Aviation's first steps at the turn of the twentieth century and how the First World War accelerated warplane development.

Plato is sometimes quoted as saying; “Necessity is the mother of invention” and this is very applicable to the development of early aircraft, especially those intended for war. The First World War would see the roles of aeroplanes change from primarily observation to combat, as commanders realised the importance of air dominance. This change drove the need for engineers and pilots to find innovative new weapon technology and air combat tactics.

The first use of the air in the theatre of war was made as early as 1794, when the French used a tethered balloon to observe the battlefield during the Battle of Fleurus, about a decade after the Montgolfier brother's first balloon flight. Over half a century later the American civil war saw both the Unionists and Confederates attempt to deploy balloons to get a military edge; however the material expense at that time limited the use of, and thus development of balloons.

PIONEERS OF FLIGHT
On December 17th 1903 the Wright brothers made their famous first flight at Kitty Hawk heralding the start of heavier than powered flight. Within five years controlled and sustained flight had become a practical reality as other pioneers paved the way for the aeronautical engineering.

The year 1910 would see the first use of aeroplanes for most potential wartime roles; starting with the simulation of a bombing run by dropping of sandbags on targets early on in the year. Following this, one of aviation’s great pioneers, Glenn H. Curtiss, dropped dummy bombs on a buoyed area on a lake representing a battle ship. Towards the end of the year, the Golden Flyer designed by Curtiss himself (figure 1), would be used to send and receive the first radio messages, hence starting the era of radiotelephony. A Golden Flyer was also used in successful take-off and landings from ships at the end of the year. The start of 1911 saw Glenn Curtiss successfully performing flights from the water, representing the first seaplane flight ever made.

Less than a decade after the first Wright flyer flights, the aeroplane would already see wartime use. During the First Balkan War (1912-1913) the first bombing campaigns were performed, with aeroplanes dropping live bombs during both day and
night. In Mexico 1913, pilots of opposing revolutionary faction performed the first dogfight by (unsuccessfully) firing revolvers at each other. Also during the same Mexico crisis, aircraft technology had already advanced enough to allow a seaplane to drop a 365kg torpedo into the sea.

BEGINNING OF THE GREAT WAR
The start of World War One, also known as the Great War, would show the importance various nations had each previously given to the development of their own military aviation. Both Germany and Russia, with around 250 aircraft each, had twice the numbers of aircraft of either Britain or France. Numbers aside though, all the participants soon found that the tactical advantage of reconnaissance missions by aeroplanes was so great, that it would be worth trying to deny this ability to their opponents. As such, handheld weapons like rifles and pistols soon found their way into aeroplanes, some pilots even tried using some more unorthodox weapons like grappling hooks. It was the machinegun, however, that held the future for air combat.

One of the first aeroplanes specifically designed for war incorporated a forward mounted machine gun. The two seat Vickers F.B.5 “Gunbus” (figure 2) avoided having the propeller being in the machinegun line of fire, by simply using a pusher propeller at the back of the aeroplane. The design however forced the tail construction to be carried by widely spaced booms and thus also extensive rigging. The additional drag this caused lead to somewhat degraded performance as well as problematic maintenance.

The French had been trying to solve the problem of the propeller interfering with a forward mounted gun by using synchronization, but during the initial years of the war they seemed content to bolt metal plates to the back of the propeller to deflect the bullets instead. In fact, the first successful downing of an aeroplane using a machinegun had been to simply rest a dismounted device on the cockpit side and shoot. Though the solutions were low-tech, they did lead to the quick development of dogfighting tactics using the more practical forward facing gun configuration. Later on in the war the French developed warplanes that had their guns placed above the top wing of their biplanes, enabling them to shoot over their propeller disk.

