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ON THE COVER

Phil Clark of Fighter Aces built this 1/5th scale 83" span Focke Wulk Fw 190D from the German *SisT Modellbau* kit.
All composite, moulded airframe model is Zenoah 62 powered and weighs in at 33 lbs.
Alex Whitakker reviews it in this month's issue.

PHOTO: ALEX WHITAKKER

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CONTACT

Here at FSM, as each successive issue is prepared, one thing just leads to another. In this issue, Alex Whittaker revues the Focke Wulf Fw 190 D-9, built from the German *SisT Modellbau* kit by leading Warbird flier Phil Clark (Mr. Fighter Aces). Whenever we feature a model of a particularly significant aircraft, especially a Warbird, we like to back it up with a feature on the full size machine, recording its significance and further backing this with maybe colour schemes and scale drawings plus, when we get access - a close-up photographic detail study.

The later, long-nose versions of the Fw 190 have been less universally documented than the original neatly proportioned A-version that caught the RAF completely by surprise in the Spring of 1941. Scale drawings seemed to be difficult to find.

The A-version by comparison has been widely address as far as scale three-views are concerned - and none better, by a country mile - than those by Arthur L. Bentley, whose work on such drawings are head and shoulders above others, as expressed in his Fw 190A drawings that we have previously featured in FSM.

I've known Arthur and admired his work for very long time and can remember when, back in the mid 1980s I accompanied him to the Fleet Air Arm Museum, Yeovilton to measure-up their Grumman F6F-5 Hellcat for scale three-view preparation. Ray Rimmell, then editor of *Scale Models International* - and now Mr. Albatros Productions Ltd also came along.

Having been out of contact with Arthur for quite a while, but remembering his '190A drawings, I called to ask if he had ever also drawn the '190D. Yes he had, although the multiple drawing sheets were incomplete for presentation as a 'conventional' set of scale three views - but he sent across copies of what he had for examination.

Arthur then agreed to quickly undertake further work on the drawings, which now allows FSM to present an *anatomy* of the Focke Wulf Fw 190 D-9. There's more sheets than we can get into one issue, so there will be more next month in June issue.

Hope you Warbirders like it - and thanks Arthur.

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WING CONSTRUCTION

Laminate up four wing tips from soft balsa strip. Being a flap inside section makes this nice and easy as shown in **Photo 14**. The port lower wing is shown under construction in **Photo 15**. Servo lead cut-outs on the inboard ribs and the 'aileron' spar are not required on the top wing.

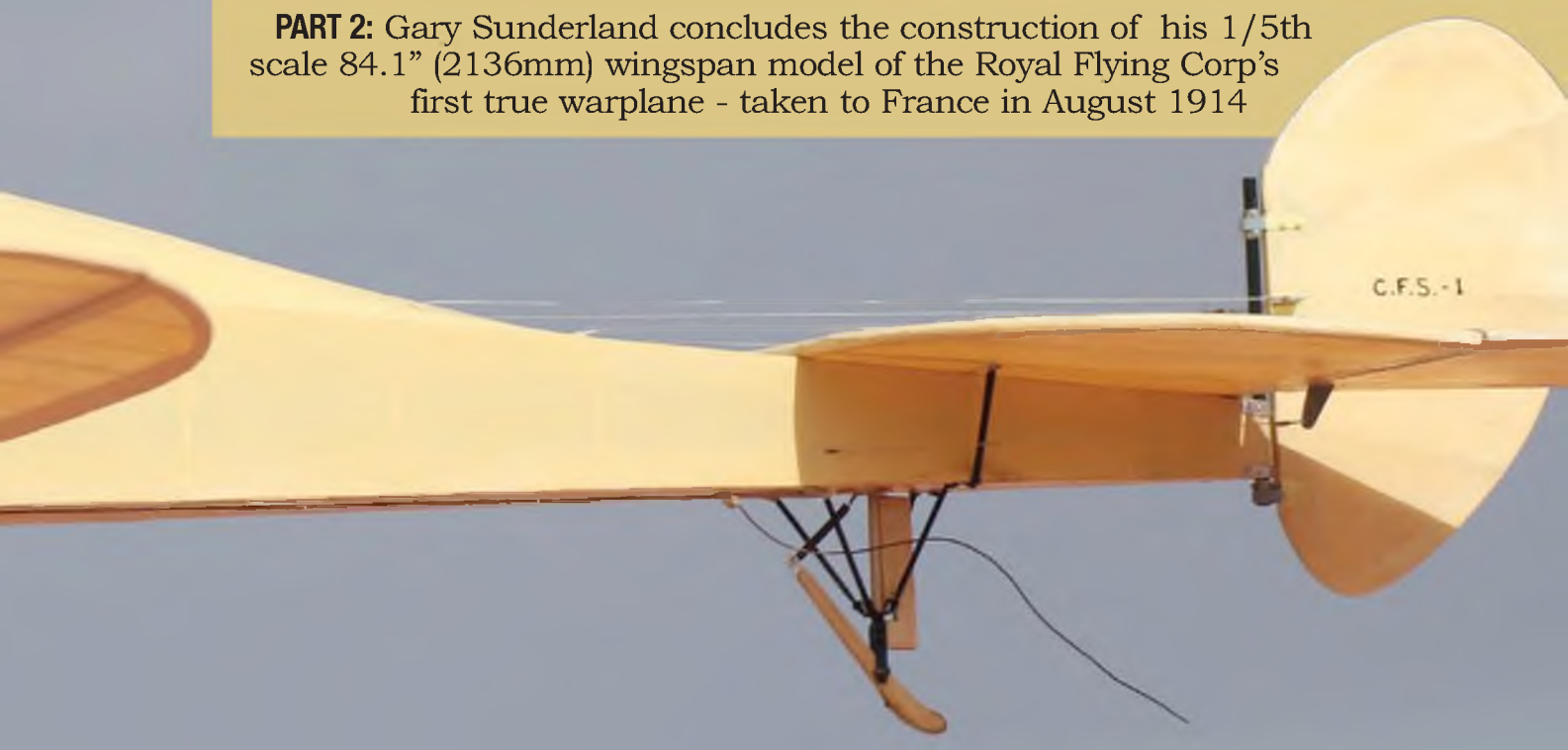
Compression (strut) ribs are from 3 or 4mm ply. All the ribs are of constant shape and I trim the tip ribs to profile afterwards.

All the wing panels are completed in one step (**Photo 16**) with the spars reinforced at the compression ribs with wood scrap. The original (full size) wings featured 'riblets' which are actually just thin laths of timber between ribs. These are seldom visible in photographs and I decided to leave them off my model.

Photo 17 shows covering underway, with the strip ailerons being top hinged. The *DuBro* pinned hinges slide under the covering into recesses and attach with five brass screws for each hinge. The

BE 2 & BE 2a

PART 2: Gary Sunderland concludes the construction of his 1/5th scale 84.1" (2136mm) wingspan model of the Royal Flying Corp's first true warplane - taken to France in August 1914



tailplane, elevators and rudder are also shown.

Details of the wire wing attach pins are shown in **Photo 18**. The root ribs and attach pins are canted at 1.0 to 1.5 degrees dihedral angle, with the wire epoxy glued to the inboard face of the spars. After painting, the aileron gap, of 1-3 millimetres is sealed with a strip of *Solartex,* ironed over. Do not use *Koverall* for this seal - the *Solartex* will not subsequently tighten and cause problems.

Screw on the rigging fittings and trial-fit the strut pairs to both upper and lower wings (**Photo 19**). The wire ends should be a tight fit in the spars. CHECK that the gap is 14.4 inches (366mm) undersurface-to-undersurface.

Assemble the wing pairs and check for parallel, no stagger, and square at the root ribs. Then apply a gentle force spanwise to slightly bend the wires, providing a dihedral angle at assembly of about one degree. Then, tape the wings


14


15


16


17


21

together as shown in **Photo 20**.

Pack up the fuselage, nose down, to three degrees at the engine mounts or front cockpit rim. CHECK that the centre section is at zero incidence. Offer up the wings and pack up to one degree (**Photo 21**). Then, CHECK the centre section level.

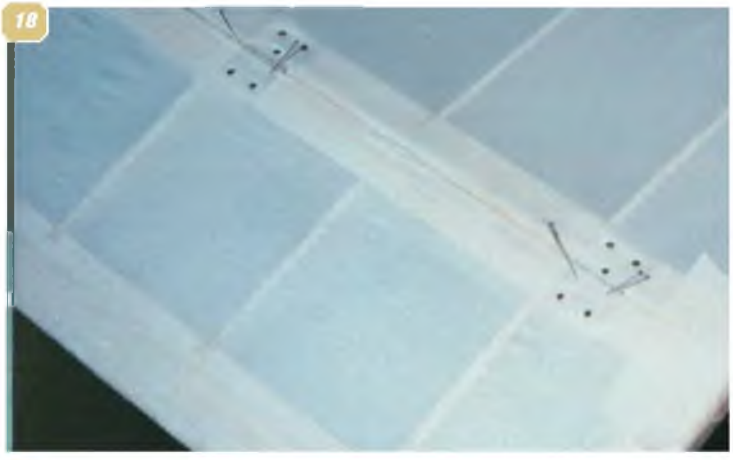
With quick-link clevises in place at the fuselage ends, wire up the front truss, inner bay only. The remainder of the rigging is completed with 40 lb. fishing trace. I use brass tube on the hard piano wire and soft copper swages on the fishing trace (**Photo 22**).

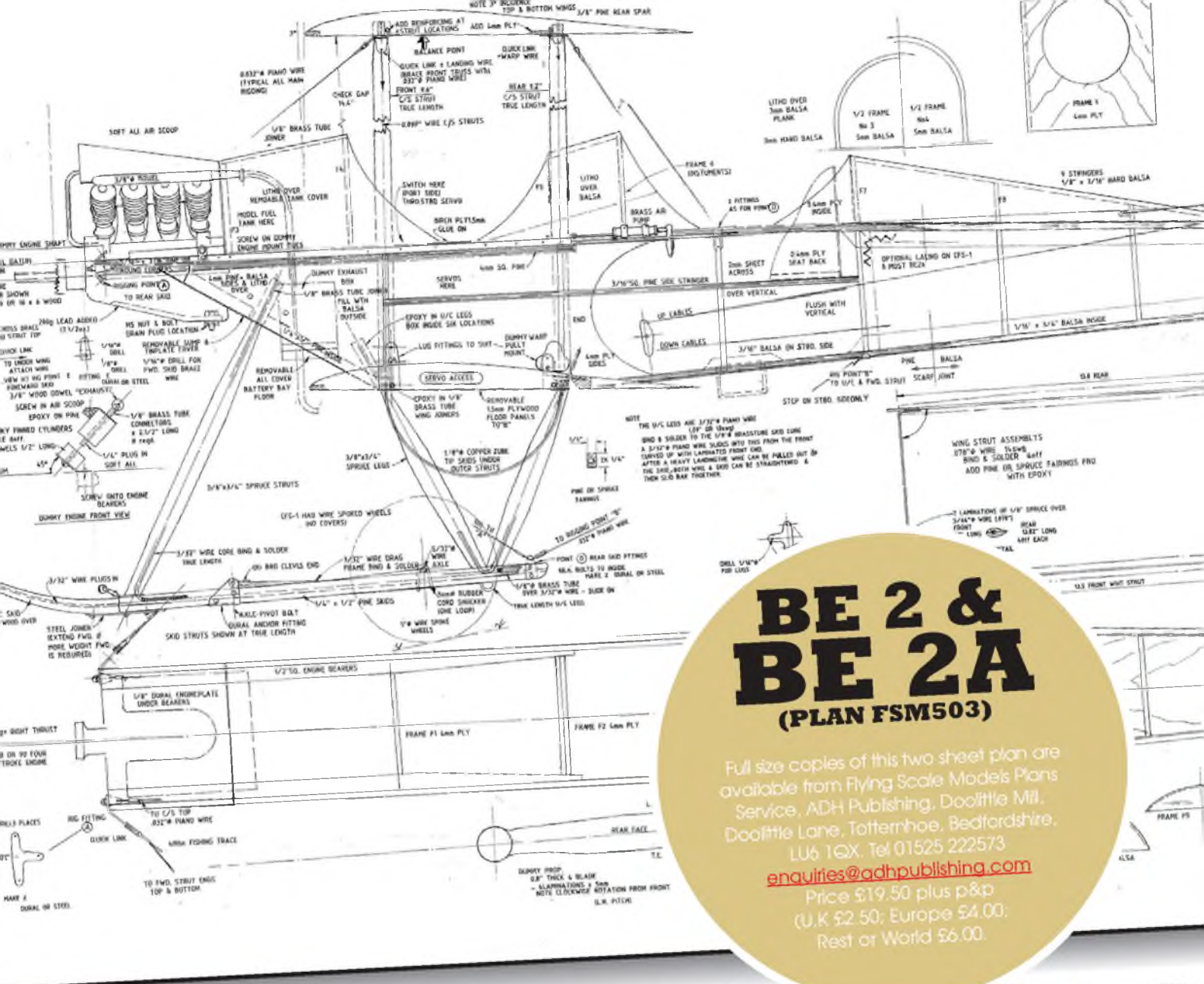
DETAILS, DETAILS...

I soldered up the dummy engine sump from tinplate. The crankcase front is from ply and timber, while the crancase sides are from folded aluminium sheet. (**Photo 23**). Note the holes in the crankcase front which, on the original Renault engine, is the camshaft-cum-propeller drive shaft. Thus, the real propeller rotates at half engine speed in the opposite-to-normal direction.

One mistake in my model was to place the centre section brace wire to the front fitting inside the fuselage line as shown. This made for much unnecessary work, carving away the dummy parts to suit. This wire should, like the full size aeroplane, be just outside the line of the fuselage and engine. The drawings have been altered to indicate the correct position.

The dummy engine parts are displayed in **Photo 24**, with dowel lower cylinders screwed onto the crankcase sides. The upper, finned cylinder heads are epoxy cast in a silicone mould. The method is described in FSM





BE 2 & BE 2A

(PLAN FSM503)

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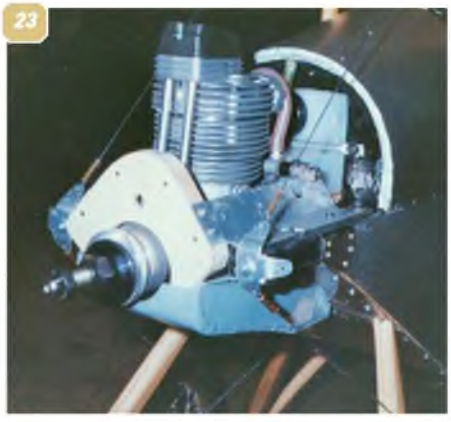
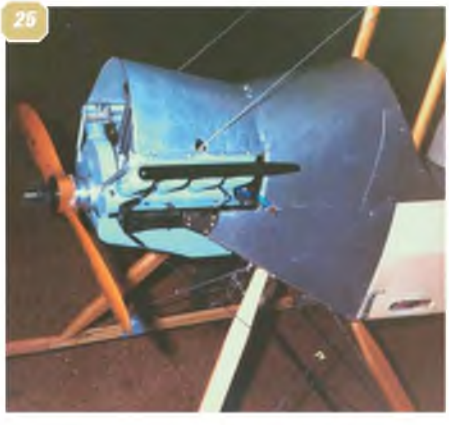
THOUGHT FOR THE DAY...

The BE 2 and the Bristol Boxkite are mainly of significance to Australians in celebrating March 1914 when the first military flight occurred in the country, but it seems to me that August 1914 was a centenary of an event of much more significance - to France and Great Britian, then including the British Empire. Britain's first warplanes were indeed the BE 2a and the Avro 504 - both excellent flying aeroplanes at a time when few instructors, let alone pupils know how to fly properly.

The old Profile No.133 has some excellent colour views of the BE 2a in action, while Windsock Datafile No.156 covering the early Avro 504 is another worth collecting. Surely the time to change the emphasis from 1918 Scouts to the REAL aeroplanes of 1914, which changed warfare forever.

A few flights or Squadrons of BE 2a and the early Avro 504 would surely be the way for modelers to commemorate August 1914 as it was, rather than the Hollywood version.





November 2011 issue except that, for the BE 2, I used smaller *Williams Bros* cylinders.

Photo 25 shows the dummy engine painted with 'pewter' epoxy paint. The aluminium tube serves to hold down the front cylinders, while tank and vent lines connect tube fittings at the front. The top cowl or air scoop is from soft aluminium. (**Photo 26** & **26a**). The airscoop nicely covers the O.S.91 S-2 four stroke in side-view. An engine muffler is not fitted, nor is it necessary for this sedate flying model.

After the first test flight, 20 grams of lead were added inside the dummy sump, the attachment bolt serving as a scale sump plug! The dummy exhaust was fashioned from aircraft brake tubing and plywood, and the pitot-static tube from copper tube. This was the original Royal Aircraft Factory design, unlike the familiar type fitted to British aircraft from BE 2c right the way through to the Tiger Moth.

The rear seat and pilot were installed. Unfortunately, the local shops no longer have those cut bamboo baskets - just great for making basket-weave seat backs! So my pilot had to make do with just a plywood seat.

The BE 2 pilot of 1913-14 had just four instruments - tachometer, ASI, aneroid (altimeter) and watch. My pilot also has a map of the area north of Point Cook, Melbourne. Unfortunately, there was not fuel contents gauge, so there were many forced landings when the pilot forgot to keep the gravity tank full! There was also a brass household-type switch, which served to earth the magneto.

The wing tip skids are made from steel wire inside copper tube. Carefully bend to shape together and trim to length. Solder on attachment clips from brass. The wire goes into drilled holes in the spars, with screws through the clips. Paint a light brown (cane).

FLYING THE BE 2

What can I say? Stable, controllable and dependable. Of all the models I have seen, the closest in handling would be the Cirrus Moth - another, later, design by Geoffrey de Havilland. The rudder is a bit small, but you don't need it in the air, certainly not for turns. After trying a few propellers, I have settled on the MENZ 16 x6 wood. Just the job for put-puttering about at half throttle on a nice calm day, but it can cope with nasty weather when required - just like a Cirrus Moth.

As for aerobatics - the original BE2 was strictly NON, and the model should be likewise. However, when I was flying alone at the local field, purely as an experiment you understand, I tried a few stall turns and loops. No problems - however, I would NEVER do that in public!

The only point to watch is the landing. The nose and tailskid angles mean that the correct attitude at touchdown is mandatory. The best method is to fly the model on downwind at about half throttle, maintaining the level attitude on base, then approach with decreasing throttle to achieve the desired approach path, keeping the model level.

As it nears the ground, a little back stick is applied to achieve the three-point attitude and the throttle is then closed. The rudder is sufficiently effective to steer into wind, but it will not taxi-in downwind.

B.E.2a fitted with an early form of oleo undercarriage. Note also the exhaust collector pipe, connected to the exhansion box just above the lower wing leading edge.

ROYAL AIRCRAFT FACTORY

BE 1, BE 2 & BE 2a

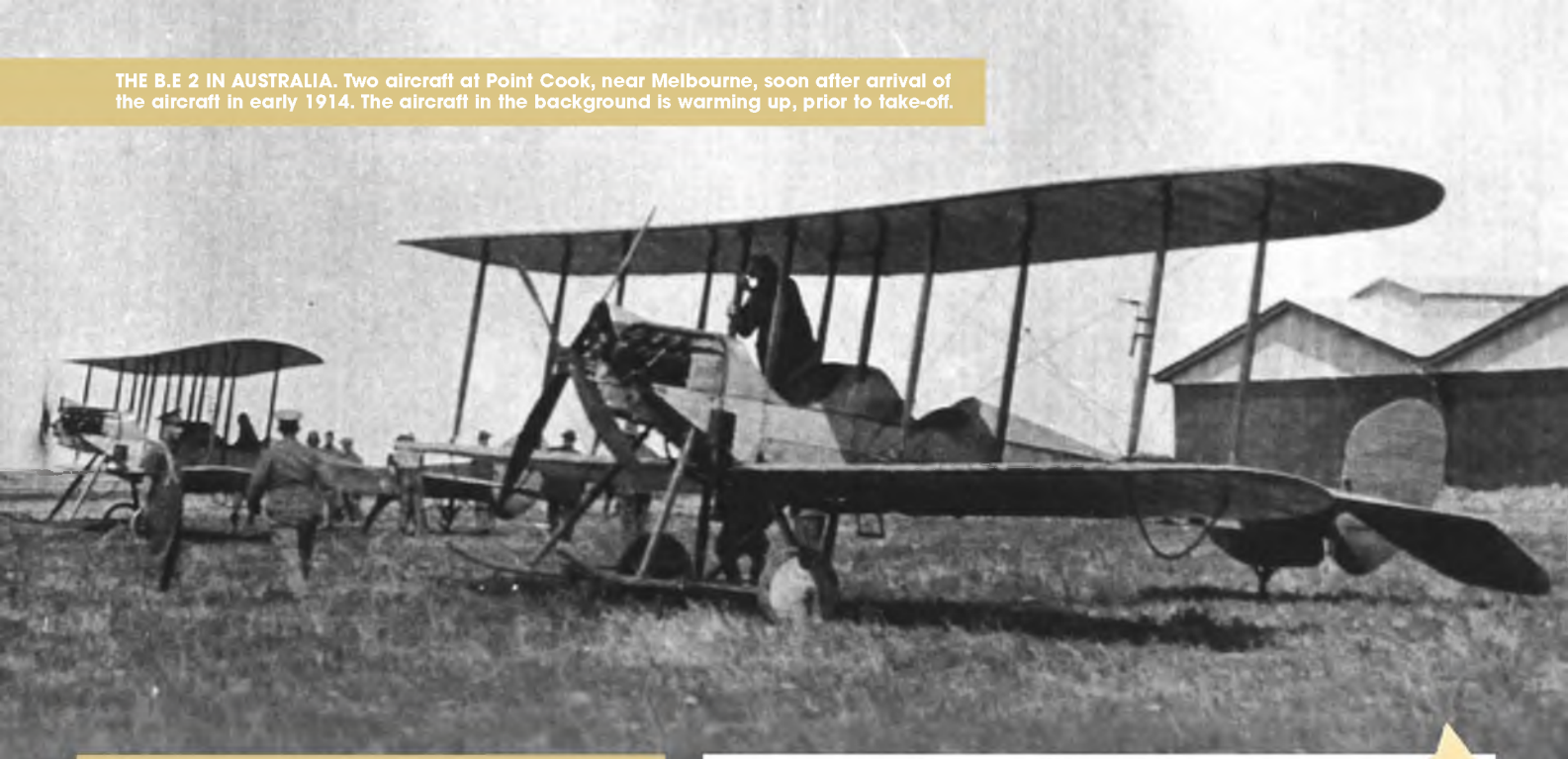
WHEN THE ROYAL FLYING CORP WENT TO WAR IN AUGUST 1914, ITS FIRST TRUE MILITARY AIRCRAFT MUST SEEM INCREDIBLY CRUDE, BUT IT WAS IN FACT WELL ADVANCED FOR ITS TIME

The Royal Aircraft Factory had its beginnings in the Army Balloon Factory, established in 1904, at a time when aerial battlefield observation was beginning to be considered in military circles as being of some possible value. One has to accept that, at the time, military attitudes tended to be centred around '...The Well Bred Horse...', so taking a surreptitious aerial look-see at what the enemy might be up to was something of a racy idea that 'gentleman-soldiers' did not do!

