THE RATCLIFFE SPITFIRE P9503

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Supported by The Leonard Stillwell Bursary and The Spitfire Society

THE WORLD'S ONLY SPITFIRE BUILT BY STUDENTS

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The spring term afforded us a full complement of sessions, allowing us to meet every week; which is somewhat of a miracle! We are making steady progress, with the Year 7's really rising to the occasion and learning high level skills quickly. The warmer weather that we are now looking forward to will allow us to do some of the bigger, and smellier tasks, outside, such as treating some of our parts with preservative before they have paint applied…exciting step forward!

The Build

We continue to work on detailing, making excellent progress with riveting as well as some of the sheet metal work needed on the frames. The level of workmanship is continually improving, and as new techniques are tried, we move forward steadily. Some of the more difficult tasks involve forming the joining sections such as those on the lower half of Frame 11. There is quite a tight curve at this point in the fuselage, and these aluminium pieces can easily buckle unless fully clamped whilst they are being formed. This is all done by hand, using formers, clamps and hammers, and I am extremely pleased with the quality we are now achieving. It has meant that we have made some pieces previously that do not meet my expected standard, but this is all part of the learning process and is therefore extremely valuable and should rightly be seen as positive. In the photograph here you can see Will, under the watchful eye of Ben, working with the mechanical nibbler to straighten some 1mm aluminium sheet in preparation for cutting one of these joining sections. The following image shows Zoe tracing out another of the many brackets needed for Frame 11. We are fortunate to have been given two original brackets, so producing our versions is made a great deal easier! Eventually these will be fitted above and below the datum longeron point of Frame 11,

and form part of the structural elements of this key frame. We will employ our method of dummy riveting which involves selecting the correct solid rivet size, and then drilling and gluing them in the correct places. An example of this effective method can be seen in the photograph to the left.

Another addition to our stock, that can be ticked off our materials list, is the purchase of the correct British Standard interior cockpit green paint. It has been fun to try this out on parts of Frame 8 and 11; the transformation is instant, with the MDF, aluminium and rivets aesthetically transformed into a 'real' Spitfire.

Ultimately, when the frames are fully completed, they will receive a coat of sealer before being primed with silver and then the cockpit green, this will ensure a greater lifespan for the wood parts, and should any of the green be rubbed off, the silver below will mimic aluminium. Here are a couple of shots of both of these frames, I hope you will agree that it makes all the difference.

The Supermarine Spitfire Mk1, a brief comparison

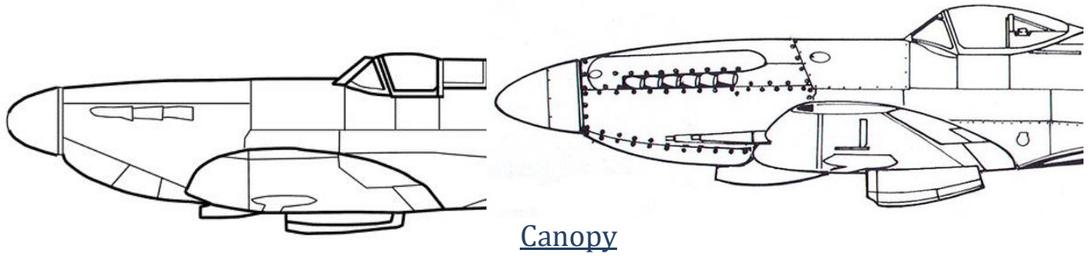
In these bulletins I have discussed various elements of our project but I don't think that I have ever made it clear what the differences are between a Mk1 Spitfire and the other Mks. I thought it a good idea to take this opportunity to go into a little detail here, but, just to fend off a barrage of replies outlining my omissions, this is by no means a comprehensive study, rather a brief(-ish) look at some of the key details that might appear more obvious. I have broken these areas down into sub-headings:

Engine, Canopy, Rudder and Flight Surfaces

Reginald Mitchell designed the Spitfire during the 1930's. It was not the RAF's first monoplane (single wing) frontline fighter, that accolade fell to Hawker's mighty Hurricane, but it was absolutely cutting edge for its time. The construction method was revolutionary for the British aircraft industry, quiet different to the Hurricane which was much like a biplane, although with only a single wing. The Spitfire was made entirely from metal, with Rolls Royce supplying their best engine, the Merlin to power it. Most aircraft have their design heavily influenced by the size and shape of the engine used. Aircraft design is not primary influenced by aesthetics, they must function. A big round engine, (radial), will make a big round shape at the front, and is exposed so that the airflow can cool it. An inline engine, such as the Merlin, has a radiator for cooling, so can sit inside the 'skin' of the aircraft. It is more streamlined as a design, so produces less drag and consequently helps with power. Below left you can compare the wonderful Pratt & Witney R985 radial engine to the Merlin III. Both of the same vintage, but utterly different in design.

Engine

The nose of the Spitfire housed its engine, neatly enclosed within the nose fairing. All marks of Spitfire, from Mk1-Mk24 were fitted with Rolls Royce engines, albeit different types as advances in power produced bigger and bigger 'lumps'. So it was that the Spitfire's nose grew longer in order to accommodate each revised, or different engine. The Mk1 Spitfire had the shortest nose, as seen on the left below, with the last of the type, Mk24, fitted with the powerful RR Griffon engine, seen on the right. The difference in lengths is certainly noticeable, as are the protrusions on either side of the Griffon engine which made room for the bulges of the rocker covers.



