How to

BUILD A SPITFIRE

David Price's early interest in aviation was inspired by days exploring deserted RAF airfields in his native Cumbria. He has written for many newspapers and magazines on military aviation and is the author of *A Bomber Crew Mystery: The Forgotten Heroes of 388th Bombardment Group*, *The Crew: The Story of a Lancaster Bomber Crew* and *Mosquito Men*.

Also by David Price

The Crew: The Story of a Lancaster Bomber Crew

Mosquito Men: The Elite Pathfinders of 627 Squadron

A Bomber Crew Mystery: The Forgotten Heroes of 388th Bombardment Group

How to
BUILD A SPITFIRE

Adventures with the RAF's legendary Second World War fighter

DAVID PRICE

An Apollo Book

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To Trish and all my family

They would follow me anywhere, but mostly out of curiosity.

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INTRODUCTION

What sort of a person builds a Spitfire in his back garden? And why? These are the questions I see playing out in the minds of my visitors as they are greeted by the sight of a Second World War aircraft in a quiet corner of a Cumbrian hamlet.

The strangeness of the spectacle places the spotlight on the builder as much as on his creation. Were I the visitor rather than the owner of the house in whose garden the Spitfire sits, as an aviation writer I would be fascinated by this person and would want to know more about them and their motivation. As it is, I find myself in the exposed position of being not only the narrator of this tale but also its subject. It would certainly have been easier to write about a peculiar man who decided to build a Spitfire at his home rather than *to actually be that person*.

But I am not alone in my eccentricity. I count myself among that group of individuals who see the world slightly differently from the majority and, in their version of normality, take on tasks and projects that others might regard as hare-brained. I am happy to say this breed remains strong and healthy in Britain, beavering away in sheds and workshops throughout the land.

I must begin with an apology, or rather two apologies. The first is for having written a book that is mainly – though I hope not exclusively – about myself. The second is to anyone who has picked up this volume hoping to build their own Spitfire based on the information I provide. Despite its title, this book will not instruct you on how to build a Spitfire. I have not set out to write

a 'how to' manual, but to describe what it is like to undertake a project that tests the limits of one's skills, knowledge and mental strength. The greatest challenge I faced was probably not the physical business of building the aircraft itself but the anxieties that accompanied me almost every step of the way.

In recording how I built a version of the Spitfire in my back garden, I have also narrated in parallel the story of those who designed, built and flew this iconic British aircraft in the 1930s and 1940s. They are the heroes of this tale. As Margaret Thatcher said of the much later military operation to retake the Falkland Islands in 1982: 'Failure is not an option'. In my case, however, failure was a definite option. My 'Operation Spitfire' could easily have become a long, costly and embarrassing misadventure that would have left me the laughing stock of my friends.

Building a Spitfire has been the longest single project I have ever undertaken. Part of the reason for its lengthy duration is that I came to it knowing only a little about aircraft manufacture. I had the benefit of thirty years in aircraft preservation as a volunteer at Solway Aviation Museum based at Carlisle Airport, but there is a massive difference between maintaining an aircraft designed and built in a factory and recreating it yourself. Nor did I have any skill at working with metal – a material I barely know in comparison to those I used in my previous trade as a building contractor. I did two years of metalwork at secondary school in the early 1970s and came away with an enjoyment for using a gas torch, but little else. So I chose to construct my Spitfire using the materials I knew best: plywood, fibreglass and screws rather than sheet metal and rivets.

When I left the building trade in 2018 and took up writing, I persuaded myself that building had only been a means of making a living, but the truth was that it flowed in my bloodstream, and I found myself missing the challenge of working in three dimensions. The Spitfire-building project was thus born of a desire to keep both my body and my mind active with a

demanding physical task. Though it has to be said that through all my years of fitting kitchens and bathrooms, I never imagined that I would one day try to build an aircraft.

In this book I attempt to explain not only how but *why* I built the Spitfire – though I'm not sure I can adequately answer either question. Many have asked me why I chose to build a full-sized replica rather than a smaller model. I have to confess I remain mystified. It seems that at this point in my life some catches were loosened and a spring was released, causing a combination of ideas, practical skills and sheer craziness to shoot out like a jack-in-the-box. My constant and enduring thanks go to Trish, my wife (still) of forty years, who has been tested to her limits by her husband's antics and has learned to live, somewhat uneasily, with the Spitfire.

I must also extend my thanks to the many onlookers who stopped and stared at the aircraft as it took shape in my garden, their curiosity proving that the Spitfire remains one of Britain's best-loved inventions. I had always known the Spitfire to be a popular aeroplane, but perhaps I had not realised the extent to which its shape – and its history – are embedded in British consciousness. It generates a response in all who see it. It evokes memories, stirs an interest in history and inspires wonder at the bravery of the young men who flew this remarkable aircraft. Despite engulfing my garden, the Spitfire is very small in comparison with the jet aeroplanes we know so well from summer holiday travel. In design terms, it is just big enough to carry a powerful engine, fuel, guns and ammunition – and of course a pilot. In its economy of scale, the Spitfire is nearly perfect. My quest to recreate one has tapped into a deep well of affection, not only in myself, but in the many visitors who have stopped to see it. Perhaps what my quixotic enterprise revealed most of all is that the Spitfire is as much an emotion as it is an aeroplane.

Prologue

THE BIRTH OF A LEGEND

RAF Biggin Hill, Kent, August 1940

Early in the morning of 26 August 1940, eleven Spitfires of 610 Squadron started their engines. The rattling cough from the exhaust stubs crackled over the airfield, producing blue plumes of smoke that drifted in the summer breeze. Once the Rolls-Royce Merlins had warmed up, the sound became more even; soon each Spitfire was ticking gently to itself as the chocks were pulled away. Bumping over the grass, the aircraft began to form up in a loose gaggle ready to take off. RAF Biggin Hill, just a few miles from London's south-eastern suburbs, was to become synonymous with the Spitfire and the battle that would decide Britain's destiny. It was a modern, sensibly built airfield with proper barrack blocks and established hangars, unlike some of the more basic, hurriedly constructed bases elsewhere. On this late summer morning, there were no romantic thoughts of death or glory in the minds of the pilots. Many had prayed a simple prayer before they took to their cockpits: 'Lord, don't let it be me today.' All they knew for certain was that they would encounter swathe after swathe of black-crossed aircraft marching in formation from the Pas de Calais.

The constant activity and lack of rest were starting to push them into an uncomfortable mental state. In action they had

every confidence in the Spitfire; on the ground they wrestled with a fatigue that far outweighed the adrenaline-fuelled minutes of air fighting. In what was clearly a life-and-death struggle, they were physically and mentally exhausted – perhaps a blessing in that it numbed the memory of friends lost in the ongoing battle. Rather than glorying in the experience of being a fighter pilot, they often found themselves falling asleep in a chair.

