

# Evolution of fighter aircraft history essay

[Environment](#), [Air](#)



The goal of this essay is to give insight into the complex and decisive subject of the evolution of the Combat fighter plane. This evolutionary race has been dominated by several significant factors, with contribution from many varied bodies of power. The reason I chose this topic is that from an early age I had a fascination for aircraft and the art of flight. As a result I have numerous books and resources collected through the years of satisfying my passion.

The development of the aeroplane and consequently the great aerial war machines of the 20th and 21st Century was dependent on, among other things, something that would normally be regarded as a toy. The kite was the first machine to take flight which eventually led to the fighter plane that first saw action in World War I. This is because it was the dynamic lessons learnt from kites that enabled the construction of the practicable aeroplane. Essentially, the first aeroplanes were nothing more than free floating, powered kites. (Edt. Perlmutter T. 1975)

At the outbreak of the First World War the fighter plane formed an insignificant part of the armouries of the major world powers. (Edt. Perlmutter T. 1975) However, within four years air power experienced a tremendous upheaval and in such a small space of time, was well on the way to becoming the crucial factor in warfare. (Edt. Perlmutter T. 1975) This upheaval was caused by the ravenous hunger of total war for any and all sorts of war machines, whatever might obtain that slight but all important advantage over the enemy. This advantage came in the form of the fighter plane. Thus, beginning the evolution of the fragile pre-war aeroplanes, which were transformed into the sleek and powerful fighter planes, screeching through the skies at unheard of speeds as the new decisive weapon.

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Until the development of the sophisticated radar equipment of the 1950s and 1960s the fighter plane was basically a flying gun platform. (Edt. Perlmutter T. 1975) The most efficient means of destroying enemy aircraft was by aiming the plane 'down the barrel'. However the major problem designers were faced with in the 1914s was how to fit a forward firing machine gun in the tractor planes (those with front propellers) of the day. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997) One such technological breakthrough was discovered at the beginning 1915. The concept was called interceptor gear with the idea of stopping the machine gun firing when the propeller moved into its line of fire. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997) This alteration had a tremendous effect on the attacking capabilities of fighter planes. As a result was the main technological advancement of the war. Other progressions were merely enhancements of existing technologies. Aircraft engines became faster and more economical and weaponry became more powerful and had a higher rate of fire. It wasn't until after World War I that additional improvement was made to other factors of the fighter plane.

The area of focus for this period between the World Wars, was adding strength and speed to aircraft design. During this time of post war design, perfecting streamlining was a major goal. Practical experiments and scientific theory made the aviation world aware of the extreme importance of streamlining for the improved performance. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997) As early as 1894, the English theorist, F. W. Lanchester, had shown scientifically that the drag of a perfectly streamlined aeroplane was no more than that caused by the friction of the air moving

over its surface plus the drag necessary to sustain it in the air. (Edt. Perlmutter T. 1975) The significance of this issue was not fully realised until after World War I, predominantly due to lack of suitable aeroplane material. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997) Advances in metallurgy and the perfection of the 'cantilever' monoplane (with the wings attached to the fuselage without any external support or bracing) went a long way towards fulfilling the vision of the fully streamlined aeroplane. (Edt. Perlmutter T. 1975) The first tentative steps in this direction were hindered by the problem of the inordinate stress on the steel skin of the fighter plane. Over a ten year period the problem was experimented and resolved and a new mode of aircraft construction was perfected. The stressed skin method was a revolutionary concept in which to have the skin of the fighter plane carries the primary structural loads. This result was achieved by building the wing around a central box section girder of thick duralumin sheet. (Edt. Perlmutter T. 1975) However, the duralumin sheet was susceptible to buckling. In order to combat the problems of compressive buckling, metal structures had to be complex, with curves and riveting and reinforcement. (Dwayne A. D.)

