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ON THE COVER

Subject of this month's Master Models feature, this Messerschmitt Bf 110 of one of a pair built by Stuart Knowles and Simon Lawson, from Don Smith plans. This one is Stuart's; 118" wingspan, powered by two Zenoah 26 petrol engines.

Photo: Alex Whittaker

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CONTACT

The Messerschmitt Bf 110 forms a major part of our coverage in this issue. The general tendency is to deride this aircraft almost exclusively due to its woeful performance during the Battle Britain in the summer and autumn of 1940, when it first came up against serious and determined opposition to the extent that this aircraft had to be given its own fighter escort by its small brother the Messerschmitt Bf 109.

The concept that spawned the Bf 110 was dreamed up a full five years prior to the commencement of WW2 in 1939 and took hold of the imagination of those, in Germany responsible for the decision making, mostly 'political animals' who subsequently were unable to stomach the findings of more knowledgeable, more qualified individuals when the concept moved from drawing board to test prototype. As we see, the aircraft soon moved on to be a major element of the Luftwaffe's order of battle, before the painful truth had to be faced.

Nevertheless, not all was lost in that when, not too long after the end of the Battle of Britain, which conclusively demonstrated the shortcomings of the Bf 110 as a day-fighter, the development of the air war created the need for night fighters, where outright speed and manoeuvrability were not the paramount considerations - and the Bf 110 became a clear and readily available aircraft capable of conversion as an effective night fighter, particularly when the first on-board airborne interception radars became available.

What struck me in all this is that in parallel with the Bf 110, in the years prior to WW2, the Royal Air Force had it's own 'good-ideal-at-the-time, in the shape of the Boulton Paul Defiant (see FSM February 2014) which failed in its initial concept as a day fighter - this one with all the fire-power concentrated in a four-gun swivelling turret behind the pilot's position.

The Defiant was the third of the RAF's fighter types (after the Hurricane and Spitfire) to reach combat-ready status for the Battle of Britain, where the concept proved unworkable and front-line Squadrons equipped with the type were very quickly removed from the front line. Indeed, as early as July 1940, while the B.of.B raged by day, the first Defiant night-sortie took place.

However, with the onset of winter in late 1940 when the Luftwaffe bomber force turned to mass nightime raids on UK, the RAF was devoid of a night fighter force to counter it and the Defiant was re-deployed in earnest at first without on-board radar assistance and then from September 1941. With on-board air-interception radar equipment.

So there's a fascinating parallel chronology of initial failure and, thereafter redeployment in a parallel combat role. In this 'second life', it has to be said that the Messerschmitt Bf 110 was by far the more successful aircraft.

CL-84 Dynavert

Flyzone
how high will you soar

No.: FLZA2800

First flown in 1965, Canadair's CL-84 Dynavert was an experimental platform designed to test the feasibility of VTOL (Vertical Takeoff & Landing) aircraft. By repositioning its entire wing, the CL-84 was able to take off like a helicopter and then transition to horizontal flight to perform like a conventional turbo-prop aircraft. In tests, it was found that in-flight transition was also possible, proving this to be a truly remarkable aircraft that pre-dated similar concepts by a significant margin!

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Required (Not Included):
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- 4S 2200mAh Flight Battery

Technical Specification:

Length:	1050 mm
Wingspan:	950 mm
Weight:	1700 g

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AVIOS YAK 52

A LOVELY LITTLE EP FOAMIE OF THIS ICONIC RUSSIAN AEROBAT.. BY KEN SHEPPARD

Looks good in the air - but where's the pilot?

The Yakovlev Yak-52 is a Soviet primary trainer aircraft which first flew in 1976. It is still being produced in Romania by Aerostar, which gained manufacturing rights under an agreement within the now defunct COMECON socialist trade organisation. The Yak-52 was designed originally as an aerobatic trainer for students in the Soviet DOSAAF training organisation, which trained both civilian sport pilots and military pilots.

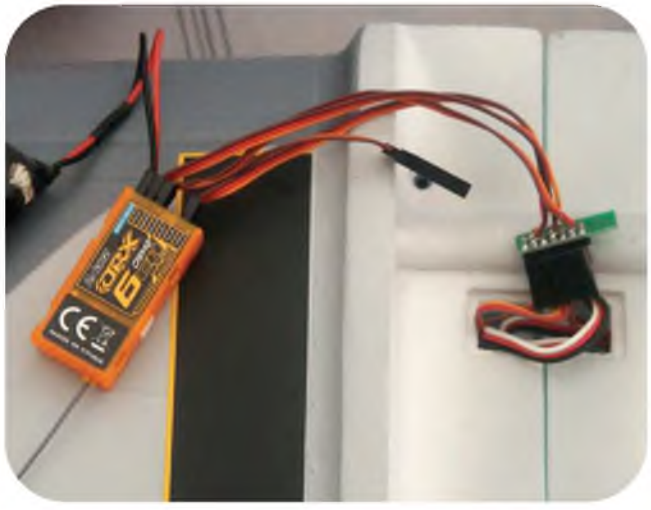
A descendant of the single-seat competition aerobatic Yakovlev Yak-50, the all-metal Yak-52 is powered by a 268 kW (360 hp) Vedeneyev M14P 9-cylinder radial engine.

Since the aircraft was designed to serve as a military trainer, the development of the aircraft incorporates a number of features to be found on the early post-WW2 fighters: to be noted that the cockpit tandem layout (instruments panel, seats design, opening system of the cockpit), tail design, tricycle landing gear, fuselage mixed construction (monocoque with steel tube construction), inner flaps, controls position, access panels on sides of the fuselage, even the location of the radio antenna and overall dimensions of the aircraft, strikingly match with the Yakovlev Yak-17 UTI jet fighter

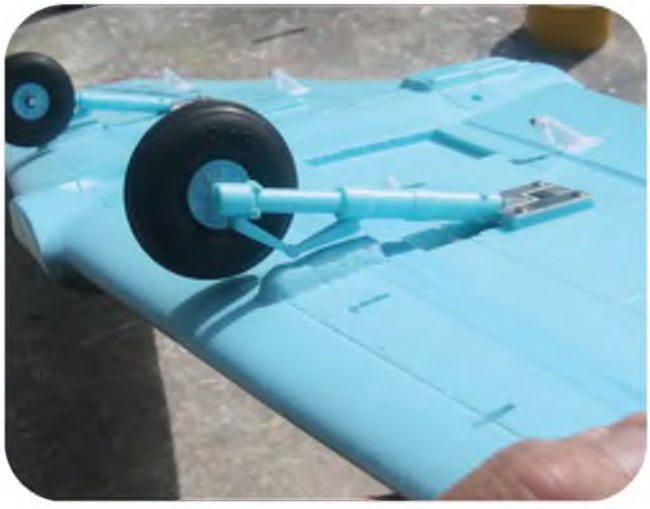
> "A descendant of the single-seat competition aerobatic Yakovlev Yak-50"

The twin carbon tube wing panel joiners.

Two plastic fittings hold the wing halves together - with four bolts.



The small PCB board used for joining wing servo leads.



The main electric uc legs retracted.

trainer (NATO code name *Magnet*).

The aircraft has inverted fuel and oil systems permitting inverted flight for as long as two minutes. The engine drives a two-bladed counter-clockwise rotating, variable pitch, wood and fiberglass laminate propeller.

At 998 kg (2,200 lb) empty weight, the full-size Yak-52 is responsive and very capable as an aerobatic aircraft. Yet it is also easy to fly and land. It has been used in international aerobatic competition up to the Advanced level and is stressed to +7 and -5 Gs, rolls (to the right) at 180 degrees/second and is capable of every manoeuvre in the Aresti schedule.

The Yak-52, like most Soviet military aircraft, was designed to operate in rugged environments with minimal maintenance.

The tricycle landing gear is retractable, but it remains semi-exposed in the retracted position, affording both a useful level of drag in downward manoeuvres and a measure of protection should the aircraft be forced to land wheels-up.

The Model

The Avios model is available in two colour schemes designated 'military' (as per the review model) or 'civilian' in a yellow/silver finish (as illustrated here on the box label). At 1,200mm span, it is not a large model and yet displays a real 'presence' in the air and the overall finish of the Avios 'foamie' needs to be examined closely to be fully appreciated. It is very nicely finished - a cut above some other brand foam 'scalies' presently available. The required Lipo pack is a four-cell 2,200mAh which provides plenty of power via its 680KV outrunner motor, so that its full aerobatic capability can be explored, with a decent flight duration. Not having the recommended 2,200mAh pack available at the time of flight testing, I made do with an 1,800mAh pack - even so, with the reduced capacity, the flight duration was ample, giving a good 6-7 minutes of spirited flying.

The foam moulding is crisp and neatly detailed with minimal protrusion of the 'injection bumps' over the surfaces. The fit of the various assemblies is excellent and the paint job applied to the military version was first class - it really looks the part.

One criticism, however; there is no pilot figure under the crystal clear canopy - only a small point, but a pity, but nevertheless, because with the super-large canopy, the absence looks very obvious and reduces the model from a miniature replica to a scale toy - this is my opinion only, of course. I have fitted a pilot bust of the right size with a bone dome (in the rear position, of course), by cutting a hole in the bottom of the cockpit moulding and mounting the bust on a thin plate glued to the foam cockpit base.

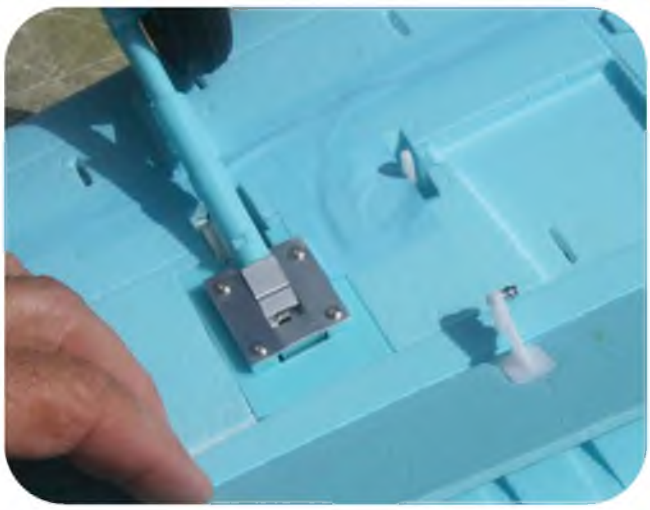
The model can be set up with six channels, utilising the small split flaps, but on a model of this size, it seems to me to be a bit over the top, as models this size don't really need flaps - but again, that's just my personal opinion - if you don't share it, fine. All is wired up, in PNF mode, just needing the servo lead to be plugged into your preferred receiver.

Assembly

This is minimal and takes but a few minutes. All the control horns are fitted, and the pushrod linkages are all ready-formed - it's a matter of clipping/screwing them into place - one end of each pushrod has a 90° bend/plastic keeper, the other, a small ball joint.

One of the nice touches on this Avios presentation is that there are small moulded recesses adjacent to the wing-mounted servos that allow you to unscrew the servo arm for fine-adjustment, rather than having to 'burrow' the screwdriver blade through the foam to access the servo arm screw - again, it's indicative of the level of thought that has gone into this design, by the Avios engineers -

One of the scale-hinged Frise ailerons.



Small split flaps are fitted - but really necessary?

The tail blades, showing joining system.

Scale prop assembly parts - four screws hold blades in position.

The sit is right - and very realistic for a relatively small model!

well done, them!

The two wing halves need to be slid onto two carbon tubes, almost full-span joiners, the halves being kept together by two plastic fittings which fit in moulded wells in the wing surface bottom. The tailplane/elevator halves slot into snug rebates in the fuselage and are retained by two small self-tappers on either side. The elevators are joined with a male/female plastic fitting, which is a nice sliding fit. At the servo end of the fuselage mounted elevator and rudder pushrods, the pushrod is clamped with a standard 'grubscrew' connector which should be eased back before connecting the ball joints to the control surface horns.

The fitting of the wing is a little different to what one

has become to expect as the norm with foam ARTF's. The wiring in the wing terminates with a little PCB board. Factory fitted, it is connected to the pair of leads for the aileron, flap and retract servo leads, with a single connector for each channel on the other side, so no 'Y'-leads are used. It caused a bit of head-scratching initially, but the excellent instruction book explains all and it all became clear - and very effective.

The wing needs to be located in the very positively fitting wing seat and retained by four steel bolts, fitting through the moulded plastic fittings. It would certainly pay to check out the radio and that all is working before fitting the wing, but it is a matter of a minute or so to remove the wing, if necessary.

Regarding the retracting undercarriage. The legs are wire, encased in 'scale' plastic moulding which look very realistic - and, it has to be said, are resilient to withstand the rigours of flight-testing, to date. It has to be said that the actual colour blue used for the undersurfaces and plastic mouldings is a little bright - a paler blue is more scale-like, I think, but again, a small matter.

The retraction sequence is very effective and quite slow, just like the full-size - well, almost!

The paddle prop blades need to be screwed into the two-part prop hub and the prop assembly is retained with a small spinner which only needs to be finger-tight.

The final touch is to fit the radio antenna and the wing mounted pitot tube (glued in position). I omitted these as experience has proved that they are very vulnerable and don't last long, usually being the first victims of 'hangar rash'!

The very final job after setting and checking the control surface throws and directions (all fully detailed in the instructions - both high and low rates given) is the CG position. There is plenty of battery pack adjustment room in the fuselage and, as the battery pack sits pretty well over the CG anyway, accurate positioning is easy, whatever capacity pack you use. So, with a fully charged pack fitted and all functions set and checked out, it was time for a bit of flying!

The front of the large cowl with scale shuttering.

The lovely twin cockpit canopy - but where's the pilot(s).

SPECIFICATIONS:

Manufacturer: Avios
UK Distributor: Hobbyking UK
Span: 1200mm (47.2")
Motor size: 3648 680KV
Battery: 4S x 2200mAh Lipo required
Functions: 5/6 channels (flaps fitted)
Price: $213. 65 (price varies with exchange rate)

FLYING

Almost a perfect maiden flight! Weather was good with just a slight breeze - very unusual for this time of year! After the 'get-the-photos-first' photo shoot on the nicely short-cut' grass at our local field, as final function and direction check and I taxied the Yak out to the pilots line. The ground handling, due to the trike undercarriage was very good and we soon had her lined up into the breeze.

Opening the throttle gently, the response was immediate and she trundled away gathering speed, needing just a touch of rudder to keep it straight and at a little over half throttle, I felt the speed about right and so eased her off the ground into a nice, scale-like (to my eyes, anyway) climb-out to height. I had the rates on high and for the first few seconds she felt a bit twitchy and so dropped the aileron rate to low.

No trim change was needed to keep the wings level hands off, but the elevator rate was also dropped to low, as it did seem a little sensitive. A couple of circuits to get the feel and I was enjoying myself. It's a scale model of a fully aerobatic machine and as such, doesn't fly itself - none of the 'bells and whistles' self-levelling gizmos that one can get in models of this size these days - and so, definitely not one for beginners, as you need to fly it all the time. The stall, however, gave no worries, as the wing drop was quite benign and easily regained, but she felt a little tail heavy, even the CG position had been religiously checked.

On full power, flat and level is quite un-scale-like being way too fast, but this power is very useful for vertical manoeuvres, with most of my aerobatic repertoire accomplished on that just over half throttle setting, blipping on the power just in the vertical sections. Pull in too much elevator in the loop and she will flick out, so again, keep the diameter of the loop scale-like (quite large) and she's a pussycat.

I am not capable of the full Aresti schedule, but I'm sure the younger tyros who are will have no difficulty in satisfying their desire to turn the Yak 52 inside out. For me, she is more than capable of doing everything I ask for - even though, I still felt that the CG should be a little ore forward. I said at the beginning that it was a perfect flight, almost - that last word refers to the fact that the landing was a bit hard with a real bounce, but the UC stood up to the abuse very well!

Before the second flight, when fitting the re-charged lipo, I moved the pack forward by 15mm, when strapping it in. The take off run was a little longer at the same 'just over half' throttle, but she felt a lot more 'solid' in the air. Now CG is always a bone of contention, or at least, a subject for individual preference and so, with the Yak 52, I reckon a lot depends on your own flying style, so a little experimenting with the Yak 52 may be called for, if you feel she is a little 'frisky' to start with. I know I have marked the forward position on the review model and always place the battery accordingly, but then again, I'm not a hotdog aerobatic pilot!

All-in-all, Avios have produced a stunningly beautiful little model of the Yak 52 which, when trimmed you your particular flying style, will no doubt give you immense pleasure and satisfaction! Don't forget to fit that pilot, though! ■

DACKEL

STUART KNOWLES AND SIMON LAWSON DECID

Two years ago, fellow Club modellers Stuart Knowles and his mate Simon Lawson decided to build a twin engined scale model each. After much research, they mutually agreed upon the Meserschmitt Bf 110. They shared the construction of the two airframes but it was mutually agreed that Simon is the better builder, so he built the basic wing and Stuart glassed it, and then prepared it for primer. They repeated this division of labour for the two fuselages and the tail components. Each pilot then finished his own model separately. Stuart's test flight two took place around Easter 2015, but it took as long to complete the finishing and painting of the model as it did to build it.

Both models were built from plans drawn by the American designer, Don Smith and Stuart elected to finish his example in a Mediterranean combat thearte scheme.

This is a bespoke hand-crafted model following traditional construction techniques, using balsa wood and ply wood.

WINGS & TAIL

These are of all wood, fully built up construction, fully sheeted, and then

> The scheme used is based on Mediterranean theatre colours to give Stuart's aged mince-pies a chance of seeing it against a grey sky

glassed with 49 gsm glass cloth, applied with pond liner resin. As with the wings, the tail unit is also of all-wood built-up construction

FUSELAGE

The fuselage is all-wood former-and-stringer construction, sheeted in balsa wood, and skinned with glass cloth, again applied with pond liner resin.

ENGINE

Power for the model is provided by two Zenoah 26cc magneto ignition petrol engines. Stuart remarks that the Zen 26 is not the most compact engine for its size, but is certainly reliable - an important consideration for any I.C. powered twin engine model. In addition, he had two in his shed which was an all important part of the decision-making process!

Corr! A convincing scale model with a sparkling performance in the air.

LBAUCH!