In 1911, the Balloon Factory was renamed Royal Aircraft Factory under the management of its Supervisor Mr. Mervyn O'Gorman. Officialdom can rarely establish a new government-ordained organisation without bequeathing to it some awkward counterproductive snag, which, in the case of the His Majesty's Aircraft Factory, was such that (notwithstanding its title) precluded actual aircraft manufacture, in favour of being a research and development establishment.

However, the Organisation was additionally made responsible for the repair of damaged military

THE B.E 2 IN AUSTRALIA. Two aircraft at Point Cook, near Melbourne, soon after arrival of the aircraft in early 1914. The aircraft in the background is warming up, prior to take-off.



aircraft, a task by which Supervisor O'Gorman circumvented the manufacturing restriction by disguising new prototypes as repaired versions of older aircraft, starting with the S.E.1, which was officially a slightly modified version of a damaged Blériot.

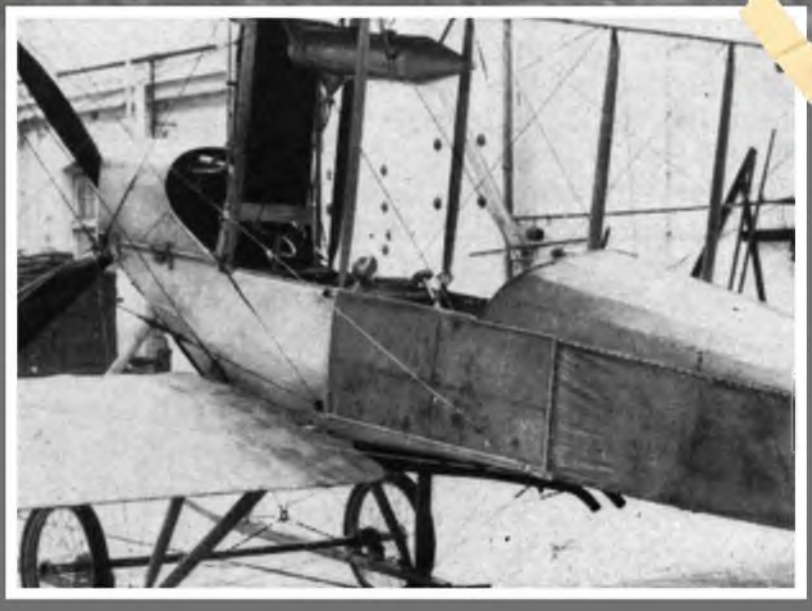
In April 1911, F.M.Green, the Assistant Engineer (Design) at R.A.F tasked Geoffrey de Havilland, the test pilot and designer with the design of a new aeroplane to suit a 60 hp Wolseley engine that had been donated to the Factory. The projected aeroplane was to be of the Bleriot layout, that is a tractor configuration with the engine and propeller in front, and consequently was designated Bleriot Experimental (B.E.) number one.

Co-incidentally, a month later that year, the Duke of Westminster donated his obsolete Voisin pusher to the War Office. This aircraft was soon badly damaged in a crash, and by July had been sent to the Royal Aircraft Factory for repair. O'Gorman reported that the wings needed to be replaced and that the controls were unfamiliar, so he was given permission to modify the aircraft so that it could be flown by anyone who was familiar with a Farman aircraft (another pusher).

O'Gorman's ruse can't have fooled many people, but when the B.E.1 emerged later in the year, the only thing it had in common with the original Voisin was its 60hp Wolseley engine. The 'slightly modified' B.E.1 was a two-bay tractor biplane, with a fabric-covered fuselage, an ear-shaped rudder and a large tailplane. The B.E.1 could carry a pilot and a passenger in its single two-seat cockpit, with the pilot at the rear and the passenger close to the centre of gravity and was test flown by Geoffrey de Havilland on 4 December.

At that period the Aircraft Factory gave a new individual number to each individual aircraft it produced, rather that a numeric progression indicating a form of design-type progression, so the series of individual development aircraft that followed the B.E.1 were designated as the B.E.2 to B.E.7, despite being very similar to the original. This system changed when the aircraft was ordered into production, with each new model being distinguished by a suffix, starting with the B.E.2a.

The B.E.1 was the first Factory aircraft to have



Not blessed with the best forward vision! An early B.E.1 with engine cooling radiator positioned smack in front of the pilot's forward view.

silencers in the exhaust pipes, and it quickly became known as the 'Silent Army Aeroplane'.

The Factory continued to work on it for three months after its maiden flight, making a series of minor adjustments before, on 11 March 1912, it was handed over Captain Burke of the Army's Air Battalion. Three days later, on 14 March, the B.E.1 was given what is generally acknowledged as the first Certificate of Airworthiness.

The B.E.1 was, by the standards of the day, a handsome two-bay biplane that owed little to the Bleriot, apart from the engine position and the rounded wing tips. The upper wings extended wider than the lower and Wright-type wing warping was adopted for control in roll, with truss bracing for the front struts. The rear struts were actuated by cables from the centre section and fuselage for roll control. Warping wing aeroplanes of the time, such as the Wrights and Bleriots, depended on the fabric covering of the wings, which was laid and stitched on at about a 45-degree angle, to resist any fore-and-aft loads on the wings. The new B.E.1 wings included compression members at each strut location and at midpoints, internally braced with piano wires, which provided a more rigid and durable structure. The wing covering was applied chord-wise and was only required to transmit air loads to the ribs.

The fuselage was also unusual in that the side panels were wire braced in the normal fashion, but the top and bottom were covered with plywood sheets to provide rigidity. The wheels were mounted onto a substantial skid undercarriage in the fashion of the time, but the tailskid was mounted on a pylon and made steerable to provide a means of directional control on the ground, another advanced feature. The Wolseley water-cooled engine, along with the large Voisin radiator and fuel tank were salvaged from a donor aeroplane.

Crystallising the design

The B.E.2 development was designed from the outset with a 60 hp air-cooled V8 Renault engine, later 70 hp, and greatly increased fuel capacity for four and a half hours duration. First flight was on 1 February 1912 and provided a significant improvement in performance, climbing at 240 feet per minute solo and 200 feet per minute with dual occupancy. This B.E.2 also did much experimental work developing instruments for aeroplanes, shown externally by an upper deck between the seats to enclose the instrument panel and an early form of pitot-static head on one outer strut.

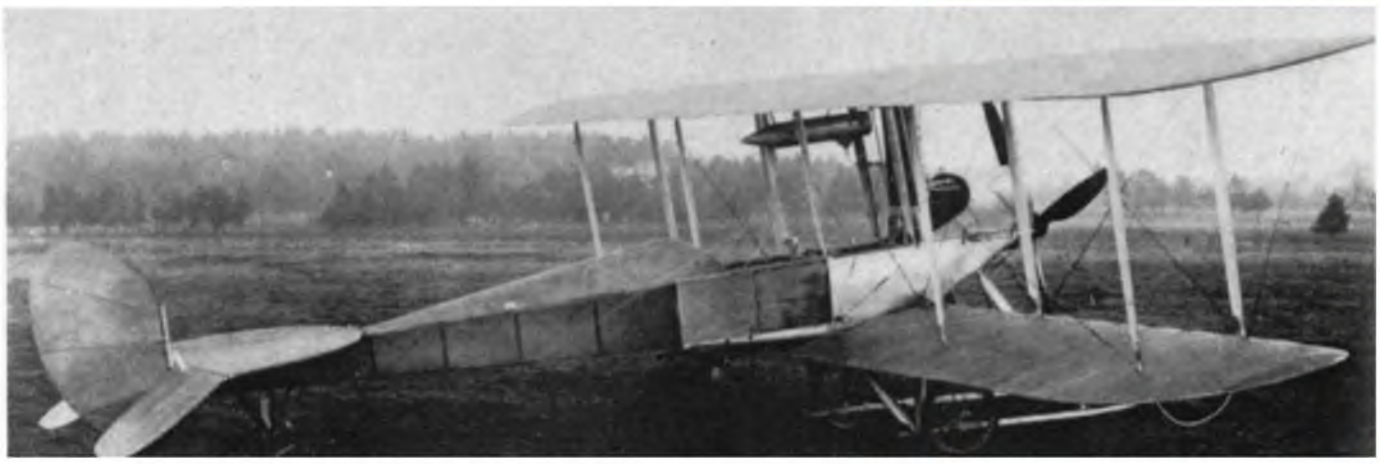
In this configuration the prototype flew at the Military Aeroplane Trials in August 1912. Organised by the British War Office, this event, at Larkhill in Wiltshire, is generally acknowledged as one of the great highlights of the early history of British military aircraft history and was organised to select the best aircraft with which to equip the Royal Flying Corps, formed only months before on April 13th 1912. Marked 'R.A.F. B.E.2'. It proved equal, or superior to all the private industry competitor entries, but was not eligible to compete for the prize due to the strictures to which we have already alluded. Consistent with officialdom's perennial ability to get it wrong, the Trial and its prize were won by the obsolete Cody biplane powered by an excellent 120 hp Austro-Daimler engine.

The clear superiority of the B.E.2 was demonstrated in part during the trial when, with a passenger, Geoffrey de Havilland climbed the B.E. 2 to over 10,000 feet.

Subsequently, the 'winner' of the 'Trials' got no further, but production of the B.E.2 went ahead, built by private contractors retaining the original open top fuselage of the prototype which, in the interim, was involved in the development of instruments and equipment during 1912. Top decking was developed to house the instrument panel and shelter the occupants and by 1913 these changes were being incorporated into production aeroplanes. Most early aeroplanes were subsequently modified in the field to include these improvements.

With all the extra load of fuel, instruments and equipment the gross take-off weight of the B.E.2 had increased to 1650 pounds, so the earlier structural test carried out on the B. E.1 prototype was no

B.E.2a No.347of No.2 Squadron, Royal Flying Corp was the first British military aircraft to land in Europe after the outbreak of WW1. Flown by Lt. H.D.Harvey-Kelly, it landed near Amiens at 8.20 am. on August 13th, 1914.



NOT MUCH OF A VOISIN IN IT! The first B.E. biplane, recreated from the bones of the Voisin pusher gifted by the Duke of Westminster in 1911 and used as the 'cover' for the construction of Geoffrey de Havilland's new design.

longer relevant At some stage a further structural test on the B.E.2 prototype was carried out, presumably at a gross weight of 1650 pounds multiplied by a load factor of three, during which the upper wing rear spar failed in combined bending and compression.

Following this test failure the Factory began a major program to investigate aerodynamic loads generated in flight, methods of load estimation and stress analysis of aeroplane structures and improved methods of structural testing. This work culminated in the Factory B.E.2a aeroplane, which featured the fuselage of the B.E.2, combined with new strengthened wings and this new B.E.2a model superseded the B.E.2 in production. For some reason the B.E.2 aeroplanes then flying were not grounded and B.E.2 production was not halted.

This is understandable given the state of ignorance, which existed at the time relating to aeroplane design. Most if not all aeroplanes flying then were no better than the B.E.2 and many were a lot worse. A number of B.E.2 aeroplanes were flying at the Factory and with RFC squadrons and were considered reliable. Then again the test method, using loose sand to load the wings was not at all accurate as regards placement and weight of sand in the first place. Even worse, when the wing structure began to deflect, the sand was liable to move outboard and increase its effect. Little wonder then that the Factory administration were reluctant to consider any action on the B.E.2 until they had established the facts.

B.E. 2a

The research and development program that culminated in the model B.E.2a took some time and it was not until August 1913 that the Factory management announced that methods of stressing and testing had been developed for the model B.E.2a.

The B.E.2a was put into relatively large-scale production for the time and most surviving B.E.2s were modified with the new strengthened wings. Scientists at the Factory had calculated that recovery from a dive at 91 mph would subject the structure to a load factor of six times normal and this factor was used in the design of the B.E.2a and all future Factory aeroplanes. The R.F.C. accepted this as a

At the Point Cook Central Flying School near Melborne, a mechanic of the Australian Army Flying Corps prepares to swing the four blade propeller to start up this B.E.2.

requirement and it became the standard for future aeroplane designs from the private industry.

Nos. 2 and 4 Squadrons of the Royal Flying Corps were very active during 1913, achieving many flying hours, that included some impressive long distance flights, notably from Farnborough, Hampshire, to Montrose in Scotland, the 550 mile flight being achieved in May that year in just under eleven hours, with two intermediate stops - improved later in the year with a 650 miles non-stop flight from Montrose to Portsmouth run and back to Farnborough.

To war on a wing and a prayer

Whilst the B.E.2a was not the only British aircraft type taken to France in August 1914 by the Royal Flying Corps (R.F.C.) and the Royal Naval Air Service (R.N.A.S.) in support of the British Expeditionary Force (B.E.F), an example was certainly the first to land in France, when Lt. H.D. Harvey-Kelly of No.2 Squadron R.F.C.) touched down in No.347 near Amiens at 08.20 hours on August 13th.

No.2 Squadron was equipped solely with the B.E.2a type, although the R.N.A.S. Eastchurch Squadron was more variedly equipped, but did have B.E. 2 types on strength including the personal aircraft of the Squadron commander C.R.Samson. which he later used for a bombing raid on the Zeppelin sheds at Dusseldorf and Cologne, while RNAS B.E.s were also used in raids on enemy installations at Ostend, Zeebrugge and Middelkerke, in Flanders.

Whilst much of the B.E.2a's military work was in aerial reconnaissance and artillery spotting, the aircraft's ability of carry and deliver a 100 lbs (45kg) bomb led to the first award of the Victoria Cross to a member of the British Flying Services after Lt. W.B.Rohodes-Moorhouse of No.2 Squadron RFC bombed the railway junction at Courtrai on April 26th 1915 during the Battle of Neuve Chapelle. To accurately deliver his 100 pounder, Rhodes-Moorhouse made his bomb run at only 400 ft, taking intense ground fire in consequence. Seriously wounded, he managed his return flight, but died of his wounds the following day.

Practically all B.E.2a action during WW1 took place on the Western Front in France, but R.N.A.S. used examples during the Dardanelles Campaign (April 1915-January 1916). Australia received two B.E.2s ordered in July 1912, eventually arriving there in February 1914, going on to the Australian Army Flying Corp's Central Flying School at Point Cook, south west of Melbourne, Victoria.

A few further examples were supplied to the Indian Flying School at Sitapur, Utter Pradesh province and one went to Egypt in December 1914 to reinforce the R.F.C's Ismailia Flight.

Throughout it's front-line military service, the B.E.2 had operated without formal combat firepower. During the first year over the Western Front, reconnaissance and aerial observation aircraft on both sides went about their business unarmed except for the odd handgun, rifle, or even the occasional grappling hook (!).

As more formally armed types, like the Fokker monoplanes (E.1-E.III) appeared, the B.E. 2 type became increasingly vulnerable, not least due to its inherently stable flying characteristics that precluded effective evasion tactics when attacked. Much B.E.2 'Fokker Fodder' fell to the guns of the 'Fokker Scourge' including the follow-on derivative B.E. types C to E, which fall outside the scope of this history.

By 1916, most B.E.2 and BE 2a types remaining were relegation to less demanding duties, including ab initio training, where it's inherent stability was of real value. ■

By the time the B.E.2b followed on from the B.E.2a, there were a few, if minimal concessions to creature comfort for the two-man crew of pilot and observer including faired-over cockpits, each with a small windscreen. By then, British militarty aircraft had standardised on red/white/blue identification roundels

Dakota

Delights!

THE HOBBYKING FOAM ARTF C-47 IS A BLAST REPORTS KEN SHEPPARD

Among the ten-to-twenty most signification aircraft of all time, one of them must certainly be the Douglas Commercial 3 – ie. the Douglas DC-3. Not surprisingly, this series started with the DC-1, which was prompted, one might argue with the crash, in 1931 of a TWA Fokker F.10 Trimotor on a commercial flight with a full load of passengers. The wooden wing broke up in flight due, it was judged, to water seepage affecting the wood glue.

This prompted the U.S.A's Department of Transport to place stringent restrictions on wooden wings for passenger airliners.

1: The C-47 access door in the fuselage side actually opens! 2: The substantial ply wing joiner in place. Note the channel-labeled servo leads.

Nice, leisurely, unhurried wide turns are what Hobbyking's Douglas DC-3 does best!

One of the U.S. aviation industry's responses to this was the all-metal DC-1 – only one of which was built, flying first in July 1933, but which was quickly followed, just less that a year later by the DC-2. This received ready acceptance by both U.S. and European commercial operators and of which just under 200 were built before it gave way to the DC-3 in 1936 – one of most successful commercial airliners ever.

From then the basic design was put to a vast variation of purposes. During WW2 in its C-47 military variant the aircraft performed a vital part of the Allied war effort for cargo transport, paratroop dropping and troop glider towing into battle zones in many war theatres.

Post 1945, the DC-3/C-47 remained one of the backbones of both military and commercial transport around the world. It was a prime mover during the Berlin Airlift in 1949 and a steady workhorse for all sorts of small and medium-size commercial carriers worldwide, which snapped up war-surplus examples, doing at knock-down prices.

One of the 'Holy Grails' of the post-WW2 aircraft industry was the viable development of a 'DC-3 replacement'. No manufacturer ever came close – there were too many perfectly reliable, fully serviceable DC-3s available to buy on the used aircraft market, capable of doing what was required, at a fraction of the cost of the new-design aircraft. It took a further couple of decades for commercial aviation to move on to a point where commercial growth and aircraft performance could eclipse Donald Douglas's creation.

Even the mighty US Military found very specialist and previously uncontemplated uses for the type in the guerilla dominated confrontations in south east Asia during the 1960s and '70s, using specially adapted C-47 derivatives for electronic intelligence gathering and a spectacularly armed ground-attach gunship with a powerful multi-barrel Gatling Gun fired through the opened cargo hatch position in the rear fuselage that would be blasted away at ground targets as the pilot flew the aircraft in a circle.

Even today, there are a few still earning their keep commercially, together with a decent number doing the rounds of the summer air shows and any aviation enthusiast worthy of the name and of 'a certain age' will still recognize the benign, low key and distinctive rumble of the twin Wright R-1820 Cyclone or Pratt & Whiney R-1830 Twin Wasp radials on a DC-3/C-47 scudding, quite low, across our skies.

THE MODEL

This Hobbyking offering, despite its relatively small size, is a practical scale model and flies well. The airframe is all EPO foam, and comes fitted with electric retracts and features split-type wing flaps. The wing comes in two panels, to be assembled into a full wing unit with centre-spar joiner, which makes transport really easy. However it may be that, due to the amount of wiring in the fuselage/wing joint, you might prefer to keep it in one piece in the car – in which case, the overall wingspan of 1600mm (63"") poses no great problem.

Two bell-type brushless motors and brushless ESCs

provide plenty of power from a 4S x 3000 - 4000mAh lipo pack (not supplied) and servos are ready installed complete with connector leads. Not supplied, is a receiver, which needs to be capable of operating six control functions.

Further authentic 'scale' touches are flashing wingtip and landing lights, plus scale looking three-blade props and spinner caps.

Colour scheme options

HobbyKing have devised a very good range of colour scheme options for their C-47 using a choice of two basic schemes – all over olive drab, with grey undersides – and an all-silver (unpainted natural metal) version. Decal sheets supplied with each version then allow for several different schemes. The review model has the former olive drab/grey finish and came with decal sheets that provided for four different livery options – two USAF, one RAF and one Australian Air Force. I opted to use the UK roundels and fin flashes. Check out all the options on the Hobbyking website – *www.hobbyking.co.uk*

How it goes together

Taking the carefully wrapped parts out of the box and the plastic sheets, I could not help but be impressed with the size and detailing on the model. I could wax lyrical, but looking at the photos will give you a much better idea of the finish, etc. As already stated, the basic rather than matt, but it still looked pretty darn good. The level of pre-fabrication was outstanding and I figured that if all went well, having received the kit on Tuesday, I should have it ready for test flying by the weekend, weather permitting!

All the servos are fitted, as are the fuselage pushrods – you just need to fit the control surface horns (two screws each), the aileron and flap pushrods (after centring the servos, of course). The main tasks are the joining of the two wing halves (glue and a ply joiner), setting the tailplane onto its seat, and the fitting of the fin/rudder into the tailplane/fuselage slots. Two long bolts through the fuselage bottom hold it all together – actually the fit was very 'foolproof' (I usually hesitate to say this as there is always someone to prove me wrong!). The only additional effort required was the removal of some excess foam from the fin 'lugs' to let the fin seat properly on the tailplane, but once a snug fit was obtained, it all lined up spot on.

The wing was then offered up to the fuselage and the wiring harnesses connected to the receiver poistioned in the fuselage behind the removable top hatch, with the extension leads poking down into the wing seat area. One excellent point about the 'spaghetti junction' harness is that each lead has a label with channel number adjacent to the connector – this makes connecting it all up a walk in the park – and a nice thoughtful touch by the manufacturer.