Streamlining took another major step forward towards making a faster fighter with the invention of engine cowlings. One of the great problems with the air cooled radial engine, which began to replace the rotary engine, was that it produced enormous amount of drag on the aeroplane. Efforts to reduce the drag were complicated by the fears that enclosing the engine would hinder its cooling. Rotary engines had been cowled but because with rotary, the engine itself moved in a circular motion, cooling was not a major

problem. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997)

However, the American National Advisory Committee for Aeronautics (NSCA) conducted tests which showed that a complete cowling system reduced drag, without, hindering engine cooling. The NSCA cowling system was quickly adapted into the designs which increased the speed and range of the fighter planes. (Dwayne A. D.)

As with the First World War, the demands of wartime led to rapid escalations in fighter efficiency and power. Leading into World War II, both the Allies and the Axis powers were involved in a deadly arms race searching for the big breakthrough that would give mastery of the air. That breakthrough however did come but not till the end of the war. The introduction of the jet aircraft would have given, with time, air superiority to the Germans. Nevertheless, that potential was underestimated by Hitler. In the meantime, the piston engine fighter plane was extended to its very limits. (Donald D. 1985)

At the outbreak of war the twin engine fighter was thought to be an effective weapon. But, gradually, the comparatively slow speeds of these machines led them to be withdrawn to the role of night fighter. Very quickly the single engine monoplane became the most effective machine. Some examples of such planes are the Spitfire, Hurricane, Me-109, Fw 190 and the P-47 Thunderbolt. (Donald D. 1985) Throughout the Second World War many the existing fighter plane technology was pushed to the limit of development with only one major drawback. This problem was found by the Germans during the battle of Britain, and by the Allies over Germany was that these fighter aircraft had limited flight endurance. For the Allies this meant that

fighter planes, when operating from Britain before D Day, could escort the bombers only as far as Aachen in Germany. (Edt. Perlmutter T. 1975) In August, 1943, an American air raid on the Schweinfurt ball-bearing factories suffered a 16 percent casualty rate. A follow-up raid in October suffered a loss of 198 (out of 291) bombers either lost or damaged. Faced with increasing casualty rates the Americans halted the raids until a long range escort was put into production. (Wilkinson M. 2008) Thus was born the P-51 Mustang, one of the most successful planes of the war. The mustang was powered by a Packard V-1650-Merlin 1, 650 horse power engine. It had a maximum speed of 440 miles per hour at 30, 000 feet. But what made the P-51 so decisive is that it had maximum range of 2, 200 miles through the use of drop tanks. (Donald D. 1985)

By the end of the Second World War piston engine aircraft had reached the limit of their advancement. Horsepower could not be increased without greatly increasing the engine weight and if this could have been achieved there existed another serious problem. This problem was the sonic barrier. As an aeroplane approaching the speed of sound the drag is increased enormously. Propellers could not cope with that kind of drag and lost all their efficiency. It thus seemed that man was limited to a speed of 400-500 miles per hour. (Chant, C. Humble, R. Davis, J. F. Macintyre, Gunston, B. 1997)

In 1928 a young R. A. F. cadet, Frank Whittle, wrote an article for the college paper on the possibility of the jet propulsion by means of the gas turbine. The idea was ridiculed at the time, yet in that youthful paper was set the foundations for the profound revolution in aviation. (Bellis M.) This revolution

was again brought to a head by the superpowers lust for technological control. Gas turbines had been around as early as the turn of 20th century. Many aviators had even thought of adapting the turbine for aeroplane use, but at the time it was still too clumsy, and aviators only thought of using it as means to power a conventional propeller. Whittle asked, why not use the trust of the hot gases of the gas turbine to propel the aeroplane? After many trials and tribulations, Whittle managed to have a prototype engine built in 1937, nine years after the idea was first announced. (Bellis M.) The engine was compounded of three parts. The compressor at the intake end sucked in air and compressed it by means of centrifugal chambers. The middle part was the combustion chamber where the fuel was mixed with the air and ignited. The outlet end contained the gas turbine which was a fast spinning, bladed wheel. A shaft joined the gas turbine and the compressor. The turbine used the energy of the hot gases to provide useful work. The rest of the hot gases were released through tiny openings, to increase exit velocity. This in consequence generated the thrust. (Bellis M.)