As the throttles were opened for take-off, each Spitfire picked up speed, bouncing along the airfield and, after a few seconds, the tail lifted in readiness for flight. Their ungainly terrestrial progress was replaced by a supreme grace as the fighters took to the air.

Today the fifty-mile flight to their forward operating base near Folkestone would take them barely twenty minutes. They were no strangers to this short commute through the misty summer dawn – it seemed that RAF Hawkinge, not far from the White Cliffs of Dover, was becoming their second home. On a beautiful morning such as this, the promise of a day's flying could lighten the heart of any pilot. The sight of the sun beginning to cast long shadows across the fields of Kent would normally be uplifting, but today it added to the pilot's apprehension. The good weather favoured the Luftwaffe attackers more than it did the struggling Royal Air Force. Historians who later defined the dates of the Battle of Britain would describe 26 August as the thirteenth day since Hermann Göring's *Adlertag* – 'Eagle Day' – the start of the Luftwaffe operation to destroy the RAF in advance of a German invasion. The pilots of 610 Squadron knew that for weeks the Luftwaffe had been flinging themselves at Britain, first attacking convoys, but now targeting airfields, radar stations and control centres – the very substance of the nation's air defences. They also knew that any strategy to invade Britain involved the complete destruction of the RAF – preferably to the last man.

Even with the daunting prospect of aerial combat ahead of them, most men agreed that their anxieties diminished

significantly once the Spitfire was airborne. The aircraft became not just a partner in their endeavours, it became part of them, a delightful extension of their bodies. It responded to the lightest of touches, enveloping its pilot like no other aircraft did. The Spitfire seemed to move effortlessly, and perfectly in tune with the flyer's instincts: where he thought the aircraft should go, it would go.

Sergeant Peter Else landed at Hawkinge and mingled with the other pilots in a choreography of waiting. They made every effort to appear relaxed, but they were like tightly coiled springs, impatient for the moment of release. The sun had risen high enough to burn off any remaining moisture in the air: the kind of glorious English summer's day when it seems a waste to sit inside – but today it was the need for readiness rather than the pleasant warmth of the late summer sun that kept them outside, close to their charges. Some chairs were found, but as this was not their home aerodrome, most sat on the ground. Others drifted back and forth exchanging stories of flights, puffing on cigarettes or lounging on the grass reading. Today there was time for mugs of tea, but they knew their adversaries would soon be in the air, just as they had been every day for several weeks. 610 Squadron was made up of more experienced men than the average. Many of its members had worked in related professions before the war: some had been pilots in civilian aviation, others designers and engineers. They were, generally, slightly older than the men of other fighter squadrons.

Peter Else was twenty-three years old and had worked as an engineer at Marshall's of Cambridge. He had begun his pilot training shortly after enlistment in 1938 with the RAF Volunteer Reserve and was called up on 1 September 1939. Else adopted the thin pencil moustache and rakish look favoured by RAF fighter pilots of the time. By now, he was no stranger to aerial combat, having shot down two Messerschmitt Me 109s and damaged four bombers and a fighter. His last victory was a month ago, on 27

July, over Folkestone. He knew the tightness in the stomach that all fighter pilots felt as they closed in on a formation of enemy aircraft. At first the enemy were tiny black dots swarming in their windscreens, but, with the closing speed around 500 miles per hour, the time between first seeing the enemy and pressing in the attack could be very short. If they were drawn into a dogfight with the Me 109s that accompanied the slower-moving German bombers, the sky could be filled with twisting aircraft and their ears with the sounds of disjointed voices over the radio. One minute they might catch a fleeting glimpse of an enemy shooting past their nose, the next they could find themselves in clear air flying serenely on their own, disconcertingly unable to locate friend or foe after the mêlée.

Their primary task was to attack the bombers, for it was they who would cause damage on the ground and not the buzzing Messerschmitts that accompanied them and gave the Spitfires a close run for their money. If they gave the enemy attackers even a half-chance, the RAF fighters would be sent spiralling in flames to earth like falling comets. Vigilance was their primary defence. Despite the sterling performance of the Spitfire, they had blind spots, particularly to the rear, to which the only reference point was a small mirror fixed to the outside of the front screen.

At 11.42 a.m. the squadron was scrambled. Most pilots could not remember hearing the shouted words or the bell, which was rung vigorously, but they reacted instinctively and Else found himself running as fast as he could towards his waiting Spitfire. The action of entering the Spitfire began with a bound up the curve of the trailing edge of the wing. In the cockpit, straps were fastened and the engine started with no time to spare for running through a checklist. With the canopy still back, the small square side door was slammed shut and Else checked it to make sure it had clicked home. Once the chocks were pulled, he opened the throttle and was waved out by the ground crew, who quickly moved clear. Looking to left and right, he could see other Spitfires

moving, the grass flattening around them, the roar of engines merging with his to form a concerto of sound.

What had seemed like a chaotic free-for-all a few seconds before now settled into an ordered routine as the Spitfires formed up on the grass. With no time to spare the take-off run began, at first a rumbling series of bumps, then, as speed built up, Else's Spitfire P9496 lurched into clear air at the top of a rise to join the other airborne squadron aircraft. As Else pumped the undercarriage lever that retracted the wheels into their bays under the wing, P9496 bobbed gently, despite Else keeping his other hand on the joystick to steady the aircraft. Once they had formed into sections comprising three aircraft each, the Spitfires swiftly gained height. Climbing to 20,000 feet in brilliant sunshine, the RAF men soon saw the tell-tale pattern of an enemy formation heading towards Folkestone. As they closed, they could see Messerschmitt Me 109Es* of Jagdgeschwader 52 peeling away from their course defending the bombers to intercept the oncoming fighters.

The ensuing air battle was a confusing dance of twisting aircraft, each trying to gain a firing position. The Germans, with the advantage of height over the rising Spitfires, scored their first victory early in the contest, shooting down Pilot Officer Frank Webster in Spitfire R6595. His aircraft fell vertically in flames, impacting the ground at Flegis Court Farm, Hawkinge, and offering no hope of survival.† Sergeant Peter Else was next to suffer severe damage to his Spitfire as it was raked with German machine-gun fire. After experiencing the furious clatter of cannon hits, he decided to bale out. Reaching up, he grasped the small ball that operated the canopy jettison mechanism, but then a

* Often referred to as the 'Bf 109' from the aircraft's origins, in 1938 the company changed its name to Messerschmitt, and all aircraft constructed after this date had the prefix 'Me'. After the war Willy Messerschmitt was asked how his designs should be referred to, 'Me' or 'Bf'. He stated firmly that the prefix 'Me' should apply to all Messerschmitt aircraft.

