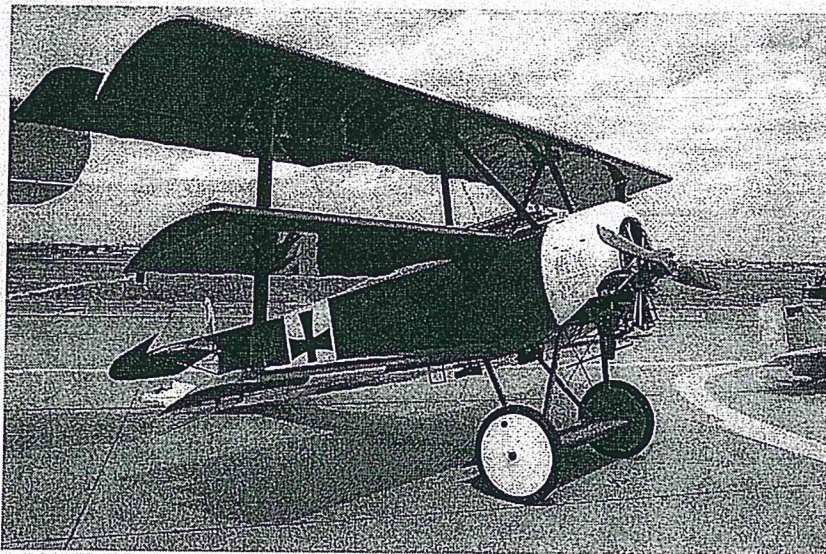


## FIGHTER AIRCRAFT

Combat between aircraft has its origins in encounters between opposing scout aircraft early in World War I. Since early scout aircraft were unarmed, early encounters between opposing scouts were peaceful—pilots would often wave to one another as they passed by. Crafty pilots attempted to bring down their counterparts in a manner of amateur ways, including grappling hooks, small arms, and grenades. As militaries realized the importance of aerial reconnaissance by aircraft and dirigibles, they also realized the importance of arming aircraft to destroy enemy scouts. One early solution was to mount a swiveling machine gun for the backseater or a forward-facing machine gun on the top wing to clear the propeller. Neither was particularly useful for a single seater, the latter being difficult to aim and reload. The central obstacle was firing a machine gun through the arc of the propeller without hitting the blades. French aviator Roland Garros' solution was to fit deflector plates to his propellers where the machinegun would strike. This was an imperfect solution as the plates could not withstand repeated fire. A copy eventually ended up in German hands after a prototype crashed in German territory. Inspired by this, Anthony Fokker's team invented the more reliable interrupter gear, which enabled the widespread design of single-seat fighters.



## Zeppelins in World War I

Zeppelins were used as bombers during WWI but were not notably successful. At the beginning of the conflict the German command had high hopes for the craft, as they appeared to have compelling advantages over contemporary aircraft - they were almost as fast, carried many more guns, and had a greater bomb load capacity and enormously greater range and endurance. However, their great weakness was their vulnerability to gunfire.

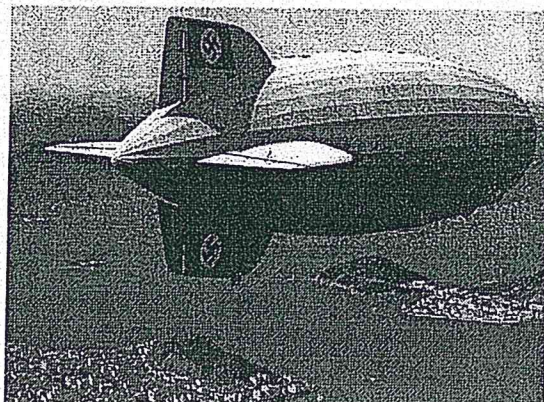
The main use of the craft was in reconnaissance over the North Sea and the Baltic, where the admirable endurance of the craft led German warships to a number of Allied vessels. During the entire war around 1,200 scouting flights were made. The Naval Air Service also directed a number of strategic raids against Britain, leading the way in bombing techniques and also forcing the British to bolster their anti-aircraft defences. The first raid was on January 19, 1915, the first bombing of civilians ever, in which two Zeppelins dropped twenty-four 50 kg high explosive bombs and incendiaries on Great Britain. In all four people were killed, sixteen injured and monetary damage estimated at £7,740, although the public and media reaction were out of all proportion to the death toll. There were a further nineteen raids in 1915, in which 37 tons of bombs were dropped, killing 181 people and injuring 455.

