built: n/a
Introduction Date: Early 1915



Appearing in early 1915, the Aviatik C.I served as a two-seat observation and artillery spotting aircraft. Like the B.E.2c, the gunner sat in front of the pilot. This arrangement restricted the arc of the gunners machine gun, since the struts blocked his vision in certain directions. Slow and awkward in the air, it revealed itself to be highly vulnerable to fighter attacks. In 1916, an upgraded version appeared at the Front and was designated the C.III. It was only modestly successful.

Roland C.II "Whalefish"

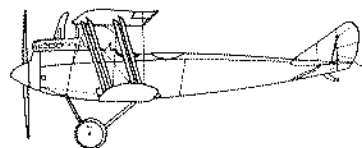
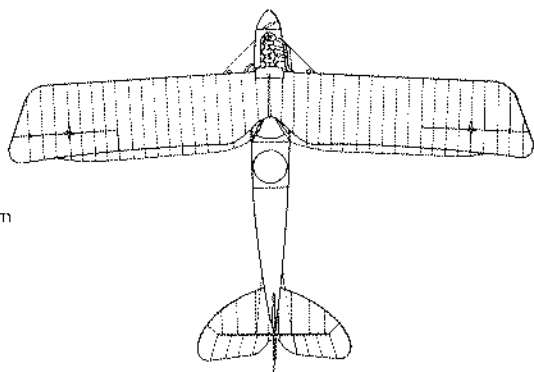
Length: 25 ft. 3 in.
Wingspan: 33 ft. 9 in.
Engine: 160 hp in-line
Armament: 1 Parabellum, 1 Spandau
Climb rate: 6 min. to 3,280 ft.
Ceiling: n/a
Max. speed: 103 mph
Total built: 350
Introduction date: April 1916



The Roland was a very tough opponent since it was one of the first two-seaters to be armed with both a rear-firing and a forward-firing machine gun. While it was fairly maneuverable, it was very tricky to fly. For its time, it was one of the fastest two-seaters in service. Its speed made the Roland a perfect long-range reconnaissance aircraft. It was not an exceptionally maneuverable plane, and it had a tendency to spin in tight turns. It remained in front-line service from April 1916 until early 1917.

Rumpler C.IV

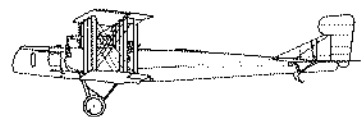
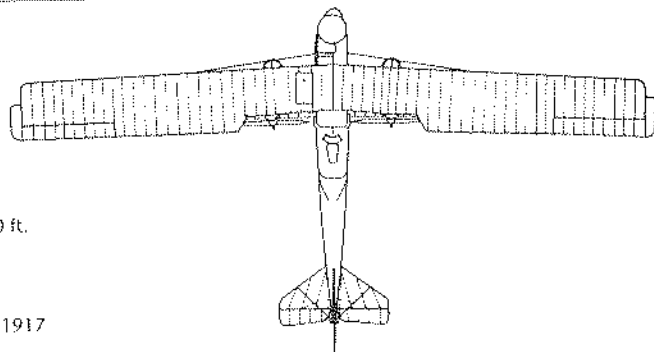
Length: 27 ft. 7 in.
Wingspan: 41 ft. 6 in.
Engine: 260 hp in-line
Armament: 1 Spandau, 1 Parabellum
Climb rate: 4 min. to 3,280 ft.
Ceiling: 21,000 ft.
Max. speed: 106 mph
Total built: 1,000
Introduction date: March 1917



One of the mainstays of the German long-range photographic reconnaissance units, the Rumpler was a fast two-seater armed with two machine guns. It first appeared at the Front in March 1917 and served until the end of the war. Average pilots had a difficult time with the C.IV since it was a quirky, tough machine to fly. Its high altitude performance, including its climb rate, was exceptional.

Gotha G.IV

Length: 38 ft. 11 in.
Wingspan: 77 ft. 9 in.
Engines: 2 x 260 hp in-lines
Armament: 3 Parabellums
Climb rate: 28 min. to 9,840 ft.
Ceiling: 21,320 ft.
Max. speed: 87 mph
Total built: 230
Introduction date: February 1917



The Gotha G.IV was Germany's principle strategic bomber during the Great War. It was used extensively in raids over England and France. Its long range allowed it to bomb London from bases in Belgium, a feat that few other German aircraft could undertake until late 1918. The first Gotha raid on London occurred on May 25, 1917 in broad daylight. Through the course of the war, only eight Gotha G.IVs were lost to British fighters, twelve were lost to ground fire, and thirty-six were destroyed in accidents. An extremely difficult plane to fly, Gotha pilots often crashed on landing since the plane was so unstable. A total of three machine guns were carried during daylight raids. One was located in the nose, one in the upper rear fuselage, and one in a tunnel facing down to the rear.

Junkers J.I

Length: 29 ft. 10 in.

Wingspan: 52 ft. 6 in.

Engine: 200 hp in-line

Armament: 2 Spandau, 1 Parabellum

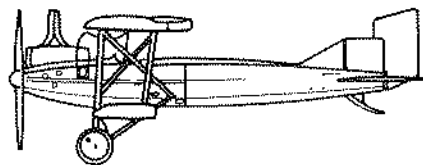
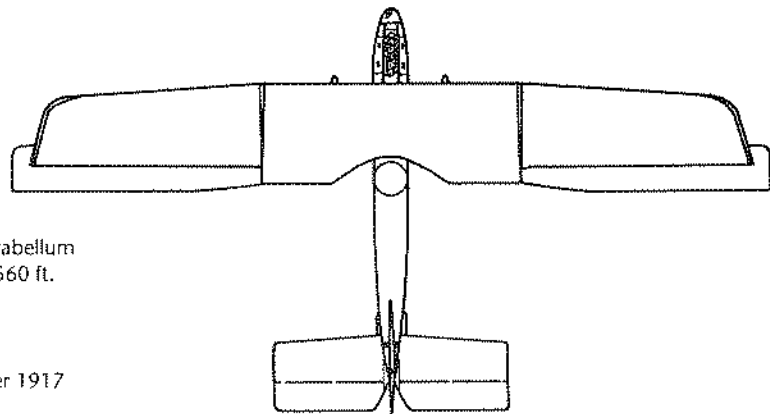
Climb rate: 32 ft. min. to 6,560 ft.

Ceiling: n/a

Max. speed: 97 mph

Total built: 227

Introduction date: November 1917

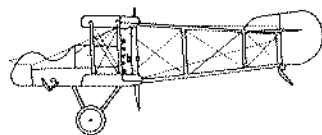
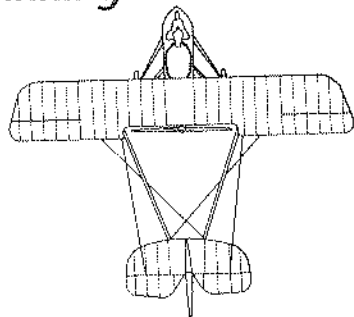


The Junkers J.I was a two-seat attack bomber used by the Schlachtstaffeln (ground attack squadrons) throughout 1918. The vital areas of the plane were covered with armor plating, making it a very difficult aircraft to shoot down. It carried two forward-firing Spandau's and one Parabellum for the gunner as its main armament. Unfortunately, it was an extremely heavy aircraft. This greatly impaired its maneuverability and general handling characteristics.