† Later investigations located parts of Webster's Spitfire embedded in the ground at a depth of twelve feet.

second attack rocked the stricken Spitfire. A sheet of flame roared from the engine cowlings in front of him and, as he moved to bale out, he remembered the curiosity of seeing his left hand still clutching the control column as he left. He was burned by the fire that had engulfed P9496* but was able to fall clear, deploying his parachute successfully at high altitude. He was fortunate to land only 200 yards from his take-off point at RAF Hawkinge and received medical attention quickly. By the time the rest of his squadron were landing at 12.40 a.m., Peter Else was being admitted to the Kent and Canterbury hospital, where surgeons amputated his shattered arm above the elbow.

610 Squadron were to claim four Messerschmitt Me 109s and a Dornier Do215 in the action, but were withdrawn five days later on 31 August after heavy losses. The squadron had suffered nine pilots killed and five injured that month, with almost every action resulting in the loss of aircraft or airmen. By March 1941, 610 Squadron were based as part of three squadrons at RAF Tangmere under the wing leadership of Douglas Bader, who became a celebrated Second World War air ace despite the loss of both his legs in a pre-war accident. Peter Else's story is less well known than Bader's, but is still remarkable. After he was discharged from hospital on 2 April 1941 he returned to Marshall's in Cambridge as an aircraft inspector. On 24 May 1944 he resumed flying, testing Tiger Moths and Auster III aircraft, using a special attachment in place of his left hand. Else finally gave up flying in 1946 to concentrate on his engineering work and became a chief engineer in 1974 until his retirement in 1987. Like so many others who fought in the Battle of Britain, Peter Else enhanced the performance of the Spitfire through his own character and bravery, making the aircraft much more than the sum of its parts.

* The Operations Record Book of 610 Squadron lists Else's Spitfire as K9947. This must be incorrect as K9947 was flown a few days later.

The warm days of the summer of 1940 embedded the Spitfire and the men who flew it in the hearts of the British people. The Hawker Hurricane may have flown in greater numbers during the Battle of Britain, but the Spitfire remains the icon of British victory. As for the historical significance of that battle, a debate continues about how serious Hitler was in attempting to invade Britain – and whether, despite the hundreds of barges moored ready for the invasion, the Germans had the will or the wherewithal to successfully complete such an operation. But any attempt to diminish the importance of the Battle of Britain misses the critical point that the British had little reason to believe the threat was not genuine. Hitler's armies had swept across northern and western Europe, defeating and occupying Denmark, Norway, the Low Countries and France in the spring and early summer of 1940. Faced with this apparently unstoppable campaign of conquest, it was easy to reach the conclusion that the full might of the German army was about to be thrown against these shores.

More importantly, the men of 610 Squadron and hundreds of others who fought alongside them cast their lives as chips on a gambling table. Every time they took to the air, they faced the strong possibility of death or serious injury; and they expected they would continue to fly until they were disabled or killed. A nation can ask no more of its sons.

*

Balanced on the edge of the worn, paisley-patterned couch in the rectory, I remember watching the 1942 film *The First of the Few*[*] with avid enthusiasm. In the era of black-and-white television, the age of a film was a little harder to discern – particularly for a six-year-old boy. Looking back, I recall Leslie Howard in the role of the Spitfire's designer, R. J. Mitchell, and David Niven as a test

* The film's score, *Spitfire Prelude and Fugue* by William Walton, was perhaps the outstanding element of the production.

pilot. The actors seemed to deliver their lines in short staccato bursts – like the machine-gun fire that peppered the action scenes. But for me, the stars of the movie were the Spitfires, whose sweeping power captivated my child's imagination. I flew with the pilots, swinging an imaginary joystick from side to side, vibrating as the gun button was pushed and ducking oncoming Messerschmitts. The final scene, in which three Spitfires fly towards heavenly sunlit clouds, sealed their angelic status – the earliest cinematic representation of the Battle of Britain had worked its intended magic.

As the titles faded on our television screen, I declared loudly that one day I would be a Spitfire pilot. My eleven-year-old brother, never slow to demonstrate his superior knowledge, was quick to put me right. 'They don't use Spitfires any more,' he said, with that infuriating tone older brothers possess. An argument immediately ensued – I hadn't appreciated that twenty-six years had passed since the making of the film and that aircraft design had moved on rapidly. After a few minutes, my father was called upon to mediate and, to my great disappointment, confirmed that the Royal Air Force had indeed retired the Spitfire many years earlier.* It was something that might have been obvious to a child of less tender age. I was the son of a clergyman in Gilcrux, a West Cumberland village five miles from the Solway coast – off the beaten track but right in the middle of a military flight path. Cold War-era jets shrieked daily over the tall chimney tops of the rectory at a height of just 250 feet. By the time our small village flashed underneath their fuselage, the pilots' eyes would have been set on the Solway Firth, the thin sliver of sea that separates England from Scotland.

It would be some years before I saw my first Spitfire. In the intervening time, like most boys of my age, I started

* The last RAF Spitfires in general service ceased flying at RAF Woodvale in June 1957.

building Airfix kits as a kind of rite of passage from infancy to adolescence. Our imaginations were exercised by assembling scale models of military aircraft from plastic kits and 'flying them' – arms outstretched – to perform various aerobatic manoeuvres. We thus became intimately acquainted with the shape and features of the best-known Second World War aircraft. Among boys of my generation, not to be able to tell a Hurricane from a Spitfire or a Halifax from a Lancaster was the mark of a complete dunce.

A love of aircraft had entered my bloodstream, a quiet addiction that embraced not only Spitfires but anything that flew. It was a hobby that dominated my childhood and early teenage years; but, in time, I left my collection of model aircraft behind as more pressing decisions about my future demanded my attention. I had set my heart on joining the Royal Air Force, despite their not operating Spitfires any more. I wanted to be a pilot – or a navigator, at least – and spent my later school years focused on that goal. I would come to realise that I was unsuited to such a role, my abilities being more artistic than technical, and mathematical aptitude being just one of the necessary skills I did not possess.

In January 1980, as a nervous sixteen-year-old. I was summoned to RAF Biggin Hill in Kent to sit a 'test in advance'. I was too young to apply to join the Royal Air Force, but this mechanism allowed aspiring boys to test their mettle – and perhaps discover their suitability (or otherwise) for a career in the RAF. I was all too aware I was entering a place that – as a key base for RAF Fighter Command – had been in the thick of operations during the Battle of Britain and the target of numerous German attacks. The Officer and Aircrew Selection Centre was attended by a stream of wide-eyed hopefuls. The walls of the common room in which we gathered were adorned with recruitment posters, one of which remains with me: a photograph of a Panavia Tornado with its nose climbing out of

the poster and the message, 'If you want to dream, cut out the picture. If you want to fly, cut out the coupon.'