Do not fit the props until last - and most definitely AFTER firing up the radio to centre all the servos! Adjust the pushrod clevises as necessary to that the control surfaces are centred. Normally at this point, I would advise setting up the control throws to those given in the manual, but guess what, no throws are given at all, only the position of the CG – 65mm back from the wing leading edge at the wing root. I set what I thought would be sufficient throws in the second position of each three-position switch on the trannie, with a bit more in the top switch position and a bit less in the lower switch position – that should cover all bases for the initial flight with fine-tuning to follow after.

With the model now pretty much assembled, the next task was to achieve the correct fore/aft balance with the undercarriage retracted. A 4S x 3300mAh pack (as recommended in the instructions) even placed as far forward as possible, needed additional noseweight for correct balance. At that point, I decided that any additional noseweight should at least 'earn its keep' and so a 4S x 5000mAh pack was substituted. The 'larger lump' brought the CG to the required position and I now had more potential flight duration.

So, with everything in its place and working, step back and admire the model, it's certainly very pretty and very definitely scale!

Air test

I would have preferred waiting until the bad weather had abated long enough for our

3: Lower swing surface showing aileron and flap servos. Note the undercarriage is 'down'. 4: The various decal sheets supplied – four different variants available. 5: The tail units – the lugs on the bottom of the fin needed a bit of 'thinning down' to fit the tailplane apertures. 6: Detail of one of the cowl, air cooler scoop and scale props. Note balloon ribbed tyres on mainwheel.

strip to dry out a bit to allow a 'New Year' cut, but kit reviews have to continue right through winter, so the best I could do was wait for a bright, dry day, preferable with minimal wind. Finally that day dawned and after a short phone call to my photographer chum, it was off to the patch to give it a go.

As it happens, the strip HAD been cut and rolled just a few days before, so the strip was perfect. Lined up into wind, gradual application of throttle soon had the 'Dak' in accelerating mode, getting up to speed after just about 10 metres or so, having reduced the 'up' elevator to allow the tail to rise – and she was off!

Climbing to height, power was reduced to about 60% to slow her down (much too much power on full stick) and the 'Dak' was trimmed out for straight and level. I immediately found the ailerons very sensitive, as was the rudder, so I switched both these controls to low rates. She was now handling quite nicely, flying big broad turns (needing just a tad of rudder initially at the start of the turn) for a few circuits to get used to the feel and look of her in the air. She certainly looked the part and in the perfect blue sky, the nav lights were clearly visible.

Time next, for a stall test, so I initiated a one-circuit to a decent height into wind, closed the throttle and eased back the elevator to full up on high rates (top position) – the nose came up briefly as the speed bled off – and gently dropped the right wing. She came out of it easily enough and quickly – not benign, but almost!

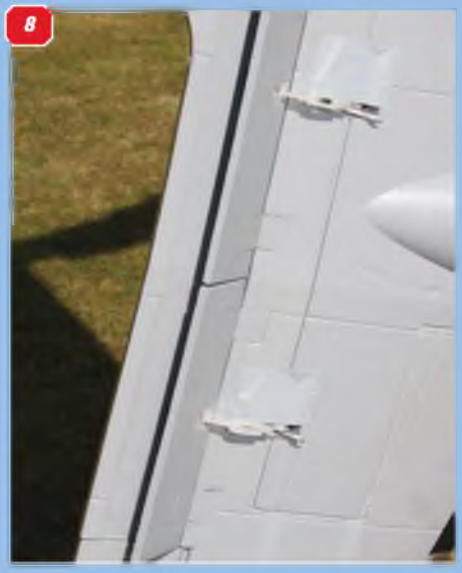
The rest of the flight was spent doing circuits and eights at about 50% throttle, which gave her a scale-like speed into wind, you don't want to fly her any faster, after all.

Flaps were next tested, at height, with the throttle set just a tad faster. At max deflection (30 deg.), the 5% 'down' elevator that I had mixed in resulted in just a little pitch-up change of trim. As there was a breeze, I felt I didn't need flaps for landing and so pulled them back up. Landing was a matter of lining up, easing off the throttle and letting the model settle onto the ground. Ground handling needs very little rudder and consequently, the throw was immediately reduced by 50%. The aileron throw was also reduced.

It was almost two weeks before another opportunity arose for further flight-testing. The aileron response felt better (reduced throw), more like what I prefer – not perfect, but decidedly better. This time the turns could be made tighter, figure eights felt a lot more solid – altogether a different animal. A very smooth flier – and didn't it look great!

I have flown the 'Dak' six times now, over four sessions, and I can say that with the reduced throws listed below, the C-47 is a very nice flying model and looks great in the air. The flight duration on the 4 x 5000mAh packs is, as you might expect - more that sufficient, especially if you fly at reduced throttle (who wants a supersonic WW2 transport?) and the model is thoroughly well behaved.

Yes, she will loop and roll (after a bit of a dive), but come on, they weren't designed to do that, were they! Low level passes with nice, big radius turns and 40 deg. bank angles are the order of the day. She presents well if flown with a bit of thought and smooth change-over manoeuvres. I always judge a model on the response of my clubmates – if they approve, then it's a good one - this one gets full, all round approval, which means highly recommended! ■



SPECIFICATIONS

Manufacturer:	Hobbyking
UK Distrubutor:	Hobbyking UK
Wingspan:	1600mm
Length:	1103mm
Weight:	1700g
Servos:	6 x 9g, 2 x 25g
Speed Control:	2 x 20A
Motor:	2 x 2215 960kv Outrunner
Functions:	6CH transmitter and receiver 4S required
Battery:	14.8V 3300~4000mAh LiPo recommended, 5000mAh used
Kit Part No.:	9306000073-0
Price:	£206.65 (price varies according to $ exchange rate)

7: The Douglas DC-3 had a fixed tailwheel.
8: Split flaps on one of the wing panels are in two sections - each driven by a separate servo that comes ready installed.

Sopwith Swallow

PART 1: A 1/6 scale 57.5" (1461mm) wingspan electric powered model of the late WW1 British fighter, designed by Peter Rake with the prototype built and described by Charles Sherman.

Having promised myself to draw up this model, things kept getting in the way of actually getting the plans drawn - usually in the form of other plans in need of drawing. I'd drawn up plans, in various scales, for the Sopwith Monoplane number 1 (Scooter), but never for the Military Monoplane number 2. A little urging from others, Charles included, prompted the model you see here. That's it from me, I'll simply hand you over to Charles for all the details. ***PETER RAKE***

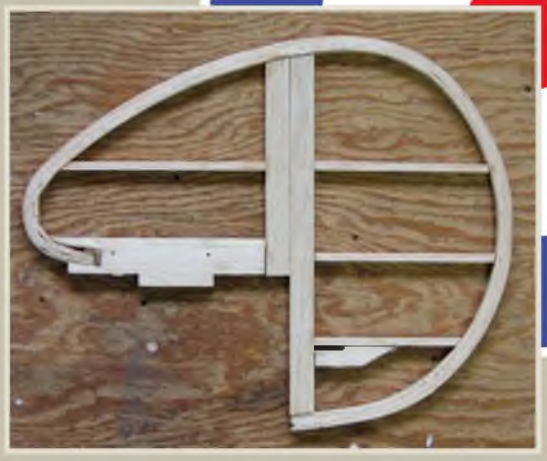
When your hear the name Sopwith, probably the first thing anyone who's ever heard the name thinks of is 'Camel'. Swallow most likely isn't on most people's list. The Sopwith Swallow was built in late 1918 as an attempt to create a monoplane fighter that could outperform current biplane fighters.

The Sopwith Aviation Company produced two monoplanes based on the Camel F1 fuselage. The first prototype, known as the *Scooter*, showed promise and led to the development of a second prototype, later known as the *Swallow*. Information on these planes is scarce. Research on the internet brings up a few sites recycling the same information and sometimes confusing the Scooter for Swallow and vice versa.

Aside from the monoplane configuration, there are some other differences between the Swallow and the Camel F1. The cockpit is located further back in the fuselage, the 'hump' is gone, the machine guns are

Cruising by in a low pass. Be careful not to force things if you are operating at the bottom end of the power range.

The tailplane and elevators are simple enough to build, with a minimum of laminated parts.



For better results if your wood is on the hard side use a greater number of thinner strips for the laminated fin/ruder outline.

The basic wing panel awaiting tip, servo rib and dihedral braces. See text for details of these.

Here you see the curved tip in place, and the issue Charles raised about tip length.

mounted on top of the fuselage and are further back and the exit holes for the elevator and rudder cables have been relocated.

Peter's 1/6th scale plans come out at a wingspan of 58" and length of 36". The first test flight weight came in at 59oz. The power set-up up for the prototype was a 480 outrunner, 60 amp ESC (40 amp would work just fine), a 13x6.5 prop and a pair of two-cell 2200mah batteries wired in parallel. A test on the watt meter gave me 29 amps and 217 watts, or around 43 w/lbs. More about this a bit later.

THE BUILD BEGINS

I started off with the horizontal and vertical stabilisers . There's nothing tricky here, just build the sections over the plans. Four pieces of 1/16" x 3/16" are laminated together for the curved edges of the vertical stabiliser, but I ran out of 1/16" x 3/16" so I used three pieces of 3/32" x 3/16" for the tips of the horizontal stabiliser. I couldn't get the tight bend done on the vertical stabiliser without cracking the wood but that won't be an issue when it is covered. *(If in any doubt about being able to bend your 1/16" strip sufficiently I'd suggest using twice the number of 1/32" balsa strips. Laminating outlines results in structures much stronger than would be the same assembly using cut sheet outlines, so your strip doesn't really need to be that hard.*

Soak it well, apply glue to the individual strips as you join them and then PULL the pieces around the former. I stress the bit about pulling them around because keeping them under tension reduces the risk of cracking. Just recently I received a suggestion about using cheap car de-icer to soak the strips. It's supposed to make them easier to bend, but I hasten to add that I haven't had a chance to try it yet. PR)

WINGS

Construction of the wings is pretty straightforward. The wing is built in two sections then joined together at the centre using some balsa and ply parts.

Each section was built over the plan. The photo shows the right wing built up to the point where all of the straight pieces have been connected. R8, a 1/8" ply rib used to hold the servo, is NOT glued in at this point - leave that out so you have room to place the servos. *(And until you have made sure that your particular servos will actually fit the opening. PR).* I've also left out the servo arm exit plate, which goes in the bottom of the wing. This will be positioned after R8 has been glued in. *(This is another part that may need adapting to suit the servos you are using on your particular model - not all servos are the same height from mounting lugs to output arm. PR)*

Plywood plates (SP1 and SP2), for attaching the centre section struts, are glued in between R3 and R4 flush with the lower surface of the wing. Make sure they are glued firmly in place or you may find it's only the rigging holding your wings on.

The wing tips are 1/8" bass parts that need to be shaped to form an arc that follows the curve of the ribs. To get the arc, I traced out the WT1 (long front section) onto cardboard and used that to get an arc that looked right. I used a marker to draw a line on the rib, then traced that onto paper to make a template I could use to create a form. I cut up some scrap wood on the band-saw, soaked the bass for a few minutes, then clamped it down on the form. I let that dry overnight and then used the same form to shape the other wing tip piece.

WT1 was longer than the distance between the leading edge and rear spar if laid flat but after it is curved, it wasn't long enough, depending on how much curve you use. I had to add a 1/8" piece of balsa to fill the gap. *(This has been remedied on the plan and parts file but I left in the point raised so you know what is going on in the photos. During the prototyping stage, as soon as the builder hits a snag I always ask them to let me know so it can be fixed. If I don't fix it straight away, and especially if there are other problems, there's always the risk it will get overlooked. Sometimes builds can take many months and my memory isn't that good. So, although I can't guarantee everything is perfect, I have done my best to make it so. PR)*

What hasn't been added yet, is a balsa gusset underneath WT1 for a little more support. If I was going to do this again, I would have extended the front bass spar out about 1.5 cm (0.6") and used that for the gusset because where I placed WT1 would have only required me to shave a little off of the top of the spar to allow WT1 to site where I finally placed it.

WT2 (small section in the aileron) didn't

The laminated triangular wedges that take up the sweep in the wing, and the ply dihedral braces that double as pylon mounts.

A clear view of how the wedges and braces work once the wing panels are joined.

With the pylon wires in position. Notice how the rear c/s laminations aren't completed until AFTER the pylon is bound and glued in place.

need to be curved. You will need to bevel the edges resting against the trailing edge and the main aileron spar to get that piece to sit correctly. A little sanding will smooth out the curve of the wingtip.

The next step is to join the wings. There are pre-cut (If you're using the laser cut parts set. PR) triangular pieces of balsa that are laminated together to form the front section of the joiner pieces. Behind the triangular pieces, short ply spars are inserted. These ply spars (DB1 and DB2) have holes along what should be the top edge. Make sure the holes are on the top side as you will need them later when joining the legs of the top pylon to the wings.

Test fit everything before gluing. The ply spars and wing ribs were a tight fit so I needed ease those parts together. (Unfortunately ply is a somewhat variable quantity and varies in thickness from what it is supposed to be. All we can do is draw it as it's supposed to be and hope for the best. Having to ease slots slightly is preferable to sloppy joints. PR)

All set for another flight the Swallow puts a less than usual shape into the air.

DURAFLY®

Retro

JUNIOR

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Modern

History

The Durafly Junior perfectly captures the essence of vintage flight and design.

A classic design is timeless, but that doesn't mean they can't be improved upon using modern techniques.

Specifications

Wingspan : 1100 mm /43.3 in.	Battery : 11.1V 1300 mAh Li-poly
Length : 765 mm / 30.1 in.	ESC : 20A Brushless
Weight : 695 g / 24.5 oz	Motor : DST-1100
Propeller : 8x6(Two blade propeller)	Servo : 9g x 4
Recommended radio system : 4CH	

THE QUIET ZONE

R/C SCALE ELECTRICS WITH PETER RAKE

Well, here we are again, more electric flight nonsense for you delectation. So, I promised you that there wouldn't be any foam featuring prominently this time, didn't I? Just for a change, what I promised you is what you're actually going to get. You see, miracles do happen occasionally.

What do I have lined up for you? Well, although it still involves small models, this one is large enough to take full advantage of those calm Spring days or Summer evenings - depending on how long it takes you to build it.

THE MODEL IN QUESTION

This idea started out when I almost treated myself to a reproduction of the *Veron Tru-Flite* kit of the Sopwith Triplane. My idea was to build the model, but convert iit to electric power and radio control. I remember building this kit many years ago and failing miserably to get it to actually fly. It did, however leave a lasting desire to build another one some day.

Being the mean beggar that I am, there was quite a bit of debate about whether or not I should actually stump up the cash for the kit. This involved finding things I didn't like about the way things were done. How accurate a representation it really was and much complaining (to my long suffering wife) about how I hated the very non-scale plastic wheels I'd be

STILL IN WINTER INDOOR-FLYER MODE? WANT MORE THAT A PROFILE SCALE FOAMIE? THEN TRY PETER RAKE'S ALL BUILT-UP-BALSA SOPWITH TRIPLANE.

A very poor photo of an even worse model that inspired all this. At least my version doesn't have anhedral on the wings.

paying for, but which would have to be replaced if the model was to look right.

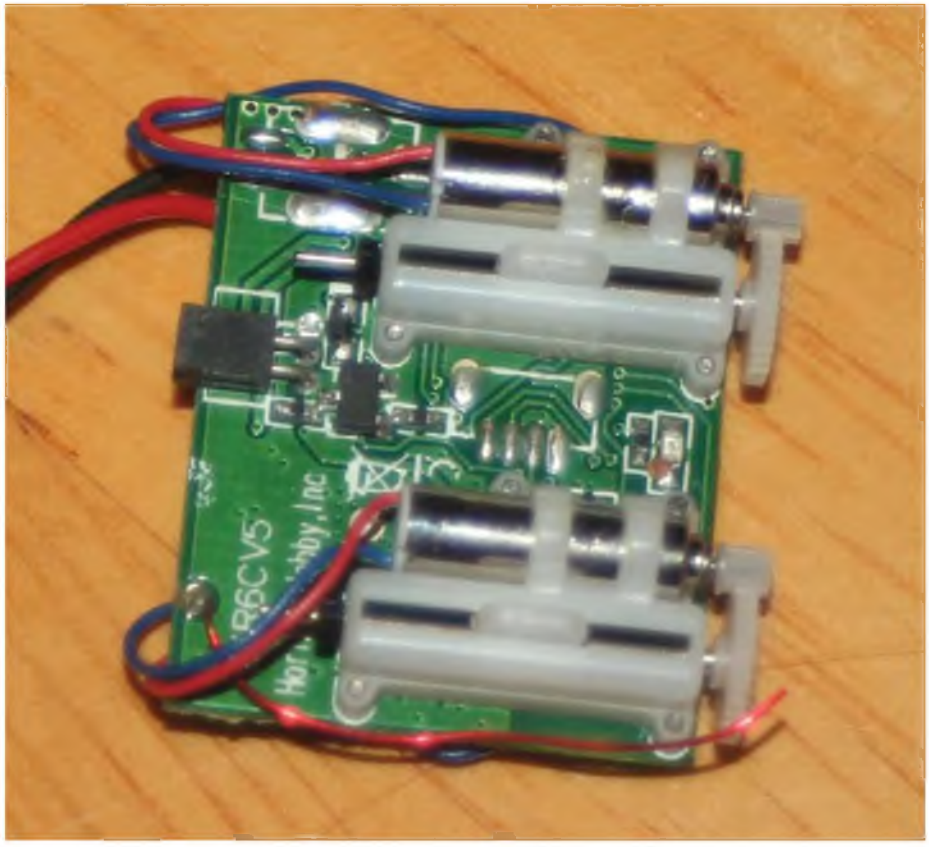
Not too surprisingly, meanness won out over the desire to spend money. After all, why pay good money for a model I'd be changing most of when I could design a better one (in my opinion) myself? Anyway, one thing led to another and I ended up with the design you see here. A little sturdier than a rubber power style model where it needs to be, and designed for lightweight radio control and electric power right from the outset.

I openly admit that I haven't actually built this model yet, but since it's based on my already successful 45" span model, and I know what the chosen equipment is capable of, there's no real need to fret over that minor point. Build it light, equip it as shown, balance it right and it will fly just fine.

EQUIPPING THE BEAST

Equipping, in this case, isn't too painful an affair. By now, I'm fairly sure that many of you will have severely wounded the RTF model you received at Christmas and about all that's left is a receiver brick, motor unit and battery. Well, as luck would have it, that is precisely what you'll be needing to fit into the little Sopwith. There are alternatives of course, but a *Parkzone* 3 or 4 channel receiver brick and one of the same manufacturer's 8.5 mm geared motor units are perfectly adequate for the model.

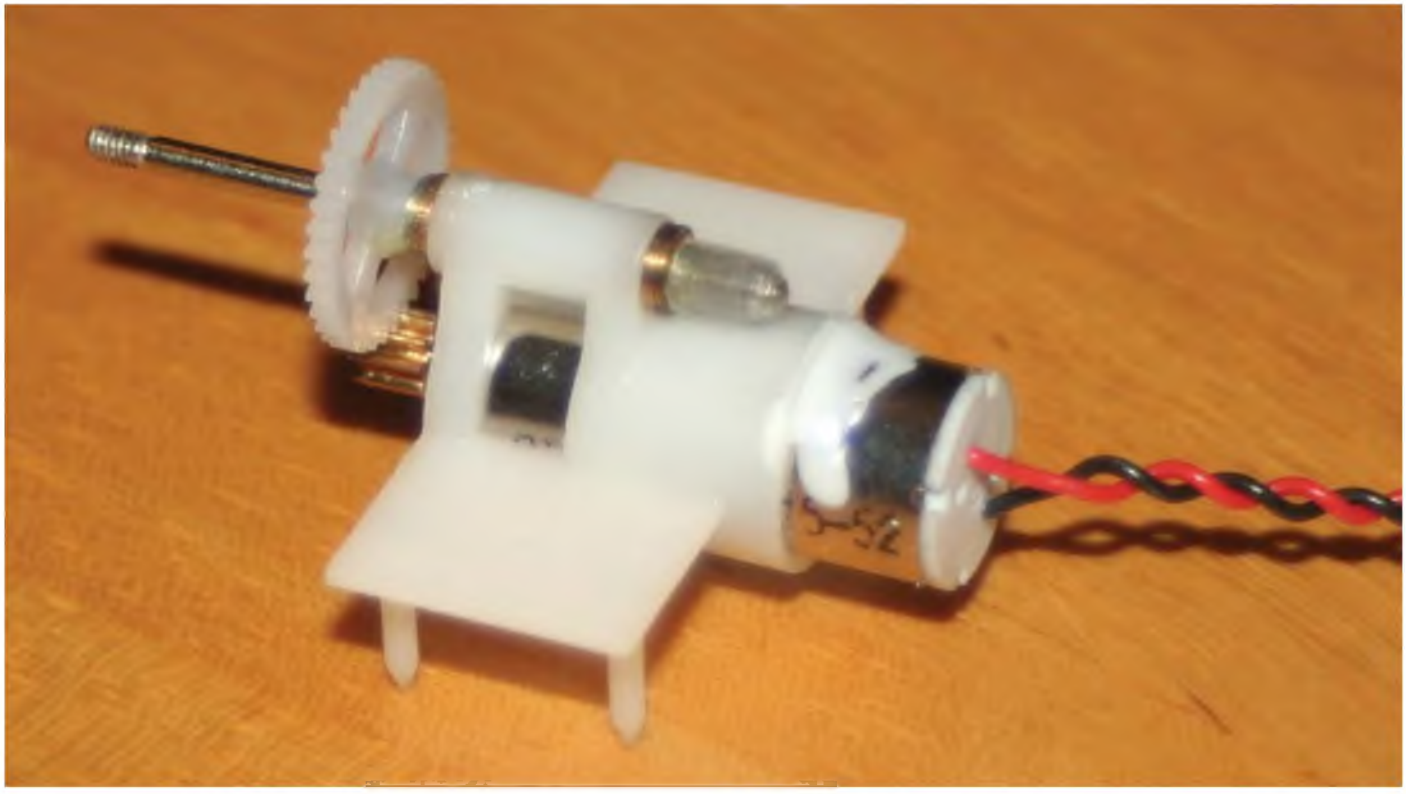
You could fit a tiny outrunner, but that would also mean you'd need a brushless ESC and larger battery pack to allow for the additional current that the brushless motor would draw. Just bear in mind that if these little models are to fly in the manner intended, they need to be kept light, have just enough power to do the job and have as simple an installation as possible. These aren't the type of model you'd want to fly on days that are sufficiently windy that you need lots of extra power and they aren't intended to take the landing stresses associated with heavier, faster flying models. Light and floaty is the key to enjoying them.