ED TO SHARE THE BUILDING OF A BF 110 EACH

1: **No shortage of flaps!**

2: **BF 110 has working landing lights.**

3: **Nicely modelled air intake in the leading edge of the wing.**

PROP & EXHAUST

The two Zenoah 26 engines are matched to 17" x 8" Menz propellers and equipped with standard Zenoah 26 exhaust and silencer.

UNDERCARRIAGE / RETRACT

Stuart chose Dave Brown retracts and oleos and reports that these proved to be a very good investment.

COVERING

As with the wing and tail, the fuselage is covered with lightweight 49 grammes per square metre woven cloth sourced from Phil Clark, of *FighterAces*. Stuart reports that it goes on really well with very little lifting or bubbling whilst being applied. The initial coat adhears the cloth to the airframe skinone and allowed to dry, followed by one lightly applied flow coat to complete the job.

PAINTING

In time-honoured scale modeller fashion, Stuart used cellulose automotive primer and paint.

LEGENDING AND DECALS

Some detailing of the hatches was achieved with self adhesive aluminium tape. Insignia masking was cut using a 'Cameo' home computer driven vinyl cutter. Smaller decals were printed on white or clear decal paper, using a small laser printer, again driven by the home computer.

The advantage of using a laser printer is that the ink is waterproof straight out of the printer. Stuart remarks that if you choose this path, you should make sure that the printer can take thick paper / thin card. Stuart told me that his printer thinks that it doesn't want to print on such stock, but actually does with some shoving and pushing. He applied lots of scratching and 'dirtying up', and a hint of riveting, pressed in with a hot soldering iron.

The scheme used is based on Mediterranean theatre colours to give Stuart's aged eyes a chance of seeing it against a grey sky. The Scottie Dog is an authentic Luftwaffe insignia.

SCALE DETAILS

All cockpit details were made using the aforementioned printer and cutter. Stuart sourced the basic images from the internet. Cockpit dials are a photo of a plastic kit of a 110 cockpit, suitably layered and detailed.

Radio equipment is based on pictures of WW2 avionics stuck onto cubes of blue foam. These were then given a hard skin with brown paper and PVA glue. The nifty MG42 machine gun is made up from scrap, while the spare ammo magazines in the back of the cockpit are blue foam and a bit of litho. Bombs are from *HobbyKing* via the internet.

CREW

The rather impressive crew were reworked from *BBI / Dragon* 1/6th scale figures. Only the heads, hands, and clothes were used since the original bodies and limbs were too heavy. These parts were replaced with hand crafted soft foam.

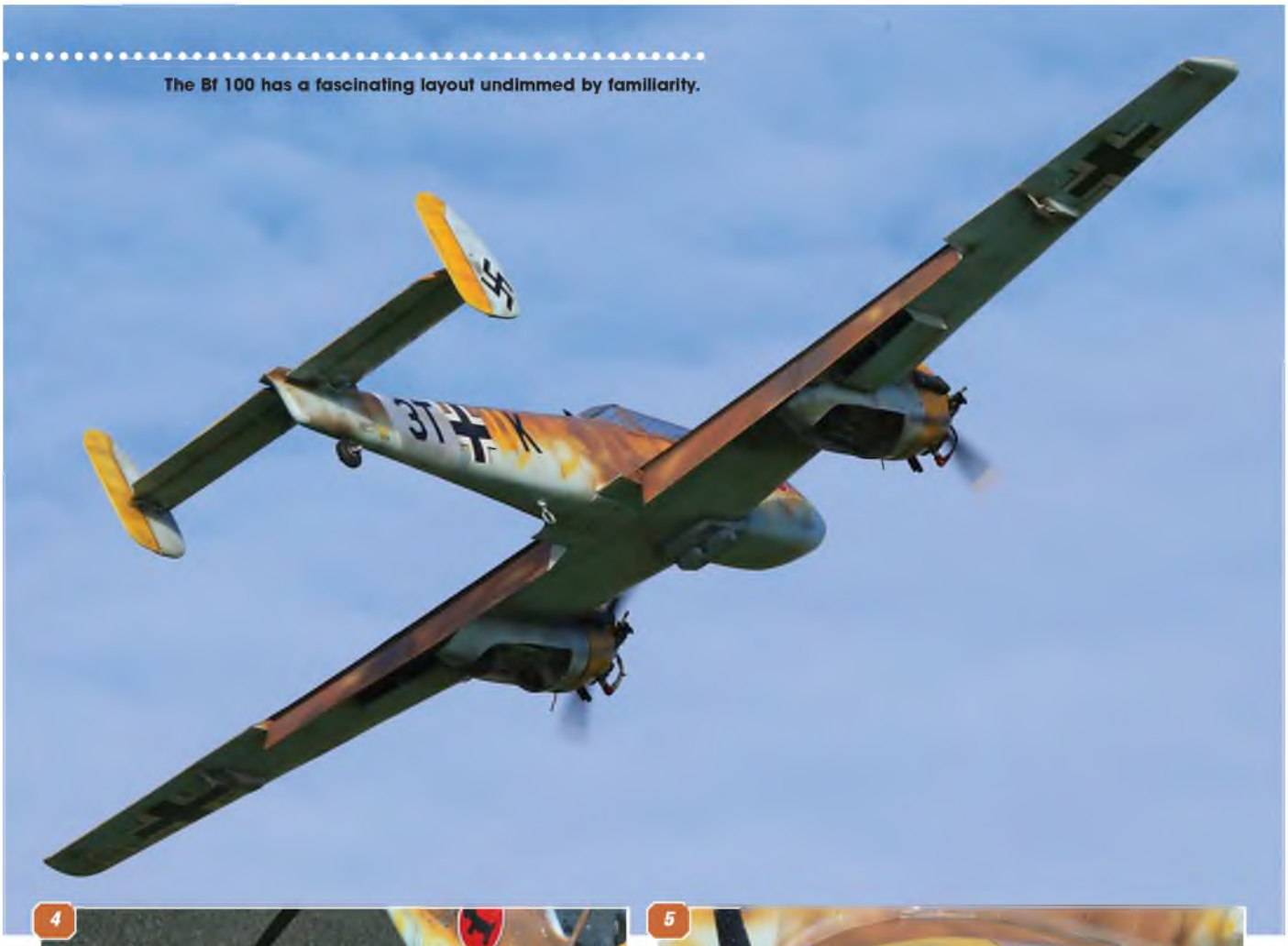
The pilot is animated, energized from a small servo in his chest which gives him the ability to move his shoulder. In this way he looks like he is checking that the ground crew are clear. This servo is driven by the aileron channel.

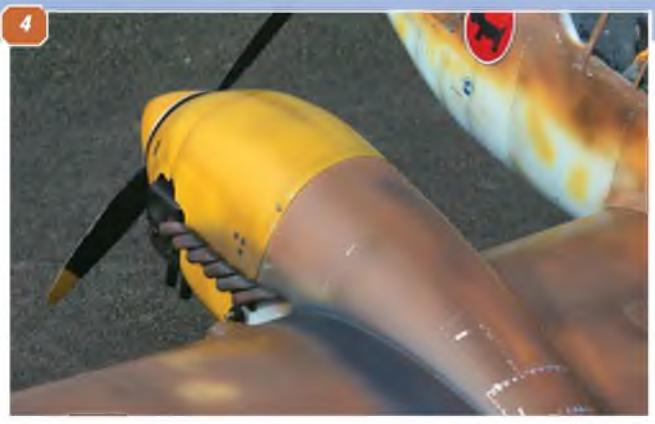
FORE/AFT BALANCE

Apart from the two five-cell 'C' size batteries up in the nose powering the avionics, no ballast was required. Even

Over wing shot shows how well Stuart and Simon have blended the main components of wing and fuselage.

The Bf 100 has a fascinating layout undimmed by familiarity.





with four servos well to the rear in the tailplane, Stuart wasn't really expecting that to happen.

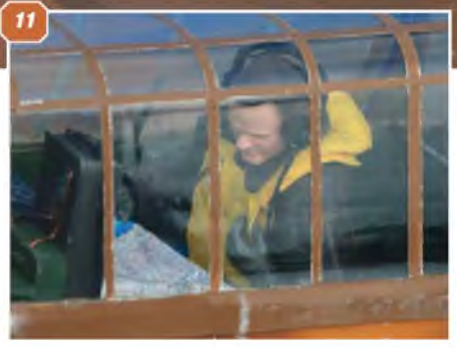
RADIO

Each battery has two output leads, one with the normal R/C plug, plus a heavier gauge *Tamiya* plug. Both leads are used to deliver power, one to each receiver. That's two batteries - four switches - two receivers, one Rx in the fuselage and one Rx in the wing. Each Rx drives one aileron, one rudder, and one elevator, to try and maintain some flight control should one of the receivers fail. Other controls are not split across the receivers. So, one Rx controls both engines, both flaps etcetera. At the last count she had thirteen servos, *HiTec 645s* for the prime surfaces, and mini digitals for the rudders.

Stuart has not used any diodes in the power supply. He reasons thus:

"I know that in theory, a dead short in one battery could flatten both, but in all my flying, I have never experienced a battery short, only a battery I thought was full of electrons and actually had none. I

4: Dolphin-like nacelles on the Bf 100 really are very stylish. 5: Stuart chose the petrol engines for their reliability not their compactness, but they pass muster. 6: Authentic Scottie Dog decal looks oddly reassuring on a Nazi war machine. 7: You can see that Stuart has put a lot of time and effort into achieving this scale patina. 8: All the excitement of a twin - a busy front end with two engines and a sleek forward fuselage. 9: Dropping bombs were sourced from Hobby King.



10: Glasshouse is a big feature of any BF 110 model, and Stuart really has made it convincing. 11: Knitted brows on the very convincing navigator. Modified commercial figure, see text. 12: Pilot is animated with a servo driven by the aileron channel. 13: Scuttle rear end of the canopy is very nicely done. Scratch-built machine gun. Love "Access Here" above the hatch. 14: Decals and legends employed a variety of techniques with a laser printer and a vinyl cutter. 15: DF loop tucked under the fuselage.

decided against diodes or backers just because of the big increase in parts / plug count, and therefore possible points of failure. Others may disagree with me, but you pays your money , and only time will tell....".

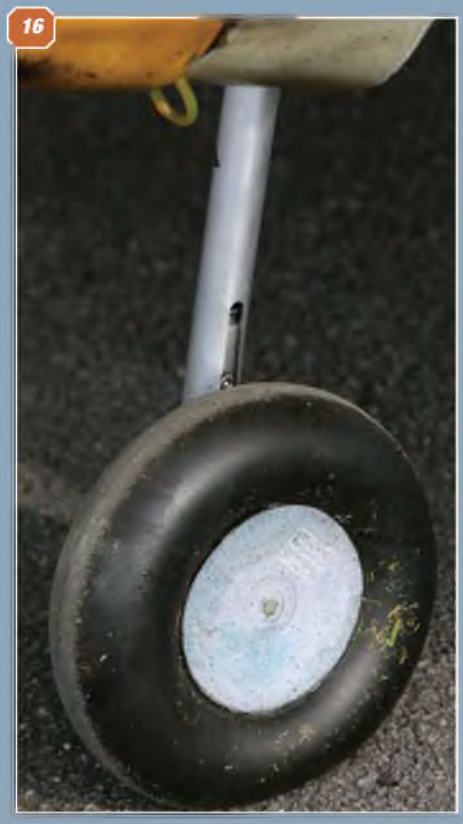
FLYING NOTES

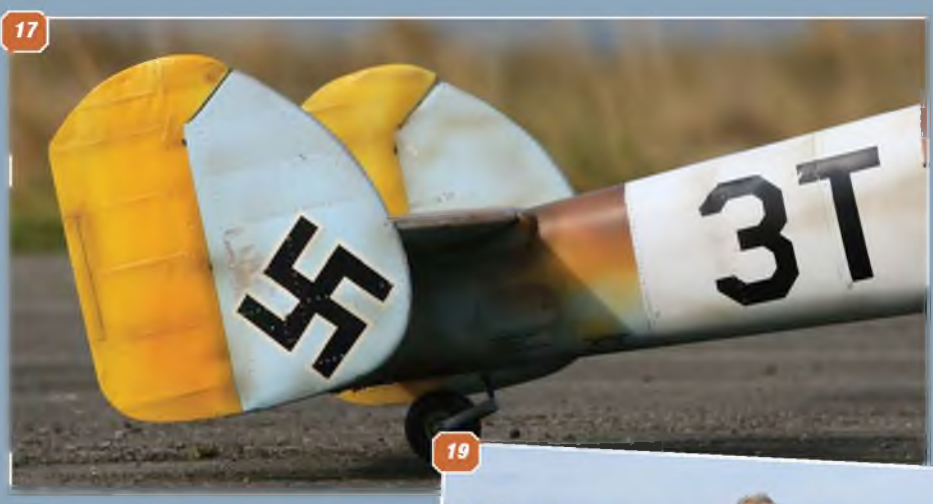
Stuart'sMesserschmitt Bf.110 looks pugnacious and impressive in the air. He reports wryly that:

"So long as both donkeys are in fine fettle, she is surprisingly straightforward to fly".

The model has plenty of power and flies and handles well. Loops and rolls can be accomplished, but as Stuart observes, they don't really look right. She is most convincing when winging in for a head-on attack.

The landing flaps are 'barn doors', which add considerable drag. In turn, this means that slow and steady approaches can be made with a brisk (and safe) power setting, but it is important not to let the





16: You can see the travel on the Dave Brown oleos. 17: Stuart has added subtle weathering throughout the airframe. 18: Trade mark distinctive fins and balanced rudders. 19: Stuart Knowles with his Zerstorer.

speed decay too much because this robs the elevator of sufficient authority to properly flare out at touchdown.

Steve points out that:

"The combined drag of full flap and two large props at near idle speed would not be increased if the Navigator threw out an anchor... it just stops flying! Bringing it in under power is the way to enlightenment...".

EPILOGUE

Stuart and Simon plan to fly both '110s together at scale events in 2016. Once details are confirmed I will pass them on. ■

SPECIFICATIONS:

Messerschmitt Bf 110 Zerstorer
Scale: Approximately 1/6th
Wingspan: 118inches
Weight: 34 lbs
Engines: 2 x Zenoah 26cc petrol
Prop type and size: 17"x8" Menz

Fins directly in line with the propeller arcs and substantial elevators aid stability in the air.

MESSERSCHMITT Bf 110

It seemed a good idea at the time of its inception, but the practcie failed to meet the theory until a different task was found for it

During the north African campaign 1941-'42 Luftwaffe transport aircraft carried supplies across the Mediteranean sea from Crete and Greece. Bf110s of III/ZF 26 provided escort protection and were also used in the ground-attack role. Three aicraft from this unit are seen here on an airfield in crete during 1942.

The Messerschmitt Bf 110 provides, for aero historians, the classic example of an aircraft of indifferent quality that was, for political and bureaucratic ends, hailed with unrealistic enthusiasm by the authorities responsible for its adoption. Consequently, the inevitable failure of the type when exposed to combat was doubly unexpected and humiliating, and many fine airmen were sacrificed on the altar of national pride and political expediency before the counsels of common sense triumphed to any extent.

The strategic fighter, or Zerstorer as it was melodramatically christened in Germany, was to be an aircraft capable of cutting a path for bomber formations through enemy airspace, eliminating fighter opposition and accompanying the bombers to and from their targets, and it is important to bear the essentials of this concept in mind if the full measure of the Bf 110's failure in that task is to be appreciated.

Such an aeroplane represents an obvious conflict between the demands of range and manoeuvrability although the concept was, nevertheless, realised in at least one effective aircraft during World War 2 in the form of the Lockheed P-38 Lightning which, although not strictly a product of this line of thought, demonstrated a successful solution to comparable problems of range, weigh, speed and control response.

It was inauspicious that the design team to which the zerstorer contract was allotted was, in all probability, never intended to succeed in producing a worthwhile aeroplane. Willy Messerschmitt's office at the Bayerische Flugzengwerke in Augsburg had been out of favour with the Secretary of State for Air, General Erhard Milch, for more than five years before the development contract was placed late in 1934. It seems more than likely that originally, Milch and his supporters saw the zerstorer theory, which they had accepted with less than unbounded enthusiasm anyway, as a convenient means of destroying Dipl.Ing. Messerschmitt's reputation for good. Similarly, when less prejudiced elements came to power in the Technical Department of the R.L.M., their determination to give the designer a fair hearing may have caused them to turn an indulgent eye on some of the more glaring inadequacies of the aeroplane which eventually emerged from this jungle of petty politics and jealousy.

During the summer of 1935 construction of the Bf 110VI was begun. It was a slim, low-wing, cantilever monoplane with an attractive, shark-like silhouette, and when two pre-production DB 600 engines of 900 h.p. were earmarked for the prototype by Daimler-Benz, the designers were relieved of their main problem. Previously, the 610 h.p. Junkers Jumo 210B had been the most potent German

A Bf 110D of III/ZG 26 on an airfield in Sicily, in 1941.

One of the rare survivors from WW2, this captured Bf 110G-4/R7 night fighter is now on display at the RAF Museum, Hendon and is the subject of our *'In Detail'* study elsewhere in this issue.

Messerschmitt Bf 110C-5 of the 4th Staffel, Close reconnaissance Gruppe 14. Note the patched battle damage to the left fin/rudder.

Pilot's position in the cockpit of a Bf 110 C-4.

View aft from the pilot's position, showing the observer/rear gunner's position.

powerplant available.

Maiden flight of the Bf 110V-1 took place on 12th May 1936 flown by test pilot Rudolph Opitz, who later played a major part in the development of the Me 163 rocket fighter. The prototype achieved 316 m.p.h. in level flight early in the trials programme, a speed comparable to that of contemporary single-engined fighter projects. The second and third prototypes flew in October and December of 1936, but when the Luftwaffe took over the Bf 110-V2 for a series of evaluation flights at Rechlin the following January, it quickly became apparent that this satisfactory speed was off-set by extremely poor acceleration and manoeuvrability.

Disregarding the reports of the experienced service pilots at Rechlin, the R.L.M. authorised the construction of four more airframes under the designation Bf 110A-O, to be (inadequately) powered by Jumo 210B engines due to a delay in DB 600 production. Two further machines were initially engined with slightly improved Jumo 210Gs as Bf 110B-Os. These airframes, completed in the spring of 1938, were re-engined with DB 600As a year later.

In the autumn of 1938 Bf 110B-1 production commenced. The DB 600A engine was now available, and the B-1 with nose armament of two 20mm MG FF canon and four MG 17 rifle calibre machine guns was undeniably a formidable unit of flying artillery - if its guns could be brought to bear.