BRITISH AIRCRAFT

Airco D.H.2 "The Spinning Incinerator"

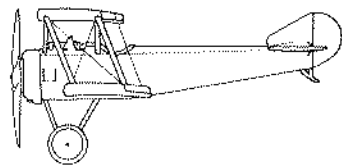
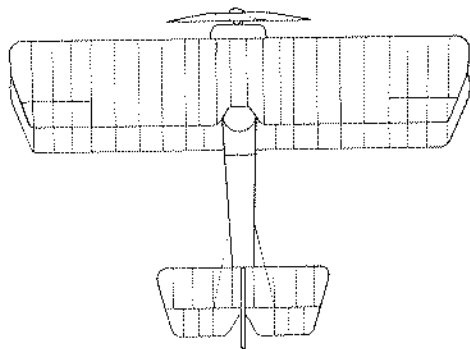
Length: 25 ft. 2 in.
Wingspan: 28 ft. 3 in.
Engine: 100 hp Gnome rotary
Armament: 1 Lewis gun
Climb rate: 12 min. to 6,500 ft.
Ceiling: 14,500 ft.
Max. speed: 93 mph
Total built: 400
Introduction date: February 1916



The D.H.2 was a nimble, highly maneuverable bi-plane that helped end the Fokker Scourge in 1916. It was one of the earliest fighters to have an engine mounted behind the pilot in a pusher-type design. Unfortunately, the engine was totally unreliable, and often several D.H.2s out of each patrol would have to abort because of engine trouble. Nevertheless, it served well into 1917. By this time, however, the D.H.2 was hopelessly outclassed by the newer German aircraft.

Sopwith Pup

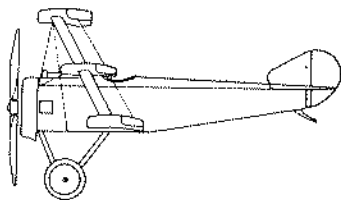
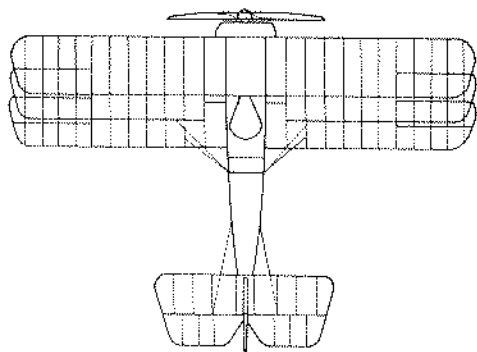
Length: 19 ft. 4 in.
Wingspan: 26 ft. 6 in.
Engine: 80 hp Le Rhone rotary
Armament: 1 Vickers
Climb rate: 7 min. to 5,000 ft.
Ceiling: 17,500 ft.
Max. speed: 99 mph
Total built: 1,770
Introduction date: April 1916



The Pup was a lightweight, graceful biplane whose docile flight characteristics earned the affection of its pilots. Though it was underpowered, it could outmaneuver many German aircraft it faced in 1916-17 above 10,000 feet. It was so nimble that it could loop dozens of times in a row, a feat not many of its contemporaries could achieve. Unfortunately, it carried only one machine gun. This was a great disadvantage by mid 1917. The Pup served with primarily R.N.A.S. and Home Defense units until they were replaced by the Sopwith Triplane and Camel.

Sopwith Triplane "Tripehound"

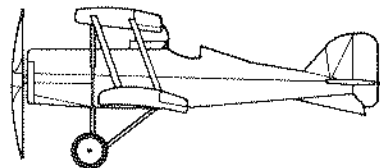
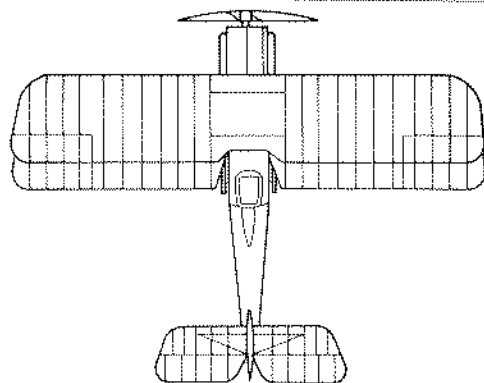
Length: 18 ft. 10 in.
Wingspan: 26 ft. 6 in.
Engine: 130 hp Clerget rotary
Armament: 1 Vickers
Climb rate: 10 min. to 10,000 ft.
Ceiling: 20,500 ft.
Max. speed: 113 mph
Total built: Equipped about 5 squadrons
Introduction date: January 1917



The inspiration behind the Fokker Dr.I, the Sopwith Triplane served only with Royal Navy squadrons for just a few months in 1917. It's maneuverability was phenomenal, especially its rate of climb. Like the Pup, it was both under-powered and under-armed, so it was replaced by the Camel by November of 1917. The Black Flight of Naval 10 Squadron, led by Raymond Collishaw, flew the Triplane and gained tremendous success with it until they converted over to the Camel in the summer of 1917.

S.E.5a

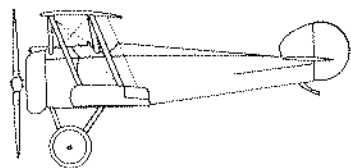
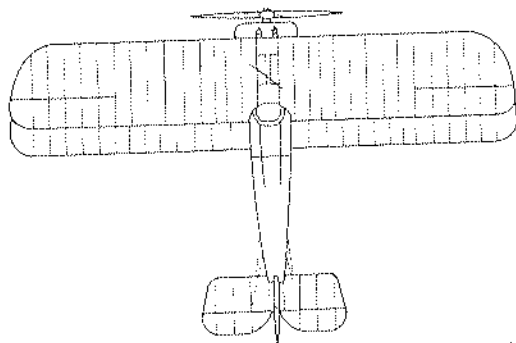
Length: 20 ft. 11 in.
Wingspan: 26 ft. 7 in.
Engine: 200 hp Viper in-line
Armament: 1 Vickers and 1 Lewis gun
Climb rate: 8 min. to 6,500 ft.
Ceiling: 19,500 ft.
Max. speed: 138 mph
Total built: 5,100
Introduction date: May 1917



S.E.5a was probably the best British scout of the war. Easy to fly, stable and very effective at high altitude, the S.E.5a made even a mediocre pilot look good. Its stability made it an excellent gun platform, and three of the top four British aces flew the S.E.5a for at least part of their careers. Though it was not as maneuverable as the Camel or the Fokker Triplane, it could outdive anything the Germans flew. It could also climb better than most other aircraft. The S.E.5a carried one Vickers gun on the cowl and one Lewis gun on the wing as armament. It served with both the British and American air services. It ranks as one of the fastest scouts of the war.

Sopwith Camel

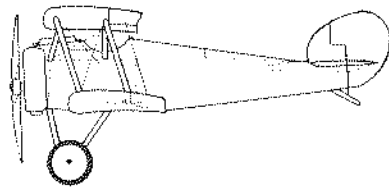
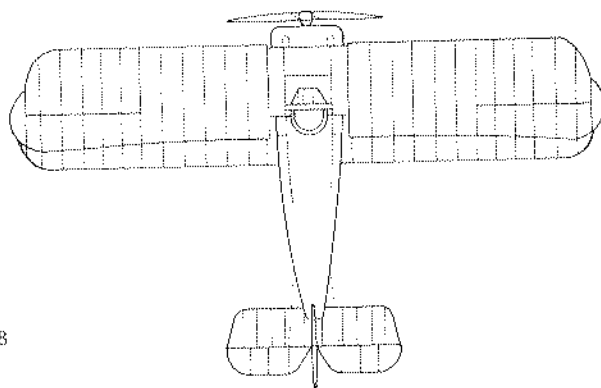
Length: 18 ft. 9 in.
Wingspan: 28 ft.
Engine: 130 hp Clerget rotary
Armament: 2 Vickers
Climb rate: 16 min. to 15,000 ft.
Ceiling: 19,000 ft.
Max. speed: 115 mph
Total built: 5,400
Introduction date: June 1917



One of the better Allied scouts of the war, the Camel was used primarily for low-altitude missions. With most of its weight concentrated in the nose, the center of gravity was well forward. This made the plane extremely unstable in the air. Further, the Camel was extremely light, while its engine was very powerful. As a result, the engine's torque was brutal. Many inexperienced pilots died as their mounts twisted to the right and then fell into a spin. Yet this seemingly damning flight characteristic was exactly what made the Camel so deadly in combat. In the hands of a veteran pilot, the Camel could turn more sharply to the right than any other aircraft (except perhaps the Fokker Dr.I). To the left, the plane had a tendency to climb. The Camel served as both a fighter and a ground attack aircraft in both the R.F.C. and the American Air Service until the end of the war.