The tests showed what I had long suspected. I didn't have the technical and mathematical bent to pass the aptitude tests to be a pilot – at heart I preferred the broad sweep of a brush to lines of figures. I was assured that many came back and passed the test during the application process proper and that I should not lose heart. But I never returned to RAF Biggin Hill. Although I was given a date to re-attend in February 1981, I was struck down with a nasty dose of chickenpox that took three weeks to improve and left me feeling like I had been hit by a bus. My application to join the RAF took me not to suburban Kent but to an interview in Glasgow, some weeks later, in a small room that smelled of furniture polish combined with a faint odour of nicotine. The RAF officer conducting proceedings looked bored by the prospect of interviewing the spotty teenagers waiting outside his office. My interview did not go well. The officer seemed unconvinced that I was the dashing type who, when he was not performing daring feats of aeronautics, enjoyed wild nights out and setting fire to pianos. My letter of rejection followed shortly afterwards, but I had already formulated alternative plans for my future.

By my early twenties I had become involved in a local church, met the love of my life, married her and started a decorating business. I had also rekindled my interest in aviation and begun to attend air shows, where, for the first time, I saw Spitfires fly. I was entirely smitten. Here was a sight to stir the soul and weaken the knees of the most resolute of plane-sceptics. After a Spitfire has flown at an air show, the onlooker becomes a dreamer – their eyes moist, their heart beating that little bit faster. The experience is more than the glorifying of a war-winning weapon or relic of a bygone age. The Spitfire is a beautiful piece of engineering that looks, flies and sounds like no other aircraft. It has won the affections of successive generations and, eighty-nine years after it first flew, shows no sign of bowing out of the limelight. It has

had a number of rivals – indeed, some would argue the Spitfire was not the best fighter of the Second World War. The American P-51 Mustang, which entered service with the RAF in January 1942, outperformed the Spitfire in some combat situations, but it did not attract the same adulation as its fellow fighter. In the jet era that followed the war British aeronautics enjoyed a golden age that saw designs of remarkable complexity and innovative flair. From the late 1960s, the Hawker Siddeley Harrier 'jump jet' captured the imagination of a new generation of aviation buffs by its sheer aeronautical impertinence – what aircraft could stand still in the air and then land vertically? For all their style and ingenuity, however, none of these designs can match the sheer emotional impact of R. J. Mitchell's masterpiece.

I am sure I am no different from thousands of other aviation enthusiasts who, if they had the money, would buy their own Spitfire and realise their dream of flying the ultimate icon of the RAF's victory in the Battle of Britain. Creating a Spitfire, even a non-flying example, is something few people attempt on their own. That it even entered my mind to build one is still a cause of some surprise to me. Perhaps the root of the idea lay in the disappointment I felt as a six-year-old discovering that this beautiful aircraft no longer flew. My path towards building a Spitfire may have begun with David Niven, but it has taken some narrow twists and turns over the years. Perhaps I will always be a person who 'cuts out the picture' rather than the 'coupon' in life – but I trust that others will enjoy my creative journey in the company of the Supermarine Spitfire.

1

INSPIRATION AND CHOCOLATE CAKE

6 April 2018

The narrow coastal paths of the White Cliffs of Dover stray close to some precipitous drops. Unlike many other coastal cliffs, here the grass travels to the very edge, making it appear as if a giant has sliced through the land with a huge knife. Viewed from the sea, the ribbon of white chalk, stretching some fifteen miles on either side of the port of Dover, has intrigued mariners and invaders alike. In more recent times, it has become the symbol of a new life for those fleeing economic hardship and political oppression. In the Second World War it became the front line of a desperate battle against Nazism, fought high in the skies above it in the summer of 1940. Here, the legend of the Spitfire was born.

In British consciousness, the White Cliffs were not just a boundary between land and sea but the walls of a fortress to repel the invader. Three months before the Battle of Britain, Vice Admiral Bertram Ramsay worked in tunnels hewn from the cliffs below Dover Castle on the planning of Operation Dynamo, the evacuation of Dunkirk. The rescue fleet that he organised succeeded in plucking 338,000 soldiers from the French beaches forty-five miles away.

Even after the threat of German invasion had receded, the cliffs remained a key navigation point for returning pilots. From late 1940 to 1944, Spitfires undertook low-level sweeps over northern France, known in RAF parlance as 'rhubarbs', seeking out targets of opportunity. When they returned, they often skimmed the waters of the English Channel, aiming for the White Cliffs. Lifting their noses to climb suddenly and dramatically to the cliff-top, they thundered over the heads of the ever-watchful guards stationed on the headlands. Bomber crews too would watch the moonlit white line disappear as they headed east to their targets, longing to see the sight again on their return. To them, the cliffs exuded a warm, enveloping feeling of safety. However far they still had to fly to their airfields, they were home as soon as they crossed them. Walter Kent and Nat Burton's ever-popular song, '(There'll Be Bluebirds Over) The White Cliffs of Dover', encapsulated the emotion – despite the American lyricist failing to realise that bluebirds are not native to Britain.

I discovered the beauty of this area when I found a cliff-top holiday home at St Margaret's Bay, east of Dover. Converted from a First World War gun position, the concrete house was a little spartan, but more than made up for any lack of interior finesse with its large picture window overlooking the English Channel. It was perched twenty yards from the cliff edge and, with no fence other than common sense, its uninterrupted views across the sea to the Pas de Calais made it an idyllic retreat. In the low evening sun it was possible to see the tower of Calais town hall glowing bright on the horizon. In the building trade, the period immediately after Christmas was a quiet time and, since we were homeschooling our two daughters, we were able to holiday when we chose. I would take a winter week away before the phone started ringing for spring work. It was an opportunity to do nothing but watch the choppy waters of the Channel from the window, walk, and take pub meals. Now and

again a storm would sweep in, pounding the windows with rain and causing the sea to hit the cliff below with such force that the house resonated with the deep percussion of the waves. At times like this, we might see cross-Channel ferries loitering not far from the shore, waiting for the wind to subside and allow them to enter Dover harbour. Sometimes they would still be there at nightfall, the disconsolate passengers visible in the ship's lounges or pacing the decks as the vessel bobbed and rolled in the waves.

The cliff-top path that leads from St Margaret's Bay to Dover offers plenty of evidence of the Second World War. There is a large bomb or shell crater 200 yards from the house and pieces of metal often emerge in the mud of the paths. Barbed wire, heavy steel shell fragments, bullets and even parts of grenades bear witness to an area used for defence exercises. Dover itself carries bitter memories of its bombardment by German artillery in the Pas de Calais. In the town's fine Victorian seafront, large gaps have been filled with 1960s buildings – testament to the destruction wrought by air raids and shelling. At 11 a.m. on 12 August 1940, shells exploded in Noah's Ark Road and St Radigunds Road, killing four people. It was the beginning of the agony of a town that would see 10,056 houses damaged and 216 people killed by bombs and shells over the course of the war. The cause of much of this destruction – the enormous 380-millimetre SK34 German naval guns of the Todt battery – sat in impregnable concrete casemates on Cap Gris-Nez, some twenty miles to the south-east. Close by, the four 280-millimetre guns of the Grosser Kurfürst battery were ready to fire across the Channel or at passing shipping.