Luftwaffe leader Goering (who was, predictably, an enthusiastic champion of the romantic-sounding zerstorer theory) had already instituted - prematurely - the formation of Zerstorergeschwader. Like the machine destined to be its weapon and its death-warrant, the organisation was born in bitterness. Of the limited manpower available to the still-young Luftwaffe, the majority were fighter pilots, and the Fighter Arm strongly resented seeing its best personnel drained off to equip one new unit after another. In the case of the Zerstorergeschwader, this resentment was aggravated when the 'stolen cream' of the Fighter Arm, once integrated into the Reichsmarshal's new toy, were in fact equipped with Bf 109Cs and Bf 109Ds while continued attempts were made to perfect the Bf 110. Thus the Bf 110B-I never saw true Luftwaffe service, the few examples built being employed almost exclusively on trials programmes of one type or another.

The first major production model was the Bf 110C which featured 1,100 h.p. DB 601A engines with direct fuel injection. Several variations on the basic design were produced including the C-4B and C-7 fighter-bomber, plus the C-5 reconnaissance fighter. The Bf 110D series were fitted with a variety of long-range fuel tanks and the Bf 110E was a specialised fighter-bomber. Of these, perhaps the most potent was the Bf 110E-I/R2 which could carry two 2,200 lb.

bombs beneath the fuselage.

The Bf 110F series were similar to the E model, but were fitted with 1,300 h.p. DB 601F engines. The F-2 was equipped with two 210 mm. WGr 21 rocket tubes.

By far the most important production variant of the Bf 110 was the G series which appeared late in 1942. The aircraft differed in being powered by two 1,475 h.p. DB 605B engines and could carry an armament of four 7.9 mm. machine guns and four 20 mm. cannon. The Bf 110G-2 was a fighter-bomber, the G-3 was a high-speed reconnaissance aircraft and the G-4, which was produced in parallel with the F-4, was a night fighter. A multitude of sub-variants were produced from the basic G-4 design featuring such refinements as different radar equipment, GM-1 power boosting equipment, additional armament etc.

Into service

Late in 1938, Goring established the first of the Zerstorergruppen - elite fighter units to be equipped with the Bf 110. The aircraft first entered service with I(Z)/LG 1 and when war was declared in September 1939, the Luftwaffe possessed nine Zerstorergruppen, although only three of these, I.(Z)/LG 1, I./ZG 1 and I./ZG 76 were equipped with the Bf 110C-I. All three units took part in the 1939 invasion of Poland, the Bf 110 proving more than a match for the ancient fighters of the opposing air force.

In December 1939, Bf 110s from I./ZG 76, in company with Bf 109s, intercepted 22 R.A.F. Vickers Wellington bombers over the Heligoland Bight with the result that only eight bombers returned intact. Not for another three years did a large Allied bomber formation interdict German airspace in daylight.

I./ZG 1 and I./ZG 76 took part in the invasion of Norway and Denmark in April 1940 and nine Bf 110C and D equipped Zerstorergruppen were operational for the campaign against France and the Low Countries in May.

Testing time

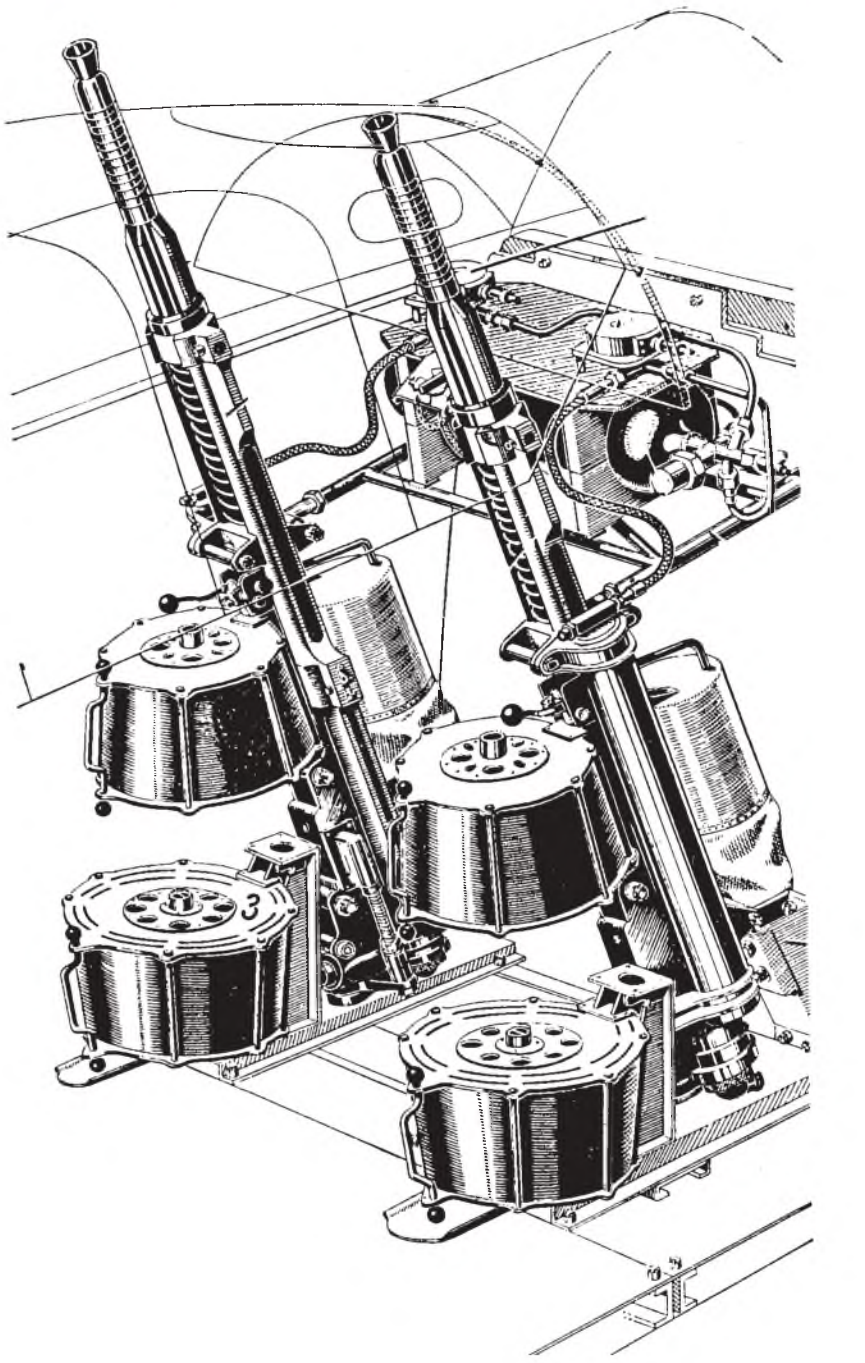
The first real test for the Bf 110 came during the summer of 1940 when the aircraft was used as an escort fighter for Luftwaffe bombing attacks on the British Isles. Nine Zerstorergruppen (drawn from ZG 2, ZG 26, ZG 76 and V.(Z)/LG 1) were operational for the Battle of Britain, plus the experimental fighter-bomber unit, Erprobungsgruppe 210. While being very fast, the Bf 110 suffered severely from the attentions of the highly manoeuvrable Spitfires and Hurricanes of the R.A.F. and the ludicrous situation developed whereby the Bf 109E had to protect the Bf 110.

A totally new task

Although proving a humiliating failure during the Battle of Britain, the Messerschmitt Bf 110 became an important aircraft in the Luftwaffe order of battle within a couple of years as it moved on to provide the backbone of the Luftwaffe's night fighter force until late in 1944.

Three night fighter Gruppen had been established within the Luftwaffe during early 1941, two of them equipped with the Bf 110. By June 1941, when German forces invaded Russia, four night fighter units (1, II and III/JG 1 and I.NJG 3) two fighter-bomber units (I and II/SKG 210) and three destroyer units (I, II and III/ZG 26) were operational.

Initially the Bf 110 night fighters attacked visually, but this was soon abandoned in favour of the *Himmelbett* system of ground-controlled interception. In February 1942 the *Lichtenstein BC* radar set was introduced into service. This set was carried onboard the aircraft with a complex radar array distributed around the nose. By February 1943, five night fighter Geschwader, NJG 1, 2, 3,4 and 5



'Schrgae Musik' (literally, slanting music) was the German term for Jazz and was the term adopted for the slaning, diagonally upward-firing dual gun system installed in some German WW2 nightfighters, including the Messerschmitt Bf 110. The attack technique was to stalk the Lancasters, Halifaxes etc., of the RAF night bomber force from the lower rear, to a position under the bomber, before firing a heavy burst into the bomber's underbelly.

In flight over Germany, this Bf 110 day fighter is seen during manufacturer's trials.

had been established, but in July the R.A.F.'s first use of the 'Window' jamming device rendered all German radar sets virtually useless.

However, by the autumn of 1943, at least for awhile, the Bf 110 was back in the day-fighter business with no less than seven Zerstorergruppen established in Germany as defence against the ever-increasing daylight attacks by U.S.A.A.F. bombers. At first the American bombers suffered heavily, especially from the rocket-firing Bf 110s, but the introduction of long-range escort fighters drastically changed the situation. By July 1944 the remaining Zerstorergruppen had been disbanded.

At the end of 1943 several new radar sets were introduced into Luftwaffe service, and during early 1944, Bomber Command suffered severe losses. Perhaps the worst was on 30 March when 94 bombers were shot down out of a force of 795 attacking Nuremburg. But, after the invasion of France in June 1944 the night fighter force rapidly declined. By December 1944, 913 night fighters were on strength, but only 150 of these were Bf 110s.

Towards the end of WW2, many night fighter units were reduced to nocturnal ground-attack sorties against Allied troops, and many aircraft were lost in this hazardous business. When the war in Europe ended on 8 May 1945, only NJG 1 retained the Bf 110 in any numbers, although the Luftwaffe's highest-scoring night fighter pilot, Maj. Heinz Schnaufer of NJG 4, was still flying his Bf 110. ■

Revealing its secrets! Captured Bf 110C-4 day fighter, on evaluation test, in wartime RAF markings.

ME-163
950MM

YAK 52
1200MM

SCALING
NEW HEIGHTS

SCALE DETAILS SUCH AS RETRACTABLE LANDING GEAR, FUNCTIONING FLAPS,NAVIGATION LIGHTS, ACCURATE IN SERVICE COLOUR SCHEMES, SCALE DETAIL PROPELLERS, POWERFUL BRUSHLESS ELECTRIC MOTOR.

SEA FURY
1200MM

P-40N
1100MM

DURAFLY®

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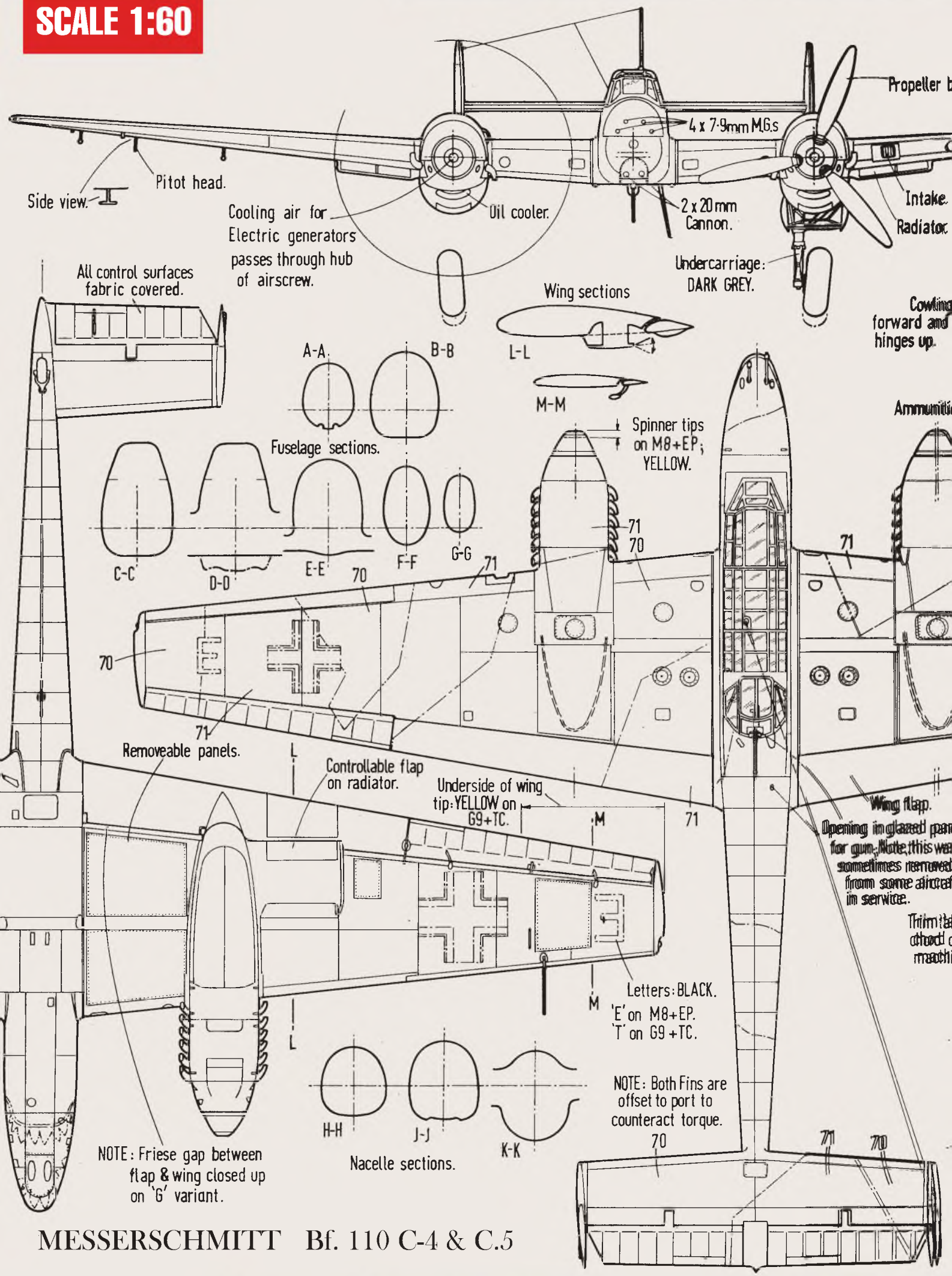
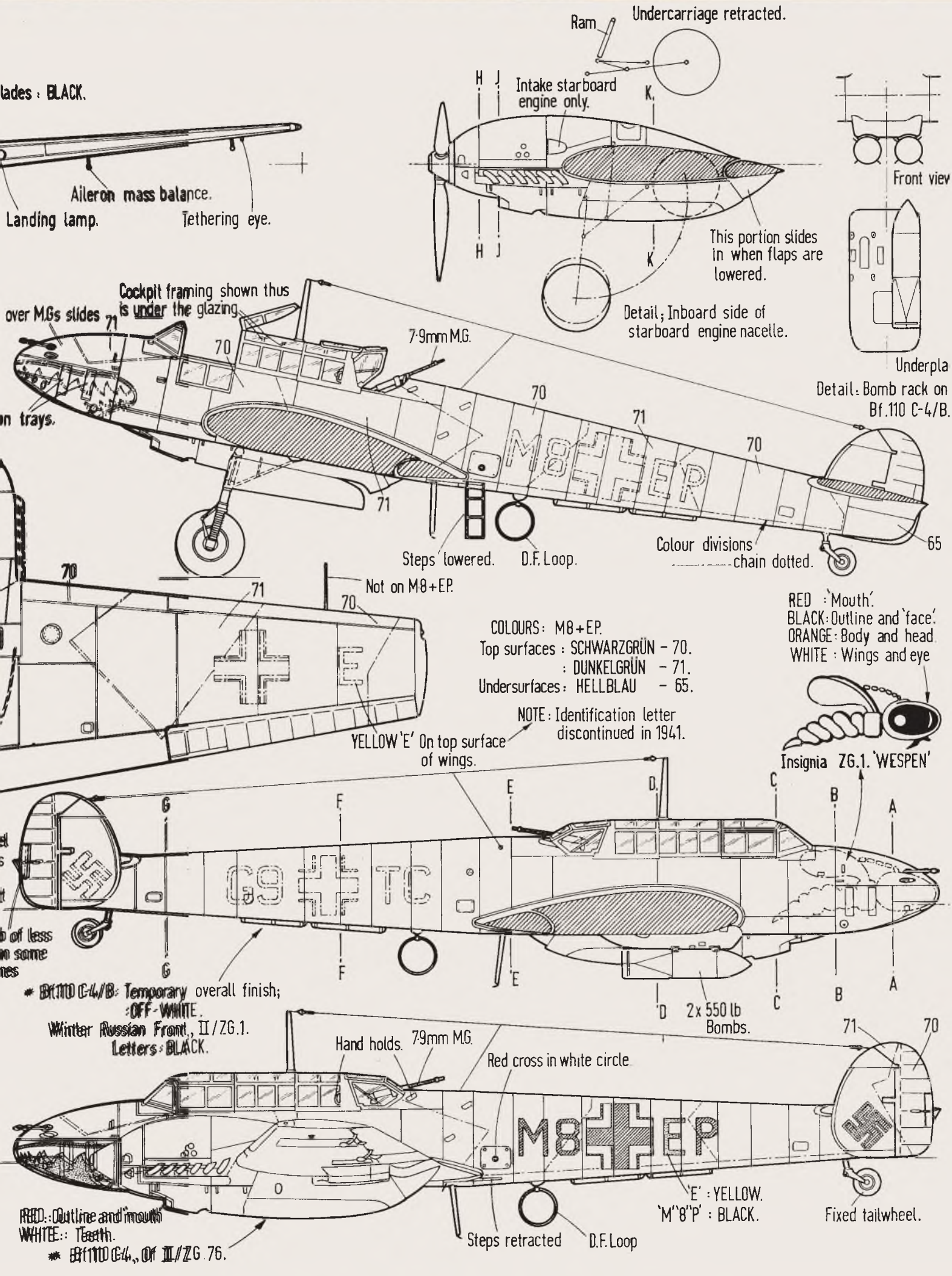
SCALE 1:60

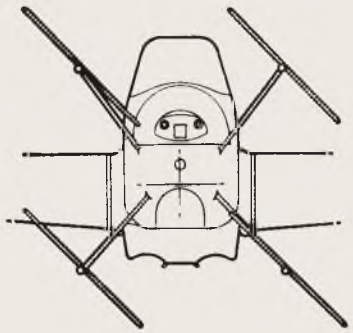


MESSERSCHMITT Bf. 110 C-4 & C.5

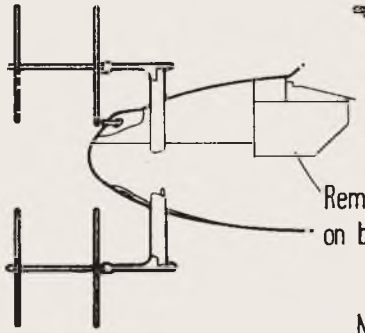

lades : BLACK.
Aileron mass balance.
Landing lamp.
Tethering eye.
Ram
Undercarriage retracted.
H J
Intake starboard engine only.
K.
H J
K
This portion slides in when flaps are lowered.
Detail; Inboard side of starboard engine nacelle.
Front view
Underpla
Detail: Bomb rack on Bf.110 C-4/B.
over M.Gs slides
71
Cockpit framing shown thus is under the glazing.
70
7·9mm M.G.
n trays.
70
71
70
M8+EP
71
70
65
Steps lowered.
D.F. Loop.
Colour divisions ——— chain dotted.
70
71
70
Not on M8+EP.
YELLOW 'E' On top surface of wings.
COLOURS: M8+EP.
Top surfaces : SCHWARZGRÜN - 70.
: DUNKELGRÜN - 71.
Undersurfaces: HELLBLAU - 65.
NOTE: Identification letter discontinued in 1941.
RED : 'Mouth'.
BLACK: Outline and 'face'.
ORANGE: Body and head.
WHITE : Wings and eye
Insignia ZG.1. 'WESPEN'
G
F
E
D
C
B
A
G9+FTC
G
F
'E'
'D'
C
B
A
2x 550 lb Bombs.
b of less
n some
nes
* Bf.110 C-4/B: Temporary overall finish;
OFF-WHITE.
Winter Russian Front., II/ZG.1.
Letters: BLACK.
Hand holds.
7·9mm M.G.
Red cross in white circle
71
70
M8+EP
RED: Outline and mouth
WHITE: Teeth.
* Bf.110 C-4, Of II/ZG.76.
Steps retracted
D.F. Loop
'E' : YELLOW.
'M' '8' 'P' : BLACK.
Fixed tailwheel.