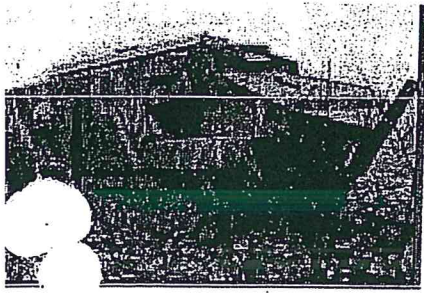
Searchlights were introduced, initially manned by the police, but their inexperience led to a number of illuminated clouds being mistaken for attacking airships. Aerial defences against Zeppelins were haphazard and the lack of interrupter gear in early aircraft meant that the basic technique of downing them was to drop bombs on them.

Anti-aircraft defences were becoming tougher and new Zeppelins were introduced which were able to fly at twice the altitude, increasing the operating altitude from 1,800 m to 3,750 m. To avoid searchlights these craft flew above the cloud layer whenever possible, lowering an observer through the clouds to direct the bombing.

The introduction of effective fighters marked the end of the Zeppelin threat. New Zeppelins came into service that could operate at 5,500 m but exposed them to extremes of cold, and changeable winds could, and did, scatter many Zeppelin raids. In 1917 and 1918 there were only eleven Zeppelin raids against England, and the final raid occurred on August 5, 1918

A total of eighty-eight Zeppelins were built during the war. Over sixty were lost, roughly evenly divided between accident and enemy action. Fifty-one raids had been undertaken, in which 5,806 bombs were dropped, killing 557 people and injuring 1,358.





## Tank Warfare

Tanks were not put into widespread use until about 1917. They proved eventually advantageous because they could break through trench lines. However, tracks often fell off the tanks, they would overheat and they were notoriously unreliable.

### Tank Numbers

By the time the war drew to a close the British, the first to use them, had produced some 2,636 tanks. The French produced rather more, 3,870. The Germans, never convinced of its merits, and despite their record for technological innovation, produced just 20.

With the French tanks proving more serviceable than their British equivalents they continued to be used beyond wartime.

The French Renault F.T. tank continued to grow in popularity as the concept of the tank as a close aid to advancing infantry prospered.

Both the U.S. and Italy produced their own tank designs which were based on the French Renault model, a testament to its design strengths. The Italians produced the Fiat 3000 and the U.S. the M1917.

Tank design continued to improve beyond the war and the tank, which helped to make trench warfare redundant, restored movement to the battlefield. Its widespread use continues to the present day.

### Tank Production 1916-18

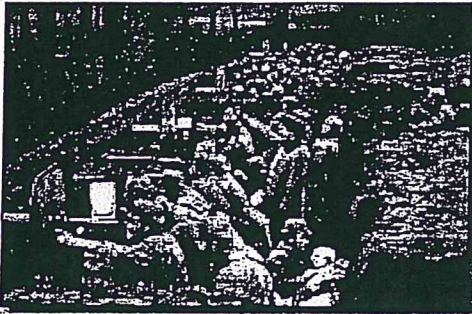
Year	UK	France	Germany	Italy	USA
1916	150	-	-	-	-
1917	1,277	800	-	-	-
1918	1,391	4,000	20	6	84

## Machine Gun

The machine gun, which so came to dominate and even to personify the battlefields of World War One, was a fairly primitive device when general war began in August 1914. Machine guns of all armies were largely of the heavy variety and decidedly ill-suited to portability for use by rapidly advancing infantry troops. Each weighed somewhere in the 30kg-60kg range - often without their mountings, carriages and supplies.