Canopy

The canopy is very recognisable on a Spitfire. I remember when I was very young being told that I could spot a Spitfire by its 'bubble canopy'. The clear Perspex 'bubble' that was designed for the Spitfire actually wasn't there on the very earliest of the type. The canopy's line followed a straight path above the pilot's head from the windscreen to the rear spine of the plane. It had straight sides too, but this wasn't any good for taller pilots, or for having a good look around in a combat situation. Pretty quickly this pilot feedback resulted in revisions being made, and most Mk1s had a raised canopy height whilst maintaining the flat sides. This certainly was an improvement, but the cockpit of a Spitfire is a cramped place to be, there's very little room either

side of your shoulders, and swinging your head around to try and spot an adversary is not helped by the flat sides, that also taper inwards compounding the problem. Again the designers worked out an alteration, and it is this version that is so recognisable today; the true bubble canopy, a rounded viewing bubble that allowed taller pilots more comfort, and all pilots better all-round visibility. The bubble type can clearly be seen in the picture on the left above, with the flatter-topped and flat-sided Mk1 on the right. You might also notice a small oval panel of the left side. This is known as a push-out panel and was put in because it was thought that equalising the air pressure inside the cockpit to that outside would be needed before the pilot could bail out. As it was, this was not the case, and all subsequent versions did away with it. (If you look at much later marks there were other canopies used, such as the low-back seen in the Mk24 drawing on this page, but the majority of Spitfires had the evocative bubble type fitted.)

Rudder

Another aspect of the earlier Spitfires, comparing them to later types, is the rudder shape. This particular difference, taken in isolation, is not a defining sign of a Mk1, but it will at least help to indicate whether you are looking at an early or late aircraft.

There are two rudder shapes used on the Spitfire, Standard and Broad Chord. On Spitfire types, up to and including some MkIX the Standard Chord rudder was used, seen on the left. From later MkIX's and subsequent aircraft, the Broad Chord rudder appeared, seen on the right. Aesthetically most people would agree that the smaller, more elegant Standard Chord rudder epitomises the lines of the Spitfire more than the larger, and pointed-topped Broad Chord rudder. Of note also is the difference in size of the trim tabs. These tabs also appear on the horizontal stabaliser and are adjustable via wheels in the cockpit. They allow the pilot to fine-tune the flight characteristics so that as little pressure is felt through the control column whilst is level flight. Over long periods of time this helps to alleviate pilot fatigue.

Flight surfaces

The final difference that we will be looking at are the flight surfaces, that is to say, the parts of the wings and tail that the pilot can move in order to manoeuvre his aircraft. For the Spitfire this means the ailerons, horizontal stabaliser and rudder. On the earlier Spitfires these were fabric covered, in exactly the same way as the biplanes of WWI used canvas, stretched over spars, hand stitched and then doped (a liquid that once applied, dries on the canvas to create an airtight, weatherproof and drum skin-like surface). At the time of its design this was a well-known method in use within the aircraft industry, with a readily available skilled workforce. As the aircraft developed though, metal surfaces were employed, which gave the Spitfire greater manoeuvrability at higher speeds.

A caveat to all of the differences mentioned above: There are many other differences, some quite subtle, but also, at any given time, any one Spitfire may well have had a variety of different updates applied, and parts fitted, so discerning a particular mark is not always easy. In recent times, many of the surviving and restored aircraft have had alterations made to them, some of which have not adhered strictly to historical accuracy. It has even been argued by some, that P9374, lauded quite rightly as amongst the most authentically restored Mk1 Spitfire, is not 100% correct.

The end of an era

The advancements in aviation technology from the 30's until the end of hostilities in 1945 were exponential. At the outset of WWII Great Britain was equipped with what it believed was an air force of reasonable strength, but it quickly became apparent, as they were tested in combat, that many of the types were outdated. Developments were rapid, new designs appeared, and existing designs either became obsolete or underwent improvement. The inherent design of the Spitfire was so good, and the engineering so strong, that the airframe could take progressively more powerful engines, with minimal changes to the aircraft's basic design. It is a true testament to the strength of its design that the Spitfire remained in RAF service from 1937, throughout the war, and continued for a further 12 years until 1957. The image to the right shows a late Mk Spitfire T.H.U.M (Temperature and Humidity) flight in 1957.

A thought to finish on…

During the summer and autumn of 1940, as the raids by German bombers and their escorting fighters intensified, the battle was brought to the skies above southern England. Eager school children would look up and watch from playgrounds, and farmers from their fields as the twirling contrails high up in the blue skies traced these encounters. Occasionally the fight would reach lower altitudes, and the aircraft would roar by frightened onlookers. Bullets and shrapnel were a constant danger, as well as a prized souvenir. Inevitably the aircraft themselves, like P9503, would succumb as victims to these aerial duals, but serve now as historical memorials.

Propaganda is an essential part of warfare, and it is no surprise that the pilots of the RAF were seen as modern versions of the knights of old, and their machines, in particular the Spitfire, were lauded as their steeds. In a time when the fate of this small island hung in the balance, Great Britain needed her heroes.