MESSERSCHMITT Bf. 110 C-4 & C.5

Aircraft coded 'HI+GM' belonged to 4.(H)/12, a reconnaissance unit based in the Middle East. The full designation of the unit was 4.(Heeres) Staffel/ Aufklarungstaffel 12 or 4. (Army co-operation) Squadron/ Reconnaissance Group 12.

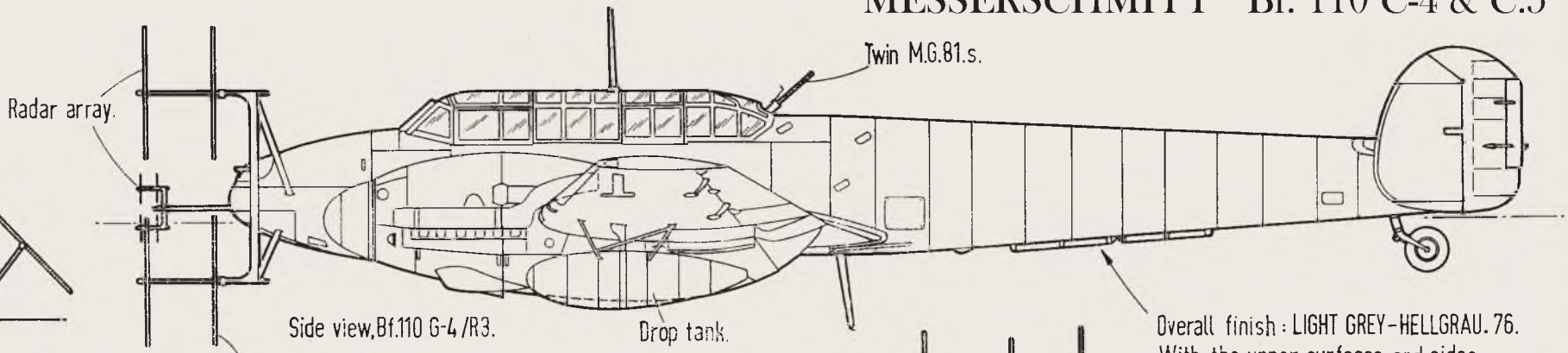


Front view, Bf.110 G-4/R-3. SN-2 Radar.



Side view, Bf.110 G-4/R-3. SN-2 Radar.

Removeable panel on both sides.



Radar array.

Twin M.G.81.s.

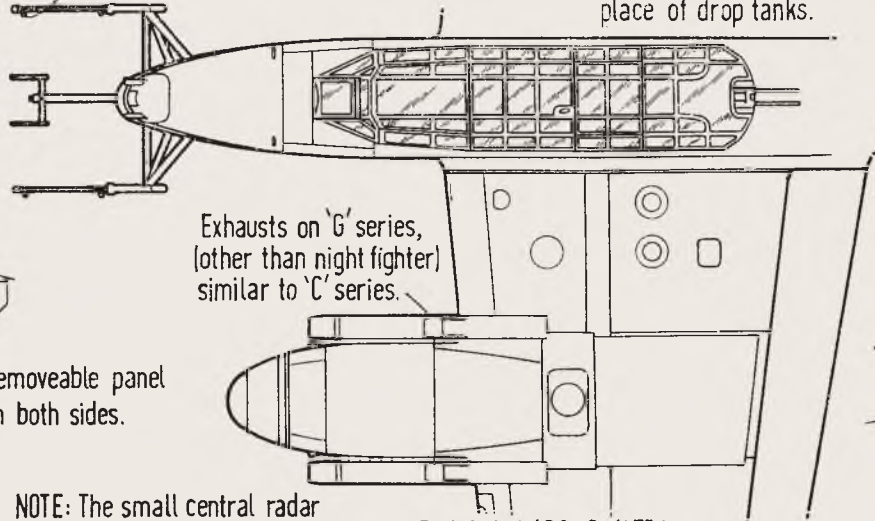
Side view, Bf.110 G-4/R3.

NOTE: Radar aerial cross-pieces attached to sides of horizontal bars.

Drop tank.

NOTE: Racks for 2 x 110 lb bombs may be fitted in place of drop tanks.

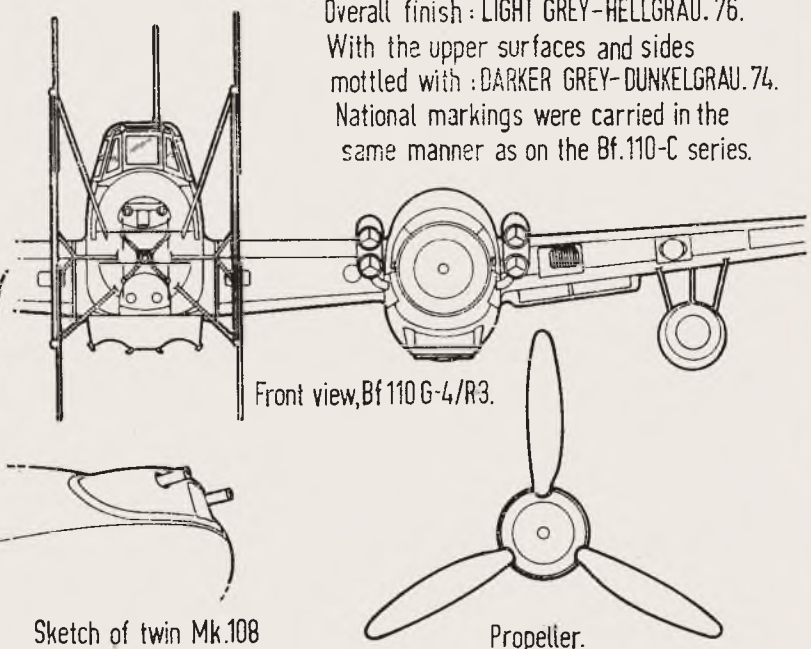
Overall finish: LIGHT GREY-HELLGRAU. 76. With the upper surfaces and sides mottled with: DARKER GREY-DUNKELGRAU. 74. National markings were carried in the same manner as on the Bf.110-C series.



Exhausts on 'G' series, (other than night fighter) similar to 'C' series.

NOTE: The small central radar aerial is fitted to some of the SN-2 type radar array.

* Bf.110 G-4/R3; 2x1475 h.p. Daimler-Benz DB-605 B.

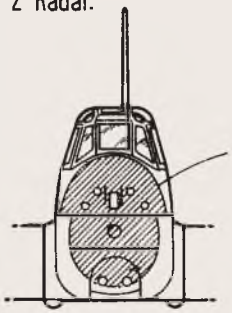


Front view, Bf 110 G-4/R3.

Sketch of twin Mk.108 installation in nose.

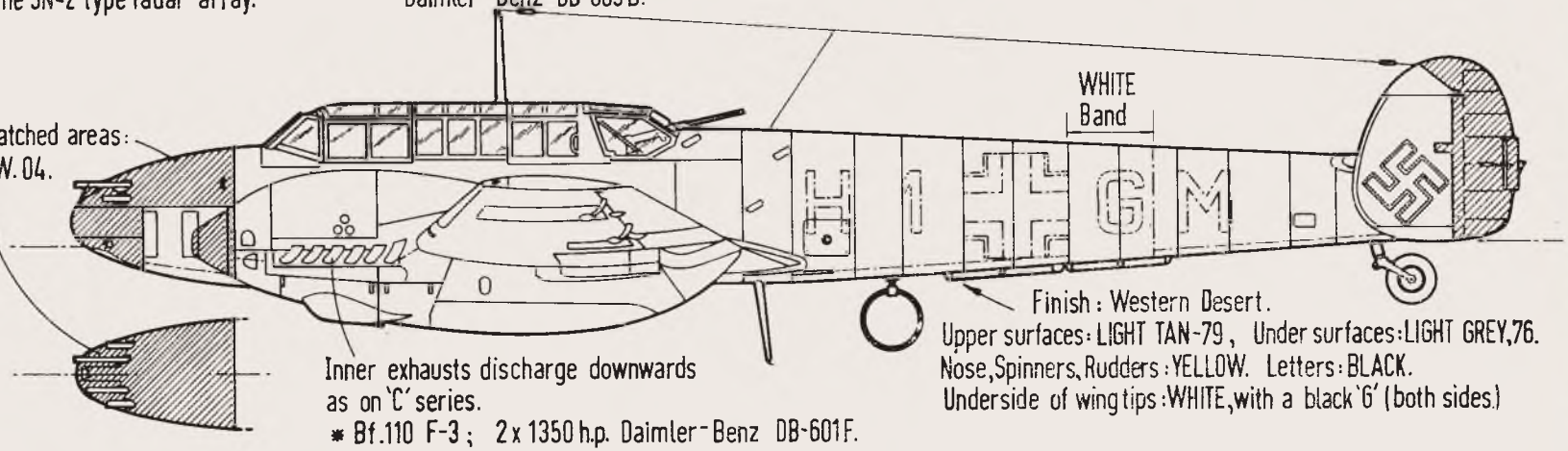
Propeller.

SCALE 1:60



Drawn by: IAN.R.STAIR.
Traced by: A.A.P. LLOYD.

Cross-hatched areas: YELLOW. 04.



Inner exhausts discharge downwards as on 'C' series.

* Bf.110 F-3; 2x1350 h.p. Daimler-Benz DB-601F.

Finish: Western Desert.
Upper surfaces: LIGHT TAN-79, Under surfaces: LIGHT GREY, 76.
Nose, Spinners, Rudders: YELLOW. Letters: BLACK.
Underside of wing tips: WHITE, with a black 'G' (both sides.)

MESSERSCHMITT BF110

A STUDY OF THE BF 110G-2 NIGHT FIGHTER AT THE RAF MUSEUM, HENDON

1 **1-5: The long 'greenhouse' cockpit conopy features many glazed panels, but few have compound curves.**

2

3

4

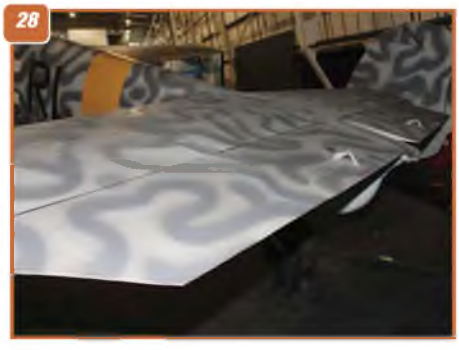
5

6 & 7: front and rear angles of one of the auxilliary fuel tanks carrier under the wings, outboard of the engine nacelles.
8: The fuel tank retainer shackles, also showing the fuel feed lines. 9: General view of the left engine nacelle. 10: Underside air scoop.
11: Rear view showing the wing skin fairing over the engine nacelle. 12: Further rear view, showing the main undercarriage fairing doors.
13 & 14: Two views of the nose spinner. 15 & 16: Two views of the fin and rudder assembly.
17: Aerial running along the rear fuselage underside centreline.

THE BF 110G NIGHT FIGHTER FEATURES AN EXTENSIVE FLAME DAMPER EXHAUST SYSTEM

18: Left wing nacelle outer side. 19: Left and right exhaust stack exits, either side of the left engine nacell. 20: Left engine, inboard flame damper. 21 & 22: Two views of the outer side flame damper on the right hand wing. 23: Inner side flame damper on the right hand engine nacelle.It exits under the wing, to clear the intake nozzle positioned on the upper nacelle at the wing joint leading edge.

24 & 25: Nose detail, showing hte lower gun ports. 26: The two upper gun ports in the nose. 27: The fixed tail wheel unit. 28: Tailplane upper surface. 29: Elevator trim tabs.



29

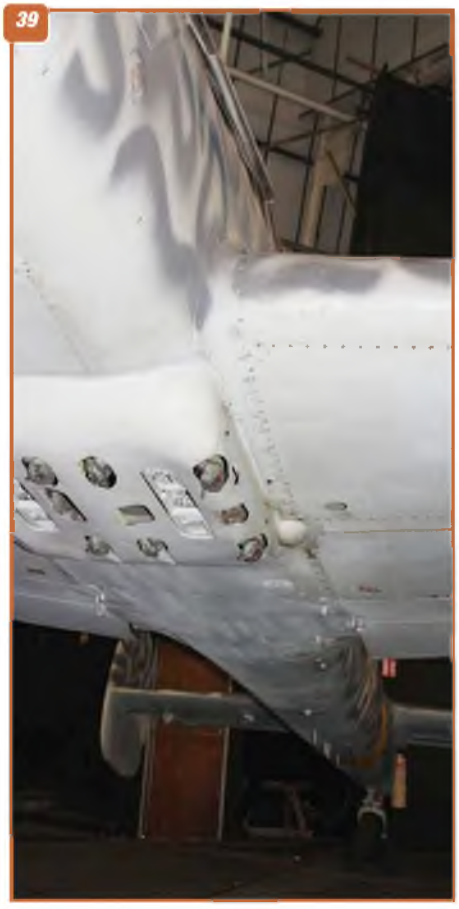
30

31

32

AIRBOURNE INTERCEPTION AERIAL ARRAY.

29 - 32: Giving the vague impression, maybe, of a Praying Mantis waiting to strike, the individual elements are quite extensive.



33: Main undercarriage leg and view up into the wheel well.

33 & 34: Inner and outer side views of the main undercarriage leg. **35:** Main undercarriage leg viewed from the rear.

37: The main undercarriage doors.

38: Further detail of the main undercarriage wheel.

39: View of the fuselage underside facing rearward.

40: Further view of the rear fuselage underside showing the position of the aerial array along the centre line.

41: Close-up of the bomb shackle on the fuselage centre section, the position of which can be seen in picture 39.


42


43


45


44

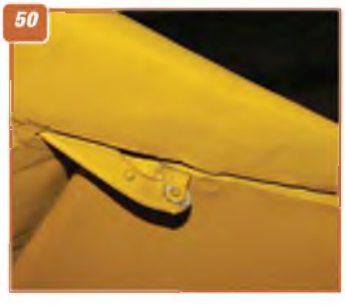

46

42: Aerial positioned on the outer left wing underside. 43: Variable cooler exit on the wing trailing edge at the engine nacelle position. Also seen in picture 44. 45 & 46: Underside view of the aileron, showing the two mass balances and aileron hinges. 47: Air intake in the left wing leading edge, just outboard of the engine nacelle. 48: Landing light in the left wing leading edge. 49: Further view of the aileron hinges and inner mass balance. 50: Wing tip aileron hinge. 51: Wing flap hinge line on the wing upper surface.


47


48


49


50


51

THE QUIET ZONE

R/C SCALE ELECTRICS WITH PETER RAKE

You see, I told you Tom built more than one model. One of them even uses the correct size wood.

As you can see, the tissue has been quite heavily wetted by the ink. This has the effect of pre-shrinking it as it dries out.

THE INDOOR FLYING SEASON IS WELL UNDERWAY, SO THIS MONTH PETER RAKE OFFERS FULL SIZE PULL-OUT PLANS FOR A NEAT LITTLE 18" WINGSPAN DE HAVILLAND DH6. PART 1 HERE DEALS WITH THE FUSELAGE AND WE'LL FINISH OFF NEXT MONTH WITH THE WINGS AND TAILPLANE

Okay then, off we go again. Another foray into the wonderful, and still slightly mystifying world of electric powered flying models. Well, it mystifies me at any rate.

Anyway, I have to be quite brief this month because I don't have much space in which to ramble on. This, as I'm sure you've guessed, is because I'm filling space normally reserved for the column with other stuff.

SO WHERE ARE WE?

This is the January edition, isn't it? So that means either you'll be looking forward to a visit from the chap in red, or it will already have happened. This probably means that you're about to acquire, or have already got a foam RTF model equipped with micro radio. Well, it's a sad fact of life that such models have a fairly hard time of it and often all too quickly end up as a box of mangled foam and

Larry's model has loads of detail features, but not without cost. The drag causes him problems given the altitude of his flying site.

some fully functioning, but devoid of an airframe in which to function, radio gear.