Britain's answer to these big German guns – the heavy gun positions of the South Foreland battery – lay close to what is now the landward side of the Dover coast path. By spring 1940 the battery had four naval 5.5-inch guns capable of defending the coast within a ten-mile range. In July, in response to the threat

of the German guns being installed to fire over the Channel, a huge emplacement was built to house a Mark VII fourteen-inch gun, of the type used to arm the navy's new *King George V*-class battleships. The South Foreland gun was christened 'Winnie' in honour of the prime minister and was fired for the first time on 22 August 1940, only ten days after the first German shell had struck Dover. Further heavy guns were installed in the St Margaret's area and were named Pooh, Clem (following a visit by Clement Attlee*) and Jane (after the cartoon-strip character in the *Daily Mirror*). As the recipient of German bombardment from across the Channel and the scene of some of the fiercest aerial combat in the Battle of Britain, the area around Dover became known as 'Hellfire Corner'.

My interest in military history was tolerated by my wife and daughters, who allowed me to 'escape' to pursue my hobby. They were only too happy to leave me to my own devices – and not to have to wait interminably on a windy airfield or next to a dilapidated, Grade II-listed pillbox while I scoured the undergrowth or purred with pleasure over piles of old concrete. On the south coast I didn't have far to travel to find places that interested me. On one occasion, I visited a field above the village of St Margaret's at Cliffe that had been the site of the crash landing of a Boeing B-17 bomber. Returning damaged from a daylight raid on Frankfurt on 8 January 1945, B-17 43-39068 of the 478th Bombardment Group could fly no further. Creeping over the White Cliffs the pilot, Captain Frank L. Casey, put her down in the first sizeable field he could find. With the wheels up, she slid safely to a halt on the thin dusting of snow-covered ground – the crew all walking away safe and grateful. The aircraft, however, was deemed to be too damaged for further use and was dismembered and taken away. Other than comparing

* There is divided opinion on the name 'Clem', with most sources claiming it was named after Churchill's wife, Clementine, but soldiers stationed on site said it was named hurriedly before a visit by Clement Attlee.

the view with a black-and-white photograph I had found on the internet, there was nothing to see, but I found it immensely satisfying to have identified the location.

My explorations also took me to the Battle of Britain Memorial at Capel-le-Ferne, east of Folkestone. A stone's throw from RAF Hawkinge and the site of Peter Else's dramatic escape from his flaming Spitfire, the site was adopted from a former Second World War gun emplacement and opened in 1993 by Queen Elizabeth the Queen Mother. Returning every year, I was able to observe how the site was improved and expanded over time. In the initial construction of the memorial, the former circular gun emplacement had a large propeller outlined in the paving as a centrepiece, on top of which a statue of a seated pilot, created by Harry Gray, looked out over the Channel. A small building served as a shop and visitor centre and a concrete round was home to a full-sized fibreglass replica Spitfire Mark I. This was joined a few years later by a Hurricane. In July 2005, a memorial wall listing the names of almost 3,000 airmen who flew in the Battle of Britain was unveiled, adding to the poignancy and character of the site. I recall a winter visit when the sloping path down to the memorial was slippery with ice, making walking hazardous. But this, and the fact that I was one of only a small number of visitors on a chilly day, didn't trouble me – I enjoyed my own company.

In April 2018, Trish agreed to accompany me to a new visitor centre that had recently opened at the memorial site – her resistance broken by the promise of a coffee shop. The spring weather was less inclement than on my earlier, freezing visits, but it was still a relief to be out of the stiff breeze and inside 'The Wing', which – with its spacious design and audio-visual effects intended to recreate something of what airmen would have experienced in the summer of 1940 – did not disappoint. The memorial site had definitely come of age. When we ventured outside again to stand beside the fibreglass Spitfire, I was struck

by two thoughts. The first was the relatively small size of the Spitfire. Although I had spent many years around the aircraft as a volunteer at my local aviation museum, on this occasion its compact dimensions stirred something in me.

'It's not very big really,' I remember saying to Trish. 'It would fit in our garden.' She concurred – not for a moment imagining that I was seriously suggesting planting a life-size replica of an iconic Second World War fighter on our lawn. Perhaps if she had disagreed and said it would be a carbuncle that would spoil the garden, things might have turned out differently.

My second thought was more practical. 'I could build something like this,' I remarked, then added, in a casual tone, 'and I could probably improve on the detail.' We then repaired to the second-storey Cockpit Café in The Wing. It was slightly too chilly to sit on the decked balcony outside, but indoors we still had a wonderful view over the memorial and cliff to the wide expanse of the Channel beyond. Gazing down on the replica Spitfire and Hurricane, I enjoyed my coffee and chocolate cake, then found a pen and paper and started to jot down what I thought it would cost to build a Spitfire – just as I would have done for replacing Mrs Armstrong's 1980s kitchen units. Even this activity did not worry Trish unduly. She was used to my playing around with figures – whether for working out potential savings from installing solar panels or the cost of changing car tyres or the ingredients for making my own furniture cleaner. Our house is full of scraps of paper covered with columns of figures, but little ever comes of these scribbles. Perhaps on this occasion her almond pastry and a pleasant holiday view lulled her into a false sense of security. If I had learned one thing in our decades of marriage, it was to avoid appearing over-enthusiastic about an idea early on – particularly if it was a controversial one.

I have to confess I have subjected Trish to a series of mini-dramas in pursuit of my aircraft obsession. In late 1992 we

Where it all started: Spitfire and Hurricane replicas at the Battle of Britain Memorial, Capel-le-Ferne, Folkestone.

bought an old barn to convert into a house. It was a single-storey Victorian sandstone building that had once housed a gig – the two-wheeled, horse-drawn carriage that served as everyday transport in that era. In the 1960s it had been converted into a milking parlour with a concrete block extension, metal corrugated roof and concrete floors and partitions. Next to this ramshackle structure was a garden or, more accurately, a triangle of field that was large enough to accommodate a number of activities – including, as it transpired, an aviation restoration project.

