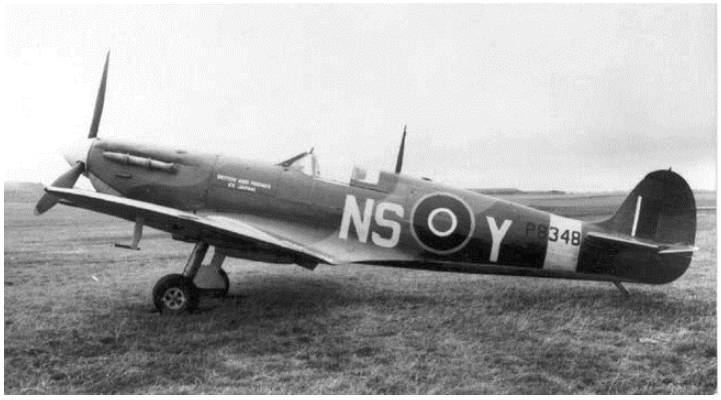
The Spitfire: A Legend

By Alex Valz



The legendary British Spitfire was designed by R.J. Mitchell, Chief Engineer of Supermarine Aviation Works. Powered by a Rolls-Royce Merlin C engine driving a two-bladed fixed pitch de Haviland propeller, the prototype Spitfire made its maiden flight on March 5, 1936. In June of that year, the Air Ministry extended a contract to Vickers-Supermarine to produce 310 Spitfire I aircraft.

Unfortunately, Mitchell died in 1937 and was unable to witness the success of his work. His assistant, Joseph Smith, took over as chief designer and oversaw its development through many variants. The first Spitfire entered service in 1938 equipping Number 19 Squadron.

Adaptability of the Spitfire Airframe

The Spitfire airframe was developed with adaptability in mind. There were 24 variants of the plane. The original Spitfire I was powered by the Rolls-Royce Merlin engine producing 1,030 horsepower. Later versions of the Spitfire were powered by the much larger and more powerful Rolls-Royce Griffon engine. In the case of the final version, the Spitfire 24, the engine used produced 2,340 horsepower. Naturally, the later versions were faster, had a greater rate of climb, and a higher service ceiling. The Spitfire 24 was twice as heavy and powerful as the Spitfire I, and showed a 30% increase in climb rate over the original. (Note: All Spitfires after the Spitfire XIX were designated with Arabic numerals).

The 24 marks of Spitfires evolved from the previous marks through the power of their engines, armament, superchargers, and numerous smaller yet important changes. The appearance of the Spitfire changed markedly with the advent of the Griffon engine. The nose became more elongated and wider to accommodate the larger engine. The bottom surface of the nose was less curved and lost its "pigeon chested" appearance to a great degree. Additionally, rudder sizes and horizontal control surfaces became larger to handle the increased power. The airframes which gave rise to later marks were those of the Spitfire I, Spitfire V, and Spitfire VIII. The Spitfire I airframe gave rise to the Spitfire II. The Spitfire V was used to produce Spitfires VII, VIII, and IX. Finally, the Spitfire VIII airframe was used in all of the Griffon-powered later marks.

Wing Design

One of the most notable features of the Spitfire was the beautiful elliptical wing. Besides its aesthetic value, the design of the wing was the solution to two conflicting requirements. First, the wing needed to be thin enough to avoid creating too much drag. Second it had to be thick enough to house the retractable landing gear, armament and ammunition. With the ellipse, the wing was thinnest the farthest from the fuselage but was thick at the root, thereby accomplishing these goals.

Another feature of the wing was the innovative spar boom design made up of five square booms that fitted into each other. Both the shape of the wing and the spar boom gave the wing the needed strength and stability for tight maneuvering, a definite advantage in combat over the Spitfire's main adversary, the German Messerschmitt Bf-109E. Finally, the Spitfire had detachable wing tips secured by two mounting points at the end of each wing assembly.