Fear not, Peter is here to help you out of such a sad state of affairs with a plan for a model to suit said radio gear. So now you'll have a choice of options for that radio gear, either build a model for it, or send it to me and I'll build my own model in which to install it. Oh come on, it is the Festive Season (more or less) and I thought you might be feeling in a charitable mood. Believe me, I'll take all the charity I can get when it comes to acquiring modelling supplies. You can keep the mangled foam though, even I'm not that desperate.

WHAT'S THIS MODEL THEN?

Now just hang on a minute, will you? I'll get to that all in my own good time. Firstly I have to extend my thanks to Larry Nagel and Tom O'Meara who both built prototype versions of this model. Larry did what Larry does, and went for scale appearance and a printed tissue finish. Tom, on the other hand, opted for minimum detail but actually built the model several times over and used a variety of finishes.

Why did he do that? Well, Tom is quite new to micro models and wanted to use the build to experiment with differing finishes and generally try things out to see what worked best and came out the lightest. Once we get a little further into this (we will do eventually, honest guv.) you may find some of his results a little surprising.

So, just for a change in terms of construction articles you get two totally different versions built from the same basic model. Basic construction for both remains pretty much the same, but the end results are vastly different. Both equally good, just very different in overall appearance - and performance, but more about that later.

Oh yes, you wanted to know just what model it is I'm rambling on about. Some people are simply never satisfied no matter how kind you are to them. Right, the model in question is an 18" wingspan DH6. There are no acceptable excuses for not building the model, it has to be about as simple as a scale model can get. Even if you add as much detail as Larry did it's hardly a complicated model. So, that's you told, you're building one so just get out there and get on with destroying that foamie.

TRIALS AND TRIBULATIONS

As I said, Tom built several of this model to try out different covering materials and techniques. Not all of which worked out as well as he would have liked. He found himself with the first model approaching completion as regards the airframe, only to discover that the laser cut parts he'd been supplied with were 3/32" balsa instead of 1/16". Not to be discouraged, a message was sent and two more sets of parts, the correct ones this time, procured. At least now he had an airframe that he could play around trying different covering material on without putting the actual model at risk.

Larry had, as mentioned, used printed tissue on his model (obviously the wood error gave him a bit of a head start) and Tom wanted to try something similar - which was when his problems really started. He tried various types of tissue, just about everything from gift wrap tissue to lightweight Esaki, and found that none of them wanted to shrink as well as he would have liked. Which was strange because neither Larry nor I had ever encountered this issue with our printed tissue finishes.

After a bit of discussion it transpired that Tom appeared to be going for somewhat denser colour that we had been using. As you can perhaps visualise, to get that denser colour, the printer has to apply more ink to the tissue. What was happening was that the ink was wetting the tissue enough to cause it to pre-shrink as the ink dried, thereby reducing its' ability to shrink further once it had been applied to the model. So, if you want to try printed tissue covering for yourself, don't try to make the colour too solid or you could find yourself in a similar situation. Anyway, Tom's solution was simply to reduce the opacity of his graphics in the program he used to create them. Reducing the opacity reduces the amount of ink applied at the printing stage and that, in turn, reduces the risk of pre-shrunk tissue.

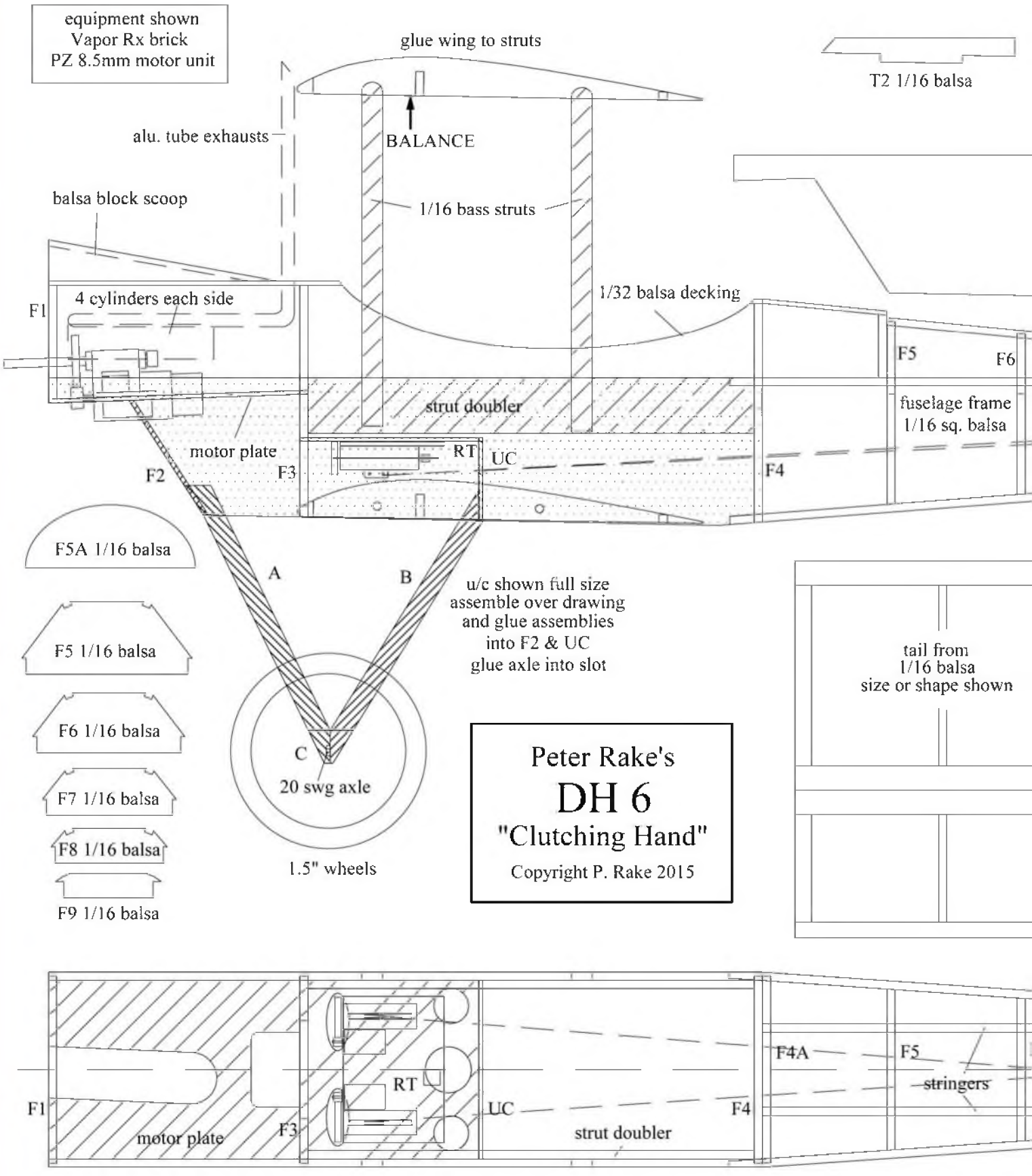
I make so much of this because although it was a disadvantage for what Tom wanted, it could very well be a useful feature if you are building very lightweight structures. Structures where the 'usual' amount of tissue shrinkage would be a distinct disadvantage. Believe me, I've seen only too clearly the damage shrinking tissue can do to a light framework. Pre-shrinking has long been the normal way to avoid warping delicate structures, and if that can be achieved at the same time your graphics are applied to the tissue, so much the better. We aren't talking about huge amounts of shrinkage (Tom didn't even notice that the panels had shrunk), so it won't affect your graphics to any great extent.

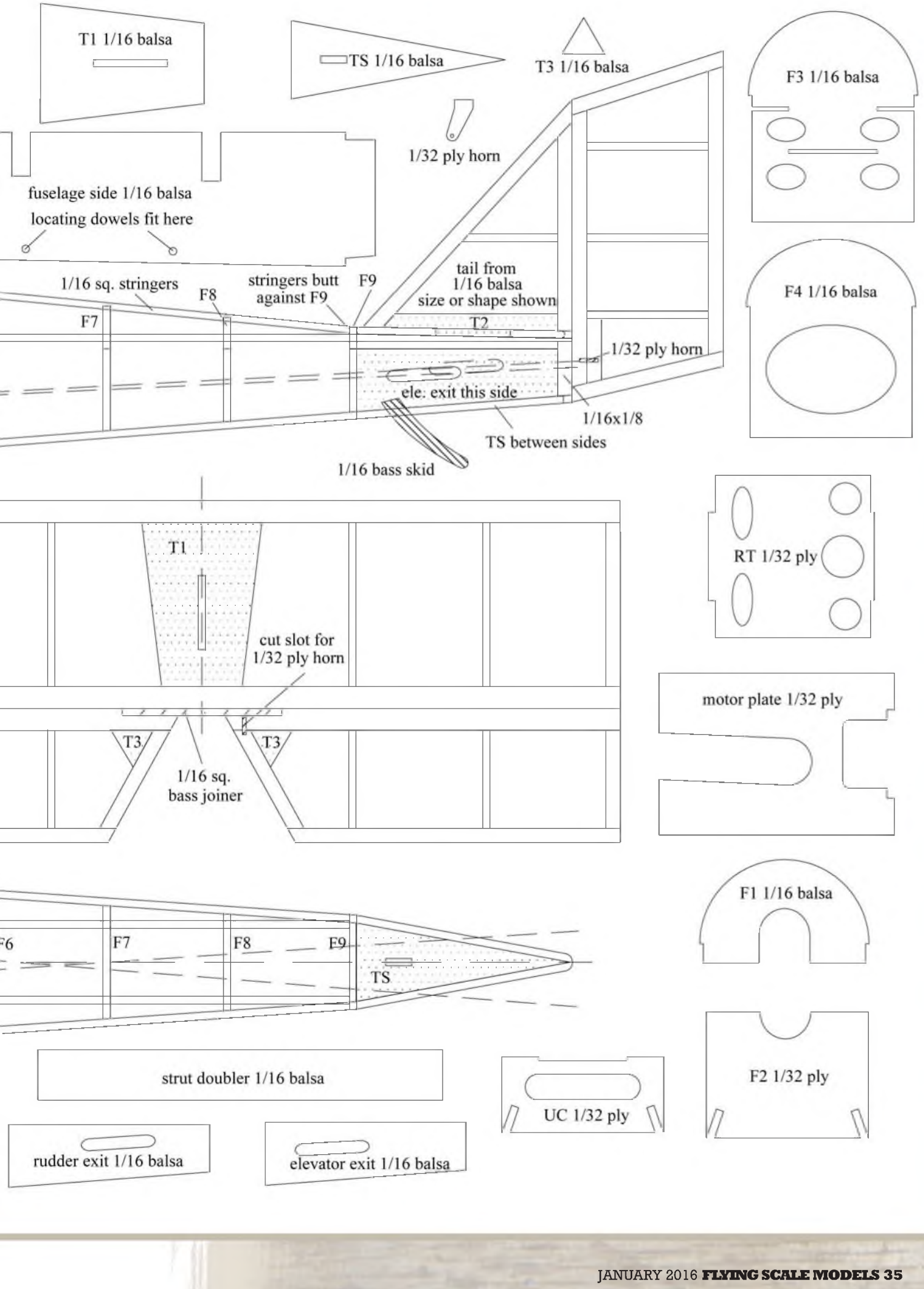
The interesting part of Tom's covering experiments involved what he actually ended up using on the model you see here. Throughout his build Tom was extremely particular about watching the weight each stage added to his model, including the various coverings. Although we generally tend to think of printed tissue as being about the lightest covering for this style of model, Tom found a far more durable covering that is only minimally heavier than printed and doped tissue. I'm sure you've often seen reference to using document laminating film to cover models, it isn't usually applicable to models this small simply because it's too heavy and shrinks too aggressively. However, laminating film comes in a multitude of thickness so, although the pouches you see just about everywhere are of much too thick a material to be of much use, Tom has a roll of 1.2 mil (mil, micron, I don't know, just suffice to say it's darned thin). That's what he opted to use on his model, applying the finish with an airbrush and what the Americans refer to as 'latex' household paint - probably what we term as emulsion. Strained to get rid of the lumps and suitably thinned apparently this takes well to the cleaned laminating film and results in barely any difference in weight to doped tissue.

Okay then, we'll leave things there and take a look at the actual construction of the model next time. You won't have the second part of the plan until then anyway, so it does no harm. Just gives you a little longer to kill off that 'foamy', ready for 'afterlife asa 'doner'! ■

Just to lend scale to things, Tom's laminating film model.

Despite having minimal detail, Tom's model still looks good in the air and suffers none of the issues Larry faced.


equipment shown
Vapor Rx brick
PZ 8.5mm motor unit
glue wing to struts
T2 1/16 balsa
alu. tube exhausts
BALANCE
balsa block scoop
1/16 bass struts
4 cylinders each side
F1
1/32 balsa decking
F5
F6
strut doubler
fuselage frame
1/16 sq. balsa
motor plate
F2
F3
RT
UC
F4
F5A 1/16 balsa
A
B
u/c shown full size
assemble over drawing
and glue assemblies
into F2 & UC
glue axle into slot
F5 1/16 balsa
F6 1/16 balsa
F7 1/16 balsa
F8 1/16 balsa
F9 1/16 balsa
C
20 swg axle
1.5" wheels
tail from
1/16 balsa
size or shape shown
Peter Rake's
DH 6
"Clutching Hand"
Copyright P. Rake 2015
F1
motor plate
F3
RT
UC
strut doubler
F4
F4A
F5
stringers
front
interplane struts 1/16 bass
rear
A
u/c legs 1/16 bass
B
C 1/32 ply


T1 1/16 balsa
TS 1/16 balsa
T3 1/16 balsa
F3 1/16 balsa
1/32 ply horn
fuselage side 1/16 balsa
locating dowels fit here
1/16 sq. stringers
F8
stringers butt against F9
F9
tail from 1/16 balsa size or shape shown
T2
F7
1/32 ply horn
F4 1/16 balsa
ele. exit this side
1/16x1/8
TS between sides
1/16 bass skid
T1
RT 1/32 ply
cut slot for 1/32 ply horn
motor plate 1/32 ply
T3
T3
1/16 sq. bass joiner
F1 1/16 balsa
F6
F7
F8
F9
TS
strut doubler 1/16 balsa
UC 1/32 ply
F2 1/32 ply
rudder exit 1/16 balsa
elevator exit 1/16 balsa

VOUGHT OS2-U-3 KINGFISHER

ERIC SMITH's 56 ins. wingspan sport-scale model of the Vought Kingfisher, for .60 to .90 motors and 4 or 5-function radio

Designed in 1938 and entering service in 1940, the Vought Kingfisher was a two-seat observation-scout monoplane for operation as a seaplane or landplane. It was designed for catapult launching and it saw active service with the U.S. Navy and British forces until 1945. The prototype selected by Eric took part in the Australian Antarctic Expedition of 1947/1948, hence the high visibility colour scheme. There is, in fact, quite a good selection of colour schemes for the 'Kingfisher', both in its land and floatplane forms.

The prorotype model being readied for test. Although the spae has been somewhat simplified from full size. The sport-scale model exudes all the air of the full size Kingfisher, aided by the surface detail which has been applied.

An unusual feature of the `Kingfisher is its ability to droop the ailerons, in addition to operating deflector plate (split) style flaps. When this was done, upper wing spoilers were used for lateral control. A machine gun was installed in the rear cockpit and the outer wing panels had bomb racks fitted.

The Model

This design is definitely sport-scale, the fuselage sides are flat but in the air, the model is very realistic. With the full size having a wingspan nearly 36 feet, the model is a little under 1/7th scale. Although no details are-shown on the drawing, it should be possible to make it convertible to the landplane variant if desired, by removing the floats and fitting a conventional wheeled undercarriage.

Modifications, to make construction and operation easier include 'squaring-off' the rounded fuselage, locating the wing at the lower extremes of the fuselage and reducing the dihedral. The latter two changes helped to minimise the length of the tip floats to avoid digging-in when alighting on water and also to reduce their vulnerability.

On reflection, these changes may not have been necessary. Scale size tip floats looked enormous, so they were reduced in dimensions somewhat, the rear' of the main float was also 'waisted' to reduce the rear float area.

Construction

If you don't have hot wire cutting facilities, find yourself a foam cutting service, or modelling colleague you can rely upon. Do cut out all the parts before commencing building and, during construction, remember that both weight and water are enemies. Keep it light and keep the water out.

Wings and tail surfaces

It is suggested that the wings and tail surfaces are built first. These can then be offered up to the fuselage when it is being constructed, to ensure a good fit. In particular, the joint between the wing and fuselage must be watertight and the wing, when finished should be covered at the centre with thin plastic and a joint seal formed on the fuselage, with silicone sealant, by forcing the wing to the wing housing.

Wing construction is standard veneered foam structure, having an aileron servo fitted to each aileron. The aileron area may be extended if you want to indulge in aerobatics. Note the 1/8" washout in the wing panels and don't forget to fit the hard points for the tip float fitting.

Tail surfaces also follow ·"Standard forms of construction, but decide on the control surface linkage methods before completing. Use lightweight balsa for the 1/8in. cores, or cut lightening holes to reduce the weight.

Fuselage

Fuselage construction is a simple sheet box structure with veneered foam and clear canopy structure super, with the lower fuselage corners founded off. Make the sides from 1/8" sheet, 1.5mm (1/16in) plywood, 1/4in. doublers and balsa triangle. It will help if saw cuts are applied to the top edge of the 1/2in. triangular to the rear of the fuselage to assist bending to the curvature. The fuselage tapers in plan view from F3 rearwards and it has to be a straight taper. Before the sides are joined with the formers, it is advisable to score the sides at F3 so that the bend can be achieved more easily.

Remember to include the 9mm (3/8") flat bracket and 6mm (1/4in) wing mounting supports.

Join the rear end of the fuselage, but do not fit the end block fairing at this stage. Fit FIA and B and sheet with 1/8in. balsawood. Ensure that the veneered foam decking pieces are not wider than the fuselage box. It is easy to sand a little off the 1/8in. sides to fair into the foam decking, the alternative may sand down to the polystyrene foam.

Beached! Handy cradle used for pre-flight start-ups saves the main and wingtip floats from surface damage.

Sitting on thr water, ready for action, Eric Smith's Vought Kingfisher has a destictive appearance.

In the air, the flat fuselage sides really don't detract from the overall impression!

The Kingfisher has excellent water handling. It gets onto the step easily and lifts off well at take-off.

Glue the 1/8, light, balsa sheet to the cockpit and observers, areas and the fuselage underside. The fuselage is now ready for rounding off.