Although Whittle was the first to propose the idea of the turbojet, the Germans were the first to exploit it. Hans von Ohain had, in the mid 1930s, independently reached similar conclusions as Whittle. (Wagner W.) But unlike the British pioneer, Ohain did not have to struggle through the political tide to get a hearing for his ideas. Heinkel, the big aeroplane manufacturer took him in for the express purpose of building a jet aircraft in which could be used as a combat fighter. The result was the Heinkel He 178, the world first jet aeroplane. (Wagner W.) Although early development work was being undertaken before the war, this incredible technological feat did

not come into its own until the last year of the conflict. This was achieved through the development of the Messerschmitt Me 262, the first jet turbine fighter. (Bellis M.)

The story of the jet fighter really began during the Korean War, when aircraft designers had the benefits of the first jet versus jet combat. From this experience stemmed several aircraft which had a profound effect on the fighter plane. (Donald D. 1985) The Mikoyan-Gurevich MiG-19 and the Lockheed F-104 Starfighter both grew directly out of the Korean experience and set a precedent for subsequent types. Following the Korean generation there was a period of general improvement and consolidation of design, resulting in such types as the Mikoyan-Gurevich MiG-21, Dassault Mirage III and McDonnell Douglas F-4 PhantomII. Throughout the late 1960s and early 1970s these aircraft fought frequent battles, in the skies over the Middle East and South East Asia. These wars enabled all the developments of the relatively peaceful proceeding period to be tested out and honed to perfection. (Donald D. 1985) The two main developments introduced into battle were air-to-air missiles and electronics. Although air-to-air missiles had been in service for many years, it was not until Vietnam that they were used in any numbers. The missile had virtually replaced the cannon for the United States Air Force, with the initial interceptors in Vietnam soon discovering that the missile was too dangerous to use at close range, often failing to track its targets when used at low altitudes or facing the sun. (Major Godfrey F. A. 1988) Consequently, fighter aircraft started appearing with cannon weapons again and this practise continues to this day. However, the advantages of the missile should not be overlooked, as it was in the Vietnamese skies that



the basic lessons of how to make missiles work for the masters were learned. (Donald D. 1985)

The Vietnam and Middle East wars introduced electronics on a large scale to aerial warfare. Combat aircraft began to carry electronic countermeasures (ECM) to confuse enemy radar-guided missiles. (Major Godfrey F. A. 1988) Also, they began to operate under the control of airborne command posts, directing the fighters to intercept or avoid enemy aircraft spotted on the command post's airborne radar. (Donald D. 1985) Further electronic developments in weapons delivery systems, terrain following radars and tactical 'jamming' means that today's aircraft are packed with a plethora of electronic equipment, connected to underwing pods, fin and wing tip airdropers, fuselage blisters and nose cones, all computerised and duplicated. (Donald D. 1985) Even the flight controls are no longer cables but hydraulic leads to printed circuits, chips and kilometres of wire. This technology has enabled the modern combat aircraft to free itself from the shackles of daylight and weather, with strikes and interceptions now able to be carried out with devastating accuracy at tree top height under any conditions. (Donald D. 1985) Whilst the superpowers debate the use of other technologies in military role, the modern combat aircraft will continue in its prestigious position, inherited during World War II, as the spearhead of the military forces of the world. (Koch H. W. 1998)

Since the aircraft was first used in an offensive role in 1914, it has evolved rapidly from the string and matchwood creations of the early pioneers, to the highly advanced, computerised machinery of today. Along the way there

have been many important developments to both aircraft and the weapons they carry and these technological leaps have occurred with increasing regularity. The underlying reason for these leaps forward has been the political backing of superpowers through time, which raised the technological arms race to fever pitch with the fighter plane performing a crucial part.