Sopwith Snipe

Length: 19 ft. 10 in.
Wingspan: 31 ft. 6 in.
Engine: 230 hp. Bentley rotary
Armament: 2 Vickers
Climb rate: 16 min. to 16,500 ft.
Ceiling: 20,500 ft.
Max. speed: 121 mph
Total built: 1,500
Introduction date: September 1918

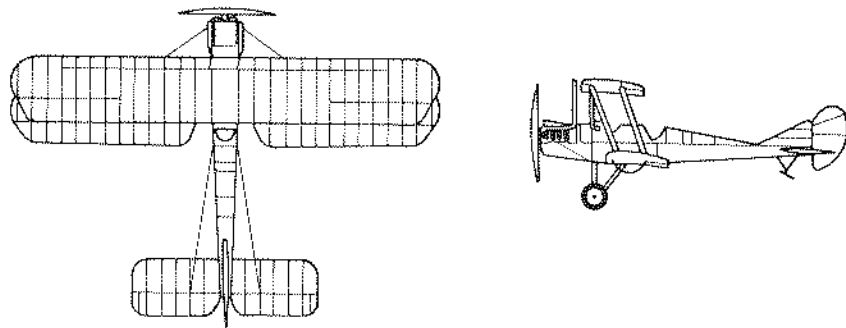


The Snipe was essentially an improved Camel. Fast, highly maneuverable and durable, the Snipe represented the peak of World War One fighter development. It arrived at the front in September and October 1918, and then in only small numbers.

BOMBERS AND RECONNAISSANCE AIRCRAFT

B.E.2 "Quirk"

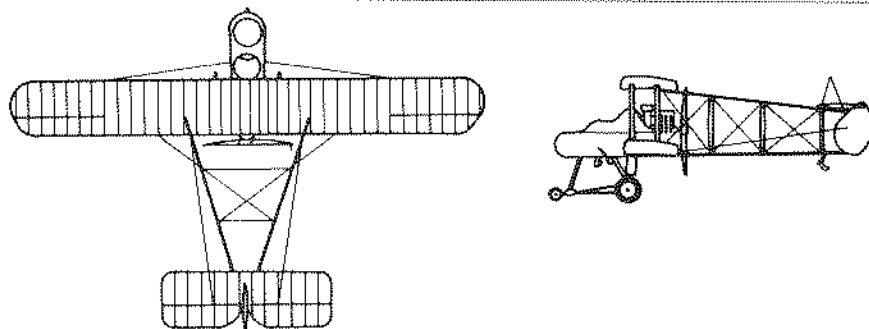
Length: 27 ft. 3 in.
Wingspan: 37 ft.
Engine: 90 hp in-line
Armament: 1 Lewis gun
Climb rate: 24 min. to 6,500 ft.
Ceiling: 10,000 ft.
Max. speed: 72 mph
Total built: 1,801
Introduction date: August 1914



The Quirk was the standard British observation and light bombing plane through a large portion of the Great War. Although it was very stable in the air, it was slow, terribly unmaneuverable and virtually defenseless. The gunner actually sat in front of the pilot under the top wing. This severely restricted his field of fire. It stayed in service long after it became hopelessly obsolete, which resulted in crippling losses in the units flying this aircraft type.

F.E.2b "Fee"

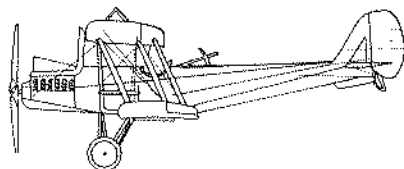
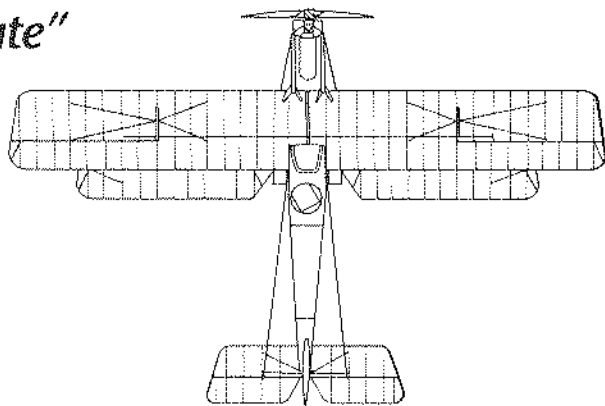
Length: 32 ft. 3 in.
Wingspan: 47 ft. 9 in.
Engine: 160 hp Beardmore in-line
Armament: 2 Lewis guns
Climb rate: 8 min. to 3,000 ft.
Ceiling: 11,000 ft.
Max. speed: 91 mph at sea level
Total built: 1,700
Introduction date: October 1915



Known as the Fee by its pilots, the F.E.2b was an effective two-seat scout against the Eindeckers in 1916. By early 1917, the Fee was obsolete as a fighter, so it was employed as a night bomber and reconnaissance aircraft. It served throughout the war in this capacity. It carried two machine guns, both of which were operated by the gunner. One fired forward on a flexible mount, and the other was mounted between the gunner and the pilot firing rear-ward over the top wing. In order to fire the rear-facing gun, the gunner had to stand on a small platform facing the pilot with his back to the nose of the aircraft. More than one F.E.2b gunner fell to his death while trying to repulse an attack.

R.E.8 "Harry Tate"

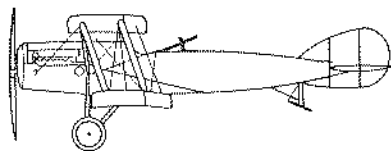
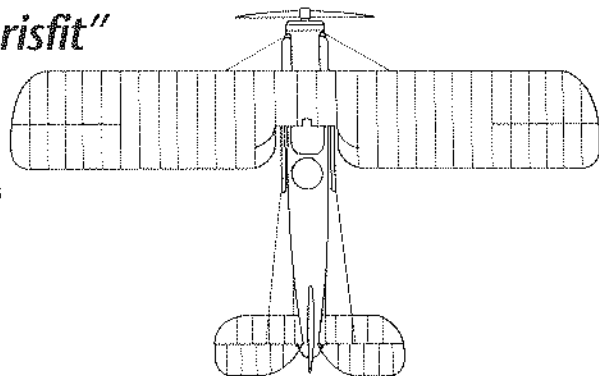
Length: 27 ft. 10 in.
Wingspan: 42 ft. 7 in.
Engine: 150 hp in-line
Armament: 1 Lewis gun, 1 Vickers
Climb rate: n/a
Ceiling: 13,500 ft.
Max. speed: 103 mph
Total built: 4,000
Introduction date: October 1916



The R.E.8 was another reconnaissance aeroplane used by the Royal Flying Corps that entered operational service in 1916. It remained active at the Front until the Armistice. It was a lumbering, unmaneuverable beast that had a nasty habit of falling into spins quite suddenly. Structurally, the R.E.8 was weak, as its upper wing extensions were not terribly strong. As if this weren't enough, the early versions possessed a power plant prone to failures.