Even as the purchase of the barn was being finalised, I acquired the front section of a de Havilland Comet 2 – the second iteration of the world's first commercial jet airliner. The Comet had been part of the Strathallan Collection at Auchterarder in Perthshire before being broken up by a scrap dealer when the museum closed in the late 1980s, and then being snapped up by a collector in Carlisle. Owing to ill-health, he decided to get

rid of it and, with the help of a local transport firm, I moved it to my field. With its grey underside, white painted upper and RAF blue stripe down the side, it resided there for a few years while I worked on it, attracting the attention of curious passers-by. Some speculated it was a ghoulish remnant of the 1988 Lockerbie disaster. One old lady who walked up our lane every day thought it was a caravan. Others wondered if it was an improvised chicken coop.

The Comet cockpit was soon joined by a Rolls-Royce Avon 117 jet engine – a thirtieth birthday present from Trish. I seemed to be growing a collection of Comet-related artefacts. But then came the birth of our first daughter, Lizzie, and the need to provide for her, combined with the pressing requirement to fund the completion of the house, meant I had to sell the Comet. With its departure, Trish had her garden back. However, any belief on

The nose section of de Havilland Comet 2R XK655 leaves my garden at Tallentire near Cockermouth. The first production Comet 2, it was known as G-AXMA before RAF service.

her part that my obsession, like a splinter, had worked its way to the surface and disappeared was wishful thinking. Five years later I persuaded Trish that we should 'invest' in an equally large section of an RAF Nimrod AEW3 to restore and sell at a profit. But this time there would be no antics in the garden. The Nimrod was placed in the care of Solway Aviation Museum at Carlisle Airport. Two house moves and ten years later, we had to part company with the Nimrod to pay for landscaping works. By this time, even I was starting to question the wisdom of owning such large chunks of aviation history. But then came that coffee-time moment at the Battle of Britain Memorial.

The idea came right out of the blue, like a sharp blow to the back of the head – but the assailant's timing was impeccable. In early 2018 I had given up my building business to pursue writing and other less physical activities. I was 'semi-retired' and looking forward to a life less exhausting and stressful. However, the desire to work with my hands and create things still needed an avenue of expression. At fifty-five I was too young to devote myself to washing the car and weeding the garden. Of course, I could have taken up collecting aircraft numbers or building from small model kits to entertain myself – but I needed a more testing challenge.

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Back home after our break in Dover, I had much to think about, not least the daunting complexity of the project. Although I had some ideas about how it could be executed, there were an awful lot of unknowns. As Donald Rumsfeld, George W. Bush's Secretary of Defense at the time of the Iraq war in 2003, said: 'As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say, we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know.'

I also found myself worrying about the essential stupidity of the idea. I had abandoned a host of crazy ideas in the past and perhaps I should abandon this one, too. Such thoughts were perhaps sensible, but they were also boringly unadventurous. Inside me a nagging voice kept asking if I was *really* going to turn my back on the challenge of building a Spitfire. If I did, would the failure to carry it through not come back to haunt me? I imagined trying to revive the flagging conversation at some future dinner party with the observation, 'You know, I once thought about building a life-sized Spitfire.' The room would fall silent; someone would observe nervously that that would have made mowing the lawn a bit of a challenge, and in a few minutes the conversation would move on.

Counterbalancing these anxieties was the knowledge that Spitfire replicas were worth a substantial amount of money. I knew of two companies in Britain that were producing fibreglass replicas. Since I was not a good metalworker, fibreglass – or, to use its proper name, glass-reinforced plastic (GRP) – was definitely the material I should use. In my naivety, I believed that if I took a year to build the Spitfire and stuck to my budget, the project would be financially viable. If I had studied Mr Rumsfeld's words more carefully, perhaps I would have realised that even my 'known unknowns' would drive both my financial and time budgets far higher than I wished. In the end I decided not to let common sense ruin a good idea.

I had spent my teenage years building things from plastic kits and although I had long since abandoned the hobby, I recalled from my model-making days the importance of closely following the assembly instructions. To recreate the Spitfire with the necessary accuracy, I was going to need a good plan. But I had to conquer my instinctive dislike of the technical complexity that the task would inevitably entail. I was setting my sights high: I wanted to make a reproduction that could sit next to a real Spitfire and still fool the observer. I had come across replica

aircraft before, some of which had been film props, and at close quarters they lacked a certain *je ne sais quoi*. Any error of dimension or shortfall in quality in their skinning or paintwork would betray them. If I was going to build a replica Spitfire, it had to be convincing not just to ordinary members of the public, but to those who know their trim flaps from their elevators.

Experts can be a fearsome breed. And aviation buffs – as I discovered in 1993 when I was helping to restore a 1950s S-55 Sikorsky helicopter – are a particularly terrifying and pedantic sub-species. Before starting work on the Sikorsky, I had researched the colour of the paintwork, and had found out that since the helicopter in question had been built in the United States before being shipped to the Royal Navy, it was painted in a lighter colour – sea-blue – than was used on British aircraft. American Sikorskys of this type had been a stop-gap purchase for the Royal Navy while the British manufacturer Westland finished work on their own licence-built version – the 'Whirlwind'. Realising this, I hand-mixed the paint to ensure it was as close to the original as I could get. One day, having completed nearly all the paintwork, I was confronted by an indignant visitor who told me I had painted it the wrong colour. He had served in the Royal Navy and he assured me that in all his years serving on windy, salt-crisped flight decks, he had never seen a Whirlwind this colour. He was, of course, wrong, because the helicopter I had just painted was *not* a British-manufactured Whirlwind but an American-built S-55 Sikorsky.* I decided, however, that the best course of action was not to rise to the bait but to adopt a blank look and sound politely interested. I could have marched him into the museum building and shown him photographs of the self-same helicopter flying into jungle clearings in Malaya, clearly painted in the lighter colour, but I couldn't be bothered to argue.

* The Westland and Sikorsky-built aircraft were near identical and were both called 'Whirlwinds' by the Royal Navy.

Through this and similar experiences, I knew any disparagement of my labours would come from those who had absorbed themselves to an unhealthy degree in all things Spitfire. While I could try to ignore such unhelpful criticisms and focus on those who praised my efforts, the lingering fear of negative comments played on my mind.

An initial search for copies of original plans for the Spitfire was disheartening – I saw one set advertised for as much as $2,300. There were plenty of modellers' plans available, but these were clearly designed for smaller-scale reproductions. The creators of these drawings had not imagined that anyone would try to recreate a full-sized replica from them, so they lacked guidance in important structural areas. Salvation came in the form of an ebook, *Spitfire Mk. IX & XVI Engineered*, by Paul Monforton. This Canadian author had examined the Spitfire in great detail, component by component, and produced a comprehensive guide to how to build the aircraft. Although he assumed metal would be used, Monforton's book provided clear instructions for how to calculate the size and shape of each frame and how to position them. With one or two alterations, it would be a straightforward matter to adapt the dimensions for timber. Monforton had also helpfully converted the numerous tables of figures into metric. I am of the first generation of British schoolchildren to be taught metric rather than imperial measurements. My former business partner, Mark Wilkes, is only eighteen months older than me, but works primarily in imperial – in feet and inches. Monforton's accurate metric rendering of the measurements would save me many hours and numerous mistakes.

