

Excerpt from 'Spitfire – A Test Pilot's Story' (Jeffrey Quill)

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Griffon Spitfires: Mks IV and XII

Shortly before the war, Rolls-Royce had begun to foresee the need for an engine of greater cylinder capacity than the Merlin. Amongst its applications would be the production of high power at low altitude for naval shipborne aircraft. The old 'R'- type engine, which had powered the Supermarine S.6 and S.6B Schneider seaplanes of 1929 and 1931, had a swept volume of 36.75 litres. This was about ten litres more than the Merlin, although its basic layout – a supercharged liquid-cooled 60° V12 – was similar. Under sprint conditions the 'R' engine had in 1931 produced an output of 2,700bhp at sea-level, admittedly using rather exotic fuel, and amply demonstrated its power potential. So it was entirely logical for Rolls-Royce to think of reviving this power unit in modernised and production-engineered form, to take over when the Merlin reached the end of its development life. By December 1939 the first Griffon – a direct descendant of the illustrious 'R' – was running on the test-bed.

Achieving the lowest possible frontal area had been an obvious requirement when the 'R' engine had been developed for the S.6 racing seaplane in 1929. For this reason the Griffon, based on the 'R', came out with a frontal area of only 7.9 sq. ft compared with the Merlin's 7.5 sq. ft. Such a very small increase for an additional ten litres of cylinder capacity at once suggested to Joe Smith that the new engine might fit into a Spitfire. So even before the first Griffon was running, Smith submitted a design proposal (Supermarine Specification No.466 dated October 1939).

The idea at once received the support and encouragement of Sir Wilfrid Freeman, the Air Member for Development and Production (AMDP) on the Air Council, and N.E. Rowe, the Deputy Director of Research and Development (Landplanes). That this was the case is highly significant, because it suggests that Freeman's thoughts were now turning actively towards the future development of the Spitfire – whereas only six months previously he had been discussing the possibility of turning Supermarine over to Beaufighter production! On 9 November 1939, Rowe minuted the RAF Director of Operational Requirements with the details of the Supermarine scheme for a Griffon Spitfire. He described it as a long-term project requiring at least eighteen months to mature into production, and added that it would not interfere with current schemes to install improved versions of the Merlin. Rowe also pointed out, however, that the larger Griffon would reduce the aircraft's endurance if the standard fuel tankage was retained, and that the extra weight involved would have some impact upon factors such as tyre pressures and landing speed.

At that stage, late in 1939, the prevailing opinion at Supermarine was that future policy should be to exploit every power increase that might come from the Merlin but that sooner or later the bigger Griffon engine was sure to take over. Furthermore this view was apparently

shared at Derby. Ernest Hives, the head of Rolls-Royce aero engines, is on record as having referred to the Griffon as a 'second power string for the Spitfire'.

Joe Smith's oft-voiced attitude was that, other things being equal, "the good big 'un will eventually beat the good little 'un". He was determined to see a Griffon installed in a Spitfire and flight-tested as soon as possible. In the event, work was delayed by the impact of events in May 1940 but resumed again in the spring of 1941. Later that year the first Griffon – the RG 25M with two-speed single-stage blower – was delivered to Supermarine and installed in what was basically a Mk III airframe. I made the first flight in this aeroplane (DP845, given the designation Mk IV) at Worthy Down on 27 November 1941.

Insofar as they affected the pilot, the main differences were that the Griffon rotated the opposite way to the Merlin, causing the aircraft to swing right-handed instead of left-handed on take-off; there was somewhat less ground clearance, resulting in a slight reduction in propeller diameter; the power available for take-off was much greater; and the engine RPM were lower than in the Merlin. These factors added up to a need for very judicious handling of the throttle during the take-off, but once in the air the aeroplane had a great feeling of power about it. DP845 felt like the airborne equivalent of a very powerful sports car and was great fun to fly. Compared with a standard Spitfire, changes of trim with changes of power were much more in evidence both directionally and longitudinally, and the aeroplane sheared about a bit during tight manoeuvres and simulated dog-fights. It was immediately evident that we should have to improve its directional characteristics and also its longitudinal stability, both of which in due time we achieved. Indeed, DP845 eventually went through many phases of development, remaining in our flight development unit throughout. I and others flew in it a great deal and it became one of our favourite aeroplanes.