Although this 'brick' is brand new, a previously owned one will work just as well.

Right then, because of the number of pages taken up with plan I have to leave things there. Next time there will be another similar plan and more information about building these models. As you can see, they don't really require instructions as such, they're far too basic for that, but it will be more in the form of hints and tips about this style of model in general. It's a size I'm very fond of at the moment, so expect to see more of them in the future at some point. Hopefully, I might actually have built some of them by then.

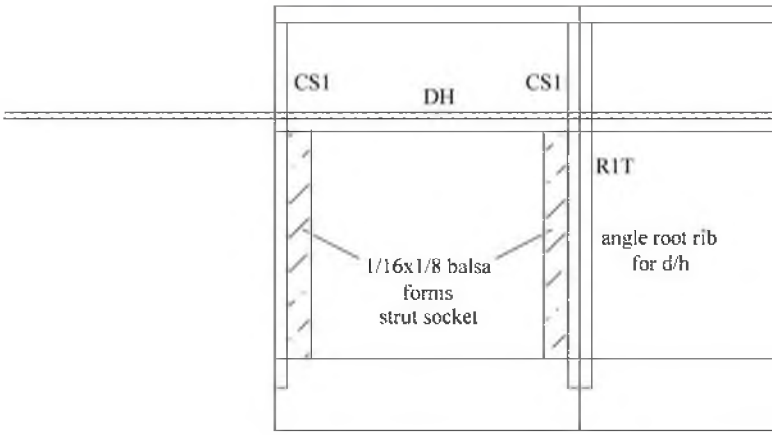
In the meantime, if you need to contact me I may be found at the usual place, *PETERRAKE@aol.com* ■

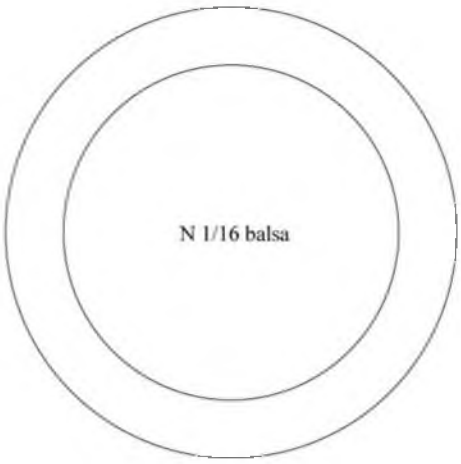


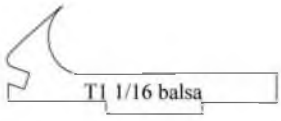
Typical of the motor units so suited to this style of model. This one is sold as a spare for the Parkzone P-51 RTF.

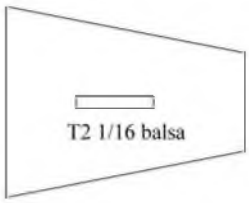
Peter Rake's

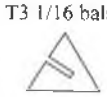
Sopwith Triplane

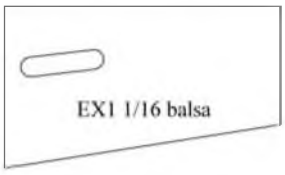


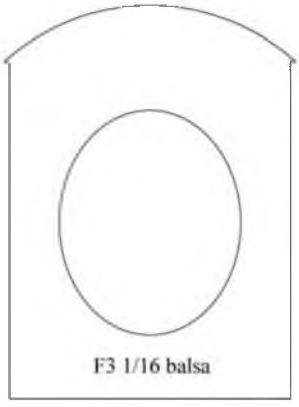


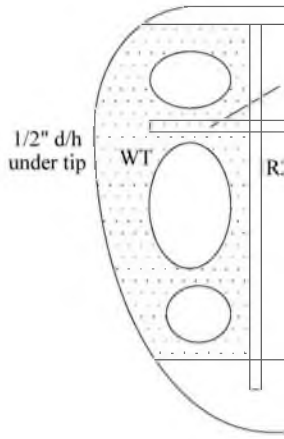


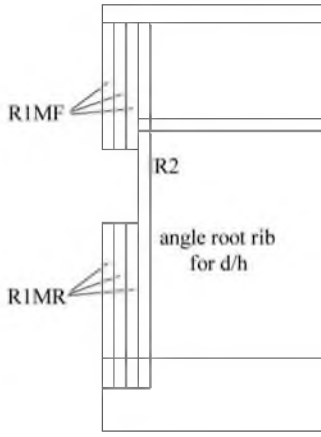


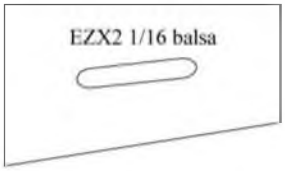


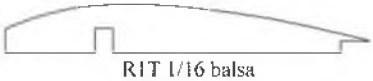


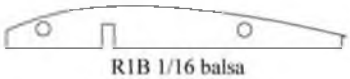


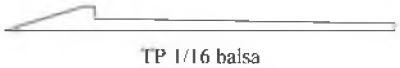


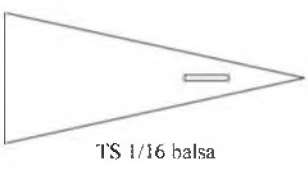


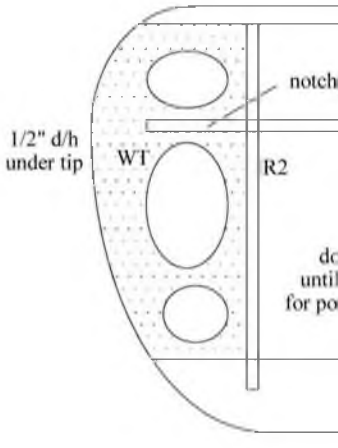


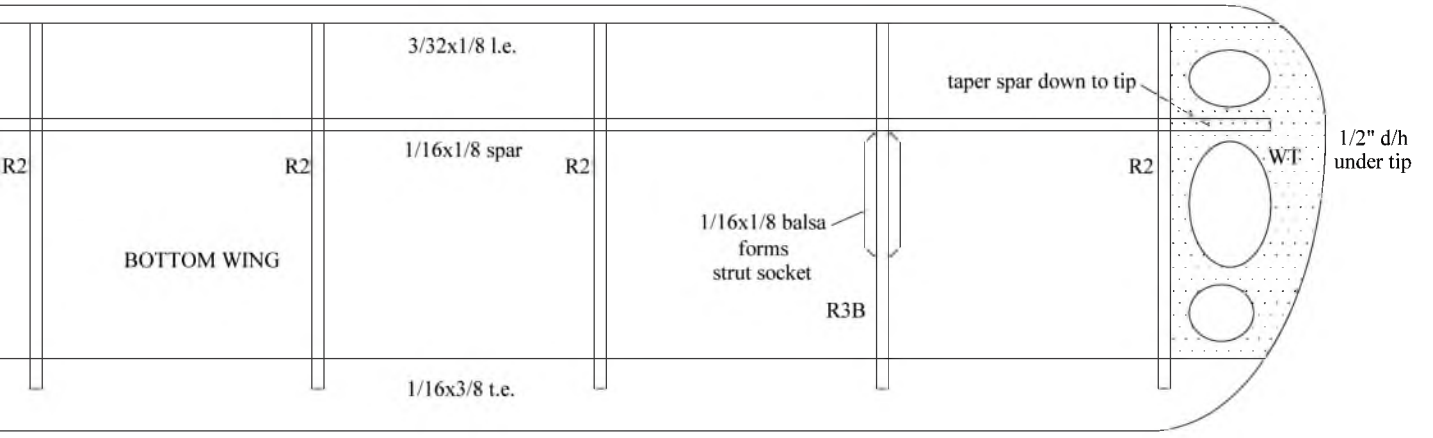


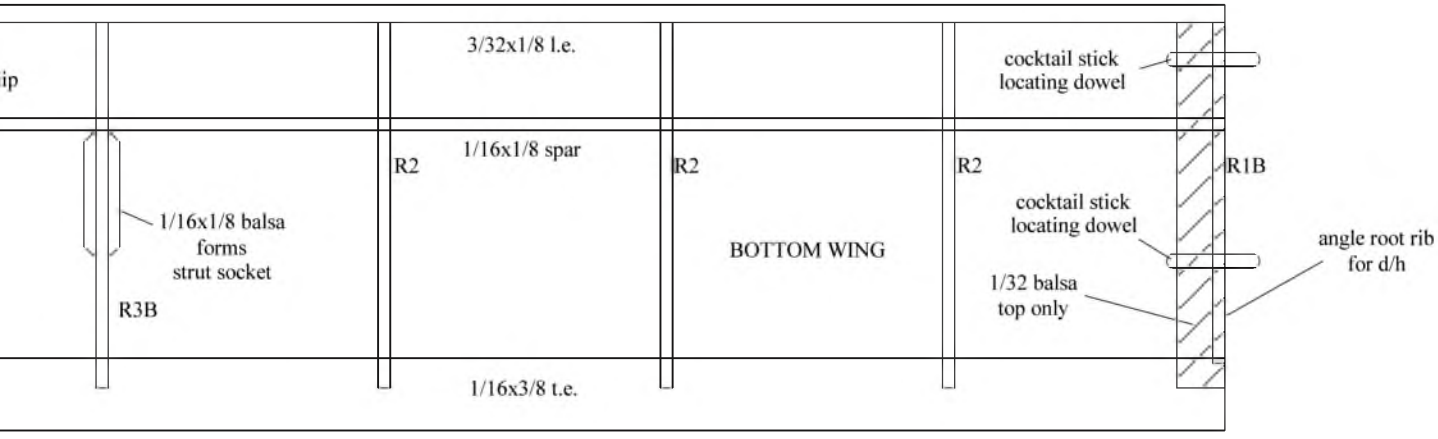






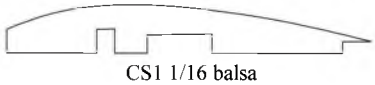






WS laminated from
1/16 balsa

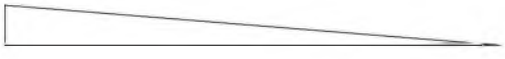
R 1/16 balsa



CS1 1/16 balsa

X 1/16 balsa

R3T 1/16 balsa

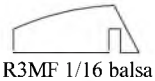


Y 1/16 balsa

R3MA 1/16 balsa

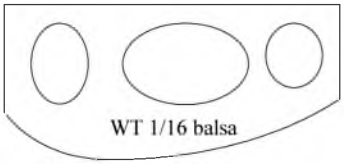
R3MR 1/16 balsa

root rib angle guide 1/16 balsa

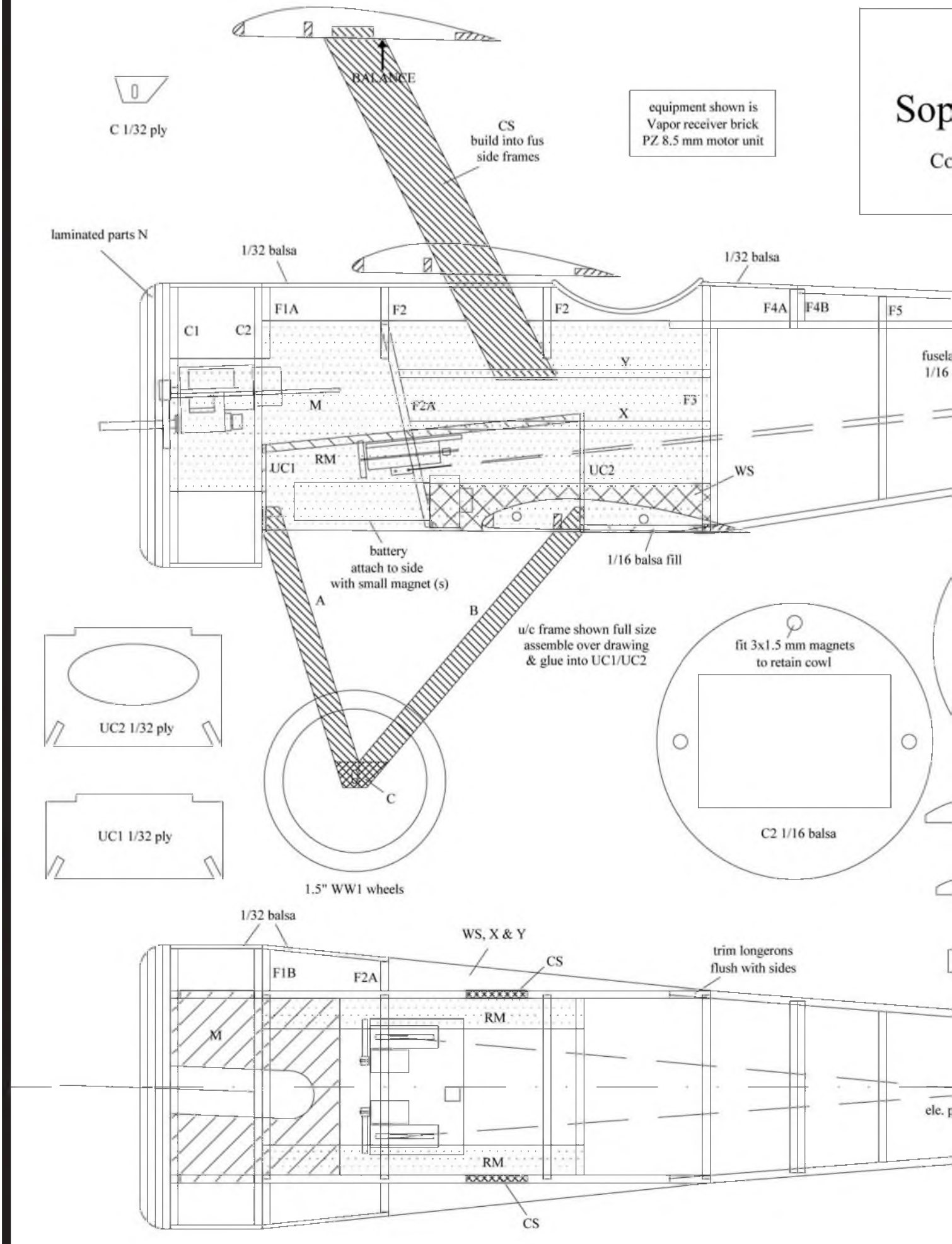


R3MF 1/16 balsa

R3B 1/16 balsa

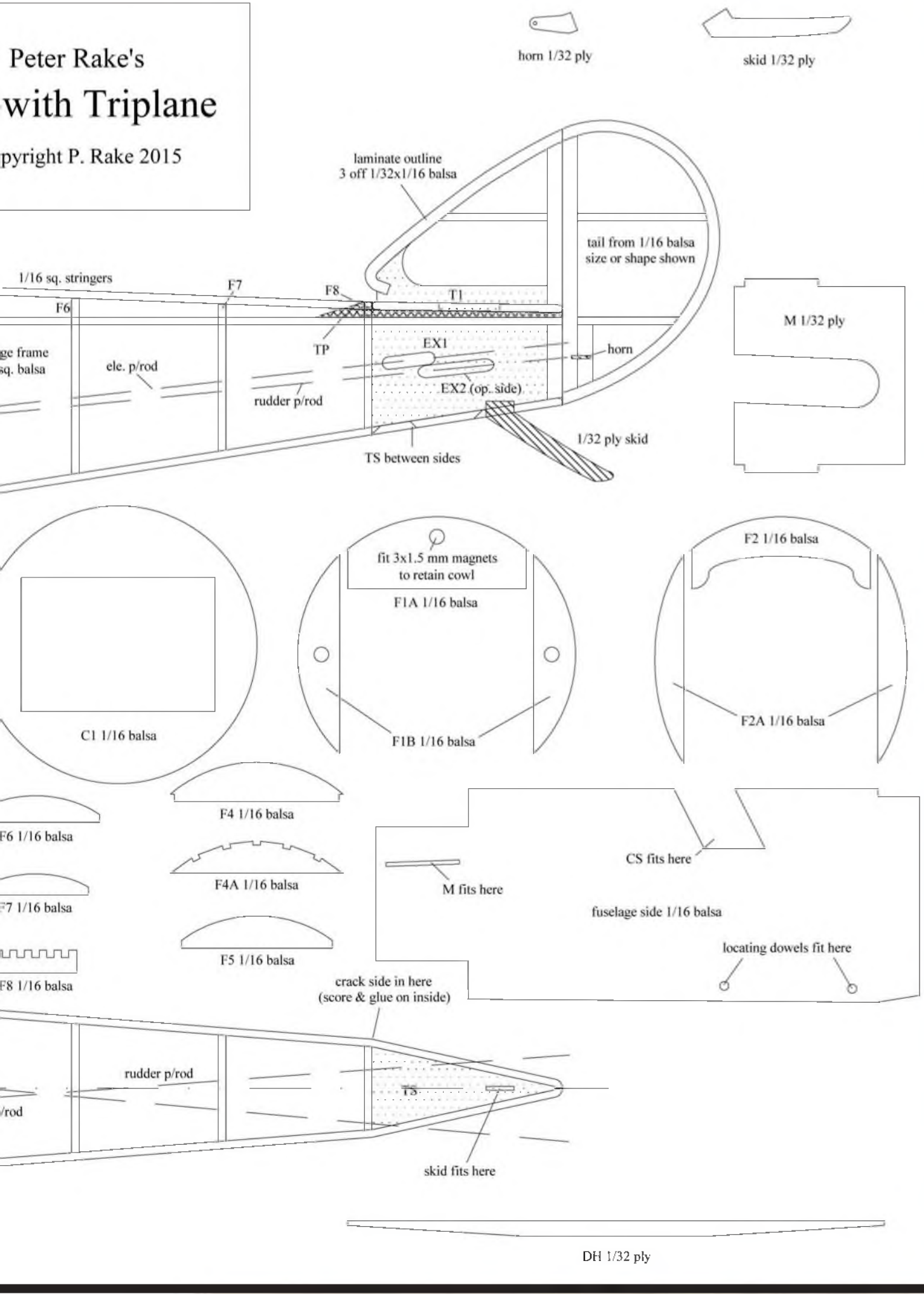


WT 1/16 balsa


BALANCE
C 1/32 ply
CS
build into fus
side frames
equipment shown is
Vapor receiver brick
PZ 8.5 mm motor unit
laminated parts N
1/32 balsa
1/32 balsa
F1A
F2
F2
F4A
F4B
F5
C1
C2
Y
M
F2A
F3
X
RM
UC1
UC2
WS
battery
attach to side
with small magnet (s)
1/16 balsa fill
A
B
u/c frame shown full size
assemble over drawing
& glue into UC1/UC2
fit 3x1.5 mm magnets
to retain cowl
UC2 1/32 ply
C
UC1 1/32 ply
C2 1/16 balsa
1.5" WW1 wheels
1/32 balsa
WS, X & Y
CS
trim longerons
flush with sides
F1B
F2A
RM
M
RM
CS