Bristol Fighter "Brisfit"

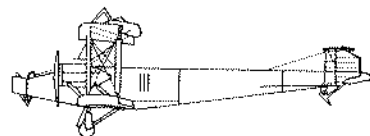
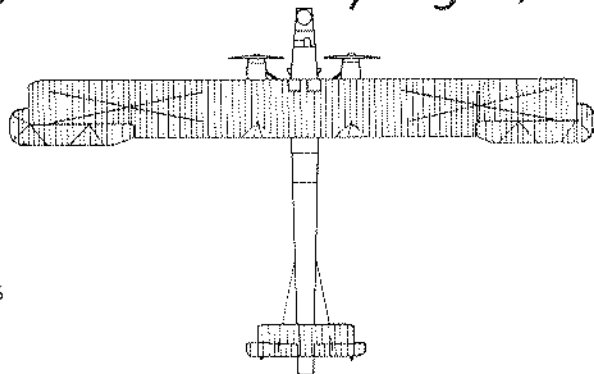
Length: 25 ft. 10 in.
Wingspan: 39 ft. 3 in.
Engine: 275 hp Rolls-Royce in-line
Armament: 1 Vickers and 2 Lewis guns
Climb rate: n/a
Ceiling: 20,000 ft.
Max. speed: 125 mph
Total built: 3,101
Introduction date: April 1917



Known as the "Brisfit" to its pilots, the two-seat Bristol F.28 Fighter proved to be an incredibly tough opponent in the air. Sturdy, stable and maneuverable for a two-seater, it saw service from April 1917 through the Armistice and all the way through the 1920's. They were finally retired from active duty in 1932. Armed with one forward-firing Vickers and twin Lewis guns in the rear, the Brisfit could be more than a match for any German scout if handled well.

Handley Page 0/100 and Handley Page 0/400

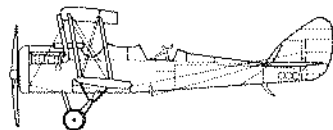
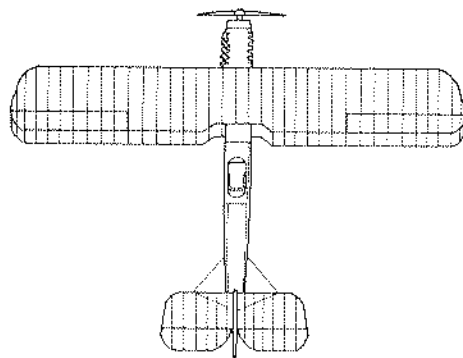
Length: 62 ft. 10 in.
Wingspan: 100 ft.
Engines: 2 X 250 hp in-lines
Armament: 3-5 Lewis guns
Climb rate: n/a
Ceiling: 7,000 ft.
Max. speed: 85 mph
Total built: 500
Introduction date: November 1916



This was the first true strategic bomber produced by the English. It appeared in France in the spring of 1917 and began raiding deep within German-held territory. Originally conceived as a daylight bomber, the 0/100 was reassigned to night raiding a few months after reaching the combat zone. They were eventually superseded by the larger and more powerful 0/400s.

Airco D.H.4

Length: 30 ft. 8 in.
Wingspan: 42 ft. 4 in.
Engine: 375 hp in-line
Armament: 2 Lewis guns, 2 Vickers
Climb rate: n/a
Ceiling: 16,000 ft.
Max. speed: 117 mph
Total built: 1,449
Introduction date: May 1917

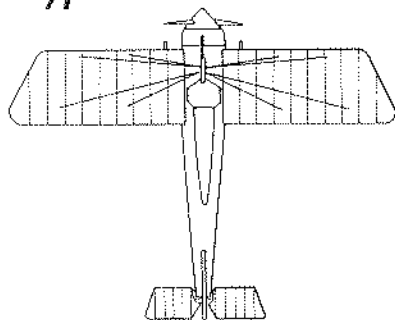


The D.H.4 was a two-seat bomber used by the British and American air services in the latter portion of the war. It was an excellent aircraft for its time, and they served on all major fronts during the war. For a bomber, the D.H.4 was a comparatively fast, achieving a maximum speed of 117 mph. By the end of the war, over 7,000 had been built in the United States and Great Britain. Some D.H.4s remained in service with American units until 1932.

FRENCH SCOUTS

Morane-Saulnier Type N Bullet

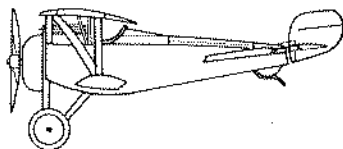
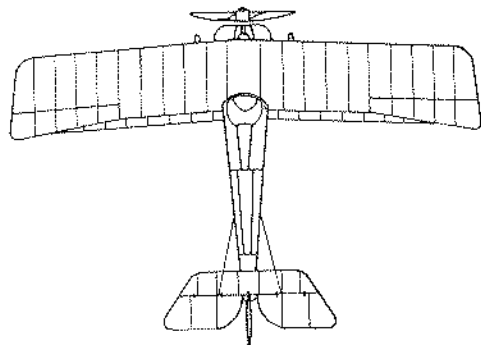
Length: 19 ft. 1 in.
Wingspan: 26 ft. 8 in.
Engine: 80 hp Le Rhone rotary
Armament: 1 Vickers or Hotchkiss
Climb rate: n/a
Ceiling: 13,123 ft.
Max. speed: 90 mph
Total built: 50
Introduction date: April 1915



A modified version of a pre-war race monoplane, the Morane Bullet saw limited action with both the French and British throughout 1915 and early 1916. While it was extremely fast for its time, the controls were very stiff since it used wing-warping instead of ailerons for movement. Its small wing area made a rather unmaneuverable aircraft as well. Nevertheless, it was one of the first single-seaters to mount a forward-firing machine gun. By the end of the summer of 1916 almost all had been withdrawn from frontline units. Roland Garros flew this as well as a Morane Parasol during his brief career.

Nieuport 17

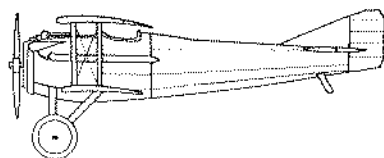
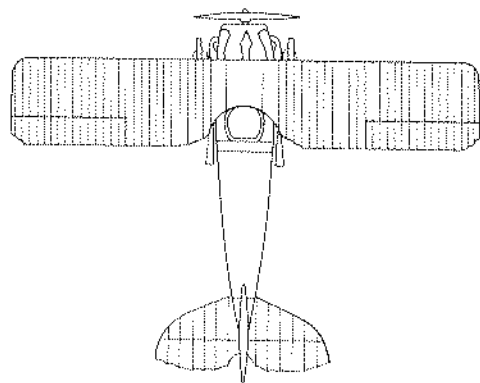
Length: 18 ft. 10 in.
Wingspan: 27 ft.
Engine: 110 hp Le Rhone
Armament: 1 Vickers or Lewis guns
Climb rate: 7 min. to 6,500 ft.
Ceiling: 17,400 ft.
Max. speed: 110 mph
Total built: several thousand
Introduction date: April 1916



The Nieuport was one of the classic designs to emerge from the Great War. Light, powerful, and incredibly nimble, this aeroplane had no equal in the sky until the advent of the Albatros D.III, first arriving in the spring and summer of 1916, the Nieuport 17 equipped most French units and many British ones also until mid 1917. Unfortunately, this type had a nasty habit of shedding its lower wings after violent maneuvers or steep dives. Nevertheless, it was one of the best Allied fighters of 1916-17.