By the time I first flew DP845 in November 1941, the Mk III Spitfire with the Merlin XX engine had been cancelled as a production project. It was superseded by the Mk V with the Merlin 45, which was by then in full production at Supermarine and at Castle Bromwich. By now the first Merlin 61 two-stage two-speed engine was flying experimentally in N3297 and R6700 (see Chapter 17). At that stage, therefore, the overall performance of the Merlin – especially at high altitudes – had leap-frogged that of its younger but larger-capacity brother. This was the result of the spectacular success of the two-stage supercharger with intercooler system which had been developed for the Merlin.

Naturally it did not take either Supermarine or the technical departments of the Ministry of Aircraft Production and the Air Ministry long to realise that whatever supercharger technologies had been developed to increase the performance of the Merlin could in due course be applied to the basically more powerful Griffon. Indeed, as early as June 1941 the Controller of Research and Development (Linnell) had stipulated at a meeting with his officials that in the layout of the Spitfire Mk IV airframe the possibility of two-stage, two-speed supercharging (and hence a longer and heavier engine) must be taken into account.

Whilst the single-stage Griffon engine had produced a big jump in performance at the lower levels, its characteristics were not ideal for the higher-altitude air war taking place over the Channel and northern France in late 1941-2. All efforts were at that time therefore devoted therefore to getting the Merlin 61-engined Spitfire Mk IX into service. The Mk IV with Griffon engine thus had no immediate production future, but as a basis for longer-term development it remained very much alive.

Future fighter policy for the Royal Air Force was somewhat in disarray by 1941. The Hawker Tornado with the large 24-cylinder Rolls-Royce Vulture engine, intended as the replacement for the Spitfire in 1942-3, had run into trouble on two counts. One relatively minor problem was that compressibility trouble in dives necessitated moving the position of the radiator. However, and more importantly, the Vulture was so troublesome that it was eventually cancelled, bringing both the Tornado and the Manchester heavy bomber programmes to a standstill. A production order for 1,000 Hawker Tornados, which had been placed with Avro, had to be cancelled. (On a happier note, the Manchester's two Vultures were replaced with four Merlins hung on a modified wing and this turned it into one of the most successful heavy bombers of the war – the Lancaster.)

In the case of the failed Tornado, Hawkers and Sydney Camm already had a back-up variant in mind using the newly developed 24-cylinder sleeve-valve Napier Sabre engine designed by Frank Halford. This aircraft, called the Typhoon, had made its first flight on 24 February 1940. Despite its early promise, the Sabre unfortunately turned out to require very protracted and difficult work to get it to a stage suitable for production, and the achievement of long-term reliability proved elusive. So there was no chance of it coming into large-scale service in 1942. In any case the Typhoon was by no means ideal for the type of 'air superiority' combat operations which had now developed. This remained the role of the Spitfire.

There was also confusion in fighter armament policy, which inhibited progress on the Spitfire Mk IV. This centred on whether future day-fighter armament should consist of six cannon, or four cannon, or two cannon and four .303 machine-guns. There was a separate issue of the possible adoption of the .50-calibre or 13mm machine-gun in place of the .303, a question much affected by problems of availability and supply. Little positive guidance was offered by Fighter Command; indeed, in the midst of the debate, Air Marshal Sholto Douglas suddenly threw the idea of 12 x .303 machine-guns into the ring and thus added considerably to the confusion.

All this created great problems for Joe Smith. The situation was pointing more and more clearly towards the continued development of the Spitfire with the Griffon engine. But the need for a settled armament policy was becoming vital from the design point of view. It was possible to fit almost anything into a Typhoon wing, but stowing greatly increased armament and ammunition into the thin and delicate wing of the Spitfire was another matter.

To try to force the issue, Joe Smith proposed a six-cannon installation for the Spitfire Mk IV and I flew this in mock-up form in DP845. Then a most significant event took place. The

Ministry of Aircraft Production decided in March 1941 to return to a procedure it had abandoned in 1940. In this, a new design of aircraft should be based upon a specification issued to the contractor by the Ministry, deriving from an Operational Requirement clearly stated by the RAF. The Ministry had accordingly been instructed to prepare a specification for the design of the Griffon Spitfire, to be officially known as the Mk IV. The official charged with this task said, reasonably enough, that he could not write a specification without a clear Operational Requirement. The rejoinder from the RAF was that they could not issue such a requirement until the armament question was settled and until there was more general agreement about essential aspects of performance. However, a file was opened in the design branch of the Ministry, marked F.4/41, and a specification was prepared but without the 'Appendix B' which normally stated the Air Staff requirement in detail.