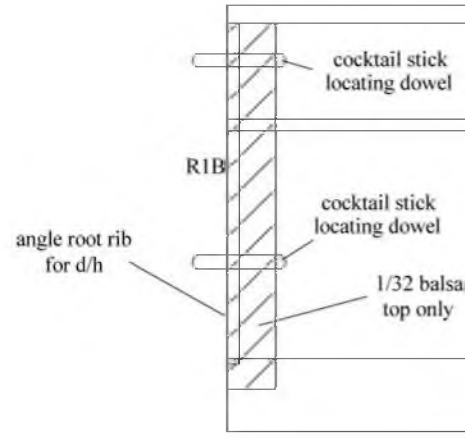
Peter Rake's

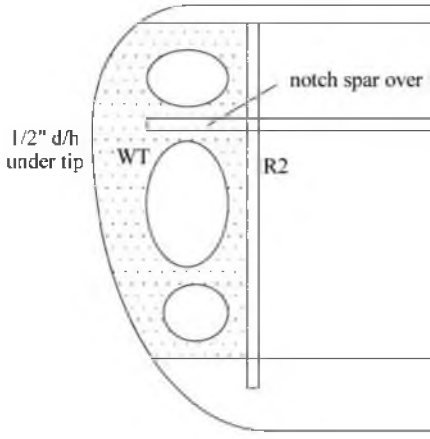
with Triplane

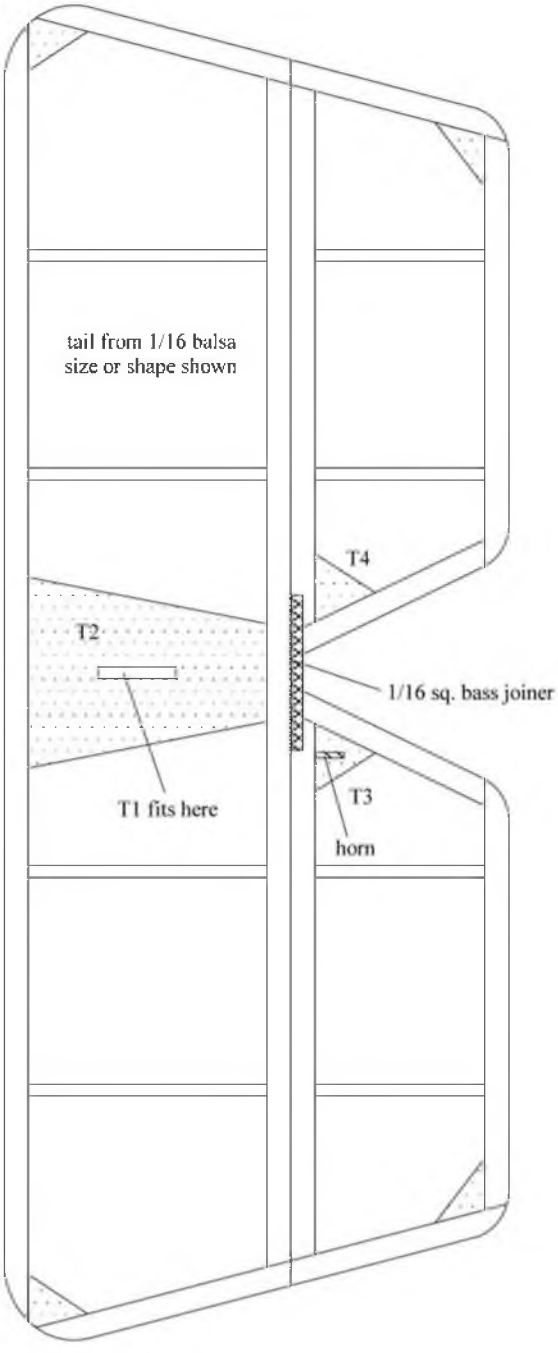


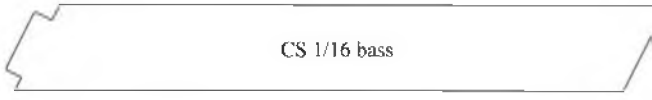
Peter Rake's

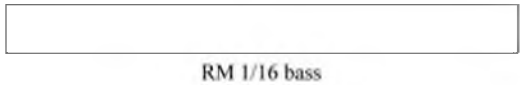
Sopwith Triplane

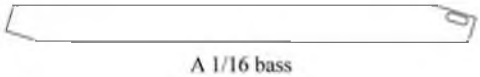


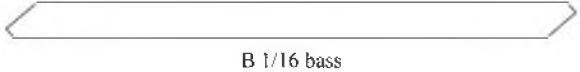


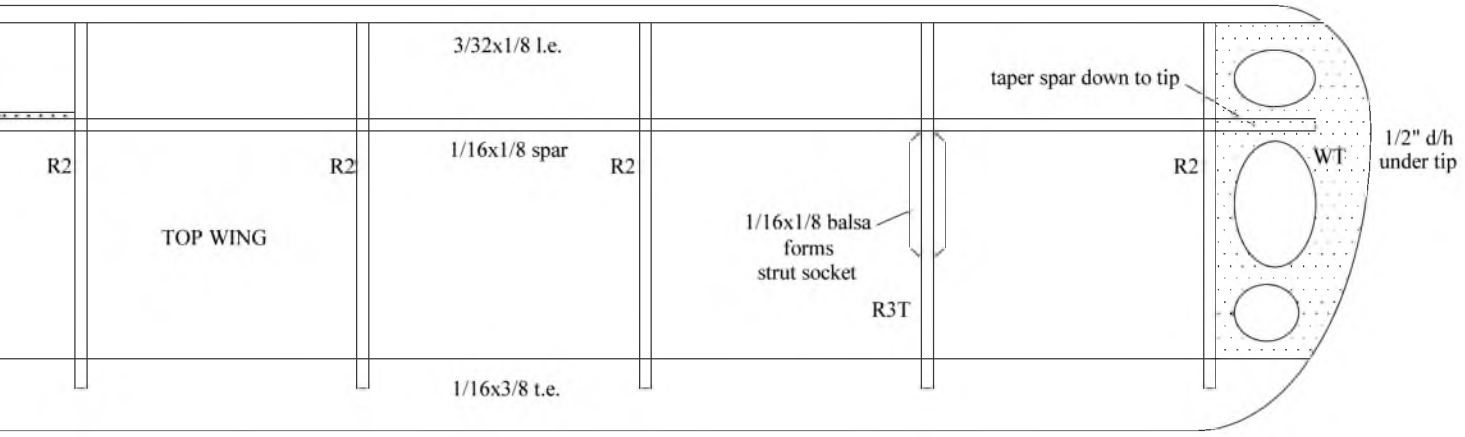


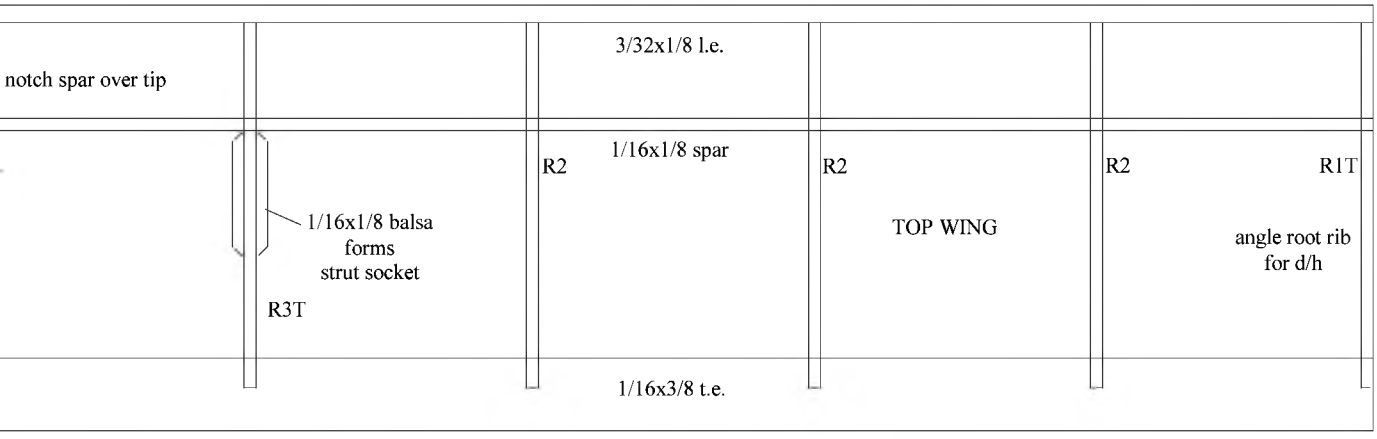


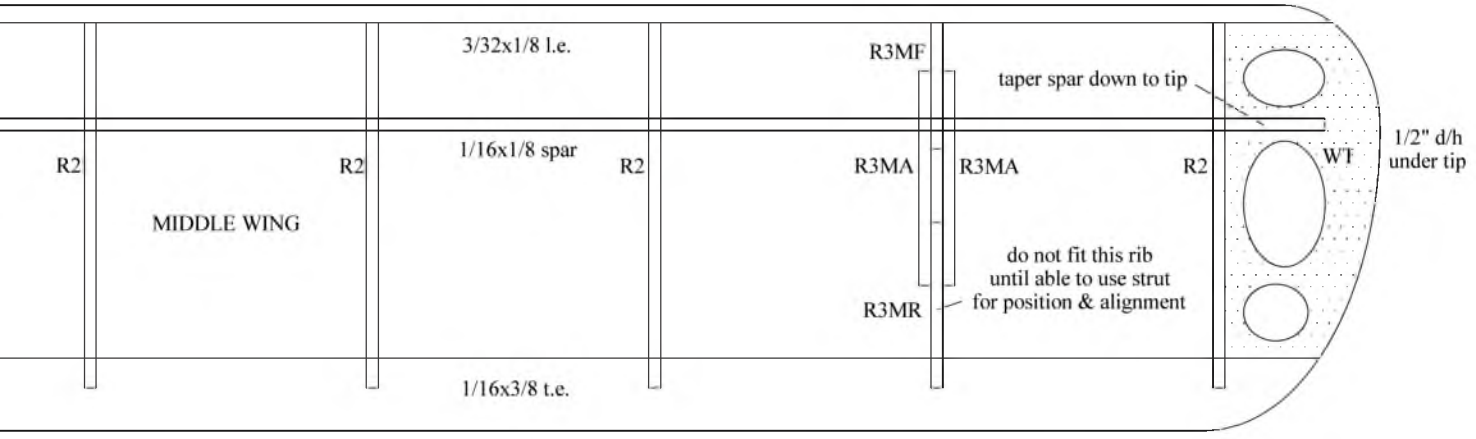


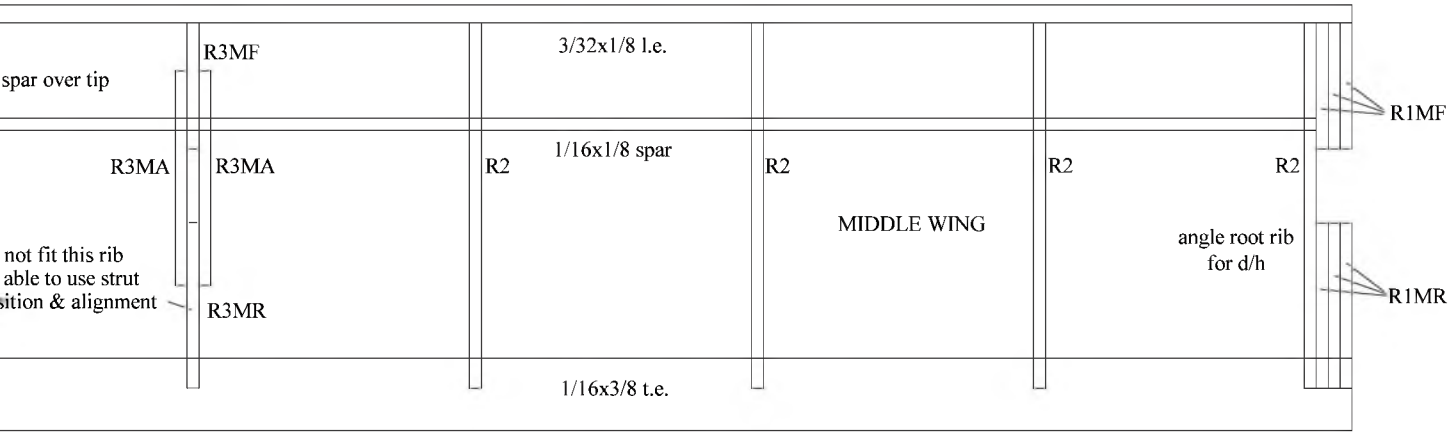





3/32x1/8 l.e.
taper spar down to tip
1/2" d/h
under tip
R2
R2
1/16x1/8 spar
R2
R2
WT
TOP WING
1/16x1/8 balsa
forms
strut socket
R3T
1/16x3/8 t.e.


notch spar over tip
3/32x1/8 l.e.
1/16x1/8 balsa
forms
strut socket
R3T
R2
1/16x1/8 spar
R2
R2
R1T
TOP WING
angle root rib
for d/h
1/16x3/8 t.e.


3/32x1/8 l.e.
R3MF
taper spar down to tip
1/2" d/h
under tip
R2
R2
1/16x1/8 spar
R2
R3MA
R3MA
R2
WT
MIDDLE WING
do not fit this rib
until able to use strut
for position & alignment
R3MR
1/16x3/8 t.e.


R3MF
3/32x1/8 l.e.
spar over tip
R1MF
R3MA
R3MA
R2
1/16x1/8 spar
R2
R2
R2
not fit this rib
able to use strut
sition & alignment
MIDDLE WING
angle root rib
for d/h
R3MR
R1MR
1/16x3/8 t.e.

LANGNASEN DORA

ALEX WHITTAKER IS IMPRESSED WITH PHIL CLARK'S STUNNING ALL-MOULDED FW 190-D

The D-9 variant of the iconic Focke Wulf Fw 190 still divides opinion amongst scale modellers. To some, it is the Ultimate Nazi fighter type. To others its extended tail and lengthened nose dilutes the purity (and well proportioned shape) of the original design. Indeed, the Fw190 D-9 was nicknamed Long-Nosed Dora by her irreverent pilots as 'Langnasen-Dora'.

The D-9 was part of the Fw 190 high altitude development programme which began with the V-12. Conceived in the later stages of the WW2, from 1944 onwards, the D-9 was primarily deployed as an interceptor to interdict Allied fighters engaged in combat and ground attack missions over Germany. Most German pilots who flew both the Messerschmitt Me109 and the D-9 preferred the Focke Wulf. Long-Nosed Dora was certainly the mount of choice for Nazi Aces such as Kittel, Nowotny, and Rudorffer.

The Model

Phil Clark is one the UK's foremost scale modellers, especially renowned for his immaculate renditions of military scale subjects. He owns *www.fighteraces.co.uk* which builds bespoke scale models for clients. *FighterAces* also supplies a large range of specialist scale items sourced from around the world. His catalogue includes paints, engines, retracts, and scale accessories.

First and foremost, Phil is a keen scale modeller, so all his instincts revolve around achieving realism in flight. He is also an excellent show pilot, well able to display his models to full effect in a formal setting. Phil's Focke Wulf FW 190 D-9 is built to 1/5th scale, a very handy size, and it spans 83". His version weighs 33lbs and is powered by a Zenoah 62cc petrol engine, which fits very neatly within the sleek radial cowl.

Plan

Phil built the model from the well-respected German Scale Classics *SisT Modellbau* kit.

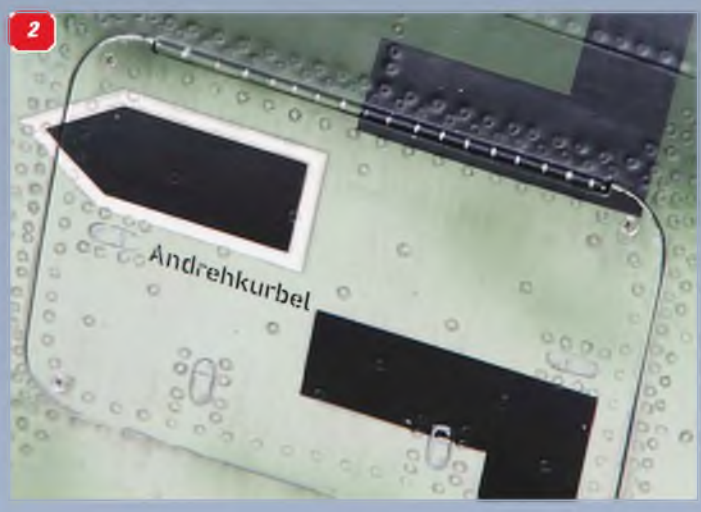
Documentation

Philip chose to finish his model as 'Black 14' as flown by 'Pips' Priller of JG26 in early 1945

Construction

The kit airframe is fully composite, using epoxy mouldings. This

CONVERTED TO BLACK AND WHITE THIS COULD BE A CONTEMPORARY SHOT OF THE D-9.



1: The paint system chosen by Phil certainly works well, but of course, much is down to the skill of the modeller. 2: If we go in closer we can actually confirm that no two rivets or fasteners are the same (!), and all panels and hinges are accurately rendered.

modern method of construction is increasingly popular with modellers of scale jets and fast WWII monoplane subjects. This form of kit delivers fully moulded surface detail of all panel lines, rivets, hatches, and screw fasteners. It also allows the scale builder to concentrate on the all-important final finishing of the model, and the installation of all flying systems.

Such brave new scale-modelling often relies on a range of specialist suppliers from across the world, for highly specific, highly-crafted scale details. These details will include everything from paints and finishing materials to exhausts, retracts, and a myriad of scale accessories. Individual scale modellers will take their own views on these developments. What cannot be doubted is that, in the right hands, the outcome is a very accurate looking scale model. Phil reports that the kit goes together very well indeed.

Engine
Zenoah ZG62 petrol engine.

Prop
Engel 'Super Silence' 22" x 10" 2-blade carbon

Exhaust
The exhaust was custom made from parts sourced from Toni Clark of *Practical Scale*, Germany.

Undercarriage / Retract
The D-9 demands a rugged undercarriage. After much research, and previous experience of the brand, Phil chose to fit *Sierra Giant Scale* retracts.

Painting
Phil used *'Warbirdcolors'* who market a water-based scale paint system. Naturally, being water-based confers great advantages when it comes to handling paint in the shed. He then finished the entire model with *Klass Kote* Matt Epoxy Clear coat sprayed on.

Legending/Decals
Phil used spray masks prepared for him by *Flightline Graphics.* All the stencils and legending nomenclature came from water slide

The Fw design team wanted to build a rugged, highly practical aircraft, able to operate in harsh conditions of modern war.

THE D-9S WIDE-TRACK UNDERCARRIAGE AIDS GROUND HANDLING.

3: Excellent fit-and-finish of shut-lines on the cockpit canopy, a weak spot of many scale kits. **4:** There is no doubt that the particular all-moulded technique on this model really does portray the "softness" of full-size aluminium construction. **5:** Surface detail on the wing makes you look twice! **6:** Concealed scale aileron controls are present and correct. **7:** This part of the model really impresses! The wing root fairing / gusset is superbly modelled.

decals supplied by *Tailormade Decals*, Germany.

Scale Details
The D-9 has a full depth cockpit interior, and a pilot figure.

Flying Impressions
The D-9 looks extremely aggressive in the air - just as she should. The model has a very broad speed range, and her flight path is very smooth indeed. The overall impression one gets from the flight line is of a well-sorted scale model with well-harmonised controls. She really does look like a thoroughbred in the air.

Epilogue
Modern, high-tech, all-moulded models such as this are seen by some scale modellers as large, expensive, glorified Airfix kits. However, that view misses the point. But truthfully, this is where some keen scale modellers have taken the available technology with our hobby. These kits are not produced by nameless Corporations. Rather, they are labours of love, in limited hand-laid production, from utterly committed scale modellers. True, they are not traditional, but they certainly represent one possible future for this high-tech strand of scale R/C modelling.

8: Trademark integral fixed doors attached directly to the undercarriage legs. 9: The correctly stalky legs even have the Manufacturer's "boiler plates". Note accurate wheel profile. 10: Even the scale wire dipole aerial is faithfully modelled. 11: Phil used Flightline Graphics products for the stencils and legending.

ALL-WEATHER FIGHTER ON A SUITABLY GREY LATE WWII DAY!

MODEL SPECIFICATION

Focke Wulf FW 190 D9	
Scale:	1/5
Wingspan:	83"
Weight:	33lbs
Engine:	Zenoah 62cc
Prop:	Engel 'Super Silence 22" x 10" carbon

PARKED OUT ON THE GRASS AT RAF COSFORD IN 2014.

12: The large spinner and slim cowl were designed for minimal frontal area, and also to channel cooling air efficiently over the hot cylinders with the least drag. 13: The detailing around this model is really crisp. Just admire those engine exhaust stubs. Rapture! 14: The nose is very nicely modelled, with no unsightly off-set to the spinner. 15: The key fit of the forward area of the wing gusset is very finely modelled. 16: Phil has achieved a very convincing scale patina on the D-9. 17: Meticulous scale detailing on the rudder. Note scale controls and wires, rudder hinges, inspection plate, and pinked rib tapes. 18: Phil has given the tail and elevators a convincing weathered look. 19: Radio aerial anchor fairing is spot on, as is the "fabric" texture on the rudder, and of course, the pinking tapes.

ONE STEP FURTHER. The ulimate extension of the Focke Wulf Fw 190 line was the TA 152, which mated a Fw 190D fuselage to a much extended, higher aspect ratio wing for enhanced higher altitude performance.

FOCKE WULF FW 190D

FROM NEATLY PROPORTIOND A-SERIES TO STRETCHED AND SKINNY 'D', THE DORA'S SHAPE DEMONSTRATED THE FREE THINKING DESIGN APROACH OF DESIGNER KURT TANK

The Luftwaffe's 'present' to the Royal Air force in the Spring of 1941 was the appearance, over Northern France, of a hitherto entirely unknown German fighter with a radial engine cowl - and a performance that outstripped the RAF's primary fighter aircraft, the Supermarine Spitfire Mk.V.

At the time, both in Britain and Germany, the emphasis on engines for fighter aircraft centred on the in-line, liquid cooled type so that, given the lack of prior warning of the introduction of a new German fighter type, the RAF Intelligence people explained the unidentified aircraft away as likely to be examples of the Curtiss Hawk 75 (P-36) captured after the fall of France in June 1940 and impressed into Luftwaffe service.

No one who came up against the formidible new radial engined aircraft with black crosses on its wings really believed that; it out-rolled, out-climbed and out-dived Spifires at low and medium altitudes during fighter-v-fighter clashes as the RAF began mounting their mass fighter sweeps over Northern France. It put British fighter squadrons at a distinct disadvantage until the arrival of the more powerfully engined Spitfire Mk.IX in 1942.

The B.M.W 801 radial engined Fw 190A was a fist class fighter for low and medium altitude action, but lost its edge at progressively higher altitudes. The BMW engine had originally been designed as a higher-power replacement for their earlier engines that were used primarily on low-altitude cargo aircraft and bombers. As a result, the designers had not invested much effort in producing high performance superchargers for it.

Second prototype for the Fw 190D-9, designated Fw 190V-53. Note the wing mounted gun positions, and paddle-blade propeller. Jumo engine is very tightly cowled.

For you, the war is over! Totally wrecked Fw 190D-9 of JG 26at Rhein-Main airfield. The lack of a tailwheel in the wheel-yoke suggests the wreck may have been robbed of parts to keep others flying.

Even before the Fw 190A was put into service, its high-altitude performance was seen to be deficient. In contrast, the Messerschmitt Bf 109's powerplant, the Daimler Benz DB 601 series featured an advanced single stage variable speed supercharger that provided excellent boost across a wide range of altitudes. The '190's short wings also presented a problem at higher altitudes, where these were highly loaded. As a result, the '190 could not compete with its '109 stablemate at altitudes above 20,000 ft. This excellent performance envelope is one of the reasons why the Messerschmitt Me109 remained in production right up until the end of WW2.

Such performance limitations were not a serious concern at the time of the Fw 190A's introduction, as most combat was taking place at medium altitudes where the '190 had ample performance, but as the air war reached higher altitudes with the widespread introduction of turbocharged USAAC Boeing B-17 and Consolidated B-24 bombers for daylight raids across occupied Europe, the need for improved performance became pressing.

One performance enhancing answer applied to the Fw 190A was the use of GM-1 Nitrous Oxide boost to provide more power at altitude, but this was complex and gave boosted performance for only a short period of time, so Focke Wulf's senior designer Kurt Tank addressed ways to mitigate the altitude performance problem early in the FW 190 program and not long after the '190A aircraft began reaching Luftwaffe Staffeln, he proposed a number of variants featuring new powerplants, and using turbochargers in place of superchargers.

Three such installations were outlined; the Fw 190B with a turbocharged BMW 801(radial), the Fw 190 C with a turbocharged Daimler-Benz DB 603, and the Fw 190D with a supercharged Junkers Jumo 213 (both in-line, liquid cooled). The aircraft would also include a pressurized cockpit and other features making them more suitable for high-altitude work. Prototypes for all three models were ordered.