Check the fit of the tailplane and elevators. These should be covered and clothed before fitting to the fuselage and this fitting will also depend on the control surface linkage methods used. On the prototype model, a closed-loop system was used for the elevators, on the port side only. If you intend to fit a steerable water rudder, it may be sensible to fit an extended torque rod, from the air rudder to below the fuselage, so that a closed loop connection can be made between the air and water rudder horns.

Either a moulded cowl or one built up from balsa block, as shown on the drawings, can be used, but note that the sides flatten slightly towards the rear of the cowl. Cowl fixings will be hardwood blocks, fixed to FI and FIA, for a GRP cowl, or through the cowl plywood backplate (CI) and into blind nuts at the rear of FI. The engine was side mounted on the prototype.

Floats

It is essential to obtain a firm glued fixing for the two main float struts and this is achieved by the method of float construction. The foam cores are cut in front and rear half segments and then cut, laterally, down the vertical centre line. This allows for the slots for the struts (ll15in x 3/4in) to be precisely cut on each side of the core centre and the recess formed for the 1/4in. former at the step location. Note that the rear of the float sides are 'scalloped' so that the section at the rear of the float is rectangular. These sides are covered with 1/8 in. balsa.

The float sections are joined, the top strut reinforcement added, the underside sheeting glued in position and the top structure veneered. When the struts are epoxied in place, ensure that they extend all the way to the underside sheeting.

Tip float construction should be self-evident from the drawings. All 'water' edges of these, and the main float, should be kept sharp. Silver soldering is recommended for the principal joints.

Engine and radio installation

A good '60' two stroke-engine will provide sufficient urge for the 'Kingfisher', while a '90' four-stroke gives an ample reserve of power. Throttle connections and fuel lines should be made as watertight as possible, using silicone sealant and petroleum jelly.

The fuel tank is accessible through F2 and you will probably need the battery pack in the area between FI and F2. Wrap this, and the receiver, in a polythene bag. There is more than adequate room for the servos, but keep them to the front end of the open fuselage area initially.

Finishing

Epoxy and 0.50z glass-cloth was used on all the sheeted areas and Solartex on the built-up rudder and elevator. Apply extra layers of cloth to reinforce the wing centre joint. After final sanding, prime the model with cellulose auto primer: thoroughly rub down, use a etch primer on the metal struts, Auto cellulose yellow topcote was then used overall, the panel lines were added with a draughting pen. Vinyl decal were used for the roundels other markings were painted on. The weathering and shading were air-brushed using black tinted clear dope.

Finally, an acid catalysed low-sheen fuel proofer (e.g. Aerokote Semi Matt) is applied to give a realistic finish. Check everywhere for possible water ingression.

Flying

The Kingfisher's water handling is surprisingly good, only in very choppy waters do the tip floats become a little vulnerable. Directional control was quite reasonable using the technique of a burst of throttle to make the air rudder effective during turns on water. The second owner of the prototype model decided to fit a steerable water rudder.

Take-offs are easy and safe - she rises on the step and the lift-off is smooth and predictable. The same applies to the landings.

In the air, she handles with authority, although she needs all the aileron movement you can obtain. Maximum differential is suggested; rudder and elevator controls are more that adequate. The only change from the first, successful flight was to more the balance point a little more rearward to the position shown on the plan. ■

"It was designed for catapult launching and it saw active service with the U.S. Navy and British forces until 1945"

VOUGHT OS2U-3 KINGFISHER (PLAN FSM 211)

Full size copies of this large THREE SHEET plan are available from Flying Scale Models Plans Service, ADH Publishing, Doolittle Mill, Doolittle Lane, Totternhoe, Bedfordshire, LU6 1QX. Tel 01525 222573 enquiries@adhpublishing.com Price £15.00 plus p&p (U.K £2.50; Europe £4.00; Rest or World £6.00.

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VOUGHT OS2U KING

American multi-task Fleet observation aircraft that, at times, became a welcome sight for do

GFISHER

wned airmen

In the late 1930s, the US Navy invited bids for a new shipbourn fleet observation floatplane aircraft capable of catapult launch from non-deck take off/landing surface ships. Among US aircraft manufacturers that took an interest to supply a replacement for the aging Curtiss SOC 'Seagull' then currently serving the purpose, was the Vought Company where Vought's Rex B. Beisel set about designing an observation monoplane aircraft capable of a range of tasks an observation monoplane aircraft capable of a multitude of tasks including directing battleship fire.

In replacing the standard biplane observation aircraft with a more modern monoplane design, Beisel incorporated constructional innovations becoming the first production type to be assembled with spot welding, a process Vought and the Naval Aircraft Factory jointly developed to create a smooth fuselage that resisted buckling and generated less drag. Vought also applied this new technique to their new, potent naval fighter type, their F4U Corsair.

For the new floatplane design, Beisel also introduced high-lift devices, spoilers and in a unique arrangement of deflector plate flaps and drooping ailerons located on the trailing edge of the wing which could be deployed to increase the camber of the wing and thus create additional lift that would assist in the virtually zero-length catapult take-off launch.

For combat missions, the pilot had a 0.30-caliber machine gun while the radio operator/gunner manned another 0.30-caliber gun (or a pair) on a flexible ring mount. The aircraft could also carry two 100 lb bombs or two 325 lb depth charges, Additionally, the 'Kingfisher', as it was designated, served as a trainer in both its seaplane and landplane configurations.

Vought's first prototype flew in 1938, powered by an air-cooled, 450 hp Pratt & Whitney R-985-4 Wasp Junior radial engine and the first 54 Kingfishers were delivered to the U.S. Navy beginning in August 1940, of which, six had been assigned to the Pearl Harbour-based Battle Force before the end of the same year. Many of the following 158 OS2U-2s were attached to flight training at Naval Air Station Pensacola, Florida, but 53 were assigned to equip the newly established Inshore Patrol Squadrons, based at NAS Jacksonville, Florida.

During WW2, the Kingfisher was widely used as a shipboard, catapult-launched scout plane on U.S. Navy battleships, heavy cruisers and light cruisers, as well as playing a major role in support of shore bombardments and air-sea rescue.

Two reported 'in-action' incidents showing the aircraft's rescue capabilities include the recovery of World War I ace Eddie Rickenbacker and his crew from the Pacific ocean in November 1942 and Lieutenant John A. Burns' unique use of the aircraft in April 1944 to taxi airmen rescued from the Truk Lagoon to the submarine USS Tang, which was serving rescue duty near the atoll on that date. In all, Burns rescued ten survivors on two trips and was awarded the US Navy Cross for his efforts.

Throughout its U.S. Navy service, the OS2U and even its predecessor, the Curtiss SOC Seagull served much longer than planned, as the planned successor, the Curtiss SO3C Seamew, suffered from an insufficiently powerful engine, and which was a complete failure. The OS2U was only slowly replaced in the latter stages of World War II with the introduction of the Curtiss SC Seahawk, the first examples reaching the

U.S. Navy in October 1944.

A total of 1,519 Kingfishers were built, serving on battleships and cruisers of the US Navy, with the United States Marine Corps, with the United States Coast Guard at coastal air stations, at sea with the Fleet Air Arm of the Royal Navy, and with the Soviet Navy. The Royal Australian Air Force also operated Kingfishers from shore bases. Australia received 18 Kingfishers from a batch of aircraft ordered by the Dutch East Indies that was diverted to Australia in 1942. They were initially used as training aircraft for pilots destined for flying boats, but in 1943, they were used to equip No. 107 Squadron RAAF, which carried out convoy escort duties until disbanded in October 1945. One Kingfisher was used in support of the Australian National Antarctic Research Expedition in 1947-48.

SPECIFICATION

Length: 33 ft 10 in (10.31 m)
Wingspan: 35 ft 11 in (10.95 m)
Height: 15 ft 1.5 in (4.61 m)
Powerplant: Pratt & Whitney R-985-AN-2 radial engine, 450 hp (336 kW)

PERFORMANCE

Maximum speed: 164 mph (264 km/h)
Range: 805 mi (1,296 km)
Service ceiling: 13,000 ft (3,960 m)

ARMAMENT

Guns: 2 x .30 in (7.62 mm) M1919 Browning machine guns (one on turret for observer)
Bombs: 650 lb (295 kg) of bombs

HERGT MONOPLANE

A 30" span electric powered model designed by Peter Rake, with the prototype model built, described and test flown by John Frost.

The Hergt Monoplane is another of the small, IPS style powered designs I have been asked for by various modellers around the world. Because I can design them far faster than I can build them, I'm always willing to offer someone else the opportunity of test building a model on my behalf. Surprising as it may seem, this has actually proved quite a popular pastime with several builders, to whom I am eternally grateful.

It was as a result of other prototype builds that John, who hails from Northwood, New Hampshire, contacted me to see if I had any designs in need of a builder. As is usually the case, there were three or four 'unclaimed' designs for him to choose from.

John openly admits to being fairly new to the hobby of small, electric powered radio control model aircraft. He is entirely self taught (the ONLY way to learn when I started model flying - back in the Dark Ages), having worked his way through several GWS foam models, a couple of kits and a rubber power model conversion. The latter models convinced him that balsa construction was the way to go and he has since built various park flyer style models. The Hergt, however, is his first model built solely from a plan.

Anyway, with the introductions completed, I'll hand you over to John for all the interesting stuff. Afterall, no-one knows the model as well as John, so who better to tell you about it?

"The latter models convinced him that balsa construction was the way to go and he has since built various park flyer style models"

Cutting a kit of parts is simplified by the patterns on the plan, not that there are that many parts to be cut.

Nothing complicated about the fuselage side frames. Getting a straight fuselage is easy with this one -what you see here is the only taper involved.

With the basic box structure assembled, John begins to add decking formers.

Models fly better with square fuselages so take care to keep it that way. This is especially important while adding sheet decking.

Okay, so this one is covered, but note the way the carbon joiner and hinge tube are built into the elevators.

When I initially approached Peter about building one of his prototype IPS designs, I had no model in particular that I was looking for to build. I have reached a point in my model selecting where I tend to lean towards the more obscure. I didn't realize just how rare this one was untill I tried to find some scale documentation. There was very little available out there on this one, so it lends itself to many 'what-if' type colour schemes.

ABOUT THE MODEL

The model is designed for a GWS IPS power system or small outrunner type brushless motor. I opted for the IPS drive with a 12mm IPS brushless replacement motor from *Medusa Research Labs*. The wingspan is a generous 30" with an approximate 7" chord, which allows a fairly light wing loading for a model in the 7 to 9oz. range. The AUW of my prototype was around the 9oz. mark, so don't worry if yours comes in on the heavy end. *(Considering how chunky the fuselage of the Hergt is, it comes as no surprise that the model weighed that much. The surprise, bearing in mind the battery capacity John used, is that it didn't weigh more. PR)*

EQUIPMENT

The R/C gear for this one is pretty simple and affordable being just Rudder/Elevator/Throttle. I installed the following in the prototype:-

Motor: Medusa 12mm brushless IPS motor with "S1" gearing
Battery: Two-cell 730mAh Thunder Power LiPo
Propeller: 9x4.7 GWS slow-fly
Servos: Two GWS pico
Motor Speed Controller: Cermark 7 amp brushless ESC
Receiver: GWS pico

THE KIT

The 'kit' once printed out required several sheets of various thickness balsa, ply and liteply, most of which were the following - 3/32" balsa,1/8" liteply, 1/16" balsa, 1/32" ply, 1/4" balsa and 1/64" ply. Because all parts that need cutting are shown on sheet size panels, transferring part shapes is easy. Lightly paste or spray mount the cut out sections of plan to their appropriate material and then treat it as an old style print-wood kit.

In addition to these few sheets of wood, you'll need some strip balsa, a small amount of wire and rubber cord for the tyres.

FUSELAGE

This a pretty simple assembly. I started by building the left and right halves over the plan. Next, I pinned the left side of the fuselage upside down over the plan, then added formers F1, F2, F2B & F3. Pin and glue as needed (making sure formers are squared properly) Note: Pay special attention to the orientation of former F2B because this sets the wing dihedral later.

Next, was to position the right fuselage half over the plan and glue to formers F1, F2 ND F3. After that, I added the 3/32" balsa cross pieces to the rear of the fuselage. The undercarriage supports UC1 & UC2 were added, along with the top formers F1A through F6A. I then sheeted the fuselage where required. *(Take extreme care during the sheeting of the rear fuselage not to induce any twists. (Securing the front fuselage to the building board and jigging the rear fuselage should prevent the problem. PR)* The battery/equipment hatch was built at this time and set aside.

The undercarriage called for basswood parts A & B and (2) 1/64" ply parts C. Pin these over the plan and glue (two required) Remove from plan, sand and set aside for final assembly.

COWL

Peter's design requires the gluing a strip of 1/32" ply around formers C1 & C2 then adding (2) part N nose blocks, which are shape. The finished cowl should be glued in place on the fuselage. I opted for a removable cowl by adding two 'ears' to former C2 which I made from 1/32" ply.

(Whilst this is a perfectly viable option, another possible means of retaining the cowl is to use short locating dowels and small rare earth magnets to hold it in place. The magnet system also works well for retaining access hatches. PR)

TAIL SURFACES

These are pretty simple structures. The rudder being a bit the more complicated requiring an outer lamination of (3) 1/32" strips of balsa. The hinges for both surfaces consist of aluminium tube and carbon fibre rod. Control linkages for both surfaces are pull/pull systems, which was a first for me, but worked out quite well.

WINGS

The wing halves are also a fairly simple construction. I started by pinning down the leading an trailing edges, wingtips and main spar. I Then added ribs R1 through R4. Next, glue all the joints and add the 1/8" wing locating dowels to rib R1. Repeat for opposite wing half and

Hardwood motor post suits either basic GWS style unit or, as John did, a brushless equivalent. Plan also shows CD-R type motor installation.

The all wood u/c legs glue in place and the access hatch fits between them.

sand as needed. (Although rib R1 is easily identified, ensure that R2 goes in the correct position. Like R1, it is 1/32" less high that the remaining ribs. This is to allow for the root bay sheeting. Don't be tempted to omit the sheeting; it will help prevent distortion of the root rib once the covering is shrunk. Also worth noting is that the spars are BASS. VERY HARD balsa could be used, but under no circumstances use anything softer. Since this model has no rigging, the spars are all that prevent the wings clapping hands during flight. PR)

COVERING AND FINISHING

As mentioned earlier, the colour scheme for this one is a tough one for the 'scale minded', but lends itself to many 'what ifs'. The covering I used on the prototype is a readily available document laminating film widely known as 'doculam'. But, any lightweight covering would be suitable. Paints were a variety of spray paints and acrylics that I had on hand. *(As near as I can tell, the actual scheme appears to have been clear doped flying surfaces, with a white painted rudder bearing a cross and a dark, possibly stained ply fuselage with aluminium cowl. Apart from those on the rudder, no other crosses were carried. Quite possibly this is because the tail surfaces were salvaged from a Fokker*

One advantage of doculam covering is that it allows us to see the straightforward structure even after the model is covered.

monoplane, they certainly have that look about them. PR)

The insignia I chose were basically a mix of some decals I had and some that I printed out on decal paper from *BelDecal*. All designs were the early German crosses. *(For those wishing to depict their model in a similar scheme to John's, I'm quite happy to prepare a file of markings suitable for home printing on clear decal paper. The white boxes are down to you to paint onto the model because unless using expensive decal paper, the white just isn't solid enough. However, I'll arrange the crosses so that you can use white decal paper if you so desire. PR)*

ASSEMBLY

The assembly of the Hergt Monoplane is pretty straight forward. I started by adding the tail surfaces and getting the pull/pull system servos in place (directly under cockpit area) and hooked up. Next was adding motor and cowling, and umdercarriage with wheels and axle. The wing assembly is very simple and self aligning. Simply slide into place and glue.

Next, I added the RX & ESC in the forward area and fashioned a simple battery tray between the servos and F1 former, allowing room to move the battery forward/back to attain balance.

To top it off, I carved a pilot figure from scrap balsa. These open cockpit planes just didn't look right without a pilot...

(As a slight variation on John's assembly sequence, I normally fit the wings first, and then use the wing/fuselage assembly as an alignment guide while fitting the tail surfaces. I find it particularly helpful in the case of all moving tail surfaces because it gives you something positive to align the hinge tube to. PR)

FLYING

Finally after tinkering and double checking of rudder/elevator deflection, proper balance, motor rotation, etc., it was off to maiden the little monoplane.

I initially set up the controls with reduced throws because of the short tail moment on this plane and was anticipating some 'touchy' response. This was perhaps a bit of an understatement.

All was set to go, so I applied throttle and immediately the plane went up into a stall, but I managed to recover due to the gentle stall characteristics. I climbed it out a bit amidst the swoops and dips and added some down and right trim, but she was still a bit twitchy on the controls with minimal input. I flew it for a few more minutes and decided to bring it in. Despite the twitchy behaviour I managed to line it up for a smooth landing.

I took it home to make a few modifications, especially to the battery position. I also reduced the throws to 1" on rudder and 1/4" on elevator. I also decided to try a GWS 9x4.7 prop (a slightly slower pitch than the original 8x6) Lastly I decided to move the CG forward an 1/8" hoping this would take away some of the twitchy behaviour.

The second flight was noticeably better with a nice smooth climb out and no stall. I was able to cruise around nice and scale like. You can almost walk beside this one at slow speed. The stall was still uneventful, the model just drops to one side and glides out.

After about 6 or 7 minutes of relaxing flying I opted to bring her in. I was able to line it up with much less effort than previously. I reduced throttle as it descended and right at touchdown cut the throttle and added a bit of up elevator to keep the tail down for a smooth rollout without nosing over (The grass was short which helps!).

So, there you have it, another happy customer and hopefully a willing volunteer for at least one more prototype build. Well, John can't have been too dissatisfied with how things worked out; he has already made enquiries about the possibility of me drawing him an Albatros DVa. That may take a while to materialise, but I am looking into it. I really do need some Albatros types in the range and those slim noses are ideally suited to brushless outrunners. ■

- MASTER MODELS
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FEATHER NUMBER TWO!

IN PART 1 OF THIS FEATURE, GORDEN WHITEHEAD LOOKED AT THE THEORY BEHIND ACHIEVING CONTROLLABLE FLIGHT IN AN ENGINE-OUT SITUATION WITH A TWIN (OR MORE). IN PART 2 HERE, WE WILL SEE WHAT ACTUALLY HAPPENED WHEN THE AUTHOR PUT THEORY INTO PRACTICE.