At this point the Mk IV assumed the status of a new design, which would form the mainstay of the fighter force for 1942-3. Furthermore, it was then clear that it would need to use a two-stage version of the Griffon. The performance potential estimated by Supermarine, based upon the assumption that two-stage supercharging would provide for the Griffon the same percentage power increase it had for the Merlin, would be very high indeed – something of the order of 470mph at 28,000ft. The opportunity would be taken to provide the weight of armament consistent with future requirements. Additional fuel would clearly be needed to maintain the aircraft's range, let alone increase it, and much structural re-design would be needed to accommodate the increases in weight. The Spitfire Mk IV therefore grew in concept from being a relatively simple conversion of a Mk III airframe to take the single-stage Griffon into a substantially re-designed Spitfire able to accept the bigger two-stage engine. It would also have greatly strengthened wings able to accommodate extra fuel as well as six 20mm cannon, or two cannon and four .303 machine-guns. A contract was placed with Supermarine for two prototypes. The second one, DP851 (which I flew on 8 August 1942) became a more advanced prototype, and in fact represented the first step towards what eventually became the Spitfire Mk XXI (or Mk 21).

However, little DP845 with the single-stage Griffon – by then almost my favourite aircraft, with its spectacular rate of climb 'off the deck' and very good low-level performance – did not become entirely redundant. As we have seen, there had been much concern in high places about the low- and medium-level performance of the Fw190. Because of this I was told one day in July 1942 to fly a Spitfire to Farnborough to take part in a demonstration for a small audience of Very Important People. Jimmy Bird had no information on what was afoot, so I immediately telephoned Willy Wilson at Farnborough to find out what it was all about. All I could gather was that it was to be a comparative demonstration of the low-level speed performance of the Fw190, the Typhoon and the Spitfire.

"How are you going to organise this, Willy?" I asked.

"God knows," he said. "I suppose we shall have to have some sort of a race."



On reflection the general scheme became clear. The Spitfire was to be a sort of datum pacemaker – Mr Average Contemporary Fighter. Its job would be to come in last, the real excitement of the proceedings being a) by how much it would be beaten by the Fw190 and the Typhoon and b) which of these two bright stars would beat the other and by how much. Outside on the tarmac at Worthy Down stood the inoffensive-looking but highly potent DP845. Nobody had said what sort of Spitfire I should bring. Just a Spitfire. . .

I rang up Joe Smith. "Joe," I said, "about this thing at Farnborough. I reckon if I take DP845 I will beat the pair of them. Will that upset any applecarts?"

"You bet it will," he said. "Take it."

At Farnborough I parked DP845 as inconspicuously as I could and walked into Willy Wilson's office. Kenneth Seth-Smith of Hawkers had arrived with his Typhoon, and together we discussed the plan. We would all three take off and fly to a point west of the nearby aerodrome at Odiham. We would then head back towards Farnborough in open line abreast at a moderate cruising speed at 1,000ft, Willy Wilson in the centre with the Fw190 and Seth-Smith and myself on each side of him. At a signal from Willy we would all open up simultaneously to full power and head for the finishing line at Farnborough, where the assembled VIPs would be waiting.

All went according to plan until we were about half-way between Odiham and Farnborough and going flat out. I was beginning to overhaul the Fw190 and the Typhoon. Suddenly I saw sparks and black smoke coming from the Fw190's exhaust, and at that moment Willy also saw them and throttled back his BMW engine. I shot past him and never saw him again. The Typhoon was also easily left behind. The eventual finishing order was the Spitfire in first place with the Typhoon second and the Fw190 third.

This was precisely the opposite result to that expected, or indeed intended. As far as the VIP audience was concerned, the cat was well and truly among the pigeons. When I taxied in and shut down, everybody crowded round DP845 and the message sank in that the Griffon Spitfire had handsomely beaten what were then supposed to be the two fastest fighters in service. The sensation was considerable, especially since the date was 22 July – exactly one day after the Secretary of State for Air, Sir Archibald Sinclair, had addressed his letter to the Minister of Aircraft Production saying 'our mastery of the daylight air is threatened'. It was also only a very few days after the Chief of the Air Staff had issued his lengthy 'Most Secret' memorandum. I was, of course, quite unaware of these matters at the time, and I must say I was somewhat startled by the general stir which our simple little exercise seemed to be causing.