Fw 190D-9

The Fw 190 D (nicknamed the 'Dora' or 'Long-Nose Dora', ('Langnasen-Dora') was intended to improve on the high-altitude performance of the A-series sufficiently to make it useful against the American heavy daylight bombers that were penetrating ever further into Third Reich territory.

The Junkers Jumbo 213A selected for the '190D generated 1,726 hp, and could also be boosted to 2,071 hp, of emergency power with MW 50 injection, improving performance to 426 mph (686 km/h) at 21,650 ft (6,600 m). In order to fit the longer in-line engine into the '190 fuselage while maintaining proper balance, both the nose and the tail of the aircraft were lengthened, adding nearly 4.99ft (1.52 m) to the fuselage, bringing the overall length to 33.438 ft (10.192 m), an extension of 3.538 ft over the late war A-9 series, imparting a stretched appearance to the rear fuselage.

The change from the radial to a V12 engine required more components to be introduced, most significantly the need for coolant radiators as opposed to radial engines, which are air-cooled. To keep the design as simple and as aerodynamic as possible, designer Kurt Tank used an annular radiator installed at the front of the engine, similar to the configuration used in the Jumo powered versions of the Junkers Ju 88. Thus, the annular radiator with its adjustable cooling gills resembled a radial engine installation, although the row of six short exhausts stacks on either

LEFT: **Fw 190D-9 with centreline under-fuselage mounted 300 litre drop tank. Lack of any combat unit markings suggest this a factory-fresh aircraft on post-production test.**
ABOVE: **The extreme wing-stretch of the TA 152 is well illustrated in the view of TA 152H Werk nr. 110020 captured intact in the Soring of 1945 and subsequently shapped to USA for eveluation.**

DORA SURVIVORS

Of the total 1,805 Fw 190Ds built, today four survive as complete airframes. D-9 Wk.nr 210968, ex-Luftwaffe 2./JG 26 is under restoration in Germany for the Luftwaffe Museum in Berlin, while D-9 Wk. Nr 400616 which was the combat mount of Uffz. Koch of JG 54 'Greenhearts' has been restored in Germany at Peenemunde and is currently on display at the Hangar 10 facility, Usedom, Germany. It is also presently for sale by *Platinum Fighter Sales* for $650,000!

Wk. Nr. 601088, a Fw 190 D-9 from IV (Sturm)./JG 3 'Udet' Geschwader, captured intact by US forces, was subsequently used in evaluation tests following the war and is now on display at the National Museum of the United States Air Force in Ohio Dayton, Ohio, USA, on long term loan from the National Air and Space Museum.

Finally, there is Fw 190 D-13 Wk. Nr. 836017 from 1./JG 26. Taken as a war-prize, it was later donated to the Georgia Technical University, and then fell into disrepair. Later restored in Germany, it was returned to the Champlin Fighter Museum in Mesa, Arizona. This example was thereafter loaned to the Museum of Flight in Seattle, Washington when the Champlin museum closed its doors, and is now on display in Everett, Washington as a part of Paul Allen's Flying Heritage Collection.

This aircraft has been restored close to flyable condition, but it will not be flown because it is the only surviving D-13.

ABOVE: FW 190D-13, Paul Allen collection.
BELOW: FW 190D-9 - yours for $650,000!

side of the elongated engine cowling showed that the Jumo 213 was an inverted vee-12 engine.

The 'Dora' became operational in August 1944, joining Luftwaffe Staffeln in the opposition of the Allied daylight mass-bombing offensive across Germany.

The redesigned D-variant fighter lacked the higher rate of roll of its close-coupled radial-engined predecessor but was faster, with a maximum speed of 422 mph at 21,650 ft and its 2,240 horsepower with methanol-water injection gave it an excellent acceleration in combat situations. It also climbed and dived more rapidly than the Fw 190A, and so proved well suited to the dive-and-zoom ambush tactics favoured by the Luftwaffe fighter formation pilots from late 1944 onward.

Many of the early models were not equipped with tanks for methanol to serve the MW 50 boost system, which was in very short supply, so that at low altitude, the top speed and acceleration of these examples were inferior to those of Allied fighters, 360 mph being typical.

In the event, the D-series was rarely used against the heavy-bomber raids, as the circumstances of the war from late 1944 meant that fighter-versus-fighter combat and ground attack missions took priority. From a production start-up in August 1944, a total of 1,805 D-9s were produced by the time WW2 ended in Europe.

Fighters protecting fighters

Owing to the failure of attempts to create an effective next-generation Fw 190, as well as the comments of some Luftwaffe pilots, expectations of the Dora project were low and Kurt Tank had made it very clear that he intended the D-9 to be a stopgap until the long winged Ta 152 arrived. These negative opinions existed for some time until positive pilot feedback began arriving at Focke-Wulf and the Luftwaffe command structure.

Sporting good handling and performance characteristics, the D-9 made an effective medium altitude, high-speed interceptor, although its performance still fell away at altitudes above about 20,000 ft. However, when flown by capable pilots, the Fw 190D proved the equal of the Allied types met in combat.

Some Fw 190Ds served as fighter cover for Messerschmitt Me 262 airfields, as the new jet fighters were very vulnerable on take-off and landing. These special units were known as *Platzsicherungstaffel* (airfield security squadrons). One unit, known as the *Würger-Staffel*, was created in April 1945 by Leutnant Heinz Sachsenberg on the orders of Inspector of Fighters General Adolf Galland, The role of the Staffel was to guard the airfield and JV 44's Me 262s as they landed. As such, the Fw 190s were supposed to take off before the jets and circle the airfield in pairs (a Rotte).

However, to allow the 262s a clear run back to the airfield the 190s had to land before the jets, negating their protection. To help anti-aircraft artillery protecting the airfields to quickly identify friendly aircraft, the under-surfaces of the Würger-Staffel 190s were painted with distinctive red with narrow white identification stripes, leading to the alternative nickname of *Papageien Staffel* (parrot squadron) prompted by the bright red colour - a practice comparable, in intent, to the black and white 'invasion stripes' applied to Allied aircraft from June 1944 onwards.)

Captured intact, Fw 190D-9 'White 15' of JG 26 awaits its fate with new owners at a German forward airstrip in the Spring of 1945.

The tightly tailored cockpit of the FW 190D-9

Detail of r/h fuselage showing the large air scoop.

Cockpit windscreen and cowl bulge ahead of the front screen.

FW 190 V 13, the first prototype of proposed Fw 190 C-1 with DB 603 engine. Overal Grey finish.

FW 190 V 18, prototype with Hirth turbo-supercharger installed.

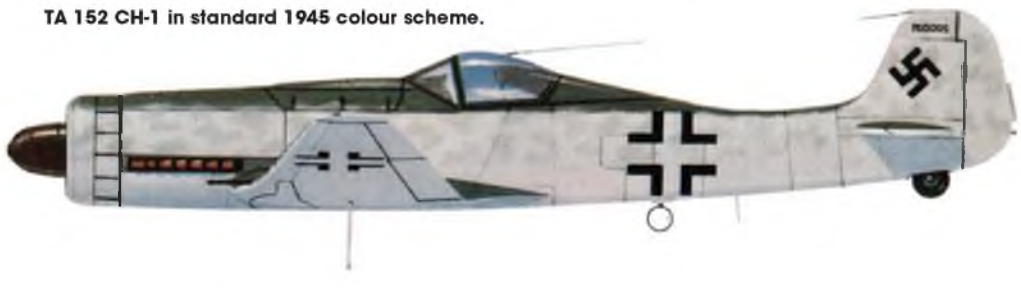
FW 190D-9 in standard camouflage scheme, late 1944-45.

FW 190D-9 crashed at Wemmel, near Brussels, January 1st, 1945 during Luftwaffe's 'Operation Herman'.

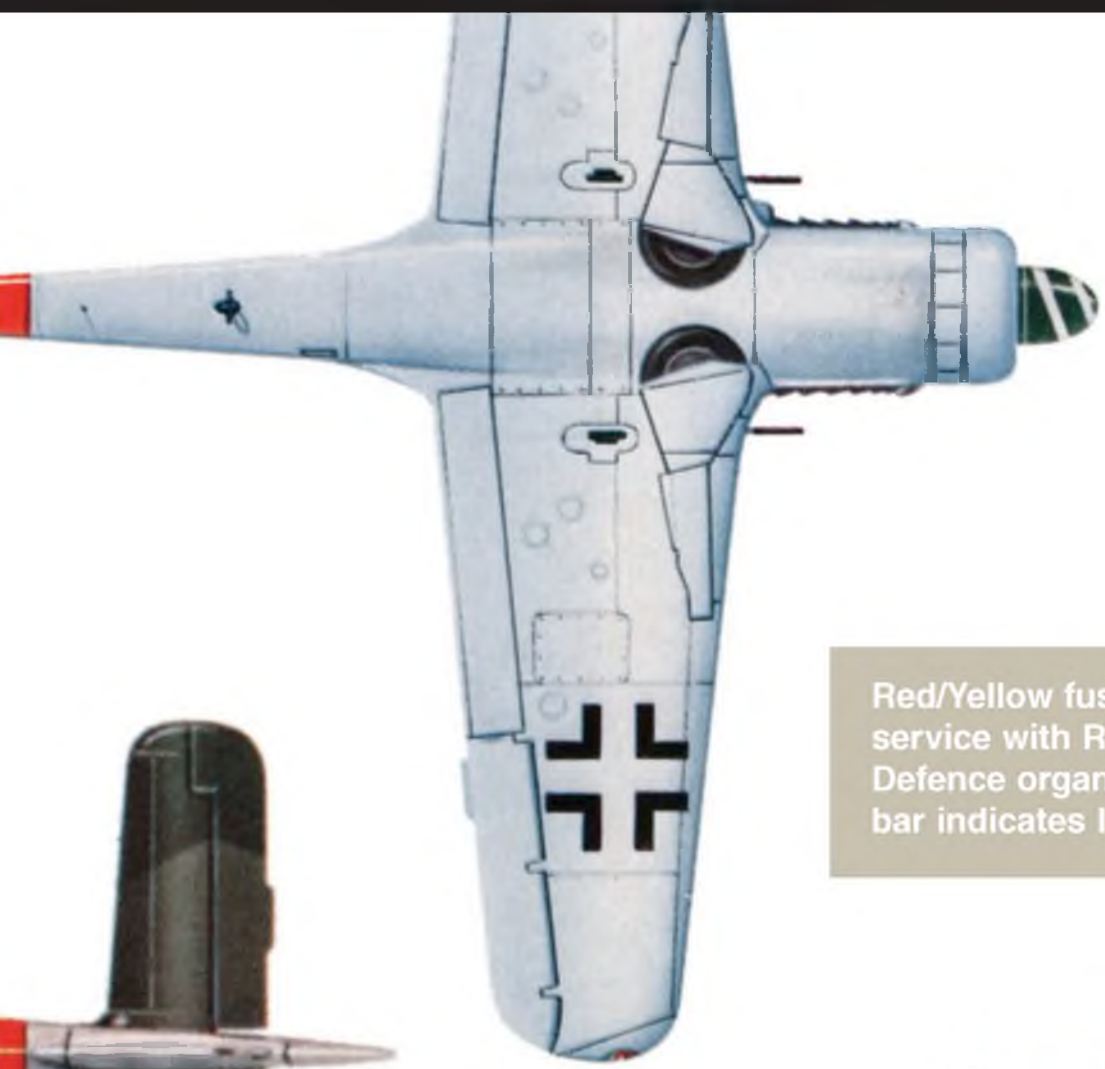
FW 190D-9 in standard 1945 scheme with Home Defence identification bands.

TA 152 C-0/R11. Black/white cross on green background.

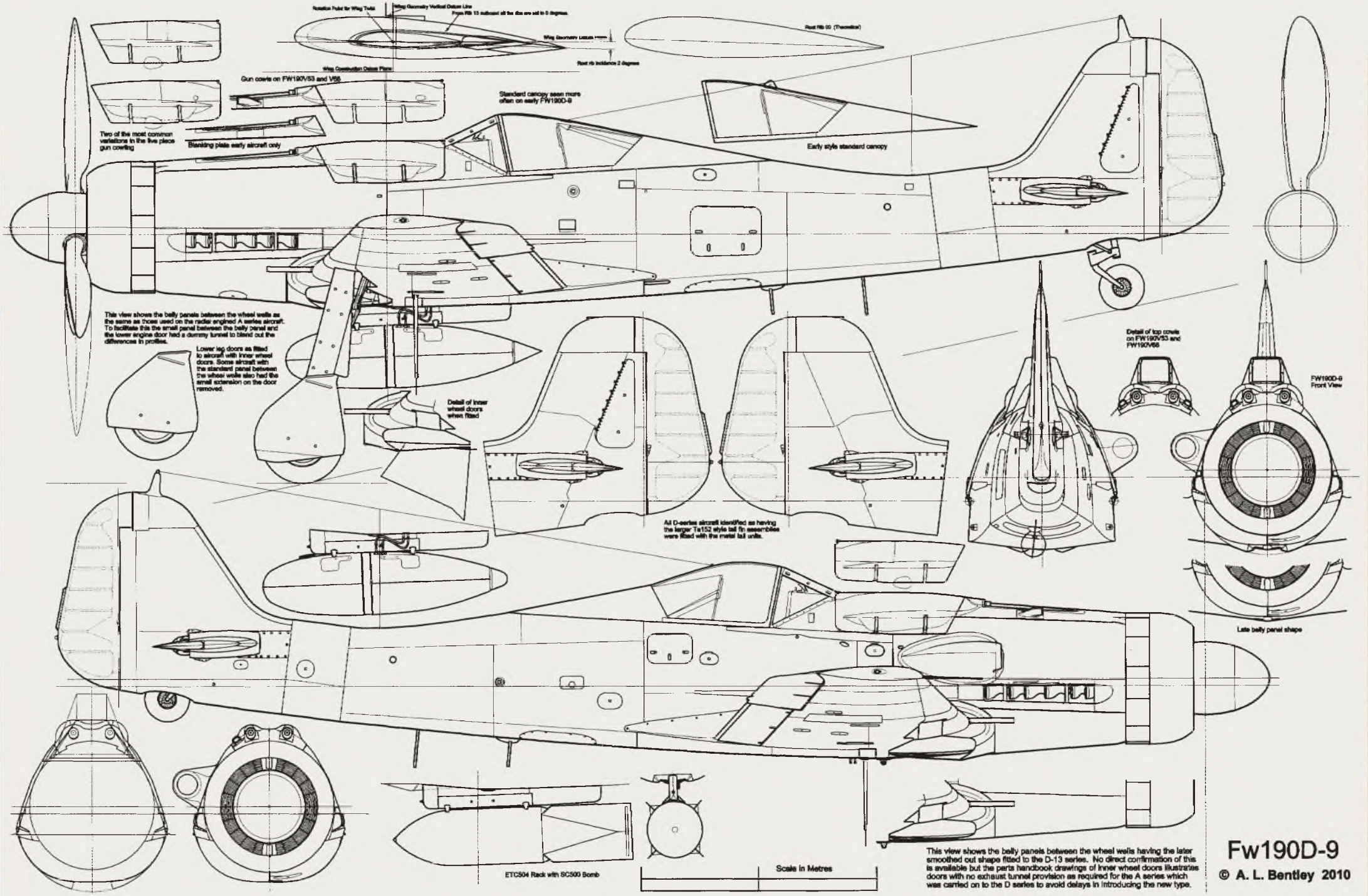
TA 152 CH-1 in standard 1945 colour scheme.



FOCKE WULF FW 190D-9 IN THE COLOURS OF III/JG54, STATIONED AT ACHMER, GERMANY, OCTOBER 1944, WHERE IT WAS OPERATED WITH THE AIRFIELD DEFENCE FORCE, PROVIDING A DEFENSIVE SCREEN FOR THE MESSERSCHMITT ME 262 JETS OF THE KOMMANDO NOWOTNEY.



Red/Yellow fuselage band indicates service with Reisverteidigung (Home Defence organisation). Vertical black bar indicates III Gruppe.



Fw190D-9

FOCKE WULF FW 190D ANATOMY

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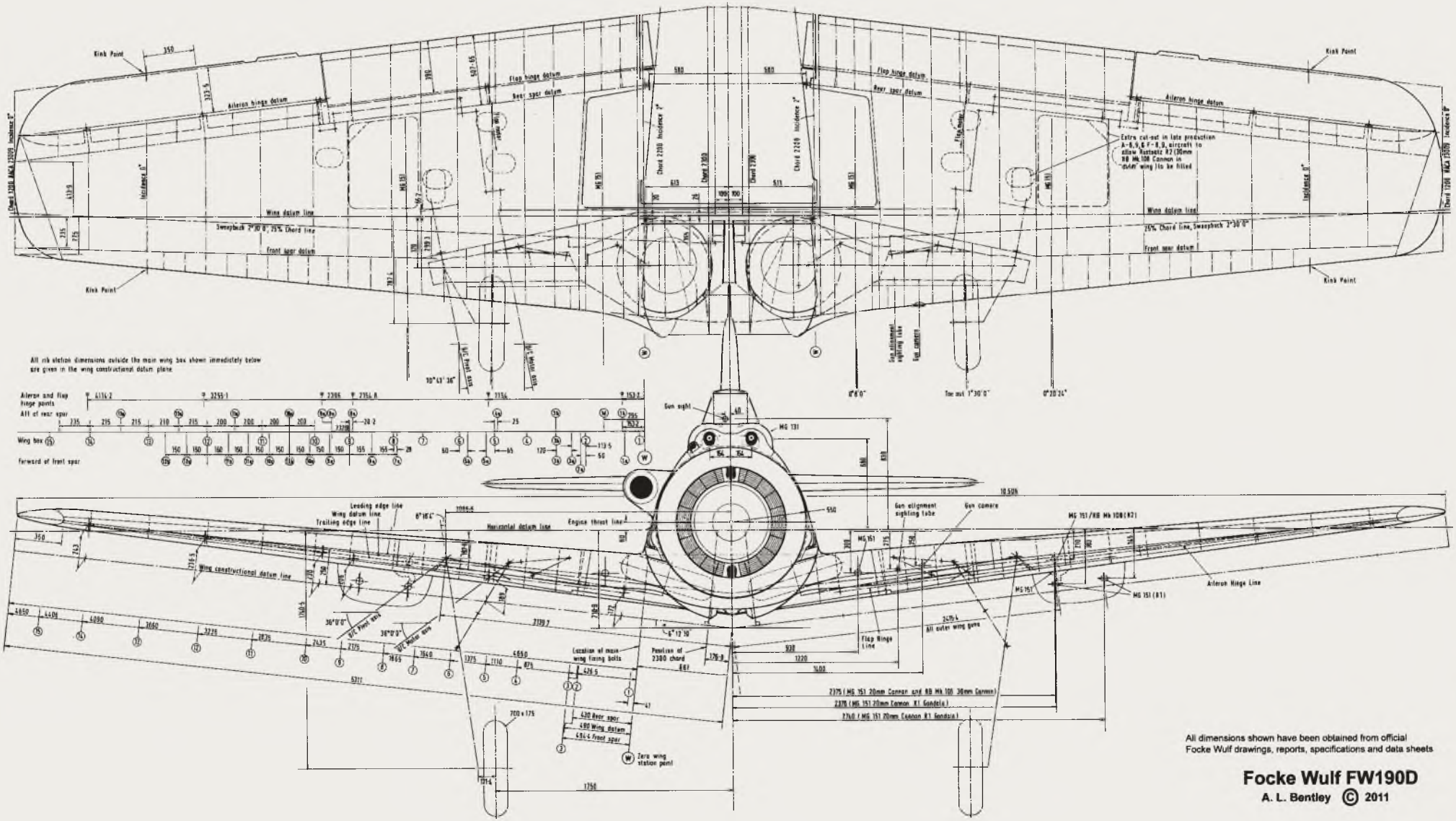
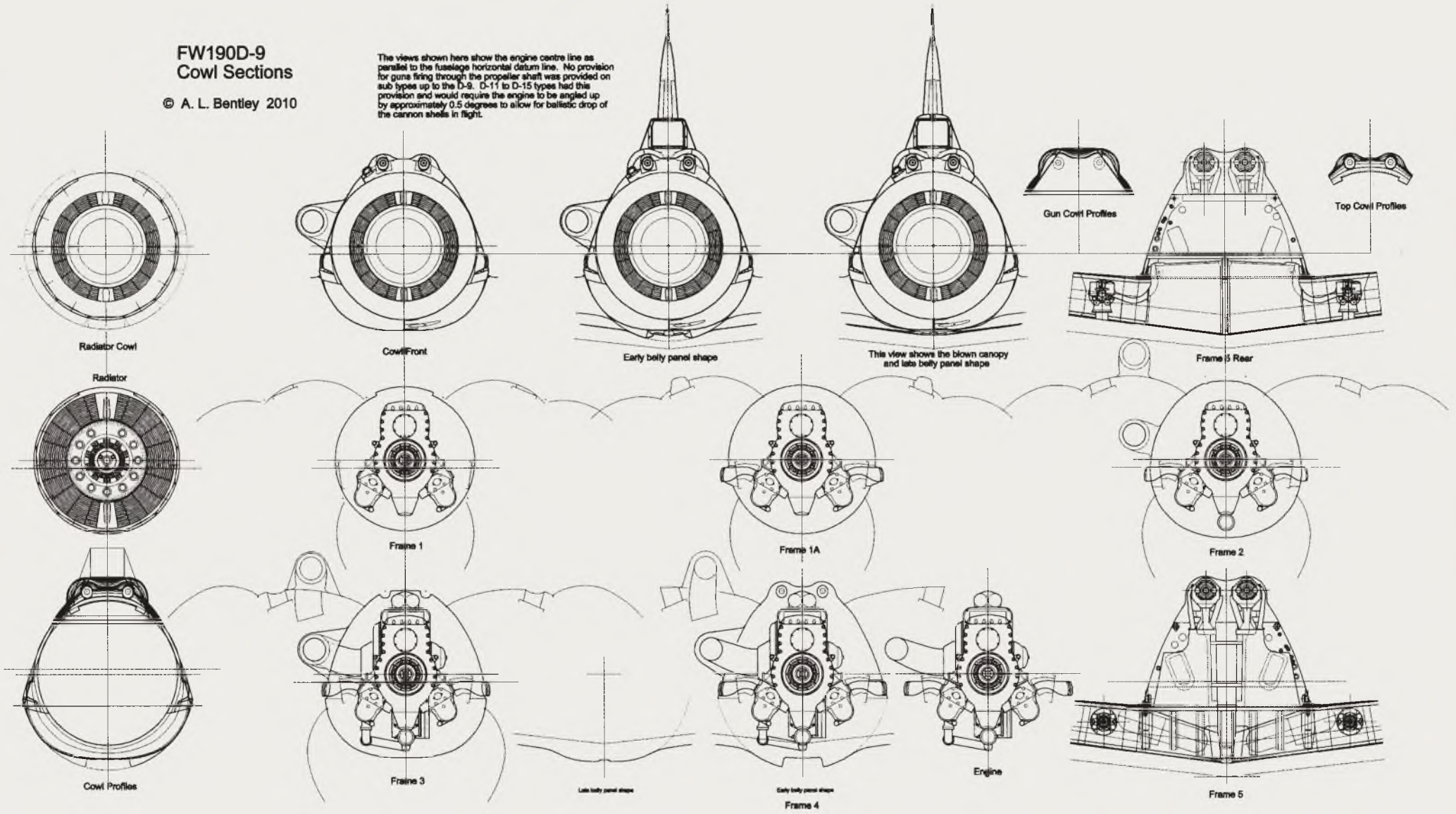