Carburetor versus Fuel Injection

The Rolls Royce designers deliberately chose the carburetor over fuel injection for the Merlin engine because it enhanced the performance of the supercharger and increased the power of the engine with a corresponding increase in speed. It was an odd choice because fuel injection is widely accepted to be more reliable. The disadvantage of the carburetor was that both the Spitfire and Hurricane, unlike the fuel injection equipped Bf-109E, were unable to simply nose down into a steep dive as fuel was forced out of the carburetor by negative "g," thus making the engine stall. RAF pilots soon realized that the solution was for them to half roll before diving to pursue opponents. Carburetors flooding under negative “g" conditions were a more serious problem. The solution came in 1942 when Bendix-manufactured pressure carburetors designed to allow fuel to flow during all flight conditions were introduced.

Armament

Early Spitfires were armed with only four Browning .303 caliber machine guns. These guns functioned fine at low altitudes but tended to freeze at higher altitudes. Supermarine did not fix the problem until late 1938 when they remedied it by adding hot air ducts from the rear of the wing-mounted radiators to the guns. Red fabric patches were doped over the gun ports to protect the guns until they were fired.

Later it was decided to add an additional four guns for a total of eight guns, each of which could fire 1,000 rounds per minute. Pilots soon found that they had a hard time destroying larger aircraft of two engines or more. A gun of at least 20 mm caliber was urgently needed.

In 1939, Hispano 20 mm cannons were fitted into each wing of a Spitfire I but often seized up after firing. Nevertheless, 30 Spitfires equipped with cannon were ordered for operational trials and were designated Spitfire IB to distinguish from the Browning-armed IA.

This was determined to be unsatisfactory, so Supermarine later remedied the problem with an improved feed mechanism and paired the two cannon with four machine guns in the outer wing panels. This mixed armament arrangement was used in the Spitfire IIB, and guns seized far less frequently as bugs were mostly eliminated.

Beginning with the Spitfire V, all succeeding marks of the Spitfire were equipped with both cannon and machine guns.

The Battle of Britain

With the invasion of Poland by German forces on September 1, 1939, Britain and France declared war on Germany and began to move forces into Belgium and northern France to defend against a probable German invasion. Britain supplied about 300,000 troops in what was designated the British Expeditionary Force (BEF). Attached to the ground component of this force were a number of Hurricane fighter units and bomber units. No Spitfire units were provided as these were considered too valuable and vital for the defense of the British home islands. The next few months were called the "Sitskreig" or the "Phony War" as there were a few air skirmishes. All that all changed when the Germans invaded France and the Low Countries on May 10, 1940.

Britain's meager air contingent was caught unprepared. Even though some aircraft made it off the ground and engaged the enemy, many were not so lucky and were destroyed on the ground. British army units soon realized that they were being outflanked and retreated to the French coast in hopes of being evacuated from the coastal city of Dunkirk.

When evacuation commenced, Spitfire squadrons from southern England were in the air to cover it, and they took a heavy toll on German fighters and bombers. The evacuation eventually succeeded in bringing 330,000 British and French troops safely back to England. The Dunkirk operation was termed a miracle, and the remaining British troops hunkered down to face an invasion from across the English Channel.

With France out of the fight, Hitler turned his attention on taking Britain out of the war. Reichsmarschall Hermann Goring, who was also the German Air Force (Luftwaffe) commandant, convinced Hitler that the Luftwaffe could destroy the RAF in one month so that the seaborne invasion of southern England, code named Operation Sea Lion, could take place.

The Battle of Britain was the first battle in history that was entirely fought in the air. The British recognize the battle's duration as being from July 10 to October 31, 1940, with the nighttime attacks known as the "Blitz" lasting from September 7 to May 11, 1941. German historians consider the battle as one single campaign lasting from July 1940 to May 1941.

The battle is generally divided into four phases. In 1940, the battle commenced with the Luftwaffe targeting coastal shipping and convoys carrying primarily coal used for British industry. After two convoys were bombed heavily and lost a number of ships, it was decided that shipping coal overland by rail was a far less risky approach. In the German attack on a convoy on July 10, the RAF acquitted itself well by downing 13 enemy planes against the loss of seven British fighters.

The second phase commenced on August when the Luftwaffe was ordered to achieve air superiority over the RAF. August 13, known as Eagle Day by the Germans, included large-scale attacks on airfields, radar stations, and aircraft factories. Although some damage and disruption was caused, most raids were picked up by radar and intercepted with heavy losses on both sides. Damage was usually repaired quickly and RAF operations continued with little disruption.