The choice of Monforton's book as my instruction manual meant that one important decision had been made for me. Of the various possible marks, it would be the Mark IX Spitfire that I would build, since the dimensions to create earlier marks were not included in the book. The Mark XVI, which Monforton also covered, was a later Spitfire development that saw the rising

slope of the rear fuselage to the cockpit reduced to facilitate a 'bubble' canopy that gave improved rearward views. Although very similar in build to the earlier models, I preferred the look of the Mark IX. After downloading the ebook, I remember sitting in front of my computer screen feeling as if I had crossed the Rubicon – a sense of excitement tinged with underlying anxiety. Ridiculously, I was concerned that I might have wasted £16 on a book, an echo of my thrifty upbringing in a family where there was little money to spare. The lines of figures in *Spitfire Mk. IX & XVI Engineered* initially triggered the same uncomprehending reaction I had on being confronted with sine, cosine and tangent as a schoolboy. I always found it hard work, learning how to use figures, but I was eventually forced to master them.

Loch Doon, Ayrshire, October 1941

Pilot Officer František Hekl climbed into Spitfire P7540 at RAF Ayr, Scotland on the morning of Saturday 25 October 1941. He was excited by the forthcoming flight, as this was only the second time he had been allowed to fly a Spitfire – his first flight having been only the day before. The low cloud that clipped the tops of the mountains ten miles way was gradually being driven away by the fresh breeze blowing in from the coast. Despite the odd patch of blue sky emerging through the grey mist and shafts of weak sunshine lighting the bracken-filled uplands, today Hekl would keep his Spitfire at low level. The twenty-five-year-old pilot from Czechoslovakia had already seen action in 1940. He had become a pilot flying the Avia B 534* biplane but left after the German occupation of his homeland and joined the Polish Air

* The Avia 534 was never used in action, as Germany marched into the Sudetenland after reaching agreement with Britain, France and Italy at the Munich Conference in November 1938, and occupied the rest of the country in March 1939.

Force at Dęblin in August 1939. The Poles were operating PZL P.11 aircraft, high-wing monoplanes powered by a radial engine. Although they had some success against the more powerful and agile Messerschmitt Me 109s, it was a contest they were eventually bound to lose. As Poland fell to the Germans, Hekl fled for a second time, south-east to Romania, only to be caught by the advancing Soviet Red Army. He was interned only briefly, however, and – anxious to join the British in their fight against the Nazis – travelled to Turkey, then Egypt and India before finally making it to Britain. Here he joined the Royal Air Force and was sent to train with the 312 (Czechoslovak) Squadron stationed at RAF Ayr.

The Spitfire Mark IIa Hekl was given to fly was quite an old one, in operational terms, P7540 having been supplied to 66 Squadron at RAF West Malling two days before the end of the Battle of Britain in October 1940. In the days of rapid aircraft production where improvements were constantly being made and aircraft quickly replaced on the front line, a year was a long time. This morning, František Hekl took off into the wind and, climbing gently, banked over the sea to avoid the town of Ayr, whose neat boxes of streets he could see laid out beneath him. Content that all was in order in his cockpit, Hekl turned south, leaving the smoke from hundreds of house chimneys rising in the chilly air. Picking up the road leading south-west towards the hills, he descended to 250 feet and after less than five minutes saw the small mining town of Dalmellington off his nose on the left side. Descending further, he turned right between the rising slopes as rugged fields of bracken and scrub rushed underneath him. His prize lay before him, Loch Doon, a six-mile sheet of calm grey water nestling at the foot of rolling hills.

Eyewitnesses recalled seeing the Spitfire flying low and fast just above the water's surface. With many airmen delighting in flying at speed down the loch, this was not an uncommon sight. This Spitfire was exceptionally low and halfway down the loch;

as it dipped its wing to bank to starboard, the tip caught the surface. Within seconds the aircraft was enveloped with spray as it cartwheeled into the water with tremendous force. The churning of water quickly subsided, leaving no sign of P7540 or František Hekl. A search was mounted, but the only trace of the aircraft was a thin slick of oil on the surface of the loch.

After the war, Hekl's name was added to the memorial to the missing at Runnymede Air Forces Memorial in Surrey, but his loss continued to haunt those who had witnessed it. In 1976, volunteers at the Dumfries and Galloway Air Museum, thirty miles from the scene of the accident, decided they would try to find P7540. After receiving permission for a search from the Ministry of Defence, they enlisted the help of Dumfries and Galloway Sub Aqua Club and members of the Northern Federation of British Sub-Aqua Clubs. Initial dives in Loch Doon in 1977 revealed the scale of the task ahead: the waters at the bottom were silt-laden, creating such low visibility in the soup-like murk that the divers would have to undertake a finger-tip search. They could only estimate the rough location of the Spitfire – and it was a large search area. The project was a mammoth undertaking, as year after year groups of divers felt their way along the bottom of the loch. Finally, in May 1982, five years after the first dive, the fuselage was located and after air bags were installed, the remains began to surface. It had taken 567 dives by a total of 109 divers to find what remained of P7540. The wreckage was scattered over a distance of 200 metres. The Merlin engine, when it was located and raised to the surface, was found to be in surprisingly good condition despite being propelled some distance by the impact with the water. Of František Hekl there was still no trace, and his body remains undisturbed in Loch Doon.

In 1994 I visited the Dumfries and Galloway Air Museum across the border in Scotland. The reconstruction of P7540 was progressing well, but slowly. The fuselage sat on the workshop

floor with most of her frame and skinning in place. It was my first opportunity to see a Spitfire at close quarters and observe the construction. Although much of the fuselage had been rescued, the condition of the wings meant that reconstruction using the original parts was impossible. As it was a private visit, I was able to talk to museum chairman David Reid about the project and the obstacles they faced. He emphasised that the biggest challenge the reconstruction team had faced was recreating the wings. It seemed that this was a difficulty faced by all builders of replica Spitfires. The elliptical shape of a Spitfire wing means that both leading and trailing edges of the wing are curved, making the components more complicated to calculate than, for example, those of a Hawker Hurricane. At the root the Spitfire wing is over eight feet in width and therefore very challenging to handle. Mounting the wing requires the setting of a dihedral, a six-degree angle that brings the wing tips upward to the fuselage centre line. Once this is achieved, the wing still requires shaped fairings to streamline it into the shape of the fuselage – all of which greatly adds to the manufacturing time. The Dumfries and Galloway Museum would eventually resolve the issue by purchasing fibreglass wings from a specialist maker. The rebuilt 'Loch Doon Spitfire' was finally rolled out in 2017 and now sits in its own building displaying a restoration of impressive proportions. Although twenty-four years had elapsed since my visit, the story of the wings stayed with me.