Sholto Douglas came and examined the aircraft, and instructions arrived in short order that some pilots from Fighter Command – including Jamie Rankin, who was then leading the Biggin Hill wing – were to fly the aircraft forthwith and report to him. Bill Lappin of Rolls-Royce was quite annoyed, perhaps because I had not brought a Merlin Spitfire. There was unease in parts of Rolls-Royce at that time that the Griffon might pre-empt further

development of the Merlin, and Bill more or less accused me of pulling a fast one – which, on reflection, I suppose I had. "Well, Bill," I said, "I had no spare aces up my sleeve. The aeroplane is faster than the other two and that's all there is to it."

Eight days later, on 30 July, there was a meeting in the Secretary's of State's Office attended by the Chief of the Air Staff (Portal), the Vice-Chief (Freeman) and the Controller of Research and Development (Linnell) at which fighter development and production was discussed. This meeting was told that our performance figures showed the Griffon IIB Spitfire – i.e. DP845 – to be superior to the Fw190 in speed of climb up to 12,000ft. It was agreed that, in addition to the various improvements to be made to the Mk IX, an immediate order should be placed for Spitfire Vs re-engined with the Griffon. The Ministry of Aircraft Production immediately went into action. The Mk VC fitted with the Griffon IIB was designated the Mk XII and an order for 100 aircraft was placed immediately. Because the Mk XII was intended only for operations at low and medium altitudes, it was decided that the aircraft should be produced without its wing-tips, thereby improving its lateral manoeuvrability at speed. The Mk XII was the first to be produced in this configuration, which was later adopted for many Mk IX aircraft with the Merlin 66. So DP845 became the prototype Mk XII.

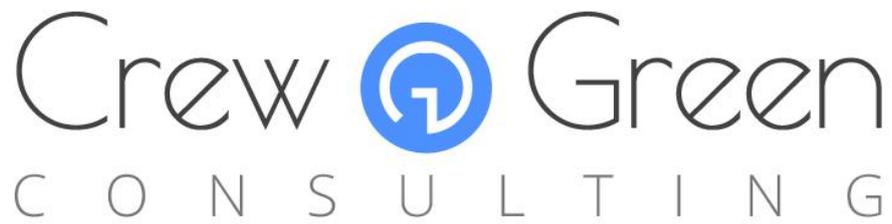
The Mk XII went into service with 41 Squadron at Tangmere in March 1943, and 91 Squadron was also subsequently re-equipped with this mark. The two squadrons were used primarily on low- or medium-level duties – particularly 91 Squadron, operating from Hawkinge, which performed fighter reconnaissance duties along the north coast of France. The Mk XII was essentially an interim type, produced quickly in small numbers to fill an immediate tactical gap, but by any standards it was a fine little aeroplane. The Air Fighter Development Unit, in its report No. 61, wrote:

17. The Spitfire XII handles in general better than the previous marks of Spitfire. Its longitudinal stability has been improved but its rudder control is not at present completely satisfactory as it needs constant retrimming and is rather heavy.

18. The aircraft fills the category of a low-level fighter extremely well, being capable of speeds of 372mph at 5,700ft and 397mph at 18,000ft.

The A & AEE considered the Mk XII to be an excellent aircraft for fighter and intruder work below 18,000ft, fast low-down and very manoeuvrable. Generally, pilots who flew the type at Boscombe preferred it to the Mk IX.

The general characteristics of the Mk XII, from the viewpoint both of performance and handling, made it extremely attractive as a potential naval carrier-borne fighter. In February 1943 two of these aircraft – EN226 and EN227 – were fitted with hooks and delivered to the Fleet Air Arm Service Trials Unit at Arbroath for evaluation and aerodrome dummy deck landings (ADDLs). Deck-landing trials were flown by Lieutenant 'Winkle' Brown on 7 March, flying from Machrihanish to HMS *Indomitable*, when he made fifteen landings with EN226. These led to the development for the Fleet Air Arm of the Seafire XV and XVII aircraft, two of



their most potent fighters. I also made landings on *Indomitable* in a Seafire II that day, this being my first experience of carrier flying and very challenging I found it. I spent that night aboard *Indomitable* and had a long conversation with Admiral Lumley Lister, Flag Officer Carrier Training, and Commander 'Tubby' Lane who commanded the Carrier Trials Unit in which 'Winkle' Brown was a leading pilot. In the process I began to acquire insights into the problems of naval aviation, and the shortcomings of the Seafire as a naval fighter. I felt sure that a great deal could be done to the Seafire to make it a more practical naval aircraft and I made up my mind I must find out more about the problems.

So the Mk XII had performed the important role of getting Griffon Spitfires into service. Now the introduction of the two-stage Griffon engines into Spitfires became the demonstrably logical next step