Spad 7

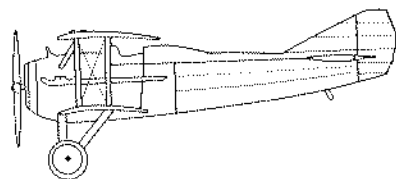
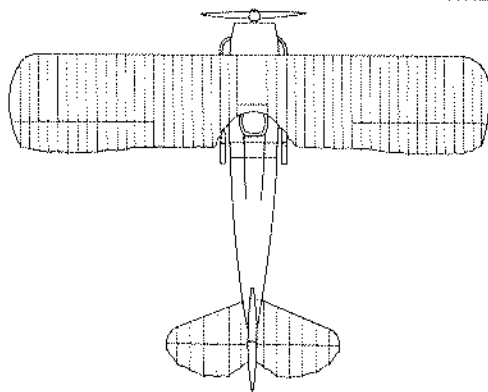
Length: 20 ft. 3 in.
Wingspan: 26 ft. 8 in.
Engine: 175 hp Hispano-Suiza in-line
Armament: 1 Vickers
Climb rate: 6 min. to 6,560 ft.
Ceiling: 18,000 ft.
Max. speed: 119 mph
Total built: 6,000
Introduction date: July 1916



First appearing in the summer of 1916, the Spad 7 combined speed and strength into a business-like airframe. Though it couldn't out-turn the Nieuport 17 or many of the German aircraft, it could handle very steep dives without losing a wing. It's solid construction made it a durable and reliable aeroplane. The early engines they were equipped with, however, suffered originally from all kinds of teething troubles. Eventually, these were ironed out and the Spad became a deadly adversary in the air.

Spad 13

Length: 20 ft. 8 in.
Wingspan: 26 ft. 11 in.
Engine: 235 hp Hispano-Suiza in-line
Armament: 2 Vickers
Climb rate: 5 min. to 6,560 ft.
Ceiling: 21,800 ft.
Max. speed: 133 mph
Total built: 8,400
Introduction date: September 1917



This was simply an improved Spad 7. It mounted a more powerful engine, and two Vickers machine guns instead of just one. The Spad 13 became one of the classic designs of World War One. Nearly every Allied nation flew this type at some point in the war. Most American units used the Spad toward the end of the war, as did the Belgians and some British and Italian units. Fast, sleek, and robust, Spads were capable of dives exceeding two hundred miles per hour.

Historical Missions



HAWKER MEETS HIS MATCH

Date: November 23, 1916

Location: Over the Somme

Battle Synopsis:

Major Lanoe Hawker and one other pilot from 24 Squadron sighted five Albatros D.IIs on patrol one morning over the Somme. Being slightly below the D.H.2s the Albatros pilots, led by von Richthofen, decided to circle away and get altitude. Before they were successful, Hawker and Andrews, the other Brit, had each chosen a target and started a firing pass.

Hawker picked von Richthofen, and the two were soon mixed-up in a wild turning melee that spanned every altitude from 9000 feet to 100 feet. Andrews, meanwhile, found himself the object of attention of the other four Albatros pilots. After his engine was hit, he half-rolled and dove for home with the eager Germans apparently chasing him all the way to the front. Hawker realized that the wind was blowing against him and his return westward, and soon found himself pushed deeper and deeper into German territory. Low on fuel, he had no choice but to break for home. Going into a series of loops, he surprised von Richthofen, piercing the Red Baron's plane with several well-placed bursts.

Hawker then dove to the deck, zigzagging all the way. Determined not to lose his prey, Richthofen followed behind, snapping out burst after burst. Finally, after wasting approximately 900 rounds, the German ace hit Hawker in the head, downing his plane within 50 yards of the front line. Hawker was Richthofen's eleventh victory.

Courtesy National Air and Space Museum, Smithsonian Institution



■ The strapping L.G. Hawker.

IMMELMANN'S FIRST VICTORY

Date: August 1, 1915

Location: Douai.

Battle Synopsis:

On the morning of August 1, 1915, the British completely surprised the Germans at the Douai aerodrome when 10 B.E.2 Quirks arrived and began a leisurely, almost insolent bombing attack. Furious, Oswald Boelcke jumped into his Eindecker

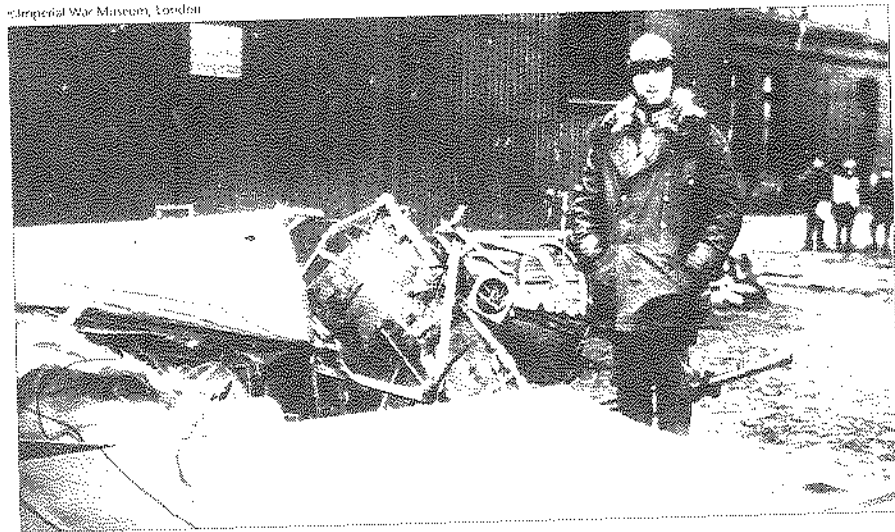
and took-off in pursuit of Brits. Max Immelmann followed a few minutes later in the squadron's second Fokker.

Immelmann quickly reached 10,000 feet and discovered two of the Quirks. Boelcke had found them as well, but his gun jammed so severely he had to disengage and return to the airfield. Immelmann pressed on alone. He swept down on one of the Quirks and poured round after round

into it with his quick-firing Spandau. The B.E.2 staggered and started a long, shallow descent towards the Allied lines. But the Quirk was too badly damaged to make it and crashed in German territory. Elated, Immelmann landed next to the wreck and struck-up a conversation with the wounded English pilot. It was the first of seventeen victories Immelmann scored before his death.

■ Immelmann poses next to the wreckage of one of his victims.

Imperial War Museum, London



FRANK LUKE, BALLOON-BUSTER EXTRAORDINAIRE

Date: September 29, 1918

Location: North-east of Verdun

Battle Synopsis:

After his commanding officer grounded him for going AWOL twice, Frank Luke decided to steal a Spad and go balloon hunting. (A few days earlier his best friend had saved his life and died in the process. Luke never really recovered from this loss and became totally reckless in combat.)