Wednesday 4 July 2018

On a quiet mid-week afternoon, as I scrolled through the pages of seemingly endless technical data, drawings and measurements of *Spitfire Mk. IX & XVI Engineered*, I pondered that most basic of questions: where should I start?

For many of those embarking on a plane replica, the most tempting place to begin is the cockpit, for it is here – with the exciting array of dials and controls – that one can create the most interest in a relatively short space of time. However, recreating an aircraft cockpit is a less straightforward business than was once the case. When I began my journey into aircraft preservation in 1992, a cockpit instrument or dial could be had for around £3–£4 and sourcing them from aircraft dismantlers was pretty easy. Carlisle, and the Solway Aviation Museum in particular, was blessed in having RAF 14 Maintenance Unit (14 MU) on the outskirts of the city. This unit specialised in maintaining, refurbishing and supplying instruments for the Royal Air Force along with a myriad of other parts necessary to keep aircraft flying. In general, instruments were in plentiful supply. For many years, the best place to get hold of them was at public auctions. Over time – and particularly after the coming of the internet – the market broadened considerably, opening the door to hundreds of keen collectors. Prices have increased twenty-fold and a genuine Spitfire part – including cockpit instruments – can run into many hundreds, if not thousands, of pounds.

Some Spitfire replica builders never make it beyond the cockpit. Others press on to complete the fuselage or a portion of it, only to find the challenge of the wings – and the space they require – is too much. The days when you might have found a pair of Spitfire wings languishing in a scrapyard are long gone. The only option – for amateur and professional replica builder alike – is to construct new ones.

Thanks to David Reid's words on my visit to Dumfries, I was forewarned about the problems I would encounter with the wings. But I decided, nonetheless, to take the bull by the horns. It was with the wings that I would start. What I wanted to avoid was building half of the aircraft and then hitting a crisis of confidence when I came face to face with the most difficult

bit. I could not afford to lose heart halfway through – that way I risked being left with a large and expensive folly that would have to be given away. Even if building the wings first made for a taxing start and an extended period of doubt and anxiety (not to mention some awkward questions from family, friends and visitors), it was surely best to get the steepest part of the climb out of the way early on.

I was already tussling with anxieties about what lay ahead. I still did not possess the confidence to start with the main structure of a wing. Instead, I would create the wing tips, experimenting with my chosen construction technique and hopefully mastering my materials. If my methods failed to live up to my expectations, and I decided to go no further, I could always hang the wing tips on a wall or try to sell them on eBay as a novelty. My lack of confidence was on display the following weekend as we attended a barbeque with friends. Knowing I had wound down my building business, they were curious to know what I was doing now. I told them about my writing and also helping Trish with her meals-on-wheels work – she was the coordinator of a local project to supply food for the elderly. I paused for a second and looked at the ground. 'I'm doing something else that I can't tell you about yet.' My friends laughed, then looked at me expectantly, hoping to persuade me to be more forthcoming. But I stood there tongue-tied. After a few seconds that seemed more like minutes, someone patted me on the back and knowing looks were exchanged: they knew me well enough to realise I was up to something.

Friday 13 July 2018

In the small and immensely cluttered garage at the side of my garden, I cleared a space to work, but it was evident that no amount of reorganising would create a space to accommodate a

growing Spitfire – I would have to do most of the work outside. With clear July skies and dry weather, cutting and finishing could be undertaken *en plein air* on my trusty Black and Decker Workmate table. I had the mistaken idea that I could bypass most of the figures and calculations in the plans by projecting an image of a diagram onto a board and drawing round it to produce an accurate outline. Setting up my laptop and small projector, I found a piece of plasterboard that I could prop up and project on to. Referring to *Spitfire Engineered*, I found that the wing tip was approximately 126 cm in width and 76 cm in length. Having marked my board where the image would fit, all seemed well. However, when I projected the diagram of the wing tip, I realised that the lines were thicker than the broadest of my felt-tip markers and there would be no hope of achieving the required accuracy for the small parts – particularly for the internal wing ribs.

This discovery was the first real hurdle I encountered, and it led me to the uncomfortable conclusion that I would need to sit down and meticulously draw each part onto plywood using the calculation tables provided in *Spitfire Engineered*. In the case of a wing rib, the starting point was to draw a straight horizontal line along the length of the piece desired – the 'chord line'. Along this line seventeen stations were measured and marked before the table was further consulted to plot a dot above and below each station – the 'upper and lower' ordinates. It was a bit like creating a child's dot-to-dot picture. Once all the dots were joined with straight lines the fish-like shape of the rib would appear. If any of the dots were misplaced, the resulting anomaly would be immediately apparent, as the connecting line would put a peak in the curving shape. It would be a new language to learn, but drawing directly onto the 12 mm ply ready for cutting would save a lot of time in comparison with working in metal. Once I had drawn and cut out one rib, I could use it as the template to cut another part for the opposite wing. However,

although there were only three ribs in each wing tip, there were twenty-one in each wing, with no two identical. So there was a lot of plotting to do. And the drawback with my method was that if I cut one rib wrongly, I would replicate the mistake on the other wing.

I was happy to be working in wood rather than metal, wood being a far more compliant substance to cut and shape. Before long, I had completed the frame for the wing tips and it was ready for the over-board – the skin. As a seven-year-old might show a picture they had drawn to a family member, I presented the completed plywood frame to Trish, and asked what she thought. Her response was: 'Very nice, dear.' On a real Spitfire the aluminium skin that would fit over the frame averaged around two millimetres in thickness. My version used hardboard that was three millimetres thick, onto which at least another three millimetres of fibreglass would be applied. Overall, my Spitfire was going to be a few millimetres bigger than the original, but I hoped this would not be noticeable. The use of fibreglass also considerably increased the weight of my replica's skin. The wing of a Spitfire is quite thin, so creating the tight curve of the leading edge required some careful thought. My solution was to use plaster between the ribs, working it as it set to create the finesse required. Once this was layered with fibreglass it would be robust and waterproof. Alongside what I knew of aircraft engineering, I found that the skills I had learned in the building trade were my mainstay in solving problems.

eBay would prove another useful ally as the work progressed. One of my best finds on the site was a pair of used tyres that came from one of the healthy number of Spitfires still flying in the United Kingdom and which I was able to acquire quite cheaply. As part of the process of gradual revelation of the project, I put photographs of the Spitfire tyres on social media without letting on what I planned to do with them. When friends

asked what I was up to, I responded with messages of the 'you'll have to wait and see' variety. In these early days there was no easy way of conveying the truth without appearing to have taken leave of my senses.