All dimensions shown have been obtained from official Focke Wulf drawings, reports, specifications and data sheets

Focke Wulf FW190D

A. L. Bentley © 2011



FOCKE WULF FW 190D ANATOMY

SHEET 3: MORE SHEETS NEXT MONTH IN JUNE ISSUE

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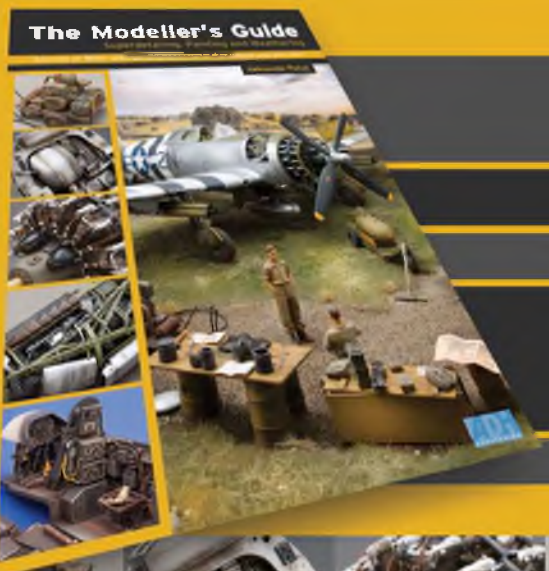

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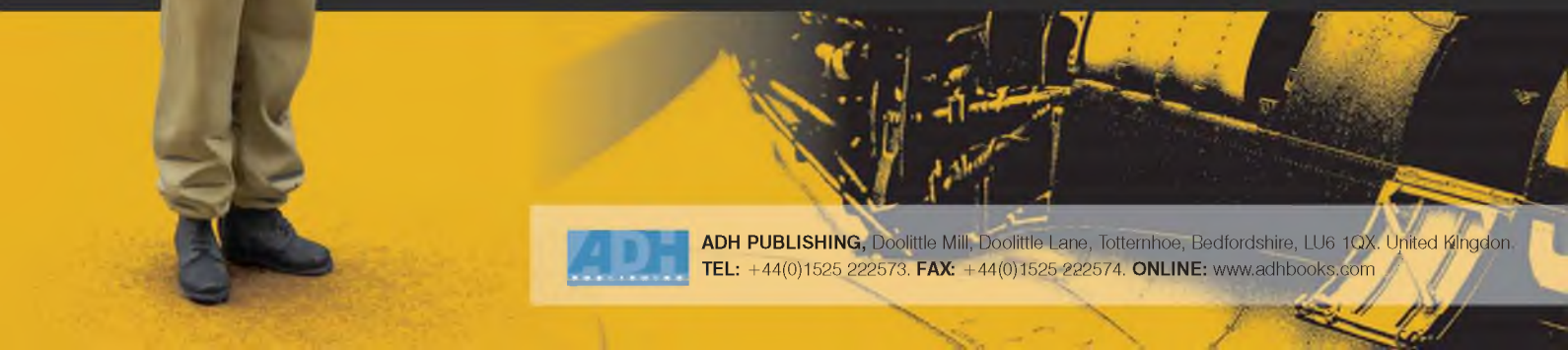

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SCALE FROM SCRATCH

WANT TO TAKE A STEP BEYOND KITS AND ARTFS? KEN SHEPPARD CONTINUES HIS SERIES TO ENCOURAGE OWN-DESIGN SCALE MODELS

PART 3: The right balance

- CG position calculation
- Wing section selection
- Wing & Tailplane incidences

Last month we looked at our enlarged three-view and gave some thought to the compromises that we might have to make in order to ensure that our model is a reasonably-easy-to-handle machine that utilises standard commercial items, without detracting too far from true scale - tail size, cowl diameter, undercarriage position, etc. All these can be manipulated to suit our requirements and, as the model is not intended for serious scale competition, I doubt if anyone will be able to identify these 'concessions'.

A MATTER OF BALANCE...

It is now useful to determine the position of the centre of gravity (fore/aft balance point) of the model, so that during the design

Designing your own lets you push out the envelope! This is the author's Not really, follows the same rules as conventional aircraft , but with a balancing twist!

1: A semi-symmetrical section like this (15%) gives a good speed range and allows decent sports model aerobatics - and is well suited to WW2 fighter models. 2: This modified Göttingen 797 section (19%) is best for slow-flying models (Miles Magister).

(and build) phase, we can position major units (servos, battery, receiver, etc.) in order to minimise the need for additional 'dead' ballast that might be needed to produce that perfect balance. It cannot be too strongly emphasised that the CG position must be calculated accurately - and the model accordingly balanced, before flying. Whilst a CG position that is too far forward may render the model sluggish and unresponsive to control inputs, but be generally safe, a CG that is too far back will almost certainly be fatal, inducing a stall, flick into a spin, tip stall - or all of them - but all with the same unwelcome result!

Let me once again refer you to Gordon Whitehead's book 'Radio Control Scale Aircraft - Models For Everyday Flying' - everything contained in this series of articles is covered - and a lot more besides, in a lot more detail - in his excellent book. I have used HIS formula for CG calculation (it's where I first saw it, anyway) for many different types and sizes of models and never once has it let me down. Care has to be taken in the calculation of the various elements, but using our full-size three-view outline drawing, we can accurately determine where the all-important point should be. Another way, favoured by some, is to make a scale-outlined chuck glider and determine it that way - how? Well, the elements that are used in calculation are wing area, tail area, wing average chord and the moment arm. Providing the chuck glider surfaces accurately replicate the outline of our proposed model, at a scale distance apart, the position of the CG of both models, expressed as a percentage of the root chord, will be the same.

Whilst this latter method is perfectly feasible, the calculation method is probably quicker - and the math is well-proven.

CALCULATIONS

So let's start by calculating the wing and tail areas. The easiest way is to reduce these to rectangles, so that we can multiply the width (span) by the depth (chord) - which is easy for parallel-chorded wings and tails, but what about tapered and swept back surfaces?

I don't propose to cover every configuration here (get Gordon's book - he does!), but I will go through my calculations for my Dornier Do335, which has a double tapered wing and tailplane (similar to most WW2 fighters and bombers).

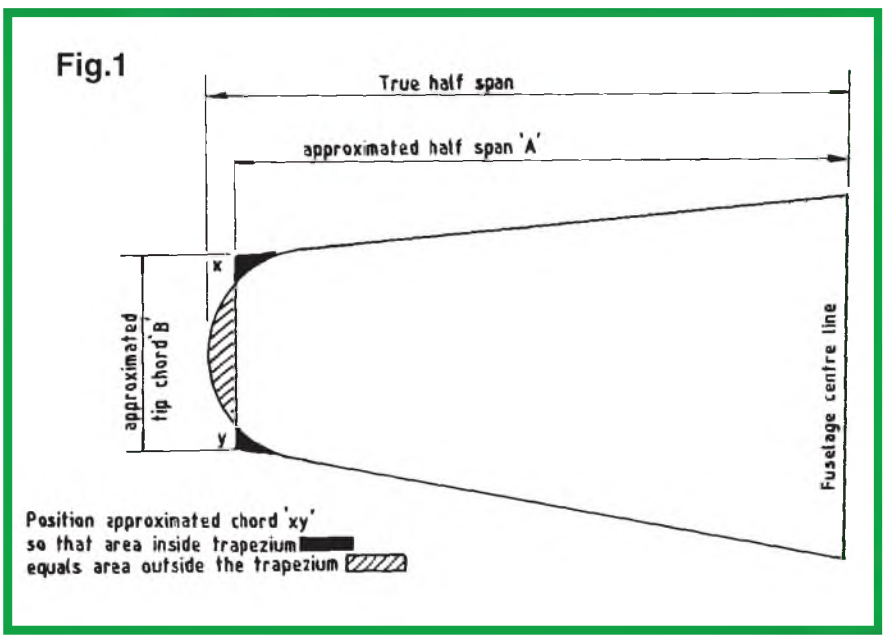
Figure 2 shows the pertinent dimensions measured directly from my three-view outline drawing. **Figure 3** shows the mathematical breakdown into rectangles used to work out the area of one of the wing panels. However, **Figure 1** shows how to reduce a curved tip section to approximated rectangular dimensions, using close 'guesstimation' so that we can commence the calculations.

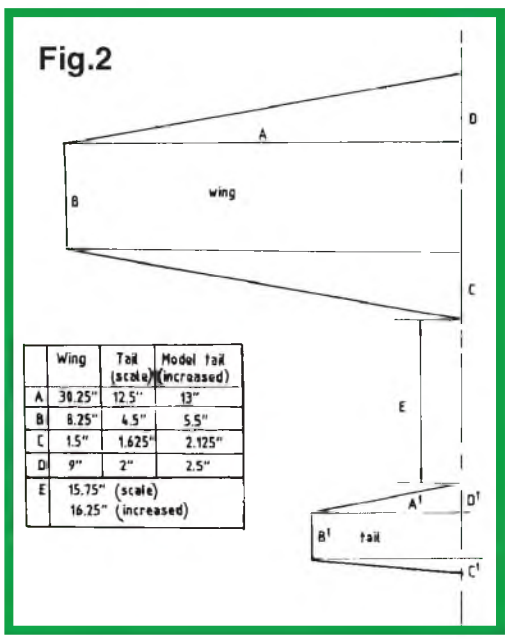
To calculate the wing area, take the dimensions in **Fig. 2** and substitute them on the formula in **Fig. 3**; then the Do335 wing area, 2AB + A(C+D), is:

(2 x 30.25 x 8.25) + (30.25 x (1.5 + 9)) =
499.125 + 317.625 = 816.75sq.in.

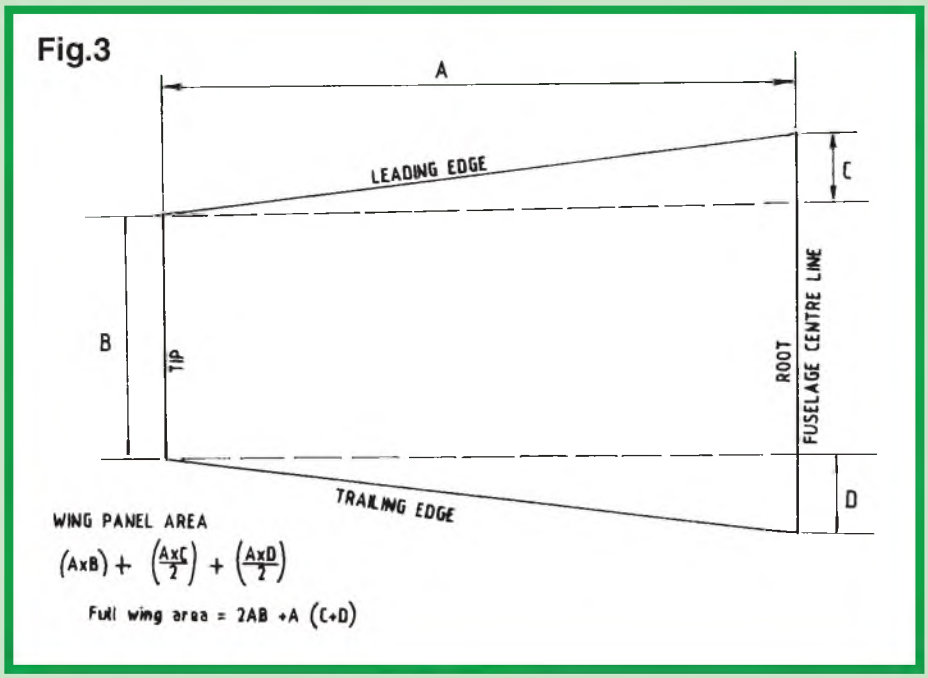
Regarding the tail, the tail area is:
(2 x 13 x 5.5) + (13 x (2.5 + 1.625)) =
143 + 53.625 = 196.6sq.in.

This gives a tail to wing area ratio of 24%.





	Wing	Tail (scale)	Model tail (increased)
A	30.25"	12.5"	13"
B	8.25"	4.5"	5.5"
C	1.5"	1.625"	2.125"
D	9"	2"	2.5"
E	15.75" (scale) 16.25" (increased)		



Next we have to calculate the wing-tailplane moment arm. This is defined as the distance between the 25% average chord of the wing and 25% average chord of the tail. So this introduces a new unknown - the average chord.

To work out the length of the average chord for a double tapered wing, refer to **Fig. 4**. Again, using the three-view outline drawing, extend the tip chord front and back to a distance equal to the root chord. Similarly, extend the fuselage centreline fore and aft equal to the tip chord.

Now, join up the four ends by two diagonals (front tip to rear root - and vice versa). The point where the two diagonals cross is thus the position of the average chord. Draw a line through this point parallel to the fuselage datum and mark where it crosses the leading and trailing edge. This is the average chord - measure it, call it XY and mark it on your three-view drawing, for future reference.

Do the same for the tail and now we can measure the distance between 25% average chord on the wing and on the tail i.e. the moment arm **(Fig. 4)**.

Right, that's the end of taking measurements (almost) - now we come to the magic formula!

Let's reiterate what we have found out so far - we've calculated the wing and tail area, we've found the position and measured the length (XY) of the wing average chord and we've worked out the length of the wing/tail moment arm. So, taking these values, we put them into the following formula:

CG = (XY/6) + (3 x tail area x moment arm)/(8 x wing area)

Note that this defines the distance of the CG back from the leading edge at THE AVERAGE CHORD. To convert it into the distance from the leading edge at the wing root; take the calculated dimension and mark it on the average chord line that you drew on your three-view drawing, then draw a line through this marked point perpendicular to the fuselage datum. Where this line crosses the fuselage centre line - voilç, you've found the aircraft's CG position!

Once you've done this, go and make a cup of tea- you deserve it - then come back and go through ALL your calculations again! With any luck, you'll get the same answer!

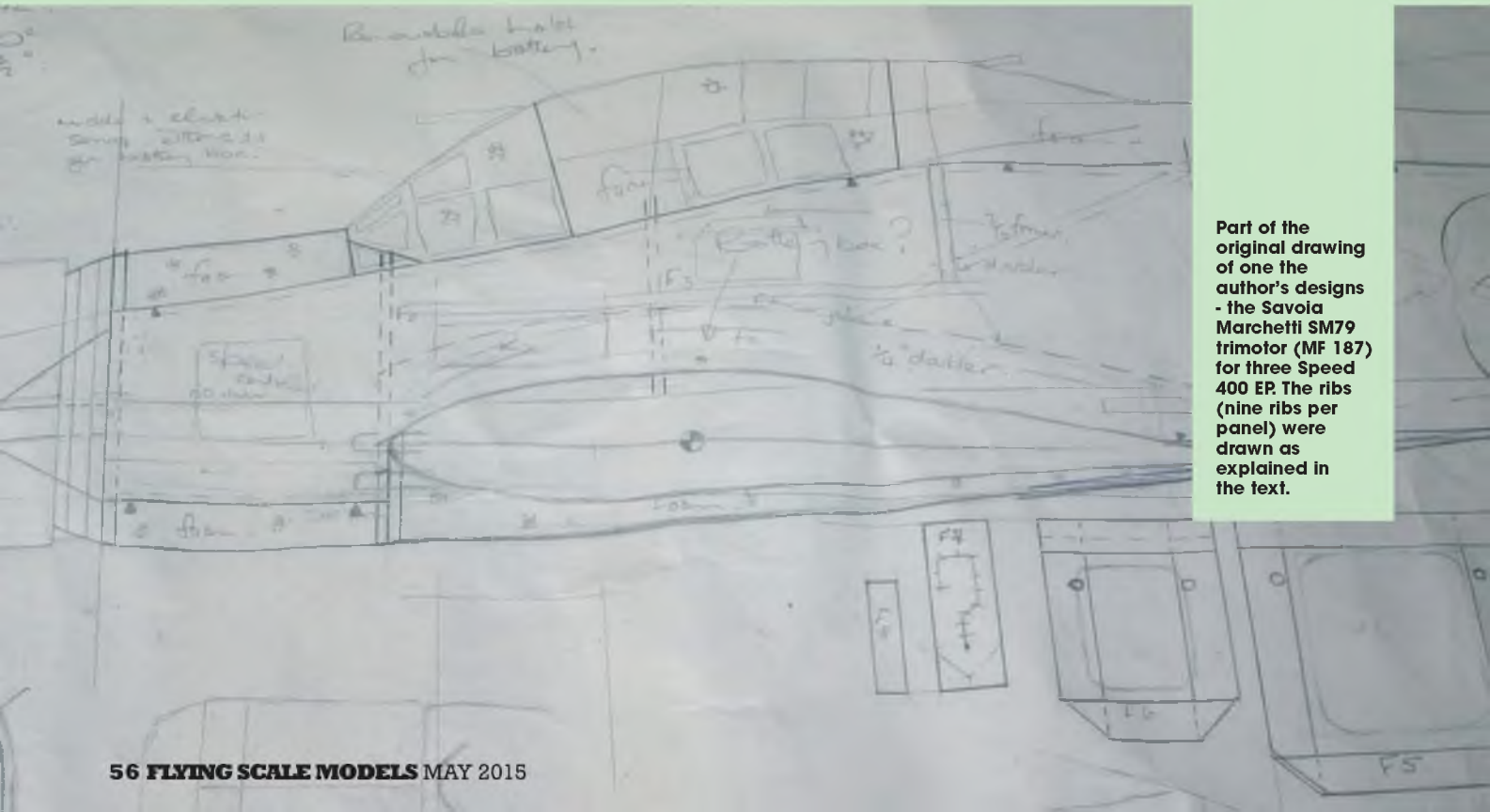
WING SECTION CHOICES

Having established the CG position, the next thing to consider and finally settle is the wing and tail section(s). Normally, on a WW2 fighter, the tail is a semi-symmetrical section of about 10% thickness on large models (say, 1/5 scale and larger), but on a 40 size model (probably 1/7 or 1/8 scale) we can fit a 1/4" sheet balsa tail with rounded leading edge and tapered elevator trailing edge (tapered to a minimum of 3/32" (NOT feather edged). This sheet tail won't have very much influence on the flying characteristics of the model (we'll talk about incidence later on), but the wing section very much does effect the way our model will fly - so we have first to consider just HOW we want it to fly - fast or slow - or a good range between.

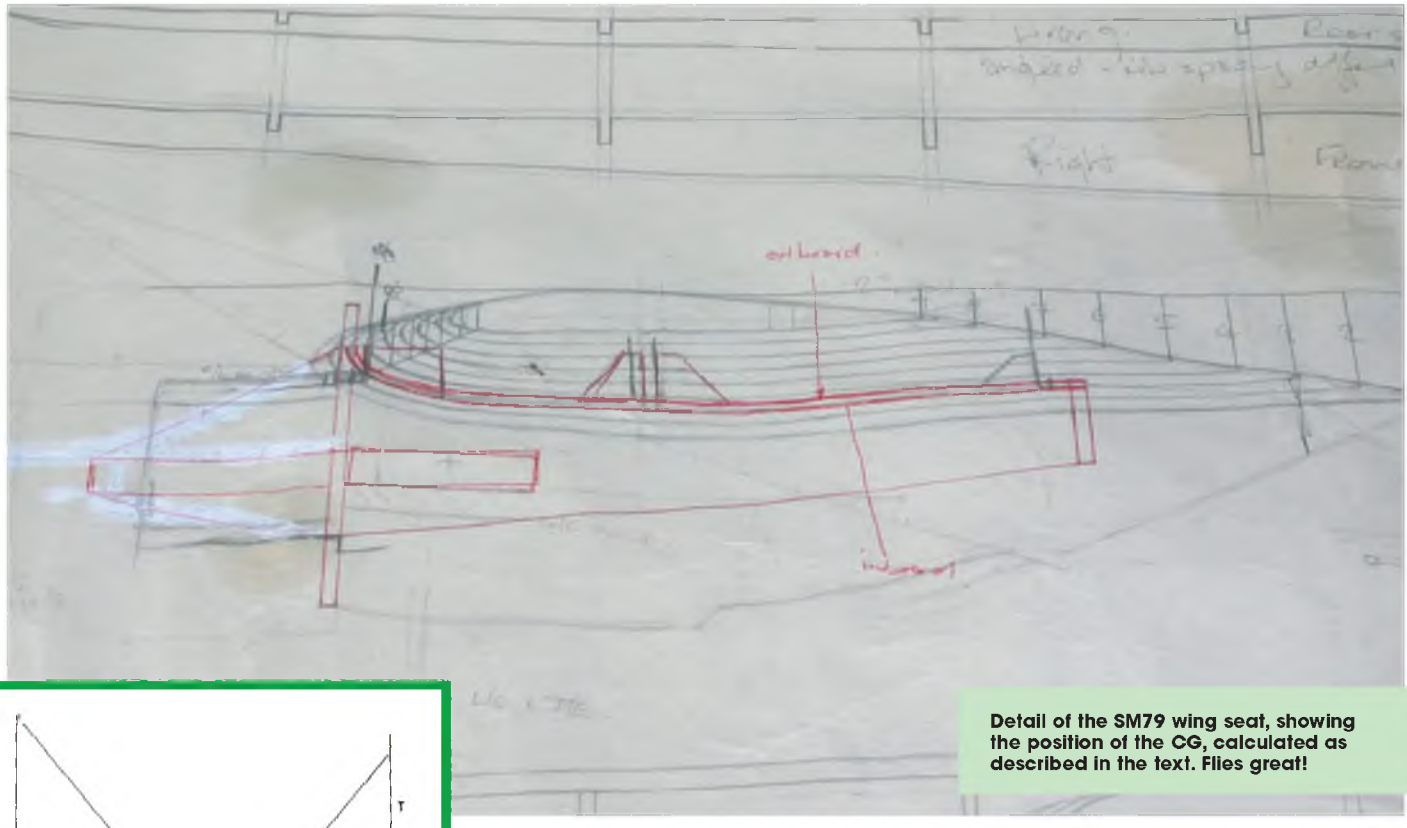
Also, in determining the maximum thickness of the wing, we have to consider the required structural strength of the wing and what equipment is going to be installed in them - the size of the retract units, size of servos, etc. We don't have to have the same section all the way from root to tip - in fact most aircraft wing sections thin out towards the tip (as a percentage of the chord); some even have different sections entirely at root and tip.