Late in the afternoon, Luke got his Spad into the air, headed north and dropped a note to an American observation-balloon unit. It read "Watch three balloons on Meuse. Luke." The lone American headed for the three German drachen and succeeded in flaming the first one. As he turned to make a run at the second one, ground fire peppered his Spad. Undaunted, he pressed his attack on the second balloon just as a

flight of Fokker D.VIIs arrived on the scene. Dodging the German scouts, Luke destroyed the second drachen. By now, his plane was full of holes, and he had received a wound to his shoulder. The Spad clearly could not remain airworthy much longer, but the American attacked and flamed the last balloon. Then his engine began to falter and he sputtered down to the deck, looking for a place to crash land. He flew over a tiny village full of German troops, and even though his plane was virtually a flying wreck, strafed the enemy soldiers. Moments later his Spad crashed into a church cemetery. Luke pulled himself from his mount and leaned against the tail assembly shaken and wounded. Soon an entire platoon of 40 Germans arrived to accept his surrender. Surrendering was not on Luke's mind. He unholstered his two revolvers and killed 7 of the Germans before they killed him.

In 1919, when the details of his last mission came to light, the United States awarded Luke a posthumous Medal of Honor.

Courtesy National Air and Space Museum, Smithsonian Institution



■ The usually unmilitary Frank Luke. Luke hated the Army and only enlisted after his sister had coerced him.

RICHTHOFEN CHEATS FATE

Date: July 6, 1917

Location: Between Ypres and Armentieres

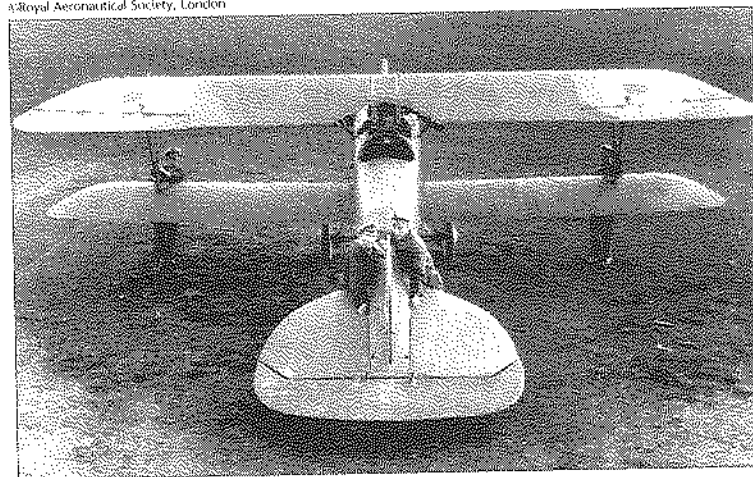
Battle Synopsis:

On a routine sweep behind German lines, 20 Squadron found itself in a particularly unenviable position on the morning of July 6, 1917. Between the British planes and their lines intervened Manfred von Richthofen's Jasta 11. Worse still for the F.E.2 pilots, the Germans had an altitude advantage. Diving to cut the British off from their escape route, Richthofen

and his men forced the pushers into a Lufberry defensive circle. Undaunted by this defensive maneuver, the Jasta 11 pilots closed in on the hopelessly outmatched British. Soon 2 Fees wavered out of formation and fell to the battleground below. At this point, several Triplanes from Naval 10 Squadron appeared on the scene and went to the rescue of the hard-pressed British pilots. Within a few minutes another Jasta arrived and the dogfight took on epic proportions. Still concentrating on the two-seaters, Richthofen swept down on Captain Connel and his gunner. Connel jinked the Fee wildly, trying to throw the Red Baron's aim off while the gunner sprayed the sky with lead. Suddenly, the German disengaged and tumbled down toward the trenches.

Richthofen had been grazed by a lucky shot from the Fee's rear-firing Lewis gun. Wounded in the head and partially paralyzed, he barely managed to crash his fighter on the German side of the lines. Richthofen spent several weeks recovering from this injury, but he never regained his thirst for battle.

Albatros D.III, London



■ A captured Albatros D.III in R.N.A.S. hands.

THE MASTER MEETS HIS END

Date: April 21, 1918

Location: St. Quentin, Somme Valley

for sure. However, the fact remains that Germany's best pilot had finally met his end.

Battle Synopsis:

■ Manfred and Lothar von Richthofen pose beside a Fokker Triplane.

No. 209 Squadron ran into a mixed patrol of Jasta 5 and 11, led by Manfred von Richthofen, who had come across two R.E.8s flying a photo-recon mission. No. 209 Squadron dove to the rescue of the two-seaters and a wild melee quickly developed in which several German planes were downed. Richthofen at some point detached himself from the fray and began to chase a rookie Camel jockey named May. Seeing this, the British flight commander, Roy Brown, disengaged from the main battle to rescue his close friend.

According to Brown's combat report, he caught the Red Baron at a very low altitude near the Somme. Brown's first burst completely surprised the Rittmeister, who slumped forward in his cockpit after the bullet pierced his side. The mighty Red Baron's plane crashed soon after.

The legendary pilot was dead, but controversy over who shot him down rages to this day. Brown is given official credit, while many believe that an Australian flak team brought him down. No one will ever know



© Imperial War Museum, London

LT. ROTH GOES BALLOON HUNTING

Date: May 29, 1918

Location: Behind Ypres

Battle Synopsis:

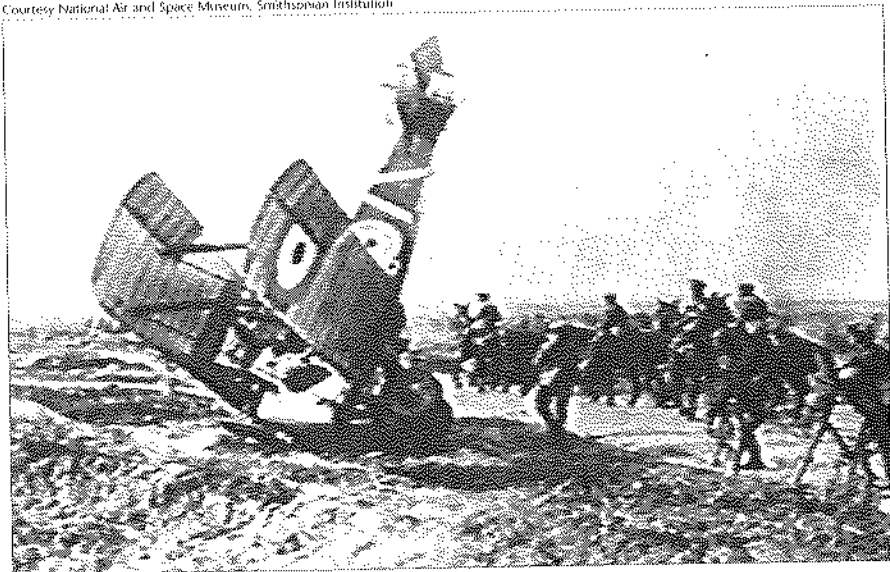
On the morning of May 25, 1918, Lt. Roth of Jasta 16 took to the sky to do some routine balloon strafing. He ended up getting more than he bargained for.

Starting behind and to the north of Ypres, Roth discovered and blew-up three balloons. Flying south-westerly, he was pounced upon by a lone Spad. In a brief but furious fight, Roth managed to rattle the Allied pilot so severely that he dove for home. Moments later, three Camels jumped him. Using every trick he knew, he was able to disengage and lose his attackers. On his way home, he came across several more balloons. Before he left the

area, two more balloons had gone up in flames. That made five for the day. Not bad.

Roth scored 28 victories during the war.

Courtesy National Air and Space Museum, Smithsonian Institution



■ A clash of eras—a cavalry patrol encounters a downed camel.