Since the second phase was largely unsuccessful, the Germans decided to step up the attacks. More and more aircraft were thrown into the fight. The third phase included large-scale attacks on aircraft factories and strategic infrastructure with

growing success. Although the RAF was now taking greater losses, aircraft production continued around the clock, and the number of front line fighters stayed much the same as before. The Germans were greatly perturbed by the staying power of the RAF.

On the night of August 24/25, the fourth phase began when the Luftwaffe, through error, bombed London. The following night the RAF retaliated with a raid on Berlin. Though little damage was done, Hitler gave Luftwaffe chief Goring free rein to bomb London on September 7. This took much pressure off RAF Fighter Command and allowed it to rebuild and repair damage to facilities and aircraft. The Luftwaffe continued raids on London and other British cities largely at night until May 11, 1941.

The Opposing Forces

The RAF Fighter Command consisted of primarily two types of aircraft: Spitfires I and II, and the Hawker Hurricane I. In the beginning of the battle, there were 19 squadrons of Spitfires and 30 squadrons of Hurricanes. The Spitfire was the more nimble and faster of the two fighters, so it was decided that the Spitfires would first engage the Bf-109s before attacking the bombers. The Hurricane, which was at a disadvantage against the Bf-109, would head straight for the bombers.

The Spitfire I and the Bf-109E were well matched against each other. The Spitfire had a tighter turning radius and thus had the ability to shake off the Bf-109. It could also get the German fighter off its tail with its outstanding rate of roll combined with a subsequent dive. The Bf-109E could out climb the Spitfire as it was equipped with fuel injection which prevented stalling. This gave the Bf-109E an advantage as it could level off at a higher altitude and then swoop down upon its opponent.

Another advantage the Bf-109 had was its armament. Two 7.92 mm machine guns and two 20 mm cannon had more hitting power than the Spitfire's eight .303 Brownings. Additionally, the Spitfire only carried enough ammunition for 15 seconds of firing. Ammunition had to be used sparingly with one and two second bursts if more than one enemy was to be engaged. Good marksmanship was necessary to inflict damage on opposing aircraft under these conditions.

Tamiya's excellent new Spitfire I

Hasegawa's classic Bf-109E

Besides the three most important fighters (Spitfire, Hurricane, Bf-109E), there were other aircraft on both sides involved in the Battle of Britain. On the RAF side there was the Boulton Paul Defiant, which featured an odd configuration of a four machine gun turret facing to the rear but no forward facing machine guns. This aircraft was used early in the conflict and initially surprised the Germans, scoring some success against bombers. But the Defiant was soon easily overcome by fighters. The Defiant was later used as a night fighter, which extended its service life.

On the German side, the Bf-110 and the Ju-87B Stuka proved ineffective and were eventually phased out of major roles. The Bf-110 was a twin engine "heavy fighter" that packed heavy armament and was intended to equip elite units. Crews were some of the best in the Luftwaffe, but the plane was so slow and sluggish that it was easy prey for both Hurricanes and Spitfires. With the Bf-109 limited by its short range, the Luftwaffe had to resort to the Bf-110 as escort for the bombers on long missions. Such formations usually suffered heavy casualties and were eventually discontinued. Later in the war, the Bf-110 found a role as a bomber interceptor, a light bomber, and a night fighter. The Ju-87B Stuka was used as a terror weapon in Poland, the Low Countries, and France. In this role, the Stuka was an essential part of the Blitzkrieg tactics and caused panic among opposing armies with its wailing sirens. These planes were used in the early stages of the Battle of Britain to attack radar installations but became very vulnerable to RAF fighters, who would wait until Stukas came out of their dive and then easily slaughtered them. RAF pilots who participated termed these fun engagements "Stuka parties."

With the Stuka all but eliminated from the Battle of Britain, bombing was carried out by three types of twin engine bombers: the Dornier Do-17Z, the Heinkel He-111, and the Junkers Ju-88A. The last of these, the Junkers Ju-88A, called the Schnell bomber or fast bomber, was the most capable of these three planes and could reach speeds approaching 300 mph. All had four or five crew members and were lightly armed with only two or three machine guns. Later in the war, more guns were added but these aircraft remained very vulnerable to fighters, resulting in high losses during the Battle of Britain. All of these planes could carry only small bomb loads compared to the Allied bombers that flew later in the war, so while the damage inflicted was significant, it was only a fraction of what Germany would suffer later.