THE WRITER'S P-38 LIGHTNING EXPERIMENTS

So how does all this work out in practice? Let me describe some experiments I performed with a 1/12th scale hand-launched Lockheed P-38 Lightning.

I allowed one engine to die early, by only putting two minutes' fuel in one the tank, whilst filling the other full. I did three flights with the left engine cutting first and three with the right hand one cutting early, checking out each extreme control combination several times on each flight.

Ted Allison's big De Havilland Hornet. It cme to grief during one of the LMA Cosford events.

North American B-25 Mitchell

North American Aviation OV-10 Br

CAPTION CONFUSION!!

Please note: the captions to Figs 4 & 5 on pages 23 and 24 of Part I in December issue were incorrectly transposed.

Naturally, I kept the model at a good height in case things became 'hairy' and when, on occasion, the inevitable happened and the model attempted to take over, I would return the controls to the correct 'balanced' combination. Each flight lasted about eight minutes. The model weighed 41b 120z, with two 0.S.15 motors on Graupner 7"x6" props, burning 10% nitro fuel.

LEFT ENGINE CUTS FIRST, LEAVING THE RIGHT ENGINE ON FULL THROTTLE:

Using the Wings Level Technique **(Fig 3)**, the model trimmed out for straight flight using about a quater of maximum rudder deflection alone. It was happier with a little aileron applied to assist the rudder. It was essential to hold in some down elevator to prevent the aeroplane from slowing down. A shallow climb was achieved, even with this down-biased stick. Safe turns in both directions were possible using aileron and elevator, keeping rudder constant.

Now, trying the 'Wings Banked Technique' **(Fig 4)**, the model could be made to fly a straight path by applying almost full aileron towards the live engine with the rudder held at neutraL Some down bias on elevator was again required.

Whenever one turned the model in either direction, using aileron or rudder, one eventually lost control because the extremely draggy attitude slowed the model to below minimum control speed, whereupon an incipient power spin developed. This was countered by throttling back and diving out to regain full airspeed.

So far, it looked as if rudder had more to offer than aileron in an engine-out situation.

ABOVE: FULL MARKS FOR AMBITION, EH? Les Eagles' Lockheed Super Constellation at 1/8th scale spans 18' 9". Not a good one on which to lose both engines on one side!

onco

Careful with the wing tip! Cal Branton"s Douglas C-47.

The amount of time and effort invested in something like Max Merkenschlager's World Champs standard Grumman F7F Tiger serves to emphasise to need to master asymmetric power control.

Airspeed Envoy is an example of a twin engine type with engines reasonably close to the centre line - which makes 'one-engine-out' a more managable problem.

James Pelly-Fry's Douglas A-20 Boston had twin .40 engine power. He flew Bostons during WW2.

RIGHT ENGINE DIES

Now let's see what happens with the right hand engine dead.

With the 'Wings Level Technique', the model could again be made to fly straight using a heavy bias on the rudder stick against the engine and was again happier with a spot of aileron and down trim. Turns had to be made using rudder only. The model felt constantly on the point of overbalance and wanted to fall over one way. or the other. That is, if you tried a right turn, the model over-reacted into the turn and a similar thing happened to the left.... Not too good, methinks.

Using the 'Wings Banked Technique', it was impossible to make the model fly straight on aileron alone. Initially, the aeroplane entered a wide horizontal turn to the right, which gradually became a spiral dive. To extricate the model, I had to throttle back the engine, push the model into a dive for speed and then recover to balanced flight using properly co-ordinated rudder-aileron control before repeating the trial. This behaviour was unacceptable, of course.

The foregoing set of trials showed that the model behaved better in asymmetric flight using rudder and not aileron to counteract the live engine. Also, there was a big difference in the overall controllability of the model, depending upon which engine kept going. If the right hand engine kept going, one was able to achieve a controllable flight pattern. If the left engine kept turning, a stable controlled flightpath was harder to achieve.

Safely down, with both engines running and full flap deployed, the Douglas DC-3/C-47 is a perennial favourite of those with the ambition to fly scale twins.

Bristol Blenheim in WW2 'Free French' markings. There's as much choice in twin engine scale subjects as for single engine types.

The North American B-25 Mitchell is a popular twin engine scale subject. This one by Lyle Vasser.

How to make an impression and play it safe! Tupolev Tu95 'Bear', has all four turning - but they're all electric! Nevertheless, if you lose one, the same asymmetric control applies.

BALANCED FLIGHT WITH CO-ORDINATED AILERON/RUDDER

Once one engine had been allowed to die, I needed to fly the model comfortably in the periods between the 'wings level' and 'wings banked' experiments; and of course I employed the balanced control inputs illustrated in **Fig 5**. The model still proved to be much happier flying on the right engine alone, rather than on the left one and it was possible to gain enough height from which a dive would permit a roll or a loop to be performed.

Although the Lightning did behave reasonably well on the left engine alone and gave the pilot a good chance of survival, aerobatics were not on the agenda in this condition!

And here we have a conundrum. It is an oft-quoted fact that, if both engines on a twin rotate the same way as our models and one engine stalls, the aircraft will be easier to control on the left-hand engine alone than on the right-hand engine. However, if you experiment with purposely initiated asymmetric flight on one engine, as your scribe has done frequently, you might find things happen differently.

Your scribe's DH Hornet and Lockheed Lightning models definitely handled better on the right engine alone rather than the left one! Apart from some variation in behaviour which might be attributable to scale effect, or the fact that I am right-handed, the only other reason I can surmise which would explain the discrepancy, is that my models had two degrees of down thrust incorporated on each engine (but no sidethrust) and this change in thrustline can be shown to move the centre of thrust of the starboard propeller inboard, effectively reducing the yawing effect of the right-hand engine; and vice-versa for the port propeller.

PRACTICING FOR ENGINE FAILURE

So let's now summarise the emergency actions required when one engine cuts on a twin. You must impress these actions, or your own versions of them, into your mind before venturing to the field. Any plan is better than none. Incidentally ... you were going to practise asymmetric flight, weren't you?

Emergency procedures should be practiced away from real world distractions, so for your first experiments, you need the air to yourself and hopefully your clubmates will grant you some unencumbered air time. You now fill one tank, measure 2 to 3 minutes' worth of juice into the other, (not half a tank, or you'll get impatient and increasingly nervous with the waiting), start up, take off and get her to a sensible height.

ENGINE CUT!

When an engine cuts, you will hear a change in engine sound and then see the model begin an uncommanded turn one way. If there are other engines running, you may not hear the engine failure and your first indication will be the change in model behaviour.

When this inevitable and always disconcerting turn begins, you smartly apply opposite rudder to straighten the model. At the same time, you forward bias the elevator stick to maintain airspeed and feed in co-ordinated aileron to produce a slight bank towards the live engine. Maintaining airspeed is very important since, if you let the model slow down, all three flight controls will lose effect and the live engine will take over. During your early asymmetric power experiments, put the model into a shallow dive immediately after the engine cuts.

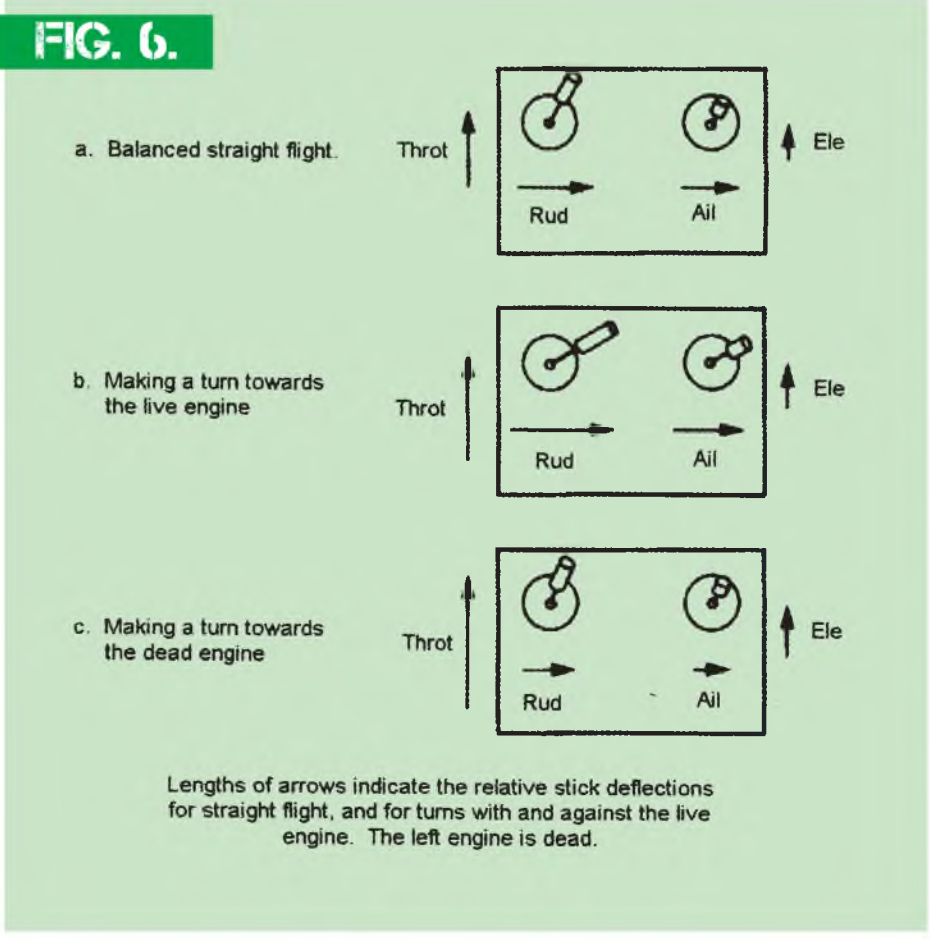
Having sorted out the situation SO far and kept calm, you will now have to turn the model. I'll describe the procedure with reference to the transmitter stick inputs I've been using in my experiments. See **Fig 6a**.

TURN NOW!

To enter a turn towards the live engine, move rudder and aileron in unison a little further in the direction they are already deflected. Be careful not to pull excessive up elevator to turn and forward stick may well be needed. Keep that speed up!

Use slightly more rudder than aileron movement here, letting the turn happen gently, and fairly flat. See **Fig 6b**. To leave the turn, relax the rudder/aileron throw and, consciously, keep the speed up. If

FIG. 6.



Lengths of arrows indicate the relative stick deflections for straight flight, and for turns with and against the live engine. The left engine is dead.

Regular BMFA Nationals Scale competitor Mike Trew has fielded a number of multi engine models. This one is his SIA (Skandinavisk Aero Industri) KZ IV - flew well!

Consolidate B-24J Liberator seen at the 'Warbirds over the Rockies' event in USA some year ago. Loss of one of the inboard engine will be less problematic that for one of the outers, while loss of two on one side would require a full shut-down and glide back.

De Havilland Mosquito's sharply tapered wings would be an added disadvantage in a one-engine-out situation. Keep the speed up - even with both running, a 'wheelie' landing is perhaps best with this type.

your model is very reluctant to turn towards the live engine, or, as many trainee twin flyers have discovered, refuses to turn in that direction at all, stop fighting it and use common sense instead; turn towards the dead engine, The model will be quite safe. Any and all advice which states otherwise is over restrictive, and quite wrong.

To turn towards the dead engine, you relax the rudder bias a little, and also relax aileron input if necessary **(Fig 6c)**. Some forward stick may well be essential. Keep that speed up! To return again to straight flight, or to 'S-turn' the other way, apply more rudder and aileron, and. keep that blinking speed up!

If, at any time, you begin to lose control, lose your cool or run out of ideas, then throttle back, centralise the sticks, push the nose down for more air speed, regain full control and then land. Then, have a think and discussion, before tanking up and taking off for another go. Practise makes perfect and eventually, steeply banked turns either way on asymmetric power will become possible.

ELECTRONIC ASSISTANCE WITH ASYMMETRIC FLIGHT

If you feel that the foregoing advice is too dicey to put into practise, but still desire to fly a twin and are happy to use technology to assist you during the crucial seconds following one engine cutting, you can always employ the idea I first saw mentioned by K. B. LeRichie.

Mr LeRichie used a helicopter gyro connected in the rudder channel, set at about half sensitivity and arranged to move the rudder to oppose the swing resulting from an engine failure.

Proven in frequent practice by Mr LeRichie, such a gyro has to be a very worthwhile addition to any twin, especially a big expensive one used for competition or at a public demonstration and resembles the yaw damper systems used on full size aeroplanes.

SUMMARY

It can be a straightforward exercise to fly a twin-engined model successfully with one engine dead. The best control configuration is with rudder and aileron applied in the same direction towards the live engine, with sufficient aileron input to produce a bank angle of around 10 degrees, enough rudder to get the model flying straight initially and with some forward pressure on the elevator stick to keep the nose from rising and causing loss of speed. When it becomes necessary to turn the model, it is easier to turn it towards the dead engine by gently relaxing the pressure on the rudder and aileron sticks, rather than trying to force the model to turn into the live engine using larger (and drag-increasing) rudder/aileron inputs. If, at any time, the model seems likely to diverge from the required flight path, one needs to increase speed by diving the model and one might even have to throttle back the live engine for a short while to reduce its yawing effect until full control can be regained.

Contrary to conventional wisdom regarding engines rotating the same way as with our model ones, this experimenter found that his twins (DH Hornet and P-38 Lighting) flew better when the starboard engine remained running, rather than when the left one stayed alive. Provided that balanced flight could be attained, either engine-out situation was safe to handle.

AND FINALLY

It is always likely, of course, that not all twins will behave exactly as described above. So, if the pilot of a twin has any doubts about continuing a flight on one engine, his sensible course of action will always be to reduce power on the live engine to an amount which is just right for prolonging the glide of the model and performing a safe circuit and landing. ■

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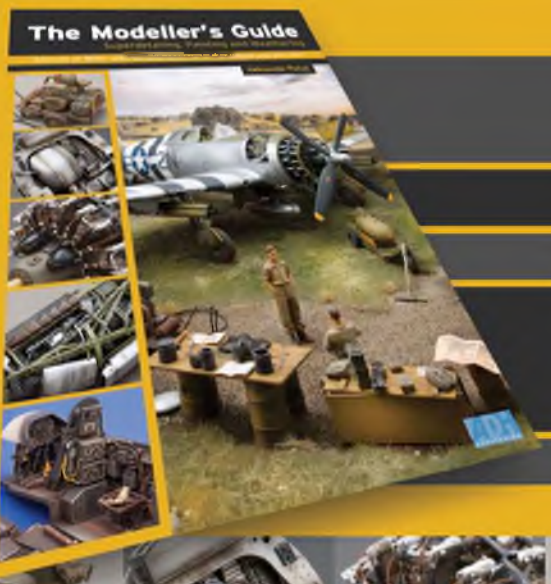

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ASHBOURNE SCALE DAY 2015

A HUGE ATTENDANCE AND A GREAT RANGE OF FLYING SCALE MODELS

Ashbourne has rapidly established itself as the hot ticket for Clubman Scale events.

It is not far from the centre of the country. It enjoys very good road and motorway communications, and it is a low-hassle /high enjoyment day out. Flying is continuous, but there are no queues on the flight line, no Jobsworths in sight, and the atmosphere is always effortlessly friendly.

Of course, this does not happen by accident. The Ashbourne Club set the 'Can-Do' tone and the visiting flyers carry the tune.

Grass or Tarmac

Of great interest to scale flyers, Ashbourne offers both grass and tarmac. This means that everything from hand-launching a foamie, to a heavy-metal jet take-off, is viable. In turn this attracts a broad range of pilots. The autumnal mist expected all day did not drift in, and the daylight was lovely so late in the year.

It wasn't even too chilly. People were still flying after four pm. Not bad when you consider that many had a long way to go home. True, it is probably the last

Lindsay Todd's Spitfire The King Rufus, as flown by his uncle during WWII.

Stuart Knowle's Fokker DR1 Lola from the Balsa USA kit.

Jez Harris's Super Cub PA 18 modelled on the example from the Shuttleworth Collection.

Peter Smedley's DH 60 from the Ripmax ARTF. 882 span, Zenoah 38 power, driving an 18"x12" prop.

Topflight kit-built Thunderbolt, 85" span, Zenoah 62 power, owned by Chris Berry. Robarts retracts.

Clubman Scale event in the annual scale calendar, but I am sure that many pilots felt it was their last outdoor meeting before winter.

Attendance was superb. When I finally got around to doing a count in the pits it was gone four pm, so some pilots had already left. Astoundingly, I counted 127 models remaining.

Hawker Tempest V

Since this is a photo report, I will let the snaps tell their own tale. However, one or two models merit a brief mention. The first that caught the eye was Karl Mander's impressively large sport-scale Hawker Tempest V. She is 124" span, weighs 22 kgs, and is powered by an astounding home-contrived Zenoah in-line petrol twin. This comprises two Z62s on a common shaft. To give you some idea of the waft, she drives a 34"x12" prop.

The Tempest flies with great authority and the meaty sound is exquisite. If the name rings a bell, this is because, as far back as 2006, we did mentioned Karl's utterly fascinating 1:3.9 scale Dornier Do.335. This beast was fitted with a spectacular power system. In that case, a Quadra 100 up front, and a shaft-driven Zenoah 62 to the rear.

Hild Marshonet

Noted scale designer Tim Hooper flew his astounding scratch-built AW FK 01 Quadraplane, as featured in FSM last month. He also brought along another own-design, a very rarely-modelled Hild Marshonet. This delicate-looking, dragonfly-like aircraft was intriguing. Unfortunately, I was facing the wrong way when she attempted her take-off in a tricky cross wind. I only managed to get a shot of her on her nose! This is a fascinating scale subject to which I will return with a full Walkaround at a later date.

Thunderbolt

Originally built by Ozyray Peters, but now flown by Chris Berry, this bubbletop 'Jug' was hand-built from the celebrated TopFlite kit. She is 85" in span, and has Zenoah 62 petrol power. This is a very fine scale model, beautifully finished, and really looks the part in the air.

Druine Turbulent

Anthony Hill flew his own-design bright red 1/2 scale Turbulent. This monster is powered by a DLE 116 petrol engine, driving a 27"x10" prop. At this sort of scale, detailing can be very crisp, so she looks exactly like a full-size home-built. If you have never hankered after a Turbulent you are not a true scale modeller.