The Germans decided to take a more practical approach and continued to develop gun-propeller synchronization. It was another pioneer of aviation, the Dutchman Anthony Fokker, who set the task of solving this specific problem to his company’s engineers. The engineers where successful and Fokker soon unveiled the Eindecker (figure 3), which, with its synchronized machinegun, dominated the sky during the early years of the war in what is known as the Fokker Scourge.

BALANCE OF FIGHTER POWER
The mid years of the war saw the Germans make another innovative step in air warfare when they formed dedicated fighter squadrons called Jagdstaffeln (Jasta). This was the idea of one of Germany’s great ace pilots, Oswald Boelcke, who had also been the first to effectively use clouds and the sun to his advantage during dogfights. Under leadership of another great German ace Manfred von Richthofen, who had learned much from Boelcke, the Albatros warplanes flown by the Jasta would prove to be a menace for the allied forces. It took the deployment of technically improved aeroplanes such as the Sopwith Camel (figure 4) for the allied forces to counter the severe lack of experienced pilots caused by the Jasta’s devastation.

The balance of power in the air finally shifted when the large number of aircraft the Allies were pumping out finally overcame the Jasta squadrons and started to dominate the air. Even the consolidation of Jasta squadrons in Jagdgeschwader, fighter wings which through its aces could provide local air superiority, could not shift the balance back in Germany’s favour. When the United States deployed their forces the course of the war was set and the Germans were forced to start the first of their “final offensives”.

AIRCRAFT CARRIERS
Maritime take-off and landings had been possible since the start of the war by using individual platforms on ships for sin-
Airships and seaplanes were mostly used in combat above the British channel so carriers saw limited use here. Instead the carriers would deploy significant numbers of aircraft, including Sopwith Camels, in operations in the Mediterranean Sea. The end of the war, however, also saw full-length flight deck carriers in final development which would more effectively extend the reach of airpower over oceans and seas.

**BIRTH OF BOMBERS**
Initially the use of long-range strategic bombing was limited on both sides. The Germans certainly had the capability by using both navy and army airships, but due to the decision by German commanders to avoid all civilian casualties these giants wasted much time trying to find purely military targets. Eventually the highly flammable nature of the airship got the better of them and though they were still used, their decline started. It was not until 1916 that the Germans were in a proper position to use their large new Gotha bombers to attack targets in Britain and France, now including civilian targets after previous bombings in Karlsruhe. The rapid development of air defences as a response to this forced the German air force to start conducting the night-time raids.

Allied forces initially did not put much faith in strategic bombing and instead used a variety of smaller aircraft to bomb tactical targets at a more local scale. Towards the end of the war especially the British started to change their stance towards bombing, driven mostly by Colonel Hugh Trenchard who had called for more independence of bombers from the army. Indeed the British were the first to create a fully autonomous air force by founding the Royal Air Force in 1918 with the objective to better coordinate air defence. The heavy bombers like the Hadley Page Type O/400 (figure 5) would be mostly used to attack industrial factories in western Germany.

The technology of bombing rapidly advanced during the course of the war, going from simply throwing small, next to useless grenades out of the side of the planes to being able to deploy bombs weighting several hundred kilograms. Aside from the destructive capability they carried, the bombers themselves also saw major upgrades in size and range. Indeed early German bombers had difficulty reaching Dover from the Belgian coast while at the end of the war they were capable of roaming over the British countryside.

**POST WAR DEVELOPMENT**
After the end of the First World War development in aviation stagnated briefly, but as civil demands grew, it started to rapidly advance again. A lot of it took place in the United States with the advent of metal stressed skin structures, retractable landing gear, extendable flaps and increasingly more powerful engines. These technologies would find their way back into combat aircraft together with other new innovations.

Improvements came so quickly that aircraft designed at the start of the interwar period would already be obsolete only a few years later. By the start of the Second World War aircraft development had progressed to the point where maximum speeds had tripled, maximum altitudes had doubled and bi-planes had become a thing of the past. Yet the pace of aircraft technology would continue on as it switched back to being driven by military motives due to a looming Second World War.

**References**