UDET DEFENDS A DRACHEN



Courtesy National Air and Space Museum, Smithsonian Institution

Date: August 22, 1918

Location: Near Arras

Battle Synopsis:

Ernst Udet received a frantic call for help from a nearby German balloon unit. Several Allied planes were in the area, and the Drachen observation balloons needed protection. Taking to the air, Udet and his men arrived on the scene just in time to witness five S.E.5s close in on the balloons. Staying between the British scouts and the gas-bags, the Germans hoped to discourage their opponents from pressing their attack on the Drachens. Initially, the play worked. However,

in a sudden move the British flight leader detached himself from his formation and plunged down on the balloons. Udet hurtled after the daring British pilot to save the balloons, but before he could reach the S.E.5 one of the last two balloons burst into flames.

Meanwhile, the other S.E.5s had engaged Udet's men and a wild dogfight developed. Udet, hard on the heels of the British flight leader, dove down to the deck and closed the range. The S.E.5 dodged around

trees and hedges in an effort to escape the German ace. Finally, the British pilot made a mistake and was forced to climb to avoid a grove of trees. Udet saw his chance, and fired a burst which struck the S.E.5 squarely. It exploded into flames and plunged to the ground. Udet glanced behind him as he flew over the downed Englishman and, to his dismay, discovered three S.E.5s above him. He couldn't climb and he couldn't turn for home, so he chose to hedge-hop straight ahead.

The tables had turned, and the chase took Udet deep into Allied territory. One of the S.E.5s closed to about 30 yards but did not open fire. It was obvious the pursuer was waiting for a clear shot. The other two S.E.5s spaced themselves a few hundred yards off each side of Udet's plane. He was trapped and began to think that this might be his end. Then Udet discovered his phosphorus ammunition had ignited itself. In a matter of seconds, his plane could burst into flames. He immediately depressed the trigger in an effort to clear the ammo trays. White smoke poured out of the barrels as his tracers pierced the empty sky. To Udet's amazement, his adversaries broke for home, thinking that he had fired backward at them. The odd white smoke of the smoldering phosphorous rounds must have confused them. Udet returned to his aerodrome so shaken that his ground crew had to haul him out of the cockpit.

■ Udet in his fighter.

Medals
and
Awards



BACKGROUND ON MEDALS

■ Charles Nungesser displays his chestfull of medals.

Courtesy National Air and Space Museum, Smithsonian Institution



Both the Central Powers and the Allies had their own awards structures that came into play during World War I and which were given for gallantry and military merit to natives and others deemed deserving. Among higher ranking officers and royalty there was much exchange of awards as a customary military nicety. But the fighting man, both officer and man alike, was also recognized not only by his own country but if his bravery was sufficient, by the other nations allied with it in war.

While many nations had highly developed and complex awards structures, especially in countries with long dynastic histories like the Romanovs in Russia and the Hohenzollerns in

Prussia, none was quite as extensive as that which existed in Imperial Germany during World War I. The reason was that even though Prussia was the lead entity in the empire and its king was the emperor (Kaiser), the other states still retained certain military privileges. These included their own individual awards. Since Germany was still a collection of four kingdoms, many grand duchies, duchies, principalities, the three free cities of the old Hanseatic League and the Imperial Domain of Alsace-Lorraine (only the latter did not make awards), a fighter pilot of the prominence of Manfred von Richthofen could amass a truly staggering array of such awards.

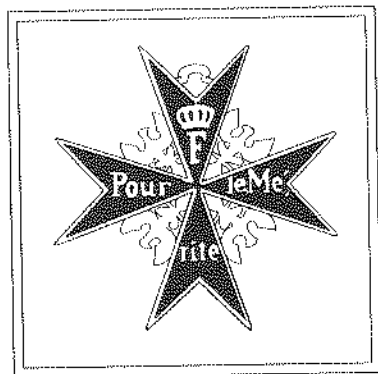
One point regarding Imperial German awards needs to be made. There were no "German," or empire, awards for bravery and military merit in World War I. Each came from an individual state. Thus it is not correct to call the famous *Orden Pour le Merite*, the so-called "Blue Max," Germany's highest recognition for officers on the battlefield. It was Prussia's. However, because of its pre-eminent position within the empire, Prussia was called upon to make its awards throughout all contingents, not just its own. So, in effect, they became empire awards while still retaining their specific identity and origin.

AWARDS

GERMAN AWARDS

Order for Merit (also known as "The Blue Max")

Prussian name: Orden Pour le Merite



Founded in 1740 by Friedrich the Great of Prussia, he used French terminology for the words "for Merit" rather than the German because he was a great admirer of French court customs and insisted that language be used in his court. It was Prussia's highest recognition to officers for courage on the battlefield and for superior military performance in time of war. Thus it was rewarded in large numbers to senior military leaders and royalty as well as to officers for bravery in actual conflict with the enemy. In that

respect it differed from the Victoria Cross and the U.S. Medal of Honor.

The order came in one class, that of knight, and was worn from the neck on a cravat. There was also a separate and higher award of the order, the Orden Pour le Merite mit Eichenlaub (the Order for Merit with Oakleaf). The oakleaf did not indicate a second award of the same order as a bar or an oak



Courtesy National Air and Space Museum, Smithsonian Institution

leaf cluster would in the case of a British or U.S. award respectively.

No combat flier received the order with Oakleaf during the war although von Richthofen was proposed for it (see the Red Eagle Order description).

■ The Red Baron wearing his Blue Max and Iron Cross 1st Class.

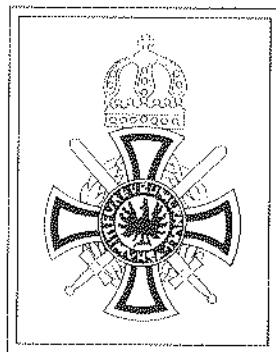
There were 81 awards of the Orden Pour le Merite within the various air services in world War I. The Prussian awards system valued the consistent performer more so than a man who might perform a single act, however brave. It usually took repeated acts of bravery or continued good work over time to earn a high award like the Pour le Merite. For the combat airmen then, this got translated into the number of victories for a fighter pilot or in the case of the men in the multi-place aircraft, many successful missions across enemy lines.

The first aviation awards of the Pour le Merite went to Oswald Boelcke and Max Immelmann on January 12, 1916, the day each scored his eighth confirmed victory. For the rest of that year, it took eight victories for the other fighter pilots who had been flying for some time before they received their awards. For the newer fighter pilots, a higher requirement was adopted in November 1916. The first to feel its effect was Manfred von Richthofen who was made to wait until he had 16 victories before his award was approved on January 12, 1917. Thereafter, it usually took at least 20 victories before the award would be approved but there were a few exceptions (Goering was one of them). In the last months of the war with scoring at a rapid rate among the leading German aces and

paperwork breaking down, the award sometimes did not reach a man until he had considerably more than 20 victories. The last two aviation recipients of the order, for example, had 30 victories when the award caught up with them.

Royal Hohenzollern House Order with Swords
German name: Ritterkreuz des Koeniglichen Hausorden von Hohenzollern mit Schwertern

Founded on December 5, 1841 by King Friedrich Wilhelm IV of Prussia, it was the major award used by Prussia in World War I to recognize bravery and distinguished military service by officers after they had received the Iron Cross, 1st Class. It thus became the customary intermediate award between an Iron Cross, 1st Class and the Orden Pour le Merite. It is important to note that unlike Great Britain and the U.S., Imperial Germany did not engage in making multiple awards of the



same order or decoration. To recognize a man for repeated acts of courage or superior performance it was necessary to go to a higher and separate award.