### The Machine Gun in 1914

The 1914 machine gun, usually positioned on a flat tripod, would require a gun crew of four to six operators. In theory they could fire 400-600 small-calibre rounds per minute, a figure that was to more than double by the war's end, with rounds fed via a fabric belt or a metal trip. The reality however was that these early machine guns would rapidly overheat and become inoperative without the aid of cooling mechanisms; they were consequently fired in short rather than sustained bursts. Cooling generally took one of two forms: water cooled and, increasingly as the war developed, air cooled. Water jackets would be provided for the former (which held around one gallon of liquid) and air vents would be built into the machine gun for the latter.



Water cooled machine guns would still overheat relatively quickly (sometimes within two minutes), with the consequence that large supplies of water would need to be on hand in the heat of a battle - and, when these ran out, it was not unknown for a machine gun crew to solve the problem by urinating into the jacket.

Whether air or water cooled, machine guns still jammed frequently, especially in hot conditions or when used by inexperienced operators.

Consequently machine guns would often be grouped together to maintain a constant defensive position.

Estimates of their equivalent, accurate, rifle firepower varied, with some estimating a single machine gun to be worth as many as 60-100 rifles: a more consensual figure is around 80, still an impressively high figure.

### British Army Rejection

By the time war broke out in August 1914 the Germans had 12,000 machine guns at their disposal, a number which eventually ballooned to 100,000.

In contrast the British and French had access to a mere few hundred equivalents when war began. British officers regarded the weapons as an improper form of

## **German Enthusiasm**

As already noted the Germans quickly grasped the potential importance of machine guns on the battlefield. From the outset the German army demonstrated the value of the machine gun by creating separate machine gun companies to support infantry battalions.

The British however did not create their Machine Gun Corps until October 1915; until this time the few machine guns available were attached in sections to individual battalions. A mere two guns were allocated to each infantry battalion in 1914.

## **Superiority of Defensive Warfare Technology**

When established in fixed strong-points sited specifically to cover potential enemy attack routes, the machine gun proved a fearsome defensive weapon. Enemy infantry assaults upon such positions invariably proved highly costly.

The British similarly found to their repeated cost the futility of massed infantry attacks against well-entrenched defensive positions protected by machine gun cover.

## **The Machine Gun as an Offensive Weapon**

Understandably most historical accounts of the First World War have tended to emphasise the defensive strengths of the machine gun. Attempts to transport light machine guns by wheeled carriages or pack animals were ultimately unsuccessful: the infantry invariably outpaced such methods.

By 1918 however one-man portable machine guns were put to some use (each weighing 9-14kg), although maintaining sufficient ammunition supplies remained a difficulty.

Although often not truly portable light machine guns were more readily transported on roads or flat ground by armoured cars.

As the war developed machine guns were adapted for use on tanks on broken ground, particularly on the Western Front (where the majority of machine guns were deployed).

Light machine guns were adopted too for incorporation into aircraft from 1915 onwards, which enabled the pilot to fire the gun through the aircraft's propeller blades.

In response to the increasing success of machine guns mounted on aircraft it was perhaps inevitable that machine guns should similarly be developed as anti-aircraft devices (in France and Italy), sometimes mounted on vehicles. Similarly machine guns began to be added to warships as a useful addition to naval armaments.

## **Weapons of War: Poison Gas**

Considered uncivilised prior to World War One, the development and use of poison gas was necessitated by the requirement of wartime armies to find new ways of overcoming the stalemate of unexpected trench warfare.

### **First Use by the French**

Although it is popularly believed that the German army was the first to use gas it was in fact initially deployed by the French. In the first month of the war, August 1914, they fired tear-gas grenades against the Germans. Nevertheless the German army was the first to give serious study to the development of chemical weapons and the first to use it on a large scale.

### **Introduction of Poison Gas**

The debut of the first poison gas however - in this instance, chlorine - came on 22 April 1915, at the start of the Second Battle of Ypres.

The effects of chlorine gas were severe. Within seconds of inhaling its vapour it destroyed the victim's respiratory organs, bringing on choking attacks.

### **Condemnation - and Escalation**

The Germans' use of chlorine gas provoked immediate widespread condemnation, and certainly damaged German relations with the neutral powers, including the U.S. The gas attacks were placed to rapid propaganda use by the British although they planned to respond in kind.