SO WHAT DO WE DO?

There are hundreds of wing sections and for out and out performance, the choice has to be made very carefully, e.g. for a sailplane or an aerobatic machine. For a



Part of the original drawing of one the author's designs - the Savoia Marchetti SM79 trimotor (MF 187) for three Speed 400 EP. The ribs (nine ribs per panel) were drawn as explained in the text.



Detail of the SM79 wing seat, showing the position of the CG, calculated as described in the text. Flies great!

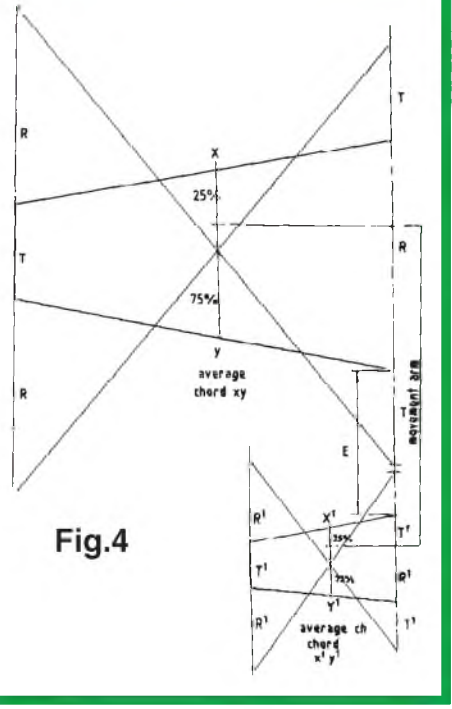


Fig.4

sports scale model, it is somewhat easier.

Our fighter needs to be able to fly fairly fast, be stable at low speed (take off and landing) and capable of full-size type aerobatics (mainly zero 'G' manoeuvres). Rather than go through all the relative merits of a lot of sections, I'll mention just a few that I favour (they work well).

For all round use, I like the NASA 2412 section. This is a semi-symmetrical section with the deepest part of the section 12% of the chord. This thickness can be increased up to 20% if needed (lift is reduced the thicker you go) and the section gives a good speed range, whilst the stall is less sudden than some. I would also recommend the NASA 2415 (15% max thickness) at the root, tapering to 2412 at the tip, with about 4 degrees of washout built in to help lower the tip stall speed, as a good all-round combination for WW2 fighter/bomber models. This is my choice for the Do335.

For slower flying prototypes (the Miles Magister, for example), the Gottingen 797 section is a good choice. This is a thick section (19%) with a flat bottom, like the traditional aeromodeller's Clark Y section. Semi symmetrical sections have better inverted performance than flat bottomed ones, and so are better suited to fighter aerobatics.

Another handy property of the NASA 24 series is that the rear section of the bottom surface can be 'flattened' for ease of building, without affecting the efficiency of the section too much. Having said that, I tend to build wing panels upside down, to get at the retract structure and flap mechanism, etc, during build, so to ensure that the ribs sit at the correct incidence on the building board, I design tabs on the top trailing edge of each rib, but more on that later.

(For anyone wanting to investigate alternative airfoil sections, I would recommend reading Martin Simons' 'Model Aircraft Aerodynamics' that lists over 200 sections - and gives co-ordinates for plotting them.)

Check the thickness of the wing at the root and at the tip from your front view drawing - you already know the root and tip chord, so you can work out the % thickness on both the root and tip at the deepest part of the section. If these are in the range 12 - 15%, then the NASA 2415 section can be used without amendment. Obtain the retract/wheel combo that you would like to use and work out how deep the wing needs to be to fully enclose the unit. Place the retract unit on the plan view in the position that you want the leg/wheel to be - is the scale thickness deep enough at this position? If not, you may need to thicken the section to accommodate the retracts - you could increase the centre section up to about 20% thickness to do this, retaining the taper to the tip as before. When you are happy that the

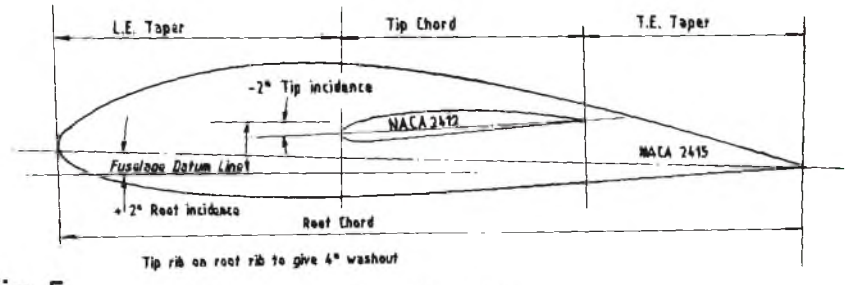


Fig. 5

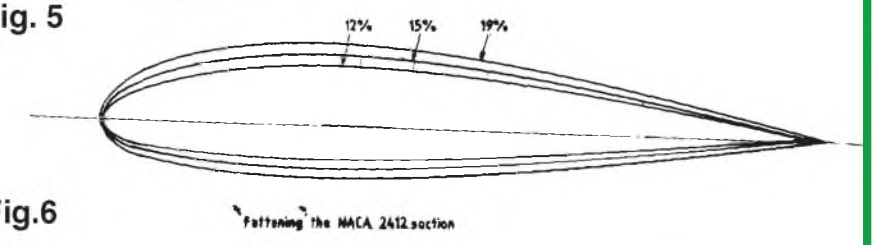


Fig.6

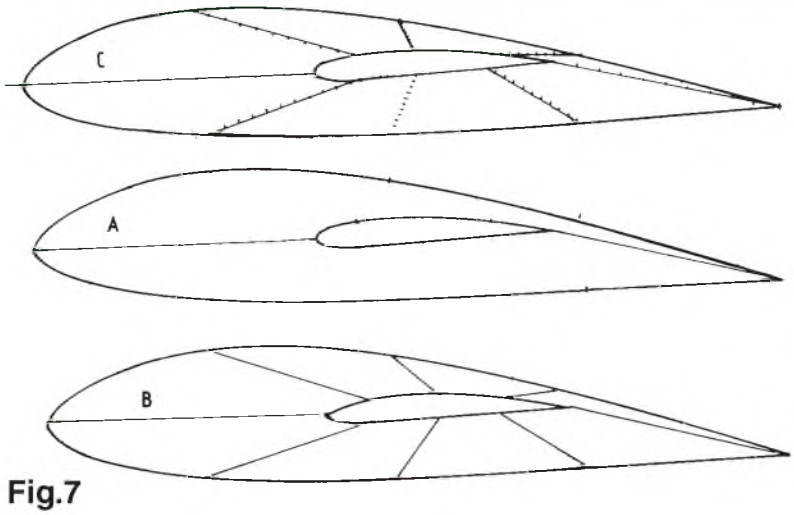


Fig.7

retracts will fit, measure the depth and 'fatten' the NASA 2415 section as necessary **(Fig. 6)**.

CHOICE OF INCIDENCES

A word now about wing/tail incidences. Again, this is a big subject and I refer you to the recognised aeromodelling experts already mentioned, for a full discourse on the subject. However, as a rule of thumb, for the sections mentioned, about one to two degrees incidence on the wing with the tail set at zero, should give the right amount of longitudinal stability, for a medium fast flying model - slower models will need more - faster will fly with less.

Regarding the tail, the trim tabs fitted to full-size aircraft are adjusted from the cockpit for the various cruise configurations. Fortunately these aren't necessary on our models as we can trim the tail at the transmitter. However, a real consideration regarding incidences selected is where this somewhat lowered incidence is significantly different from that shown on our scale three-view. The 'sit' of the full-size aircraft in the air - and on the ground - may well be affected adversely in the model if the wing incidence is reduced, so we can restore this wing incidence by giving the tail a bit of positive incidence, rather than none at all.

For example, to achieve a desired overall wing incidence of +2 deg., on a scale wing/tail incidence of +4/0 deg., apply +2 deg. To the tailplane. This +4 deg/+2 deg. combination will look better and equates to an overall 'longitudinal dihedral' (the difference between the incidences of wing and tailplane) of +2 deg. An added benefit of this solution is that it automatically increases the engine downthrust, minimising the 'unscale' downthrust that we would normally have to incorporate with a zero-set tail.

A common pitfall when measuring incidence is to measure from the lower surface of the airfoil section. The datum for any airfoil is through the centre of the trailing edge and through the centre of the leading edge nose radius. Failure to do this could result in a few extra degrees being built in - disaster!

FOAM WINGS

We could stop this article here by advocating the use of foam wings - nothing wrong with foam wings, of course, and there are any number of people who will cut you a pair of wing panels, if you supply them root and tip templates with half span and washout dimensions - and skin them in balsa or obechi, if you desire it - for a reasonable price, too.

The use of foam is a lot easier than you may think, if you haven't used it before! There is a very good book still in print and available from Nexus-Highbury, that will tell you all you need to know, with excellent illustrations. I'm not going to deviate further along the foam trail as it is very well documented elsewhere (maybe a later article, showing the latest techniques) - this series purely at designing built-up structures, in the traditional manner. So where was I?

SIZING TAPERED WING RIBS

So now we have an outline, a chosen wing section (s) and the relative incidence between root and tip - so how do we start to draw the wings?

First, determine your wing rib spacing. I would recommend that the spacing be equal across the span (it's a lot easier to draw!) and that for a 1/16" sheet (or rib capped) covered wing of about 30" half span, I would suggest about 3" spacing between ribs, giving 11 ribs in each panel, including root and tip ribs.

Fig.5 shows the initial drawing of the wing section at the root, with the tip rib superimposed on it, in the correct position regarding the leading and trailing edge taper and inclined at the desired angle to give the required root to tip tip washout (trailing edge higher than leading edge). From this relationship we can start plotting the other ribs.

Fig. 6 shows the three stages in plotting the intermediate rib sizes.

A) Mark points on the root and tip ribs at 25%, 50% and 75% chord, top and bottom.

B) Join up the points at 25% root to tip, top and bottom and repeat for 50% and 75%. Draw a line between the trailing edges root to tip and between the centre of the leading edge nose, root to tip. As there are eleven ribs, divide each of the eight lines joining root to tip, into 10 equal lengths. This doesn't have to be measured and divided, there is a drawing technique involving a ruler and a setsquare that makes this very easy - as I'm not teaching you HOW to draw - look it up! (It's detailed in Gordon's book!)

Now you have eight plotted points for the remaining nine ribs in between the tip and the root - just join up the eight marks for each rib! Seriously - investment in a set of French Curves will make this a relatively simple task - draw all the ribs on one piece of paper - it'll make drawing the sections evenly, easier - see **Fig.7**. Don't trace each rib individually yet, as we first have to place the spar positions and sizes - once we've decided, where, how many, and how big! ■

Nothing wrong with foam - it saves drawing all those ribs! The author's Liberator was 90% blue foam. Note the fatter section of the centre section - more like NACA 2418 (18%).

Sheeted centre section of the author's Shavrov flying boat. Uses the NACA 2415 section. Note the outer panel location tab is placed parallel to the rib chord line.

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SCALE CLUB FLY
DE-LUX

ALEX WHITTAKER ENJOYS A TASTE OF TRUE CLUB LEVEL SCALE FLYING A BA
BASED ON AN HISTORIC WWII RAF STATION

Most weekends of the year I attend the larger scale and Warbird meetings for FSM. However, as a Clubman myself, I always try to keep a balance and cover Clubman scale events too. Clubs have noticed FSM's interest in the grass-roots of scale flying, and a number have sent me invitations to attend their Club events. So, over the past twelve months I have deliberately crossed the country to catch up with what ordinary everyday scale enthusiasts like you and I are getting up to.

The first Club to invite me was Bardney, when Mark 'Sparky' Roberts suggested that I attend their Inaugural Warbird Day. I did, and it was a hoot!

RAF Bardney

The Bardney Club has an ideal venue for a scale meeting: an historic WWII RAF Station, complete with authentic Control

ING
KE

ARDNEY WARBIRDS EVENT

A great day and a very good turn out for a Club event.

Tower. No: 9 Squadron Lancasters flew from this very field, and one pilot received the Victoria Cross.

It gets better: the Control Tower is habitable. It has power, water, and heating, and is their Clubhouse! You can walk upstairs and stand on the verandah like scores of WWII pilots before you. A truly awe-inspiring moment for any true scale modeller.

Historic aspects aside, this really is Scale Modelling De Luxe. There is an upstairs Pilots Lounge complete with a real open fire. Outside, along a very large bench, there is even mains power conveniently available, ideal for battery charging, or the use of power tools outside the tower. These days at most scale events, pilots rest their larger i.c. powered aircraft during the lunch-time lull. In this interlude they fly small foam scale models, so such power accessibility is doubly welcome.

The Club's highly benevolent Landlords are Keith, John and Jamie, the Cartwright

Howard Jones flew a rare early ARTF Mustang powered by an OS 70 Four Stroke engine. The surface detailing appears to be printed into the covering.

Dennis Richardson's scratch-built 1/13th scale / 69" span HP Heyford. Two OS .30 FS power.

Bob Goodliffe's 80" span Sea Fury hauling off rather steeply in the blow. She is fitted with a 26cc petrol engine, and weighs around 17 lbs.

Reece Harvey carrying out his electric Skyraider.

Catch 'Em Young (1). Daniel Wheater (13) flew his Parkzone /Mustang.

brothers. They own Bardney, and run a local haulage firm. There is a strong feeling, shared between the Club and the Brothers, that the memory of No.9 Sqdrn RAF should live on. I was surprisingly touched to learn that the Club has set aside a wall inside the tower to remember RAF personnel. The wall is full of WWII station photos and memorabilia.

I wondered how the Club came across them. Then I was told that ordinary members of the public turn up throughout the year on private pilgrimages. In particular, Bardney receives regular visits from families with historic links to the old RAF Station. People clearly feel a strong emotional connection between Bardney and their loved ones who fought from here in WWII.

Pull Up!

The Bardney field is very good for scale model flying, but you have to have your wits about you. Especially if approaching from the left of the flight line. A good few hundred yards downwind are a series of large scrapped tanks removed from old road tankers. They are far enough away not to be an immediate hazard, but close enough in your peripheral vision to keep you on your toes. My long lenses often cheat on perspective, and on some low passes, I was convinced that one or two models might clang into the metal. It did not happen, but it did add spice to the proceedings. Of course, some Bardney pilots delighted in swooping in very low over the tanks, to lots of ooohs and aaahs from the delighted crowd, who may have secretly been expecting blood.

Young Scale Men

On the flight line, I was struck by the number of young people who flew scale models during this event. The Bardney Club obviously believes in catching `em young. For example, Daniel Wheater is 13, and he and his Dad flew scale models all day. Also on hand was young Reece Harvey, a very accomplished young

A fact of life at Bardney is the array of old tankers! You have to learn to live with them.

Simon Lawson's magnificent Meister Me 109G.

scale pilot, who flew a Douglas Skyraider very convincingly.

Given the number of grey heads at most scale meetings, I found this inter-generational interest in scale flying hugely encouraging. This really was a family event in bright sunshine., The large crowd was mostly composed of picnic-ing families, who gave all the flyers bold and encouraging vocal support. This carnival atmosphere, all the British and RAF flags flapping in the boisterous breeze, and a stream of people buying ice creams for the van, made it great day out. They even had a BBQ.

Old Faithful

The first model I spotted was a well-beloved old design. This warm feeling was because many of us .. ahem .. more mature ... UK scale modellers got our first taste of scale modelling techniques by tackling the revered Flair Scout range. I spotted this well-used example the instant she took to the air. Although 25 years old she looked very nostalgic and flew excellently. She was a Flair Fokker D.VIII, nicely powered by an O.S. 70 four stroke. Built and owned by Andy Gedney who, many years ago. used to fly in the Panic Display Team, of blessed memory. Later this venerable old bipe had a mid-air collision with Brian Cooper's Kyosho Spitfire.

Simon Illsley carries out his Dad's Eindekker EIII. Actually a modded Hannibal from the famous Flair Scout Series of kits.

Many a scale man cut his teeth on a Flair Scout. This is Andy Gedney with his Fokker D.VIII.

Mark "Sparky" Roberts with his 76" span Republic P-47DThunderbolt powered by a PTE 36cc petrol engine.

The Fokker E.III Eindekker on finals.

Andy Gedney's Flair Fokker D.VII is powered by an O.S. 70 four stroke. Had mid-air collision with Brian Cooper's Kyosho Spitfire.

Event organiser Mark "Sparky" Roberts flew his 76" span Thunderbolt "FTL" powered by a PTE 36cc petrol engine.

John Elkington told me that the Severin Storch fuselage arrives like this in the kit box. Finished model will be 14 feet in span.

Keith Birkin's stunningly executed Fw 190A. Superb hand-crafted model built to the famed Jerry Bates plan.

Geoff Dales' Blackhorse Macchi 200, DLE 30 petrol powered.

Simon Illsley joined the lunch time foamie flying with his GWS Fw 190A. 40" span / Wasp C3452-1250kV motor/ 10.5" prop / 2200 mAh pack. 50A E-Pro electronic speed control.

Keith Birkin's Jerry Bates Plans' Focke Wulf 190A. Definitely a Class One scale model.

Geoff Dales' markedly changed the appearance of the panels on his Macchi ARTF by rubbing them with auto panel wipes and then satin fuel-proofed the model.

She survived, but sadly the Spitfire sustained significant damage.

Messerschmitt Me 109G

Simon Lawson was campaigning his very nicely finished Me109G. This was a meticulously presented example, hand-crafted by Simon in his own shed. Built from the famous Meister kit, she is 100" in span, and is powered by a Zenoah 38 petrol engine, driving a 20" x 10" prop. She was handling the boisterous blow very well, until the treacherous wind swung right across the runway.

Unfussed, Simon initiated a perfectly normal landing approach. However, his Me 109 suffered a mystifyingly abrupt landing. We all exchanged glances,

Richard Scarbrough's well-known Red Hot Mama Thunderbolt scorching into the lens.

The Bardney Inaugural Warbirds Meeting was quite an event.

astounded that she landed so firmly, on such a correct and unremarkable approach. The upshot is that the retracts were pulled from their mountings in the wing, but she was otherwise unscathed. Maybe a wing-gradiant was the culprit?

Macchi MC-200

As scale modellers become cash rich and time poor, over recent years reworking airframes that started life as ARTFs has become commonplace. Nowadays, there are even BMFA Nats Scale Competition entries in Flying Only Class whose owners have trodden this controversial path. My own view is that a genuine flying scale model, hand-built by its owner in his shed, remains the Gold Standard. However, some techniques applied by clever scale modellers to their ARTFs are interesting in their own right.

This was definitely the case with Geoff Dales' subtly reworked Blackhorse Macchi 200. This 1500mm span model is designed for 30-35cc petrol power, with a target weight of 5.6 kgs. The original model comes with a grp cowl and metal retracts. These Blackhorse models are hand-built from wood, not moulded, and the pre-printed covering carries the entire scheme, including all legends, rivets, and markings. Now I have seen one of these models untouched "out of the box" and they arrive a bit shiny, and a bit too 'precise' to the scale eye.

Well, Geoff Dales DLE 30 petrol powered version had me stumped. From a viewing distance of five or six feet I was convinced she had been built from a kit. Getting a bit closer the impression was still highly favourable. It was only when I looked really closely that I realised that I was viewing a reworked ARTF. The main thing Geoff had done was to gently rub the panels of the model with panel wipes from the car shop. These are used by vehicle finishers and car sprayers to prepare body panels. The effect on the look of the model was considerable. The model had lost its toylike newness, and now adopted what I would describe as a 'recently in-service' look.

Of course if you get your eyeball very close, it is clearly not a hand-applied finish. However, I plan to experiment with these panel wipes to weather down my own latest scratch-built flying scale model, a WWI Austrian scout. Geoff says that it is not an aggressive process, so you can progressively control the effect. Certainly worth a try.

The Verdict

It got very breezy by late-afternoon, grounding a number of the scale models, but it was still an excellent day. I was delighted with the Bardney Club. It seemed to me to have everything the keen scale pilot could wish for, in an authentic historic setting. Having your own WWII airfield, complete with RAF Control Tower, really is the ultimate scale status symbol. ■

Brain Cooper gets in close before a crosswind touchdown with his Kyosho 90 Spitfire.

Crash Rescue Team bringing back the remains of Brian Cooper's Spit. He has new one now of course!

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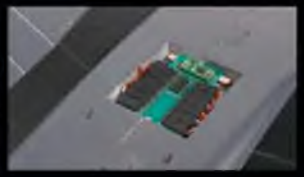

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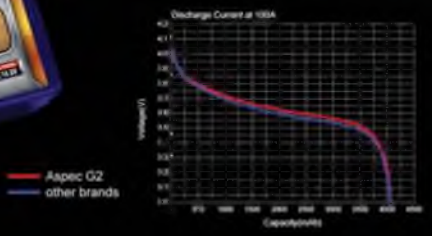

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