The order came in three classes with the lowest, that of Knight, being the one going to the young combat officers. Since the order could also be given in peacetime for service to the House of Hohenzollern, when awarded in wartime, a pair of crossed swords were placed between the arms of the cross on the insignia. It was then said that the order had been given "with Swords."

The first airmen to receive the Knight's Cross with Swords of the order were, again, Boelcke and Immelmann. They received it in November 1915 after their sixth confirmed victories. Throughout 1916 it usually took fighter pilots six victories before they, too, received the award. In 1917 and thereafter it usually took at least 10 victories before a man would be favorably considered. In total, 8,291 Knight's Crosses with Swords were awarded for service in World War I.

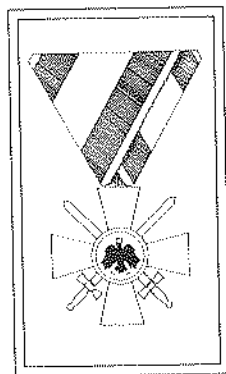
The Red Eagle Order

German name: Roter Adler-Orden mit Schwertern

Prior to World War I, this order, founded in 1705, was used to reward junior officers for bravery in action and for meritorious service. Its usage in these ways was dropped in World War I and the Royal Hohenzollern House Order was employed instead.

However, one combat airman received the order. He was Manfred von Richthofen who received the Red Eagle Order, 3rd Class with Crown and Swords on April 6, 1918 in recognition of his 70th victory and his nearly three years of service in the air. It was thus a unique award within the Imperial German Air Service in World War I.

Actually, von Richthofen had been proposed for the award of the Pour le Merite with Oakleaf instead. This was turned down on the basis of the archaic criteria for that award among which was that a recipient had to have forced the enemy to withdraw from a battlefield, i.e., to have won a battle. When General Ludendorff heard that von Richthofen had been denied the award because of this narrow interpretation, he is alleged to have snorted, "Richthofen has won many battles!"



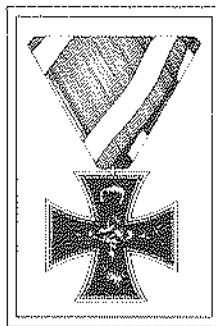
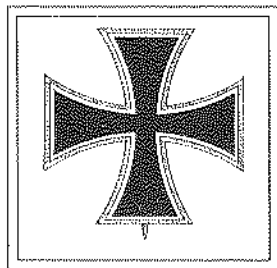
Iron Cross 1st Class, Iron Cross 2nd Class
German Name: Eisernes Kreuz I. Klasse and Eisernes Kreuz II. Klasse

The Iron Cross was established on March 10, 1813 by King Friedrich Wilhelm III of Prussia as the main award to be used in the war then being fought against the French under Napoleon. There were three classes, Grand Cross, 1st Class and 2nd Class. Originally, it was a very prestigious award and temporarily replaced many other Prussian bravery awards that might otherwise have been used.

After the Napoleonic Wars the Iron Cross was discontinued but renewed again on July 19, 1870 by King Wilhelm I of Prussia for the war that had again broken out with France. After the war, it again lapsed and was not renewed until August 5, 1914 when Emperor (Kaiser) Wilhelm II did so for World War I.

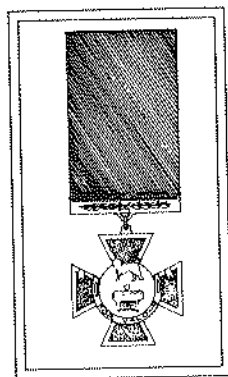
In the first years of the war, the award still retained much of its original prestige but large

numbers awarded in the later years of the war, particularly in the 2nd Class, caused it to lose much of its meaning. It is estimated that for service in World War I, about 218,000 1st Class awards and over 5 million 2nd Class awards were made. No figures for aviation awards are known to exist although it can be said that any successful airman would undoubtedly have possessed both the 1st and the 2nd Class by the time the war ended.



BRITISH AWARDS

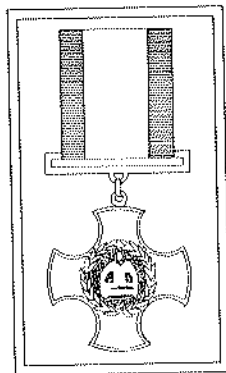
The Victoria Cross



Instituted by Queen Victoria in 1856, it takes precedence over every other honor in the British Empire including such illustrious orders of knighthood and chivalry such as the Order of the Garter, Order of the Thistle, Order of St. Patrick, Etc. It was meant to recognize some signal act of valor or devotion to the country that was performed in the presence of the enemy.

The Distinguished Service Order

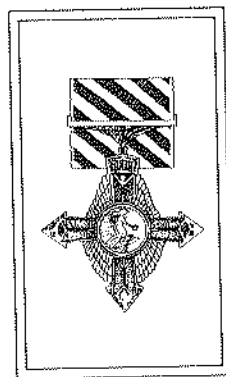
Established in 1886 to recognize distinguished or meritorious service in war, it was awarded to officers only. It generally went to more senior officers for superior work. It was also awarded as a recognition for valor or merit of a superior kind which did not warrant the award of the Victoria Cross.



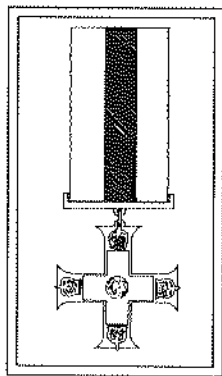
As with other British awards, bars were awarded to represent subsequent awards of the same decoration. Albert Ball is believed to be the first officer to receive the D.S.O. with 2 Bars.

The Distinguished Flying Cross

When the Royal Flying Corps and the Royal Naval Air Service were combined to create the Royal Air Force with an effective date of April 1, 1918, it had been decided to found a new range of awards for the service which were meant to replace the Army and Navy awards previously bestowed.



The Distinguished Flying Cross was meant to reward officers and Warrant Officers of the R.A.F. for an act or acts of valor, courage or devotion to duty performed while flying in active operations against the enemy. It was meant to replace the M.C. There were 889 awards of the D.F.C. to pilots in the R.A.F..



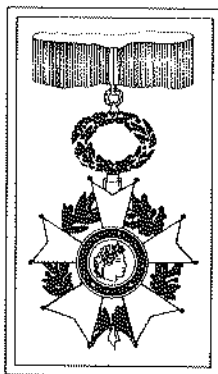
The Military Cross

This decoration was established on December 31, 1914 as an Army award to commissioned officers from the rank of Captain and below and to Warrant Officers. It was meant to recognize distinguished and meritorious service in time of war by men of these ranks. There were 1,077 awards of the M.C. for service by men in the R.F.C. / R.A.F.

FRENCH AWARDS

Legion of Honor

Founded by Napoleon Bonaparte on May 19, 1802, it was France's highest honor. It came in five grades. The two lowest, the Officer's Cross and Knight's Cross, could go to the younger combat officers and the Knight's Cross could also go exceptionally to non-commissioned officers and men.



It was awarded to French citizens and foreigners for outstanding services of a civil or military nature. There was, however, no distinction on the insignia to differentiate between an award won, for example, on the battlefield versus one that might have been given for a distinguished career in civil life.

Croix de Guerre

This decoration was established on April 8, 1915 as a means to mark individuals who had been mentioned in dispatches. It could go to both officer and man alike.

For a mention in an Army Dispatch (or the corresponding unit in the navy), a bronze laurel wreath, called a palm, was affixed to the ribbon of the cross. An Army Corps dispatch mention rated a gilt star. A Divisional dispatch mention was marked by a silver star and a Brigade, Regimental or Unit mention in a dispatch by a bronze star.