The attack had one clear benefit at home however, for it brought to an end German hesitancy (and disagreement) over its use. The cat was out of the bag; and the use of poison gas continued to escalate for the remainder of the war.

### **The Need for a New Delivery Mechanism**

Although it was the British who chiefly suffered, all three chief armies - Britain, France and Germany - suffered similar self-inflicted gas reversals during 1915. It became apparent that if gas was to be used a more reliable delivery mechanism was called for.

In consequence experiments were undertaken to deliver the gas payload in artillery shells. This provided the additional benefits of increasing the target range as well as the variety of gases released.

### **Mustard Gas**

Mustard gas, an almost odourless chemical, was distinguished by the serious blisters it caused both internally and externally, brought on several hours after exposure.

Protection against mustard gas proved more difficult than against either chlorine or phosgene gas.

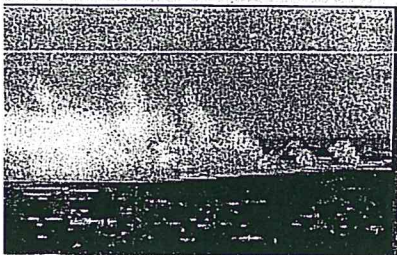
The use of mustard gas - sometimes referred to as Yperite - also proved to have mixed benefits. While inflicting serious injury upon the enemy the chemical remained potent in soil for weeks after release: making capture of infected trenches a dangerous undertaking.

### **Ever Increasing Production**

The German army ended the war as the heaviest user of gas. It is suggested that German use reached 68,000 tons; the French utilised 36,000 tons and the British 25,000.

### **Diminishing Effectiveness of Gas**

Although gas claimed a notable number of casualties during its early use, once the crucial element of surprise had been lost the overall number of casualties quickly diminished. Indeed, deaths from gas after about May 1915 were relatively rare.



### **Protection Against Gas**

The types of protection initially handed out to the troops around Ypres following the first use of chlorine in April 1915 were primitive in the extreme. 100,000 wads of cotton pads were quickly manufactured and made available. These were dipped in a solution of bicarbonate of soda and held over the face.

Soldiers were also advised that holding a urine drenched cloth over their face would serve in an emergency to protect against the effects of chlorine.

By 1918 soldiers on both sides were far better prepared to meet the ever-present threat of a gas attack. Filter respirators (using charcoal or antidote chemicals) were the norm and proved highly effective, although working in a trench while wearing such respirators generally proved difficult and tiring.

With the Armistice, such was the horror and disgust at the wartime use of poison gases that its use was outlawed in 1925 - a ban that is, at least nominally, still in force today.

## Submarines during World War I

The first time military submarines had significant impact on a war was in WWI. Forces such as the U-boats of Germany saw action in the First Battle of the Atlantic and were responsible for the sinking of the RMS *Lusitania*, which receives much of the credit for prompting the United States to enter the war.

Though there was a great deal of outrage at the sinking of an "innocent" merchant ship at the time, historians now believe the *Lusitania* had 10 tons of weapons aboard, making it a valid target under international law. Of the 1,198 lives lost, 128 were American civilians. This event turned American public opinion against Germany and was a significant factor in getting the United States involved in the war on the Allied side.

With the United States already on the side of the Allies, Germany announced on January 31, 1917 that its U-boats would engage in unrestricted submarine warfare .

The U-boats' ability to function as practical war machines relied on new tactics, their numbers, and submarine technologies such as combination diesel/electric power system that had been developed in the preceding years. More like submersible ships than the submarines of today, U-boats operated primarily on the surface using regular engines, submerging occasionally to attack under battery power. They were roughly triangular in cross-section, with a distinct keel, to control rolling while surfaced, and a distinct bow. In 1916, Serbian pilot Konjovic entered the history books as the first pilot who destroyed a submarine from the air, a French submarine in the Adriatic. When he saw that there were survivors after he dropped the bombs, he came down in his hydro-plane and saved them. For this heroic act, the French Government awarded him on 14 February 1968 a special recognition for heroism, humanity and compassion in sea battles.