The RAF's and Luftwaffe's Leaders During the Battle of Britain

As for leaders, British Prime Minister Winston Churchill was an active participant in the Battle of Britain, encouraging his people with inspiring speeches and taking keen interest in the day-to-day operations of the RAF and Britain's other defenses. The British also had capable and active fighter force commanders in Air Chief Marshal Hugh Dowding, who was responsible for introducing the "Dowding System" whereby radar, raid plotting, and radio control of aircraft were integrated. Vice Marshal Keith Parks was in command of No.11 Fighter Group, which covered London and surrounding countryside. Further north was No. 12 Fighter Group, commanded by Trafford Leigh-Mallory, which could give assistance to No.11 Fighter Group. Two other fighter groups, No.10 and No.13, were responsible for the southern coast and northern England and Scotland respectively.

Air Marshal Hugh Dowding

Keith Parks, 11 Group

Trafford Leigh-Mallory, 12 Group

On the German side, the Luftwaffe was commanded by the amateurish Reichsmarschall Hermann Goring who made many bad decisions, some of which no doubt allowed the RAF to continue to fight. Also called "Fatso Goring" by Luftwaffe personnel, he was a Hitler sycophant who was mainly interested in promoting himself. In command of Luftflotte (Air Force) 2 was Albert "Smiling Albert" Kesselring, who was responsible for the bombing of southeast England and the London area, where most of the action would take place. Kesselring would later be placed in command of the Mediterranean Theater, where he would gain prominence. Monocle-wearing Hugo Sperrle commanded Luftflotte 3 covering the western, midland, and northwest areas of England. He later took over night bombing during the so-called "Blitz." A rising star in the Luftwaffe was Adolph Galland who took over command of JG26 (Fighter Group 26) and became an ace while flying as a General. These men were competent but Goring still called the shots and offended them in doing so. Galland, in particular, later feuded with Goring, but Goring realized Galland's talent and even promoted him to command all fighters.

Hermann Goring

Albert Kesselring

Hugo Sperrle

Final Results of the Battle

The most dangerous days of the Battle of Britain were considered to be August 24 to September 6. During that time the Germans targeted airfields and aircraft factories with growing success. In August alone, the RAF lost 136 Spitfires but they inflicted even heavier losses on the Germans. Goring questioned the tactics of attacking radar stations and was explicit in his orders not to attack airfields again after they had already been

successfully attacked. This was a major break for the RAF and enabled it to replace losses and continue to fight.

On September 7, Goring began bombing London instead of RAF bases, allowing Fighter Command to regroup unmolested. On that day, a vast formation of 350 bombers, escorted by 617 fighters descended on London. Unprepared for an attack of this magnitude, Fighter Command was slow to respond but managed to down 38 enemy planes while losing 28 of its own.

On September 15, known as Battle of Britain Day, two massive daylight raids involving more than 250 German bombers and 350 Bf-109Es hit London. This time, 300 or more RAF fighters took to the skies to intercept them. Against 56 losses by the Luftwaffe, the RAF lost seven Spitfires and 20 Hurricanes. Lopsided scores like this continued until the Germans called off daylight bombing on October 31. They continued with nighttime bombing until May 1941 in order to reduce losses. With the invasion of the Soviet Union in the summer of 1941, most of Germany's air assets were moved east in order to subdue this massive new enemy.

In terms of overall losses, both sides made exaggerated claims of the number of enemy planes destroyed. The RAF claimed 2,698 kills while the Luftwaffe claimed 3,198 RAF aircraft downed. In actuality, Luftwaffe losses totaled 1,977 aircraft, including 243 twin and 569 single engine fighters, 822 bombers, and 343 non-combat types such as reconnaissance and transport aircraft.

RAF Fighter Command aircraft losses totaled 1,087 including 53 twin-engine fighters. The RAF also lost 376 bombers and 148 Coastal Command aircraft. Of the 1,034 single engine fighters lost, 361 were Spitfires and 673 were Hurricanes.