Thunderbolt from Japan

The Mitsubishi JM2 'Raiden' (Thunderbolt) entered service with the Imperial Janapese Army Air Force in 1942 and was promptly given the Allied identification code of *'Jack'*. The Raiden is rarely modeled, so it was interesting to see this one in the pits - although, unfortunately, it did not fly.

This one is owned by well-known Dawn Patrol pilot, Matt Harrowven and there is

With three or four up in most slots, it was very pleasant viewing.

an outside chance that it might fly at Dickie Scarbrough's much loved Xmas Warbird Bash in December, so I will keep my eyes peeled. If the stars align, watch this space.

Doppel Stuka

There were two Nick Ziroli designed Junkers Ju87 Stukas at Ashbourne. Both spanned 100" and, luckily, were in different colour schemes. Neil Armstrong flew the one with a desert scheme, while Richard Curry Peace flew the one in the Eastern Front scheme. Later in a steep dive, Richard's Stuka lost her metal spinner, but flew on safely.

Piper Pacer

Chris Poyser has flown his surprisingly rarely-modelled Piper PA-22 Tri-Pacer for a few seasons. Recently though, he decided to retro-modify it to a tail dragger in the form of the PA-20 Pacer that chronologically pre-dated the PA-22 in the the Piper scheme of things. He then found out that the original subject had also been so modified. How's that for scale fidelity?

Chris' model is built to the Wendell Hosteler plan. A few years ago I had the

John Braithwaite's well known Little Toot bustling in.

Richard Daigleish's Brian Taylor Corsair. Built to 1/6th scale, weighs 19 lbs, and is powered by a laser 200V Twin, driving an 18"x8" prop.

Tony Hill's PZL Wilga, 1/3rd scale / 3.5 metres in span. DLE 170 petrol engine driving a 33"x10" prop.

Piper L-4 Grasshopper. 1/3rd scale, flown by 'Tony Hill. Recently recovered in Solartex.

Tim Hooper's electric powered 80" span Armstrong Whitworth FK 01 with an open hatch.

One of the best scale models on the circuit, the Chris Peers / Spartacus own-design 1062 span Firefly. ZDZ 70 power. Weighs 41lbs.

Tim Hooper's pretty own design Hild Marshonet bit the tarmac and lost a tyre. Not damaged.

A great variety of models graced the pits.

Matt Harrowven's nifty Japanese Raiden spotted in the pits.

Dennis Richardson's elegant Macchi Folgore. 72" span, weighs 12 lbs, Laser 150 power, driving a 16"x82 prop.

There was even scale glider towing!

Neat instrument panel on this 1/3rd scale Turbulent flown by 'Tony Hill.

privilege to fly in one. It felt a surprisingly modern aeroplane for its age. Inside it was quite car-like, with some nice touches of Americana, like a white-rimmed steering wheel.

Jungmeister

There was an immaculate Bucker Jungmeister being flown by a tall gent at the end of the flight line. Little did I know that its pilot was no other than Gordon Whitehead. Aye, THE Gordon Whitehead who wrote the best book on scale modelling that will ever be written in this, or any other available Universe! *'Radio Control Scale Model Aircraft: Models For Everyday Flying'* is the classic text for all traditional radio modellers. Utterly practical and amazingly clear, it is a gem. You can still find a used copy on Amazon UK or eBay UK, if you look closely enough. I bought my first copy in 1980. I have three now, in various states of perusal from 'dog-eared', through 'well thumbed', right on to 'sunday best'.

Truthfully, despite moving house, and starting a family, I have had a copy of this book by my bed since 1980. I had a chat with The Master and he does not disappoint. A great modeller, a great communicator, and a lovely man.

Piper Super Cub

The Super Cub often plays second fiddle to her older sister. However, Jez Harris's large PA 18 was very impressive, modelled on the example from the Shuttleworth Collection - the one that has been known to indulge in a bit of flour bombing at Old Warden.

Chris Poyser's PIPER PA-20 Pacer started life as a PA-22 Tri-Pacer from the Wendell Hosteler plan. Now retro=modified modified to tail-dragger. configuration. 3 metre span, weighs 40 lbs, powered by a Zenoah 80cc flat twin.

MAN & MACHINE!: Gordon Whitehead's truly immaculate own-design Jungmeister. Gordon seen at right.

Two Zenoah 62s in-line take some restraining! Karl Mander's Tempest V.

Just part of the pits first thing in the morning. Packed by lunchtime.

I counted 127 models in the pits at four pm.

Neil Armstrong flew his lovely Stuka from the Nic Ziroli plan. 100" span, DLE 55 petrol power, driving a 24"x8" prop.

Richard Curry Peace's impressive Stuka from ther Nic Ziroli plan. Later on in this same dive it lost its spinner!

Jez's Cub really does look convincing in flight. Unfortunately, the packed flightline was hectic all day, so I will have to quiz Jez at a later date for more details.

PZL Wilga

There was even some scale glider towing at Ashbourne. One of the tugs was Tony Hill's PZL Wilga. The Wilga is a wonderfully quirky, highly utilitarian STOL aircraft from Poland, the first of which flew as long ago as 1962, though I always think they look starkly modern. An interesting bit of full-size Wilga trivia is that the Russian- built engine rotates in the opposite sense to American light aircraft (well it would woudn't it!). Tony's smart model is built to 1/3rd scale and spans a hefty 3.5 metres. She is powered by a DLE 170 petrol engine driving a 33"x10" prop. Needless to say she has no shortage of power or lift. A very interesting aircraft. A great scale subject to go on your Winter Project List, perhaps?

The Verdict

To be truthful, it felt like The Old Days of big scale meetings and a diversity of aircraft types. Well over a hundred models in a lively pits, with every sort of scale subject you can imagine buzzing by. One scale modeller I spoke to had come down all the way from Bonnie Scotland. The flying was continuous, the camaraderie was blissful, and the weather was benign.

There was also superb food - never to be overlooked on a brisk autumn day outdoors. Chef John Lewis worked tirelessly to feed us all. His North Staffordshire Oat Cakes are rightly legendary. Stuffed with melted cheese, sausage, and bacon, they fortified the inner man for the whole day.

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SCALE FROM SCRATCH

PART 11: KEN SHEPPARD RECHES THE END OF HIS SERIES TO ENCOURAGE OWN-DESIGN SCALE MODELS

PART 11: A ROCKY ROAD... TO SUCCESS?

Last month the model flew for the first time and suffered retract problems on our grass strip - a take off dolly was made - but how did it work? More problems awaited around the corner.

In this last part, resolution, of sorts! And I reflect on this very enjoyable project.

DOLLY DROP

A major setback to the project occurred at Old Warden when a pile-in after loss of radio (more on this later) took the nose off the Do335 right back to the front of the wing. The design philosophy of the core lite-ply flat-sided box fuselage paid off however, and a rebuild of the nose was not difficult, using birch ply doublers to graft new box sides to the remaining structure. The day before the nose came to pieces, the Do335 had jumped out of the dolly on the bumpy Old Warden peri track flightline damaging the cowl. Luckily for me, fellow modeller Dave Rayner was visiting the show and he's a professional model maker with his company *3D Services Ltd*. He volunteered to turn up a blank using the dimensions from the damaged cowl and vac form a replacement from ABS - in fact he did three! The canopy had taken a battering too, but as Graham Iredale still had the master blank, he was able to make another couple for me, so within two weeks, following what seemed at the time, a complete disaster, the Do 335 was ready to go again - what a friendly, helpful bunch modellers are!

I incorporated a few mods in the rebuild along the way, naturally! As I was going to continue with the dolly (it had worked OK, after all) and leave the retracts safely locked up, I rotated the RCV 58CD clockwise on the firewall to protect the silencer which would have been the first thing to contact terra firma in the belly landing. I also replaced the noseleg and wheel with an equal weight of lead sheet and used the mounting beams to support a wire skid, so that when landing, the nose would be kept off the ground. In for a

Photo of a two seat Do335 are pretty rare - this is no. 112 captured by the Allies at the end of the war. (Photo courtesy Bernard & Graefe).

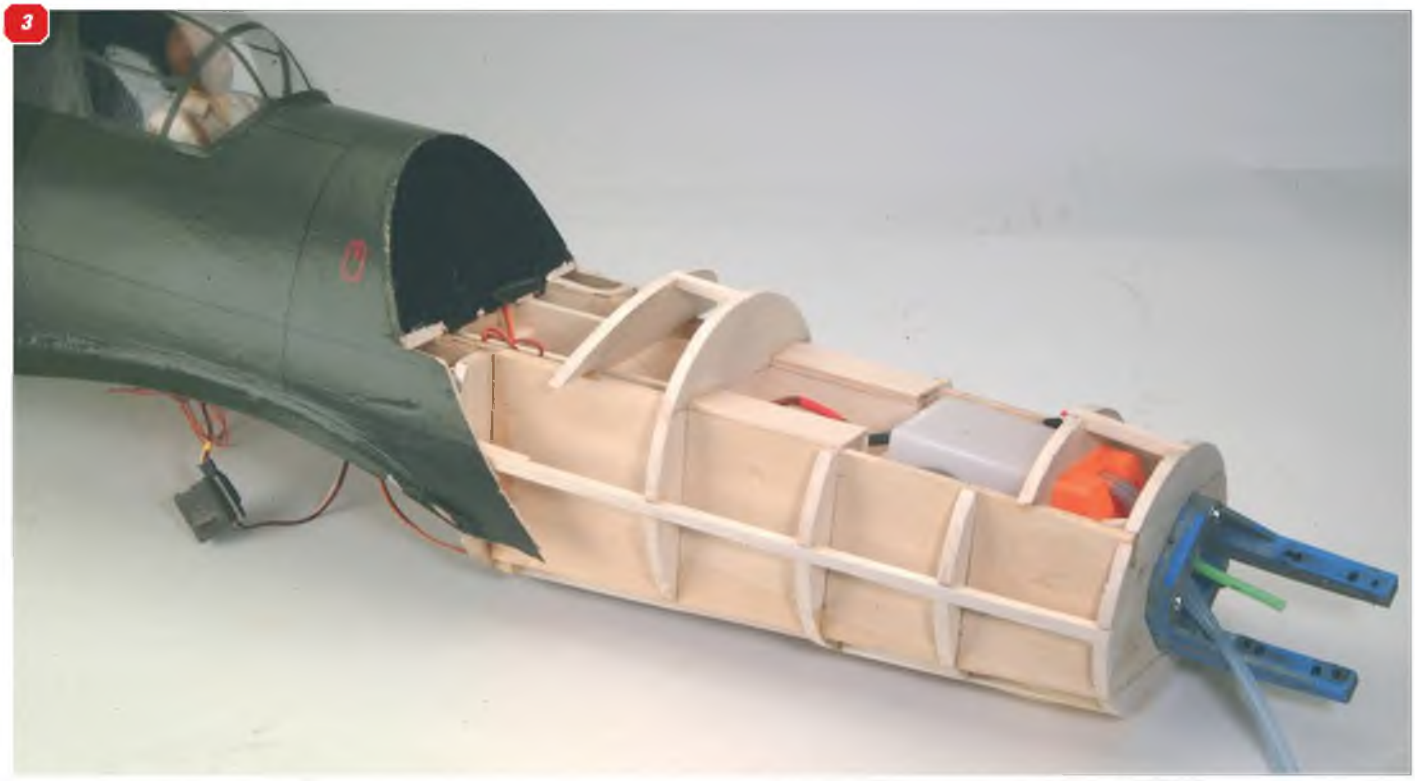
1: A photo of the full-size cockpit shows clearly that the width of my model fuselage is too wide - the apex of the front canopy has a much tighter radius. (Photo courtesy Bernard & Graefe). 2: Look no nose! A major setback at Old Warden - RF interference caused vertical return to terra firma - and matchwood! 3: Not to be deterred, a new nose was soon grafted on.

penny, in for a pound, if I was going the 'dolly/bellyflop' route, I might as well try to keep the wings from digging in on landing, so fitted thin wire skids under each wing tip. Not scale, I hear the purists shout - too bad, it's a practical solution that works - and they're invisible in the air anyway!

IN THE AIR - AGAIN?

In order to get some flying shots to prove that she does actually fly well, the Do335 was taken to Baldock for the North London MFC Open Scale Day. Knowing that she needed a long take off run into wind to get off the dolly, it was disappointing that the wind was at 90 degrees across the strip, too narrow for a prolonged run - I opted to go for a diagonal run - but no luck, just a long embarrassing run across the grass. Disappointing.

Whilst the thrust of the Twister 19 is impressive, I reckon it can be improved by using a larger diameter, or increased pitch, prop. The problem was that commercial pusher prop sizes are somewhat limited in both diameter and pitch - the answer would be, I guess, to carve one myself, but that seemed a little outside my envelope!. The other alternative would be to increase the grunt at the front, by fitting a larger capacity four-stroke. Increasing from .58 to .65 would certainly help in the take-off acceleration department. As I had an ASP .65FS without a home, the latter option was a ready experiment. I also had a couple of spare cowls, courtesy of Dave



4: One end of the replacement harness - gold connectors, large diameter flux ring and twisted cable between motor and Esc - a combination that worked! 5: The original damaged cowl and the excellent replacement moulding made by Dave Rayner (see text). 6: Ready for final painting. Note the rotation of the RCV from the original position to protect the silencer in a belly landing.

Rayner, I could hack the one fitted to the RCV 58CD to fit the taller head of the ASP 65 and fit a new one when the RCV was replaced later, to check out the electric prop change.

RF INTERFERENCE

The ASP 65FS-engined '335 took to the air a few days later. The increase in power certainly did the trick and she rose off the dolly in a fairly short run. After a circuit at what was approximately half throttle, I opened her up and set up for a few low fast passes - fine at close range, but as she turned away and the range increased, massive glitching occurred - just on ailerons - I guess the elevator gyro was earning its keep! Shutting the throttle brought her back to steady flight - and at that point I should have turned her into wind and brought her in, but I continued in the circuit at reduced throttle. At the bottom of the circuit (furthest range) I opened the throttle up, as the speed was bleeding off too quickly - and she became uncontrollable again. Luckily, if not belatedly, I grasped that the combination of max power and long range were causing the problem, so I once again lowered the throttle and tried to regain some sort of control, but no such luck; for the second time in two weeks, the Dornier bit the dust. Again, the big man in the sky was watching over me and, having approached the model though the one foot high crop, I could see that she was miraculously still in one piece, with just the top of the fuselage crushed - superficial damage only!

Reflecting on the flight (and previous flights) led to the following conclusions :-

The one-metre-long electric motor harness was generating large amounts of RF interference - the more current going through it (up to 40A), the greater the level of interference.

Despite being outside the fuselage, the 35MHz aerial was running almost parallel to the harness. I had been extremely lucky on previous 'no incidents' flights (3) because they had been flown at less than

full power and at closer range. The Old Warden 'arrival' happened at the farthest corner of the circuit, in a similar position as the second 'incident'.

Consensus of advice to resolve this situation was as follows:

1) Remove the motor harness and twist the three cables in a spiral along its full length.

2) Fit chokes (large diameter) on the harness a) at the motor and b) close to the where the harness passes the Rx.

3) Fit a choke on the lead between the esc and the Rx.

4) Replace all harness connectors with 4mm gold connectors.

5) Re-route the aerial to be as far away from the harness as possible.

This would hopefully eliminate the RF interference. In addition, the need to have separate throttle controls for both the IC and EP motors had become a necessity. I would retain the Tx throttle stick for the IC motor and connect the esc to a spare channel, operated by a proportional knob on the Tx, so that I could switch in the EP for take-off and fast passes and lower the rear power for cruise/landing.

(Note that this was written several years ago, before the emergence of 2.4GHz, which would have solved the interference problem outright!)

INTO THE UNKNOWN

This project has shown me that when you design your own, it doesn't always work perfectly first time - however, the flights to date had proved that perseverance with the project was worth the effort.

I needed to go to maximise available thrust, eliminate the RF interference and sort out the retracts - it's turned into a real a challenge - but that's where I came from at the start of the series - designing your own scale model is challenging - and when you finally get it right, there's no greater aeromodelling feeling! I've just got a bit further to go, that's all!

LESSONS LEARNED

It's been a steep learning curve combining both IC and EP in one package - the problem with RF interference was not anticipated and took two partial re-builds to get to the state where I thought I had the answers - yet to be proven.

First and foremost, choose a prototype that is practical in ALL respects. With the Do335, despite problems of the push-pull thrust considerations, the Achilles heel for a truly scale model of the Do.335 is the undercarriage. The legs are long, the wheels relatively small - both obvious potential problems for small model off grass operation. Having seen it in the air 'clean', there's no way that I would fly it with a fixed U/C again though - horrible!

Regarding power-to-weight-to-wing loading calculations, the potential power is more than adequate, but in hindsight, it would have benefited me best to have experimented with the Twister to find the optimum prop dimensions, at the beginning - I think that this would have saved me a lot of grief - and time! (The black art of electric power has moved on incredibly since this was written and so getting the optimum power is no longer a problem!)

On the plus side, the aerodynamics of the airframe design are good - she flies and flies well - ignoring the RF interference - so I'm satisfied that my design considerations and calculations have worked out OK. More than OK, I'm pretty chuffed with it!

The practicality of combining EP with IC with the unusual layout of the Do335 has almost been proven, and being able to use the battery pack to fine-tune the CG position without adding extra ballast is a real bonus.

MOVING ON TO THE PRESENT...

The advent of 2.4GHz and universal use of EP has definitely changed the success factors, I think! However, as the airframe is pretty well intact after all these years (series originally written in 2004) I think I'll give another go over the coming months.

I've had several enquiries about whether I am going to publish the plan. The short answer is no. I'm not 100% happy with the retractable undercarriage and interference situation and later documentation has shown that my fuselage cross section is too wide (it's way down the build list, however), but I would not like my errors to be published as is. If anyone is really serious about building one, then I will consider letting them have a copy of my drawings (not fully detailed) for cost of copying and postage - the rest is up to them. ■

7: The bumpy peri track at Old Warden caused the model to bounce out of the dolly, aborting several take off attempts.

8: The bigger capacity ASP 65FS fitted to give more oomph for the take off run - the height difference between conventional 4-strokes and the RCV CD motor is obvious - the RCV 58CD was totally enclosed in the cowl!

9: A reference book that give invaluable Do335 documentation for this (and future) project, found on the internet.

10: See - she does fly, honest! What a feeling when all your efforts culminate in this!

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