The Battle of Britain officially ended on October 31, 1940, according to the British. There were other statistics besides lost aircraft, specifically those of human casualties. On the British side, RAF casualties totaled 1,542 killed and 422 wounded. For the Luftwaffe, personnel killed totaled 2,585 while 1,735 were wounded. Significantly, 925 Luftwaffe pilots and air crewmen became prisoners and would remain in England for the duration of the war. The loss of these skilled and highly trained air crews would be a major blow for the Luftwaffe and Germany. Finally, on the British side 23,000 civilians were killed and 32,000 wounded in the bombing of London and other cities. Germany's failure to destroy Britain's air defenses led to the cancelation of Operation Sea Lion, the amphibious invasion of Britain, and gave Germany its first defeat of World War II.

As 1940 ended, more Hurricane fighters were turned in for Spitfires. Many of the battle weary Spitfire I's were pulled off the line and replaced by newer Spitfire II's and the much improved Spitfire V's. Soon all of the Spitfire I's, which had fought so gallantly during the Battle of Britain, would be replaced.

Spitfire Aces of the Battle of Britain

There were too many Spitfire aces during the Battle of Britain to recognize in this article, so I have written a short profile of four of the most successful who brought something extra to the defense of the skies over Britain.

Group Captain Colin Gray

Gray was born in Christchurch, New Zealand and joined the RAF in 1938. He first saw action flying a Spitfire I as a member of Number 54 Squadron where he got his first kill of a Bf-109. He was a critic of the "vic" formation like his fellow ace Adolph 'Sailor' Malan. In September 1940 his unit was withdrawn from action with his score standing at 16 enemy aircraft destroyed. He later returned to action after the Battle of Britain and, at the end of the war, his score stood at 27 victories.

Group Captain Adolph 'Sailor' Malan

From South Africa, Malan joined the RAF in 1936. He is considered by many to be the greatest tactician of Fighter Command. He was a fierce critic of the "vic" formation which had squadrons of 12 planes organized into four groups of three. Malan saw this as putting RAF fighters at a significant disadvantage against the Germans, so he organized his squadrons into three groups of four planes, similar to the German "Schwarm." This allowed a group of four to divide into two pairs, which would enable each pilot to have a wingman who could cover his tail. Soon all RAF squadrons would use this system and kill ratios improved as a result.

Flying with Number 74 Squadron over Dunkirk in May 1940, Malan destroyed three enemy aircraft and shared in destroying two more. Prior to the Battle of Britain, he shot down two He-111s while flying night sorties. Malan was subsequently promoted to squadron leader of Number 74 Squadron and, by March 1941, he had destroyed 15 enemy aircraft. This gained him an appointment as commander of the Biggin Hill Fighter Wing. His final score at the end of the war was 27 enemy aircraft destroyed, seven shared, three probables and 16 damaged.

Brian Carbury

Another New Zealander, Carbury was the RAF's leading ace during the Battle of Britain and one of only two Fighter Command pilots to become an ace in a day when on August 31, 1940, he shot down five Bf-109s. On August 28, Carbury's 603 Squadron was sent to Hornchurch Airfield to relieve Number 65 Squadron. Carbury became the unit's ace of aces while downing eight Bf-109s during the first week of his unit's operations. By the end of the year, Carbury had destroyed 16 aircraft and shared in two more victories.

Wing Commander Robert Tuck

In May 1940, Robert Tuck was posted to Number 92 Squadron as a Flight Commander and shot down seven enemy aircraft by the end of the Dunkirk evacuation. He was one of the first pilots to score five victories while flying the Spitfire. By the end of the year, Tuck's score stood at fourteen enemy planes destroyed, all in a Spitfire I. In January 1941, he was shot down over France and taken prisoner while flying a Spitfire VB. By that time his score stood at 27 enemy aircraft destroyed and six probables.

Next article: Spitfires fly fighter sweeps over France and face a formidable new foe, the Focke-Wulf 190. Axis bombers lay siege to the island of Malta, the British bastion in the Mediterranean. Spitfire pilots fight for their lives to save this vital island. New Spitfire variants are introduced, including the answer to the FW-190, the Spitfire IX.